

**REGAL**

## MD100G Series, Low Voltage, IP66

### Variable Frequency Drive

Brief Manual



**marathon**<sup>™</sup>  
Drives

A Regal Brand

**REGAL**

[www.regalaustralia.com.au](http://www.regalaustralia.com.au)



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

\* MARATHON DRIVES-MD100G is the official name for MD100G.

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



V1

# 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, T1
- 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.
- Do not operate Disconnect Switch when motor is operating.

### Note

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

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Preparing the Installation .....</b>                                   | <b>1</b>  |
| 1.1      | Product Identification.....   | 1         |
| 1.2      | Part Names.....   | 3         |
| 1.3      | Installation Considerations.....  | 5         |
| 1.4      | Selecting and Preparing a Site for Installation.....                      | 6         |
| 1.5      | Cable Selection.....  | 9         |
| <b>2</b> | <b>Installing the Inverter .....</b>                                      | <b>11</b> |
| 2.1      | Mounting the Inverter .....   | 13        |
| 2.2      | Cable Wiring .....  | 17        |
| 2.3      | Post-Installation Checklist.....  | 32        |
| 2.4      | Test Run .....  | 33        |
| <b>3</b> | <b>Learning to Perform Basic Operations .....</b>                         | <b>37</b> |
| 3.1      | About the Keypad.....   | 37        |
| 3.1.1    | About the Display .....   | 38        |
| 3.1.2    | Operation Keys.....   | 39        |
| 3.1.3    | Control Menu .....  | 40        |
| 3.2      | Learning to Use the Keypad.....   | 41        |
| 3.2.1    | Group and Code Selection.....   | 41        |
| 3.2.2    | Navigating Directly to Different Codes.....                               | 42        |
| 3.2.3    | Setting Parameter Values.....   | 43        |
| 3.2.4    | Configuring the [ESC] Key .....   | 44        |
| 3.3      | Actual Application Examples .....   | 45        |
| 3.3.1    | Acceleration Time Configuration.....                                      | 45        |
| 3.3.2    | Frequency Reference Configuration.....                                    | 46        |
| 3.3.3    | Jog Frequency Configuration.....  | 48        |
| 3.3.4    | Initializing All Parameters.....  | 48        |
| 3.3.5    | Frequency Setting (Keypad) and Operation (via Terminal Input) .....       | 51        |
| 3.3.6    | Frequency Setting (Potentiometer) and Operation (Terminal Input)<br>..... | 52        |
| 3.3.7    | Frequency Setting (Potentiometer) and Operation (Keypad) .....            | 53        |



|          |  |           |
|----------|--|-----------|
| 3.4      | Monitoring the Operation .....   | 56        |
| 3.4.1    | Output Current Monitoring.....   | 56        |
| 3.4.2    | Fault Trip Monitoring.....   | 57        |
| <b>4</b> | <b>Learning Basic Features.....</b>  | <b>59</b> |
| 4.1      | Setting Frequency Reference.....   | 62        |
| 4.1.1    | Keypad as the Source (KeyPad-1 setting).....   | 62        |
| 4.1.2    | Keypad as the Source (KeyPad-2 setting).....   | 62        |
| 4.1.3    | V1 Terminal as the Source.....   | 63        |
| 4.1.4    | Setting a Frequency Reference with Input Voltage (Terminal I2).....                    | 70        |
| 4.1.5    | Setting a Frequency with TI Pulse Input.....   | 70        |
| 4.1.6    | Setting a Frequency Reference via RS-485 Communication.....                            | 72        |
| 4.2      | Frequency Hold by Analog Input.....  | 72        |
| 4.3      | Changing the Displayed Units (Hz↔Rpm).....   | 73        |
| 4.4      | Setting Multi-step Frequency .....   | 73        |
| 4.5      | Command Source Configuration.....  | 76        |
| 4.5.1    | The Keypad as a Command Input Device.....  | 76        |
| 4.5.2    | Terminal Block as a Command Input Device (Fwd/Rev Run<br>Commands).....                | 76        |
| 4.5.3    | Terminal Block as a Command Input Device (Run and Rotation<br>Direction Commands)..... | 77        |
| 4.5.4    | RS-485 Communication as a Command Input Device.....                                    | 78        |
| 4.6      | Local/Remote Mode Switching.....   | 78        |
| 4.7      | Forward or Reverse Run Prevention .....  | 80        |
| 4.8      | Power-on Run.....  | 81        |
| 4.9      | Reset and Restart.....   | 81        |
| 4.10     | Setting Acceleration and Deceleration Times.....                                       | 82        |
| 4.10.1   | Acc/Dec Time Based on Maximum Frequency.....   | 82        |
| 4.10.2   | Acc/Dec Time Based on Operation Frequency.....   | 85        |
| 4.10.3   | Multi-step Acc/Dec Time Configuration.....   | 85        |
| 4.10.4   | Configuring Acc/Dec Time Switch Frequency.....   | 87        |
| 4.11     | Acc/Dec Pattern Configuration .....  | 88        |
| 4.12     | Stopping the Acc/Dec Operation.....  | 91        |



|          |  |            |
|----------|--|------------|
| 4.13     | V/F(Voltage/Frequency) Control .....                                 | 91         |
| 4.13.1   | Linear V/F Pattern Operation.....                                    | 91         |
| 4.13.2   | Square Reduction V/F pattern Operation.....                          | 92         |
| 4.13.3   | User V/F Pattern Operation .....                                     | 93         |
| 4.14     | Torque Boost.....  | 94         |
| 4.14.1   | Manual Torque Boost .....  | 94         |
| 4.14.2   | Auto Torque Boost.....   | 95         |
| 4.15     | Output Voltage Setting .....   | 95         |
| 4.16     | Start Mode Setting.....  | 96         |
| 4.16.1   | Acceleration Start.....  | 96         |
| 4.16.2   | Start After DC Braking.....  | 97         |
| 4.17     | Stop Mode Setting.....   | 97         |
| 4.17.1   | Deceleration Stop .....  | 97         |
| 4.17.2   | Stop After DC Braking.....   | 98         |
| 4.17.3   | Free Run Stop.....   | 99         |
| 4.17.4   | Power Braking.....   | 100        |
| 4.18     | Frequency Limit.....   | 100        |
| 4.18.1   | Frequency Limit Using Maximum Frequency and Start Frequency<br>..... | 101        |
| 4.18.2   | Frequency Limit Using Upper and Lower Limit Frequency Values         | 101        |
| 4.18.3   | Frequency Jump.....  | 102        |
| 4.19     | 2 <sup>nd</sup> Operation Mode Setting.....                          | 103        |
| 4.20     | Multi-function Input Terminal Control .....                          | 104        |
| 4.21     | P2P Setting.....   | 105        |
| 4.22     | Multi-keypad Setting.....  | 106        |
| 4.23     | User Sequence Setting .....  | 107        |
| 4.24     | Fire Mode Operation .....  | 115        |
| <b>5</b> | <b>RS-485 Communication Features.....</b>                            | <b>117</b> |
| 5.1      | Communication Standards.....   | 117        |
| 5.2      | Communication System Configuration.....                              | 117        |
| 5.2.1    | Communication Line Connection.....                                   | 118        |
| 5.2.2    | Setting Communication Parameters .....                               | 118        |



|          |  |            |
|----------|--|------------|
| 5.2.3    | Setting Operation Command and Frequency.....                 | 120        |
| 5.2.4    | Command Loss Protective Operation.....                       | 121        |
| 5.2.5    | Setting Virtual Multi-Function Input .....                   | 121        |
| 5.2.6    | Saving Parameters Defined by Communication .....             | 122        |
| 5.2.7    | Total Memory Map for Communication .....                     | 123        |
| 5.2.8    | Parameter Group for Data Transmission .....                  | 123        |
| 5.2.9    | Parameter Group for User/Macro Group .....                   | 124        |
| 5.3      | Communication Protocol.....                                  | 125        |
| 5.3.1    | LS INV 485 Protocol.....                                     | 125        |
| 5.3.2    | Modbus-RTU Protocol .....                                    | 130        |
| 5.4      | Compatible Common Area Parameter.....                        | 134        |
| 5.5      | MD100G Expansion Common Area Parameter .....                 | 137        |
| 5.5.1    | Monitoring Area Parameter (Read Only).....                   | 137        |
| 5.5.2    | Control Area Parameter (Read/ Write).....                    | 142        |
| 5.5.3    | Inverter Memory Control Area Parameter (Read and Write)..... | 144        |
| <b>6</b> | <b>Table of Functions .....</b>                              | <b>147</b> |
| 6.1      | Operation Group .....  | 147        |
| 6.2      | Drive group (PAR→dr) .....                                   | 149        |
| 6.3      | Basic Function group (PAR→bA).....                           | 154        |
| 6.4      | Expanded Function group (PAR→Ad).....                        | 159        |
| 6.5      | Control Function group (PAR→Cn).....                         | 164        |
| 6.6      | Input Terminal Block Function group (PAR→In).....            | 169        |
| 6.7      | Output Terminal Block Function group (PAR→OU).....           | 175        |
| 6.8      | Communication Function group (PAR→CM) .....                  | 179        |
| 6.9      | Application Function group (PAR→AP).....                     | 184        |
| 6.10     | Protection Function group (PAR→Pr) .....                     | 187        |
| 6.11     | 2nd Motor Function group (PAR→M2).....                       | 192        |
| 6.12     | User Sequence group (US).....                                | 195        |
| 6.13     | User Sequence Function group(UF) .....                       | 198        |
| 6.14     | Groups for LCD Keypad Only.....                              | 218        |
| 6.14.1   | Trip Mode (TRP Last-x).....                                  | 218        |



|  |            |
|--|------------|
| 6.14.2 Config Mode (CNF).....              | 218        |
| <b>7 Troubleshooting .....</b>             | <b>223</b> |
| 7.1 Trips and Warnings .....               | 223        |
| 7.1.1 Fault Trips .....                    | 223        |
| 7.1.2 Warning Messages .....               | 226        |
| 7.2 Troubleshooting Fault Trips.....       | 227        |
| 7.3 Troubleshooting Other Faults.....      | 229        |
| <b>8 Maintenance.....</b>                  | <b>235</b> |
| 8.1 Regular Inspection Lists .....         | 235        |
| 8.1.1 Daily Inspections .....              | 235        |
| 8.1.2 Annual Inspections .....             | 236        |
| 8.1.3 Bi-annual Inspections .....          | 238        |
| 8.2 Storage and Disposal.....              | 238        |
| 8.2.1 Storage .....                        | 238        |
| 8.2.2 Disposal.....                        | 239        |
| <b>9 Technical Specification .....</b>     | <b>241</b> |
| 9.1 Input and Output Specification .....   | 241        |
| 9.2 Product Specification Details .....    | 245        |
| 9.3 External Dimensions (IP 66 Type) ..... | 248        |
| 9.4 Peripheral Devices.....                | 253        |
| 9.5 Fuse and Reactor Specifications .....  | 254        |
| 9.6 Terminal Screw Specification.....      | 255        |
| 9.7 Braking Resistor Specification.....    | 257        |
| 9.8 Continuous Rated Current Derating..... | 258        |
| 9.9 Heat Emmission .....                   | 260        |
| <b>Product Warranty.....</b>               | <b>261</b> |
| <b>Index .....</b>                         | <b>269</b> |



# 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.

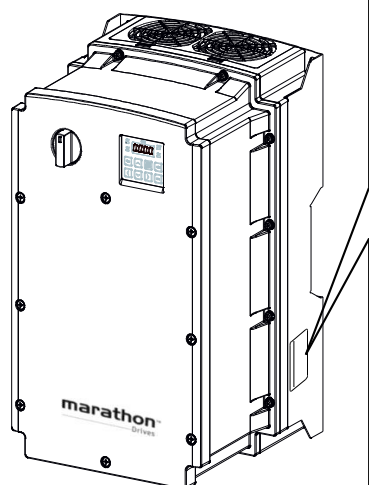
## 1.1 Product Identification

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 [241](#).

### Note

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





|                            |                       |               |            |
|----------------------------|-----------------------|---------------|------------|
| <b>MDLV0055100G-4EXFNS</b> |                       |               |            |
| <b>INPUT</b>               | 380-480V              | 3 Phase       | 50/60Hz    |
|                            | HD: 11.0A             |               |            |
| <b>OUTPUT</b>              | 0-Input V             | 3 Phase       | 0.01-400Hz |
|                            | HD: 12A               |               |            |
|                            | 9.1kVA                |               |            |
|                            | Ser. No 55025310146   |               |            |
|                            | Inspected by D. K. YU |               |            |
|                            | KCC-REM-LSR-XXXXXXX   |               |            |
| <b>marathon™</b><br>Drives |                       | Made in KOREA |            |

Model name

Power source specifications

Output specifications

## MDLV 0055 100G - 4EXFNS

Motor capacity

|               |               |
|---------------|---------------|
| 0004 - 0.4KW  | 0055 - 5.5KW  |
| 0008 - 0.75KW | 0075 - 7.5KW  |
| 0015 - 1.5KW  | 0110 - 11KW   |
| 0022 - 2.2KW  | 0150 - 15KW   |
| 0037 - 3.7KW  | 0185 - 18.5KW |
| 0040 - 4.0KW  | 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  
X - IP66

EMC filter

F - Built-in EMC  
N - Non-EMC

Reactor

N - Non-Reactor

I/O

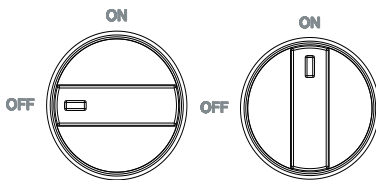
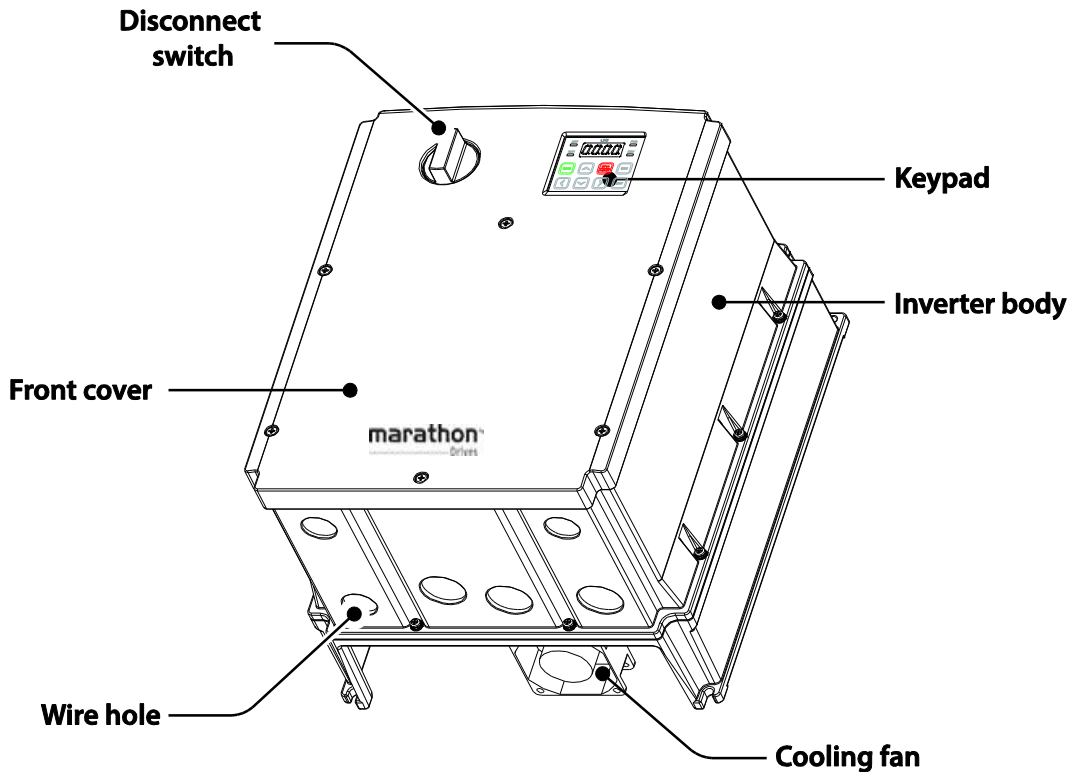
M - 3.5mm  
S - 5mm



## 1.2 Part Names

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

### Full product

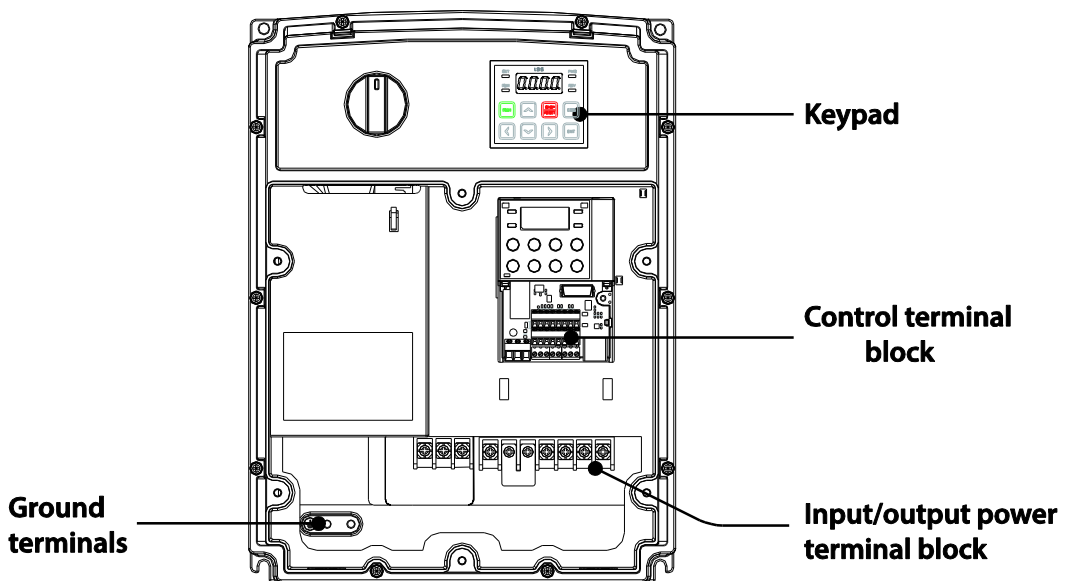


### ⚠ Caution

Do not operate Disconnect Switch when motor is operating.  
Cooling fan is only supported to 5.5~7.5kW products.



### Front cover removed



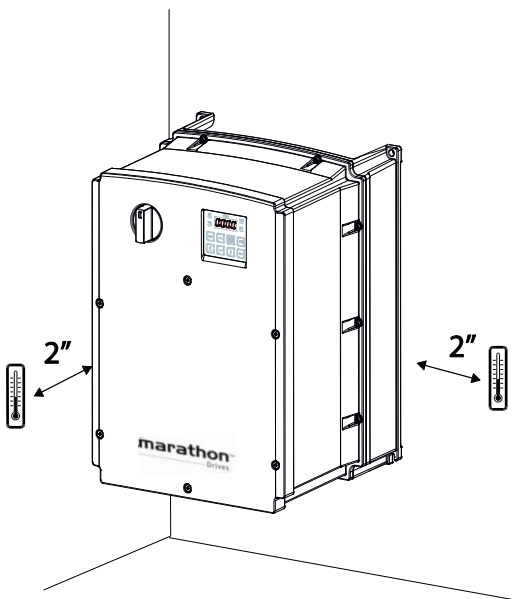


# 1.3 Installation Considerations

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

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

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



## ⚠ Caution

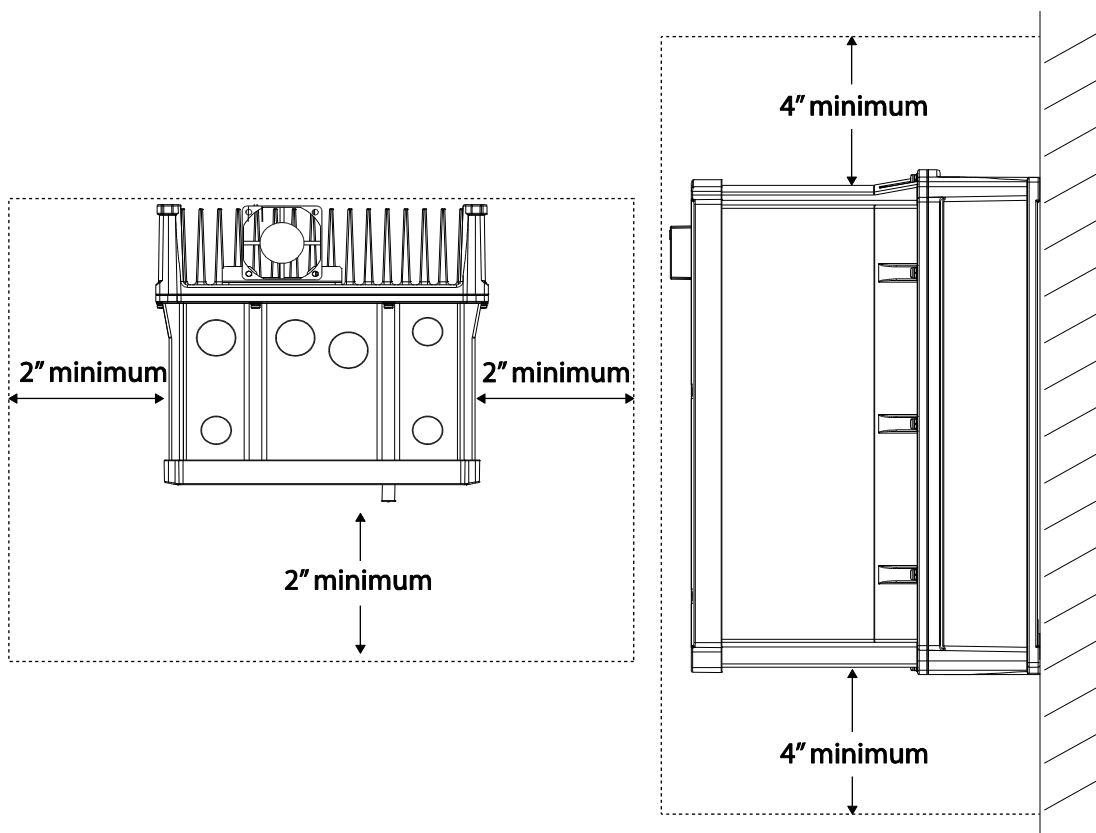
Do not allow the ambient temperature to exceed the allowable range while operating the inverter.



### 1.4 Selecting and Preparing a Site for Installation

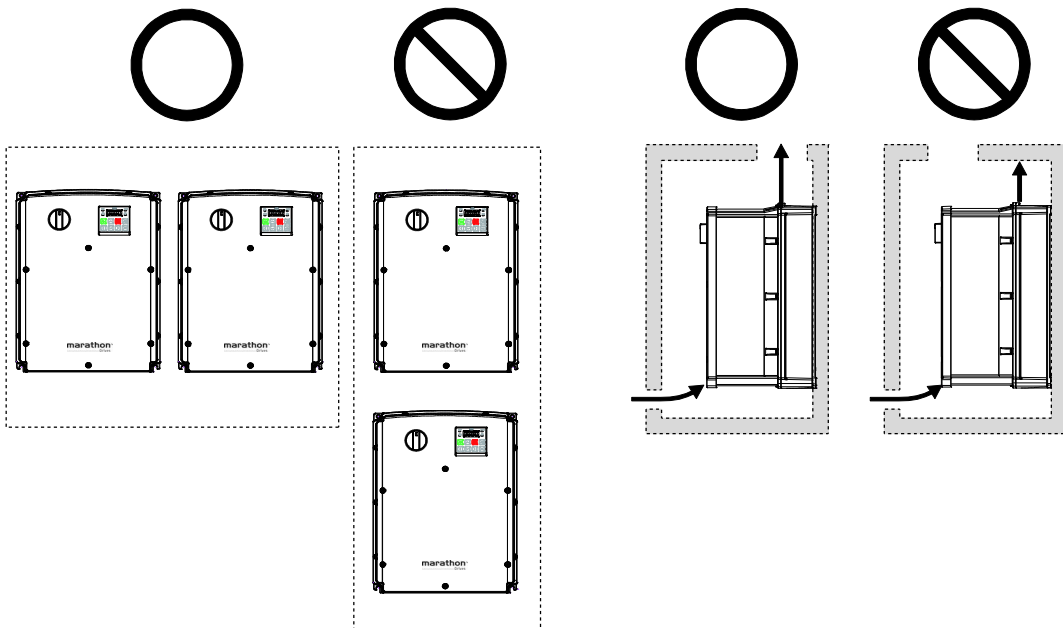
When selecting an installation location consider the following points:

- 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.





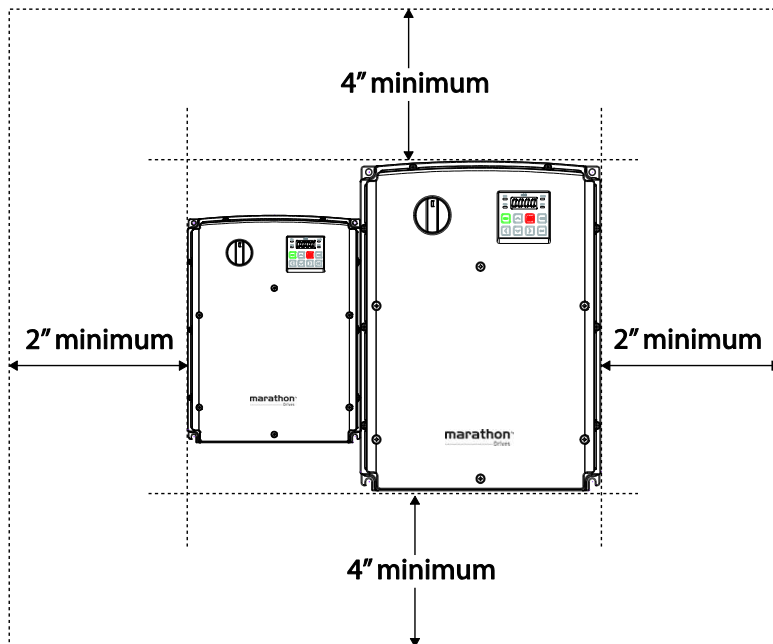
- Ensure sufficient air circulation is provided around the inverter when it is installed. If the inverter is to be installed inside a panel, enclosure, or cabinet rack, carefully consider the position of the inverter's cooling fan and the ventilation louver. The cooling fan must be positioned to efficiently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





## Preparing the Installation

- 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 <sup>2</sup> | AWG | mm <sup>2</sup> |       | AWG   |       |
|              |      |                 |     | R/S/T           | U/V/W | R/S/T | U/V/W |
| 3-Phase 200V | 0.4  | 3.5             | 12  | 2               | 2     | 14    | 14    |
|              | 0.75 |                 |     |                 |       |       |       |
|              | 1.5  |                 |     |                 |       |       |       |
|              | 2.2  |                 |     |                 |       |       |       |
|              | 3.7  |                 |     |                 |       |       |       |
|              | 4    | 5.5             | 10  | 6               | 6     | 10    | 10    |
|              | 5.5  |                 |     |                 |       |       |       |
|              | 7.5  |                 |     |                 |       |       |       |
|              | 11   |                 |     |                 |       |       |       |
|              | 15   |                 |     |                 |       |       |       |
| 3-Phase 400V | 0.4  | 2               | 14  | 2               | 2     | 14    | 14    |
|              | 0.75 |                 |     |                 |       |       |       |
|              | 1.5  |                 |     |                 |       |       |       |
|              | 2.2  |                 |     |                 |       |       |       |
|              | 3.7  |                 |     |                 |       |       |       |
|              | 4    | 3.5             | 12  | 2.5             | 2.5   | 14    | 14    |
|              | 5.5  |                 |     |                 |       |       |       |
|              | 7.5  |                 |     |                 |       |       |       |
|              | 11   |                 |     |                 |       |       |       |
|              | 15   |                 |     |                 |       |       |       |
|              | 18.5 | 8               | 8   | 6               | 6     | 10    | 10    |
|              | 22   |                 |     |                 |       |       |       |
|              |      | 14              | 6   | 10              | 10    | 8     | 8     |
|              |      |                 |     |                 |       |       |       |



### Signal (Control) Cable Specifications

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





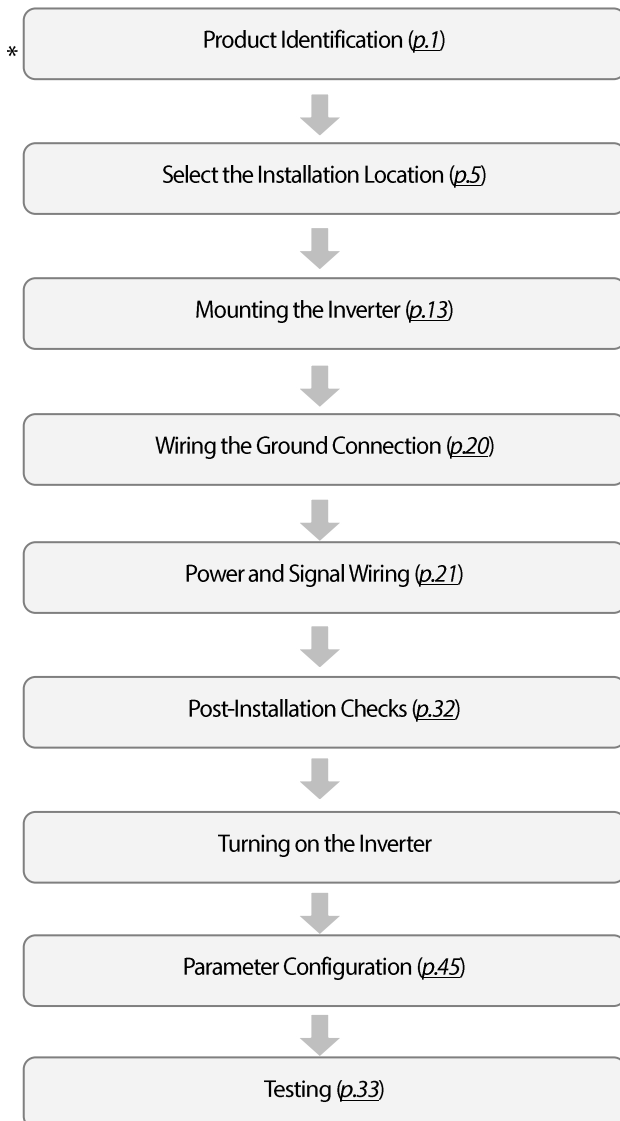


## 2 Installing the Inverter

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

### Installation Flowchart

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

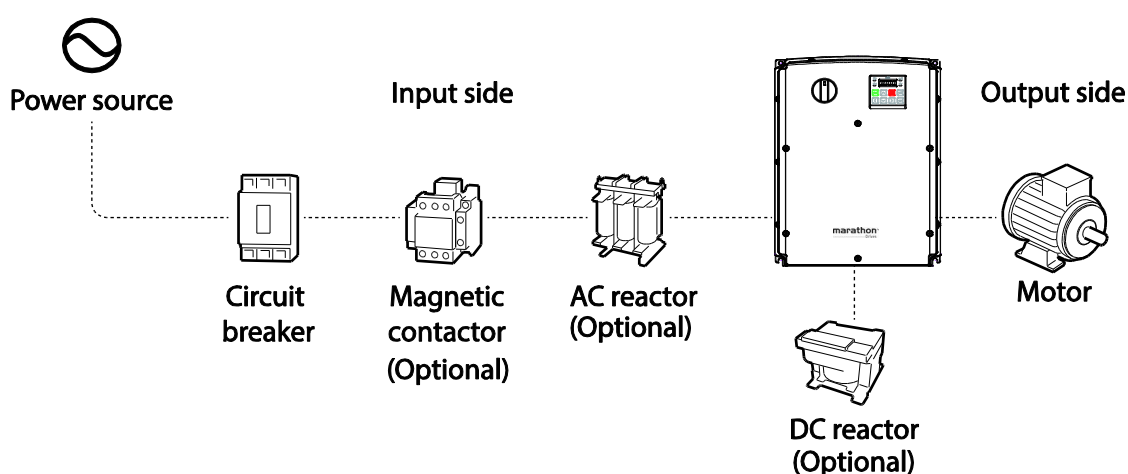




### Basic Configuration Diagram

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

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



### ⚠ 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 [254](#) and carefully select a reactor that meets the requirements.

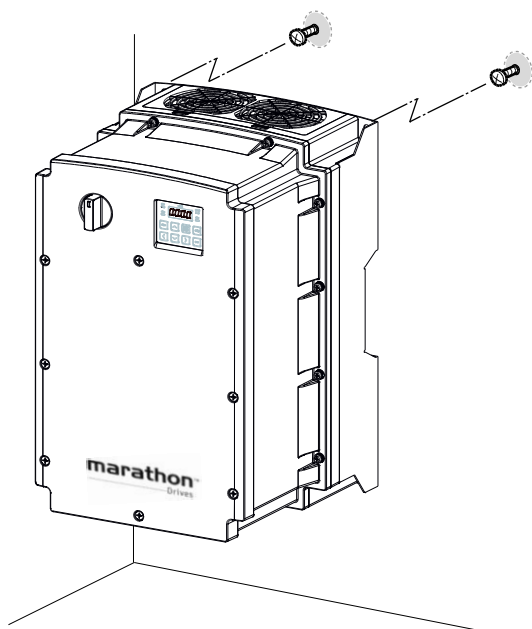


## 2.1 Mounting the Inverter

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.

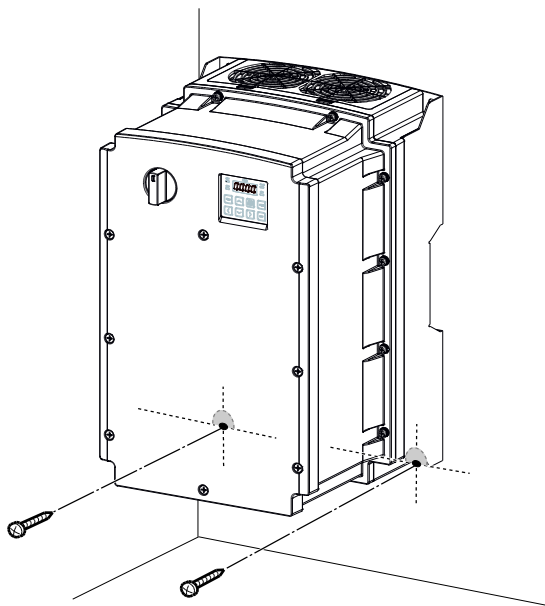
Select a wall or panel suitable to support the installation. Refer to 9.3 External Dimensions (IP 66 Type) on page 248 and check the inverter's mounting bracket dimensions.

- 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.





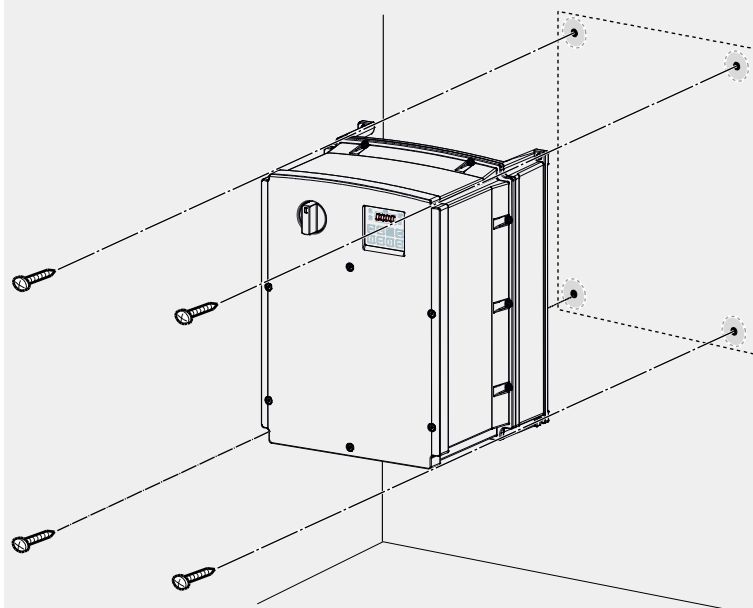
- 3 Mount the inverter on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.





**Note**

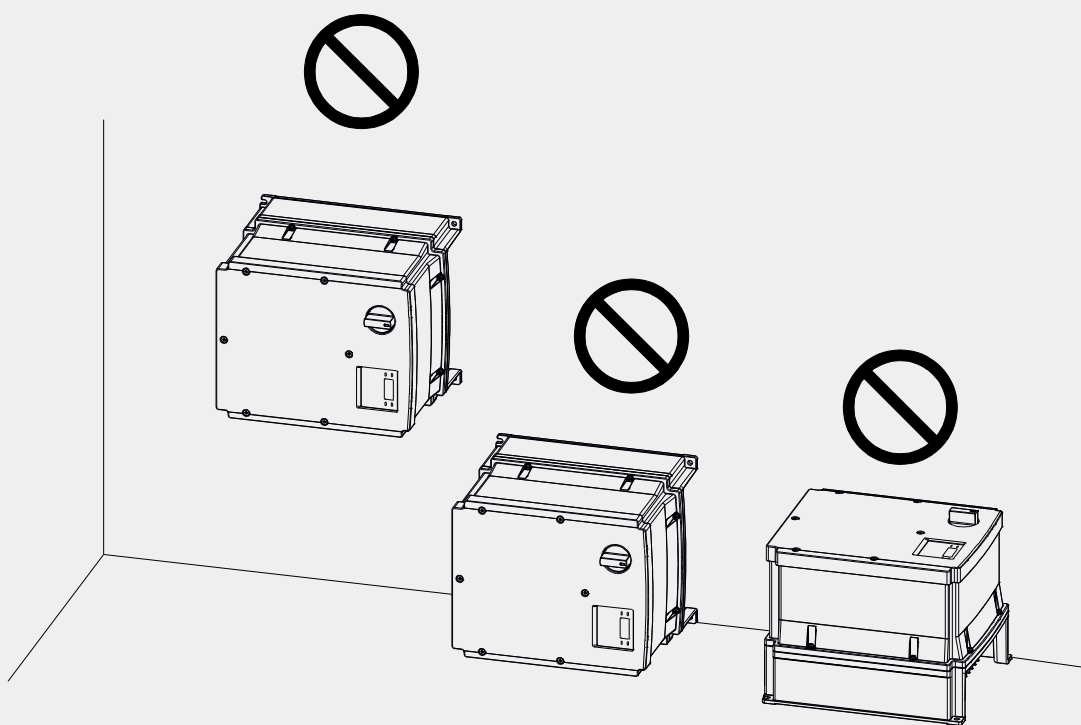
The quantity and dimensions of the mounting brackets vary based on frame size. Refer to [9.3 External Dimensions \(IP 66 Type\)](#) on page [248](#) for detailed information about your model.





### ⚠ 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, 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 [255](#) for torque specifications.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- The power supply system for this equipment (inverter) is a grounded system. Only use a grounded power supply system for this equipment (inverter). Do not use a TT, TN, IT, or corner grounded system with the inverter.
- The equipment may generate direct current in the protective ground wire. When installing the residual current device (RCD) or residual current monitoring (RCM), only Type B RCDs and RCMs can be used.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated at 600V, 75 °C for power terminal wiring.
- Use copper cables rated at 300V, 75 °C for control terminal wiring.
- Separate control circuit wires from the main circuits and other high voltage circuits (200V relay sequence circuit).
- Check for short circuits or wiring failure in the control circuit. They could cause system failure or device malfunction.
- Use shielded cables when wiring the control circuit. Failure to do so may cause malfunction due to interference. If a ground is needed, use STP (Shielded Twisted Pair) cables.
- If you need to re-wire the terminals due to wiring-related faults, ensure that the inverter keypad display is turned off and the charge lamp under the front cover is off before working on wiring connections. The inverter may hold a high voltage electric charge long after the power supply has been turned off.

