Multi-function Compact Inverter

M1 Series Standard Type

User's Manual

3G3M1-A□□□□

I669-E1-02

Introduction

Thank you for purchasing the Multi-function Compact Inverter 3G3M1 Series.
This User's Manual describes the installation/wiring of the 3G3M1 Series Inverter,and parameter setting method which is required for the operation, as well as troubleshooting and inspection methods.

Intended Readers

This manual is intended for the following personnel.

Those who have knowledge of electrical systems (an electrical engineer or the equivalent) and also are qualified for one of the following:

- Personnel in charge of introducing the control equipment
- Personnel in charge of designing the control systems
- Personnel in charge of installing and maintaining the control equipment
- Personnel in charge of managing the control systems and facilities

Notice

This manual contains information you need to know to correctly use the Multi-function Compact Inverter 3G3M1 Series.
Before using the inverter, read this manual and gain a full understanding of the information provided herein.
After you finished reading this manual, keep it in a convenient place so that it can be referenced at any time.
Make sure this manual is delivered to the end user.

Manual Configuration

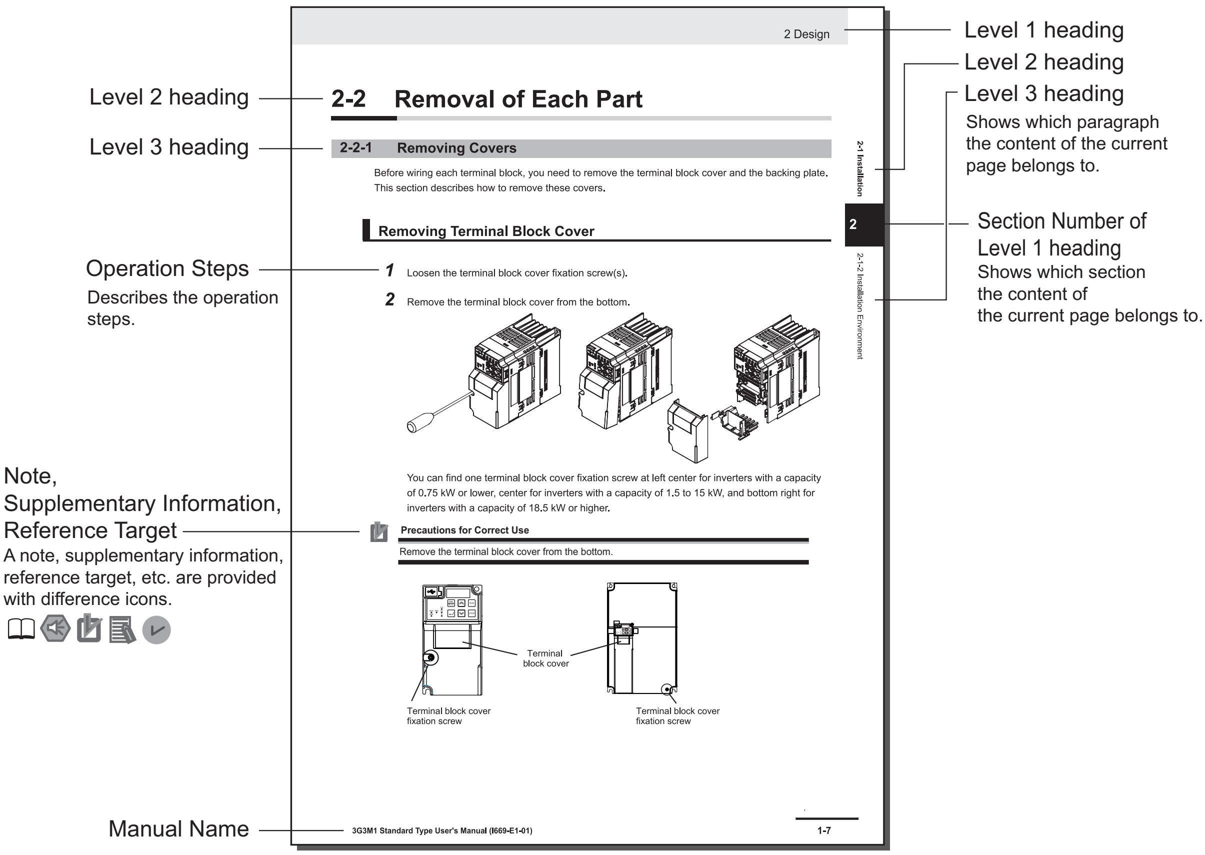
This manual is compiled section by section for user's convenience as follows.

Section		Overview
Section 1	Overview	This section provides an overview of the 3G3M1 Series features, standard specifications, and external dimensions by inverter capacity. It also shows the differences of this inverter from conventional inverters for those who use previous models.
Section 2	Design	This section describes the installation environment and wiring methods.
Section 3	Operation and Test Run	This section describes the part names and key operations of the Operator, and the operation method of this product as well as the test run procedure.
Section 4	Parameter List	This section provides the parameter lists that show monitor functions and available parameters for this inverter.
Section 5	Basic Settings	This section describes the basic functions such as the Run command.
Section 6	Vector Control and Applied Functions	This section describes the vector control and applied functions characteristic of this inverter.
Section 7	Other Functions	This section describes the details of functions not described in Section 5 or Section 6.
Section 8	Communications Function	This section describes the general-purpose serial communications functions (Modbus communication).
Section 9	Troubleshooting	This section describes how to analyze the cause and take countermeasures if the inverter fails, and provides troubleshooting for possible troubles.
Section 10	Maintenance and Inspection	This section describes the maintenance and periodical inspection items.
Appendix		This section provides information on derating, capacitor life curve, compliance with the UL/cUL Standards, and inverter selection.

Manual Structure

Page Structure and Symbol Icons

The following page structure and symbol icons are used in this manual.



Note: The above page is only a sample for illustrative purposes. It is not the actual content of the manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.
This information is provided to increase understanding or make operation easier.

References are provided to more detailed or related information.

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Terms and Conditions Agreement

Warranty, Limitations of Liability

Warranties

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Suitability of Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Disclaimers

Performance Data

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

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OMRON SHALL NOT BE RESPONSIBLE AND/OR LIABLE FOR ANY LOSS, DAMAGE, OR EXPENSES DIRECTLY OR INDIRECTLY RESULTING FROM THE INFECTION OF OMRON PRODUCTS, ANY SOFTWARE INSTALLED THEREON OR ANY COMPUTER EQUIPMENT, COMPUTER PROGRAMS, NETWORKS, DATABASES OR OTHER PROPRIETARY MATERIAL CONNECTED THERETO BY DISTRIBUTED DENIAL OF SERVICE ATTACK, COMPUTER VIRUSES, OTHER TECHNOLOGICALLY HARMFUL MATERIAL AND/OR UNAUTHORIZED ACCESS.

It shall be the users sole responsibility to determine and use adequate measures and checkpoints to satisfy the users particular requirements for (i) antivirus protection, (ii) data input and output, (iii) maintaining a means for reconstruction of lost data, (iv) preventing Omron Products and/or software installed thereon from being infected with computer viruses and (v) protecting Omron Products from unauthorized access.

Safety Precautions

To ensure that the Multi-function Compact Inverter 3G3M1 Series is used safely and correctly, be sure to read this Safety Precautions section and the main text before using the product.
Learn all items you should know before use, regarding the equipment as well as required safety information and precautions.
Make an arrangement so that this manual also gets to the end user of this product.
After reading this manual, keep it in a convenient place so that it can be referenced at any time.

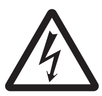
Indications and Meanings of Safety Information

In this user’s manual, the following precautions and signal words are used to provide information to ensure the safe use of the Multi-function Compact Inverter 3G3M1 Series.
The information provided here is vital to safety. Strictly observe the precautions provided.
The following notation is used.

Meanings of Signal Words

⚠ WARNING	Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Explanation of Symbols

	⊘ This symbol indicates a prohibited item (an item you must not do). The specific instruction is indicated using an illustration or text inside or near ⊘. The symbol shown to the left indicates “non-specific general prohibitions.”
	⊘ This symbol indicates a prohibited item (an item you must not do). The specific instruction is indicated using an illustration or text inside or near ⊘. The symbol shown to the left indicates “disassembly prohibited.”
	△This symbol indicates caution and warning. The specific instruction is indicated using an illustration or text inside or near △. The symbol shown to the left indicates "Caution against electric shock."
	△This symbol indicates caution and warning. The specific instruction is indicated using an illustration or text inside or near △. The symbol shown to the left indicates “Caution against fire.”

⚠	△This symbol indicates caution and warning. The specific instruction is indicated using an illustration or text inside or near △. The symbol shown to the left indicates "general caution."
⚠	△This symbol indicates caution and warning. The specific instruction is indicated inside △ as well as by using text. The symbol shown to the left indicates "risk of hot surface."
●	● This symbol indicates a compulsory item (an item that must be done). The specific instruction is indicated using an illustration or text inside or near ●. The symbol shown to the left indicates a "general compulsory item."
●	● This symbol indicates a compulsory item (an item that must be done). The specific instruction is indicated inside ● as well as by using text. The symbol shown to the left indicates "grounding required."

⚠ WARNING

Be sure to ground the ground terminal of the inverter. (200-V class: type-D grounding, 400-V class: type-C grounding) Not doing so may result in a serious injury due to an electric shock or fire.	
Do not remove the surface cover during inverter power supply and for 10 minutes after power shut off. Doing so may result in a serious injury due to an electric shock. Switch various switches, change wiring and perform inspections at least 10 minutes after the power supply has been shut off; after confirming that the Operator is OFF and that a tester or similar tool has been used to confirm that the voltage between the main circuit terminals P(+) and N(-) has dropped to a safe voltage (25 VDC or less).	
There is a risk of severe injury due to electric shock. Wiring work must be carried out only by qualified personnel. Do not touch cables when the power supply is turned ON. Additionally, only designated personnel should perform maintenance or inspections, or replace parts.	
There is a risk of severe injury due to electric shock. After confirming that the power supply is OFF, wait at least 10 minutes and then perform wiring.	
Do not operate the Operator or switches with wet hands. Also, remove metal objects (watches, rings, etc.) before starting work, and use insulating tools when using tools. Not doing so may result in a serious injury due to an electric shock.	
Do not touch the cooling fins, braking resistors and the motor, which become too hot during the power supply and for some time after the power shut off. Doing so may result in a burn.	
Inspection of the inverter must be conducted after the power supply was turned off. Not doing so may result in a serious injury due to an electric shock. The main power supply is not necessarily shut off even if the safety stop function is activated.	
There is a risk of severe injury. Do not enter the operating area during operation.	
There is a risk of severe injury due to electric shock. Do not perform maintenance while the power supply is ON.	

Although this product is manufactured under strict quality control, install equipment to ensure safety when used with applications in which serious accidents or property damage can be anticipated in the event of its failure.
Not doing so may result in accidents.

The Multi-function Compact Inverter (3G3M1 Series) is designed to drive a three-phase induction motor and synchronous motor. Do not use it for single-phase motors or for other purposes.
Doing so may result in fire or accident.

Install the inverter on a non-flammable material such as metallic wall. Also, do not place flammable object nearby.
Doing so may result in fire.

Be sure to perform wiring after installing the inverter unit. Also, tighten terminals with specified torque.
Not doing so may result in injury, electric shock or fire.

Ensure that the specifications of the input power of the product match the power supply to which the product is to be connected.
Not doing so may result in fire or accidents.

Be sure to use the wire of specified size.
Not doing so may result in fire.