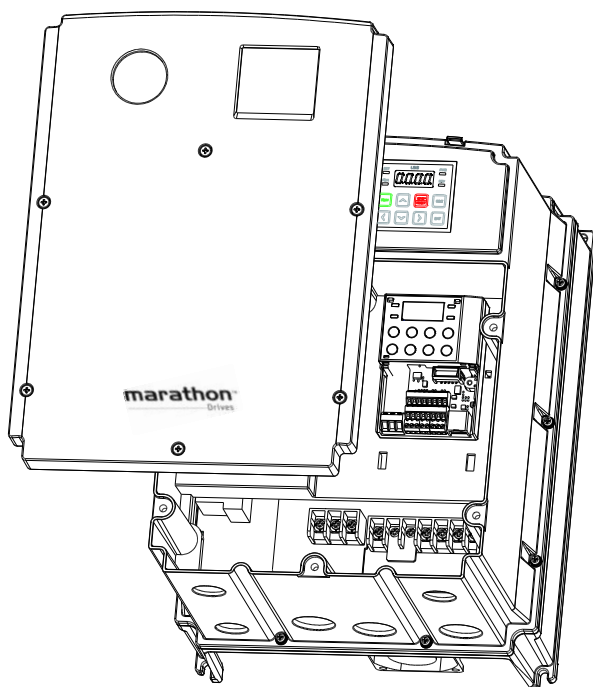


### Step 1 Front Cover

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

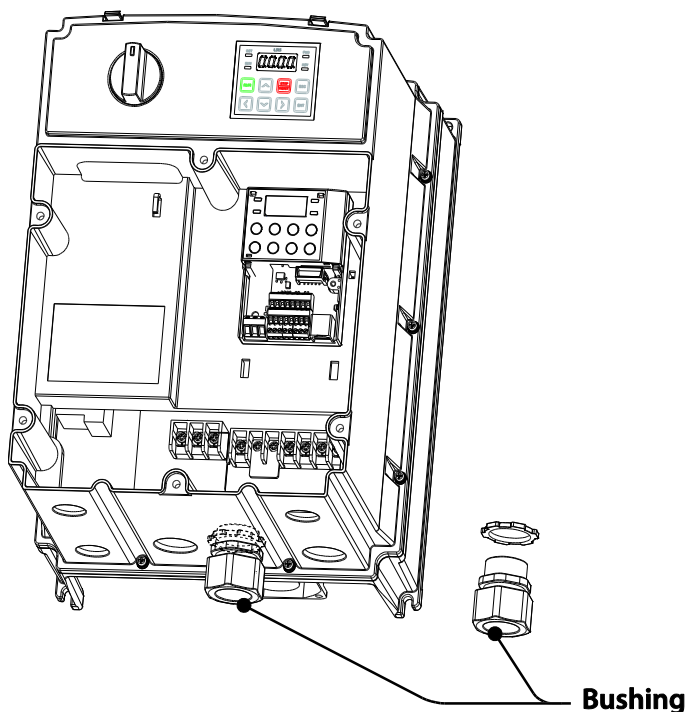
#### **0.4~15kW (3-phase 2type), 0.4~22kW (3-phase 4type)**

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





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



- 3 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to 1.5 Cable Selection on page 9.

#### Note

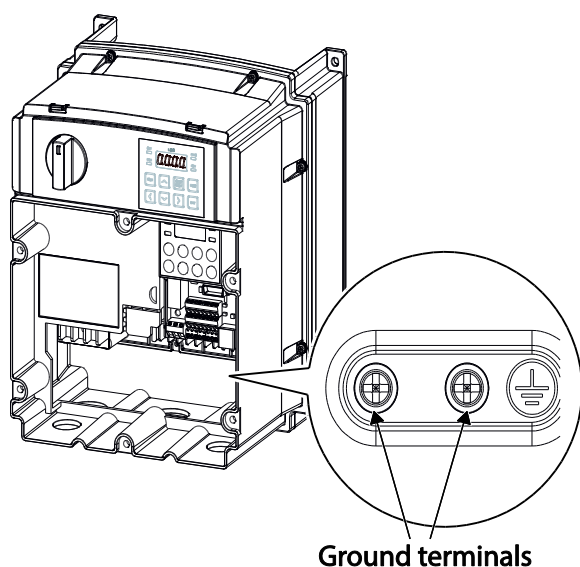
To connect an LCD keypad, remove the plastic knock-out from the bottom of the front cover. Then connect the signal cable to the RJ-45 port on the control board.



### 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 9 to find the appropriate cable specification for your installation.



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

#### Note

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

#### ⚠ Warning

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



### Step 3 Power Terminal Wiring

The following illustration shows the terminal layout on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections. Ensure that the cables selected meet or exceed the specifications in [1.5 Cable Selection](#) on page 9 before installing them.

#### ⓘ Caution

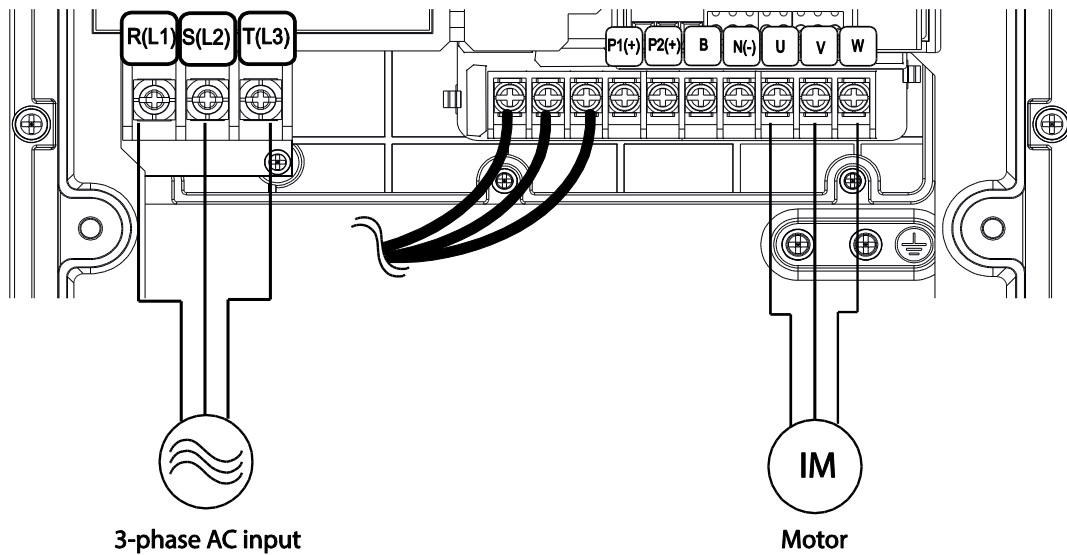
- Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfunctions.
- Use copper wires only with 600V, 75°C rating for the power terminal wiring, and 300V, 75°C rating for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

#### ⓘ Attention

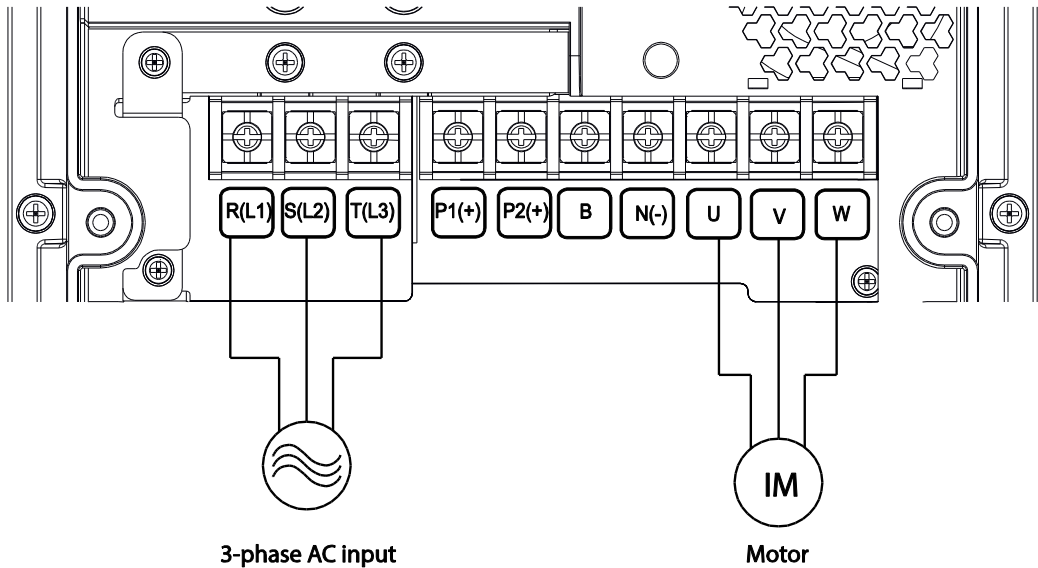
- Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risqué d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements. Utiliser uniquement des fils de cuivre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



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





**5.5–22kW (3-phase)****Power Terminal Labels and Descriptions**

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

**Note**

- 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  $\leq 4.0\text{kW}$  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:  

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

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

### Warning

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

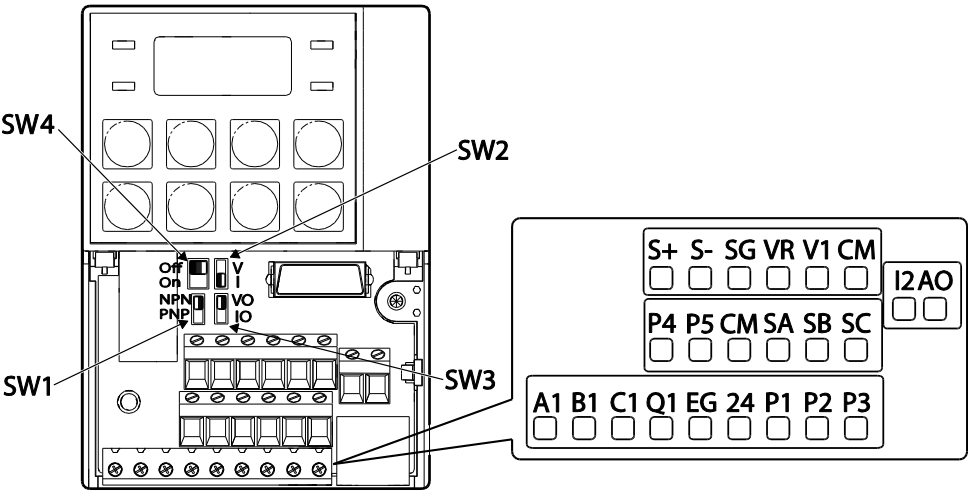
### Caution

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

## Step 4 Control Terminal Wiring

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

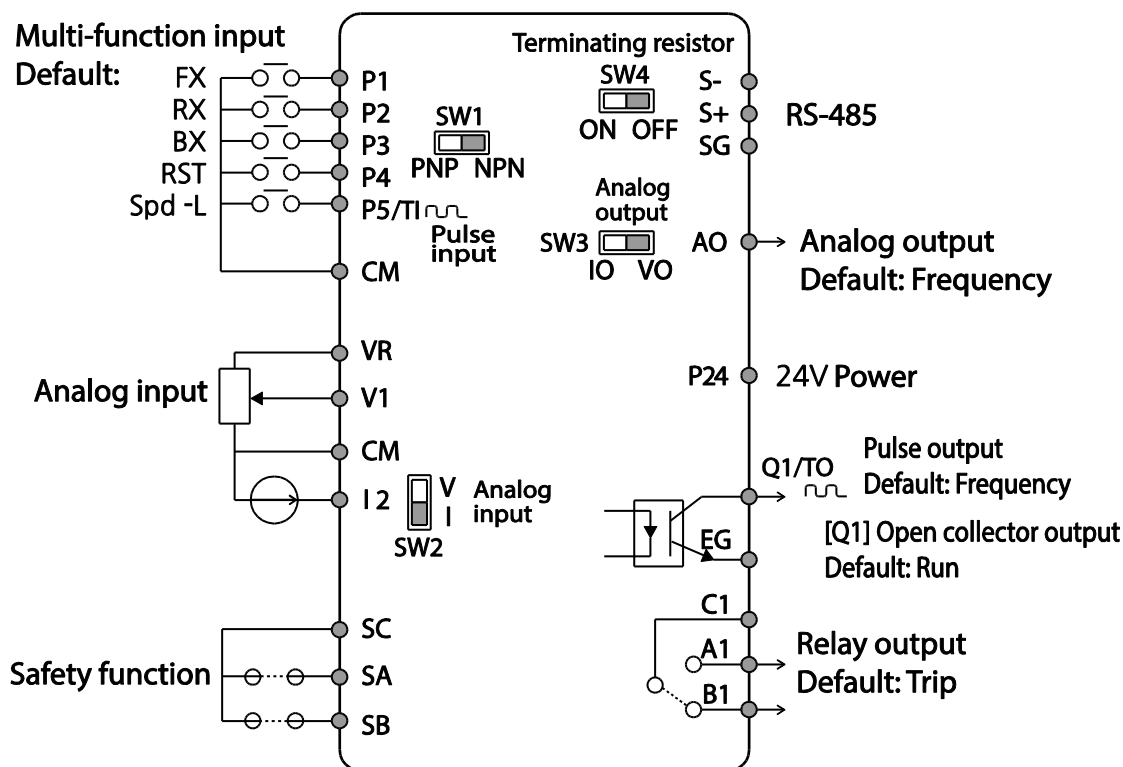




Control Board Switches

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





## Input Terminal Labels and Descriptions

| Function                              | Label | Name                                    | Description  |
|---------------------------------------|-------|---|--|
| Multi-function terminal configuration | P1-P5 | Multi-function Input 1-5                | Configurable for multi-function input terminals. Factory default terminals and setup are as follows: <ul style="list-style-type: none"> <li>P1: Fx</li> <li>P2: Rx</li> <li>P3: BX</li> <li>P4: RST</li> <li>P5: Speed-L</li> </ul>    |
|                                       | 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. <ul style="list-style-type: none"> <li>Maximum Voltage Output: 12V</li> <li>Maximum Current Output: 100mA,</li> <li>Potentiometer: 1-5kΩ</li> </ul> |
|                                       | V1    | Voltage input for frequency             | Used to setup or modify a frequency reference via analog voltage input terminal.   |



| Function                           | Label | Name  | Description   |
|------------------------------------|-------|---|---|
|                                    |       | reference input   | <ul style="list-style-type: none"> <li>Unipolar: 0–10V (12V Max.)</li> <li>Bipolar: -10–10V (<math>\pm 12</math>V Max.)</li> </ul>  |
|                                    | I2    | Voltage/current input for frequency reference input     | <p>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).</p> <p>V2 Mode:</p> <ul style="list-style-type: none"> <li>Unipolar: 0–10V (12V Max.)</li> </ul> <p>I2 Mode</p> <ul style="list-style-type: none"> <li>Input current: 4–20mA</li> <li>Maximum Input current: 24mA</li> <li>Input resistance: 249<math>\Omega</math></li> </ul> |
|                                    | TI    | Pulse input for frequency reference input (pulse train) | <p>Setup or modify frequency references using pulse inputs from 0 to 32kHz.</p> <ul style="list-style-type: none"> <li>Low Level: 0–0.8V</li> <li>High Level: 3.5–12V</li> </ul> <p>(Pulse input TI and Multi-function terminal P5 share the same terminal. Set the In.69 P5 Define to 54(TI).)</p>   |
| Safety functionality configuration | SA    | Safety input A  | Used to block the output from the inverter in an emergency.<br>Conditions:  |
|                                    | SB    | Safety input B  | <ul style="list-style-type: none"> <li>Normal Operation: Both the SA and SB terminals are connected to the SC terminal.</li> <li>Output Block: One or both of the SA and SB terminals lose connection with the SC terminal.</li> </ul>  |
|                                    | SC    | Safety input power source                               | DC 24V, < 25mA  |

### Output/Communication Terminal Labels and Descriptions

| Function      | Label | Name                   | Description  |
|---------------|-------|------------------------|--|
| Analog output | AO    | Voltage/Current Output | <p>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:</p> <ul style="list-style-type: none"> <li>Output voltage: 0–10V</li> <li>Maximum output voltage/current: 12V/10mA</li> </ul> |

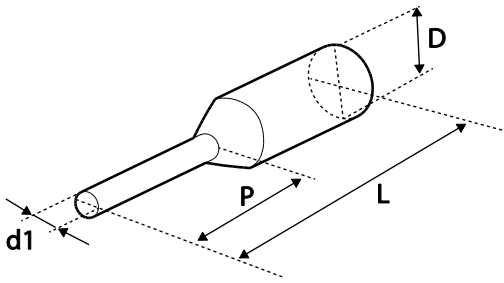


| Function       | Label    | Name                              | Description   |
|----------------|----------|-----------------------------------|---|
|                |          |                                   | <ul style="list-style-type: none"> <li>Output current: 0–20mA</li> <li>Maximum output current: 24mA</li> <li>Factory default output: Frequency</li> </ul>   |
|                | TO       | Pulse Output                      | <p>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.</p> <p>Output Signal Specifications:</p> <ul style="list-style-type: none"> <li>Output frequency: 0–32kHz</li> <li>Output voltage: 0–12V</li> <li>Factory default output: Frequency</li> </ul> <p>(Pulse output TO and Multi-function output Q1 share the same terminal. Set the OU.33Q1 Define to 38(TO).)</p> |
| Digital output | Q1       | Multi-functional (open collector) | DC 26V, 100mA or less<br>Factory default output: Run  |
|                | EG       | Common                            | Common ground contact for an open collector (with external power source)  |
|                | 24       | External 24V power source         | Maximum output current: 150mA   |
|                | A1/C1/B1 | Fault signal output               | <p>Sends out alarm signals when the inverter's safety features are activated (AC 250V &lt; 1A, DC 30V &lt; 1A).</p> <ul style="list-style-type: none"> <li>Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection)</li> <li>Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection)</li> </ul>   |
| Communication  | S+/S-/SG | RS-485 signal line                | Used to send or receive RS-485 signals. Refer to 5. <a href="#"><i>RS-485 Communication Features</i></a> on page 117 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.

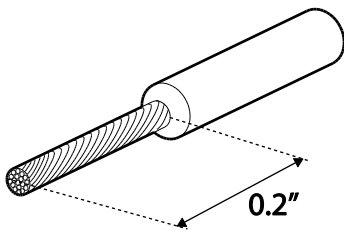




| P/N      | Cable Spec. |                 | Dimensions (inches/mm) |            |            |             | Manufacturer   |
|----------|-------------|-----------------|------------------------|------------|------------|-------------|--|
|          | AWG         | mm <sup>2</sup> | L*                     | P          | d1         | D           |  |
| CE002506 | 26          | 0.25            | 10.4                   | 0.4 / 6.0  | 0.04 / 1.1 | 0.1 / 2.5   | JEONO<br>(Jeono Electric,<br><a href="http://www.jeono.com/">http://www.jeono.com/</a> ) |
| 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.

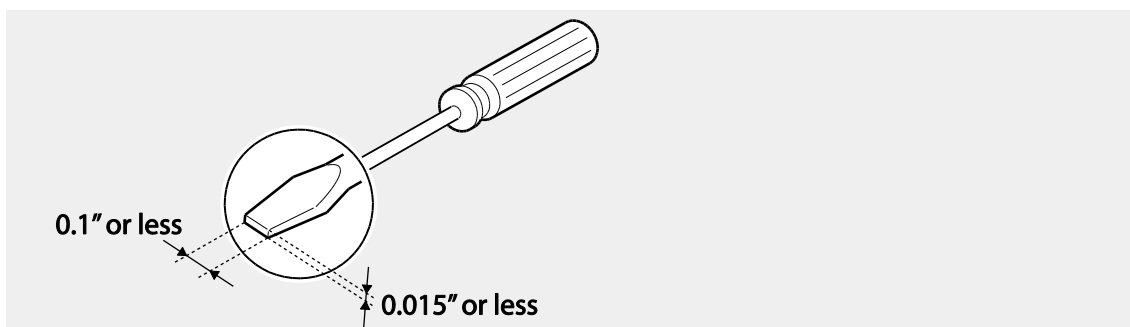
To connect cables to the control terminals without using crimp terminals, refer to the following illustration detailing the correct length of exposed conductor at the end of the control cable.



#### 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).



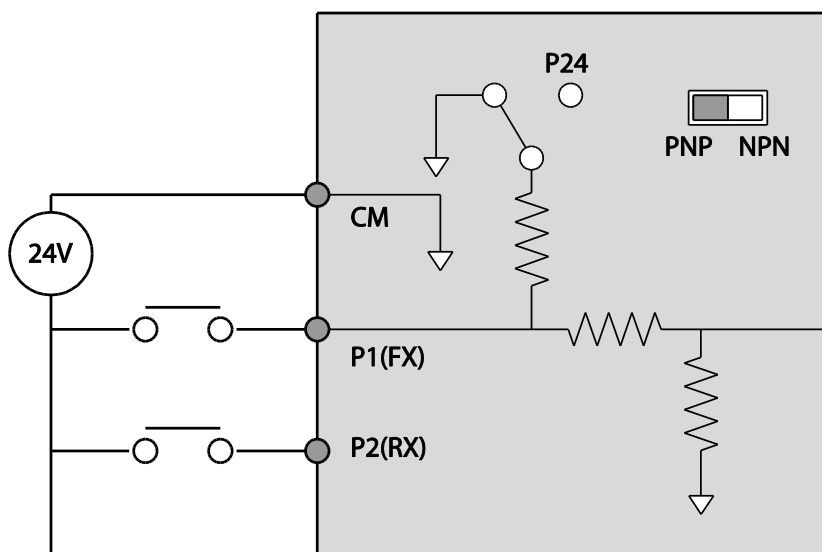


### Step 5 PNP/NPN Mode Selection

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)

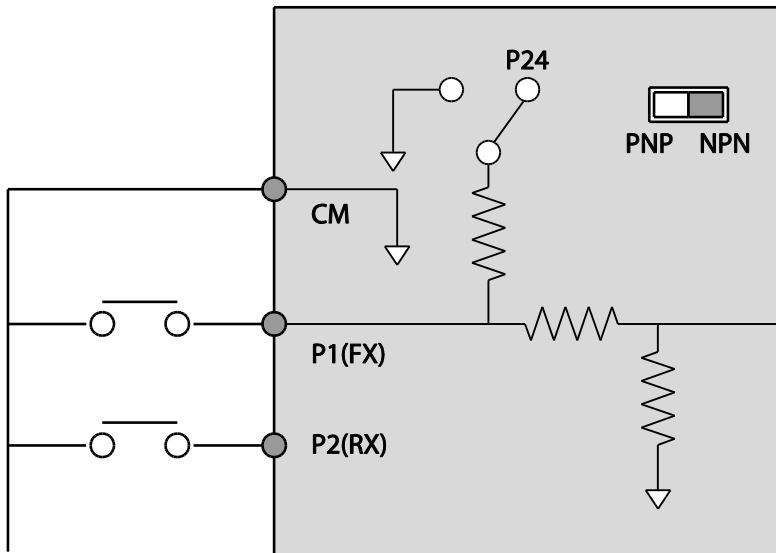
Select PNP using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source. If you are using an external 24V source, build a circuit that connects the external source (-) 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 Re-assembling the Cover

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



## 2.3 Post-Installation Checklist

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

| Items  | Check Point   | Ref.                  | Result |
|--|---|-----------------------|--------|
| Installation Location/Power I/O Verification | Is the installation location appropriate?   | <a href="#">p.5</a>   |        |
|  | Does the environment meet the inverter's operating conditions?  | <a href="#">p.6</a>   |        |
|  | Does the power source match the inverter's rated input?   | <a href="#">p.241</a> |        |
|  | Is the inverter's rated output sufficient to supply the equipment?<br>(Degraded performance will result in certain circumstances. Refer to <i>9.8 Continuous Rated Current Derating</i> on page 258 for details.) | <a href="#">p.241</a> |        |
| Power Terminal Wiring                        | Is a circuit breaker installed on the input side of the inverter?   | <a href="#">p.12</a>  |        |
|  | Is the circuit breaker correctly rated?   | <a href="#">p.253</a> |        |
|  | Are the power source cables correctly connected to the R/S/T terminals of the inverter?<br>(Caution: connecting the power source to the U/V/W terminals may damage the inverter.)                                 | <a href="#">p.21</a>  |        |
|  | Are the motor output cables connected in the correct phase rotation (U/V/W)?<br>(Caution: motors will rotate in reverse direction if three phase cables are not wired in the correct rotation.)                   | <a href="#">p.21</a>  |        |
|  | Are the cables used in the power terminal connections correctly rated?  | <a href="#">p.9</a>   |        |
|  | Is the inverter grounded correctly?   | <a href="#">p.20</a>  |        |
|  | Are the power terminal screws and the ground terminal screws tightened to their specified torques?  | <a href="#">p.21</a>  |        |
|  | 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)?  | <a href="#">p.12</a>  |        |
|  | Are advanced-phase capacitors, surge protection and electromagnetic interference filters installed correctly?<br>(These devices MUST not be installed on the output side of the inverter.)                        | <a href="#">p.21</a>  |        |
| 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?  | <a href="#">p.24</a>  |        |



| Items         | Check Point  | Ref.         | Result |
|---------------|--|--------------|--------|
|               | Are the control cables properly wired?   | <u>p.24</u>  |        |
|               | Are the control terminal screws tightened to their specified torques?                  | <u>p.17</u>  |        |
|               | Is the total cable length of all control wiring < 165ft (100m)?                        | <u>p.29</u>  |        |
|               | Is the total length of safety wiring < 100ft (30m)?                                    | <u>p.29</u>  |        |
| Miscellaneous | Are optional cards connected correctly?  | -            |        |
|               | Is there any debris left inside the inverter?  | <u>p.17</u>  |        |
|               | Are any cables contacting adjacent terminals, creating a potential short circuit risk? | -            |        |
|               | Are the control terminal connections separated from the power terminal connections?    | -            |        |
|               | 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?  | <u>p.254</u> |        |
|               | 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

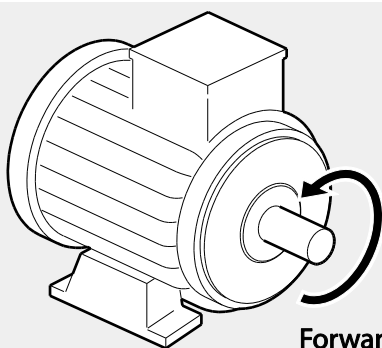
Si la commande avant (Fx) est activée, le moteur doit tourner dans le sens anti-horaire si on le regarde côté charge du moteur. Si le moteur tourne dans le sens inverse, inverser les câbles aux bornes U et V.

### 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 accidentally exceed the motor's rated capacity.





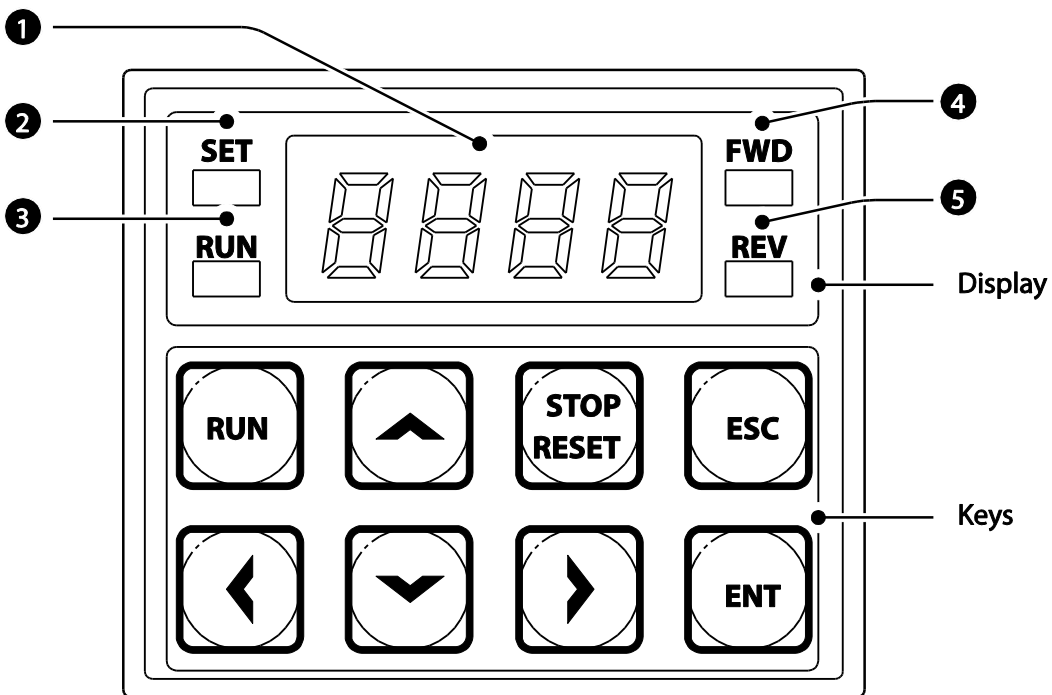


## 3 Learning to Perform Basic Operations

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] key        | Used to run the inverter (inputs a RUN command).   |
|  | [STOP/RESET] key | STOP: stops the inverter.<br>RESET: resets the inverter following fault or failure condition.  |
|  | [▲] key, [▼] key | Switch between codes, or to increase or decrease parameter values.   |
|  | [◀] key, [▶] key | Switch between groups, or to move the cursor during parameter setup or modification.   |
|  | [ENT] key        | Used to select, confirm, or save a parameter value.  |
|  | [ESC] key        | A multi-function key used to configure different functions, such as: <ul style="list-style-type: none"> <li>• Jog operation</li> <li>• Remote/Local mode switching</li> <li>• Cancellation of an input during parameter setup</li> </ul> |

#### ⚠ 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.69) 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 147 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.   | -              |



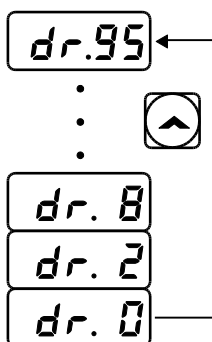
### Note

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.<br>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.<br>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.' | 95             |
| 6    | Press the [ENT] key.<br>Code dr.95 is displayed.  | DR.95          |

### 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.<br>The first number on the right side of the display will flash. | 5.)  |
| 2    | Press the [◀] or [▶] key to move the cursor to the number that you would like to modify.  | <div> <div>◀</div> <div>◀</div> <div>05.0</div> <div>5.0</div> <div>5.0</div> <div>▶</div> <div>▶</div> </div> |
| 3    | Press the [▲] or [▼] key to adjust the value, and then press the [ENT] key to confirm it.<br>The selected value will flash on the display.                      | <div>6.0</div> <div>▲ ▼</div> <div>5.0</div> <div>▲ ▼</div> <div>4.0</div>                                     |
| 4    | Press the [ENT] key again to save the change.   | -  |

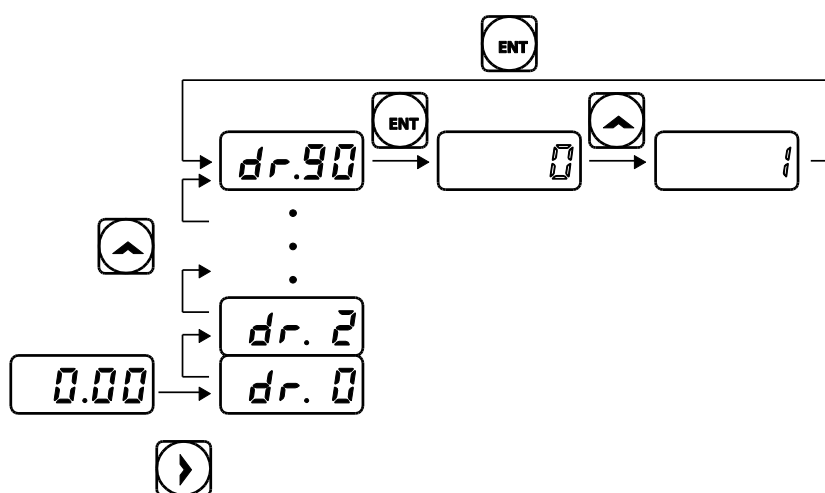


## Note

- 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 147 for information about the features and ranges before setting or modifying parameter values.


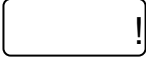
## 3.2.4 Configuring the [ESC] Key

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 78 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.<br>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.<br>The new parameter value will flash. |  |
| 5    | Press the [ENT] key again to save changes.  | -   |

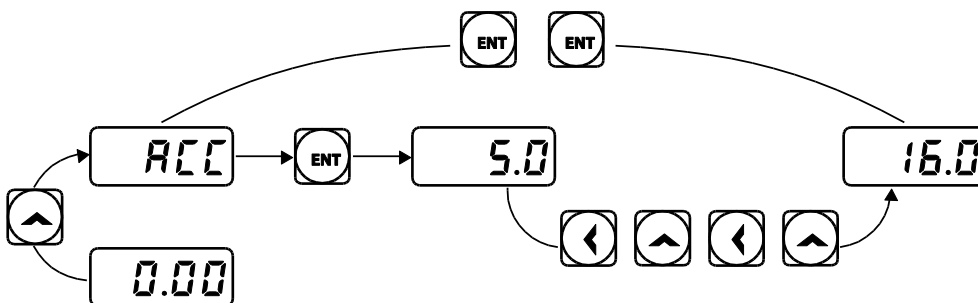
**Note**

- 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.<br>The display will change to the second code in the Operation group, the ACC (Acceleration Time) code.  | ACC            |
| 3    | Press the [ENT] key.<br>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.<br>'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.<br>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.<br>Both digits will flash on the display.                                 | !^,)           |
| 8    | Press the [ENT] key once again to save changes.<br>'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.<br>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.<br>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.<br>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.<br>The parameter value will flash on the display. | #),)%          |
| 7    | Press the [ENT] key once again to save changes.<br>Flashing stops. The frequency reference has been configured to 30.05 Hz.  | 30.05          |

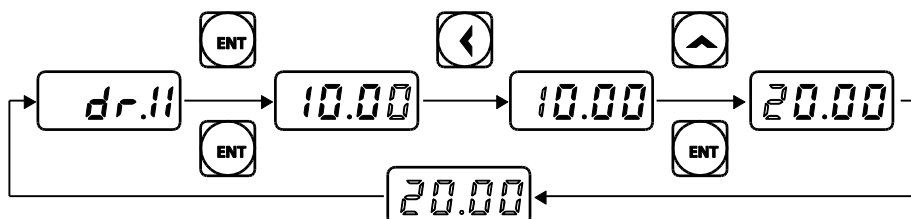
### Note

- 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.

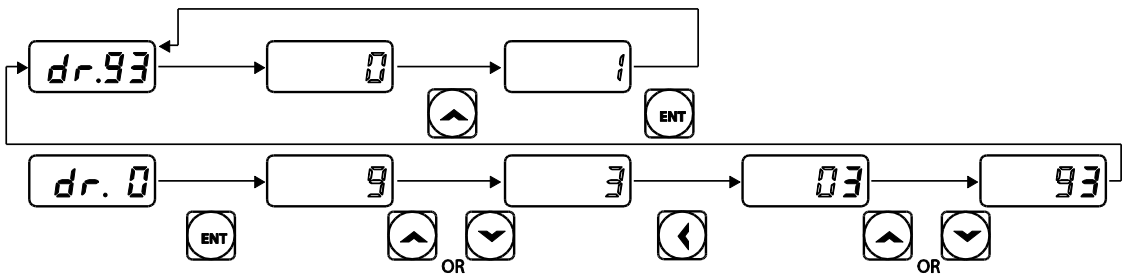


| Step | Instruction  | Keypad Display |
|------|--|----------------|
| 1    | Go to code 11(Jog Frequency) in the Drive group.   | DR.11          |
| 2    | Press the [ENT] key.<br>The current Jog Frequency value (10.00) for code dr.11 is displayed.   | 10.00          |
| 3    | Press the [◀] key 3 times to move to the 10s place value.<br>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.<br>All parameter digits will flash on the display. | @,))           |
| 5    | Press the [ENT] key once again to save the changes.<br>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.<br>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.<br>'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.<br>Code dr.93 will be displayed.  | DR.93          |
| 7    | Press the [ENT] key once again.<br>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.<br>The parameter value will flash.                             | !              |
| 9    | Press the [ENT] key once again.<br>Parameter initialization begins. Parameter initialization is complete when code dr.93 reappears on the display. | DR.93          |

### Note


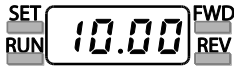
Following parameter initialization, all parameters are reset to factory default values. Ensure that parameters are reconfigured before running the inverter again after an initialization.

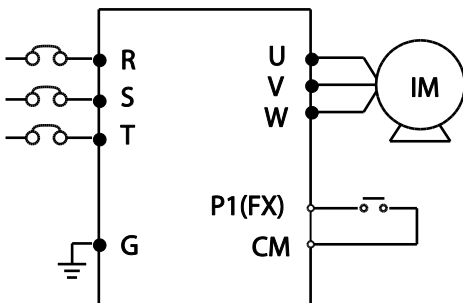




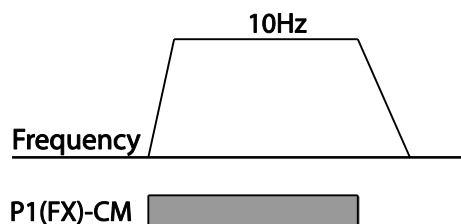


### 3.3.5 Frequency Setting (Keypad) and Operation (via Terminal Input)

| 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.<br>The first digit on the right will flash.   | 0.0)  |
| 3    | Press the [◀] key 3 times to go to the 10s place position.<br>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.<br>The parameter value (10.00) will flash.  | !) ,))  |
| 5    | Press the [ENT] key once again to save changes.<br>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.<br>The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.  |   |
| 7    | When the frequency reference is reached (10Hz), open the switch between the P1 (FX) and CM terminals.<br>The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicator lights turn off, and the frequency reference (10.00Hz) is displayed again. |  |



[Wiring Diagram]





[Operation Pattern]

#### Note

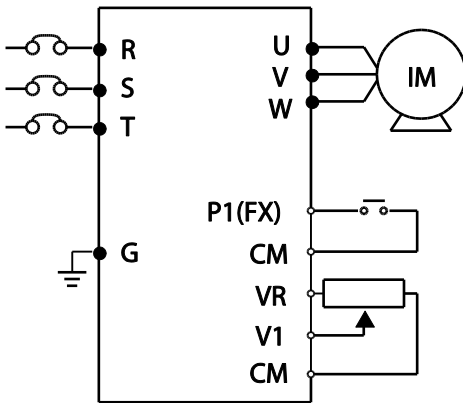
The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the values to factory default parameter settings before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



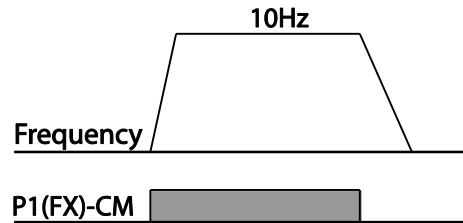
### 3.3.6 Frequency Setting (Potentiometer) and Operation (Terminal Input)

| 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.<br>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.<br>The new parameter value will flash.   | @  |
| 6    | Press the [ENT] key once again.<br>The Frq code will be displayed again. The frequency input has been configured for the potentiometer.  | FRQ  |
| 7    | Press the [▼] key 4 times.<br>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.<br>The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.  |  |
| 10   | When the frequency reference is reached (10Hz), open the switch between the P1 (FX) and CM terminals.<br>The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0Hz, the RUN and FWD indicators turn off, and the frequency reference (10.00Hz) is displayed again. |  |





[Wiring Diagram]



[Operation Pattern]

**Note**

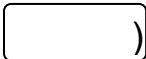
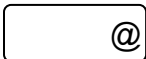

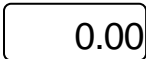
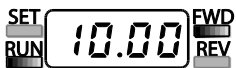

The instructions in the table are based on the factory default parameter settings. The inverter may not work correctly if the default parameter settings are changed after the inverter is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following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

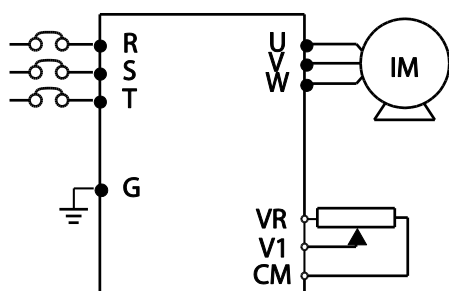
### 3.3.7 Frequency Setting (Potentiometer) and Operation (Keypad)

| 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.<br>The drv code in the Operation group is currently set to 1 (Analog Terminal).                                | !              |
| 5    | Press the [▼] key to change the parameter value to 0 (Keypad), and then press the [ENT] key.<br>The new parameter value will flash. | )              |
| 6    | Press the [ENT] key once again.<br>The drv code is displayed again. The frequency input has been configured for the keypad.         | DRV            |
| 7    | Press the [▲] key.<br>To move to the Frq (Frequency reference source) code.   | FRQ            |

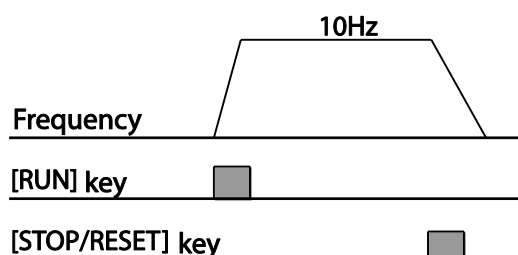


## Learning to Perform Basic Operations

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



[Wiring Diagram]



[Operation Pattern]

### Note

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



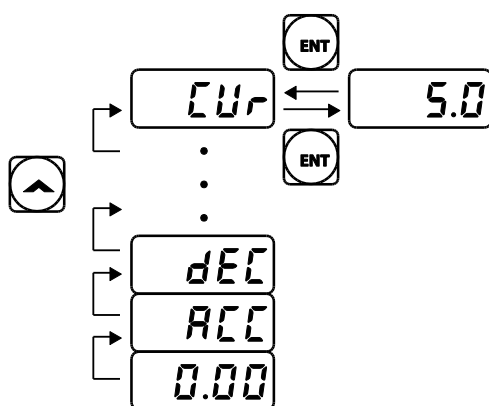




## 3.4 Monitoring the Operation

### 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.<br>The output current (5.0A) is displayed.  | 5.0            |
| 4    | Press the [ENT] key again.<br>Returns to the Cur code.   | CUR            |

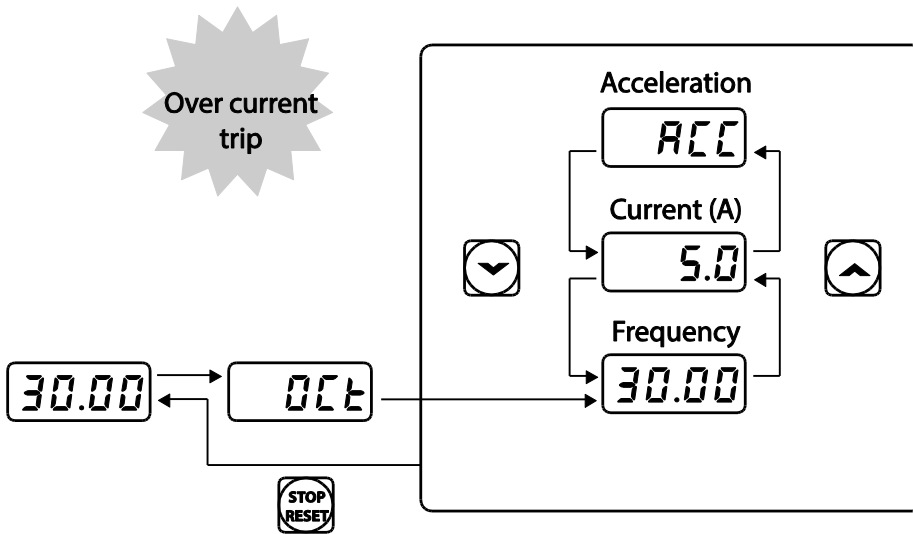
#### Note

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.