When wiring each inverter to the power supply, install a molded-case circuit breaker or earth leakage circuit breaker (with overcurrent protection function). Use recommended molded-case circuit breakers or earth leakage circuit breakers that do not exceed the recommended current capacity.
Not doing so may result in fire.

If no suitable equipment to detect leakage is installed in the upstream power supply line, in order to avoid the entire power supply system's shutdown due to operation of devices such as earth leakage circuit breaker as this is undesirable to operation, install an earth leakage circuit breaker individually to inverters to break the individual inverter power supply lines only.
Not doing so may result in fire.

When the capacity of the power transformer is 500 kVA or more and 10 times or more than the rated capacity of the inverter, ensure that a DC reactor is connected.
Not doing so may result in fire.

Never connect the power lines to the inverter output terminals U, V, or W.
Doing so may result in fire.

When connecting a braking resistor, do not connect it to any terminal other than terminals P(+) and DB.
Doing so may result in fire or accident.

Do not bundle multiple cables as one cable.
Doing so may result in fire.

Do not connect a surge suppressor to the output lines of the inverter.
Doing so may result in fire.

In general, sheaths of the control signal wires do not use reinforced insulation, therefore if a control signal wire comes into direct contact with a live part of the main circuit, the insulation of the sheath might break down. In these cases, there is a danger of the control signal wire being exposed to high voltage from the main circuit, therefore ensure that the control signal wires will not come into contact with live parts of the main circuit.
Not doing so may result in electric shock or accidents.

Even if the inverter has interrupted power to the motor, if the voltage is applied to the main circuit input terminals L1/R, L2/S and L3/T, voltage may be output to inverter output terminals U, V and W.
This may result in a serious injury due to an electric shock.

Even if the motor is stopped due to DC braking or pre-excitation, voltage is output to inverter output terminals U, V and W.
This may result in a serious injury due to an electric shock.

Starting auto-tuning involves motor rotation. Sufficiently check that motor rotation carries with it no danger beforehand.
Not doing so may result in injury or accidents.

The inverter may operate with acceleration/deceleration time or speed different from as set due to stall prevention function. Design the machine so that safety is ensured even in such cases.
Not doing so may result in accidents.

The inverter can easily have high-speed operation set. When changing the speed setting, carefully check the specifications of motors or machine beforehand.
Additionally, set the parameters only after fully understanding the User's Manual. If the user recklessly changes the parameters and then operates the inverter, the motor may rotate at a torque or speed not permitted for the machine.
This may result in injury.

If you enable the "Restart mode after momentary power failure" (F014 = 3 or 4), then the inverter automatically restarts running the motor when the power is recovered. Design the machine so that safety is ensured even after such restarts.
Not doing so may result in injury or accidents.

The STOP key on the Operator may be disabled due to parameter setting, etc. Provide an emergency stop switch separately.
Not doing so may result in accidents.

If the motor stops as a result of a trip, the inverter may automatically restart and drive the motor depending on the parameter setting. Design the machine so that human safety and the safety of surroundings is ensured at the time of restarting.
Not doing so may result in accidents.

Remove any cause of the protective functions operating, then check the RUN command is OFF and cancel the alarm. Canceling the alarm when the RUN command is ON means that the inverter will supply power to the motor, which may start rotation thus posing a danger.
This may result in accidents.

When switching start methods or speed by external input, the motor may start suddenly or the speed may abruptly change.
This may result in injury or accidents.

Input terminals have functions such as run, stop and speed change. If the parameters are changed while signals are input to the input terminals, the motor operation may suddenly change. Ensure that you change parameters only after fully securing safety.
Not doing so may result in injury or accidents.

The branch circuit protection being open may indicate an interruption in the fault current.
In order to reduce the danger of fire and electric shock, inspect energized parts and other controller components, and replace if damaged.
In the event of the overload relay current element burning out, the entire overload relay must be replaced.
Not doing so may result in a serious injury due to an electric shock or fire.

Output terminals (ROA, ROB) use relays, and may remain ON, OFF or undetermined when their lifetime is reached. For safety, equip the inverter with an external protective function.
Not doing so may result in fire or accidents.

Do not dismantle, repair or modify the product.
Doing so may result in injury or electric shock.

Always carry out the daily and periodic inspections described in the User's Manual. Use of the inverter for long periods of time without carrying out regular inspections could result in malfunction or damage of the inverter, and an accident or fire could occur.
This may result in fire or accident.

It is recommended that parts for periodic replacement be replaced in accordance with the standard replacement frequency indicated in the User's manual. Use of the inverter for long periods of time without replacement could result in malfunction or damage of the inverter, and an accident or fire could occur.
This may result in fire or accident.

It is recommended that periodic inspections be carried out every one to two years, however, they should be carried out more frequently depending on the usage conditions.
Not doing so may result in fire or accident.

When using a DC reactor, AC reactor, braking resistor or noise filter, etc., there is the possibility that a human body may touch the main circuit terminal block (live parts). In such cases, take measures such as installing the inverters in an location not easily accessible by humans.
Not doing so may result in a serious injury due to an electric shock.

There are conditions for compliance with the EU Low Voltage Directive and Machinery Directive. Strictly observe the conditions listed in the instruction manual or user's manual.
Not doing so may result in a serious injury due to an electric shock or fire.

Security Measures

Anti-virus protection
Install the latest commercial-quality antivirus software on the computer connected to the control system and maintain to keep the software up-to-date.

Security measures to prevent unauthorized access
Take the following measures to prevent unauthorized access to our products.

- Install physical controls so that only authorized personnel can access control systems and equipment.
- Reduce connections to control systems and equipment via networks to prevent access from untrusted devices.
- Install firewalls to shut down unused communications ports and limit communications hosts and isolate control systems and equipment from the IT network.
- Use a virtual private network (VPN) for remote access to control systems and equipment.
- Adopt multifactor authentication to devices with remote access to control systems and equipment.
- Set strong passwords and change them frequently.
- Scan virus to ensure safety of USB drives or other external storages before connecting them to control systems and equipment.

Data input and output protection
Validate backups and ranges to cope with unintentional modification of input/output data to control systems and equipment.

- Checking the scope of data
- Checking validity of backups and preparing data for restore in case of falsification and abnormalities
- Safety design, such as emergency shutdown and fail-soft operation in case of data tampering and abnormalities

Data recovery Backup data and keep the data up-to-date periodically to prepare for data loss.	
When using an intranet environment through a global address, connecting to an unauthorized terminal such as a SCADA, HMI or to an unauthorized server may result in network security issues such as spoofing and tampering. You must take sufficient measures such as restricting access to the terminal, using a terminal equipped with a secure function, and locking the installation area by yourself.	
When constructing an intranet, communication failure may occur due to cable disconnection or the influence of unauthorized network equipment. Take adequate measures, such as restricting physical access to network devices, by means such as locking the installation area.	
When using a device equipped with the SD Memory Card function, there is a security risk that a third party may acquire, alter, or replace the files and data in the removable media by removing the removable media or unmounting the removable media. Please take sufficient measures, such as restricting physical access to the Controller or taking appropriate management measures for removable media, by means of locking the installation area, entrance management, etc., by yourself.	

⚠ Caution

If connecting a commercially available braking resistor or regenerative braking unit, this may result in a moderate burn due to the heat generated in the braking resistor or regenerative braking unit. In case of a braking resistor, install a thermal relay that monitors the temperature of the resistor. Configure a sequence that enables the inverter power to turn OFF when unusual over heating is detected in the braking resistor or regenerative braking unit.	
The inverter has high voltage parts inside which, if short-circuited, might cause damage to itself or other property. Place covers on the openings or take other precautions to make sure that no metal objects such as cutting bits or lead wire scraps go inside when installing and wiring.	
Install a stop motion device to ensure safety. Not doing so might result in a minor injury. (A holding brake is not a stop motion device designed to ensure safety.)	
Be sure to confirm safety before conducting maintenance, inspection or parts replacement.	
A breakdown of the built-in braking transistor could result in braking resistor heating or damage to the inverter's internal units. Shut off the main power of the inverter using Braking transistor broken signal (DBAL).	
A breakdown of the built-in braking transistor or misconnection of the braking resistor could result in braking resistor heating or damage to the inverter's internal units. If the inverter does not start up or continue being undervoltage (LU) after the main power of the inverter is turned ON, shut off the main power of the inverter.	
When installing the product, use only the specified screws. Not doing so may result in fire or accidents.	
Do not install or operate an inverter with damaged external or internal components. Doing so may result in injury, fire or accidents.	

Prevent lint, paper fibers, sawdust, dust, metallic chips, or other foreign materials from getting into the inverter or from accumulating on the cooling fin.
Not doing so may result in fire or accidents.

Support the inverter case or cooling fin instead of the surface cover during transportation.
Not doing so may result in injury due to the inverter dropping.

The inverter, motor and wiring generate electric noise. Be careful about malfunction of the nearby sensors and devices. Take noise control measures to prevent them from malfunctioning.
Not doing so may result in accidents.

The inverter has an overload protection function. Set the protection level using parameters.

The brake function of the inverter does not provide any holding mechanism. Provide a separate holding brake if necessary.
Not doing so may result in injury.

Comply with the local ordinance and regulations when disposing of the product.
Not doing so may result in injury.

UL and cUL compliance is subject to conditions. Strictly observe the conditions listed in the instruction manual or user's manual.
Not doing so may result in fire or accidents.

Precautions for Safe Use

Installation and Storage

Do not store or use the product in the following places.

- Locations subject to direct sunlight.
- Locations subject to ambient temperature exceeding the specifications.
- Locations subject to relative humidity exceeding the specifications.
- Locations subject to condensation due to severe temperature fluctuations.
- Locations subject to corrosive or flammable gases.
- Locations subject to exposure to combustibles.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

Transportation, Installation, and Wiring

- Do not drop or apply strong impact on the product. Doing so may result in damaged parts or malfunction.
- Do not connect an AC power supply voltage to the control input/output terminals. Doing so may result in damage to the product. Also, check the voltage and current of the connected circuit and implement wiring correctly.
- Take sufficient shielding measures when using the product in the following locations. Not doing so may result in damage to the product.
  - Locations subject to static electricity or other forms of noise
  - Locations subject to strong magnetic fields
  - Locations close to power lines
- If there is noise or other effects, install a ferrite core. When installing a ferrite core, do not allow the shield sheath to be caught between the communications connector and the cable. Not doing so may cause insufficient noise reduction effect, resulting in the Inverter to malfunction.
- Fix the shield wire or use other means so that it is not subject to a heavy load. Shield wire breakage may occur due to the weight of the ferrite core.
- When carrying out wiring of communications line and configuring network settings, refer to applicable sections of the manual to ensure correct connection and configuration procedures.
- Install an appropriate stopping device to ensure safety. In particular, if configured to operate continuously even in the event of a communications error, the Inverter may not stop, resulting in equipment damage.

Operation and Adjustment

- When checking a signal during the power supply and the voltage is erroneously applied to the control input terminals, the motor may start abruptly. Be sure to confirm safety before checking a signal.
- When changing parameters, do not turn OFF the inverter unit until saving is completed.
- Even when the inverter power is turned OFF, the counter-electromotive force occurs while the PM motor rotates, which may result in electric shock.
  Do not remove the surface cover of the inverter until the PM motor stops.

Maintenance and Inspection

- The capacitor service life is influenced by the ambient temperature. Refer to “Smoothing Capacitor Life Curve” described in the manual. When a capacitor reaches the end of its service life and does not work as the product, you need to replace the capacitor.

Precautions for Correct Use

Maintenance and Parts Replacement

- When a cooling fan reaches the end of its service life, replace it.