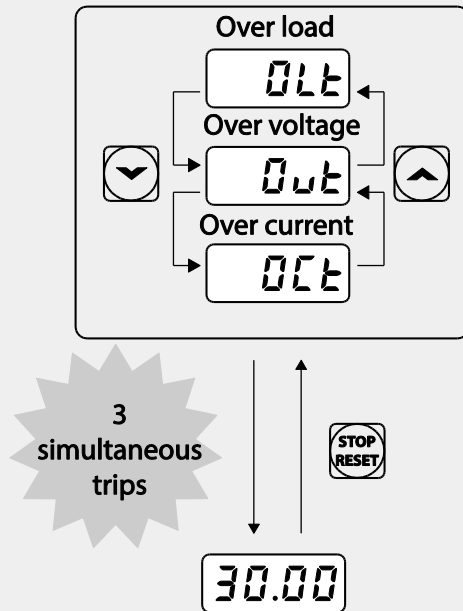


| Step | Instruction   | Keypad Display |
|------|---|----------------|
| 1    | Refer to the example keypad display.<br>An over current trip fault has occurred.  | OCT            |
| 2    | Press the [ENT] key, and then the [▲] key.<br>The operation frequency at the time of the fault (30.00Hz) is displayed.                                      | 30.00          |
| 3    | Press the [▲] key.<br>The output current at the time of the fault (5.0A) is displayed.  | 5.0            |
| 4    | Press the [▲] key.<br>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.<br>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.  | <a href="#">p.62</a>                           |
| 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.   | <a href="#">p.63</a> ,<br><a href="#">p.70</a> |
| 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.   | <a href="#">p.68</a>                           |
| 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.  | <a href="#">p.70</a>                           |
| 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.  | <a href="#">p.72</a>                           |
| Frequency control using analog inputs   | Enables the user to hold a frequency using analog inputs at terminals.   | <a href="#">p.72</a>                           |
| Motor operation display options   | Configures the display of motor operation values. Motor operation is displayed either in frequency (Hz) or speed (rpm).  | <a href="#">p.73</a>                           |
| Multi-step speed (frequency) configuration                                      | Configures multi-step frequency operations by receiving an input at the terminals defined for each step frequency.   | <a href="#">p.73</a>                           |
| Command source configuration for keypad buttons                                 | Configures the inverter to allow the manual operation of the [FWD], [REV] and [Stop] keys.   | <a href="#">p.76</a>                           |
| Command source configuration for terminal block inputs                          | Configures the inverter to accept inputs at the FX/RX terminals.   | <a href="#">p.76</a>                           |
| Command source configuration for RS-485 communication                           | Configures the inverter to accept communication signals from upper level controllers, such as PLCs or PCs.   | <a href="#">p.78</a>                           |
| 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. | <a href="#">p.78</a>                           |



| Basic Tasks  | Description   | Ref.                 |
|--|---|----------------------|
| Motor rotation control   | Configures the inverter to limit a motor's rotation direction.  | <a href="#">p.80</a> |
| 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.   | <a href="#">p.81</a> |
| 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. | <a href="#">p.81</a> |
| Acc/Dec time configuration based on the Max. Frequency                   | Configures the acceleration and deceleration times for a motor based on a defined maximum frequency.  | <a href="#">p.82</a> |
| Acc/Dec time configuration based on the frequency reference              | Configures acceleration and deceleration times for a motor based on a defined frequency reference.  | <a href="#">p.85</a> |
| 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.  | <a href="#">p.85</a> |
| Acc/Dec time transition speed (frequency) configuration                  | Enables modification of acceleration and deceleration gradients without configuring the multi-functional terminals.   | <a href="#">p.87</a> |
| Acc/Dec pattern configuration  | Enables modification of the acceleration and deceleration gradient patterns. Basic patterns to choose from include linear and S-curve patterns.   | <a href="#">p.88</a> |
| 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.  | <a href="#">p.91</a> |
| 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.  | <a href="#">p.91</a> |
| 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.  | <a href="#">p.92</a> |
| 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.   | <a href="#">p.93</a> |
| 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.   | <a href="#">p.94</a> |
| Automatic torque boost   | Automatic configuration of the inverter that provides "auto tuning" that produces a momentary torque boost. This  | <a href="#">p.95</a> |



| 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.   | <a href="#">p.95</a>  |
| 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. | <a href="#">p.96</a>  |
| 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.  | <a href="#">p.97</a>  |
| 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.   | <a href="#">p.97</a>  |
| 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.                       | <a href="#">p.98</a>  |
| 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.  | <a href="#">p.99</a>  |
| Power braking                                       | Configures the inverter to provide optimal, motor deceleration, without tripping over-voltage protection.   | <a href="#">p.100</a> |
| Start/maximum frequency configuration               | Configures the frequency reference limits by defining a start frequency and a maximum frequency.  | <a href="#">p.101</a> |
| Upper/lower frequency limit configuration           | Configures the frequency reference limits by defining an upper limit and a lower limit.   | <a href="#">p.101</a> |
| Frequency jump                                      | Configures the inverter to avoid running a motor in mechanically resonating frequencies.  | <a href="#">p.102</a> |
| 2 <sup>nd</sup> Operation Configuration             | Used to configure the 2 <sup>nd</sup> operation mode and switch between the operation modes according to your requirements.   | <a href="#">p.103</a> |
| Multi-function input terminal control configuration | Enables the user to improve the responsiveness of the multi-function input terminals.   | <a href="#">p.104</a> |
| P2P communication configuration                     | Configures the inverter to share input and output devices with other inverters.   | <a href="#">p.105</a> |
| Multi-keypad configuration                          | Enables the user to monitor multiple inverters with one monitoring device.  | <a href="#">p.106</a> |
| User sequence configuration                         | Enables the user to implement simple sequences using various function blocks.   | <a href="#">p.107</a> |



## 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   |




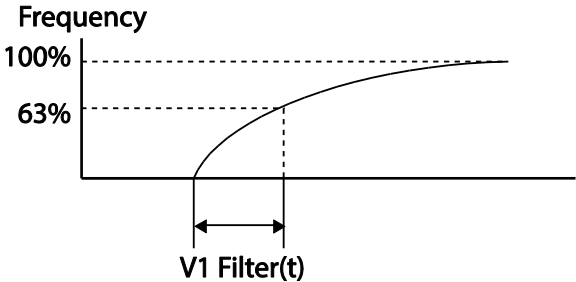
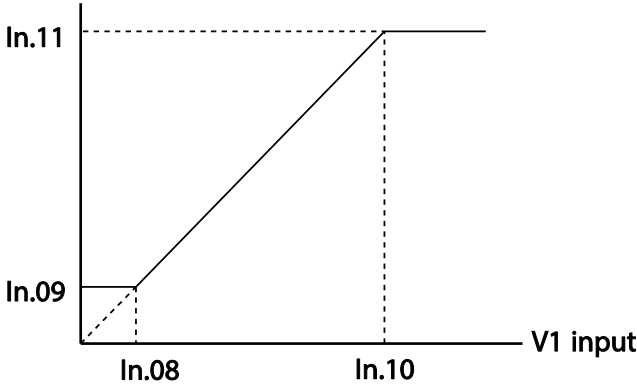
| Group | Code | Name                             | LCD Display   | Parameter Setting | Setting Range     | Unit |
|-------|------|----------------------------------|---------------|-------------------|-------------------|------|
|       |      | constant                         |               |                   |                   |      |
|       | 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.

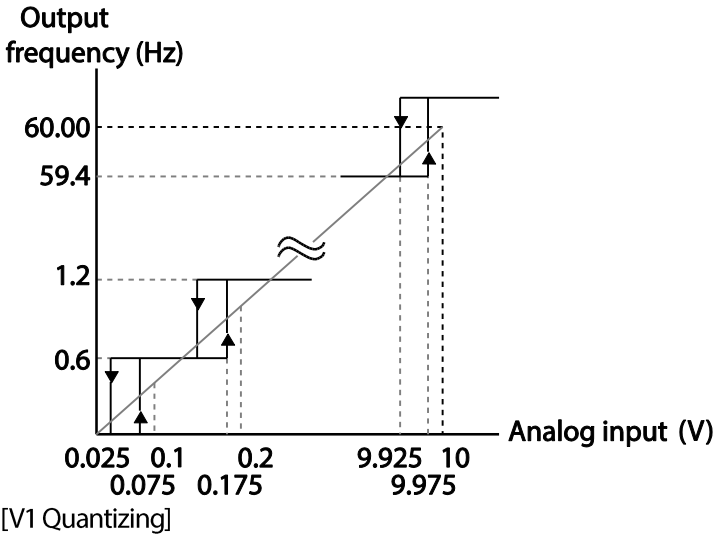
## 0–10V Input Voltage Setting Details

| Code                | Description  |
|---------------------|--|
| In.01 Freq at 100%  | <p>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(%).</p> <ul style="list-style-type: none"> <li>Set code In.01 to 40.00 and use default values for codes In.02–In.16. Motor will run at 40.00Hz when a 10V input is provided at V1.</li> <li>Set code In.11 to 50.00 and 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.</li> </ul> |
| In.05 V1 Monitor[V] | Configures the inverter to monitor the input voltage at V1.  |
| In.07 V1 Filter     | <p>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.</p> <p>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.</p>   |



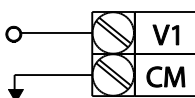
| Code                                  | Description   |
|---------------------------------------|---|
|                                       | <p>V1 input from external source </p> <p>Frequency</p>  <p>V1 Filter(t)</p> <p>[V1 Filter]</p>  |
| In.08 V1 Volt x1–<br>In.11 V1 Perc y2 | <p>These parameters are used to configure the gradient level and offset values of the Output Frequency, based on the Input Voltage.</p> <p>Frequency reference</p>  <p>V1 input</p> <p>[Volt x1–In.11 V1 Perc y2]</p>  |
| In.16 V1 Inverting                    | <p>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.</p>  |
| In.17.V1 Quantizing                   | <p>Quantizing may be used when the noise level is high in the analog input (V1 terminal) signal.</p> <p>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).</p> <p>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.</p> |



| Code | Description   |
|------|---|
|      | <p>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.</p> <p>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.</p> <p>As a result, the output frequency will be different at acceleration and deceleration, mitigating the effect of analog input changes over the output frequency.</p> <p><b>Output frequency (Hz)</b></p>  <p><b>Analog input (V)</b></p> <p>[V1 Quantizing]</p> |

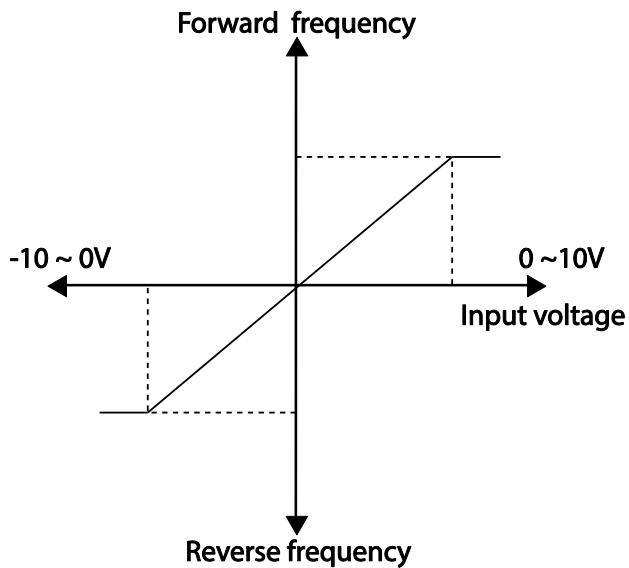
#### 4.1.3.2 Setting a Frequency Reference for -10–10V Input

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   | V1 maximum 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–<br>In.15 V1- Perc y2 | <p>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.</p> <p>[In.12 V1-volt X1–In.15 V1 Perc y]</p> <p>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 65.</p> |

#### 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%                    | <p>Configures the frequency reference for operation at the maximum current (when In.56 is set to 100%).</p> <ul style="list-style-type: none"> <li>If In.01 is set to 40.00Hz, and default settings are used for In.53–56, 20mA input current (max) to I2 will produce a frequency reference of 40.00Hz.</li> <li>If In.56 is set to 50.00 (%), and default settings are used for In.01 (50Hz) and In.53–55, 20mA input current (max) to I2 will produce a frequency reference of 25.00Hz (50% of 50Hz).</li> </ul> |
| In.50 I2 Monitor                      | Used to monitor input current at I2.  |
| In.52 I2 Filter                       | Configures the time for the operation frequency to reach 63% of target frequency based on the input current at I2.  |
| In.53 I2 Curr x1–<br>In.56 I2 Perc y2 | <p>Configures the gradient level and off-set value of the output frequency.</p> <p><b>Frequency Reference</b></p> <p>[Gradient and off-set configuration based on output frequency]</p>   |



#### 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). 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 | %    |

\*Quantizing is disabled if '0' is selected.

### TI Pulse Input Setting Details

| Code                                 | Description   |
|--------------------------------------|---|
| In.69 P5 Define                      | Pulse input TI and Multi-function terminal P5 share the same terminal. 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. <ul style="list-style-type: none"> <li>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.</li> <li>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.</li> </ul> |
| 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–<br>In.96 TI Perc y2 | Configures the gradient level and offset values for the output frequency.   |



| Code                                       | Description   |
|--|---|
|  | <p>Frequency reference</p>  |
| In.97 TI Inverting–<br>In.98 TI Quantizing | Identical to In.16–17 (refer to In.16 V1 Inverting/In.17.V1 Quantizing on page 65). |

### 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 117.

| 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   |               |      |

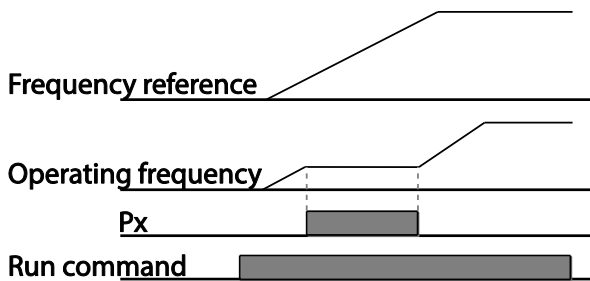
## 4.2 Frequency Hold by Analog Input

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        | 65–69 | Px terminal configuration  | Px Define(Px: P1–P5) | 21                | Analog Hold   | 0–54 |



### 4.3 Changing the Displayed Units (Hz↔Rpm)

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

| Group | Code | Name                 | LCD Display | 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



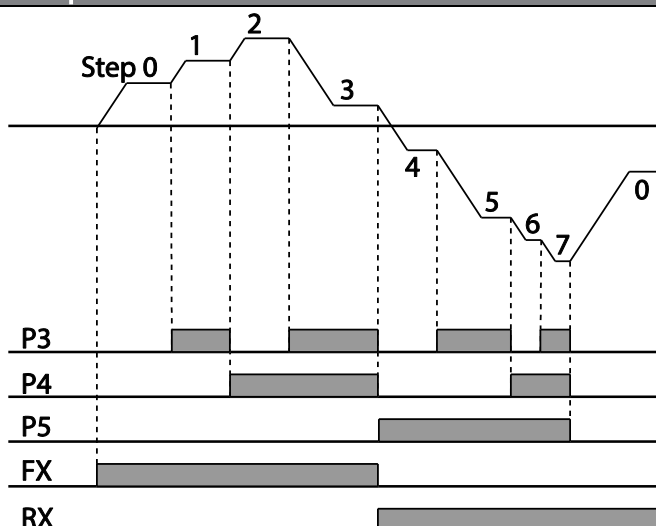
frequency 4–7) and the binary command combinations.

| 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        | 65–69   | Px terminal configuration     | Px Define (Px: P1–P5) | 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<br>St 1–St3<br>Step Freq - 1–3 | Configure multi-step frequency 1–3.<br>If an LCD keypad is in use, bA.50–52 is used instead of St1–St3 (multi-step frequency 1–3).  |
| bA.53–56<br>Step Freq - 4–7                    | Configure multi-step frequency 4–7.   |
| In.65–69 Px Define                             | Choose the terminals to setup as multi-step inputs, and then set the relevant codes (In.65–69) to 7(Speed-L), 8(Speed-M), or 9(Speed-H).<br><br>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   |       |       |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|--------------------|---|-------|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|                    | <div></div> <div><p>[An example of a multi-step operation]</p><table><tr><th>Speed</th><th>Fx/Rx</th><th>P5</th><th>P4</th><th>P3</th></tr><tr><td>0</td><td>✓</td><td>-</td><td>-</td><td>-</td></tr><tr><td>1</td><td>✓</td><td>-</td><td>-</td><td>✓</td></tr><tr><td>2</td><td>✓</td><td>-</td><td>✓</td><td>-</td></tr><tr><td>3</td><td>✓</td><td>-</td><td>✓</td><td>✓</td></tr><tr><td>4</td><td>✓</td><td>✓</td><td>-</td><td>-</td></tr><tr><td>5</td><td>✓</td><td>✓</td><td>-</td><td>✓</td></tr><tr><td>6</td><td>✓</td><td>✓</td><td>✓</td><td>-</td></tr><tr><td>7</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr></table></div> | Speed | Fx/Rx | P5 | P4 | P3 | 0 | ✓ | - | - | - | 1 | ✓ | - | - | ✓ | 2 | ✓ | - | ✓ | - | 3 | ✓ | - | ✓ | ✓ | 4 | ✓ | ✓ | - | - | 5 | ✓ | ✓ | - | ✓ | 6 | ✓ | ✓ | ✓ | - | 7 | ✓ | ✓ | ✓ | ✓ |
| Speed              | Fx/Rx   | P5    | P4    | P3 |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 0                  | ✓   | -     | -     | -  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 1                  | ✓   | -     | -     | ✓  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2                  | ✓   | -     | ✓     | -  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3                  | ✓   | -     | ✓     | ✓  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4                  | ✓   | ✓     | -     | -  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5                  | ✓   | ✓     | -     | ✓  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6                  | ✓   | ✓     | ✓     | -  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7                  | ✓   | ✓     | ✓     | ✓  |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| In.89 InCheck Time | <p>Set a time interval for the inverter to check for additional terminal block inputs after receiving an input signal.</p> <p>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.</p>  |       |       |    |    |    |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |



## 4.5 Command Source Configuration

Various devices can be selected as command input devices for the MD100G 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.65–69 for P1–P5) to 1 (Fx) and 2 (Rx) respectively. This application enables both terminals to be turned on or off at the same time, constituting a stop command that will cause the inverter to stop operation.

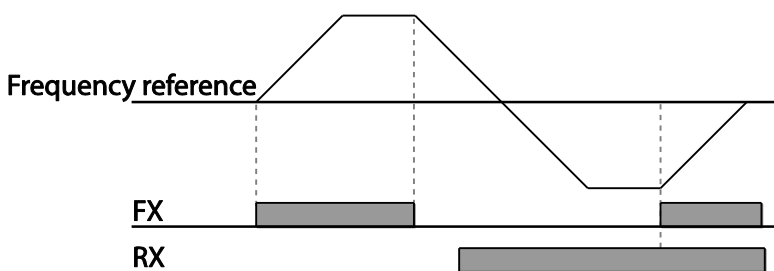
| Group     | Code  | Name                      | LCD Display          | Parameter Setting |         | Setting Range | Unit |
|-----------|-------|---------------------------|----------------------|-------------------|---------|---------------|------|
| Operation | drv   | Command source            | Cmd Source*          | 1                 | Fx/Rx-1 | 0–4           | -    |
| In        | 65–69 | Px terminal configuration | Px Define(Px: P1–P5) | 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<br>drv– Cmd Source | Set to 1(Fx/Rx-1).   |
| In.65–69 Px Define                 | Assign a terminal for forward (Fx) operation.<br>Assign a terminal for reverse (Rx) operation. |



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

Multi-function terminals can be selected as a command input device. This is configured by setting the drv (command source) code in the Operation group to 2(Fx/Rx-2). Select 2 terminals for run and rotation direction commands, and then select the relevant codes (2 of the 5 multi-function terminal codes, In.65–69 for P1–P5) to 1(Fx) and 2(Rx) respectively. This application uses an Fx input as a run command, and an Rx input to change a motor's rotation direction (On-Rx, Off-Fx).

| Group     | Code  | Name                      | LCD Display             | Parameter Setting | Setting Range | Unit |
|-----------|-------|---------------------------|-------------------------|-------------------|---------------|------|
| Operation | Drv   | Command source            | Cmd Source*             | 2 Fx/Rx-2         | 0–4           | -    |
| In        | 65–69 | Px terminal configuration | Px Define (Px: P1 – P5) | 1 Fx              | 0–54          | -    |
|           |       |                           |                         | 2 Rx              |               |      |

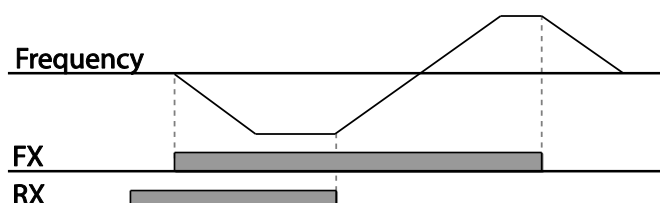
\* Displayed under DRV-06 on the LCD keypad.

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

| Code                              | Description        |
|-----------------------------------|--------------------|
| Operation group<br>drv Cmd Source | Set to 2(Fx/Rx-2). |



| Code               | Description  |
|--------------------|--|
| In.65–69 Px Define | Assign a terminal for run command (Fx).<br>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 117.

| 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 44.

| Group     | Code | Name                | LCD Display | Parameter Setting |              | Setting Range | Unit |
|-----------|------|---------------------|-------------|-------------------|--------------|---------------|------|
| dr        | 90   | [ESC] key functions | -           | 2                 | Local/Remote | 0–2           | -    |
| Operation | drv  | Command source      | Cmd 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<br>[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–P5 multi-function terminals (codes In.65–69) is set to 13(RUN Enable) and the relevant terminal is turned on.
- During remote operation (remote operation), the inverter will operate according to the previously set frequency reference source and the command received from the input device.
- If Ad.10 (power-on run) is set to 0(No), the inverter will NOT operate on power-on even when the following terminals are turned on:
  - Fwd/Rev run (Fx/Rx) terminal
  - Fwd/Rev jog terminal (Fwd jog/Rev Jog)
  - Pre-Excitation terminal

To operate the inverter manually with the keypad, switch to local mode. Use caution when switching back to remote operation mode as the inverter will stop operating. If Ad.10 (power-on run) is set to 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. |

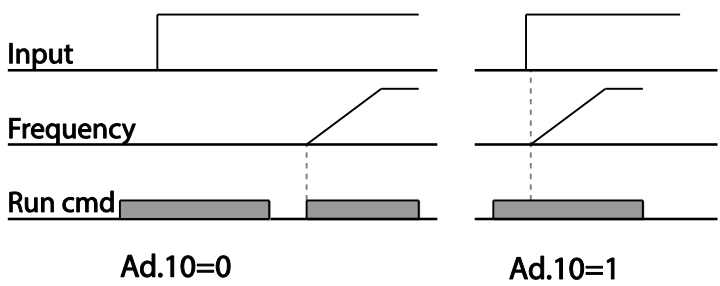


## 4.8 Power-on Run

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

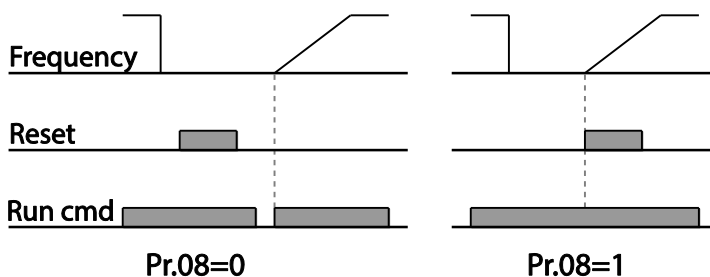
Reset and restart operations can be setup for inverter operation following a fault trip, based on the terminal block operation command (if it is configured). When a fault trip occurs, the inverter cuts off the output and the motor will free-run. Another fault trip may be triggered if the inverter



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<br>2            | Fx/Rx-1 or<br>Fx/Rx-2 | 0-4<br>-    |
|           |      |                         |              |                   |                       |             |
| 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<br>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<br>Ramp T Mode | Set the parameter value to 0 (Max Freq) to setup Acc/Dec time based on maximum frequency.   |               |             |   |          |   |            |   |
|                      | <table border="1"> <thead> <tr> <th>Configuration</th><th>Description</th></tr> </thead> <tbody> <tr> <td>0</td><td>Max Freq</td></tr> <tr> <td>1</td><td>Delta Freq</td></tr> </tbody> </table> <p>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 25Hz (half of 50Hz), the time required to reach 25Hz therefore is 2.5 seconds (half of 5 seconds).</p> | Configuration | Description | 0 | Max Freq | 1 | Delta Freq |   |
| Configuration        | Description   |               |             |   |          |   |            |   |
| 0                    | Max Freq  |               |             |   |          |   |            |   |
| 1                    | Delta Freq  |               |             |   |          |   |            |   |
| bA.09 Time scale     | Use the time scale for all time-related values. It is particularly useful when a more accurate Acc/Dec times are required because of load characteristics, or when the maximum time range needs to be extended.   |               |             |   |          |   |            |   |
|                      | <table border="1"> <thead> <tr> <th>Configuration</th><th>Description</th></tr> </thead> <tbody> <tr> <td>0</td><td>0.01sec</td></tr> <tr> <td>1</td><td>0.1sec</td></tr> <tr> <td>2</td><td>1sec</td></tr> </tbody> </table>   | Configuration | Description | 0 | 0.01sec  | 1 | 0.1sec     | 2 |
| Configuration        | Description   |               |             |   |          |   |            |   |
| 0                    | 0.01sec   |               |             |   |          |   |            |   |
| 1                    | 0.1sec  |               |             |   |          |   |            |   |
| 2                    | 1sec  |               |             |   |          |   |            |   |

### ⓘ 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<br>Ramp T Mode  | Set the parameter value to 1 (Delta Freq) to set Acc/Dec times based on Maximum frequency.   |               |  |             |   |          |  |   |            |  |
|   | <table><tr><th colspan="2">Configuration</th><th>Description</th></tr><tr><td>0</td><td>Max Freq</td><td>Set the Acc/Dec time based on Maximum frequency.</td></tr><tr><td>1</td><td>Delta Freq</td><td>Set the Acc/Dec time based on Operation frequency.</td></tr></table> | Configuration |  | Description | 0 | Max Freq | Set the Acc/Dec time based on Maximum frequency. | 1 | Delta Freq | Set the Acc/Dec time based on Operation frequency. |
|   | Configuration  |               | Description  |             |   |          |  |   |            |  |
|   | 0  | Max Freq      | Set the Acc/Dec time based on Maximum frequency.   |             |   |          |  |   |            |  |
|   | 1  | Delta Freq    | Set the Acc/Dec time based on Operation frequency. |             |   |          |  |   |            |  |
| If Acc/Dec times are set to 5 seconds, and multiple frequency references are used in the operation in 2 steps, at 10Hz and 30 Hz, each acceleration stage will take 5 seconds (refer to the graph below).   |  |               |  |             |   |          |  |   |            |  |
| <div><div><div>Frequency</div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div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|  |               |  |             |   |          |  |   |            |  |

### 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        | 65–69 | Px terminal configuration       | Px Define (Px: P1–P5) | 11                | XCEL-L        | 0–54 |
|           |       |                                 |                       | 12                | XCEL-M        |      |
|           |       |                                 |                       | 49                | XCEL-H        |      |
|           | 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.   |        |                   |
| bA.71–83 Dec Time 1–7         | Set multi-step deceleration time1–7.   |        |                   |
| In.65–69<br>Px Define (P1–P5) | Choose and configure the terminals to use for multi-step Acc/Dec time inputs.  |        |                   |
|                               | Configuration  |        | Description       |
|                               | 11   | XCEL-L | Acc/Dec command-L |
|                               | 12   | XCEL-M | Acc/Dec command-M |
|                               | 49   | XCEL-H | Acc/Dec command-H |
|                               | Acc/Dec commands are recognized as binary code inputs and will control the acceleration and deceleration based on parameter values set with bA.70–82 and bA.71–83. |        |                   |
|                               | If, for example, the P4 and P5 terminals are set as XCEL-L and XCEL respectively, the following operation will be available.                                       |        |                   |



| Code                | Description  |              |    |    |   |   |   |   |   |   |   |   |   |   |   |   |
|---------------------|--|--------------|----|----|---|---|---|---|---|---|---|---|---|---|---|---|
|                     | <div><p>The diagram illustrates the relationship between frequency, terminal inputs P4 and P5, and the Run command. The frequency curve is divided into acceleration (Acc0 to Acc3) and deceleration (Dec0 to Dec3) phases. P4 pulses occur during Acc1, Acc2, Dec1, and Dec2. P5 pulses occur during Acc2 and Dec2. The Run cmd pulse occurs during Acc0 and Acc1.</p><table><thead><tr><th>Acc/Dec time</th><th>P5</th><th>P4</th></tr></thead><tbody><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></tbody></table></div> | Acc/Dec time | P5 | P4 | 0 | - | - | 1 | - | ✓ | 2 | ✓ | - | 3 | ✓ | ✓ |
| Acc/Dec time        | P5   | P4           |    |    |   |   |   |   |   |   |   |   |   |   |   |   |
| 0                   | -  | -            |    |    |   |   |   |   |   |   |   |   |   |   |   |   |
| 1                   | -  | ✓            |    |    |   |   |   |   |   |   |   |   |   |   |   |   |
| 2                   | ✓  | -            |    |    |   |   |   |   |   |   |   |   |   |   |   |   |
| 3                   | ✓  | ✓            |    |    |   |   |   |   |   |   |   |   |   |   |   |   |
| In.89 In Check Time | 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.   |              |    |    |   |   |   |   |   |   |   |   |   |   |   |   |

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

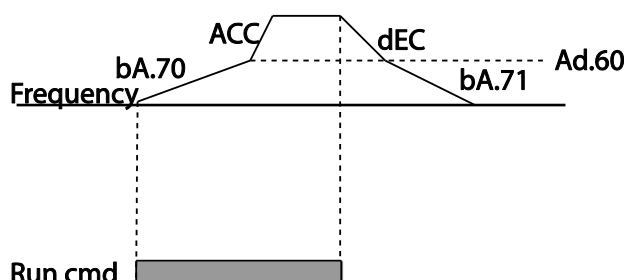
You can switch between two different sets of Acc/Dec times (Acc/Dec gradients) by configuring the switch frequency without configuring the multi-function terminals.

| 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<br>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.<br><br>If you configure the P1–P5 multi-function input terminals for multi-step Acc/Dec gradients (XCEL-L, XCEL-M, XCEL-H), the inverter will operate based on the Acc/Dec inputs at the terminals instead of the Acc/Dec switch frequency configurations. |



## 4.11 Acc/Dec Pattern Configuration

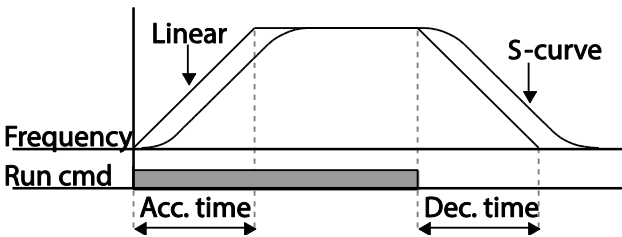
Acc/Dec gradient level patterns can be configured to enhance and smooth the inverter's acceleration and deceleration curves. Linear pattern features a linear increase or decrease to the output frequency, at a fixed rate. For an S-curve pattern a smoother and more gradual increase or decrease of output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

| Group | Code | Name                       | LCD Display | 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         | %    |



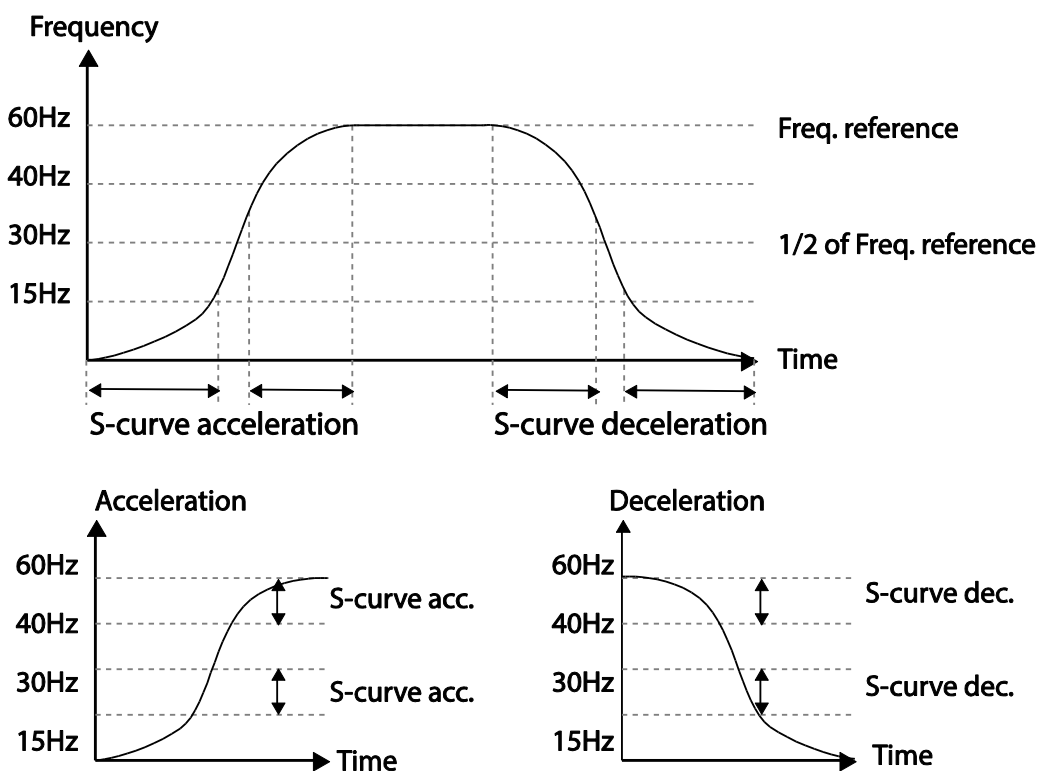
### Acc/Dec Pattern Setting Details

| Code                                   | Description  |
|--|--|
| Ad.03 Acc S Start                      | <p>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.</p> <p>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 30Hz). Linear acceleration will be applied to the remaining acceleration within the 15–30Hz frequency range.</p>   |
| Ad.04 Acc S End                        | <p>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.</p> <p>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.</p> |
| Ad.05 Dec S Start –<br>Ad.06 Dec S End | <p>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.</p>  |



[Acceleration / deceleration pattern configuration]





[Acceleration / deceleration S-curve partrten 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

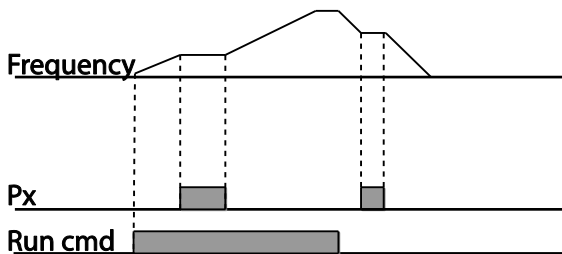
Note that actual Acc/Dec times become greater than user defined Acc/Dec times when S-curve Acc/Dec patterns are in use.



## 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    | 65–69 | Px terminal configuration | Px Define(Px: P1–P5) | 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 torque boost used during low frequency operations can also be adjusted.

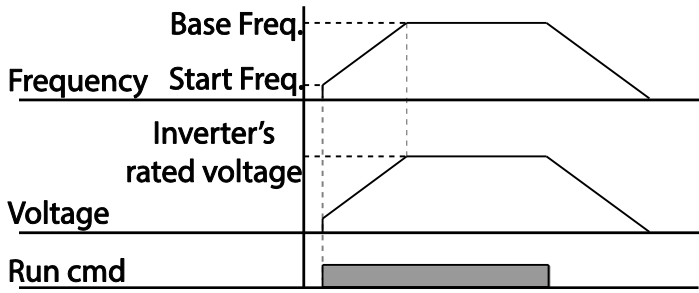
### 4.13.1 Linear V/F Pattern Operation

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 particularly 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 | <p>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).</p>  <p>The graph illustrates the Linear V/F pattern. The top plot shows Frequency (Hz) on the y-axis against time on the x-axis. It starts at a 'Start Freq' value, rises linearly to 'Base Freq', remains constant at 'Base Freq' for a period, and then falls linearly back to 0Hz. The bottom plot shows Voltage (V) on the y-axis against time on the x-axis. It starts at 0V, rises linearly to the 'Inverter's rated voltage' at the 'Start Freq' frequency, remains constant at that voltage until the 'Base Freq' frequency, and then falls linearly back to 0V. A 'Run cmd' pulse is shown as a shaded rectangle starting at the 'Start Freq' frequency and ending when the frequency returns to 0Hz.</p> |

### 4.13.2 Square Reduction V/F pattern Operation

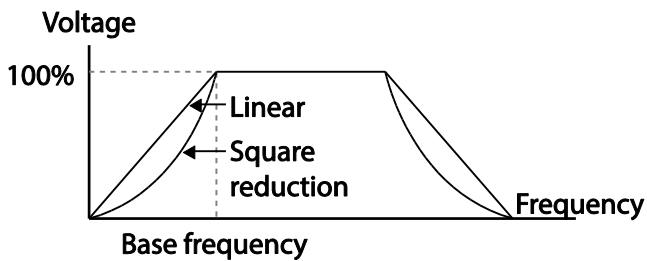
Square reduction V/F pattern is ideal for loads such as fans and pumps. It provides non-linear acceleration and deceleration patterns to sustain torque throughout the whole frequency range.

| 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.

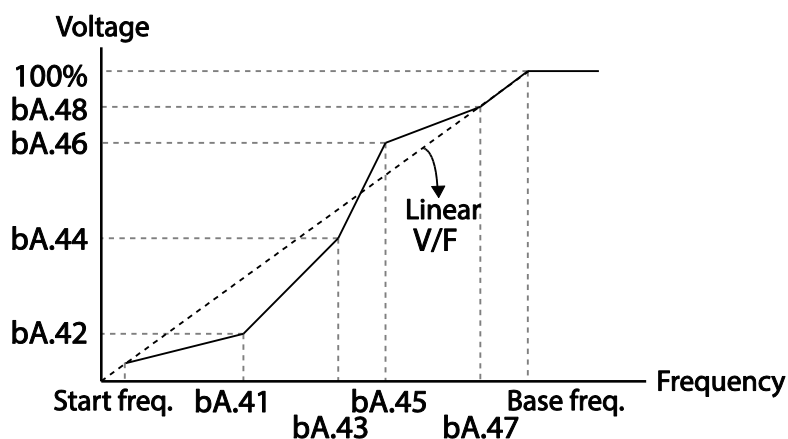
| Group | Code | Name            | LCD Display | Parameter Setting |          | Setting Range       | Unit |
|-------|------|-----------------|-------------|-------------------|----------|---------------------|------|
| bA    | 07   | V/F pattern     | V/F Pattern | 2                 | User V/F | 0-3                 | -    |
|       | 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–<br>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

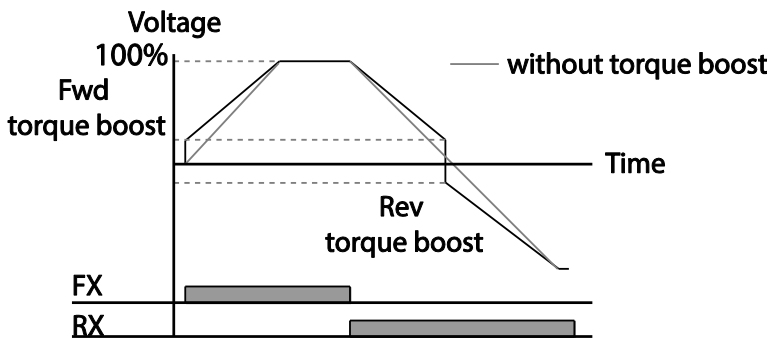
Manual torque boost enables users to adjust output voltage during low speed operation or motor start. Increase low speed torque or improve motor starting properties by manually increasing output voltage. Configure manual torque boost while running loads that require high starting torque, such as lift-type 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

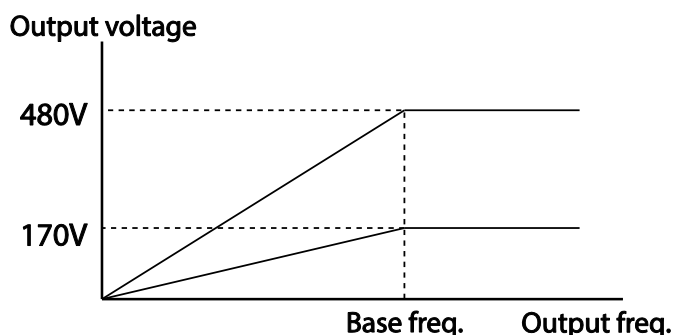
Output voltage settings are required when a motor's rated voltage differs from the input voltage to the inverter. Set bA.15 to configure the motor's rated operating voltage. The set voltage



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.

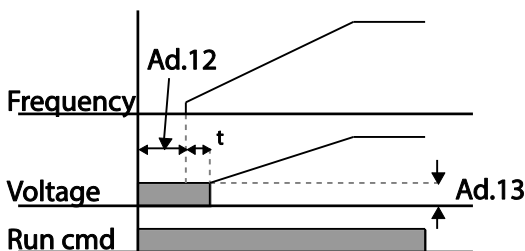
| Group | Code | Name       | LCD Display | Parameter Setting | Setting Range | Unit |
|-------|------|------------|-------------|-------------------|---------------|------|
| Ad    | 07   | Start mode | Start mode  | 0 Acc             | 0–1           | -    |



### 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

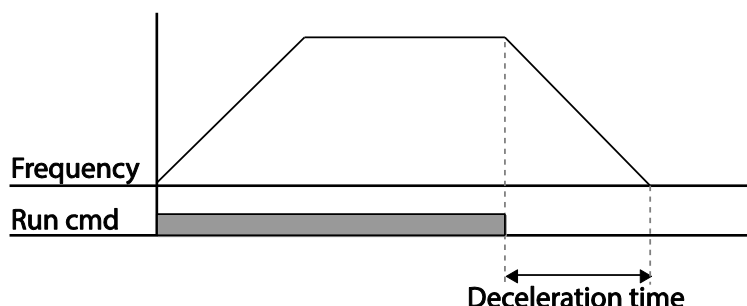
Select a stop mode to stop the inverter operation.

### 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

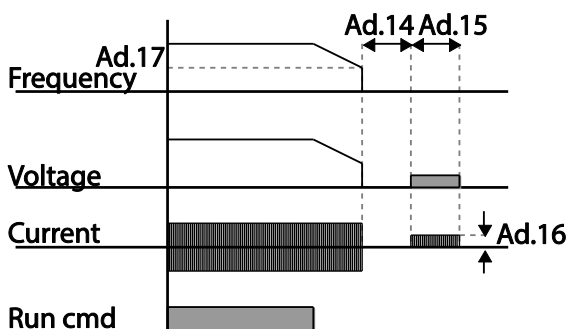
When the operation frequency reaches the set value during deceleration (DC braking frequency), the inverter stops the motor by supplying DC power to the motor. With a stop command input, the inverter begins decelerating the motor. When the frequency reaches the DC braking frequency set at Ad.17, the 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.  |





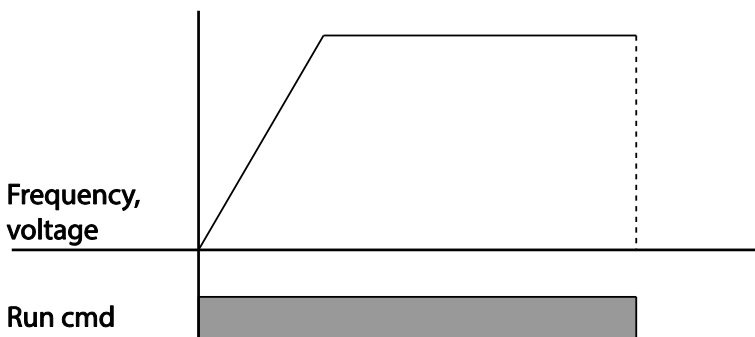
### ⚠ Caution

- 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.<br>This restriction also applies when you input a frequency reference using the keypad. |

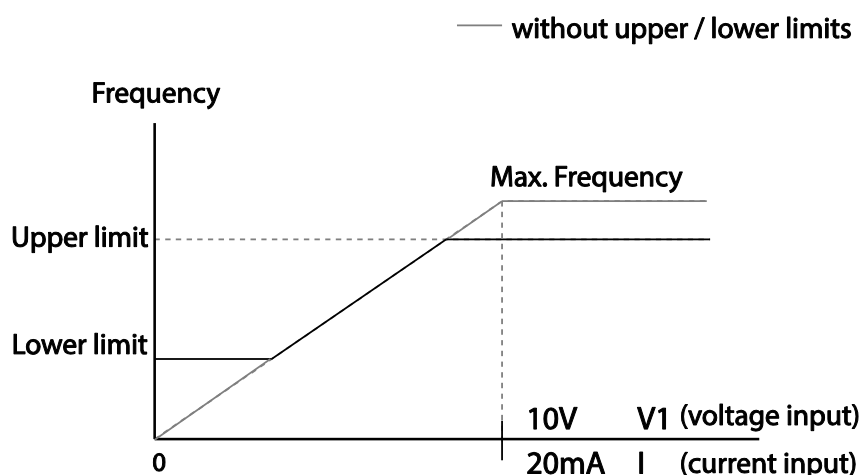
### 4.18.2 Frequency Limit Using Upper and Lower Limit Frequency Values

| 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,<br>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.  |





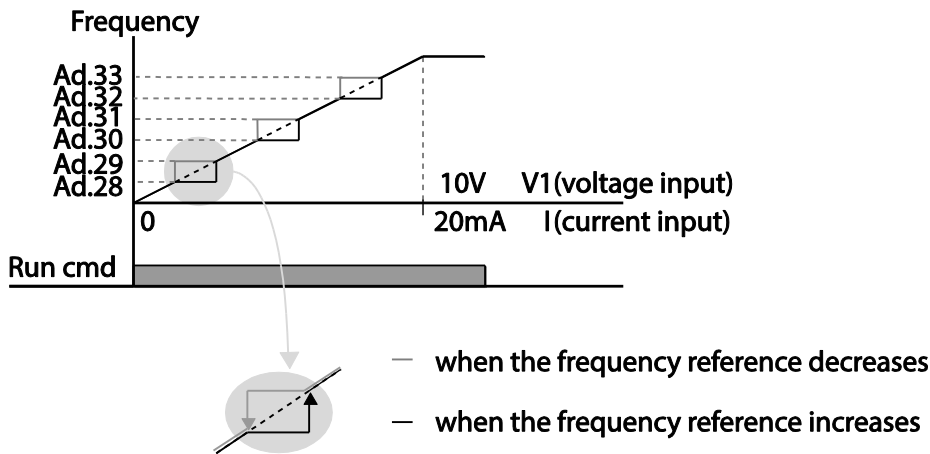
### 4.18.3 Frequency Jump

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 limit 1 | Jump Lo 1   | 10.00             |    | 0.00–Jump frequency upper limit 1              | Hz   |
|       | 29   | Jump frequency upper limit 1 | Jump Hi 1   | 15.00             |    | Jump frequency lower limit 1–Maximum frequency | Hz   |
|       | 30   | Jump frequency lower limit 2 | Jump Lo 2   | 20.00             |    | 0.00–Jump frequency upper limit 2              | Hz   |
|       | 31   | Jump frequency upper limit 2 | Jump Hi 2   | 25.00             |    | Jump frequency lower limit 2–Maximum frequency | Hz   |
|       | 32   | Jump frequency lower limit 3 | Jump Lo 3   | 30.00             |    | 0.00–Jump frequency upper limit 3              | Hz   |
|       | 33   | Jump frequency upper limit 3 | Jump Hi 3   | 35.00             |    | Jump frequency lower limit 3–Maximum frequency | Hz   |





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

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

Select one of the multi-function terminals from codes In. 65–69 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    | 2 <sup>nd</sup> Command source             | Cmd 2nd Src              | 0                 | Keypad        | 0–4  |
|           | 05    | 2 <sup>nd</sup> Frequency reference source | Freq 2nd Src             | 0                 | KeyPad-1      | 0–12 |
| In        | 65–69 | Px terminal configuration                  | Px Define<br>(Px: P1–P5) | 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  | If signals are provided to the multi-function terminal set as the 2 <sup>nd</sup> command source (2nd Source), the operation can be performed using the set values from |
| bA.05 Freq 2nd Src |   |



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


## ⚠ Caution

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

## 4.20 Multi-function Input Terminal Control

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









| Group | Code | Name                                     | LCD Display  | Parameter Setting | Setting Range | Unit |
|-------|------|--|--------------|-------------------|---------------|------|
| 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,<br>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–P5, from right to left.  |  |  |
|                 | Type  | B terminal status (Normally Closed)  | A terminal status (Normally Open)  |
|                 | Keypad  |   |   |
|                 | LCD keypad  |   |   |
| 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–P5, 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  | Int485 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   | User 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–<br>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–<br>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–<br>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–<br>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 input 8-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–<br>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-<br>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-<br>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-<br>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-<br>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-<br>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 input 14-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–<br>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–<br>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–<br>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–<br>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–<br>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.<br>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.<br>User sequence loop time can be set to 0.01s/0.02s/ 0.05s/0.1s/0.5s/1s.   |
| US.11–28<br>Link UserOut1–18 | Set parameters to connect 18 Function Blocks. If the input value is 0x0000, an output value cannot be used.<br>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.<br>If the function block setting is invalid, the output of the User Output@ is -1.<br>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, $(A + B) + C$<br>If the C parameter is 0x0000, it will be recognized as 0.                          |
| 2      | SUB    | Subtraction operation, $(A - B) - C$<br>If the C parameter is 0x0000, it will be recognized as 0.                       |
| 3      | ADDSUB | Addition and subtraction compound operation, $(A + B) - C$<br>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).<br>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).<br>If the C parameter is 0x0000, operate only with A, B.    |
| 6      | ABS    | Output the absolute value of the A parameter, $ A $ .<br>This operation does not use the B, or C parameter.             |
| 7      | NEGATE | Output the negative value of the A parameter, $-(A)$ .<br>This operation does not use the B, or C parameter.            |



| Number | Type                                     | Description   |
|--------|--|---|
| 8      | REMAINDER                                | Remainder operation of A and B, $A \% B$<br>This operation does not use the C parameter.  |
| 9      | MPYDIV                                   | Multiplication, division compound operation, $(A \times B)/C$ .<br>If the C parameter is 0x0000, output the multiplication operation of $(A \times B)$ .  |
| 10     | COMPARE-GT<br>(greater than)             | Comparison operation: if $(A > B)$ the output is C; if $(A \leq B)$ the output is 0.<br>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<br>(great than or equal to) | Comparison operation; if $(A \geq B)$ output is C; if $(A < B)$ the output is 0.<br>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.<br>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.<br>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.<br>A: Max Loop, B: Timer Run/Stop, C: Choose output mode.<br>If input of B is 1, timer stops (output is 0). If input is 0, timer runs.<br>If input of C is 1, output the current timer value.<br>If input of C is 0, output 1 when timer value exceeds A(Max) value.<br>If the C parameter is 0x0000, C will be recognized as 0.<br>Timer overflow Initializes the timer value to 0. |
| 15     | LIMIT                                    | Sets a limit for the A parameter.<br>If input to A is between B and C, output the input to A.<br>If input to A is larger than B, output B. If input of A is smaller than C, output C.<br>B parameter must be greater than or equal to the C parameter.  |
| 16     | AND                                      | Output the AND operation, $(A \text{ and } B) \text{ and } C$ .<br>If the C parameter is 0x0000, operate only with A, B.  |
| 17     | OR                                       | Output the OR operation, $(A   B)   C$ .<br>If the C parameter is 0x0000, operate only with A, B.   |
| 18     | XOR                                      | Output the XOR operation, $(A \wedge B) \wedge C$ .<br>If the C parameter is 0x0000, operate only with A, B.  |
| 19     | AND/OR                                   | Output the AND/OR operation, $(A \text{ and } B)   C$ .<br>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.<br>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).<br>If the B bit of the A input is 1, the output is 1. If it is 0, then the output is 0.<br>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.<br>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.<br>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, $B \times US-02$ (US Loop Time).<br>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.<br>Conditions for PI_PROCESS output: C = 0: Const PI,<br>C = 1: PI_PROCESS-B $\geq$ PI_PROCESS-OUT $\geq$ 0,<br>C = 2: PI_PROCESS-B $\geq$ PI_PROCESS-OUT $\geq$ -(PI_PROCESS-B),<br>P gain = A/100, I gain = 1/(Bx Loop Time),<br>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.<br>Range of C is 0–32,767.   |
| 27     | UPCOUNT       | Upcounts the pulses and then output the value- UPCOUNT(A, B, C).<br>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.<br>If the C parameter is 0, upcount when the input at A changes from 0 to 1.<br>If the C parameter is 1, upcount when the input at A is changed from 1 to 0.<br>If the C parameter is 2, upcount whenever the input at A changes.<br>Output range is: 0–32767 |
| 28     | DOWNCOUNT     | Downcounts the pulses and then output the value- DOWNCOUNT(A, B, C).<br>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.<br>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    | 65–69 | Px terminal configuration | Px Define (Px: P1–P5) | 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. 65-69) configured for Fire mode (51: Fire Mode) is turned on. The Fire mode count increases by 1 at Ad. 83 (Fire Mode Count) each time a Fire mode operation is run.

### ⚠ Caution

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



'0.'

## Fire Mode Function Setting Details

| Code                            | Description                   | Details   |
|---------------------------------|-------------------------------|---|
| Ad.81 Fire Mode frequency       | Fire mode frequency reference | The frequency set at Ad. 81 (Fire mode frequency) is used for the inverter operation in Fire mode. The Fire mode frequency takes priority over the Jog frequency, Multi-step frequencies, and the keypad input frequency.   |
| Dr.03 Acc Time / Dr.04 Dec Time | Fire mode Acc/Dec times       | 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). |
| PR.10 Retry Delay               | Fault trip process            | Some fault trips are ignored during Fire mode operation. The fault trip history is saved, but trip outputs are disabled even when they are configured at the multi-function output terminals.   |
|                                 |                               | <b>Fault trips that are ignored in Fire mode</b><br>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.  |
|                                 |                               | <b>Fault trips that force a Reset Restart in Fire mode</b><br>Over Voltage, Over Current1(OC1), Ground Fault Trip   |
|                                 |                               | The inverter stops operating when the following fault trips occur:<br><br><b>Fault trips that stop inverter operation in Fire mode</b><br>H/W Diag, Over Current 2 (Arm-Short)  |



## 5 RS-485 Communication Features

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

### 5.1 Communication Standards

Following the RS-485 communication standards, 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/<br>Transmission type                 | RS-485/Bus type, Multi-drop Link System   |
| Inverter type name   | MD100G  |
| Number of connected<br>inverters/ Transmission<br>distance | Maximum of 16 inverters / Maximum 1,200m (recommended distance:<br>within 700m)           |
| Recommended cable size                                     | 0.75mm <sup>2</sup> , (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<br>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   |

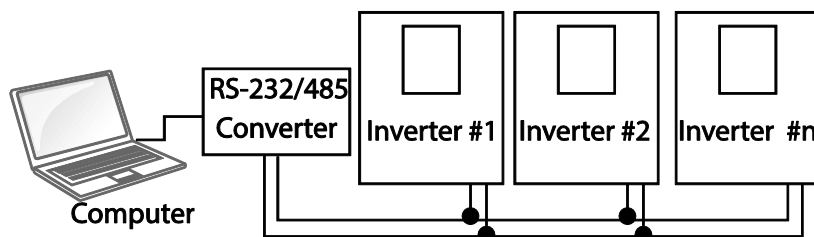
### 5.2 Communication System Configuration

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   |
|------|---|
|      | <p>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.</p> <p>The diagram illustrates the timing between a Master and a Slave. The Master sends a 'Request' pulse. The Slave responds with a 'Response' pulse. The time between the end of the Master's Request and the start of the Slave's Response is labeled 'CM.5 Resp Delay'. This sequence is shown twice with ellipses indicating further communication.</p> |

### 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

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

## 5.2.5 Setting Virtual Multi-Function Input

Multi-function input can be controlled using a communication address (0h0385). Set codes CM.70–77 to the functions to operate, and then set the BIT relevant to the function to 1 at 0h0322 to operate it. Virtual multi-function operates independently from In.65–69 analog multi-function inputs and cannot be set redundantly. Virtual multi-function input can be monitored using CM.86 (Virt DI Status). Before you configure the virtual multi-function inputs, set the DRV code according to the command source.



| Group | Code  | Name  | LCD Display           | 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 communication 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-<br>Status Parameter-8   | Parameter communication code value registered at CM.31-38 (Read-only)         |
| 0h0110-0h0117 | Control Parameter-1-<br>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 129)
- 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 = 1A7h (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=  $(8 + n \times 4)$ : a maximum of 40

### Monitor Registration Normal Response

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

Total bytes=7

### Monitor Registration Error Response

| NAK    | Station ID | CMD    | Error Code | SUM     | EOT    |
|--------|------------|--------|------------|---------|--------|
| 15h    | '01'-FA'   | 'X'    | '***'      | '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=  $(7 + n \times 4)$ : 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 [134](#).



**Function Code #03: Read Holding Register**

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

# number of Points

**Function Code #04: Read Input Register**

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

# number of Points



**Function Code #06: Preset Single Register**

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

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

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

# number of Points



## Exception Code

| Code                     |
|--------------------------|
| 01: ILLEGAL FUNCTION     |
| 02: ILLEGAL DATA ADDRESS |
| 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<br>Int485 St<br>ID | Preset<br>Multiple<br>Register | Starting<br>Address -1<br>(0x1103-1) | -             | -          | 50<br>(ACC<br>time<br>5.0sec) | 100<br>(DEC<br>time<br>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<br>Int485 St ID | Preset Multiple<br>Register | Starting Address -1<br>(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<br>3: 3.7 kW, 4: 5.5 kW, 5: 7.5 kW<br>6: 11 kW, 7: 15 kW, 8: 18.5 kW<br>9: 22 kW<br>256: 0.4 kW, 257: 1.1 kW, 258: 3.0 kW<br>259: 4.0 kW |  |
| 0h0002        | Inverter input voltage     | -     | -    | R   | 0: 240V product<br>1: 415V product  |  |
| 0h0003        | Version                    | -     | -    | R   | Example 0h0100: Version 1.00<br>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,                              |
|               |                            |       |      |     | B13   | 1: Keypad Torq                               |
|               |                            |       |      |     | B12   | 2-16: Terminal block multi-                  |
|               |                            |       |      |     | B11   | step speed                                   |
|               |                            |       |      |     | B10   | 17: Up, 18: Down                             |
|               |                            |       |      |     | B9  | 19: STEADY                                   |
|               |                            |       |      |     |   | 22: V1, 24: V2, 25: I2,                      |
|               |                            |       |      |     |   | 26: Reserved                                 |
|               |                            |       |      |     |   | 27: Built-in 485                             |
|               |                            |       |      |     |   | 28: Communication option                     |
|               |                            |       |      |     |   | 30: JOG, 31: PID                             |
|               |                            |       |      | R/W | B8  | 0: Keypad                                    |
|               |                            |       |      |     | B7  | 1: Fx/Rx-1                                   |
|               |                            |       |      |     | B6  | 2: Fx/Rx-2                                   |
|               |                            |       |      |     |   | 3: Built-in 485                              |
|               |                            |       |      |     |   | 4: Communication option                      |
|               |                            |       |      |     | 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                                  |
| 0h000F        | Fault trip information | -     | -    | R   | B1                      | Operating in forward direction                                  |
|               |                        |       |      |     | B0                      | Stopped   |
|               |                        |       |      |     | 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                            |                 |
|-------------------|--|-------|------|-----|--|-----------------|
| 0h0010            | Input terminal information                         | -     | -    | R   | B0   | Latch Type trip |
|                   |  |       |      |     | B15-B7   | Reserved        |
|                   |  |       |      |     | B6   | Reserved        |
|                   |  |       |      |     | B5   | Reserved        |
|                   |  |       |      |     | 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<br>-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<br>1.1 kW: 4011h, 1.5 kW: 4015h<br>2.2 kW: 4022h, 3.0 kW: 4030h<br>3.7 kW: 4037h, 4.0 kW: 4040h<br>5.5 kW: 4055h, 7.5 kW: 4075h<br>11 kW: 40B0h, 15 kW: 40F0h<br>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<br>100 V single phase forced cooling: 0121h, 400 V single phase self cooling: 0420h<br>200 V single phase self cooling: 0220h, 400 V 3-phase self cooling: 0430h<br>200 V 3-phase self cooling: 0230h, 400 V single phase forced cooling: 0421h<br>200 V single phase forced cooling: 0221h, 400 V 3-phase forced cooling: 0431h |   |
| 0h0303 |         | Inverter S/W version  | -     | -    | (Ex) 0h0100: Version 1.00<br>0h0101: Version 1.01  |   |
| 0h0304 |         | Reserved  | -     | -    | -  |   |
| 0h0305 |         | Inverter operation state  | -     | -    | B15<br>B14<br>B13<br>B12<br>B11 -<br>B8<br>B7<br>B6<br>B5  | 0: Normal state<br>4: Warning occurred<br>8: Fault occurred [operates according to Pr. 30 (Trip Out Mode) setting.]<br>-<br>1: Speed searching<br>2: Accelerating<br>3: Operating at constant rate<br>4: Decelerating |



| Comm. Address | Parameter                                   | Scale | Unit | Assigned content by bit            |   |
|---------------|---|-------|------|------------------------------------|---|
|               |   |       |      | B4                                 | 5: Decelerating to stop<br>6: H/W OCS<br>7: S/W OCS<br>8: Dwell operating           |
|               |   |       |      | B3                                 | 0: Stopped  |
|               |   |       |      | B2                                 | 1: Operating in forward direction   |
|               |   |       |      | B1                                 | 2: Operating in reverse direction   |
|               |   |       |      | B0                                 | 3: DC operating (0 speed control)   |
| 0h0306        | Inverter operation frequency command source | -     | -    | B15                                | Operation command source  |
|               |   |       |      | B14                                | 0: Keypad   |
|               |   |       |      | B13                                | 1: Communication option   |
|               |   |       |      | B12                                | 3: Built-in RS 485  |
|               |   |       |      | B11                                | 4: Terminal block   |
|               |   |       |      | B10                                |   |
|               |   |       |      | B9                                 |   |
|               |   |       |      | B8                                 |   |
|               |   |       |      | B7                                 | Frequency command source  |
|               |   |       |      | B6                                 | 0: Keypad speed   |
|               |   |       |      | B5                                 | 1: Keypad torque  |
|               |   |       |      | B4                                 | 2-4: Up/Down operation speed  |
|               |   |       |      | B3                                 | 5: V1, 7: V2, 8: I2   |
|               |   |       |      | B2                                 | 9: Pulse  |
|               |   |       |      | B1                                 | 10: Built-in RS 485   |
|               |   |       |      | B0                                 | 11: Communication option<br>13: Jog<br>14: PID<br>25-39: Multi-step speed frequency |
| 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 1 <sup>st</sup> motor | -     | -    | Displays the number of poles for the first motor    |                     |
| 0h031B          | Display the number of poles for the 2 <sup>nd</sup> 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                                 |       |      | B15   | Reserved            |
|                 |   |       |      | -   | -                   |
|                 |   |       |      | B7  | Reserved            |
|                 |   |       |      | B6  | Reserved            |
|                 |   |       |      | B5  | Reserved            |
|                 |   |       |      | B4  | P5(I/O board)       |
|                 |   |       |      | B3  | P4(I/O board)       |
|                 |   |       |      | B2  | P3(I/O board)       |
|                 |   |       |      | B1  | P2(I/O board)       |
|                 |   |       |      | B0  | P1(I/O board)       |
| 0h0321          | Digital output information                                | -     | -    | B15   | 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   |
| 0h0331        | Latch type trip information - 2 | -     | -    | B0                          | Overload Trip  |
|               |                                 |       |      | 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                            |
| 0h0333        | H/W Diagnosis Trip information | -         | -     |      | B0                      | BX                            |
|               |                                |           |       |      | B15                     | Reserved                      |
|               |                                |           |       |      | -                       | Reserved                      |
|               |                                |           |       |      | B6                      | Reserved                      |
|               |                                |           |       |      | B5                      | Queue Full                    |
|               |                                |           |       |      | B4                      | Reserved                      |
|               |                                |           |       |      | B3                      | Watchdog-2 error              |
|               |                                |           |       |      | B2                      | Watchdog-1 error              |
| 0h0334        | Warning information            | -         | -     |      | B1                      | EEPROM error                  |
|               |                                |           |       |      | B0                      | ADC error                     |
|               |                                |           |       |      | 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                  |
| 0h0335-0h033F | Reserved                       | -         | -     |      | B2                      | Inverter Overload             |
|               |                                |           |       |      | B1                      | Underload                     |
|               |                                |           |       |      | B0                      | Overload                      |



| 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<br>-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<br>3: bA Grp, 4: Ad Grp, 5: Cn Grp<br>6: In Grp, 7: OU Grp, 8: CM Grp<br>9: AP Grp, 12: Pr Grp, 13: M2 Grp<br>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-registered codes                      | -     | -    | O                           | 0: No, 1: Yes                             |
| 0h03E7        | Hide parameter mode                               | 0     | Hex  | O                           | Write: 0-9999<br>Read: 0: Unlock, 1: Lock |
| 0h03E8        | Lock parameter mode                               | 0     | Hex  | O                           | Write: 0-9999<br>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  | <a href="#">p.42</a> |
| -    | 0h1F01        | Acceleration time          | ACC            | 0.0-600.0(s)  | 20.0          | O/7       | O   | O  | <a href="#">p.82</a> |
| -    | 0h1F02        | Deceleration time          | dEC            | 0.0-600.0(s)  | 30.0          | O/7       | O   | O  | <a href="#">p.82</a> |
| -    | 0h1F03        | Command source             | drv            | <div>0 Keypad</div> <div>1 Fx/Rx-1</div> <div>2 Fx/Rx-2</div> <div>3 Int 485</div> <div>4 Field Bus<sup>1</sup></div> | 1: Fx/Rx-1    | X/7       | O   | O  | <a href="#">p.76</a> |
| -    | 0h1F04        | Frequency reference source | Frq            | <div>0 Keypad-1</div> <div>1 Keypad-2</div> <div>2 V1</div> <div>4 V2</div> <div>5 I2</div> <div>6 Int 485</div>      | 0: Keypad-1   | X/7       | O   | O  | <a href="#">p.62</a> |

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



## Table of Functions

| 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  | <a href="#">p.73</a> |
| -    | 0h1F06        | Multi-step speed frequency 2    | St2            | 0.00-Maximum frequency(Hz) |             | 20.00         | O/7       | O   | O  | <a href="#">p.73</a> |
| -    | 0h1F07        | Multi-step speed frequency 3    | St3            | 0.00-Maximum frequency(Hz) |             | 30.00         | O/7       | O   | O  | <a href="#">p.73</a> |
| -    | 0h1F08        | Output current                  | CUr            |                            |             |               | -/7       | O   | O  | <a href="#">p.56</a> |
| -    | 0h1F09        | Motor revolutions per minute    | Rpm            |                            |             |               | -/7       | O   | O  | -                    |
| -    | 0h1F0A        | Inverter direct current voltage | dCL            | -                          |             | -             | -/7       | O   | O  | <a href="#">p.56</a> |
| -    | 0h1F0B        | Inverter output voltage         | vOL            |                            |             |               | -/7       | O   | O  | <a href="#">p.56</a> |
| -    | 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  | <a href="#">p.42</a> |
| 01 <sup>2</sup> | 0h1101        | Target frequency           | Cmd Frequency | Start frequency - Maximum frequency(Hz)   | 0.00          | O/L       | O   | O  | <a href="#">p.46</a> |
| 02              | 0h1102        | Torque command             | Cmd Torque    | -180~180[%]   | 0.0           | O/A       | X   | O  | -                    |
| 03 <sup>2</sup> | 0h1103        | Acceleration time          | Acc Time      | 0.0-600.0(s)  | 20.0          | O/L       | O   | O  | <a href="#">p.82</a> |
| 04 <sup>2</sup> | 0h1104        | Deceleration time          | Dec Time      | 0.0-600.0(s)  | 30.0          | O/L       | O   | O  | <a href="#">p.82</a> |
| 06 <sup>2</sup> | 0h1106        | Command source             | Cmd Source    | <div>0 Keypad</div> <div>1 Fx/Rx-1</div> <div>2 Fx/Rx-2</div> <div>3 Int 485</div> <div>4 Field Bus</div>   | 1: Fx/Rx-1    | X/L       | O   | O  | <a href="#">p.76</a> |
| 07 <sup>2</sup> | 0h1107        | Frequency reference source | Freq Ref Src  | <div>0 Keypad-1</div> <div>1 Keypad-2</div> <div>2 V1</div> <div>4 V2</div> <div>5 I2</div> <div>6 Int 485</div> <div>8 Field Bus</div> <div>12 Pulse</div> | 2: V1         | X/L       | O   | O  | <a href="#">p.62</a> |
| 08              | 0h1108        | Torque reference setting   | Trq Ref Src   | <div>0 Keypad-1</div> <div>1 Keypad-2</div> <div>2 V1</div> <div>4 V2</div> <div>5 I2</div> <div>6 Int 485</div> <div>8 FieldBus</div> <div>12 Pulse</div>  | 0: Keypad-1   | X/A       | X   | O  | -                    |
| 09              | 0h1109        | Control mode               | Control Mode  | 0 V/F   | 0: V/F        | X/A       | O   | O  | -                    |

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



## Table of Functions

| Code            | Comm. Address | Name                      | LCD Display    | Setting Range  |               | Initial value            | Property* | V/F | SL | Ref.        |
|-----------------|---------------|---------------------------|----------------|--|---------------|--------------------------|-----------|-----|----|-------------|
|                 |               |                           |                | 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 time | Jog Dec Time   | 0.0-600.0(s)   |               | 30.0                     | O/A       | O   | O  |             |
| 14              | 0h110E        | Motor capacity            | Motor Capacity | 0: 0.2kW,<br>1: 0.4kW<br>2: 0.75kW,<br>3: 1.1kW<br>4: 1.5kW,<br>5: 2.2kW<br>6: 3.0kW,<br>7: 3.7kW<br>8: 4.0kW,<br>9: 5.5kW<br>10: 7.5kW,<br>11: 11.0kW<br>12: 15.0kW,<br>13: 18.5kW<br>14: 22.0kW,<br>15: 30.0kW |               | Varies by Motor capacity | X/A       | O   | O  | -           |
| 15              | 0h110F        | Torque boost options      | Torque Boost   | 0  | Manual        | 0: Manual                | X/A       | O   | X  | -           |
|                 |               |                           |                | 1  | Auto          |                          |           |     |    |             |
| 16 <sup>3</sup> | 0h1110        | Forward Torque boost      | Fwd Boost      | 0.0-15.0(%)  |               | 2.0                      | X/A       | O   | X  | <u>p.94</u> |
| 17 <sup>3</sup> | 0h1111        | Reverse Torque boost      | Rev Boost      | 0.0-15.0(%)  |               | 2.0                      | X/A       | O   | X  | <u>p.94</u> |
| 18              | 0h1112        | Base frequency            | Base Freq      | 30.00-400.00(Hz)   |               | 50.00                    | X/A       | O   | O  | <u>p.91</u> |

<sup>3</sup> Displayed when dr.15 is set to 0 (Manual)



| Code            | Comm. Address | Name                         | LCD Display   | Setting Range   | Initial value           | Property* | V/F | SL | Ref.                  |
|-----------------|---------------|------------------------------|---------------|---|-------------------------|-----------|-----|----|-----------------------|
| 19              | 0h1113        | Start frequency              | Start Freq    | 0.01-10.00(Hz)  | 0.50                    | X/A       | O   | O  | <a href="#">p.91</a>  |
| 20              | 0h1114        | Maximum frequency            | Max Freq      | 40.00-400.00(Hz)[V/F, Slip Compen]<br>40.00-120.00(Hz)[IM Sensorless]   | 50.00                   | X/A       | O   | O  | <a href="#">p.100</a> |
| 21              | 0h1115        | Select speed unit            | Hz/Rpm Sel    | 0 Hz Display<br>1 Rpm Display   | 0:Hz Display<br>Display | O/L       | O   | O  | <a href="#">p.73</a>  |
| 22 <sup>4</sup> | 0h1116        | (+)Torque gain               | (+)Trq Gain   | 50.0 ~ 150.0[%]   | 100.0                   | O/A       | X   | O  | -                     |
| 23 <sup>4</sup> | 0h1117        | (-)Torque gain               | (-)Trq Gain   | 50.0 ~ 150.0[%]   | 80.0                    | O/A       | X   | O  | -                     |
| 24 <sup>4</sup> | 0h1118        | (-)Torque gain 0             | (-)Trq Gain0  | 50.0 ~ 150.0[%]   | 80.0                    | O/A       | X   | O  | -                     |
| 25 <sup>4</sup> | 0h1119        | (-)Torque offset             | (-)Trq Offset | 0.0 ~ 100.0[%]  | 40.0                    | O/A       | X   | O  | -                     |
| 80 <sup>5</sup> | 0h1150        | Select ranges at power input | -             | Select ranges inverter displays at power input<br>0 Run frequency<br>1 Acceleration time<br>2 Deceleration time<br>3 Command source<br>4 Frequency reference source<br>5 Multi-step speed frequency 1<br>6 Multi-step speed | 0:run frequency         | O/7       | O   | O  | -                     |

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

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



## Table of Functions

| Code            | Comm. Address | Name                      | LCD Display | Setting Range               |                              | Initial value     | Property* | V/F | SL | Ref.        |
|-----------------|---------------|---------------------------|-------------|-----------------------------|------------------------------|-------------------|-----------|-----|----|-------------|
|                 |               |                           |             |                             | 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 order       |                   |           |     |    |             |
|                 |               |                           |             | 13                          | Select run direction         |                   |           |     |    |             |
|                 |               |                           |             | 14                          | output current2              |                   |           |     |    |             |
|                 |               |                           |             | 15                          | Motor RPM2                   |                   |           |     |    |             |
|                 |               |                           |             | 16                          | Inverter DC voltage2         |                   |           |     |    |             |
|                 |               |                           |             | 17                          | User select signal2 (dr.81)  |                   |           |     |    |             |
| 81 <sup>5</sup> | 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 <sup>5</sup> | 0h03E3        | Display changed parameter | -           | 0                           | View All                     | 0: View All       | O/7       | O   | O  | -           |
|                 |               |                           |             | 1                           | View Changed                 |                   |           |     |    |             |
| 90 <sup>5</sup> | 0h115A        | [ESC] key functions       | -           | 0                           | Move to initial              | 0: None           | X/7       | O   | O  | <u>p44,</u> |



| Code            | Comm. Address | Name                          | LCD Display | Setting Range |                 | Initial value | Property* | V/F | SL | Ref.  |
|-----------------|---------------|-------------------------------|-------------|---------------|-----------------|---------------|-----------|-----|----|-------|
|                 |               |                               |             |               | position        |               |           |     |    | p.78, |
|                 |               |                               |             | 1             | JOG Key         |               |           |     |    |       |
|                 |               |                               |             | 2             | Local/Remote    |               |           |     |    |       |
| 93 <sup>5</sup> | 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          |               |           |     |    |       |
|                 |               |                               |             | 16            | run Grp         |               |           |     |    |       |
|                 |               |                               |             |               |                 |               |           |     |    |       |
| 94 <sup>5</sup> | 0h115E        | Password registration         |             | 0-99          |                 |               | O/7       | O   | O  | -     |
| 95 <sup>5</sup> | 0h115F        | Parameter lock settings       |             | 0-99          |                 |               | O/7       | O   | O  | -     |
| 97 <sup>5</sup> | 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  | <a href="#">p.42</a>  |
| 01              | 0h1201        | Auxiliary reference source         | Aux Ref Src   | 0               | None           | 0:None       | X/A | O  | -                     |
|                 |               |                                    |               | 1               | V1             |              |     |    |                       |
|                 |               |                                    |               | 3               | V2             |              |     |    |                       |
|                 |               |                                    |               | 4               | I2             |              |     |    |                       |
|                 |               |                                    |               | 6               | Pulse          |              |     |    |                       |
| 02 <sup>6</sup> | 0h1202        | Auxiliary command calculation type | Aux Calc Type | 0               | M+(G*A)        | 0: M+(GA )   | X/A | O  | -                     |
|                 |               |                                    |               | 1               | Mx (G*A)       |              |     |    |                       |
|                 |               |                                    |               | 2               | M/(G*A)        |              |     |    |                       |
|                 |               |                                    |               | 3               | M+[M*(G*A)]    |              |     |    |                       |
|                 |               |                                    |               | 4               | M+G*2(A-50%)   |              |     |    |                       |
|                 |               |                                    |               | 5               | Mx[G*2(A-50%)  |              |     |    |                       |
|                 |               |                                    |               | 6               | M/[G*2(A-50%)] |              |     |    |                       |
|                 |               |                                    |               | 7               | M+M*G*2(A-50%) |              |     |    |                       |
| 03 <sup>6</sup> | 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  | <a href="#">p.103</a> |
|                 |               |                                    |               | 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  | <a href="#">p.103</a> |
|                 |               |                                    |               | 1               | Keypad-2       |              |     |    |                       |
|                 |               |                                    |               | 2               | V1             |              |     |    |                       |
|                 |               |                                    |               | 4               | V2             |              |     |    |                       |
|                 |               |                                    |               | 5               | I2             |              |     |    |                       |
|                 |               |                                    |               | 6               | Int 485        |              |     |    |                       |
|                 |               |                                    |               | 8               | FieldBus       |              |     |    |                       |

<sup>6</sup> 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.                 |
|-----------------|---------------|----------------------------|--------------|---------------|----------------------------|-----------|-----|----|----------------------|
|                 |               |                            |              | 12 Pulse      |                            |           |     |    |                      |
| 06 <sup>7</sup> | 0h1206        | 2nd Torque command source  | Trq 2nd Src  | 0 Keypad-1    | 0: Keypad-1                | O         | 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  | <a href="#">p.91</a> |
|                 |               |                            |              | 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  | <a href="#">p.82</a> |
|                 |               |                            |              | 1 Delta Freq  |                            |           |     |    |                      |
| 09              | 0h1209        | Time scale settings        | Time Scale   | 0 0.01 sec    | 1:0.1 sec                  | X/A       | O   | O  | <a href="#">p.82</a> |
|                 |               |                            |              | 1 0.1 sec     |                            |           |     |    |                      |
|                 |               |                            |              | 2 1 sec       |                            |           |     |    |                      |
| 10              | 0h120A        | Input power frequency      | 60/50 Hz Sel | 0 60Hz        | 1:50Hz                     | X/A       | O   | O  | -                    |
|                 |               |                            |              | 1 50Hz        |                            |           |     |    |                      |
| 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  | <a href="#">p.95</a> |
| 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  | -                    |

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



## Table of Functions

| Code            | Comm. Address | Name                          | LCD Display    | Setting Range                   |                           | Initial Value              | Property* | V/F | SL | Ref.                 |
|-----------------|---------------|-------------------------------|----------------|---------------------------------|---------------------------|----------------------------|-----------|-----|----|----------------------|
| 19              | 0h1213        | Input power voltage           | AC Input Volt  | 170-480V                        |                           | 240/415V                   | O/A       | O   | O  | -                    |
| 20              | -             | Auto Tuning                   | Auto Tuning    | 0                               | None                      | 0:None                     | X/A       | X   | O  | -                    |
|                 |               |                               |                | 1                               | All (Rotation type)       |                            |           |     |    |                      |
|                 |               |                               |                | 2                               | ALL (Static type)         |                            |           |     |    |                      |
|                 |               |                               |                | 3                               | Rs+Lsigma (Rotation type) |                            |           |     |    |                      |
|                 |               |                               |                | 6                               | Tr (Static type)          |                            |           |     |    |                      |
| 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 <sup>7</sup> | -             | Rotor time constant           | Tr             | 25-5000(ms)                     |                           | -                          | X/A       | X   | O  | -                    |
| 25 <sup>7</sup> | -             | Stator inductance scale       | Ls Scale       | 50 ~ 150[%]                     |                           | 100                        | X/A       | X   | O  | -                    |
| 26 <sup>7</sup> | -             | Rotor time constant scale     | Tr Scale       | 50 ~ 150[%]                     |                           | 100                        | X/A       | X   | O  | -                    |
| 31 <sup>7</sup> |               | Regeneration inductance scale | Ls Regen Scale | 70 ~ 100[%]                     |                           | 80                         | X/A       | X   | O  | -                    |
| 41 <sup>8</sup> | 0h1229        | User frequency1               | User Freq 1    | 0.00-Maximum frequency(Hz)      |                           | 15.00                      | X/A       | O   | X  | <a href="#">p.93</a> |
| 42 <sup>8</sup> | 0h122A        | User voltage1                 | User Volt 1    | 0-100(%)                        |                           | 25                         | X/A       | O   | X  | <a href="#">p.93</a> |
| 43 <sup>8</sup> | 0h122B        | User frequency2               | User Freq 2    | 0.00-0.00-Maximum frequency(Hz) |                           | 30.00                      | X/A       | O   | X  | <a href="#">p.93</a> |
| 44 <sup>8</sup> | 0h122C        | User voltage2                 | User Volt 2    | 0-100(%)                        |                           | 50                         | X/A       | O   | X  | <a href="#">p.93</a> |
| 45 <sup>8</sup> | 0h122D        | User frequency3               | User Freq 3    | 0.00-Maximum frequency(Hz)      |                           | 45.00                      | X/A       | O   | X  | <a href="#">p.93</a> |
| 46 <sup>8</sup> | 0h122E        | User voltage3                 | User Volt 3    | 0-100(%)                        |                           | 75                         | X/A       | O   | X  | <a href="#">p.93</a> |

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



| Code             | Comm. Address | Name                          | LCD Display | Setting Range              | Initial Value     | Property* | V/F | SL | Ref.                 |
|------------------|---------------|-------------------------------|-------------|----------------------------|-------------------|-----------|-----|----|----------------------|
| 47 <sup>8</sup>  | 0h122F        | User frequency4               | User Freq 4 | 0.00-Maximum frequency(Hz) | Maximum frequency | X/A       | O   | X  | <a href="#">p.93</a> |
| 48 <sup>8</sup>  | 0h1230        | User voltage4                 | User Volt 4 | 0-100(%)                   | 100               | X/A       | O   | X  | <a href="#">p.93</a> |
| 50 <sup>9</sup>  | 0h1232        | Multi-step speed frequency1   | Step Freq-1 | 0.00-Maximum frequency(Hz) | 10.00             | O/L       | O   | O  | <a href="#">p.73</a> |
| 51 <sup>9</sup>  | 0h1233        | Multi-step speed frequency2   | Step Freq-2 | 0.00-Maximum frequency(Hz) | 20.00             | O/L       | O   | O  | <a href="#">p.73</a> |
| 52 <sup>9</sup>  | 0h1234        | Multi-step speed frequency3   | Step Freq-3 | 0.00-Maximum frequency(Hz) | 30.00             | O/L       | O   | O  | <a href="#">p.73</a> |
| 53 <sup>10</sup> | 0h1235        | Multi-step speed frequency4   | Step Freq-4 | 0.00-Maximum frequency(Hz) | 40.00             | O/A       | O   | O  | <a href="#">p.73</a> |
| 54 <sup>10</sup> | 0h1236        | Multi-step speed frequency5   | Step Freq-5 | 0.00-Maximum frequency(Hz) | 50.00             | O/A       | O   | O  | <a href="#">p.73</a> |
| 55 <sup>10</sup> | 0h1237        | Multi-step speed frequency6   | Step Freq-6 | 0.00-Maximum frequency(Hz) | Maximum frequency | O/A       | O   | O  | <a href="#">p.73</a> |
| 56 <sup>10</sup> | 0h1238        | Multi-step speed frequency7   | Step Freq-7 | 0.00-Maximum frequency(Hz) | Maximum frequency | O/A       | O   | O  | <a href="#">p.73</a> |
| 70               | 0h1246        | Multi-step acceleration time1 | Acc Time-1  | 0.0-600.0(s)               | 20.0              | O/A       | O   | O  | <a href="#">p.85</a> |
| 71               | 0h1247        | Multi-step deceleration time1 | Dec Time-1  | 0.0-600.0(s)               | 20.0              | O/A       | O   | O  | <a href="#">p.85</a> |
| 72 <sup>11</sup> | 0h1248        | Multi-step acceleration time2 | Acc Time-2  | 0.0-600.0(s)               | 30.0              | O/A       | O   | O  | <a href="#">p.85</a> |

<sup>9</sup> Displayed when an LCD keypad is in use.