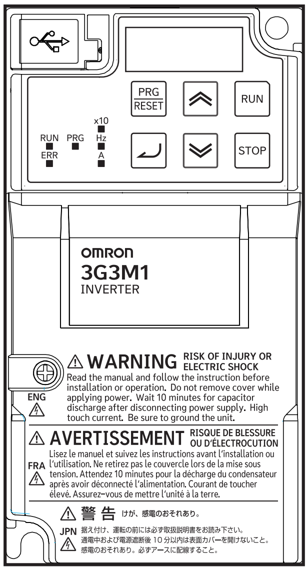
Product Disposal

Comply with the local ordinance and regulations when disposing of the product.

This mark urges disposal in accordance with the WEEE Directive.

Warning Label

- This product bears a warning label at the following location to provide handling warnings.
- Be sure to follow the instructions.
  The appearance differs depending on the capacity of the inverter.



Warning Description

WARNING RISK OF INJURY OR ELECTRIC SHOCK

ENG

Read the manual and follow the instruction before installation or operation. Do not remove cover while applying power. Wait 10 minutes for capacitor discharge after disconnecting power supply. High touch current. Be sure to ground the unit.

AVERTISSEMENT RISQUE DE BLESSURE OU D'ÉLECTROCUTION

FRA

Lisez le manuel et suivez les instructions avant l'installation ou l'utilisation. Ne retirez pas le couvercle lors de la mise sous tension. Attendez 10 minutes pour la décharge du condensateur après avoir déconnecté l'alimentation. Courant de toucher élevé. Assurez-vous de mettre l'unité à la terre.

警 告 けが、感電のおそれあり。

JPN

据え付け、運転の前には必ず取扱説明書をお読み下さい。
通電中および電源遮断後 10 分以内は表面カバーを開けないこと。
感電のおそれあり。必ずアースに配線すること。

Regulations and Standards

To export (or provide to nonresident aliens) any part of this product that falls under the category of goods (or technologies) for which an export certificate or license is mandatory according to the Foreign Exchange and Foreign Trade Control Law of Japan, an export certificate or license (or service transaction approval) according to this law is required.

<table>
<tr><th colspan="2">Standard</th><th>Applicable standard</th></tr>
<tr><td rowspan="3">CE
UKCA</td><td>EMC</td><td>EN 61800-3:2004/A1:2012</td></tr>
<tr><td>Functional safety</td><td>EN 61800-5-2 :2017 STO SIL3
EN/ISO 13849-1:2015, Cat.3 / PLe</td></tr>
<tr><td>Electrical safety</td><td>EN 61800-5-1:2017</td></tr>
<tr><td rowspan="2">UL</td><td>US</td><td>UL61800 -5-1, Edition 1, 2012</td></tr>
<tr><td>CA</td><td>CSA-C22.2 No.274, 2017</td></tr>
<tr><td>KC</td><td colspan="2">KS-C9800-3</td></tr>
<tr><td>EAC</td><td colspan="2">-</td></tr>
<tr><td>RCM</td><td colspan="2">EN 61800-3:2004+A1:2012</td></tr>
</table>

The customer must check the conditions that must be met for compliance with the environmental standards and regulations of their respective country.

1. Checking use of regulated chemical substances
   This product complies with regulated substances used in electrical parts based on the RoHS Directive.
   For details on the Certificate of Conformance and other regulations, contact the place of purchase.
2. Motor efficiency regulations
   This product is subject to energy efficiency regulations when it is used in motor systems that are driven by an inverter. For details on inverter efficiency with respect to motor output in accordance with EU efficiency regulations, refer to the following website.
   https://industrial.omron.eu/en/company-info/environmental/ecodesign-directive

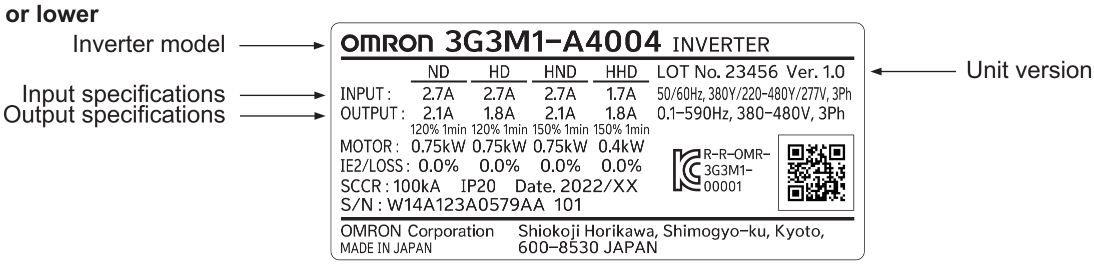
Items to Check after Unpacking

After unpacking, check the following items.
- Is this the model you ordered?
- Was there any damage sustained during shipment?

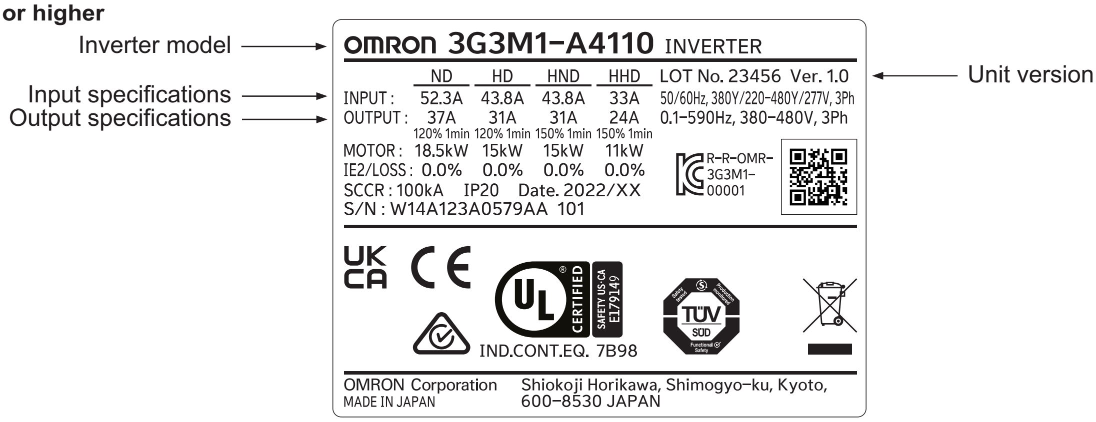
Checking the Nameplate

The nameplate is affixed to the product.

7.5 kW or lower



11 kW or higher



Checking the Model

3G3M1 - A 2 055

Maximum applicable motor capacity (HHD rating)

001	0.1kW
002	0.2kW
004	0.4kW
007	0.75kW
015	1.5kW
022	2.2kW
030	3.0kW
037	3.7kW
040	4.0kW
055	5.5kW
075	7.5kW
110	11kW
150	15kW
185	18.5kW
220	22kW

Voltage class

B	Single phase 200 VAC (200-V class)
2	Three-phase 200 VAC (200-V class)
4	Three-phase 400 VAC (400-V class)

Enclosure rating

A	Panel-mounting (IP10 or higher) or closed wall-mounting models

Checking the Accessories

The instruction manual is the only accessory included in the Multi-function Compact Inverter (3G3M1 Series).
Mounting screws and other necessary parts must be provided by the user.

Related Manuals

The following table summarizes the manuals relating to this manual. Read these manuals together with this manual.

Name	Catalog No.	Model	Application	Description
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	To learn about how to operate Sysmac Studio and its features.	Describes how to operate Sysmac Studio.
Sysmac Studio Version 1 Drive Functions Operation Manual	I589	SYSMAC-SE2□□□	To learn about how to set and adjust the inverter.	Describes how to operate Sysmac Studio.

Revision History

The manual revision code is an alphabet appended to the end of the catalog number found in the bottom right-hand corner of the front cover and in the bottom left-hand corner of the back cover.

Example

Man.No. I669-E1-01

Revision code

Revision code	Revision date	Revised content
01	September 2022	Original production
02	January 2023	• Improved descriptions, etc

1

Overview

This section provides an overview of the 3G3M1 Series features, standard specifications, and external dimensions by inverter capacity. It also shows the differences of this inverter from conventional inverters for those who use previous models.

1-1 Overview of Functions

The Multi-function Compact Inverter (3G3M1 Series) provides a variety of functions such as PM motor control and simple position control. It is also designed for open field networks to extend application usability.
In addition, the 3G3M1 Series complies as standard with both the EC Directives and UL/cUL Standards. You can use this product as a world standard inverter.

1-1-1 Features of 3G3M1 Series Inverter

The 3G3M1 Series Inverter has the following features.

Enhanced Application Support

Although this inverter is compact, it provides high functionality for enhanced application support and addresses diverse needs with optimal performance.

● PM motors

In addition to conventional induction motors, this inverter provides the PM motor mode that supports highly efficient PM motors, which results in highly efficient control.
This is combined with the OMRON’s unique auto-tuning function and magnetic pole position estimation function that estimates the magnetic pole position of a PM motor during startup to enable its smooth start.
This control is suitable for applications with reduced torque characteristics (which do not require torque at low speeds) such as fans and pumps.

● Implementation of the dual rating function

This inverter has the dual rating function that consists of the heavy load mode and the light load mode.
This enables the efficient utilization of the inverter depending on your application.

- Heavy load mode (HHD/HD)
  The heavy load mode is used for a transfer machine, elevator, or other device that temporarily requires a torque exceeding the rated torque. This mode enables high torque control similar to that achieved with the previous product.
  The current overload capacity is 1 minute at 150% of the rated current and 0.5 seconds at 200% of the rated current.
- Light load mode (HND/ND)
  The light load mode is used for a fan, pump, or other device that operates at the rated motor torque or lower.
  Setting the light load mode causes the rated current of the inverter to increase, enabling the inverter to drive a motor whose capacity is one size larger.
  However, check when selecting an inverter because this also decreases the current overload capacity to 120% of the rated current for one minute.

- **Position control**

  This inverter provides position control that enables the control of up to eight points with a single inverter unit.
  With the standard pulse train input function, it realizes accurate position control based on the feed-back of the pulse generator (PG) signal or the encoder's phase-A/B signal.

- **PID control function**

  The inverter provides PID control that adjusts the feedback value to match the target value.
  This is available to the process control such as temperature, pressure, flow rate.

- **Modbus communication functions**

  This inverter has built-in Modbus communication functions as standard.
  These Modbus communication functions of the inverter include sophisticated, convenient functions as listed below.

• Modbus mapping	:	Up to 10 register addresses can be set as desired. This is convenient, for example, when designing a replacement.
• Broadcasting to up to five groups (Simultaneous broadcast)	:	Broadcasting to up five inverter groups can be performed by dividing those located within a single network connected to this inverter. It is useful to reduce the variation in the startup timings within a group.
• High transmission speed	:	This inverter supports the maximum transmission speed of 115.2 kbps. This helps reduce the communications data processing time.
• Co-inverter communication	:	Mutual data exchange can be performed among inverters, without presence of the master in Modbus communication.

Environmental Consideration

OMRON gives consideration to not only the functions inherent to the inverter, but also its service life and energy efficiency.
This inverter, as a standard, complies with the RoHS Directive and other international standards to realize an environmental-friendly inverter.

- **Automatic energy-saving function**

  The automatic energy-saving function automatically adjusts the output power of the inverter operating at a constant speed to the minimum. It has an energy-saving effect in applications such as a fan or pump.

- **Side-by-side installation**

  This inverter can be installed side by side, which contributes to the reduction of the installation space.
  Depending on the model, the reduction of the carrier frequency and the derating of the rated current are required. Refer to *2-1-2 Installation Environment* on page 2-2 for details.