<sup>10</sup> Displayed if one of In.65-71 is set to Speed-L/M/H

<sup>11</sup> Displayed one of In.65-71 is set to Xcel-L/M/H.



## Table of Functions

| Code             | Comm. Address | Name                          | LCD Display | Setting Range | Initial Value | Property* | V/F | SL | Ref.                 |
|------------------|---------------|-------------------------------|-------------|---------------|---------------|-----------|-----|----|----------------------|
| 73 <sup>11</sup> | 0h1249        | Multi-step deceleration time2 | Dec Time-2  | 0.0-600.0(s)  | 30.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 74 <sup>11</sup> | 0h124A        | Multi-step acceleration time3 | Acc Time-3  | 0.0-600.0(s)  | 40.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 75 <sup>11</sup> | 0h124B        | Multi-step deceleration time3 | Dec Time-3  | 0.0-600.0(s)  | 40.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 76 <sup>11</sup> | 0h124C        | Multi-step acceleration time4 | Acc Time-4  | 0.0-600.0(s)  | 50.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 77 <sup>11</sup> | 0h124D        | Multi-step deceleration time4 | Dec Time-4  | 0.0-600.0(s)  | 50.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 78 <sup>11</sup> | 0h124E        | Multi-step acceleration time5 | Acc Time-5  | 0.0-600.0(s)  | 40.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 79 <sup>11</sup> | 0h124F        | Multi-step deceleration time5 | Dec Time-5  | 0.0-600.0(s)  | 40.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 80 <sup>11</sup> | 0h1250        | Multi-step acceleration time6 | Acc Time-6  | 0.0-600.0(s)  | 30.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 81 <sup>11</sup> | 0h1251        | Multi-step deceleration time6 | Dec Time-6  | 0.0-600.0(s)  | 30.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 82 <sup>11</sup> | 0h1252        | Multi-step acceleration time7 | Acc Time-7  | 0.0-600.0(s)  | 20.0          | O/A       | O   | O  | <a href="#">p.85</a> |
| 83 <sup>11</sup> | 0h1253        | Multi-step deceleration time7 | Dec Time-7  | 0.0-600.0(s)  | 20.0          | O/A       | O   | O  | <a href="#">p.85</a> |



## 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  | <a href="#">p.42</a> |
| 01               | 0h1301        | Acceleration pattern                       | Acc Pattern | 0             | Linear        | 0:<br>Linear  | X/A       | O   | O  | <a href="#">p.88</a> |
| 02               | 0h1302        | Deceleration pattern                       | Dec Pattern | 1             | S-curve       |               | X/A       | O   | O  | <a href="#">p.88</a> |
| 03 <sup>12</sup> | 0h1303        | S-curve acceleration start point gradient  | Acc S Start | 1-100(%)      |               | 40            | X/A       | O   | O  | <a href="#">p.88</a> |
| 04 <sup>12</sup> | 0h1304        | S-curve acceleration end point gradient    | Acc S End   | 1-100(%)      |               | 40            | X/A       | O   | O  | <a href="#">p.88</a> |
| 05 <sup>13</sup> | 0h1305        | S-curve deceleration start point gradient  | Dec S Start | 1-100(%)      |               | 40            | X/A       | O   | O  | <a href="#">p.88</a> |
| 06 <sup>13</sup> | 0h1306        | S-curve deceleration end point gradient    | Dec S End   | 1-100(%)      |               | 40            | X/A       | O   | O  | <a href="#">p.88</a> |
| 07               | 0h1307        | Start Mode                                 | Start Mode  | 0             | Acc           | 0:Acc         | X/A       | O   | O  | <a href="#">p.96</a> |
|                  |               |  |             | 1             | DC-Start      |               |           |     |    |                      |
| 08               | 0h1308        | Stop Mode                                  | Stop Mode   | 0             | Dec           | 0:Dec         | X/A       | O   | O  | <a href="#">p.97</a> |
|                  |               |  |             | 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  | <a href="#">p.80</a> |
|                  |               |  |             | 1             | Forward Prev  |               |           |     |    |                      |
|                  |               |  |             | 2             | Reverse Prev  |               |           |     |    |                      |

<sup>12</sup> Displayed when Ad.01 is set to 1 (S-curve).

<sup>13</sup> Displayed when Ad.02 is set to 1 (S-curve).



## Table of Functions

| Code             | Comm. Address | Name                                   | LCD Display    | Setting Range                               |     | Initial Value     | Property* | V/F | SL | Ref.                  |
|------------------|---------------|--|----------------|---|-----|-------------------|-----------|-----|----|-----------------------|
| 10               | 0h130A        | Starting with power on                 | Power-on Run   | 0   | No  | 0:No              | O/A       | O   | O  | <a href="#">p.81</a>  |
|                  |               |  |                | 1   | Yes |                   |           |     |    |                       |
| 12 <sup>14</sup> | 0h130C        | DC braking time at startup             | DC-Start Time  | 0.00-60.00(s)                               |     | 0.00              | X/A       | O   | O  | <a href="#">p.96</a>  |
| 13               | 0h130D        | Amount of applied DC                   | DC Inj Level   | 0-200(%)                                    |     | 50                | X/A       | O   | O  | <a href="#">p.96</a>  |
| 14 <sup>15</sup> | 0h130E        | Output blocking time before DC braking | DC-Block Time  | 0.00- 60.00(s)                              |     | 0.10              | X/A       | O   | O  | <a href="#">p.97</a>  |
| 15 <sup>15</sup> | 0h130F        | DC braking time                        | DC-Brake Time  | 0.00- 60.00(s)                              |     | 1.00              | X/A       | O   | O  | <a href="#">p.97</a>  |
| 16 <sup>15</sup> | 0h1310        | DC braking rate                        | DC-Brake Level | 0-200(%)                                    |     | 50                | X/A       | O   | O  | <a href="#">p.97</a>  |
| 17 <sup>15</sup> | 0h1311        | DC braking frequency                   | DC-Brake Freq  | Start frequency-50Hz                        |     | 5.00              | X/A       | O   | O  | <a href="#">p.97</a>  |
| 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 frequency(Hz)       |     | 5.00              | X/A       | O   | O  | -                     |
| 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             | X/A       | O   | O  | <a href="#">p.101</a> |
|                  |               |  |                | 1   | Yes |                   |           |     |    |                       |
| 25 <sup>16</sup> | 0h1319        | Frequency lower limit value            | Freq Limit Lo  | 0.00-Upper limit frequency(Hz)              |     | 0.50              | O/A       | O   | O  | <a href="#">p.101</a> |
| 26 <sup>16</sup> | 0h131A        | Frequency upper limit value            | Freq Limit Hi  | Lower limit frequency-Maximum frequency(Hz) |     | maximum frequency | X/A       | O   | O  | <a href="#">p.101</a> |
| 27               | 0h131B        | Frequency jump                         | Jump Freq      | 0   | No  | 0:No              | X/A       | O   | O  | <a href="#">p.102</a> |
|                  |               |  |                | 1   | Yes |                   |           |     |    |                       |

<sup>14</sup> Displayed when Ad. 07 is set to 1 (DC-Start).

<sup>15</sup> Displayed when Ad. 08 is set to 1 (DC-Brake).

<sup>16</sup> Displayed when Ad. 24 is set to 1 (Yes).



| Code             | Comm. Address | Name                            | LCD Display   | Setting Range                                     |        | Initial Value | Property* | V/F | SL | Ref.                  |
|------------------|---------------|---------------------------------|---------------|---|--------|---------------|-----------|-----|----|-----------------------|
| 28 <sup>17</sup> | 0h131C        | Jump frequency lower limit1     | Jump Lo 1     | 0.00-Jump frequency upper limit1(Hz)              |        | 10.00         | O/A       | O   | O  | <a href="#">p.102</a> |
| 29 <sup>17</sup> | 0h131D        | Jump frequency upper limit1     | Jump Hi 1     | Jump frequency lower limit1-Maximum frequency(Hz) |        | 15.00         | O/A       | O   | O  | <a href="#">p.102</a> |
| 30 <sup>17</sup> | 0h131E        | Jump frequency lower limit2     | Jump Lo 2     | 0.00-Jump frequency upper limit2(Hz)              |        | 20.00         | O/A       | O   | O  | <a href="#">p.102</a> |
| 31 <sup>17</sup> | 0h131F        | Jump frequency upper limit2     | Jump Hi 2     | Jump frequency lower limit2-Maximum frequency(Hz) |        | 25.00         | O/A       | O   | O  | <a href="#">p.102</a> |
| 32 <sup>17</sup> | 0h1320        | Jump frequency lower limit3     | Jump Lo 3     | 0.00-Jump frequency upper limit3(Hz)              |        | 30.00         | O/A       | O   | O  | <a href="#">p.102</a> |
| 33 <sup>17</sup> | 0h1321        | Jump frequency upper limit3     | Jump Hi 3     | Jump frequency lower limit3-Maximum frequency(Hz) |        | 35.00         | O/A       | O   | O  | <a href="#">p.102</a> |
| 41 <sup>18</sup> | 0h1329        | Brake release current           | BR Rls Curr   | 0.0-180.0(%)                                      |        | 50.0          | O/A       | O   | O  | -                     |
| 42 <sup>18</sup> | 0h132A        | Brake release delay time        | BR Rls Dly    | 0.00-10.00(s)                                     |        | 1.00          | X/A       | O   | O  | -                     |
| 44 <sup>18</sup> | 0h132C        | Brake release Forward frequency | BR Rls Fwd Fr | 0.00-Maximum frequency(Hz)                        |        | 1.00          | X/A       | O   | O  | -                     |
| 45 <sup>18</sup> | 0h132D        | Brake release Reverse frequency | BR Rls Rev Fr | 0.00-Maximum frequency(Hz)                        |        | 1.00          | X/A       | O   | O  | -                     |
| 46 <sup>18</sup> | 0h132E        | Brake engage delay time         | BR Eng Dly    | 0.00-10.00(s)                                     |        | 1.00          | X/A       | O   | O  | -                     |
| 47 <sup>18</sup> | 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   | 0:None        | X/A       | O   | X  | -                     |
|                  |               |                                 |               | 1   | Manual |               |           |     |    |                       |
|                  |               |                                 |               | 2   | Auto   |               |           |     |    |                       |

<sup>17</sup> Displayed when Ad. 27 is set to 1 (Yes).

<sup>18</sup> Displayed if either OU.31 or OU.33 is set to 35 (BR Control).



## Table of Functions

| Code             | Comm. Address | Name   | LCD Display     | Setting Range                       | Initial Value       | Property* | V/F | SL | Ref.                 |
|------------------|---------------|--|-----------------|-------------------------------------|---------------------|-----------|-----|----|----------------------|
| 51 <sup>19</sup> | 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  | <a href="#">p.87</a> |
| 64               | 0h1340        | Cooling fan control                            | FAN Control     | 0 During Run                        | 0:Durin<br>g Run    | O/A       | O   | O  | -                    |
|                  |               |  |                 | 1 Always ON                         |                     |           |     |    |                      |
|                  |               |  |                 | 2 Temp Control                      |                     |           |     |    |                      |
| 65               | 0h1341        | Up/down operation frequency save               | U/D Save Mode   | 0 No                                | 0:No                | O/A       | O   | O  | -                    |
|                  |               |  |                 | 1 Yes                               |                     |           |     |    |                      |
| 66               | 0h1342        | Output contact On/Off control options          | On/Off Ctrl Src | 0 None                              | 0:None              | X/A       | O   | O  | -                    |
|                  |               |  |                 | 1 V1                                |                     |           |     |    |                      |
|                  |               |  |                 | 3 V2                                |                     |           |     |    |                      |
|                  |               |  |                 | 4 I2                                |                     |           |     |    |                      |
|                  |               |  |                 | 6 Pulse                             |                     |           |     |    |                      |
| 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 selection                       | Run En Mode     | 0 Always Enable                     | 0:Alway<br>s Enable | X/A       | O   | O  | -                    |
|                  |               |  |                 | 1 DI Dependent                      |                     |           |     |    |                      |
| 71 <sup>20</sup> | 0h1347        | Safe operation stop options                    | Run Dis Stop    | 0 Free-Run                          | 0:Free-<br>Run      | X/A       | O   | O  | -                    |
|                  |               |  |                 | 1 Q-Stop                            |                     |           |     |    |                      |
|                  |               |  |                 | 2 Q-Stop Resume                     |                     |           |     |    |                      |
| 72 <sup>20</sup> | 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 | RegenAvd Sel    | 0 No                                | 0:No                | X/A       | O   | O  | -                    |
|                  |               |  |                 | 1 Yes                               |                     |           |     |    |                      |

<sup>19</sup> Displayed if Ad.50 is not set to 0 (None).

<sup>20</sup> Displayed when Ad.70 is set to 1 (DI Dependent).



| Code             | Comm. Address | Name   | LCD Display    | Setting Range       | Initial Value | Property* | V/F | SL | Ref.         |
|------------------|---------------|--|----------------|---------------------|---------------|-----------|-----|----|--------------|
|                  |               | press  |                |                     |               |           |     |    |              |
| 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 <sup>21</sup> | 0h134C        | Compensation frequency limit of regeneration evasion for press | CompFreq Limit | 0.00- 10.00Hz       | 1.00          | X/A       | O   | O  | -            |
| 77 <sup>21</sup> | 0h134D        | Regeneration evasion for press P gain                          | RegenAvd Pgain | 0.0- 100.0%         | 50.0          | O/A       | O   | O  | -            |
| 78 <sup>21</sup> | 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  | <u>p.115</u> |
|                  |               |  |                | 1 Fire Mode         |               |           |     |    |              |
|                  |               |  |                | 2 Fire Mode Test    |               |           |     |    |              |
| 81 <sup>22</sup> | 0h1351        | Fire mode frequency  | Fire Mode Freq | 0.00~50.00(Hz)      | 50.00         | X/A       | O   | X  | <u>p.115</u> |
| 82 <sup>22</sup> | 0h1352        | Fire mode direction  | Fire Mode Dir  | 0 Forward           | 0: Forward    | X/A       | O   | X  | <u>p.115</u> |
|                  |               |  |                | 1 Reverse           |               |           |     |    |              |
| 83 <sup>22</sup> |               | Fire Mode Count  | Fire Mode Cnt  | Can not be modified |               |           |     |    | <u>p.115</u> |

<sup>21</sup> Displayed when Ad.74 is set to 1 (Yes).

<sup>22</sup> Displayed when Ad.80 is set to 1 (Yes).



## 6.5 Control Function group (PAR→Cn)

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

**SL:** Sensorless vector control (dr.09)

**\*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  | <u>p.42</u> |
| 04   | 0h1404        | Carrier frequency                       | Carrier Freq   | Heavy Duty     | V/F: 1.0-15.0(kHz)<br>z) <sup>23</sup><br>SL: 2.0-15.0(kHz)<br>z) | 3.0           | O/A       | O   | O  | -           |
|      |               |   |                | Normal Duty    | V/F: 1.0-5.0(kHz)<br><sup>24</sup><br>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              | Low leakage PWM   |               |           |     |    |             |
| 09   | 0h1409        | Initial excitation time                 | PreExTime      | 0.00-60.00(s)  |   | 1.00          | X/A       | X   | O  | -           |
| 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 2 <sup>nd</sup> gain display | SL2 G View Sel | 0              | No  | 0:No          | O/A       | X   | O  | -           |
|      |               |   |                | 1              | Yes   |               |           |     |    |             |

<sup>23</sup> In case of 0.4~4.0kW, the setting range is 2.0~15.0(kHz).

<sup>24</sup> 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. |
|------------------|---------------|---|----------------|---------------|----------------------------|-----------|-----|----|------|
|                  |               | setting   |                |               |                            |           |     |    |      |
| 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 <sup>25</sup> | 0h1417        | Sensorless speed controller proportional gain2  | ASR-SL P Gain2 | 1.0-1000.0(%) | Dependent on motor setting | O/A       | X   | O  | -    |
| 24 <sup>25</sup> | 0h1418        | Sensorless speed controller integral gain2      | ASR-SL I Gain2 | 1.0-1000.0(%) |                            | O/A       | X   | O  | -    |
| 25 <sup>25</sup> | 0h1419        | Sensorless speed controller integral gain 0     | ASR-SL I Gain0 | 1.0~999.9(ms) |                            | O/A       | X   | O  | -    |
| 26 <sup>25</sup> | 0h141A        | Flux estimator proportional gain                | Flux P Gain    | 10-200(%)     |                            | O/A       | X   | O  | -    |
| 27 <sup>25</sup> | 0h141B        | Flux estimator integral gain                    | Flux I Gain    | 10-200(%)     |                            | O/A       | X   | O  | -    |
| 28 <sup>25</sup> | 0h141C        | Speed estimator proportional gain               | S-Est P Gain1  | 0-32767       |                            | O/A       | X   | O  | -    |
| 29 <sup>25</sup> | 0h141D        | Speed estimator integral gain1                  | S-Est I Gain1  | 100-1000      |                            | O/A       | X   | O  | -    |
| 30 <sup>25</sup> | 0h141E        | Speed estimator integral gain2                  | S-Est I Gain2  | 100-10000     |                            | O/A       | X   | O  | -    |
| 31 <sup>25</sup> | 0h141F        | Sensorless current controller proportional gain | ACR SL P Gain  | 10-1000       |                            | O/A       | X   | O  | -    |
| 32 <sup>25</sup> | 0h1420        | Sensorless current controller integral gain     | ACR SL I Gain  | 10-1000       |                            | O/A       | X   | O  | -    |
| 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  | -    |

<sup>25</sup> Displayed when dr.09 is set to 4 (IM Sensorless) and Cn.20 is set to 1 (YES).



## Table of Functions

| Code             | Comm. Address | Name   | LCD Display    | Setting Range               |          | Initial Value | Property* | V/F | SL | Ref. |
|------------------|---------------|--|----------------|-----------------------------|----------|---------------|-----------|-----|----|------|
| 53               | 0h1435        | Torque limit setting options                 | Torque Lmt Src | 0                           | Keypad-1 | 0: Keypad -1  | X/A       | X   | O  | -    |
|                  |               |  |                | 1                           | Keypad-2 |               |           |     |    |      |
|                  |               |  |                | 2                           | V1       |               |           |     |    |      |
|                  |               |  |                | 4                           | V2       |               |           |     |    |      |
|                  |               |  |                | 5                           | I2       |               |           |     |    |      |
|                  |               |  |                | 6                           | Int 485  |               |           |     |    |      |
|                  |               |  |                | 8                           | FieldBus |               |           |     |    |      |
|                  |               |  |                | 12                          | Pulse    |               |           |     |    |      |
| 54 <sup>26</sup> | 0h1436        | Positive-direction reverse torque limit      | FWD +Trq Lmt   | 0.0-200.0(%)                |          | 180           | O/A       | X   | O  | -    |
| 55 <sup>26</sup> | 0h1437        | Positive-direction regeneration torque limit | FWD -Trq Lmt   | 0.0-200.0(%)                |          | 180           | O/A       | X   | O  | -    |
| 56 <sup>26</sup> | 0h1438        | Negative-direction reverse torque limit      | REV +Trq Lmt   | 0.0-200.0(%)                |          | 180           | O/A       | X   | O  | -    |
| 57 <sup>26</sup> | 0h1439        | Negative-direction regeneration torque limit | REV -Trq Lmt   | 0.0-200.0(%)                |          | 180           | O/A       | X   | O  | -    |
| 62 <sup>26</sup> | 0h143E        | Speed limit Setting                          | Speed Lmt Src  | 0                           | Keypad-1 | 0: Keypad -1  | X/A       | X   | O  | -    |
|                  |               |  |                | 1                           | Keypad-2 |               |           |     |    |      |
|                  |               |  |                | 2                           | V1       |               |           |     |    |      |
|                  |               |  |                | 4                           | V2       |               |           |     |    |      |
|                  |               |  |                | 5                           | I2       |               |           |     |    |      |
|                  |               |  |                | 6                           | Int 485  |               |           |     |    |      |
|                  |               |  |                | 7                           | FieldBus |               |           |     |    |      |
| 63 <sup>26</sup> | 0h143F        | Positive-direction speed limit               | FWD Speed Lmt  | 0.00~Maximum frequency (Hz) |          | 50.00         | O/A       | X   | O  | -    |
| 64 <sup>26</sup> | 0h1440        | Negative-direction speed limit               | REV Speed Lmt  | 0.00~Maximum frequency (Hz) |          | 50.00         | O/A       | X   | O  | -    |
| 65 <sup>26</sup> | 0h1441        | Speed limit operation gain                   | Speed Lmt Gain | 100~5000[%]                 |          | 500           | O/A       | X   | O  | -    |

<sup>26</sup> Displayed when dr.09 is set to 1 (Yes). 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. |
|------------------|---------------|----------------------------------|----------------|---------------|--|--------------------|-----------|-----|----|------|
| 70               | 0h1446        | Speed search mode selection      | SS Mode        | 0             | Flying Start-1 <sup>27</sup>                           | 0: Flying Start-1  | X/A       | O   | O  | -    |
|                  |               |                                  |                | 1             | Flying Start-2   |                    |           |     |    |      |
| 71               | 0h1447        | Speed search operation selection | Speed Search   | bit           | 0000- 1111   | 0000 <sup>28</sup> | X/A       | O   | O  | -    |
|                  |               |                                  |                | 00            | Selection of speed search on acceleration              |                    |           |     |    |      |
|                  |               |                                  |                | 01            | When starting on initialization after fault trip       |                    |           |     |    |      |
|                  |               |                                  |                | 10            | When restarting after instantaneous power interruption |                    |           |     |    |      |
| 72 <sup>29</sup> | 0h1448        | Speed search reference current   | SS Sup-Current | 80-200(%)     | 150  | O/A                | O         | O   | O  | -    |
|                  |               |                                  |                |               |  |                    |           |     |    |      |
| 73 <sup>30</sup> | 0h1449        | Speed search proportional gain   | SS P-Gain      | 0-9999        | Flying Start-1 : 100                                   | O/A                | O         | O   | O  | -    |
|                  |               |                                  |                |               | Flying Start-2   |                    |           |     |    |      |

<sup>27</sup> Will not be displayed if dr.09 is set to 4 (IM Sensorless).

<sup>28</sup> The initial value 0000 will be displayed on the keypad as .

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

<sup>30</sup> Displayed when any of the Cn.71 code bits are set to 1.



## Table of Functions

| Code             | Comm. Address | Name                                     | LCD Display   | Setting Range  | Initial Value                                 | Property* | V/F | SL | Ref. |
|------------------|---------------|--|---------------|----------------|---|-----------|-----|----|------|
|                  |               |  |               |                | : 600 <sup>31</sup>                           |           |     |    |      |
| 74 <sup>30</sup> | 0h144A        | Speed search integral gain               | SS I-Gain     | 0-9999         | Flying Start-1 : 200<br>Flying Start-2 : 1000 | O/A       | O   | O  | -    |
| 75 <sup>30</sup> | 0h144B        | Output blocking time before speed search | SS Block Time | 0.0-60.0(s)    | 1.0   | X/A       | O   | O  | -    |
| 76 <sup>30</sup> | 0h144C        | Speed search Estimator gain              | Spd Est Gain  | 50-150(%)      | 100   | O/A       | O   | O  | -    |
| 77               | 0h144D        | Energy buffering selection               | KEB Select    | 0 No<br>1 Yes  | 0:No  | X/A       | O   | O  | -    |
| 78 <sup>32</sup> | 0h144E        | Energy buffering start level             | KEB Start Lev | 110.0-140.0(%) | 125.0   | X/A       | O   | O  | -    |
| 79 <sup>32</sup> | 0h144F        | Energy buffering stop level              | KEB Stop Lev  | 125.0-145.0(%) | 130.0   | X/A       | O   | O  | -    |
| 80 <sup>32</sup> | 0h1450        | Energy buffering gain                    | KEB Gain      | 1-20000        | 1000  | O/A       | O   | O  | -    |
| 85 <sup>33</sup> | 0h1455        | Flux estimator proportional gain1        | Flux P Gain1  | 100-700        | 370   | O/A       | X   | O  | -    |
| 86 <sup>33</sup> | 0h1456        | Flux estimator proportional gain2        | Flux P Gain2  | 0-100          | 0   | O/A       | X   | O  | -    |
| 87 <sup>33</sup> | 0h1457        | Flux estimator proportional gain3        | Flux P Gain3  | 0-500          | 100   | O/A       | X   | O  | -    |
| 88 <sup>33</sup> | 0h1458        | Flux estimator integral gain1            | Flux I Gain1  | 0-200          | 50  | O/A       | X   | O  | -    |
| 89 <sup>33</sup> | 0h1459        | Flux estimator integral gain2            | Flux I Gain2  | 0-200          | 50  | O/A       | X   | O  | -    |
| 90 <sup>33</sup> | 0h145A        | Flux estimator integral gain3            | Flux I Gain3  | 0-200          | 50  | O/A       | X   | O  | -    |
| 91 <sup>33</sup> | 0h145B        | Sensorless voltage                       | SL Volt Comp1 | 0-50           | Dependent on                                  | O/A       | X   | O  | -    |

<sup>31</sup> The initial value is 1200 when the motor-rated capacity is less than 7.5 kW

<sup>32</sup> Displayed when Cn.77 is set to 1 (Yes).

<sup>33</sup> Displayed when Cn.20 is set to 1 (Yes).



| Code             | Comm. Address | Name                                       | LCD Display   | Setting Range | Initial Value | Property* | V/F | SL | Ref. |
|------------------|---------------|--|---------------|---------------|---------------|-----------|-----|----|------|
|                  |               | compensation1                              |               |               | motor setting |           |     |    |      |
| 92 <sup>33</sup> | 0h145C        | Sensorless voltage compensation2           | SL Volt Comp2 | 0-50          |               | O/A       | X   | O  | -    |
| 93 <sup>33</sup> | 0h145D        | Sensorless voltage compensation3           | SL Volt Comp3 | 0-50          |               | O/A       | X   | O  | -    |
| 94 <sup>33</sup> | 0h145E        | Sensorless field weakening start frequency | SL FW Freq    | 80.0-110.0(%) | 100.0         | X/A       | X   | O  | -    |
| 95 <sup>33</sup> | 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  | <u><a href="#">p.42</a></u> |
| 01   | 0h1501        | Frequency for maximum analog input | Freq at 100%  | Start frequency-<br>Maximum frequency(Hz) |          | Maximum frequency | O/A       | O   | O  | <u><a href="#">p.63</a></u> |
| 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  | <u><a href="#">p.63</a></u> |
| 06   | 0h1506        | V1 input polarity selection        | V1 Polarity   | 0   | Unipolar | 0:                | X/A       | O   | O  | <u><a href="#">p.63</a></u> |
|      |               |                                    |               | 1   | Bipolar  | Unipolar          |           |     |    |                             |
| 07   | 0h1507        | Time constant of V1 input filter   | V1 Filter     | 0-10000(ms)                               |          | 10                | O/A       | O   | O  | <u><a href="#">p.63</a></u> |



## Table of Functions

| Code             | Comm. Address | Name                             | LCD Display   | Setting Range                      |     | Initial Value | Property* | V/F | SL | Ref.                 |
|------------------|---------------|----------------------------------|---------------|------------------------------------|-----|---------------|-----------|-----|----|----------------------|
| 08               | 0h1508        | V1 Minimum input voltage         | V1 Volt x1    | 0.00-10.00(V)                      |     | 0.00          | O/A       | O   | O  | <a href="#">p.63</a> |
| 09               | 0h1509        | V1 output at Minimum voltage (%) | V1 Perc y1    | 0.00-100.00(%)                     |     | 0.00          | O/A       | O   | O  | <a href="#">p.63</a> |
| 10               | 0h150A        | V1 Maximum input voltage         | V1 Volt x2    | 0.00-12.00(V)                      |     | 10.00         | O/A       | O   | O  | <a href="#">p.63</a> |
| 11               | 0h150B        | V1 output at Maximum voltage (%) | V1 Perc y2    | 0.00-100.00(%)                     |     | 100.00        | O/A       | O   | O  | <a href="#">p.63</a> |
| 12 <sup>34</sup> | 0h150C        | V1 Minimum input voltage         | V1 –Volt x1’  | -10.00- 0.00(V)                    |     | 0.00          | O/A       | O   | O  | <a href="#">p.66</a> |
| 13 <sup>34</sup> | 0h150D        | V1output at Minimum voltage (%)  | V1 –Perc y1’  | -100.00-0.00(%)                    |     | 0.00          | O/A       | O   | O  | <a href="#">p.66</a> |
| 14 <sup>34</sup> | 0h150E        | V1 Maximum input voltage         | V1 –Volt x2’  | -12.00- 0.00(V)                    |     | -10.00        | O/A       | O   | O  | <a href="#">p.66</a> |
| 15 <sup>34</sup> | 0h150F        | V1 output at Maximum voltage (%) | V1 –Perc y2’  | -100.00-0.00(%)                    |     | -100.00       | O/A       | O   | O  | <a href="#">p.66</a> |
| 16               | 0h1510        | V1 rotation direction change     | V1 Inverting  | 0                                  | No  | 0: No         | O/A       | O   | O  | <a href="#">p.63</a> |
|                  |               |                                  |               | 1                                  | Yes |               |           |     |    |                      |
| 17               | 0h1511        | V1 quantization level            | V1 Quantizing | 0.00 <sup>35</sup> , 0.04-10.00(%) |     | 0.04          | X/A       | O   | O  | <a href="#">p.63</a> |
| 35 <sup>36</sup> | 0h1523        | V2 input voltage display         | V2 Monitor(V) | 0.00-12.00(V)                      |     | 0.00          | -/A       | O   | O  | <a href="#">p.70</a> |
| 37 <sup>36</sup> | 0h1525        | V2 input filter time constant    | V2 Filter     | 0-10000(ms)                        |     | 10            | O/A       | O   | O  | <a href="#">p.70</a> |
| 38 <sup>36</sup> | 0h1526        | V2 Minimum input voltage         | V2 Volt x1    | 0.00-10.00(V)                      |     | 0.00          | O/A       | X   | X  | <a href="#">p.70</a> |
| 39 <sup>36</sup> | 0h1527        | V2 output at Minimum voltage (%) | V2 Perc y1    | 0.00-100.00(%)                     |     | 0.00          | O/A       | O   | O  | <a href="#">p.70</a> |
| 40 <sup>36</sup> | 0h1528        | V2 Maximum                       | V2 Volt x2    | 0.00-10.00(V)                      |     | 10            | O/A       | X   | X  | <a href="#">p.70</a> |

<sup>34</sup> Displayed when In.06 is set to 1 (Bipolar).

<sup>35</sup> Quantizing is not used when set to 0.