Ease of Use

This inverter is also designed for ease of use in terms of the parameter settings, protection, and operations.
This contributes to the reduction of man-hours in inverter-related work.

● Password Function

This inverter has the password protection function to prevent unauthorized reading and changing of parameters.

● Initial screen automatic return function of the Operator

You can register the initial screen (data etc.) to display on its Operator.
After operating the Digital Operator for adjustment or inverter monitoring, the screen will return to the initial screen unless you operate any key for five minutes.

● Simplified parameter setting by user parameters

Any parameters can be registered as user parameters.
It is possible to display only the registered parameters to improve the operability of equipment.

1-1-2 Classes of 3G3M1 Series Inverter

There are three voltage classes for 3G3M1 Series Inverters: 200-V class supporting single-phase 200 VAC and three-phase 200 VAC, and 400-V class supporting three-phase 400 VAC.
The maximum applicable motor capacity for this inverter is 0.1 to 22 kW for the heavy load mode and 0.2 to 30 kW for the light load mode.
All models comply as standard with the EC Directives and UL/cUL Standards.

Rated voltage	Enclosure rating	Maximum applicable motor capacity		Model
		HHD: Heavy load	HND: Light load	
Three-phase 200 VAC	IP20	0.1 kW	0.2 kW	3G3M1-A2001
		0.2 kW	0.4 kW	3G3M1-A2002
		0.4 kW	0.75 kW	3G3M1-A2004
		0.75 kW	1.1 kW	3G3M1-A2007
		1.5 kW	2.2 kW	3G3M1-A2015
		2.2 kW	3.0 kW	3G3M1-A2022
		3.7 kW	5.5 kW	3G3M1-A2037
		5.5 kW	7.5 kW	3G3M1-A2055
		7.5 kW	11 kW	3G3M1-A2075
		11 kW	15 kW	3G3M1-A2110
		15 kW	18.5 kW	3G3M1-A2150
		18.5 kW	22 kW	3G3M1-A2185

Rated voltage	Enclosure rating	Maximum applicable motor capacity		Model
		HHD: Heavy load	HND: Light load	
Three-phase 400 VAC	IP20	0.4 kW	0.75 kW	3G3M1-A4004
		0.75 kW	1.1 kW	3G3M1-A4007
		1.5 kW	2.2 kW	3G3M1-A4015
		2.2 kW	3.0 kW	3G3M1-A4022
		3.0 kW	4.0 kW	3G3M1-A4030
		4.0 kW	5.5 kW	3G3M1-A4040
		5.5 kW	7.5 kW	3G3M1-A4055
		7.5 kW	11 kW	3G3M1-A4075
		11 kW	15 kW	3G3M1-A4110
		15 kW	18.5 kW	3G3M1-A4150
		18.5 kW	22 kW	3G3M1-A4185
		22 kW	30 kW	3G3M1-A4220
Single-phase 200 VAC	IP20	0.1 kW	0.2 kW	3G3M1-AB001
		0.2 kW	0.4 kW	3G3M1-AB002
		0.4 kW	0.55 kW	3G3M1-AB004
		0.75 kW	1.1 kW	3G3M1-AB007
		1.5 kW	2.0 kW	3G3M1-AB015
		2.2 kW	2.7 kW	3G3M1-AB022
		3.7 kW	-	3G3M1-AB037

Checking the Model

3 G 3 M 1 - A 2 0 0 1

Maximum applicable motor capacity (HHD rating)

001	0.1kW
002	0.2kW
004	0.4kW
007	0.75kW
015	1.5kW
022	2.2kW
030	3.0kW
037	3.7kW
040	4.0kW
055	5.5kW
075	7.5kW
110	11kW
150	15kW
185	18.5kW
220	22kW

Voltage class

B	Single-phase 200 VAC (200-V class)
2	Three-phase 200 VAC (200-V class)
4	Three-phase 400 VAC (400-V class)

Enclosure rating

A	Panel-mounting or closed wall-mounting models

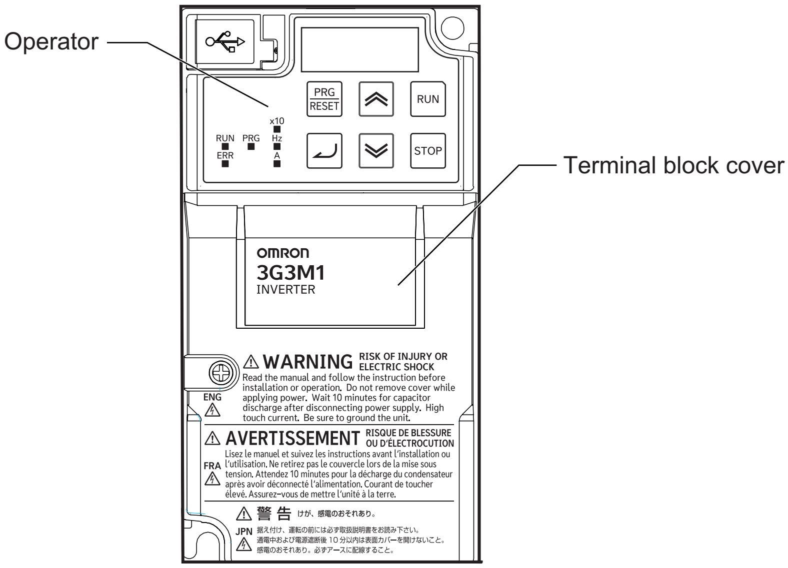
1-1-3 Compliance with International Standards

The 3G3M1 Series is compliant with the IEC international standard and so supports safety standards within Europe and other countries.

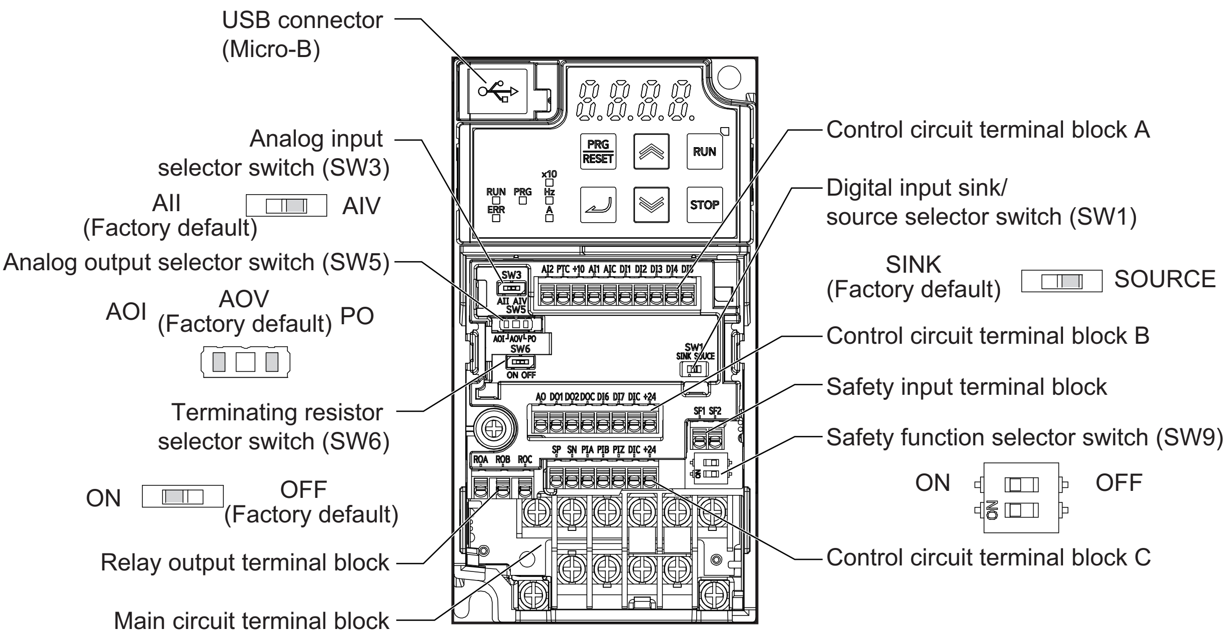
Standard		Applicable standard
CE UKCA	EMC	EN 61800-3:2004/A1:2012
	Functional safety	EN 61800-5-2 :2017 STO SIL3 EN/ISO 13849-1:2015, Cat.3 / PLe
	Electrical safety	EN 61800-5-1:2017
UL	US	UL61800 -5-1, Edition 1, 2012
	CA	CSA-C22.2 No.274, 2017
KC	KS-C9800-3	
EAC	-	
RCM	EN 61800-3:2004+A1:2012	

1-2 Appearance and Part Names

The following shows the front view when the product is unpacked.
(An example of 3G3M1-AB001/AB002/AB004/AB007/A2001/A2002/A2004/A2007)



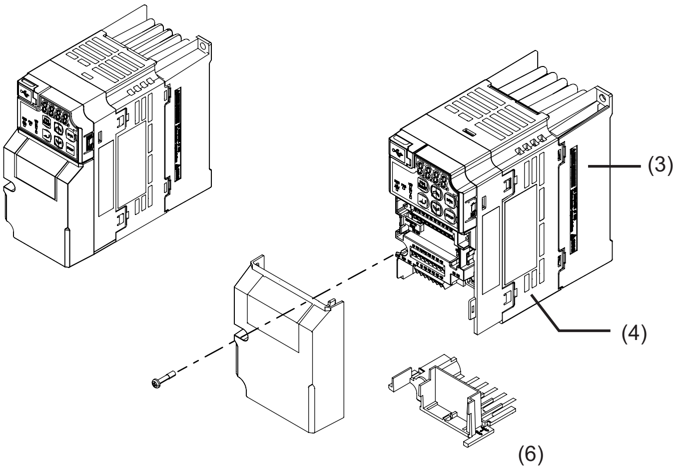
Open the terminal block cover to wire the main circuit terminal block and the control circuit terminal block.



The figures below show the components of each Inverter model.

Single-phase 200 V, 0.1/0.2/0.4/0.75 kW

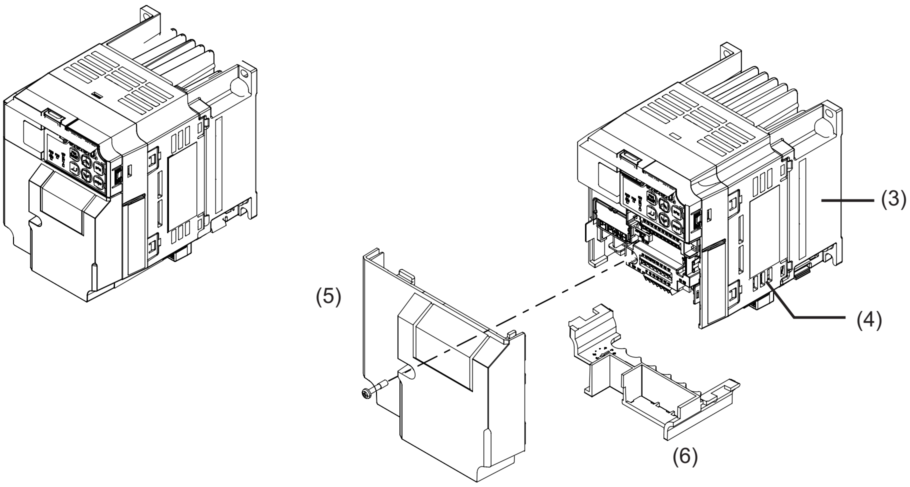
Three-phase 200 V, 0.1/0.2/0.4/0.75 kW



Single-phase 200 V, 1.5 kW

Three-phase 200 V, 1.5/2.2 kW

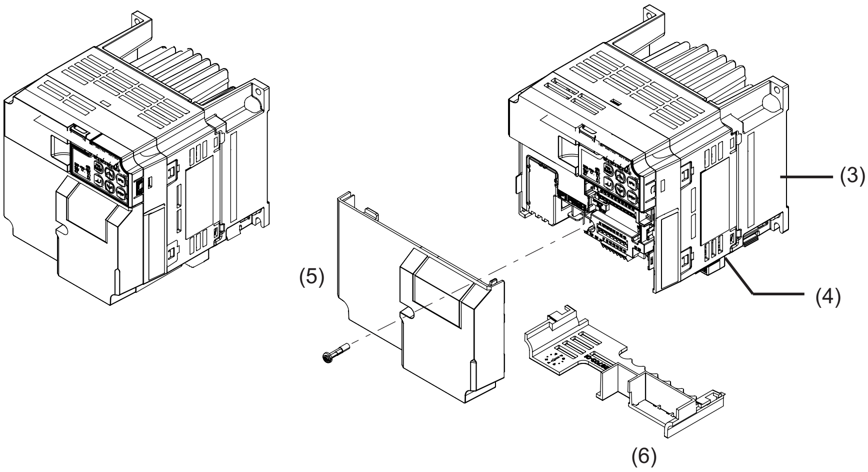
Three-phase 400 V, 0.4/0.75/1.5/2.2 kW



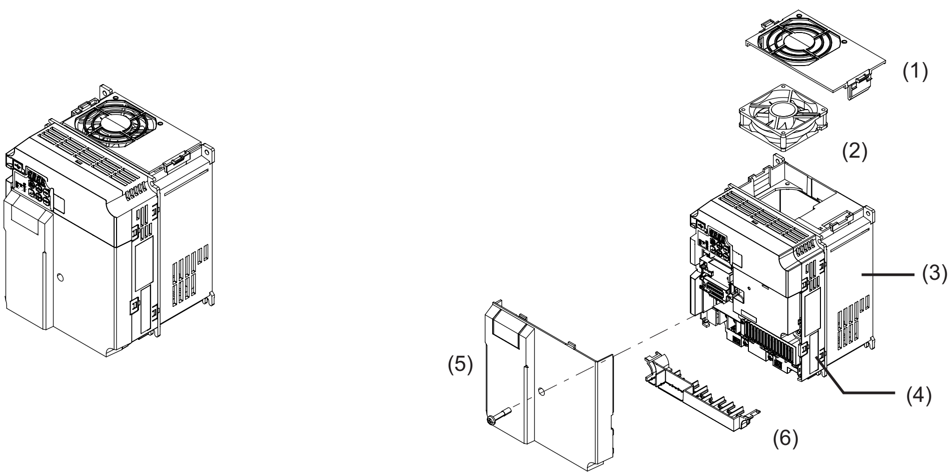
(1) Cooling Fan Cover
(2) Cooling Fan
(3) Cooling Fin
(4) Inverter Case
(5) Surface cover (Terminal block cover)
(6) Surface cover (Backing plate)

Note The single-phase 200-V, 1.5-kW and three-phase 200-V, 1.5-kW models have a cooling fan.
The three-phase 400-V, 0.4/0.75/1.5 kW model, however, has no cooling fan.

Single-phase 200 V, 2.2 kW
Three-phase 200 V, 3.7 kW
Three-phase 400 V, 3.0/4.0 kW

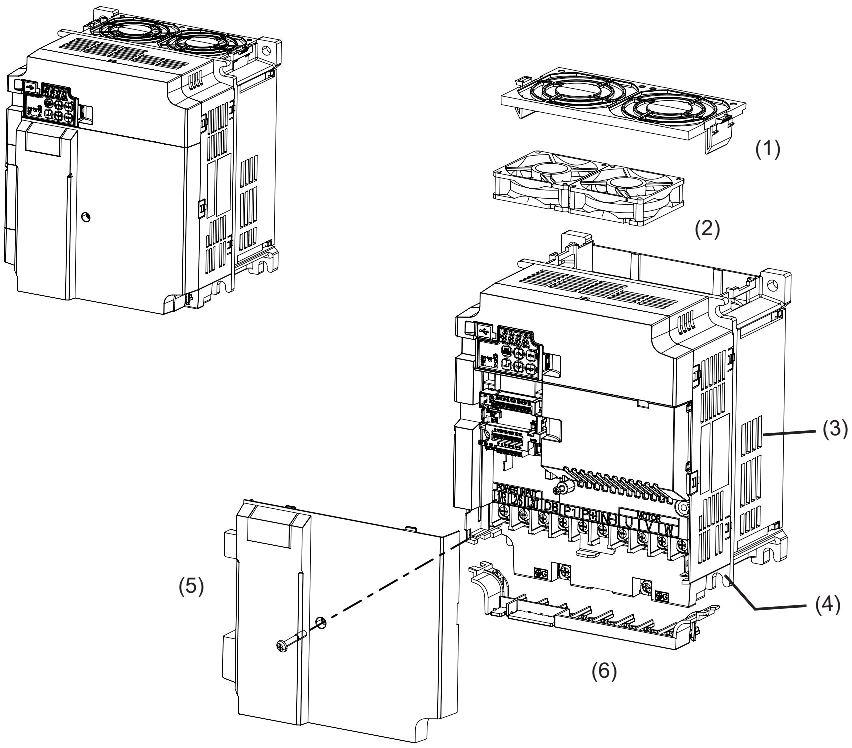


Single-phase 200 V, 3.7 kW
Three-phase 200 V, 5.5/7.5 kW
Three-phase 400 V, 5.5/7.5 kW

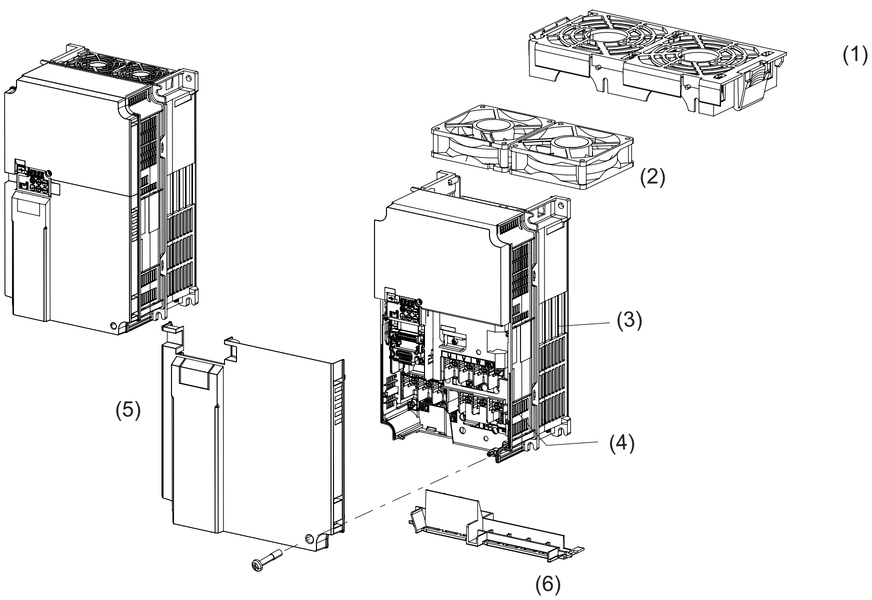


(1) Cooling Fan Cover	(4) Inverter Case
(2) Cooling Fan	(5) Surface cover (Terminal block cover)
(3) Cooling Fin	(6) Surface cover (Backing plate)

Three-phase 200 V, 11/15 kW
Three-phase 400 V, 11/15 kW



Three-phase 200 V, 18.5/22 kW
Three-phase 400 V, 18.5/22 kW



(1) Cooling Fan Cover
(2) Cooling Fan
(3) Cooling Fin
(4) Inverter Case
(5) Surface cover (Terminal block cover)
(6) Surface cover (Backing plate)

1-3 Specifications

1-3-1 Standard Specifications

Three-phase 200-V Class

HHD: Heavy load, HND: Light load

Item			Three-phase 200 V											
Model (3G3M1-A2□□□)			001	002	004	007	015	022	037	055	075	110	150	185
Maximum applicable motor capacity[*1]	kW	HHD	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5
		HND	0.2	0.4	0.75	1.1	2.2	3[*7]	5.5[*7]	7.5	11	15	18.5	22
	HP	HHD	1/8	1/4	1/2	1	2	3	5	7 1/2	10	15	20	25
		HND	1/4	1/2	1	1 1/2	3	4	7 1/2	10	15	20	25	30
Rated output capacity [kVA] [*2]	200 V	HHD	0.3	0.6	1	1.7	2.8	3.8	6.1	8.7	11	16	21	26
		HND	0.5	0.7	1.2	2.1	3.3	4.2	6.8	10	14	19	24	30
	240 V	HHD	0.4	0.7	1.2	2.1	3.3	4.6	7.3	10	14	20	25	32
		HND	0.5	0.8	1.5	2.5	4.0	5.0	8.1	12	17	23	29	37
Rated input voltage[*3]			Three-phase 200 to 240 V, 50/60 Hz											
Rated input current [A][*4]		HHD	1.1	1.8	3.1	5.3	9.5	13.2	22.2	31.5	42.7	60.7	80	97
		HND	1.8	2.6	4.9	6.7	12.8	17.9	28.5	42.7	60.7	80	97	112
Rated output voltage			Three-phase 200 to 240 V (with AVR)											
Rated output current [A][*5]		HHD	1	1.6	3	5	8	11	17.5	25	33	47	60	76
		HND	1.3	2	3.5	6	9.6	12[*7]	19.6 [*7]	30	40	56	69	88
Braking torque [%][*6]		HHD	150		100		70	40		20				
		HND	75		53	68	48	29[*7]	27[*7]	15				
Braking resistor circuit	Regenerative braking		Built-in braking resistor circuit (discharge resistor separately mounted)											
	Minimum connection resistance [Ω]		100 to 120				40 to 120		33 to 120	20 min.	15 min.	10 min.	8.6 min.	4 min.
Short circuit current rating [kA]			100											
Weight [kg]			0.5	0.5	0.6	0.8	1.4	1.4	1.7	3.8	4	5.3	5.4	11
Dimensions (Width × Height) [mm]			68×127				110×130		140 × 130	180×220		220×260		250 × 400
Dimensions (Depth) [mm]			98		113	145	156			171		203		203

*1. The maximum applicable motor capacity is given for a standard four-phase motor. When selecting an inverter, select not just by kW but also ensure that the inverter rated output current is greater than the motor rated current.

*2. In calculating the rated capacity, the rated output voltage is assumed to be 200 V or 240 V.

*3. A voltage higher than the power supply voltage cannot be output.
*4. When Carrier Frequency (F26) is set to the following or below, derating is required.
HHD mode...A2001 to A2037: 8 kHz, A2055 to A2185: 10 kHz
HND mode...A2001 to A2037: 4 kHz, A2055 to A2150: 10 kHz, A2185: 4 kHz
For derating, refer to *A-1 Derating Table* on page A-2.
*5. The following shows the calculated value when the power supply capacity is 500 kVA (10x the inverter capacity when the inverter capacity exceeds 50 kVA) and when a %X = 5% power supply is connected.
*6. The numeric value is the average braking torque per individual motor. (Varies according to motor efficiency)
*7. Allowable ambient temperature of 40°C or below of A2022 to A2037 in the HND mode.
The rated output current in the HND mode decreases by 1% for every temperature increase of 1°C when the ambient temperature is 40°C or more.