<sup>36</sup> 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.                 |
|------------------|---------------|-----------------------------------|-----------------|------------------------------------|------|---------------|-----------|-----|----|----------------------|
|                  |               | input voltage                     |                 |                                    |      |               |           |     |    |                      |
| 41 <sup>36</sup> | 0h1529        | V2 output at Maximum voltage (%)  | V2 Perc y2      | 0.00-100.00(%)                     |      | 100.00        | O/A       | O   | O  | <a href="#">p.70</a> |
| 46 <sup>36</sup> | 0h152E        | V2 rotation direction change      | V2 Inverting    | 0                                  | No   | 0:No          | O/A       | O   | O  | <a href="#">p.70</a> |
|                  |               |                                   |                 | 1                                  | Yes  |               |           |     |    |                      |
| 47 <sup>36</sup> | 0h152F        | V2 quantization level             | V2 Quantizing   | 0.00 <sup>35</sup> , 0.04-10.00(%) |      | 0.04          | O/A       | O   | O  | <a href="#">p.70</a> |
| 50 <sup>37</sup> | 0h1532        | I2 input current display          | I2 Monitor (mA) | 0-24(mA)                           |      | 0.00          | -/A       | O   | O  | <a href="#">p.68</a> |
| 52 <sup>37</sup> | 0h1534        | I2 input filter time constant     | I2 Filter       | 0-10000(ms)                        |      | 10            | O/A       | O   | O  | <a href="#">p.68</a> |
| 53 <sup>37</sup> | 0h1535        | I2 minimum input current          | I2 Curr x1      | 0.00-20.00(mA)                     |      | 4.00          | O/A       | O   | O  | <a href="#">p.68</a> |
| 54 <sup>37</sup> | 0h1536        | I2 output at Minimum current (%)  | I2 Perc y1      | 0.00-100.00(%)                     |      | 0.00          | O/A       | O   | O  | <a href="#">p.68</a> |
| 55 <sup>37</sup> | 0h1537        | I2 maximum input current          | I2 Curr x2      | 0.00-24.00(mA)                     |      | 20.00         | O/A       | O   | O  | <a href="#">p.68</a> |
| 56 <sup>37</sup> | 0h1538        | I2 output at Maximum current (%)  | I2 Perc y2      | 0.00-100.00(%)                     |      | 100.00        | O/A       | O   | O  | <a href="#">p.68</a> |
| 61 <sup>37</sup> | 0h153D        | Changing rotation direction of I2 | I2 Inverting    | 0                                  | No   | 0:No          | O/A       | O   | O  | <a href="#">p.68</a> |
|                  |               |                                   |                 | 1                                  | Yes  |               |           |     |    |                      |
| 62 <sup>37</sup> | 0h153E        | I2 quantization level             | I2 Quantizing   | 0.00 <sup>35</sup> , 0.04-10.00(%) |      | 0.04          | O/A       | O   | O  | <a href="#">p.68</a> |
| 65               | 0h1541        | P1 terminal function setting      | P1 Define       | 0                                  | None | 1:Fx          | X/A       | O   | O  | <a href="#">p.76</a> |
|                  |               |                                   |                 | 1                                  | Fx   |               |           |     |    |                      |
| 66               | 0h1542        | P2 terminal function setting      | P2 Define       | 2                                  | Rx   | 2:Rx          | X/A       | O   | O  | <a href="#">p.76</a> |
| 67               | 0h1543        | P3 terminal function              | P3 Define       | 3                                  | RST  | 5:BX          | X/A       | O   | O  | -                    |

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



## Table of Functions

| Code | Comm. Address | Name                                    | LCD Display  | Setting Range |                  | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|---|--------------|---------------|------------------|---------------|-----------|-----|----|-----------------------|
|      |               | setting                                 |              |               |                  |               |           |     |    |                       |
| 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  | -                     |
|      |               |   |              | 6             | JOG              |               |           |     |    |                       |
|      |               |   |              | 7             | Speed-L          |               |           |     |    |                       |
|      |               |   |              | 8             | Speed-M          |               |           |     |    | <a href="#">p.73</a>  |
|      |               |   |              | 9             | Speed-H          |               |           |     |    | <a href="#">p.73</a>  |
|      |               |   |              | 11            | XCEL-L           |               |           |     |    | <a href="#">p.85</a>  |
|      |               |   |              | 12            | XCEL-M           |               |           |     |    | <a href="#">p.85</a>  |
|      |               |   |              | 13            | RUN Enable       |               |           |     |    | -                     |
|      |               |   |              | 14            | 3-Wire           |               |           |     |    | -                     |
|      |               |   |              | 15            | 2nd Source       |               |           |     |    | <a href="#">p.103</a> |
|      |               |   |              | 16            | Exchange         |               |           |     |    | -                     |
|      |               |   |              | 17            | Up               |               |           |     |    | -                     |
|      |               |   |              | 18            | Down             |               |           |     |    | -                     |
|      |               |   |              | 20            | U/D Clear        |               |           |     |    | -                     |
|      |               |   |              | 21            | Analog Hold      |               |           |     |    | <a href="#">p.72</a>  |
|      |               |   |              | 22            | I-Term Clear     |               |           |     |    | -                     |
|      |               |   |              | 23            | PID Openloop     |               |           |     |    | -                     |
|      |               |   |              | 24            | P Gain2          |               |           |     |    | -                     |
|      |               |   |              | 25            | XCEL Stop        |               |           |     |    | <a href="#">p.91</a>  |
|      |               |   |              | 26            | 2nd Motor        |               |           |     |    | -                     |
|      |               |   |              | 34            | Pre Excite       |               |           |     |    | -                     |
|      |               |   |              | 38            | Timer In         |               |           |     |    | -                     |
|      |               |   |              | 40            | dis Aux Ref      |               |           |     |    | -                     |
|      |               |   |              | 46            | FWD JOG          |               |           |     |    | -                     |
|      |               |   |              | 47            | REV JOG          |               |           |     |    | -                     |
|      |               |   |              | 49            | XCEL-H           |               |           |     |    | <a href="#">p.85</a>  |
|      |               |   |              | 50            | User Seq         |               |           |     |    | <a href="#">p.107</a> |
|      |               |   |              | 51            | Fire Mode        |               |           |     |    |                       |
|      |               |   |              | 54            | TJ <sup>38</sup> |               |           |     |    |                       |
| 85   | 0h1555        | Multi-function input terminal On filter | DI On Delay  | 0-10000(ms)   |                  | 10            | O/A       | O   | O  | <a href="#">p.104</a> |
| 86   | 0h1556        | Multi-function                          | DI Off Delay | 0-10000(ms)   |                  | 3             | O/A       | O   | O  | <a href="#">p.104</a> |

<sup>38</sup> Displayed when P5 is selected on Px terminal function.



| Code | Comm. Address | Name  | LCD Display            | Setting Range                          | Initial Value           | Property* | V/F | SL | Ref.         |
|------|---------------|---|------------------------|--|-------------------------|-----------|-----|----|--------------|
|      |               | input terminal<br>Off filter                    |                        |  |                         |           |     |    |              |
| 87   | 0h1557        | Multi-function<br>input<br>contact<br>selection | DI NC/NO Sel           | P7 – P1                                | 0<br>0000 <sup>39</sup> | X/A       | O   | O  | <u>p.104</u> |
|      |               |   |                        | 0 A contact<br>(NO)                    |                         |           |     |    |              |
|      |               |   |                        | 1 B contact (NC)                       |                         |           |     |    |              |
| 89   | 0h1559        | Multi-step<br>command<br>delay time             | InCheck Time           | 1-5000(ms)                             | 1                       | X/A       | O   | O  | <u>p.73</u>  |
| 90   | 0h155A        | Multi-function<br>input terminal<br>status      | DI Status              | P7 – P1                                | 0<br>0000 <sup>39</sup> | -A        | O   | O  | <u>p.104</u> |
|      |               |   |                        | 0 release(Off)                         |                         |           |     |    |              |
|      |               |   |                        | 1 Connection<br>(On)                   |                         |           |     |    |              |
| 91   | 0h155B        | Pulse input<br>amount<br>display                | Pulse Monitor<br>(kHz) | 0.00-50.00(kHz)                        | 0.00                    | -A        | O   | O  | <u>p.70</u>  |
| 92   | 0h155C        | TI input filter<br>time constant                | TI Filter              | 0-9999(ms)                             | 10                      | O/A       | O   | O  | <u>p.70</u>  |
| 93   | 0h155D        | TI Minimum<br>input pulse                       | TI Pls x1              | 0.00-32.00(kHz)                        | 0.00                    | O/A       | O   | O  | <u>p.70</u>  |
| 94   | 0h153E        | TI output at<br>Minimum<br>pulse (%)            | TI Perc y1             | 0.00-100.00(%)                         | 0.00                    | O/A       | O   | O  | <u>p.70</u>  |
| 95   | 0h155F        | TI Maximum<br>input pulse                       | TI Pls x2              | 0.00-32.00(kHz)                        | 32.00                   | O/A       | O   | O  | <u>p.70</u>  |
| 96   | 0h1560        | TI Output at<br>Maximum<br>pulse (%)            | TI Perc y2             | 0-100(%)                               | 100.00                  | O/A       | O   | O  | <u>p.70</u>  |
| 97   | 0h1561        | TI rotation<br>direction<br>change              | TI Inverting           | 0 No                                   | 0:No                    | O/A       | O   | O  | <u>p.70</u>  |
|      |               |   |                        | 1 Yes                                  |                         |           |     |    |              |
| 98   | 0h1562        | TI<br>quantization<br>level                     | TI Quantizing          | 0.00 <sup>35</sup> , 0.04-<br>10.00(%) | 0.04                    | O/A       | O   | O  | <u>p.70</u>  |
| 99   | 0h1563        | SW1(NPN/PNP)<br>SW2(V1/V2[I2])<br>status        | IO SW State            | Bit 00~11                              | 00                      | -A        | O   | O  | -            |
|      |               |   |                        | 00 V2, NPN                             |                         |           |     |    |              |
|      |               |   |                        | 01 V2, PNP                             |                         |           |     |    |              |
|      |               |   |                        | 10 I2, NPN                             |                         |           |     |    |              |
|      |               |   |                        | 11 I2, PNP                             |                         |           |     |    |              |

<sup>39</sup> The initial value 0000 will be displayed on the keypad as .







## 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  | <u>p.42</u> |
| 01   | 0h1601        | Analog output 1 item     | AO1 Mode      | 0                 | Frequency        | 0:Frequency       | O/A | 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 constant output 1 | AO1 Const %   | 0.0-100.0(%)      | 0.0              | O/A               | O   | O  | -           |
| 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 <sup>40</sup> | O/A | O  | -           |
|      |               |                          |               | 1                 | Low voltage      |                   |     |    |             |
|      |               |                          |               | 2                 | Any faults other |                   |     |    |             |

<sup>40</sup> The initial value 0010 will be displayed on the keypad as .



## Table of Functions

| Code | Comm. Address | Name                        | LCD Display | Setting Range |                                 | Initial Value | Property* | V/F | SL | Ref. |
|------|---------------|-----------------------------|-------------|---------------|---------------------------------|---------------|-----------|-----|----|------|
|      |               |                             |             |               | 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                      |               |           |     |    |      |
|      |               |                             |             | 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                             |               |           |     |    |      |



| Code | Comm. Address | Name                                    | LCD Display  | Setting Range  | Initial Value  | Property*        | V/F | SL | Ref. |
|------|---------------|---|--------------|----------------|----------------|------------------|-----|----|------|
|      |               |   |              | 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 On delay          | DO On Delay  | 0.00-100.00(s) | 0.00           | O/A              | O   | O  | -    |
| 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     |                | 00 <sup>41</sup> | X/A | O  | O    |
|      |               |   |              | 0              | A contact (NO) |                  |     |    |      |
|      |               |   |              | 1              | B contact (NC) |                  |     |    |      |

<sup>41</sup> The initial value 0000 will be displayed on the keypad as .



## Table of Functions

| Code | Comm. Address | Name                           | LCD Display    | Setting Range              |                | Initial Value      | Property* | V/F | SL | Ref. |
|------|---------------|--------------------------------|----------------|----------------------------|----------------|--------------------|-----------|-----|----|------|
| 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      | 0: Frequency<br>cy | 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       |                    |           |     |    |      |
| 62   | 0h163E        | Pulse output gain              | TO Gain        | -1000.0-1000.0(%)          |                | 100.0              | O/A       | O   | O  | -    |
| 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  | <a href="#">p.42</a>  |
| 01               | 0h1701        | Built-in communication inverter ID   | Int485 St ID | 1-250         |                        | 1             | O/A       | O   | O  | <a href="#">p.118</a> |
| 02 <sup>42</sup> | 0h1702        | Built-in communication protocol      | Int485 Proto | 0             | ModBus RTU             | 0: ModBus RTU | O/A       | O   | O  | <a href="#">p.118</a> |
|                  |               |                                      |              | 2             | LS Inv 485             |               |           |     |    |                       |
| 03 <sup>42</sup> | 0h1703        | Built-in communication speed         | Int485 BaudR | 0             | 1200 bps               | 3: 9600 bps   | O/A       | O   | O  | <a href="#">p.118</a> |
|                  |               |                                      |              | 1             | 2400 bps               |               |           |     |    |                       |
|                  |               |                                      |              | 2             | 4800 bps               |               |           |     |    |                       |
|                  |               |                                      |              | 3             | 9600 bps               |               |           |     |    |                       |
|                  |               |                                      |              | 4             | 19200 bps              |               |           |     |    |                       |
|                  |               |                                      |              | 5             | 38400 bps              |               |           |     |    |                       |
|                  |               |                                      |              | 6             | 56 Kbps                |               |           |     |    |                       |
|                  |               |                                      |              | 7             | 115 Kbps <sup>43</sup> |               |           |     |    |                       |
| 04 <sup>42</sup> | 0h1704        | Built-in communication frame setting | Int485 Mode  | 0             | D8/PN/S1               | 0: D8/PN/S1   | O/A       | O   | O  | <a href="#">p.118</a> |
|                  |               |                                      |              | 1             | D8/PN/S2               |               |           |     |    |                       |
|                  |               |                                      |              | 2             | D8/PE/S1               |               |           |     |    |                       |
|                  |               |                                      |              | 3             | D8/PO/S1               |               |           |     |    |                       |
| 05 <sup>42</sup> | 0h1705        | Transmission delay after reception   | Resp Delay   | 0-1000(ms)    |                        | 5ms           | O/A       | O   | O  | <a href="#">p.118</a> |
| 06 <sup>44</sup> | 0h1706        | Communication option S/W version     | FBus S/W Ver | -             |                        | 0.00          | O/A       | O   | O  | -                     |
| 07 <sup>44</sup> | 0h1707        | Communication                        | FBus ID      | 0-255         |                        | 1             | O/A       | O   | O  | -                     |

<sup>42</sup> Will not be displayed when P2P and MultiKPD is set.

<sup>43</sup> 115,200bps

<sup>44</sup> Displayed only when a communication option card is installed.



## Table of Functions

| Code             | Comm. Address | Name                            | LCD Display    | Setting Range | Initial Value | Property* | V/F | SL | Ref.                  |
|------------------|---------------|---------------------------------|----------------|---------------|---------------|-----------|-----|----|-----------------------|
|                  |               | n option inverter ID            |                |               |               |           |     |    |                       |
| 08 <sup>44</sup> | 0h1708        | FIELD BUS communication speed   | FBUS BaudRate  | -             | 12Mbps        | -/A       | O   | O  | -                     |
| 09 <sup>44</sup> | 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  | <a href="#">p.124</a> |
| 31 <sup>45</sup> | 0h171F        | Output Communication address1   | Para Stauts-1  | 0000-FFFF Hex | 000A          | O/A       | O   | O  | <a href="#">p.123</a> |
| 32 <sup>45</sup> | 0h1720        | Output Communication address2   | Para Stauts-2  | 0000-FFFF Hex | 000E          | O/A       | O   | O  | <a href="#">p.123</a> |
| 33 <sup>45</sup> | 0h1721        | Output Communication address3   | Para Stauts-3  | 0000-FFFF Hex | 000F          | O/A       | O   | O  | <a href="#">p.123</a> |
| 34 <sup>45</sup> | 0h1722        | Output Communication address4   | Para Stauts-4  | 0000-FFFF Hex | 0000          | O/A       | O   | O  | <a href="#">p.123</a> |
| 35 <sup>45</sup> | 0h1723        | Output Communication address5   | Para Stauts-5  | 0000-FFFF Hex | 0000          | O/A       | O   | O  | <a href="#">p.123</a> |
| 36 <sup>45</sup> | 0h1724        | Output Communication address6   | Para Stauts-6  | 0000-FFFF Hex | 0000          | O/A       | O   | O  | <a href="#">p.123</a> |
| 37 <sup>45</sup> | 0h1725        | Output Communication address7   | Para Stauts-7  | 0000-FFFF Hex | 0000          | O/A       | O   | O  | <a href="#">p.123</a> |
| 38 <sup>45</sup> | 0h1726        | Output Communication address8   | Para Stauts-8  | 0000-FFFF Hex | 0000          | O/A       | O   | O  | <a href="#">p.123</a> |
| 50               | 0h1732        | Number of input parameters      | Para Ctrl Num  | 0-8           | 2             | O/A       | O   | O  | <a href="#">p.124</a> |
| 51 <sup>46</sup> | 0h1733        | Input                           | Para Control-  | 0000-FFFF Hex | 0005          | X/A       | O   | O  | <a href="#">p.123</a> |

<sup>45</sup> Only the range of addresses set at COM-30 is displayed.

<sup>46</sup> Only the range of addresses set at COM-50 is displayed.



| Code             | Comm. Address | Name                                 | LCD Display    | Setting Range |               | Initial Value | Property* | V/F | SL | Ref.                  |
|------------------|---------------|--------------------------------------|----------------|---------------|---------------|---------------|-----------|-----|----|-----------------------|
|                  |               | Communication address1               | 1              |               |               |               |           |     |    |                       |
| 52 <sup>46</sup> | 0h1734        | Input Communication address2         | Para Control-2 | 0000-FFFF Hex |               | 0006          | X/A       | O   | O  | <a href="#">p.123</a> |
| 53 <sup>46</sup> | 0h1735        | Input Communication address3         | Para Control-3 | 0000-FFFF Hex |               | 0000          | X/A       | O   | O  | <a href="#">p.123</a> |
| 54 <sup>46</sup> | 0h1736        | Input Communication address4         | Para Control-4 | 0000-FFFF Hex |               | 0000          | X/A       | O   | O  | <a href="#">p.123</a> |
| 55 <sup>46</sup> | 0h1737        | Input Communication address5         | Para Control-5 | 0000-FFFF Hex |               | 0000          | X/A       | O   | O  | <a href="#">p.123</a> |
| 56 <sup>46</sup> | 0h1738        | Input Communication address6         | Para Control-6 | 0000-FFFF Hex |               | 0000          | X/A       | O   | O  | <a href="#">p.123</a> |
| 57 <sup>46</sup> | 0h1739        | Input Communication address7         | Para Control-7 | 0000-FFFF Hex |               | 0000          | X/A       | O   | O  | <a href="#">p.123</a> |
| 58 <sup>46</sup> | 0h173A        | Input Communication address8         | Para Control-8 | 0000-FFFF Hex |               | 0000          | X/A       | O   | O  | <a href="#">p.123</a> |
| 68               | 0h1744        | Field bus data swap                  | FBus Swap Sel  | 0<br>1        | No<br>Yes     | 0             | X/A       | O   | O  | <a href="#">p.123</a> |
| 70               | 0h1746        | Communication multi-function input 1 | Virtual DI 1   | 0             | None          | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
| 71               | 0h1747        | Communication multi-function input 2 | Virtual DI 2   | 1             | Fx            | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
| 72               | 0h1748        | Communication multi-function input 3 | Virtual DI 3   | 2             | Rx            | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
| 73               | 0h1749        | Communication multi-function input 4 | Virtual DI 4   | 3             | RST           | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
| 74               | 0h174A        | Communication multi-                 | Virtual DI 5   | 4             | External Trip | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |



## Table of Functions

| Code | Comm. Address | Name  | LCD Display    | Setting Range |              | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|---|----------------|---------------|--------------|---------------|-----------|-----|----|-----------------------|
|      |               | function input 5                              |                |               |              |               |           |     |    |                       |
| 75   | 0h174B        | Communication multi-function input 6          | Virtual DI 6   | 5             | BX           | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
| 76   | 0h174C        | Communication multi-function input 7          | Virtual DI 7   | 6             | JOG          | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
| 77   | 0h174D        | Communication multi-function input 8          | Virtual DI 8   | 7             | Speed-L      | 0:None        | O/A       | O   | O  | <a href="#">p.143</a> |
|      |               |   |                | 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    |               |           |     |    |                       |
|      |               |   |                | 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  | <a href="#">p.121</a> |
| 90   | 0h175A        | Selection of data frame communication monitor | Comm Mon Sel   | 0             | Int485       | 0             | O/A       | O   | O  | -                     |
|      |               |   |                | 1             | KeyPad       |               |           |     |    |                       |



| Code             | Comm. Address | Name                        | LCD Display   | Setting Range |                       | Initial Value  | Property* | V/F | SL | Ref.         |
|------------------|---------------|-----------------------------|---------------|---------------|-----------------------|----------------|-----------|-----|----|--------------|
| 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 <sup>47</sup> | -             | 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  | <u>p.105</u> |
|                  |               |                             |               | 1             | P2P Master            |                |           |     |    |              |
|                  |               |                             |               | 2             | P2P Slave             |                |           |     |    |              |
|                  |               |                             |               | 3             | KPD-Ready             |                |           |     |    |              |
| 96 <sup>48</sup> | -             | DO setting selection        | P2P OUT Sel   | Bit           | 000~111               | 0:No           | O/A       | O   | O  | <u>p.105</u> |
|                  |               |                             |               | 001           | Analog output         |                |           |     |    |              |
|                  |               |                             |               | 010           | Multi-function relay  |                |           |     |    |              |
|                  |               |                             |               | 100           | Multi-function output |                |           |     |    |              |

<sup>47</sup> Displayed only when a communication option card is installed.

<sup>48</sup> Displayed when AP.01 is set to 2 (Proc PID).



## 6.9 Application Function group (PAR→AP)

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

**SL:** Sensorless vector control (dr.09)

**\*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  | <u>p.42</u>  |
| 01               | 0h1801        | Application function selection   | App Mode       | 0                 | None     | 0: None       | X/A        | O   | O  | -            |
|                  |               |                                  |                | 1                 | -        |               |            |     |    |              |
|                  |               |                                  |                | 2                 | Proc PID |               |            |     |    |              |
| 02               | -             | Enable user sequence             | User Seq En    | 0                 | No       | 0:No          | X/A        | O   | O  | <u>p.107</u> |
|                  |               |                                  |                | 1                 | Yes      |               |            |     |    |              |
| 16 <sup>49</sup> | 0h1810        | PID output monitor               | PID Output     | (%)               |          | 0.00          | -/A        | O   | O  | -            |
| 17 <sup>49</sup> | 0h1811        | PID reference monitor            | PID Ref Value  | (%)               |          | 50.00         | -/A        | O   | O  | -            |
| 18 <sup>49</sup> | 0h1812        | PID feedback monitor             | PID Fdb Value  | (%)               |          | 0.00          | -/A        | O   | O  | -            |
| 19 <sup>49</sup> | 0h1813        | PID reference setting            | PID Ref Set    | -100.00-100.00(%) |          | 50.00         | O/A        | O   | O  | -            |
| 20 <sup>49</sup> | 0h1814        | PID reference source             | PID Ref Source | 0                 | Keypad   | 0: Keypad     | X/A        | O   | O  | -            |
|                  |               |                                  |                | 1                 | V1       |               |            |     |    |              |
|                  |               |                                  |                | 3                 | V2       |               |            |     |    |              |
|                  |               |                                  |                | 4                 | I2       |               |            |     |    |              |
|                  |               |                                  |                | 5                 | Int 485  |               |            |     |    |              |
|                  |               |                                  |                | 7                 | FieldBus |               |            |     |    |              |
|                  |               |                                  |                | 11                | Pulse    |               |            |     |    |              |
| 21 <sup>49</sup> | 0h1815        | PID feedback source              | PID F/B Source | 0                 | V1       | 0:V1          | X/A        | O   | O  | -            |
|                  |               |                                  |                | 2                 | V2       |               |            |     |    |              |
|                  |               |                                  |                | 3                 | I2       |               |            |     |    |              |
|                  |               |                                  |                | 4                 | Int 485  |               |            |     |    |              |
|                  |               |                                  |                | 6                 | FieldBus |               |            |     |    |              |
|                  |               |                                  |                | 10                | Pulse    |               |            |     |    |              |
| 22 <sup>49</sup> | 0h1816        | PID controller proportional gain | PID P-Gain     | 0.0-1000.0(%)     |          | 50.0          | O/A        | O   | O  | -            |
| 23 <sup>49</sup> | 0h1817        | PID controller integral time     | PID I-Time     | 0.0-200.0(s)      |          | 10.0          | O/A        | O   | O  | -            |

<sup>49</sup> Displayed when AP.01 is set to 2 (Proc PID).



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



## Table of Functions

| Code             | Comm. Address | Name                          | LCD Display    | Setting Range  |              | Initial Value | Property * | V/F | SL | Ref. |
|------------------|---------------|-------------------------------|----------------|----------------|--------------|---------------|------------|-----|----|------|
|                  |               |                               |                | 2              | Beyond Level |               |            |     |    |      |
| 42 <sup>49</sup> | 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 <sup>49</sup> | 0h182B        | PID unit gain                 | PID Unit Gain  | 0.00-300.00(%) |              | 100.00        | O/A        | O   | O  | -    |
| 44 <sup>49</sup> | 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 <sup>49</sup> | 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  | <u>p.42</u> |
| 04               | 0h1B04        | Load level setting                    | Load Duty      | 0             | Normal Duty       | 1:Heavy Duty     | X/A        | O   | O  | -           |
|                  |               |                                       |                | 1             | Heavy Duty        |                  |            |     |    |             |
| 05               | 0h1B05        | Input/output open-phase protection    | Phase Loss Chk | bit 00-11     |                   | 00 <sup>50</sup> | X/A        | O   | O  | -           |
|                  |               |                                       |                | 01            | Output open phase |                  |            |     |    |             |
|                  |               |                                       |                | 10            | Input open phase  |                  |            |     |    |             |
| 06               | 0h1B06        | Input voltage range during open-phase | IPOV 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                | 0:No             | O/A        | O   | O  | -           |
|                  |               |                                       |                | 1             | Yes               |                  |            |     |    |             |
| 09               | 0h1B09        | Number of automatic restarts          | Retry Number   | 0-10          |                   | 0                | O/A        | O   | O  | -           |
| 10 <sup>51</sup> | 0h1B0A        | Automatic restart                     | Retry Delay    | 0.0-60.0(s)   |                   | 1.0              | O/A        | O   | O  | -           |

<sup>50</sup> The initial value 0000 will be displayed on the keypad as .

<sup>51</sup> Displayed when Pr.09 is set higher than 0.



## Table of Functions

| 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 <sup>52</sup> | 0h1B0D        | Time to decide speed command loss         | Lost Cmd Time  | 0.1-120(s)                            |             | 1.0           | O/A        | O   | O  | -    |
| 14 <sup>52</sup> | 0h1B0E        | Operation frequency at speed command loss | Lost Preset F  | Start frequency-Maximum frequency(Hz) |             | 0.00          | O/A        | O   | O  | -    |
| 15 <sup>52</sup> | 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         |               |            |     |    |      |

<sup>52</sup> 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              | 0:None        | O/A        | O   | O  | -    |
|      |               |  |                | 1             | Free-Run          |               |            |     |    |      |
|      |               |  |                | 2             | Dec               |               |            |     |    |      |
| 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              | 0:None        | O/A        | O   | O  | -    |
|      |               |  |                | 1             | Free-Run          |               |            |     |    |      |
| 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              | 0:None        | O/A        | O   | O  | -    |
|      |               |  |                | 1             | Free-Run          |               |            |     |    |      |
|      |               |  |                | 2             | Dec               |               |            |     |    |      |
| 41   | 0h1B29        | Motor cooling fan type                   | Motor Cooling  | 0             | Self-cool         | 0:Self-cool   | O/A        | O   | O  | -    |
|      |               |  |                | 1             | Forced-cool       |               |            |     |    |      |
| 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          | 0             | X/A        | O   | O  | -    |
|      |               |  |                | 1             | Dec               |               |            |     |    |      |
| 50   | 0h1B32        | Stall prevention motion and flux braking | Stall Prevent  | bit           | 0000-1111         | 1000          | X/A        | O   | O  | -    |
|      |               |  |                | 00 01         | Accelerating      |               |            |     |    |      |
|      |               |  |                | 00 10         | At constant speed |               |            |     |    |      |



## Table of Functions

| Code             | Comm. Address | Name                | LCD Display        | Setting Range                          |                 | Initial Value | Property * | V/F | SL | Ref. |
|------------------|---------------|---------------------|--------------------|--|-----------------|---------------|------------|-----|----|------|
|                  |               |                     |                    | 01<br>00                               | At deceleration |               |            |     |    |      |
|                  |               |                     |                    | 10<br>00                               | 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 <sup>53</sup> | 0h1B3D        | CAP diagnosis mode  | CAP. Diag          | 0                                      | None            | 0             | X/A        | O   |    | -    |
|                  |               |                     |                    | 1                                      | Ref Diag        |               |            |     |    |      |
|                  |               |                     |                    | 2                                      | Pre Diag        |               |            |     |    |      |
|                  |               |                     |                    | 3                                      | Init Diag       |               |            |     |    |      |
| 62 <sup>53</sup> | 0h1B3E        | CAP Exchange Level  | CAP Exchange Level | 50.0 ~ 95.0[%]                         |                 | 0             | X/A        | O   | O  | -    |
| 63 <sup>53</sup> | 0h1B3F        | CAP Diag Level      | CAP Diag Level     | 0.0~100.0[%]                           |                 | 100.0         | -/A        | O   | O  | -    |

<sup>53</sup> 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<br>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   | 50            | O/A        | O   | O  |      |
| 79               | 0h1B4F        | Cooling fan fault selection           | FAN Trip Mode      | 0 Trip<br>1 Warning                                   | 0:Trip        | O/A        | O   | O  | -    |
| 80               | 0h1B50        | Motion selection at option trip       | Opt Trip Mode      | 0 None<br>1 Free-Run<br>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<br>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 <sup>54</sup> | 0h1B58        | Fan reset time                        | Fan Time Rst       | 0 No<br>1 Yes   | 0             | X/A        | O   | O  | -    |
| 89               | 0h1B59        | CAP, FAN Status                       | CAP, FAN State     | Bit 00~10<br>00 -<br>01 CAP Warning<br>10 FAN Warning | 0             | -/A        | O   | O  | -    |
| 90 <sup>54</sup> | 0h1B5A        | Warning information                   | -                  | -   | -             | -/7        | O   | O  | -    |
| 91 <sup>54</sup> | 0h1B5B        | Fault history 1                       | -                  | -   | -             | -/7        | O   | O  | -    |
| 92 <sup>54</sup> | 0h1B5C        | Fault history 2                       | -                  | -   | -             | -/7        | O   | O  | -    |

<sup>54</sup> 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 <sup>54</sup> | 0h1B5D        | Fault history 3        | -           | -             |     | -             | -/7        | O   | O  | -    |
| 94 <sup>54</sup> | 0h1B5E        | Fault history 4        | -           | -             |     | -             | -/7        | O   | O  | -    |
| 95 <sup>54</sup> | 0h1B5F        | Fault history 5        | -           | -             |     | -             | -/7        | O   | O  | -    |
| 96 <sup>54</sup> | 0h1B60        | Fault history deletion | -           | 0             | No  | 0:No          | -/7        | O   | O  | -    |
|                  |               |                        |             | 1             | Yes |               |            |     |    |      |

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

The 2nd Motor function group will be displayed if any of In.65-69 are set to 26 (2nd MOTOR). In the following table, the data shaded in grey will be displayed when a related code has been selected.

**SL:** Sensorless vector control (dr.09)

**\*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  | <u>p.42</u> |
| 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  | -             | X/A       | O   | O  | -           |
|      |               |                   |              | 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 |               |           |     |    |             |
| 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           | 0:V/F                       | X/A       | O   | O  | -    |
|                  |               |                                    |                | 2                           | Slip Compen   |                             |           |     |    |      |
|                  |               |                                    |                | 4                           | IM Sensorless |                             |           |     |    |      |
| 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 <sup>55</sup> | -             | Rotor time constant                | M2-Tr          | 25-5000(ms)                 |               | X/A                         | O         | O   | -  |      |
| 25               | 0h1C19        | V/F pattern                        | M2-V/F Patt    | 0                           | Linear        | 0: Linear                   | X/A       | O   | O  | -    |
|                  |               |                                    |                | 1                           | Square        |                             |           |     |    |      |
|                  |               |                                    |                | 2                           | User V/F      |                             |           |     |    |      |
| 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  | -    |

<sup>55</sup> Displayed when M2.08 is set to 4 (IM Sensorless).



## Table of Functions

| 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  | <a href="#">p.42</a>  |
| 01   | 0h1D01        | User sequence operation command   | User Seq Con   | 0 Stop           | 0:Stop        | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                                   |                | 1 Run            |               |           |     |    |                       |
|      |               |                                   |                | 2 Digital In Run |               |           |     |    |                       |
| 02   | 0h1D02        | User sequence operation loop time | US Loop Time   | 0 0.01s          | 1:0.02s       | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                                   |                | 1 0.02s          |               |           |     |    |                       |
|      |               |                                   |                | 2 0.05s          |               |           |     |    |                       |
|      |               |                                   |                | 3 0.1s           |               |           |     |    |                       |
|      |               |                                   |                | 4 0.5s           |               |           |     |    |                       |
|      |               |                                   |                | 5 1s             |               |           |     |    |                       |
| 11   | 0h1D0B        | Output address link1              | Link UserOut1  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 12   | 0h1D0C        | Output address link2              | Link UserOut2  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 13   | 0h1D0D        | Output address link3              | Link UserOut3  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 14   | 0h1D0E        | Output address link4              | Link UserOut4  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 15   | 0h1D0F        | Output address link5              | Link UserOut5  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 16   | 0h1D10        | Output address link6              | Link UserOut6  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 17   | 0h1D11        | Output address link7              | Link UserOut7  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 18   | 0h1D12        | Output address link8              | Link UserOut8  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 19   | 0h1D13        | Output address link9              | Link UserOut9  | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 20   | 0h1D14        | Output address link10             | Link UserOut10 | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 21   | 0h1D15        | Output address link11             | Link UserOut11 | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 22   | 0h1D16        | Output address link12             | Link UserOut12 | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |



## Table of Functions

| Code | Comm. Address | Name                     | LCD Display    | Setting Range | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|--------------------------|----------------|---------------|---------------|-----------|-----|----|-----------------------|
| 23   | 0h1D17        | Output address link13    | Link UserOut13 | 0-0xFFFF      | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 24   | 0h1D18        | Output address link14    | Link UserOut14 | 0-0xFFFF      | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 25   | 0h1D19        | Output address link15    | Link UserOut15 | 0-0xFFFF      | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 26   | 0h1D1A        | Output address link16    | Link UserOut16 | 0-0xFFFF      | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 27   | 0h1D1B        | Output address link17    | Link UserOut17 | 0-0xFFFF      | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 28   | 0h1D1C        | Output address link18    | Link UserOut18 | 0-0xFFFF      | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 31   | 0h1D1F        | Input constant setting1  | Void Para1     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 32   | 0h1D20        | Input constant setting2  | Void Para2     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 33   | 0h1D21        | Input constant setting3  | Void Para3     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 34   | 0h1D22        | Input constant setting4  | Void Para4     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 35   | 0h1D23        | Input constant setting5  | Void Para5     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 36   | 0h1D24        | Input constant setting6  | Void Para6     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 37   | 0h1D25        | Input constant setting7  | Void Para7     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 38   | 0h1D26        | Input constant setting8  | Void Para8     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 39   | 0h1D27        | Input constant setting9  | Void Para9     | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 40   | 0h1D28        | Input constant setting10 | Void Para10    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 41   | 0h1D29        | Input constant setting11 | Void Para11    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 42   | 0h1D2A        | Input constant setting12 | Void Para12    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 43   | 0h1D2B        | Input constant setting13 | Void Para13    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 44   | 0h1D2C        | Input constant setting14 | Void Para14    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 45   | 0h1D2D        | Input constant setting15 | Void Para15    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 46   | 0h1D2E        | Input constant           | Void Para16    | -9999-9999    | 0             | X/A       | O   | O  | <a href="#">p.107</a> |



| Code | Comm. Address | Name                     | LCD Display | Setting Range  | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|--------------------------|-------------|----------------|---------------|-----------|-----|----|-----------------------|
|      |               | setting16                |             |                |               |           |     |    |                       |
| 47   | 0h1D2F        | Input constant setting17 | Void Para17 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 48   | 0h1D30        | Input constant setting18 | Void Para18 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 49   | 0h1D31        | Input constant setting19 | Void Para19 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 50   | 0h1D32        | Input constant setting20 | Void Para20 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 51   | 0h1D33        | Input constant setting21 | Void Para21 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 52   | 0h1D34        | Input constant setting22 | Void Para22 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 53   | 0h1D35        | Input constant setting23 | Void Para23 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 54   | 0h1D36        | Input constant setting24 | Void Para24 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 55   | 0h1D37        | Input constant setting25 | Void Para25 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 56   | 0h1D38        | Input constant setting26 | Void Para26 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 57   | 0h1D39        | Input constant setting27 | Void Para27 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 58   | 0h1D3A        | Input constant setting28 | Void Para28 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 59   | 0h1D3B        | Input constant setting29 | Void Para29 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 60   | 0h1D3C        | Input constant setting30 | Void Para30 | -9999-9999     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 80   | 0h1D50<br>S   | Analog input 1           | P2P In V1   | 0-12,000       |               | -/A       | O   | O  | <a href="#">p.107</a> |
| 81   | 0h1D51        | Analog input2            | P2P In I2   | -12,000-12,000 |               | -/A       | O   | O  | <a href="#">p.107</a> |
| 82   | 0h1D52        | Digital input            | P2P In DI   | 0-0x7F         |               | -/A       | O   | O  | <a href="#">p.107</a> |
| 85   | 0h1D55        | Analog output            | P2P OutAO1  | 0-10,000       | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 88   | 0h1D58        | Digital output           | P2P OutDO   | 0-0x03         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |



## 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  | <a href="#">p.42</a>  |
| 01   | 0h1E01        | User function1 | User Func1  | <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> <div>12</div> <div>13</div> <div>14</div> <div>15</div> <div>16</div> <div>17</div> <div>18</div> <div>19</div> <div>20</div> <div>21</div> <div>22</div> <div>23</div> <div>24</div> <div>25</div> <div>NOP</div> <div>ADD</div> <div>SUB</div> <div>ADDSUB</div> <div>MIN</div> <div>MAX</div> <div>ABS</div> <div>NEGATE</div> <div>MPYDIV</div> <div>REMAINDER</div> <div>COMPARE-GT</div> <div>COMPARE-GEQ</div> <div>COMPARE-EQUAL</div> <div>COMPARE-NEQUAL</div> <div>TIMER</div> <div>LIMIT</div> <div>AND</div> <div>OR</div> <div>XOR</div> <div>ANDOR</div> <div>SWITCH</div> <div>BITTEST</div> <div>BITSET</div> <div>BITCLEAR</div> <div>LOWPASSFILTER</div> <div>PI_CONTORL</div> | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |



| Code | Comm. Address | Name                   | LCD Display   | Setting Range     | Initial Value | Property* | V/F | SL | Ref.         |
|------|---------------|------------------------|---------------|-------------------|---------------|-----------|-----|----|--------------|
|      |               |                        |               | 26 PI_PROCESS     |               |           |     |    |              |
|      |               |                        |               | 27 UPCOUNT        |               |           |     |    |              |
|      |               |                        |               | 28 DOWNCOUNT      |               |           |     |    |              |
| 02   | 0h1E02        | User function input1-A | User Input1-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 03   | 0h1E03        | User function input1-B | User Input1-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 04   | 0h1E04        | User function input1-C | User Input1-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 05   | 0h1E05        | User function output1  | User Output1  | -32767-32767      | 0             | -/A       | O   | O  | <u>p.107</u> |
| 06   | 0h1E06        | User function 2        | User Func2    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <u>p.107</u> |
|      |               |                        |               | 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       |               |           |     |    |              |



## Table of Functions

| Code | Comm. Address | Name                   | LCD Display   | Setting Range |                | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|------------------------|---------------|---------------|----------------|---------------|-----------|-----|----|-----------------------|
|      |               |                        |               | 24            | LOWPASSFILTER  |               |           |     |    |                       |
|      |               |                        |               | 25            | PI_CONTORL     |               |           |     |    |                       |
|      |               |                        |               | 26            | PI_PROCESS     |               |           |     |    |                       |
|      |               |                        |               | 27            | UPCOUNT        |               |           |     |    |                       |
|      |               |                        |               | 28            | DOWNCOUNT      |               |           |     |    |                       |
| 07   | 0h1E07        | User function input2-A | User Input2-A | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 08   | 0h1E08        | User function input2-B | User Input2-B | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 09   | 0h1E09        | User function input2-C | User Input2-C | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 10   | 0h1E0A        | User function output2  | User Output2  | -32767-32767  |                | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 11   | 0h1E0B        | User function3         | User Func3    | 0             | NOP            | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                        |               | 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        |               |           |     |    |                       |



| Code | Comm. Address | Name                   | LCD Display   | Setting Range  |               | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|------------------------|---------------|----------------|---------------|---------------|-----------|-----|----|-----------------------|
|      |               |                        |               | 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  | <a href="#">p.107</a> |
| 13   | 0h1E0D        | User function input3-B | User Input3-B | 0-0xFFFF       |               | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 14   | 0h1E0E        | User function input3-C | User Input3-C | 0-0xFFFF       |               | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 15   | 0h1E0F        | User function output3  | User Output3  | -32767-32767   |               | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 16   | 0h1E10        | User function4         | User Func4    | 0              | NOP           | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
| 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         |                        |               |                |               |               |           |     |    |                       |



## Table of Functions

| 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      |               |           |     |    |                       |
| 17   | 0h1E11        | User function input4-A | User Input4-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 18   | 0h1E12        | User function input4-B | User Input4-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 19   | 0h1E13        | User function input4-C | User Input4-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 20   | 0h1E14        | User function output4  | User Output4  | -32767-32767      | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 21   | 0h1E15        | User function5         | User Func5    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                        |               | 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      |               |           |     |    |              |
| 22   | 0h1E16        | User function input5-A | User Input5-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 23   | 0h1E17        | User function input5-B | User Input5-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 24   | 0h1E18        | User function input5-C | User Input5-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 25   | 0h1E19        | User function output5  | User Output5  | -32767-32767      | 0             | -/A       | O   | O  | <u>p.107</u> |
| 26   | 0h1E1A        | User function6         | User Func6    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <u>p.107</u> |
|      |               |                        |               | 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             |               |           |     |    |              |



## Table of Functions

| Code | Comm. Address | Name                   | LCD Display   | Setting Range    | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|------------------------|---------------|------------------|---------------|-----------|-----|----|-----------------------|
|      |               |                        |               | 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  | <a href="#">p.107</a> |
| 28   | 0h1E1C        | User function input6-B | User Input6-B | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 29   | 0h1E1D        | User function input6-C | User Input6-C | 0-0xFFFF         | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 30   | 0h1E1E        | User function output6  | User Output6  | -32767-32767     | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 31   | 0h1E1F        | User function7         | User Func7    | 0 NOP            | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                        |               | 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         |               |           |     |    |                       |
|      |               |                        |               | 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      |               |           |     |    |                       |
| 32   | 0h1E20        | User function input7-A | User Input7-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 33   | 0h1E21        | User function input7-B | User Input7-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 34   | 0h1E22        | User function input7-C | User Input7-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 35   | 0h1E23        | User function output7  | User Output7  | -32767-32767      | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 36   | 0h1E24        | User function8         | User Func8    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                        |               | 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 |               |           |     |    |                       |