Three-phase 400-V Class

HHD/HD: Heavy load, HND/ND: Light load

Item			Three-phase 400 V											
Model (3G3M1-A4□□□)			004	007	015	022	030	040	055	075	110	150	185	220
Maximum applicable motor capacity[*1]	kW	HD	0.75	1.1	2.2	3	4	5.5	7.5	11	15	18.5	22	30
		ND	0.75	1.5	2.2	3	4	5.5	11	15	18.5	22	30	37
		HHD	0.4	0.75	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22
		HND	0.75	1.1	2.2	3[*7]	4	5.5[*7]	7.5	11	15	18.5	22	30
	HP	HD	1	1 1/2	3	4	5	7 1/2	10	15	20	25	30	40
		ND	1	1 1/2	3	4	5	7 1/2	15	20	25	30	40	50
		HHD	1/2	1	1 1/2	3	4	5	7 1/2	10	15	20	25	30
		HND	1	1 1/2	3	4	5	7 1/2	10	15	20	25	30	40
Rated output capacity [kVA][*2]	380 V	HD	1.2	2.2	3.3	4.1	5.8	7.3	12	15	20	25	30	39
		ND	1.4	2.7	3.6	4.5	6.1	7.9	14	19	24	29	39	47
		HHD	1.2	2.2	3.2	3.6	4.7	6.1	9.7	12	16	20	26	30
		HND	1.4	2.7	3.6	4.5	5.8	7.3	12	15	20	25	30	39
	480 V	HD	1.5	2.8	4.2	5.2	7.3	9.2	15	19	26	32	37	50
		ND	1.7	3.4	4.6	5.7	7.6	10	18	24	31	37	49	60
		HHD	1.5	2.8	4	4.6	6	7.6	12.3	15	20	26	32	37
		HND	1.7	3.4	4.6	5.7	7.3	9.2	15	19	26	32	37	50
Rated input voltage[*3]			Three-phase 380 to 480 V, 50/60 Hz											
Rated input current [A][*4]		HD	2.7	3.9	7.3	11.3	14.2	16.8	23.2	33	43.8	52.3	60.6	77.9
		ND	2.7	4.8	7.3	11.3	14.2	16.8	33	43.8	52.3	60.6	77.9	94.3
		HHD	1.7	3.1	5.9	8.2	11.3	14.2	17.3	23.2	33	43.8	52.3	60.6
		HND	2.7	3.9	7.3	11.3	14.2	16.8	23.2	33	43.8	52.3	60.6	77.9
Rated output voltage			Three-phase 380 to 480 V (with AVR)											

Item		Three-phase 400 V											
Rated output current [A]*5	HD	1.8	3.4	5	6.3	8.8	11.1	17.5	23	31	38	45	60
	ND	2.1	4.1	5.5	6.9	9.2	12	21.5	28.5	37	44	59	72
	HHD	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18	24	31	39	45
	HND	2.1	4.1	5.5	6.9*7	8.8	11.1*7	17.5	23	31	38	45	60
Braking torque [%]*6	HD	53.3	68.2	47.7	29.3	29.3	26.9	15					
	ND	53.3	50.0	47.7	29.3	29.3	26.9	12					
	HHD	100		70	40	40	40	20					
	HND	53	68	48	29*7	29	27*7	15					
Braking resistor circuit	Regenerative braking	Built-in braking resistor circuit (discharge resistor separately mounted)											
	Minimum connection resistance [Ω]	200		160 to 200		130 to 200		80 min.	60 min.	40 min.	34.4 min.	16 min.	
Short circuit current rating [kA]		100											
Weight [kg]		1.1	1.4	1.4	1.4	1.7	1.7	3.8	3.8	5.2	5.4	11	11
Dimensions (Width × Height) [mm]		110×130				140×130		180×220		220×260		250×400	
Dimensions (Depth) [mm]		132	156					171		203		203	

*1. The maximum applicable motor capacity is given for a standard four-phase motor. When selecting an inverter, select not just by kW but also ensure that the inverter rated output current is greater than the motor rated current.
*2. In calculating the rated capacity, the rated output voltage is assumed to be 380 V or 480 V.
*3. A voltage higher than the power supply voltage cannot be output.
*4. When Carrier Frequency (F26) is set to the following or below, derating is required.
HHD mode...A4004 to A4040: 8 kHz, A4055 to A4220: 10 kHz
HND mode...A4004 to A4040: 8 kHz, A4055 to A4185: 10 kHz, A4220: 6 kHz
HD and ND...modes All models: 4 kHz
For derating, refer to *A-1 Derating Table* on page A-2.
*5. The following shows the calculated value when the power supply capacity is 500 kVA (10x the inverter capacity when the inverter capacity exceeds 50 kVA) and when a %X = 5% power supply is connected.
*6. The numeric value is the average braking torque per individual motor. (Varies according to motor efficiency)
*7. Allowable ambient temperature of 40°C or below of A4022 to A4040 in the HND mode.
The rated output current of A4022 and A4040 in the HND mode decreases by 1% for every temperature increase of 1°C when the ambient temperature is 40°C or more.

Single-phase 200-V Class

HHD: Heavy load, HND: Light load

Item	Single-phase 200 V						
Model (3G3M1-AB□□□)	001	002	004	007	015	022	037

Item			Single-phase 200 V						
Maximum applicable motor capacity[*1]	kW	HHD	0.1	0.2	0.4	0.75	1.5	2.2	3.7
		HND	0.2	0.4	0.55	1.1	2[*8]	2.7[*9]	-
	HP	HHD	1/8	1/4	1/2	1	2	3	5
		HND	1/4	1/2	3/4	1 1/2	3	4	-
Rated output capacity [kVA][*2]	200 V	HHD	0.3	0.6	1	1.7	2.8	3.8	6.1
		HND	0.4	0.7	1.2	2.1	3.3	4.2	-
	240 V	HHD	0.4	0.7	1.2	2.1	3.3	4.6	7.3
		HND	0.5	0.8	1.5	2.5	4	5	-
Rated input voltage[*3]			Single-phase 200 to 240 V, 50/60 Hz						
Rated input current [A][*4]		HHD	1.8	3.3	5.4	9.7	16.4	22	45.4
		HND	3.3	4.9	7.3	13.8	20.2	26	-
Rated output voltage			Single-phase 200 to 240 V (with AVR)						
Rated output current [A][*5]		HHD	1	1.6	3	5	8	11	17.5
		HND	1.2	1.9	3.5[*7]	6.0[*7]	9.6[*7]	12[*7]	-
Braking torque [%][*6]		HHD	150		100		70	40	40
		HND	75		73	68	48	29	-
Braking resistor circuit	Regenerative braking		Built-in braking resistor circuit (discharge resistor separately mounted)						
	Minimum connection resistance [Ω]		100 to 120				40 to 120		
Short circuit current rating [kA]			100						
Weight [kg]			0.5	0.5	0.6	0.9	1.4	1.7	3.8
Dimensions (Width × Height) [mm]			68×127				110×130	140×130	180×220
Dimensions (Depth) [mm]			98		120	165	166	156	171

*1. The maximum applicable motor capacity is given for a standard four-phase motor. When selecting an inverter, select not just by kW but also ensure that the inverter rated output current is greater than the motor rated current.

*2. In calculating the rated capacity, the rated output voltage is assumed to be 200 V or 240 V.

*3. A voltage higher than the power supply voltage cannot be output.

*4. When Carrier Frequency (F26) is set to the following or below, derating is required.
HHD mode...AB001 to A2037: 8 kHz
HND mode...AB001 to A2022: 4 kHz
For derating, refer to *A-1 Derating Table* on page A-2.

*5. The following shows the calculated value when the power supply capacity is 500 kVA (10x the inverter capacity when the inverter capacity exceeds 50 kVA) and when a %X = 5% power supply is connected.

*6. The numeric value is the average braking torque per individual motor. (Varies according to motor efficiency)

*7. Allowable ambient temperature of 40°C or below of AB004, AB007, AB015 and AB022.
The rated output current in the HND mode decreases by 2% for every temperature increase of 1°C when the ambient temperature is 40°C or more.

*8. The maximum applicable motor capacity is 2.2 kW when the input voltage is 220 to 240 V.

*9. The maximum applicable motor capacity is 3.0 kW when the input voltage is 220 to 240 V.

Common Specifications

Item		Specifications
Enclosure rating[*1]		Open type (IP20)
Control	Control method	Phase-to-phase sinusoidal modulation PWM
	Output frequency range[*2]	5.00 to 590 Hz
	Frequency precision	Digital command: ±0.01% of the maximum frequency, Analog command: ±0.2% of the maximum frequency (25±10°C)
	Frequency setting resolution	Digital setting: 0.01 Hz, Analog setting: Maximum frequency × 5/10,000
	Overload current rating of inverter	Heavy load rating (HHD): 150%/60 s or 200%/0.5 s Heavy load rating (HD): 150%/60 s Light load rating (HND/ND): 120%/60 s
	Instantaneous overcurrent protection	• Digital setting: 0.01 Hz (99.99 Hz max.), 0.1 Hz (100.0 to 590.0 Hz) • Analog setting: Maximum frequency × 5/10,000 • Communication setting: 0.005% of the maximum output frequency or 0.01 Hz (fixed)
	Acceleration/ Deceleration time	0.00 to 6000 s (line/curve arbitrary setting), 2nd acceleration/deceleration setting provided
	Carrier frequency change range	Three-phase 400-V class • 3G3M1-A4004 to A4185 0.75 to 16 kHz (HHD/HND/HD) 0.75 to 10 kHz (ND) • 3G3M1-A4220 0.75 to 16 kHz (HHD) 0.75 to 10 kHz (HND/HD) 0.75 to 6 kHz (ND) Three-phase 200-V class • 3G3M1-A2001 to A2015, A2055 to A2185 0.75 to 16 kHz (HHD/HND) • 3G3M1-A2022/A2037 0.75 to 16 kHz (HHD) 0.75 to 10 kHz (HND) Single-phase 200-V class • 3G3M1-AB001 to AB022 0.75 to 16 kHz (HHD) 0.75 to 10 kHz (HND) • 3G3M1-AB037 0.75 to 16 kHz (HHD) The carrier frequency automatically drops according to the ambient temperature and output current. (This function can be disabled.)

Item		Specifications
Control	Starting torque	• 150% min. / Rated speed of 10% V/f control (IM motor) V/f control (slip compensation) V/f control with speed sensor (IM motor) • 200% min./0.5 Hz Vector control without speed sensor (dynamic vector control) (IM motor) V/f control with speed feedback (Automatic torque boost) Sensorless vector control • 200% min./0.0 Hz (0 Hz torque control) Vector control with speed sensor (IM motor) Vector control with speed and pole position sensor (PM motor) To obtain 200% starting torque at low speed, consider raising the capacity of the inverter to the next higher capacity. • 200% min. / Rated speed of 10% Vector control without speed and pole position sensor (PM motor) To obtain these starting torques at low speed, the capacity of the inverter and motor must be taken into consideration. The maximum torque that can be used is limited when the current capacity matched to the mode is exceeded. Current capacity of 200% in HHD mode, 150% in HD mode, and 120% in HND and ND modes
Protective function		Overcurrent, Overvoltage, Undervoltage, Electronic thermal, Temperature error, Ground-fault current at power-on, Inrush current protection circuit, Overload limit, Incoming overvoltage, External trip, Memory error, CPU error, USP error, Communication error, Overvoltage suppression during deceleration, Power interruption protection, Emergency shutoff, etc.
Input signal	Frequency settings	Operator External analog input signal (variable resistor/0 to 10 VDC/-10 to 10 VDC/4 to 20 mA), Modbus communication
	RUN/STOP command	Operator External digital input signal (3-wire input available), Modbus communication
	Multi-function Input[*3]	Seven points (DI1 to DI7, Functions can be selected from among 101)
	Analog input[*4]	Two points (voltage AI1 terminal: 10 bits/-10 to 10 VDC, voltage AI2 (AIV) terminal: 10 bits/0 to 10 V, current AI2 (AII) terminal: 10 bits/4 to 20 mA or 0 to 20 mA)
	Pulse input	One point (A, B, Z phases can be input, max. 32 kHz, 5 to 24 VDC)
Output signal	Multi-function output[*3]	Two points (DO1 and DO2, Functions can be selected from among 92)
	Relay output[*3]	One point (SPDT contact (ROA, ROB, ROC), Functions can be selected from among 92)
	Analog output[*5]	One point (AO (AOV) terminal: Voltage 10 bits/0 to 10 V, AO (AOI) terminal: Current 10 bits/4 to 20 mA or 0 to 20 mA, AO (PO) terminal: Max. 32 kHz, 0 to 11 V)
	Pulse output	
Communications	RS-485	RJ45 connector (for Digital Operator)
	RS-485	Control circuit terminal block, Modbus communication
	USB	USB 2.0, Micro-B connector

<table>
<tr><th colspan="2">Item</th><th>Specifications</th></tr>
<tr><td colspan="2">Other functions</td><td>AVR function, V/f characteristics switching, Upper/Lower limit, Multi-step speed (16 steps), Starting frequency adjustment, Jogging operation, Carrier frequency adjustment, PID control, Frequency jump, Analog gain/bias adjustment, S-shape acceleration/deceleration, Electronic thermal characteristics/ level adjustment, Restart function, Torque boost function, Fault monitor, Soft lock function, Frequency conversion display, USP function, 2nd control function, UP/DOWN, Overcurrent suppression function, etc.</td></tr>
<tr><td rowspan="5">General specifications</td><td>Operating ambient temperature*6</td><td>-10 to 50°C (Derating required)</td></tr>
<tr><td>Storage ambient temperature</td><td>-25 to 70°C (Short-time temperature during shipment)</td></tr>
<tr><td>Operating ambient humidity</td><td>5% to 95% (with no condensation)</td></tr>
<tr><td>Vibration resistance</td><td><table>
<tr><th>Vibration Frequency</th><th>Specification</th></tr>
<tr><td>2 to less than 9Hz</td><td>3mm (0.12inch) (Max. amplitude)</td></tr>
<tr><td>9 to less than 20Hz</td><td>1G</td></tr>
<tr><td>20 to less than 55Hz</td><td>0.2G</td></tr>
<tr><td>55 to less than 200Hz</td><td>0.1G</td></tr>
</table></td></tr>
<tr><td>Location</td><td>At a maximum altitude of 1,000 m, indoors (without corrosive gases or dust)</td></tr>
</table>

*1. The enclosure rating complies with JISC0920.

*2. If you must use the motor at higher than 50/60 Hz, check the allowable maximum motor speed and other information with the motor manufacturer.

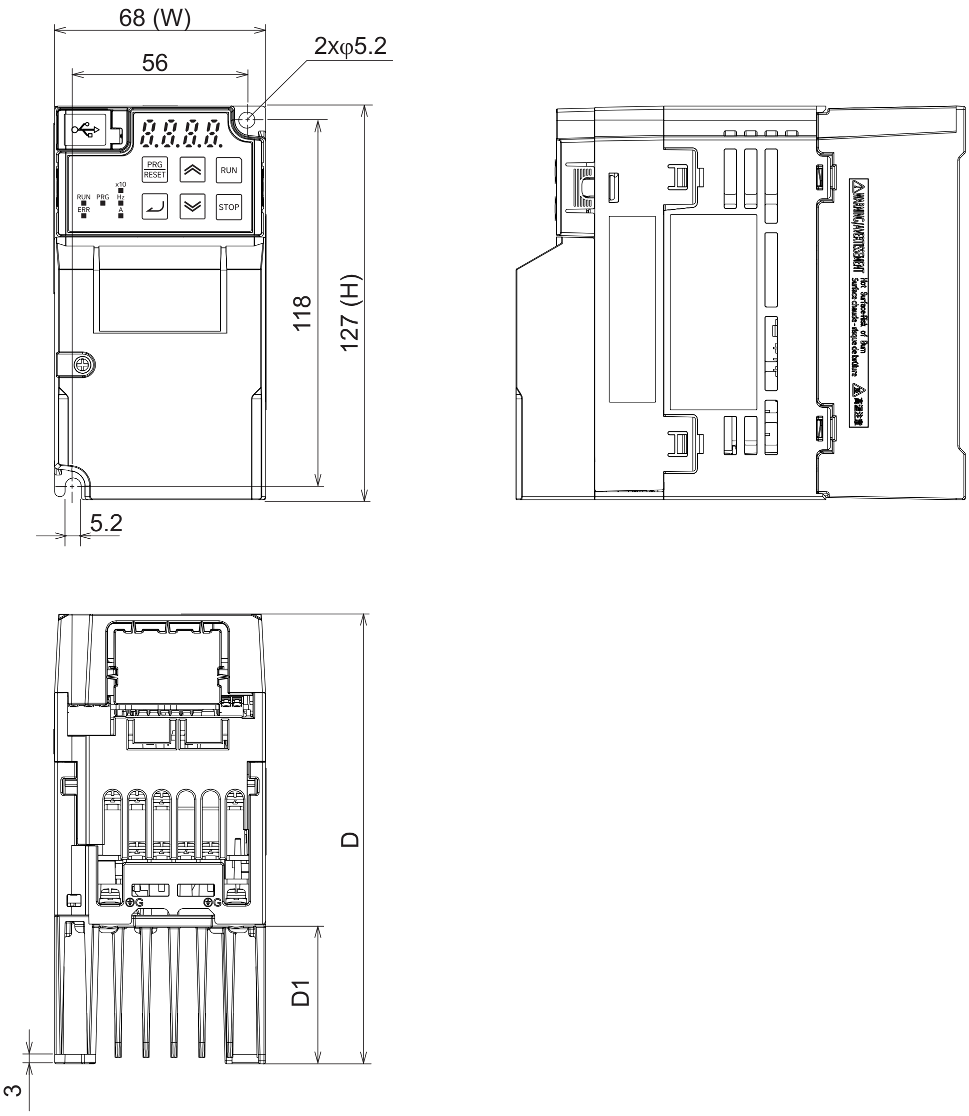
*3. In the HND/ND (light load) mode or PM motor mode compared with the HHD/HD (heavy load) mode, for some parameters, the default data and setting range also differ. For details, refer to *5-2-2 Load Mode Selection* on page 5-12.

*4. By default, the maximum frequency is adjusted to 10 V for a voltage input of 0 to 10 VDC and to 20 mA for a current input of 4 to 20 mA, respectively. If necessary, adjust the default parameter settings. For details, refer to *7-3-2 Analog Input Start/End Function Settings* on page 7-34.

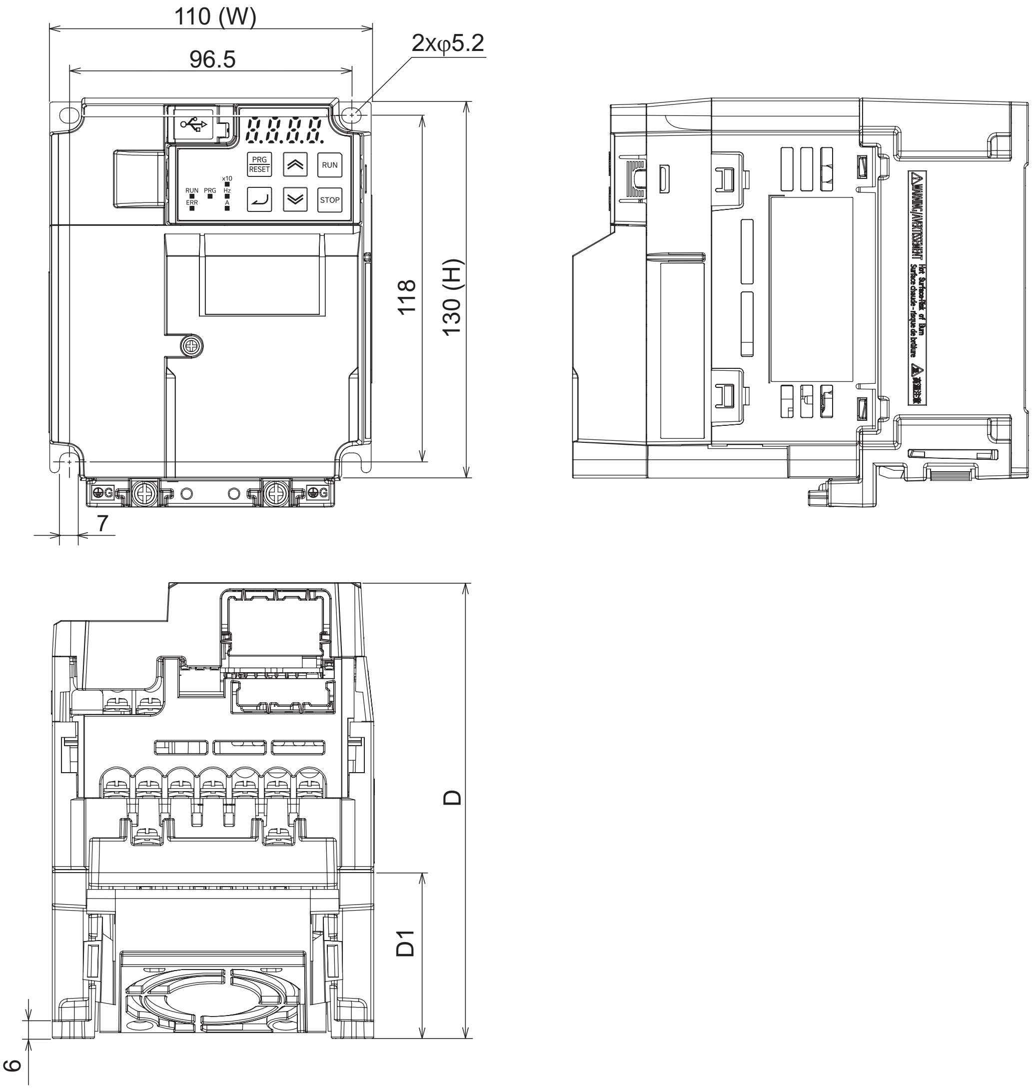
*5. The analog output shows values that can only be used as a guide for analog meter connection. The maximum output value may differ from 10 V or 20 mA due to the variability of the analog output circuit. If necessary, adjust the default parameter settings.

*6. Derating of the rated output current of the inverter may be required depending on the heavy/light load mode selection, operating ambient temperature, side-by-side installation, and carrier frequency settings.
Use the inverter in an appropriate environment according to *A-1 Derating Table* on page A-2.