## Table of Functions

| Code | Comm. Address | Name                   | LCD Display   | Setting Range |               | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|------------------------|---------------|---------------|---------------|---------------|-----------|-----|----|-----------------------|
|      |               |                        |               | 14            | TIMER         |               |           |     |    |                       |
|      |               |                        |               | 15            | LIMIT         |               |           |     |    |                       |
|      |               |                        |               | 16            | AND           |               |           |     |    |                       |
|      |               |                        |               | 17            | OR            |               |           |     |    |                       |
|      |               |                        |               | 18            | XOR           |               |           |     |    |                       |
|      |               |                        |               | 19            | ANDOR         |               |           |     |    |                       |
|      |               |                        |               | 20            | SWITCH        |               |           |     |    |                       |
|      |               |                        |               | 21            | BITTEST       |               |           |     |    |                       |
|      |               |                        |               | 22            | BITSET        |               |           |     |    |                       |
|      |               |                        |               | 23            | BITCLEAR      |               |           |     |    |                       |
|      |               |                        |               | 24            | LOWPASSFILTER |               |           |     |    |                       |
|      |               |                        |               | 25            | PI_CONTORL    |               |           |     |    |                       |
|      |               |                        |               | 26            | PI_PROCESS    |               |           |     |    |                       |
|      |               |                        |               | 27            | UPCOUNT       |               |           |     |    |                       |
|      |               |                        |               | 28            | DOWNCOUNT     |               |           |     |    |                       |
| 37   | 0h1E25        | User function input8-A | User Input8-A | 0-0xFFFF      |               | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 38   | 0h1E26        | User function input8-B | User Input8-B | 0-0xFFFF      |               | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 39   | 0h1E27        | User function input8-C | User Input8-C | 0-0xFFFF      |               | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 40   | 0h1E28        | User function output8  | User Output8  | -32767-32767  |               | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 41   | 0h1E29        | User function9         | User Func9    | 0             | NOP           | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
| 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      |               |           |     |    |              |
| 42   | 0h1E2A        | User function input9-A | User Input9-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 43   | 0h1E2B        | User function input9-B | User Input9-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 44   | 0h1E2C        | User function input9-C | User Input9-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 45   | 0h1E2D        | User function output9  | User Output9  | -32767-32767      | 0             | -/A       | O   | O  | <u>p.107</u> |
| 46   | 0h1E2E        | User function10        | User Func10   | 0 NOP             | 0:NOP         | X/A       | O   | O  | <u>p.107</u> |
|      |               |                        |               | 1 ADD             |               |           |     |    |              |
|      |               |                        |               | 2 SUB             |               |           |     |    |              |
|      |               |                        |               | 3 ADDSUB          |               |           |     |    |              |
|      |               |                        |               | 4 MIN             |               |           |     |    |              |
|      |               |                        |               | 5 MAX             |               |           |     |    |              |
|      |               |                        |               | 6 ABS             |               |           |     |    |              |
|      |               |                        |               | 7 NEGATE          |               |           |     |    |              |
|      |               |                        |               | 8 MPYDIV          |               |           |     |    |              |
|      |               |                        |               | 9 REMAINDER       |               |           |     |    |              |
|      |               |                        |               | 10 COMPARE-GT     |               |           |     |    |              |
|      |               |                        |               | 11 COMPARE-GEQ    |               |           |     |    |              |



## Table of Functions

| 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      |               |           |     |    |                       |
| 47   | 0h1E2F        | User function input10-A | User Input10-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 48   | 0h1E30        | User function input10-B | User Input10-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 49   | 0h1E31        | User function input10-C | User Input10-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 50   | 0h1E32        | User function output10  | User Output10  | -32767-32767      | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 51   | 0h1E33        | User function11         | User Func11    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                         |                | 1 ADD             |               |           |     |    |                       |
|      |               |                         |                | 2 SUB             |               |           |     |    |                       |
|      |               |                         |                | 3 ADDSUB          |               |           |     |    |                       |
|      |               |                         |                | 4 MIN             |               |           |     |    |                       |
|      |               |                         |                | 5 MAX             |               |           |     |    |                       |
|      |               |                         |                | 6 ABS             |               |           |     |    |                       |
|      |               |                         |                | 7 NEGATE          |               |           |     |    |                       |



| Code | Comm. Address | Name                    | LCD Display    | Setting Range |                | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|-------------------------|----------------|---------------|----------------|---------------|-----------|-----|----|-----------------------|
|      |               |                         |                | 8             | MPYDIV         |               |           |     |    |                       |
|      |               |                         |                | 9             | REMAINDER      |               |           |     |    |                       |
|      |               |                         |                | 10            | COMPARE-GT     |               |           |     |    |                       |
|      |               |                         |                | 11            | COMPARE-GEQ    |               |           |     |    |                       |
|      |               |                         |                | 12            | COMPARE-EQUAL  |               |           |     |    |                       |
|      |               |                         |                | 13            | COMPARE-NEQUAL |               |           |     |    |                       |
|      |               |                         |                | 14            | TIMER          |               |           |     |    |                       |
|      |               |                         |                | 15            | LIMIT          |               |           |     |    |                       |
|      |               |                         |                | 16            | AND            |               |           |     |    |                       |
|      |               |                         |                | 17            | OR             |               |           |     |    |                       |
|      |               |                         |                | 18            | XOR            |               |           |     |    |                       |
|      |               |                         |                | 19            | ANDOR          |               |           |     |    |                       |
|      |               |                         |                | 20            | SWITCH         |               |           |     |    |                       |
|      |               |                         |                | 21            | BITTEST        |               |           |     |    |                       |
|      |               |                         |                | 22            | BITSET         |               |           |     |    |                       |
|      |               |                         |                | 23            | BITCLEAR       |               |           |     |    |                       |
|      |               |                         |                | 24            | LOWPASSFILTER  |               |           |     |    |                       |
|      |               |                         |                | 25            | PI_CONTORL     |               |           |     |    |                       |
|      |               |                         |                | 26            | PI_PROCESS     |               |           |     |    |                       |
|      |               |                         |                | 27            | UPCOUNT        |               |           |     |    |                       |
| 28   | DOWNCOUNT     |                         |                |               |                |               |           |     |    |                       |
| 52   | 0h1E34        | User function input11-A | User Input11-A | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 53   | 0h1E35        | User function input11-B | User Input11-B | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 54   | 0h1E36        | User function input11-C | User Input11-C | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 55   | 0h1E37        | User function output11  | User Output11  | -32767-32767  |                | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 56   | 0h1E38        | User function12         | User Func12    | 0             | NOP            | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                         |                | 1             | ADD            |               |           |     |    |                       |
|      |               |                         |                | 2             | SUB            |               |           |     |    |                       |
|      |               |                         |                | 3             | ADDSUB         |               |           |     |    |                       |



## Table of Functions

| Code | Comm. Address | Name                   | LCD Display   | Setting Range |                | Initial Value | Property* | V/F | SL | Ref.                  |                         |                |          |  |   |     |   |   |                       |
|------|---------------|------------------------|---------------|---------------|----------------|---------------|-----------|-----|----|-----------------------|-------------------------|----------------|----------|--|---|-----|---|---|-----------------------|
|      |               |                        |               | 4             | MIN            |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 5             | MAX            |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 6             | ABS            |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 7             | NEGATE         |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 8             | MPYDIV         |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 9             | REMAINDER      |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 10            | COMPARE-GT     |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 11            | COMPARE-GEQ    |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 12            | COMPARE-EQUAL  |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 13            | COMPARE-NEQUAL |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 14            | TIMER          |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 15            | LIMIT          |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 16            | AND            |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 17            | OR             |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 18            | XOR            |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 19            | ANDOR          |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 20            | SWITCH         |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 21            | BITTEST        |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 22            | BITSET         |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 23            | BITCLEAR       |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 24            | LOWPASSFILTER  |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 25            | PI_CONTORL     |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 26            | PI_PROCESS     |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 27            | UPCOUNT        |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 28            | DOWNCOUNT      |               |           |     |    |                       |                         |                |          |  |   |     |   |   |                       |
|      |               |                        |               | 57            | 0h1E39         |               |           |     |    |                       | User function input12-A | User Input12-A | 0-0xFFFF |  | 0 | X/A | O | O | <a href="#">p.107</a> |
|      |               |                        |               | 58            | 0h1E3A         |               |           |     |    |                       | User function input12-B | User Input12-B | 0-0xFFFF |  | 0 | X/A | O | O | <a href="#">p.107</a> |
|      |               |                        |               | 59            | 0h1E3B         |               |           |     |    |                       | User function input12-C | User Input12-C | 0-0xFFFF |  | 0 | X/A | O | O | <a href="#">p.107</a> |
| 60   | 0h1E3C        | User function output12 | User Output12 | -32767-32767  |                | 0             | -/A       | O   | O  | <a href="#">p.107</a> |                         |                |          |  |   |     |   |   |                       |



| Code | Comm. Address | Name                    | LCD Display    | Setting Range |                | Initial Value | Property* | V/F | SL | Ref.         |
|------|---------------|-------------------------|----------------|---------------|----------------|---------------|-----------|-----|----|--------------|
| 61   | 0h1E3D        | User function13         | User Func13    | 0             | NOP            | 0:NOP         | X/A       | O   | O  | <u>p.107</u> |
|      |               |                         |                | 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  | <u>p.107</u> |
| 63   | 0h1E3F        | User function input13-B | User Input13-B | 0-0xFFFF      |                | 0             | X/A       | O   | O  | <u>p.107</u> |



## Table of Functions

| Code | Comm. Address | Name                    | LCD Display    | Setting Range  |     | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|-------------------------|----------------|----------------|-----|---------------|-----------|-----|----|-----------------------|
| 64   | 0h1E40        | User function input13-C | User Input13-C | 0-0xFFFF       |     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 65   | 0h1E41        | User function output13  | User Output13  | -32767-32767   |     | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 66   | 0h1E42        | User function14         | User Func14    | 0              | NOP | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
| 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      |     |               |           |     |    |                       |
| 67   | 0h1E43        | User function           | User           | 0-0xFFFF       |     | 0             | X/A       | O   | O  | <a href="#">p.107</a> |



| Code | Comm. Address | Name                    | LCD Display    | Setting Range | Initial Value | Property* | V/F | SL | Ref.         |
|------|---------------|-------------------------|----------------|---------------|---------------|-----------|-----|----|--------------|
|      |               | input14-A               | Input14-A      |               |               |           |     |    |              |
| 68   | 0h1E44        | User function input14-B | User Input14-B | 0-0xFFFF      | 0             | X/A       | O   | O  | <u>p.107</u> |
| 69   | 0h1E45        | User function input14-C | User Input14-C | 0-0xFFFF      | 0             | X/A       | O   | O  | <u>p.107</u> |
| 70   | 0h1E46        | User function output14  | User Output14  | -32767-32767  | 0             | -/A       | O   | O  | <u>p.107</u> |
| 71   | 0h1E47        | User function15         | User Func15    | 0             | 0:NOP         | X/A       | O   | O  | <u>p.107</u> |
|      |               |                         |                | 1             |               |           |     |    |              |
|      |               |                         |                | 2             |               |           |     |    |              |
|      |               |                         |                | 3             |               |           |     |    |              |
|      |               |                         |                | 4             |               |           |     |    |              |
|      |               |                         |                | 5             |               |           |     |    |              |
|      |               |                         |                | 6             |               |           |     |    |              |
|      |               |                         |                | 7             |               |           |     |    |              |
|      |               |                         |                | 8             |               |           |     |    |              |
|      |               |                         |                | 9             |               |           |     |    |              |
|      |               |                         |                | 10            |               |           |     |    |              |
|      |               |                         |                | 11            |               |           |     |    |              |
|      |               |                         |                | 12            |               |           |     |    |              |
|      |               |                         |                | 13            |               |           |     |    |              |
|      |               |                         |                | 14            |               |           |     |    |              |
|      |               |                         |                | 15            |               |           |     |    |              |
|      |               |                         |                | 16            |               |           |     |    |              |
|      |               |                         |                | 17            |               |           |     |    |              |
|      |               |                         |                | 18            |               |           |     |    |              |
|      |               |                         |                | 19            |               |           |     |    |              |
|      |               |                         |                | 20            |               |           |     |    |              |
|      |               |                         |                | 21            |               |           |     |    |              |
|      |               |                         |                | 22            |               |           |     |    |              |
|      |               |                         |                | 23            |               |           |     |    |              |
|      |               |                         |                | 24            |               |           |     |    |              |
|      |               |                         |                | 25            |               |           |     |    |              |



## Table of Functions

| Code | Comm. Address | Name                    | LCD Display    | Setting Range | Initial Value  | Property* | V/F | SL | Ref.                  |
|------|---------------|-------------------------|----------------|---------------|----------------|-----------|-----|----|-----------------------|
|      |               |                         |                | 26            | PI_PROCESS     |           |     |    |                       |
|      |               |                         |                | 27            | UPCOUNT        |           |     |    |                       |
|      |               |                         |                | 28            | DOWNCOUNT      |           |     |    |                       |
| 72   | 0h1E48        | User function input15-A | User Input15-A | 0-0xFFFF      | 0              | X/A       | O   | O  | <a href="#">p.107</a> |
| 73   | 0h1E49        | User function input15-B | User Input15-B | 0-0xFFFF      | 0              | X/A       | O   | O  | <a href="#">p.107</a> |
| 74   | 0h1E4A        | User function input15-C | User Input15-C | 0-0xFFFF      | 0              | X/A       | O   | O  | <a href="#">p.107</a> |
| 75   | 0h1E4B        | User function output15  | User Output15  | -32767-32767  | 0              | -/A       | O   | O  | <a href="#">p.107</a> |
| 76   | 0h1E4C        | User function 16        | User Func16    | 0             | NOP            | 0:NOP     | X/A | O  | <a href="#">p.107</a> |
|      |               |                         |                | 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        |           |     |    |                       |



| Code | Comm. Address | Name                    | LCD Display    | Setting Range     | Initial Value | Property* | V/F | SL | Ref.         |
|------|---------------|-------------------------|----------------|-------------------|---------------|-----------|-----|----|--------------|
|      |               |                         |                | 22 BITSET         |               |           |     |    |              |
|      |               |                         |                | 23 BITCLEAR       |               |           |     |    |              |
|      |               |                         |                | 24 LOWPASSFILTER  |               |           |     |    |              |
|      |               |                         |                | 25 PI_CONTORL     |               |           |     |    |              |
|      |               |                         |                | 26 PI_PROCESS     |               |           |     |    |              |
|      |               |                         |                | 27 UPCOUNT        |               |           |     |    |              |
|      |               |                         |                | 28 DOWNCOUNT      |               |           |     |    |              |
| 77   | 0h1E4D        | User function input16-A | User Input16-A | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 78   | 0h1E4E        | User function input16-B | User Input16-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 79   | 0h1E4F        | User function input16-C | User Input16-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <u>p.107</u> |
| 80   | 0h1E50        | User function output16  | User Output16  | -32767-32767      | 0             | -/A       | O   | O  | <u>p.107</u> |
| 81   | 0h1E51        | User function 17        | User Func17    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <u>p.107</u> |
|      |               |                         |                | 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             |               |           |     |    |              |



## Table of Functions

| Code | Comm. Address | Name                    | LCD Display    | Setting Range     | Initial Value | Property* | V/F | SL | Ref.                  |
|------|---------------|-------------------------|----------------|-------------------|---------------|-----------|-----|----|-----------------------|
|      |               |                         |                | 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  | <a href="#">p.107</a> |
| 83   | 0h1E53        | User function input17-B | User Input17-B | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 84   | 0h1E54        | User function input17-C | User Input17-C | 0-0xFFFF          | 0             | X/A       | O   | O  | <a href="#">p.107</a> |
| 85   | 0h1E55        | User function output17  | User Output17  | -32767-32767      | 0             | -/A       | O   | O  | <a href="#">p.107</a> |
| 86   | 0h1E56        | User function 18        | User Func18    | 0 NOP             | 0:NOP         | X/A       | O   | O  | <a href="#">p.107</a> |
|      |               |                         |                | 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 |               |           |     |    |                       |



| Code | Comm. Address | Name                    | LCD Display    | Setting Range | Initial Value | Property* | V/F | SL | Ref.         |
|------|---------------|-------------------------|----------------|---------------|---------------|-----------|-----|----|--------------|
|      |               |                         |                | 14            | TIMER         |           |     |    |              |
|      |               |                         |                | 15            | LIMIT         |           |     |    |              |
|      |               |                         |                | 16            | AND           |           |     |    |              |
|      |               |                         |                | 17            | OR            |           |     |    |              |
|      |               |                         |                | 18            | XOR           |           |     |    |              |
|      |               |                         |                | 19            | ANDOR         |           |     |    |              |
|      |               |                         |                | 20            | SWITCH        |           |     |    |              |
|      |               |                         |                | 21            | BITTEST       |           |     |    |              |
|      |               |                         |                | 22            | BITSET        |           |     |    |              |
|      |               |                         |                | 23            | BITCLEAR      |           |     |    |              |
|      |               |                         |                | 24            | LOWPASSFILTER |           |     |    |              |
|      |               |                         |                | 25            | PI_CONTORL    |           |     |    |              |
|      |               |                         |                | 26            | PI_PROCESS    |           |     |    |              |
|      |               |                         |                | 27            | UPCOUNT       |           |     |    |              |
|      |               |                         |                | 28            | DOWNCOUNT     |           |     |    |              |
| 87   | 0h1E57        | User function input18-A | User Input18-A | 0-0xFFFF      | 0             | X/A       | O   | O  | <u>p.107</u> |
| 88   | 0h1E58        | User function input18-B | User Input18-B | 0-0xFFFF      | 0             | X/A       | O   | O  | <u>p.107</u> |
| 89   | 0h1E59        | User function input18-C | User Input18-C | 0-0xFFFF      | 0             | X/A       | O   | O  | <u>p.107</u> |
| 90   | 0h1E5A        | User function output18  | User Output18  | -32767-32767  | 0             | -A        | O   | O  | <u>p.107</u> |



## 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<br>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            | <u>p.42</u>  |
| 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             | <u>p.106</u> |
| 10   | Inverter S/W version       | Inv S/W Ver    | -             |           | -             | -            |
| 11   | LCD keypad S/W version     | Keypad S/W Ver | -             |           | -             | -            |
| 12   | LCD keypad title version   | KPD Title Ver  | -             |           | -             | -            |
| 20   | Status window display item | Anytime Para   | 0             | Frequency | 0: Frequency  | -            |



| Code | Name                        | LCD Display    | 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        |                  |      |
|      |                             |                | 8             | COM Grp        |                  |      |



## Table of Functions

| Code | Name                                | LCD Display     | Setting Range              |                | Initial Value | Ref. |
|------|-------------------------------------|-----------------|----------------------------|----------------|---------------|------|
|      |                                     |                 | 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<br>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<br>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 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 Current <sup>1</sup> | Latch | Displayed when inverter output current exceeds 200% of the rated current.  |



| Keypad Display | LCD Display    | Type  | Description  |
|----------------|----------------|-------|--|
| <b>OVT</b>     | Over Voltage   | Latch | Displayed when internal DC circuit voltage exceeds the specified value.  |
| <b>LVT</b>     | Low Voltage    | Level | Displayed when internal DC circuit voltage is less than the specified value.   |
| <b>LV2</b>     | Low Voltage2   | Latch | Displayed when internal DC circuit voltage is less than the specified value during inverter operation.   |
| <b>GFT</b>     | 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.  |
| <b>ETH</b>     | 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.  |
| <b>POT</b>     | 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.  |
| <b>IPO</b>     | 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.  |
| <b>IOL</b>     | 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. |
| <b>NMT</b>     | 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   |
|----------------|---------------|-------|---|
| <b>OHT</b>     | Over Heat     | Latch | Displayed when the temperature of the inverter heat sink exceeds the specified value.   |
| <b>OC2</b>     | Over Current2 | Latch | Displayed when the DC circuit in the inverter detects a specified level of excessive, short circuit current.  |
| <b>EXT</b>     | External Trip | Latch | Displayed when an external fault signal is provided by the multi-function terminal. Set one of the multi-function input terminals at In.65-69 to 4 (External Trip) to enable external trip. |



| Keypad Display | LCD Display        | 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.65-69 to 5 (BX) to enable input block function.   |
| HWT            | H/W-Diag           | Fatal | <p>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).</p> <p>EEP Err: An error in reading/writing parameters due to keypad or memory (EEPROM) fault.</p> <p>ADC Off Set: An error in the current sensing circuit (U/V/W terminal, current sensor, etc.).</p> |
| 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<br>SFB     | Safety A(B)<br>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<br>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.<br>(‘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).   |



| Keypad Display | LCD Display   | Description   |
|----------------|---------------|---|
| DBW            | DB Warn %ED   | Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at Pr.66.  |
| 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 specified 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   | Replace the magnetic contactor.  |



| Type              | Cause   | Remedy  |
|-------------------|---|---|
|                   | power source has a faulty connection.                                 |   |
| Low Voltage2      | The input voltage has decreased during the operation.                 | Determine if the input voltage is above 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 40°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                         | Remove the foreign object from the air  |



| Type          | Cause                                   | Remedy                     |
|---------------|---|----------------------------|
| IP54 FAN Trip | vent.                                   | inlet or outlet.           |
|               | The cooling fan needs to be replaced.   | Replace the cooling fan.   |
|               | 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   |



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



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



| Type   | Cause  | Remedy  |
|--|--|---|
| When the inverter is operating, the earth leakage breaker is activated.    | An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation. | Connect the inverter to a ground terminal.  |
|  |  | Check that the ground resistance is less than 100Ω for 200V inverters and less than 10Ω for 400V inverters.                                 |
|  |  | Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.            |
|  |  | Lower the carrier frequency.  |
|  |  | Make the cable length between the inverter and the motor as short as possible.  |
| The motor vibrates severely and does not rotate normally.                  | Phase-to-phase voltage of 3-phase power source is not balanced.  | Check the input voltage and balance the voltage.  |
|  |  | Check and test the motor's insulation.  |
| The motor makes humming, or loud noises.                                   | Resonance occurs between the motor's natural frequency and the carrier frequency.                        | Slightly increase or decrease the carrier frequency.  |
|  | Resonance occurs between the motor's natural frequency and the inverter's output frequency.              | Slightly increase or decrease the carrier frequency.  |
|  |  | Use the frequency jump function to avoid the frequency band where resonance occurs.   |
| The motor vibrates/hunts.  | The frequency input command is an external, analog command.  | In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (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                    | 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  |



| Type                             | Cause  | Remedy   |
|----------------------------------|--|--|
| reference.                       |  | 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 <a href="#">1.3 Installation Considerations</a> on page <a href="#">5</a> . | 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 <a href="#">9.1 Input and Output Specification</a> on page <a href="#">241</a> .  | 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 $\pm 10\%$ of the rated value of the resistor.                                |                                    |
|                 | Control circuit Protection circuit | 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 controlled 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

#### 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      |
| Rated output          | Rated capacity (kVA) | Heavy load | 1.0                                | 1.9     | 3.0      | 4.2      | 6.1      | 6.5      |
|                       | Rated current (A)    | Heavy load | 2.5                                | 5.0     | 8.0      | 11.0     | 16.0     | 17.0     |
|                       | Output frequency     |            | 0-400 Hz (IM Sensorless: 0-120 Hz) |         |          |          |          |          |
|                       | Output voltage (V)   |            | 3-phase 200-240V                   |         |          |          |          |          |
| Rated input           | Working voltage (V)  |            | 3-phase 200-240VAC (-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     |
| Weight (lb /kg)       |                      |            | 7.9/3.6                            | 7.9/3.6 | 11.5/5.2 | 11.7/5.3 | 12.3/5.6 | 12.3/5.6 |

- 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 440V 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        |
| Rated output          | Rated capacity (kVA) | Heavy load | 9.1                                 | 12.2     | 17.5     | 22.9      |
|                       | Rated current (A)    | Heavy load | 24.0                                | 32.0     | 46.0     | 60.0      |
|                       | Output frequency     |            | 0-400 Hz (IM Sensorless : 0-120 Hz) |          |          |           |
|                       | Output voltage (V)   |            | 3 phase 200-240V                    |          |          |           |
| Rated input           | Working voltage (V)  |            | 3 phase 200-240VAC (-15% to +10%)   |          |          |           |
|                       | Input frequency      |            | 50-60 Hz (±5%)                      |          |          |           |
|                       | Rated current (A)    | Heavy load | 25.8                                | 34.9     | 50.8     | 66.7      |
| Weight (lb /kg)       |                      |            | 19.8/9.0                            | 19.8/9.0 | 21.2/9.6 | 26.7/12.1 |

- 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      |
| Rated output          | Rated capacity (kVA) | Heavy load | 1.0                                | 1.9     | 3.0      | 4.2      | 6.1      | 6.5      |
|                       | Rated current (A)    | Heavy load | 1.3                                | 2.5     | 4.0      | 5.5      | 8.0      | 9.0      |
|                       | Output 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      |
| Weight (lb /kg)       |                      |            | 8.2/3.7                            | 8.2/3.7 | 11.7/5.3 | 12.1/5.5 | 12.3/5.6 | 12.3/5.6 |

- 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        |
| Rated output          | Rated capacity (kVA) | Heavy load | 9.1                                | 12.2     | 18.3     | 22.9     | 29.7      | 34.3      |
|                       | Rated current (A)    | Heavy load | 12.0                               | 16.0     | 24.0     | 30.0     | 39.0      | 45.0      |
|                       | Output 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      |
| Weight (lb /kg)       |                      |            | 19.4/8.8                           | 19.6/8.9 | 21.2/9.6 | 21.6/9.8 | 27.3/12.4 | 27.3/12.4 |

- 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<br>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  |
|           | 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<br>Digital type: key pad, pulse train input   |
|           | Operation function                  | <ul style="list-style-type: none"> <li>• PID control</li> <li>• 3-wire operation</li> <li>• Frequency limit</li> <li>• Second function</li> <li>• Anti-forward and reverse direction rotation</li> <li>• Commercial transition</li> <li>• Speed search</li> <li>• Power braking</li> <li>• Leakage reduction</li> <li>• Up-down operation</li> <li>• DC braking</li> <li>• Frequency jump</li> <li>• Slip compensation</li> <li>• Automatic restart</li> <li>• Automatic tuning</li> <li>• Energy buffering</li> <li>• Flux braking</li> <li>• Fire mode</li> </ul>   |
|           | Input                               | <div> <div>Multi function terminal (5EA) P1-P5</div> <div>           Select PNP (Source) or NPN (Sink) mode. Functions can be set according to In.65- In.69 codes and parameter settings.           <ul style="list-style-type: none"> <li>• Forward direction operation</li> <li>• Reset</li> <li>• Emergency stop</li> <li>• Multi step speed frequency-high/med/low</li> <li>• DC braking during stop</li> <li>• Frequency increase</li> <li>• 3-wire</li> <li>• Local/remote operation mode transition</li> <li>• Select acc/dec/stop</li> <li>• Reverse direction operation</li> <li>• External trip</li> <li>• Jog operation</li> <li>• Multi step acc/dec-high/med/low</li> <li>• Second motor selection</li> <li>• Frequency reduction</li> <li>• Fix analog command frequency</li> <li>• Transition from PID to general operation</li> </ul> </div> </div> |
|           | Pulse train                         | 0-32 kHz, Low Level: 0-0.8V, High Level: 3.5-12V  |



| Items                         |                        |  | Description  |  |
|-------------------------------|------------------------|--|--|--|
|                               | 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                   |  | <ul style="list-style-type: none"> <li>Over current trip</li> <li>External signal trip</li> <li>ARM short circuit current trip</li> <li>Over heat trip</li> <li>Input imaging trip</li> <li>Ground trip</li> <li>Motor over heat trip</li> <li>I/O board link trip</li> <li>No motor trip</li> <li>Parameter writing trip</li> <li>Emergency stop trip</li> <li>Command loss trip</li> <li>External memory error</li> <li>CPU watchdog trip</li> <li>Motor normal load trip</li> </ul> | <ul style="list-style-type: none"> <li>Over voltage trip</li> <li>Temperature sensor trip</li> <li>Inverter over heat</li> <li>Option trip</li> <li>Output imaging trip</li> <li>Inverter overload trip</li> <li>Fan trip</li> <li>Pre-PID operation failure</li> <li>External break trip</li> <li>Low voltage trip during operation</li> <li>Low voltage trip</li> <li>Safety A(B) trip</li> <li>Analog input error</li> <li>Motor overload trip</li> </ul> |
|                               | Alarm                  |  | 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 than 15 ms: continue operation (must be within the rated input voltage and rated output range)<br>Heavy load more than 15 ms: auto restart operation   |  |
| Structure/working environment | Cooling type           |  | Forced fan cooling structure<br>Forced cooling type: 0.4-15 kW 200V/0.4-22 kW 400V (excluding some models)   |  |
|                               | Protection structure   |  | IP66(NEMA 4X Indoor Only)  |  |
|                               | Ambient temperature    |  | Heavy load: -10-40°C (14-104°F)<br>No ice or frost should be present.  |  |

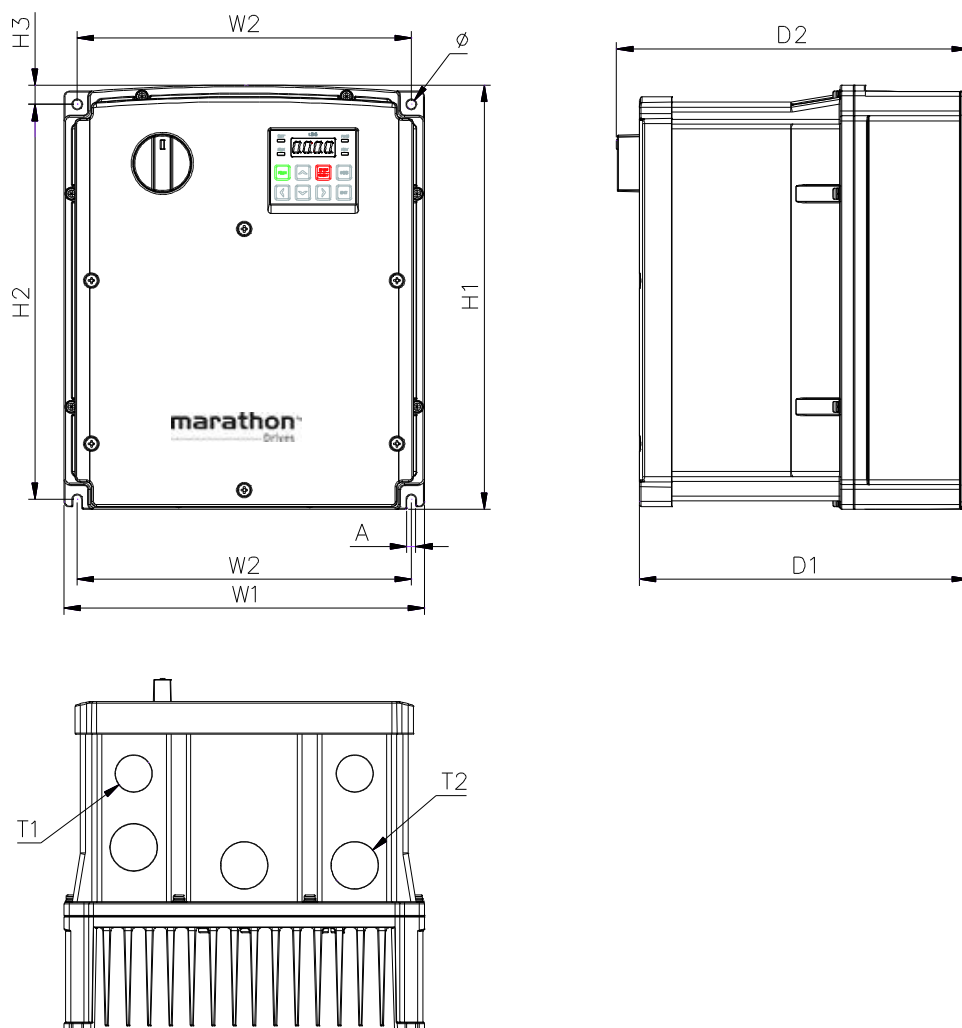


| Items |                                | Description   |
|-------|--------------------------------|---|
|       | Ambient humidity               | Relative humidity less than 90% RH (to avoid condensation forming)  |
|       | Storage temperature.           | -20°C-65°C (-4–149°F)   |
|       | Surrounding environment        | Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 3 Environment). |
|       | Operation altitude/oscillation | No higher than 3280ft (1,000m). Less than 9.8m/sec <sup>2</sup> (1G).   |
|       | Pressure                       | 70-106 kPa  |



## 9.3 External Dimensions (IP 66 Type)

0.4~4.0kW (3-Phase)



| Items           |                  | W1            | W2            | H1              | H2            | H3            | D1              | D2              | A             | $\Phi$        | T1             | T2 |
|-----------------|------------------|---------------|---------------|-----------------|---------------|---------------|-----------------|-----------------|---------------|---------------|----------------|----|
| 3-phase<br>200V | 0004MD10<br>0G-2 | 180<br>(7.09) | 170<br>(6.69) | 256.6<br>(1010) | 245<br>(9.65) | 8.2<br>(0.32) | 174.2<br>(6.86) | 188.2<br>(7.41) | 4.5<br>(0.18) | 4.5<br>(0.18) | 22.3<br>(0.88) | -  |
|                 | 0008MD10         |               |               |                 |               |               |                 |                 |               |               |                |    |

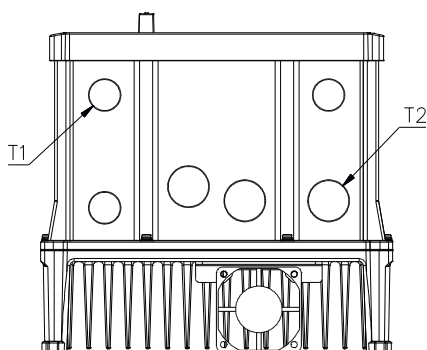
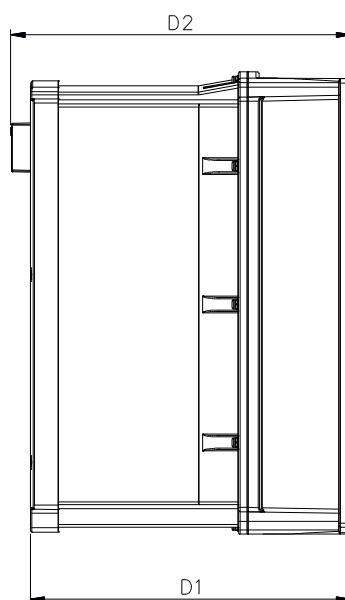
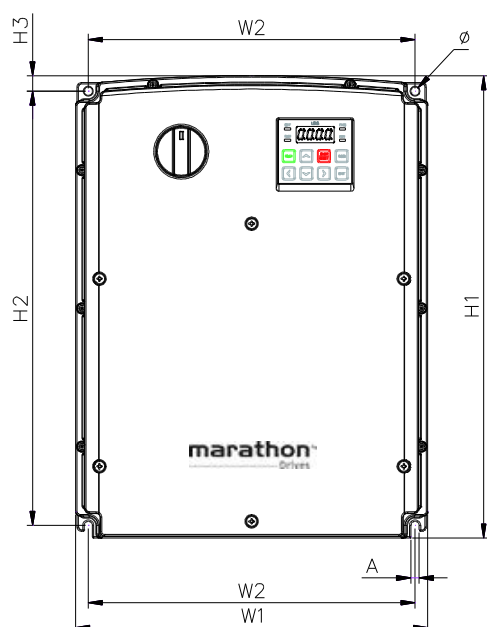


| Items               |                  | W1     | W2     | H1      | H2     | H3     | D1     | D2     | A      | Ø      | T1     | T2     |
|---------------------|------------------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|
|                     | 0G-2             |        |        |         |        |        |        |        |        |        |        |        |
|                     | 0015MD10<br>0G-2 |        |        |         |        |        |        |        |        |        |        |        |
|                     | 0022MD10<br>0G-2 | 220    | 204    | 258.8   | 241    | 11.8   | 201    | 215    | 5.5    | 5.5    | 22.3   | 28.6   |
|                     | 0037MD10<br>0G-2 | (8.66) | (8.03) | (10.19) | (9.49) | (0.46) | (7.91) | (8.46) | (0.22) | (0.22) | (0.88) | (1.13) |
|                     | 0040MD10<br>0G-2 |        |        |         |        |        |        |        |        |        |        |        |
| 3-<br>phase<br>400V | 0004MD10<br>0G-4 | 180    | 170    | 256.6   | 245    | 8.2    | 174.2  | 188.2  | 4.5    | 4.5    | 22.3   | -      |
|                     | 0008MD10<br>0G-4 | (7.09) | (6.69) | (10.10) | (9.65) | (0.32) | (6.86) | (7.41) | (0.18) | (0.18) | (0.88) |        |
|                     | 0015MD10<br>0G-4 |        |        |         |        |        |        |        |        |        |        |        |
|                     | 0022MD10<br>0G-4 | 220    | 204    | 258.8   | 241    | 11.8   | 201    | 215    | 5.5    | 5.5    | 22.3   | 28.6   |
|                     | 0037MD10<br>0G-4 | (8.66) | (8.03) | (10.19) | (9.49) | (0.46) | (7.91) | (8.46) | (0.22) | (0.22) | (0.88) | (1.13) |
|                     | 0040MD10<br>0G-4 |        |        |         |        |        |        |        |        |        |        |        |
|                     |                  |        |        |         |        |        |        |        |        |        |        |        |

Units: mm (inches)



## 5.5~7.5Kw (3-Phase)

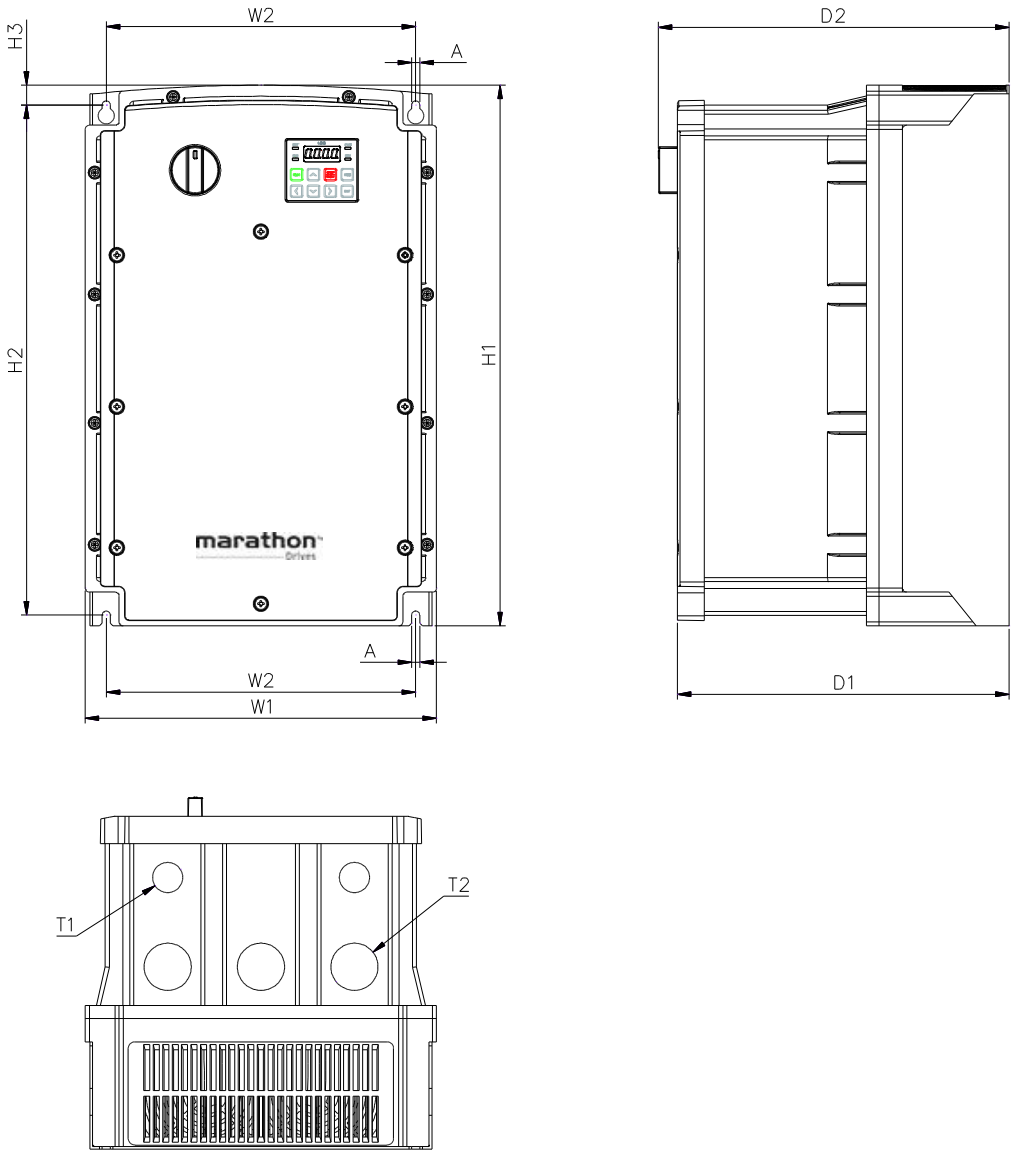


| Items           |                  | W1     | W2     | H1      | H2      | H3     | D1     | D2     | A      | Φ      | T1     | T2     |
|-----------------|------------------|--------|--------|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| 3-phase<br>200V | 0055MD10<br>0G-2 | 250    | 232    | 328     | 308     | 11     | 227.2  | 241.2  | 6      | 6      | 22.3   | 28.6   |
|                 | 0075MD10<br>0G-2 | (9.84) | (9.13) | (12.91) | (12.13) | (0.43) | (8.94) | (9.50) | (0.24) | (0.24) | (0.88) | (1.13) |
| 3-phase<br>400V | 0055MD10<br>0G-4 | 250    | 232    | 328     | 308     | 11     | 227.2  | 241.2  | 6      | 6      | 22.3   | 28.6   |
|                 | 0075MD10<br>0G-4 | (9.84) | (9.13) | (12.91) | (12.13) | (0.43) | (8.94) | (9.50) | (0.24) | (0.24) | (0.88) | (1.13) |



Units: mm (inches)

11.0~22.0kW (3 Phase)





| Items           |                  | W1             | W2               | H1               | H2               | H3             | D1              | D2               | A           | Φ | T1             | T2             |
|-----------------|------------------|----------------|------------------|------------------|------------------|----------------|-----------------|------------------|-------------|---|----------------|----------------|
| 3-phase<br>200V | 0110MD10<br>OG-2 | 260<br>(10.24) | 229<br>(9.02)    | 399.6<br>(15.73) | 377<br>(14.84)   | 14.6<br>(0.57) | 245.4<br>(9.66) | 259.6<br>(10.22) | 6<br>(0.24) | - | 22.3<br>(0.88) | 34.9<br>(1.37) |
|                 | 0150MD10<br>OG-2 | 300<br>(11.81) | 270.8<br>(10.66) | 460<br>(18.11)   | 436.5<br>(17.19) | 15.5<br>(0.61) | 250<br>(9.84)   | 264<br>(10.39)   | 6<br>(0.24) | - | 22.3<br>(0.88) | 44.5<br>(1.75) |
| 3-phase<br>400V | 0110MD10<br>OG-4 | 260<br>(10.24) | 229<br>(9.02)    | 399.6<br>(15.73) | 377<br>(14.84)   | 14.6<br>(0.57) | 245.4<br>(9.66) | 259.6<br>(10.22) | 6<br>(0.24) | - | 22.3<br>(0.88) | 34.9<br>(1.37) |
|                 | 0150MD10<br>OG-4 |                |                  |                  |                  |                |                 |                  |             |   |                |                |
|                 | 0185MD10<br>OG-4 | 300<br>(11.81) | 270.8<br>(10.66) | 460<br>(18.11)   | 436.5<br>(17.19) | 15.5<br>(0.61) | 250<br>(9.84)   | 264<br>(10.39)   | 6<br>(0.24) | - | 22.3<br>(0.88) | 44.5<br>(1.75) |
|                 | 0220MD10<br>OG-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) |                   |
| 3-phase<br>200V | 0.4  | ABS33c          | 5           | UTE100 | 15          | EBS33c          | 5           | MC-6a              | 9           |                   |
|                 | 0.75 |                 | 10          |        |             |                 | 10          | MC-9a,<br>MC-9b    | 11          |                   |
|                 | 1.5  |                 | 15          |        |             |                 | 15          | MC-18a,<br>MC-18b  | 18          |                   |
|                 | 2.2  |                 | 20          |        |             |                 | 20          | MC-22b             | 22          |                   |
|                 | 3.7  |                 | 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<br>400V | 0.4  | ABS33c          | 3           | UTE100 | 15          | EBS33c          | 5           | MC-6a              | 7           |                   |
|                 | 0.75 |                 | 5           |        |             |                 |             | MC-6a              |             |                   |
|                 | 1.5  |                 | 10          |        |             |                 | 10          | MC-9a,<br>MC-9b    | 9           |                   |
|                 | 2.2  |                 |             |        |             |                 |             | MC-12a,<br>MC-12b  |             | 12                |
|                 | 3.7  |                 |             |        |             |                 |             | 15                 | 15          | MC-18a,<br>MC-18b |
|                 | 4    |                 | 20          |        |             |                 |             | 20                 |             |                   |
|                 | 5.5  |                 | 30          |        |             |                 | 30          | 30                 | MC-22b      | 22                |
|                 | 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) |
| 3-phase<br>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         | 1.33            | 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<br>400V | 0.4  | 10            | 600         | 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            |             |                 |            |                 |             |
|                 | 4    | 32            |             | 1.22            | 15         | 5.4             | 13.2        |
|                 | 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          |
|                 | 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 fusibles et des disjoncteurs.



## 9.6 Terminal Screw Specification

### Input/Output Terminal Screw Specification

| Product (kW)    |      | Terminal Screw Size | Screw Torque (Kgf·cm/Nm) |
|-----------------|------|---------------------|--------------------------|
| 3-phase<br>200V | 0.4  | M3.5                | 2.1-6.1/0.2-0.6          |
|                 | 0.75 |                     |                          |
|                 | 1.5  |                     |                          |
|                 | 2.2  |                     |                          |
|                 | 3.7  | M4                  | 2.1-6.1/0.2-0.6          |
|                 | 4    |                     |                          |
|                 | 5.5  |                     |                          |
|                 | 7.5  |                     |                          |
|                 | 11   | M5                  | 4.0-10.2/0.4-1.0         |
|                 | 15   |                     |                          |
| 3-phase<br>400V | 0.4  | M3.5                | 2.1-6.1/0.2-0.6          |
|                 | 0.75 |                     |                          |
|                 | 1.5  |                     |                          |
|                 | 2.2  |                     |                          |
|                 | 3.7  | M4                  | 2.1-6.1/0.2-0.6          |
|                 | 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-P5/<br>CM/VR/V1/I2/AO/Q1/EG/24/<br>SA,SB,SC/S+,S-,SG | M2                  | 2.2-2.5/0.22-0.25        |
| A1/B1/C1  | M2.6                | 4.0/0.4                  |



### ⚠ Caution

Apply the rated torque when tightening terminal screws. Loose screws may cause short circuits and malfunctions. Overtightening terminal screws may damage the terminals and cause short circuits and malfunctions. Use copper conductors only, rated at 600V, 75°C for power terminal wiring, and rated at 300V, 75°C 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 °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.



## 9.7 Braking Resistor Specification

| Product (kW)    |      | Resistance ( $\Omega$ ) | Rated Capacity (W) |
|-----------------|------|-------------------------|--------------------|
| 3-phase<br>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<br>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              |

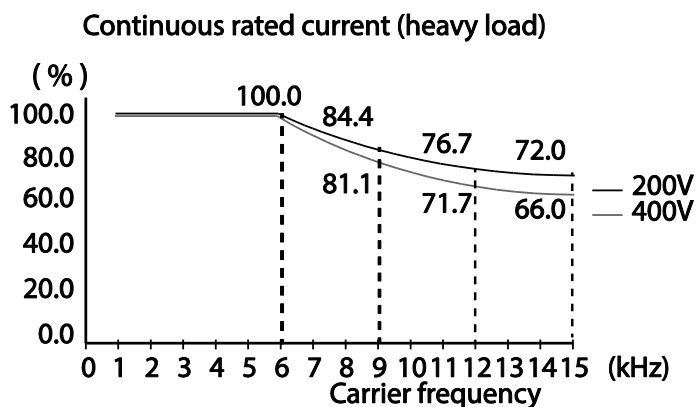
- The standard for braking torque is 150% and the working rate (%ED) is 5%. If the working rate is 10%, the rated capacity for braking resistance must be calculated at twice the standard.



## 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.

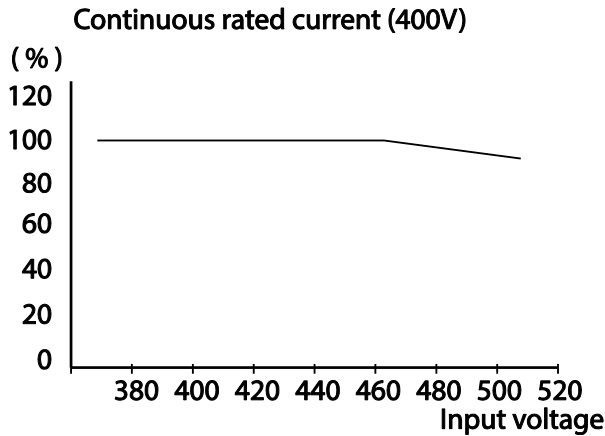
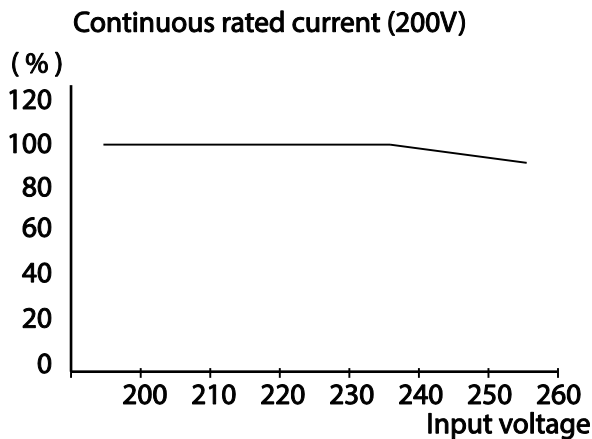


| 200V                    |                            | 400V                    |                            |
|-------------------------|----------------------------|-------------------------|----------------------------|
| Carrier Frequency (kHz) | Constant-rated Current (%) | Carrier Frequency (kHz) | 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                       |



Derating by Input Voltage

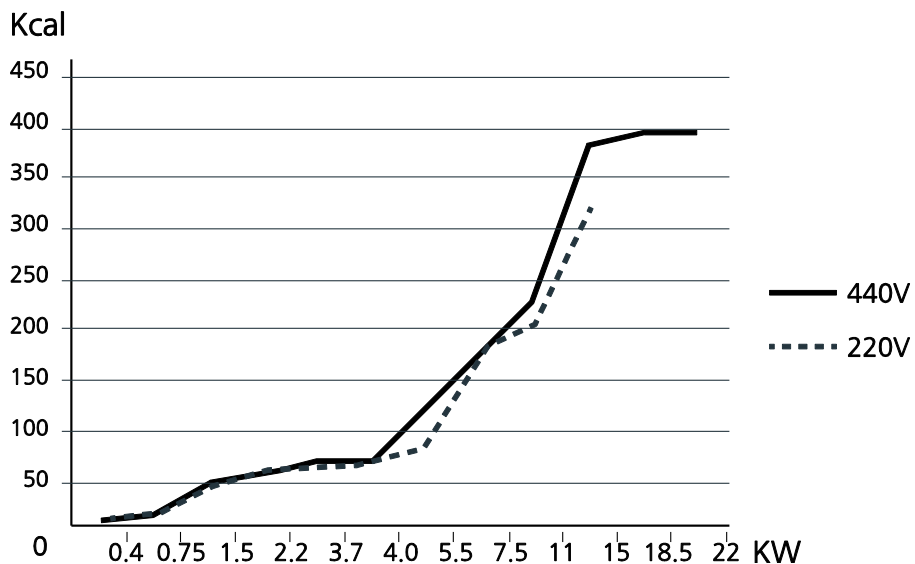
The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.





## 9.9 Heat Emission

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



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



# Product Warranty

## Warranty Information

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

|               |                      |                      |  |
|---------------|----------------------|----------------------|--|
| Product Name  | Marathon Drives      | Date of Installation |  |
| Model Name    | MD100G               | Warranty Period      |  |
| Customer Info | Name<br>(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 sale, subject to Regal Australia standard 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

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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: MDLV100G 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

최인식

(Signature / Date)

2012.01.23

Mr. In Sik Choi / General Manager

11 (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 Handling 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



### RFI FILTERS

THE LS RANGE OF POWER LINE FILTERS **FEB (Standard)** and **FE (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

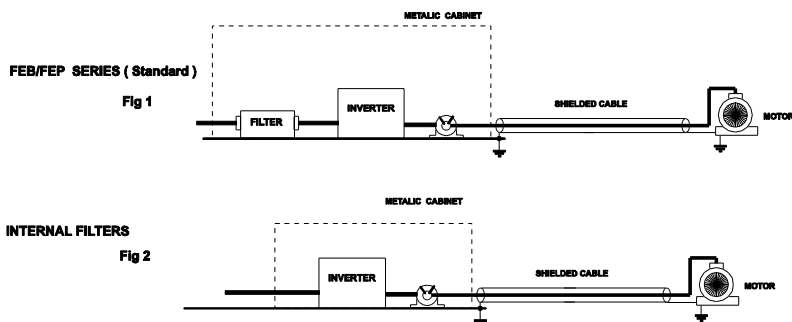
IN CASE OF A LEAKAGE CURRENT PROTECTIVE DEVICES IS USED ON POWER SUPPLY, IT MAY BE FAULT AT POWER-ON OR OFF. IN AVOID THIS CASE, THE SENSE CURRENT OF PROTECTIVE DEVICE SHOULD BE LARGER

### 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 enclosure, usually directly after the enclosures 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 enclosure body via and earthed cable gland.
- 7-) Connect any control cables as instructed in the inverter instructions manual.

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

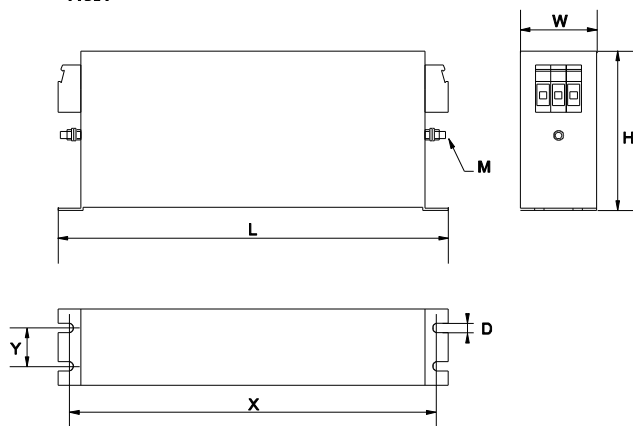


PR0064



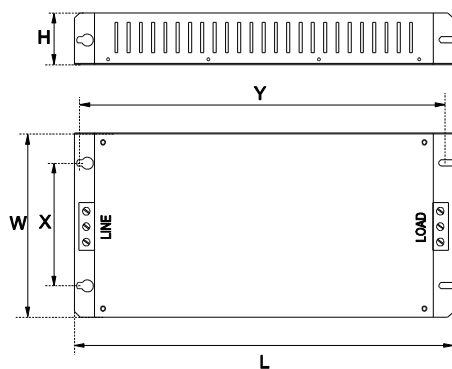
# **FEB SERIES ( Standard )**

**FIG. A**



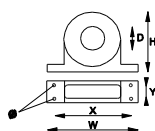
# **FF SERIES ( Footprint )**

**FIG. B**



**marathon™**  
Drives  
**VMC**  
vector motor control

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

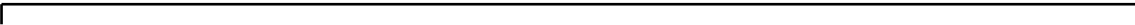


# **FS SERIES ( output chokes )**

| CODE   | D    | W   | H   | X        | g |
|--------|------|-----|-----|----------|---|
| FS - 1 | 21   | 85  | 50  | 22       | 4 |
| FS - 2 | 28.5 | 105 | 62  | 90       | 5 |
| FS - 3 | 48   | 150 | 110 | 125 x 30 | 6 |

PR0064











# Index

## 2

|                                      |                                     |
|--------------------------------------|-------------------------------------|
| 2 square reduction.....              | 58                                  |
| 24 terminal.....                     | 28, 30                              |
| 2nd Motor group.....                 | Refer to <i>M2(2nd Motor) group</i> |
| 2 <sup>nd</sup> Operation mode ..... | 100                                 |
| 2 <sup>nd</sup> command source ..... | 100                                 |
| Shared command (Main Source).....    | 100                                 |

## 3

|                               |     |
|-------------------------------|-----|
| 3-phase 200V (0.4~4k W).....  | 235 |
| 3-phase 200V (5.5~15 kW)..... | 236 |
| 3-phase 400V (0.4~4 kW).....  | 237 |
| 3-phase 400V (5.5~22 kW)..... | 238 |

## 4

|                             |          |
|-----------------------------|----------|
| 4-pole standard motor ..... | 237, 238 |
|-----------------------------|----------|

## 7

|                         |    |
|-------------------------|----|
| 7-segment display ..... | 38 |
| letters.....            | 38 |
| numbers .....           | 38 |

## A

|  |                                |
|--|--------------------------------|
| A terminal (Normally Open).....                | 101                            |
| A1/C1/B1 terminal .....                        | 28                             |
| AC power input terminal .....                  | Refer to <i>R/S/T terminal</i> |
| Acc/Dec pattern .....                          | 58, 85                         |
| linear pattern.....                            | 85                             |
| S-curve pattern.....                           | 85                             |
| Acc/Dec reference .....                        | 82                             |
| Delta Freq.....                                | 81                             |
| Max Freq.....                                  | 81                             |
| Acc/Dec reference frequency.....               | 80                             |
| Ramp T Mode.....                               | 80                             |
| Acc/Dec stop.....                              | 88                             |
| Acc/Dec time .....                             | 80                             |
| Acc/Dec time switch frequency.....             | 84                             |
| configuration via multi-function terminal..... | 82                             |
| maximum frequency.....                         | 80                             |
| operation frequency.....                       | 82                             |
| Ad (Expanded function group).....              | 155                            |

|  |                                       |
|--|---------------------------------------|
| Ad(Advanced) group.....                  | 40                                    |
| Advanced group.....                      | Refer to <i>Ad(Advanced) group</i>    |
| analog frequency hold .....              | 70                                    |
| Analog Hold.....                         | 70                                    |
| Analog Hold .....                        | Refer to <i>analog frequency hold</i> |
| analog input .....                       | 26, 40                                |
| I2 current input .....                   | 66                                    |
| I2 voltage input.....                    | 68                                    |
| TI Pulse input.....                      | 68                                    |
| V1 voltage input.....                    | 61                                    |
| analog input selection switch(SW2) ..... | 25, 68                                |
| analog output .....                      | 27, 40                                |
| AO terminal.....                         | 27                                    |
| analog output selection switch(SW3)..... | 25                                    |
| AO terminal .....                        | 27, 78                                |
| analog output selection switch(SW3)..... | 25                                    |
| AP(Application Function group) .....     | 179                                   |
| AP(Application group).....               | 40                                    |
| Application group .....                  | Refer to <i>AP(Application) group</i> |
| ASCII code.....                          | 125                                   |
| asynchronous communications system.....  | 113                                   |
| auto torque boost.....                   | 92                                    |
| auto tuning.....                         | 92                                    |
| Auto Tuning.....                         | 152                                   |

## B

|                                   |                                 |
|-----------------------------------|---------------------------------|
| B terminal (Normally Closed)..... | 101                             |
| bA(Basic function group) .....    | 150                             |
| bA(Basic group).....              | 40                              |
| basic configuration diagram ..... | 12                              |
| Basic group.....                  | Refer to <i>bA(Basic) group</i> |
| basic operation.....              | 37                              |
| bit 101                           |                                 |
| bit (Off).....                    | 102                             |
| bit (On).....                     | 102                             |
| bit setting.....                  | 102                             |
| multi-function input setting..... | 101                             |
| Bootlace Ferrule.....             | 28                              |
| brake resistor.....               | 23                              |
| braking resistance                |                                 |
| braking torque .....              | 251                             |
| braking resistors .....           | 12                              |
| broadcast .....                   | 122                             |
| built-in communication .....      | Refer to <i>RS-485</i>          |



|          |     |
|----------|-----|
| BX ..... | 219 |
|----------|-----|

## C

|   |                                   |
|---|-----------------------------------|
| cable .....                                       | 9, 19, 20, 21, 24                 |
| selection.....                                    | 9, 19, 20, 21, 24                 |
| shielded twisted pair .....                       | 33                                |
| signal(control) cable specifications.....         | 10                                |
| Cable   |                                   |
| Ground Specifications.....                        | 9                                 |
| Power I/O Cable Specifications .....              | 9                                 |
| cable tie .....                                   | 29                                |
| carrier frequency .....                           | 23                                |
| derating.....                                     | 252                               |
| charge indicator.....                             | 17, 217, 223                      |
| charge lamp .....                                 | 17                                |
| cleaning .....                                    | 229                               |
| CM terminal .....                                 | 26, 30                            |
| CM(communication function group) .....            | 174                               |
| CM(Communication group) .....                     | 40                                |
| Cn (Control Function group).....                  | 160                               |
| Cn(Control) group .....                           | 40                                |
| code number input.....                            | 42                                |
| command.....                                      | 73                                |
| configuration .....                               | 73                                |
| Command   |                                   |
| Cmd Source .....                                  | 73                                |
| command source                                    |                                   |
| keypad.....                                       | 73                                |
| Command source                                    |                                   |
| fwd/rev command terminal .....                    | 74                                |
| RS-485 .....                                      | 75                                |
| run command/rotational direction configuration .. | 75                                |
| common terminal.....                              | Refer to <i>EG terminal</i>       |
| communication .....                               | 113                               |
| command loss protective operation .....           | 117                               |
| communication address.....                        | 126                               |
| communication line connection.....                | 114                               |
| communication parameters.....                     | 114                               |
| communication speed .....                         | 115                               |
| communication standards .....                     | 113                               |
| memory map.....                                   | 119                               |
| PLC.....  | 113                               |
| protocol.....                                     | 121                               |
| saving parameters defined by communication....    | 118                               |
| setting virtual multi-function input.....         | 117                               |
| Communication group .....                         | <i>CM(Refer to Communication)</i> |
| group   |                                   |

|  |                                   |
|--|-----------------------------------|
| compatible common area parameter ..... | 130                               |
| Considerations for the installation    |                                   |
| Air Pressure.....                      | 5                                 |
| Altitude/Vibration.....                | 5                                 |
| Ambient Humidity.....                  | 5                                 |
| Environmental Factors.....             | 5                                 |
| Considerations for the installation    |                                   |
| Ambient Temperature.....               | 5                                 |
| Control group .....                    | Refer to <i>Cn(Control) group</i> |
| control terminal board wiring.....     | 24                                |

## D

|                              |                                 |
|------------------------------|---------------------------------|
| DC braking after start ..... | 94                              |
| DC braking after stop .....  | 95                              |
| DC braking frequency .....   | 95                              |
| digital source.....          | 77                              |
| disposal.....                | 229, 233                        |
| dr(Drive group) .....        | 40, 145                         |
| Drive group.....             | Refer to <i>dr(Drive) group</i> |

## E

|  |                             |
|--|-----------------------------|
| earth leakage breaker .....                      | 226                         |
| EG terminal .....                                | 28                          |
| error code .....                                 | 125                         |
| FE(frame error).....                             | 125                         |
| IA(illegal data address).....                    | 125                         |
| ID(illegal data value).....                      | 125                         |
| IF(illegal function).....                        | 125                         |
| WM(write mode error).....                        | 125                         |
| ESC key .....                                    | 39                          |
| [ESC] key setup.....                             | 76                          |
| cancel input .....                               | 39                          |
| Jog key.....                                     | 44                          |
| local/remote switching.....                      | 76                          |
| multi-function key.....                          | 76                          |
| remote / local operation switching.....          | 77                          |
| external 24V power terminal .....                | Refer to <i>24 terminal</i> |
| external dimensions                              |                             |
| 0.8~1.5kW(Single Phase), 1.5~2.2kW(3 Phase)..... | 244                         |
| External dimensions .....                        | 242                         |
| External dimensions                              |                             |
| 0.4kW(Single Phase), 0.4~0.8kW(3 Phase) .....    | 242                         |
| External Trip .....                              | 218                         |

## F

|                      |            |
|----------------------|------------|
| factory default..... | 50, 52, 53 |
|----------------------|------------|



|  |                             |
|--|-----------------------------|
| Fan Trip.....  | 219                         |
| Fan Warning .....  | 220                         |
| fatal.....   | 217                         |
| fault  |                             |
| fatal.....   | 217                         |
| latch.....   | 217                         |
| level.....   | 217                         |
| fault signal output terminal ... Refer to <i>A1/C1/B1 terminal</i> |                             |
| FE(FRAME ERROR) .....  | 125                         |
| ferrite .....  | 29                          |
| fieldbus.....  | 60, 73                      |
| communication option.....  | 100                         |
| Fieldbus.....  | Refer to <i>fieldbus</i>    |
| filter time constant .....   | 61                          |
| filter time constant number .....                                  | 101                         |
| free run stop.....   | 96                          |
| frequency jump .....   | 99                          |
| frequency limit.....   | 97                          |
| frequency jump.....  | 99                          |
| frequency upper and lower limit value .....                        | 98                          |
| maximum/start frequency .....                                      | 98                          |
| frequency reference .....  | 60, 93                      |
| frequency setting.....   | 60                          |
| I2 current input .....   | 66                          |
| I2 voltage input.....  | 68                          |
| keypad.....  | 60                          |
| RS-485 .....   | 70                          |
| TI Pulse input.....  | 68                          |
| V1 voltage input.....  | 61                          |
| variable resistor .....  | 51                          |
| frequency setting (Pulse train) terminal .....                     | Refer to <i>TI terminal</i> |
| frequency setting(voltage) terminal...Refer to <i>V1 terminal</i>  |                             |
| fuse .....   | 248                         |

## G

|                                   |     |
|-----------------------------------|-----|
| ground .....                      | 20  |
| class 3 ground.....               | 20  |
| class 3 ground.....               | 20  |
| ground terminal.....              | 20  |
| Ground                            |     |
| Ground Cable Specifications ..... | 9   |
| Ground Trip.....                  | 218 |
| ground fault trip.....            | 218 |

## H

|                         |     |
|-------------------------|-----|
| half duplex system..... | 113 |
|-------------------------|-----|

|                 |   |
|-----------------|---|
| Heavy Duty..... | 5 |
|-----------------|---|

## I

|   |  |
|---|--|
| I2 27, 66   |  |
| analog input selection switch(SW2).....           | 27                                       |
| frequency setting(current/voltage) terminal ..... | 27                                       |
| IA(illegal data address).....                     | 125                                      |
| ID(illegal data value) .....                      | 125                                      |
| IF(illegal function) .....                        | 125                                      |
| In Phase Open .....                               | 218                                      |
| In(Input Terminal Block Function group).....      | 165                                      |
| In(Input Terminal) group.....                     | 40                                       |
| input terminal.....                               | 26                                       |
| CM terminal .....                                 | 26                                       |
| I2 terminal.....                                  | 27                                       |
| P1 -P7 terminal.....                              | 26                                       |
| SA terminal.....                                  | 27                                       |
| SB terminal.....                                  | 27                                       |
| SC terminal.....                                  | 27                                       |
| TI terminal.....                                  | 27                                       |
| V1 terminal.....                                  | 26                                       |
| VR terminal.....                                  | 26                                       |
| Input Terminal group .....                        | Refer to <i>In(input terminal) group</i> |
| inspection  |  |
| annual inspection.....                            | 230                                      |
| bi-annual inspection).....                        | 232                                      |
| installation .....                                | 11                                       |
| basic configuration diagram .....                 | 12                                       |
| Installation flowchart.....                       | 11                                       |
| wiring.....                                       | 17                                       |
| Installation                                      |  |
| Mounting the Inverter .....                       | 13                                       |
| installation considerations .....                 | 5, 229, 232                              |

## J

|                              |    |
|------------------------------|----|
| Jog Operation                |    |
| [ESC] key configuration..... | 44 |
| jump frequency .....         | 99 |

## K

|                          |    |
|--------------------------|----|
| keypad .....             | 37 |
| display .....            | 37 |
| operation keys.....      | 37 |
| keypad display .....     | 38 |
| keypad key .....         | 39 |
| [▲]/[▼]/[←]/[→] key..... | 39 |



|                        |    |
|------------------------|----|
| [ESC] key .....        | 39 |
| [RUN] key.....         | 39 |
| [STOP/RESET] key ..... | 39 |

## L

|                                      |            |
|--------------------------------------|------------|
| latch .....                          | 217        |
| LCD keypad .....                     | 19         |
| wiring length.....                   | 29         |
| leakage breaker .....                | 247        |
| level .....                          | 217        |
| lift-type load .....                 | 85, 91, 92 |
| linear pattern.....                  | 85         |
| linear V/F pattern operation.....    | 88         |
| linear V/F pattern Operation         |            |
| base frequency .....                 | 89         |
| start frequency.....                 | 89         |
| local operation                      |            |
| [ESC] key .....                      | 76         |
| Local/Remote Mode Switching.....     | 76         |
| remote peration .....                | 77         |
| local Operation.....                 | 77         |
| locating the installation site ..... | 6          |
| location.....                        | 6          |
| loop.....                            | 104        |
| loop time .....                      | 108        |
| Lost Command .....                   | 219, 220   |
| Low Voltage .....                    | 218        |
| LS INV 485 protocol .....            | 121        |

## M

|  |     |
|--|-----|
| M2(2nd Motor Function group) .....         | 187 |
| M2(2nd Motor) group.....                   | 40  |
| magnetic contactor .....                   | 24  |
| Magnetic contactor .....                   | 247 |
| maintenance .....                          | 229 |
| manual torque boost .....                  | 91  |
| Master .....                               | 113 |
| master inverter.....                       | 103 |
| master unit .....                          | 102 |
| megger test .....                          | 230 |
| micro surge filter.....                    | 23  |
| monitor.....                               | 54  |
| monitor registration protocol details..... | 123 |
| motor output voltage adjustment .....      | 92  |
| motor rotational direction .....           | 34  |
| mounting bolt .....                        | 13  |
| mounting bracket .....                     | 15  |

|  |        |
|--|--------|
| multi function  input terminal                               |        |
| In.65~71 .....   | 167    |
| Px terminal function setting .....                           | 167    |
| multi function input terminal                                |        |
| Px Define .....  | 167    |
| multi keypad   |        |
| Multi KPD.....   | 104    |
| multi keypad(Multi-keypad)                                   |        |
| slave parameter .....  | 104    |
| multi-drop Link System .....                                 | 113    |
| Multi-function (open collector) output terminal              |        |
| Multi-function output item1(Q1 Define).....                  | 171    |
| Multi-function relay 1 item(Relay 1) .....                   | 171    |
| multi-function input terminal.....                           | 26     |
| factory default .....  | 26     |
| multi-function input terminal Off filter .....               | 101    |
| multi-function input terminal On filter .....                | 101    |
| P1 - P7 .....  | Refer  |
| multi-function input terminal control .....                  | 101    |
| multi-function key.....                                      | 38, 44 |
| [ESC] key .....  | 44     |
| Multi Key Sel .....  | 214    |
| multi-function key options.....                              | 214    |
| multi-function(open collector) output terminal .... Refer to |        |
| <i>Q1 terminal</i>   |        |
| multi-keypad.....  | 103    |
| master parameter.....  | 104    |
| multi-keypad)  |        |
| setting.....   | 103    |
| multi-step frequency .....                                   | 71     |
| setting .....  | 71     |
| Speed-L/Speed-M/Speed-H .....                                | 72     |

## N

|                                       |     |
|---------------------------------------|-----|
| N- terminal(- DC link terminal) ..... | 23  |
| No Motor Trip .....                   | 218 |
| noise .....                           | 63  |
| NPN mode(Sink) .....                  | 30  |

## O

|   |                                   |
|---|-----------------------------------|
| oOut Phase Open .....                         | 218                               |
| Operation frequency .....                     | <i>Refer to frequency setting</i> |
| operation group .....                         | 143                               |
| Operation group .....                         | 40                                |
| operation noise                               |                                   |
| frequency jump .....                          | 99                                |
| OU(Output Terminal Block Function group)..... | 170                               |



|                                     |   |
|-------------------------------------|---|
| OU(Output Terminal) group .....     | 40  |
| output terminal .....               | Refer to <i>R/S/T terminal</i>            |
| Output Terminal group .....         | Refer to <i>OU(output terminal) group</i> |
| output/communication terminal ..... | 27  |
| 24 terminal .....                   | 28  |
| A1/C1/B1 terminal .....             | 28  |
| AO terminal .....                   | 27  |
| EG terminal .....                   | 28  |
| Q1 terminal .....                   | 28  |
| S+/S-/SG terminal .....             | 28  |
| TO terminal .....                   | 28  |
| Over Current1 .....                 | 217                                       |
| Over Current2 .....                 | 218                                       |
| Over Heat .....                     | 218                                       |
| Over Load .....                     | 217                                       |
| overload warning .....              | 220                                       |
| Over Voltage .....                  | 218                                       |

## P

|  |          |
|--|----------|
| P1+ terminals(+ DC link terminals) ..... | 23       |
| P2P .....                                | 102      |
| communication function .....             | 102      |
| master parameter .....                   | 102      |
| setting .....                            | 102, 103 |
| slave parameter .....                    | 103      |
| parameter .....                          | 43       |
| parameter setting .....                  | 43       |
| part names .....                         | 3        |
| parts illustrated .....                  | 3        |
| password .....                           | 141      |
| Peripheral devices .....                 | 247      |
| phase-to-phase voltage .....             | 224      |
| PID control .....                        |          |
| PID feedback .....                       | 219      |
| PNP mode(Source) .....                   | 30       |
| PNP/NPN mode selection switch(SW1) ..... | 25       |
| NPN mode(Sink) .....                     | 30       |
| PNP mode(Source) .....                   | 30       |
| post-installation checklist .....        | 32       |
| power terminal .....                     | 23       |
| N- terminal .....                        | 23       |
| P2+/B terminal .....                     | 23       |
| U/V/W terminal .....                     | 23       |
| power terminal board wiring .....        | 21       |
| power terminals .....                    |          |
| R/S/T terminals .....                    | 23       |

|                                     |   |
|-------------------------------------|---|
| Power-on Run .....                  | Refer to <i>start at power-on</i>             |
| Pr(Protection Function group) ..... | 182   |
| Pr(Protection) group .....          | 40  |
| Preinsulated Crimp Terminal .....   | 28  |
| Protection group .....              | Refer to <i>Pr(Protection) group protocol</i> |
| LS INV 485 protocol .....           | 121   |
| Pulse output terminal .....         | Refer to <i>TO terminal</i>                   |

## Q

|                   |                            |
|-------------------|----------------------------|
| Q1 terminal ..... | 28                         |
| quantizing .....  | Refer to <i>Quantizing</i> |
| Quantizing .....  | 63                         |
| noise .....       | 63                         |

## R

|   |   |
|---|---|
| R/S/T terminal .....                    | 24                                      |
| R/S/T terminals .....                   | 23, 223                                 |
| rated .....                             | 235                                     |
| braking resistance rated capacity ..... | 251                                     |
| rated input .....                       | 235                                     |
| Rated .....                             |   |
| rated output .....                      | 235                                     |
| reactor .....                           | 12, 248                                 |
| regenerated energy .....                | 97                                      |
| remote operation .....                  | 77                                      |
| [ESC] key .....                         | 76                                      |
| local operation .....                   | 77                                      |
| Local/Remote Mode Switching .....       | 76                                      |
| Reset Restart .....                     | refer to <i>restarting after a trip</i> |
| resonance frequency .....               | 99                                      |
| frequency jump .....                    | 99                                      |
| restarting after a trip .....           | 79                                      |
| RS-232 .....                            | 113                                     |
| communication .....                     | 113                                     |
| RS-485 .....                            | 113                                     |
| communication .....                     | 113                                     |
| converter .....                         | 113                                     |
| integrated communication .....          | 70                                      |
| signal terminal .....                   | 28, 70                                  |
| RS-485 signal input terminal .....      | Refer to <i>S+/S-/SG terminal</i>       |
| run prevention .....                    |   |
| Fwd .....                               | 78                                      |
| Rev .....                               | 78                                      |



## S

|  |   |
|--|---|
| S+/S-/SG terminal .....                        | 28  |
| MD100G expansion common area parameter         |   |
| control area parameter(Read/Write).....        | 138   |
| memory control area parameter(Read/Write)..... | 140   |
| monitor area parameter (read only).....        | 133   |
| SA terminal.....                               | 27  |
| safety information.....                        | ii  |
| safety input power terminal .....              | Refer to <i>SC terminal</i>                         |
| safety inputA terminal .....                   | Refer to <i>SA terminal</i>                         |
| Safety inputB terminal .....                   | Refer to <i>SB terminal</i>                         |
| SB terminal.....                               | 27  |
| SC terminal.....                               | 27  |
| screw specification                            |   |
| control circuit terminal screw.....            | 249   |
| input/output terminal screw.....               | 249   |
| screw size .....                               | 249   |
| screw torque.....                              | 249   |
| S-curve pattern.....                           | 85  |
| actual Acc/Dec time.....                       | 87  |
| sequence common terminal.....                  | Refer to <i>CM terminal</i>                         |
| serge killer .....                             | 32  |
| setting virtual multi-function input .....     | 117   |
| Slave.....                                     | 113   |
| slave inverter .....                           | 103   |
| slave unit.....                                | 102   |
| speed unit selection (Hz or Rpm) .....         | 71  |
| Square reduction                               |   |
| Square reduction load .....                    | 89  |
| V/F pattern Operation.....                     | 89  |
| start at power-on .....                        | 78  |
| start mode .....                               | 93  |
| acceleration start.....                        | 93  |
| start after DC braking .....                   | 94  |
| Station .....                                  | 104   |
| Station ID.....                                | 126   |
| stop mode .....                                | 94  |
| DC braking after stop .....                    | 95  |
| deceleration stop.....                         | 94  |
| free run stop.....                             | 96  |
| power braking.....                             | 97  |
| storage .....                                  | 232   |
| Storing Temperature.....                       | 5   |
| surge killer .....                             | 24  |
| SW1 .....                                      | Refer to <i>PNP/NPN mode selection switch(SW1)</i>  |
| SW2 .....                                      | Refer to <i>analog input selection switch(SW2)</i>  |
| SW3 .....                                      | Refer to <i>analog output selection switch(SW3)</i> |

|   |    |
|---|----|
| switch .....                              | 25 |
| analog input selection switch(SW2).....   | 25 |
| analog output selection switch(SW3) ..... | 25 |
| PNP/NPN mode selection switch(SW1) .....  | 25 |

## T

|   |                             |
|---|-----------------------------|
| target frequency                              |                             |
| Cmd Frequency .....                           | 145                         |
| technical specification .....                 | 235                         |
| terminal .....                                | 101                         |
| A terminal.....                               | 101                         |
| B terminal.....                               | 101                         |
| terminal for frequency reference setting..... | Refer to <i>VR terminal</i> |
| test run .....                                | 33                          |
| TI terminal .....                             | 27, 68                      |
| time scale                                    |                             |
| 0.01sec .....                                 | 81                          |
| 0.1sec.....                                   | 81                          |
| 1sec.....                                     | 81                          |
| time scale setting .....                      | 80                          |
| TO terminal.....                              | 28                          |
| torque.....                                   | 23                          |
| torque boost .....                            | 91                          |
| auto torque boost .....                       | 92                          |
| manual torque boost.....                      | 91                          |
| overexcitation.....                           | 92                          |
| trip .....                                    | 217                         |
| trip condition monitor.....                   | 55                          |
| Trip  |                             |
| troubleshooting .....                         | 221                         |
| troubleshooting.....                          | 217                         |
| other faults .....                            | 223                         |
| troubleshooting fault trips .....             | 221                         |

## U

|                                       |        |
|---------------------------------------|--------|
| U&M mode .....                        | 120    |
| U/V/W terminal .....                  | 23, 24 |
| U/V/W terminals.....                  | 223    |
| UF192                                 |        |
| UF(User Sequence Function) group..... | 40     |
| Under Load                            |        |
| underload trip.....                   | 217    |
| underload warning.....                | 220    |
| update .....                          | 123    |
| US189                                 |        |
| US(User Sequence) group .....         | 40     |



|   |  |
|---|--|
| user sequence .....                                   | 104  |
| function block parameter .....                        | 108  |
| setting .....   | 104  |
| UF group .....  | 105  |
| US group .....  | 105  |
| user function operation condition .....               | 108  |
| void parameter .....                                  | 104, 108   |
| User Sequence Function group .....                    | Refer to <i>UF(User Sequence Function) group</i> |
| User Sequence group ..                                | Refer to <i>US(user sequence) group</i>          |
| user V/F pattern Operation .....                      | 90   |
| user/macro group .....                                | 120  |
| parameter group .....                                 | 120  |
| U&M mode .....  | 120  |
| using the keypad .....                                | 41   |
| groups/codes .....                                    | 41   |
| Jog Operation key .....                               | 44   |
| moving directly to a code .....                       | 42   |
| using the using the keypad<br>parameter setting ..... | 43   |

## V

|  |    |
|--|----|
| V/F control .....                            | 88 |
| linear V/F pattern operation .....           | 88 |
| Square reduction V/F pattern Operation ..... | 89 |
| user V/F pattern Operation .....             | 90 |

|  |                             |
|--|-----------------------------|
| V1 terminal .....                        | 26, 61                      |
| V2                                       |                             |
| analog input selection switch(SW2) ..... | 27                          |
| V2 input .....                           | 68                          |
| I2 voltage input .....                   | 68                          |
| variable resistor .....                  | 51                          |
| variable torque load .....               | 89                          |
| voltage drop .....                       | 23                          |
| voltage/current output terminal .....    | Refer to <i>AO terminal</i> |
| VR terminal .....                        | 26, 61                      |

## W

|                                     |        |
|-------------------------------------|--------|
| warning .....                       | 217    |
| wiring .....                        | 17     |
| 3 core cable .....                  | 23     |
| circuit breaker .....               | 247    |
| control terminal board wiring ..... | 24     |
| copper cable .....                  | 17     |
| cover disassembly .....             | 18     |
| ferrite .....                       | 29     |
| ground .....                        | 20     |
| power terminal board wiring .....   | 21     |
| signal wiring .....                 | 28     |
| torque .....                        | 17     |
| wiring length .....                 | 23, 29 |
| WM(write mode error) .....          | 125    |



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