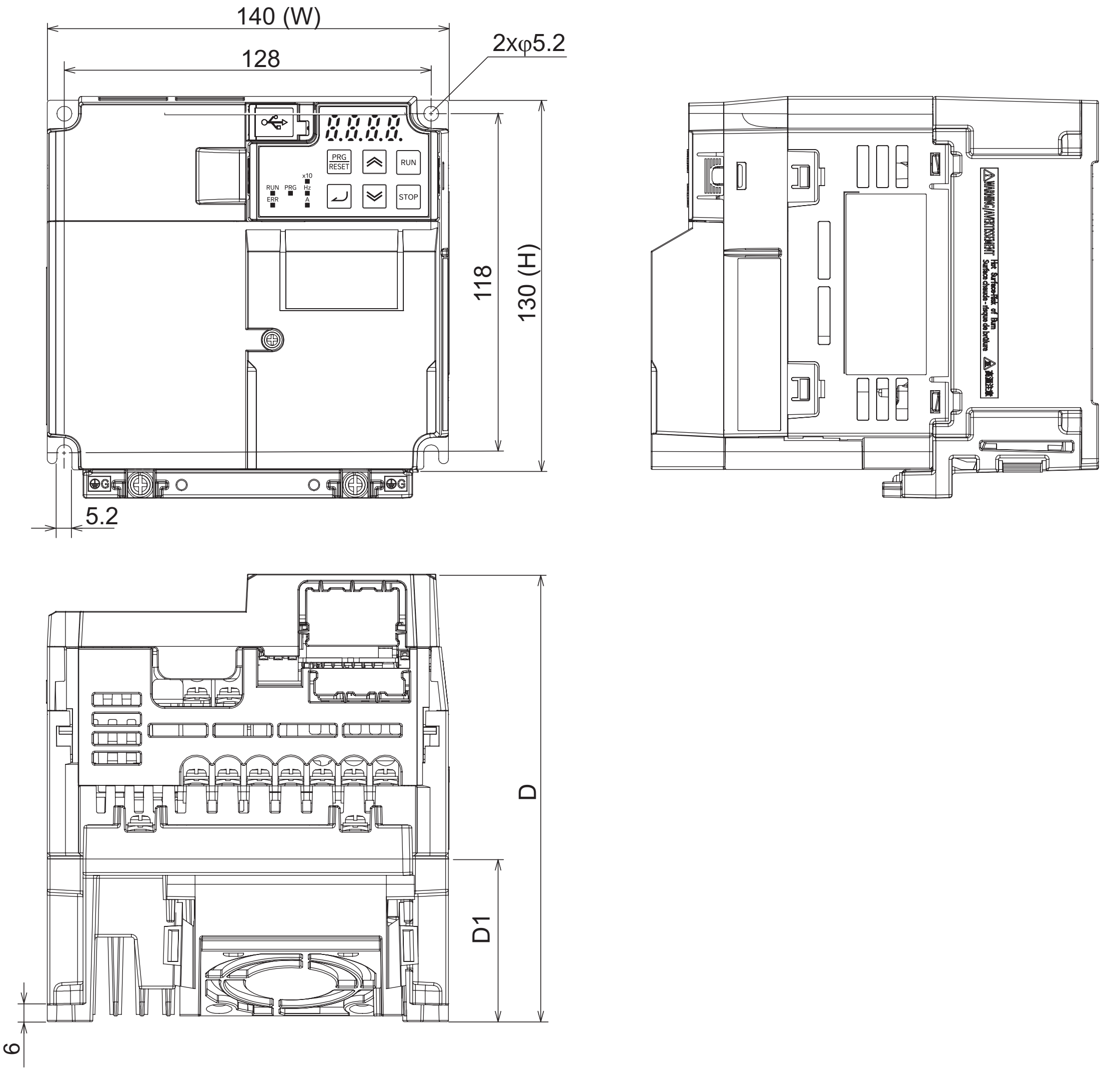
1-3-2 External Dimensions



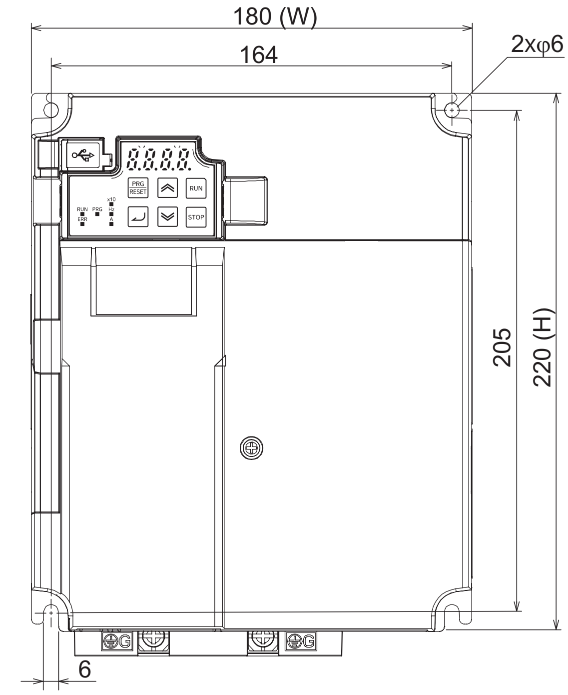
<table>
<tr><th>Power supply</th><th>Model</th><th>W [mm]</th><th>H [mm]</th><th>D [mm]</th><th>D1 [mm]</th></tr>
<tr><td rowspan="3">Single-phase 200 V</td><td>3G3M1-AB001
3G3M1-AB002</td><td rowspan="6">68</td><td rowspan="6">127</td><td>98</td><td>8</td></tr>
<tr><td>3G3M1-AB004</td><td>120</td><td>23</td></tr>
<tr><td>3G3M1-AB007</td><td>165</td><td>48</td></tr>
<tr><td rowspan="3">Three-phase 200 V</td><td>3G3M1-A2001
3G3M1-A2002</td><td>98</td><td>8</td></tr>
<tr><td>3G3M1-A2004</td><td>113</td><td>23</td></tr>
<tr><td>3G3M1-A2007</td><td>145</td><td>48</td></tr>
</table>

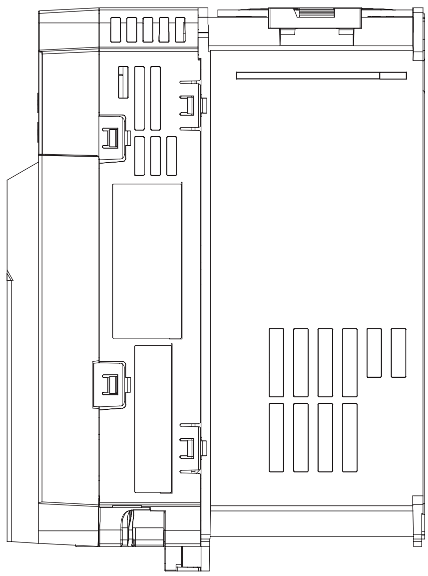


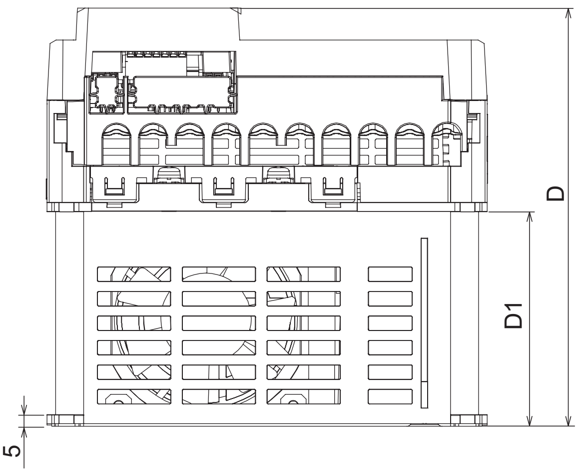
Power supply	Model	W [mm]	H [mm]	D [mm]	D1 [mm]
Single-phase 200 V	3G3M1-AB015	110	130	166	58
Three-phase 200 V	3G3M1-A2015 3G3M1-A2022			156	
Three-phase 400 V	3G3M1-A4004			132	38
	3G3M1-A4007 3G3M1-A4015 3G3M1-A4022			156	58



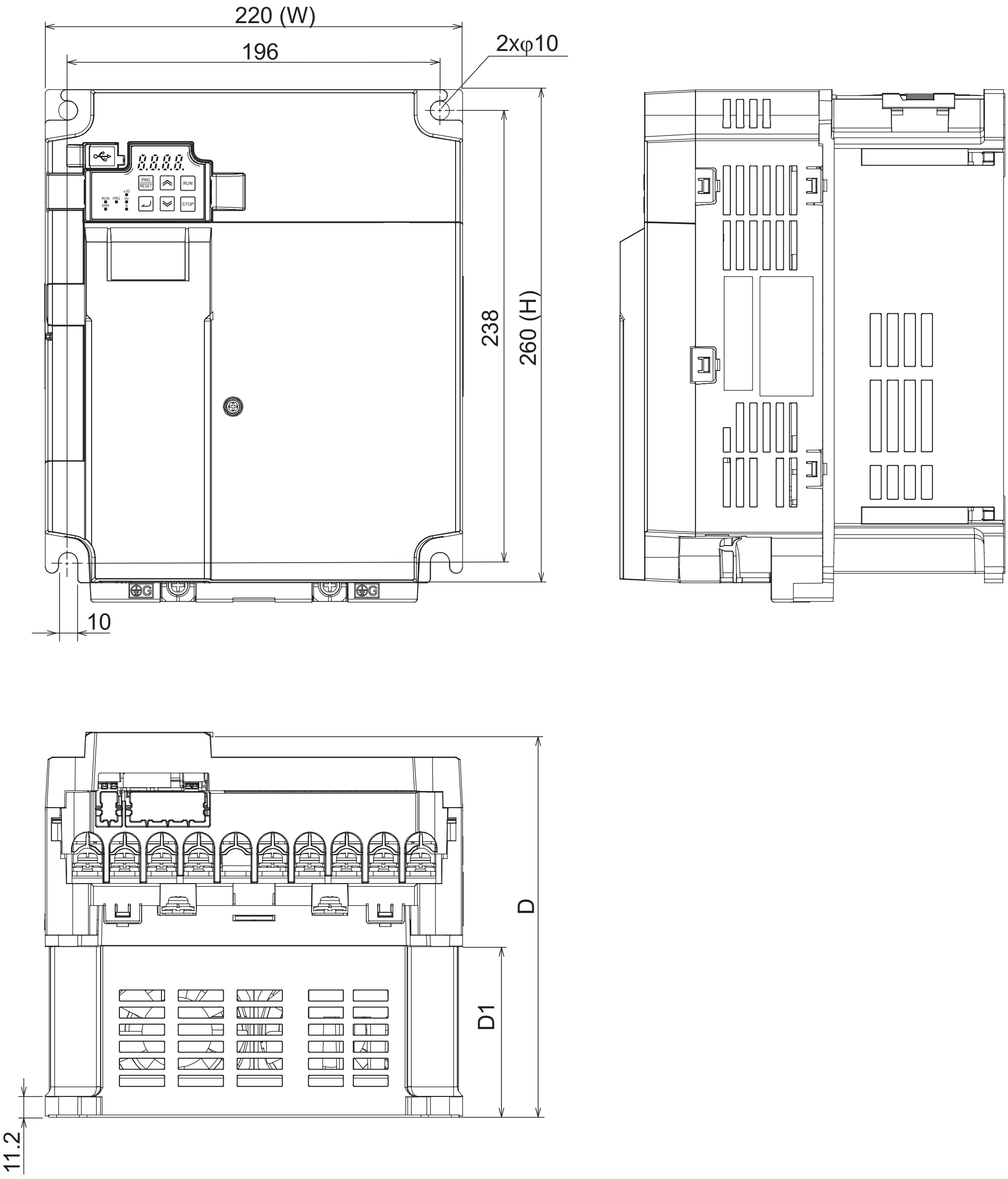
Power supply	Model	W [mm]	H [mm]	D [mm]	D1 [mm]
Single-phase 200 V	3G3M1-AB022				
Three-phase 200 V	3G3M1-A2037	140	130	156	58
Three-phase 400 V	3G3M1-A4030 3G3M1-A4040				



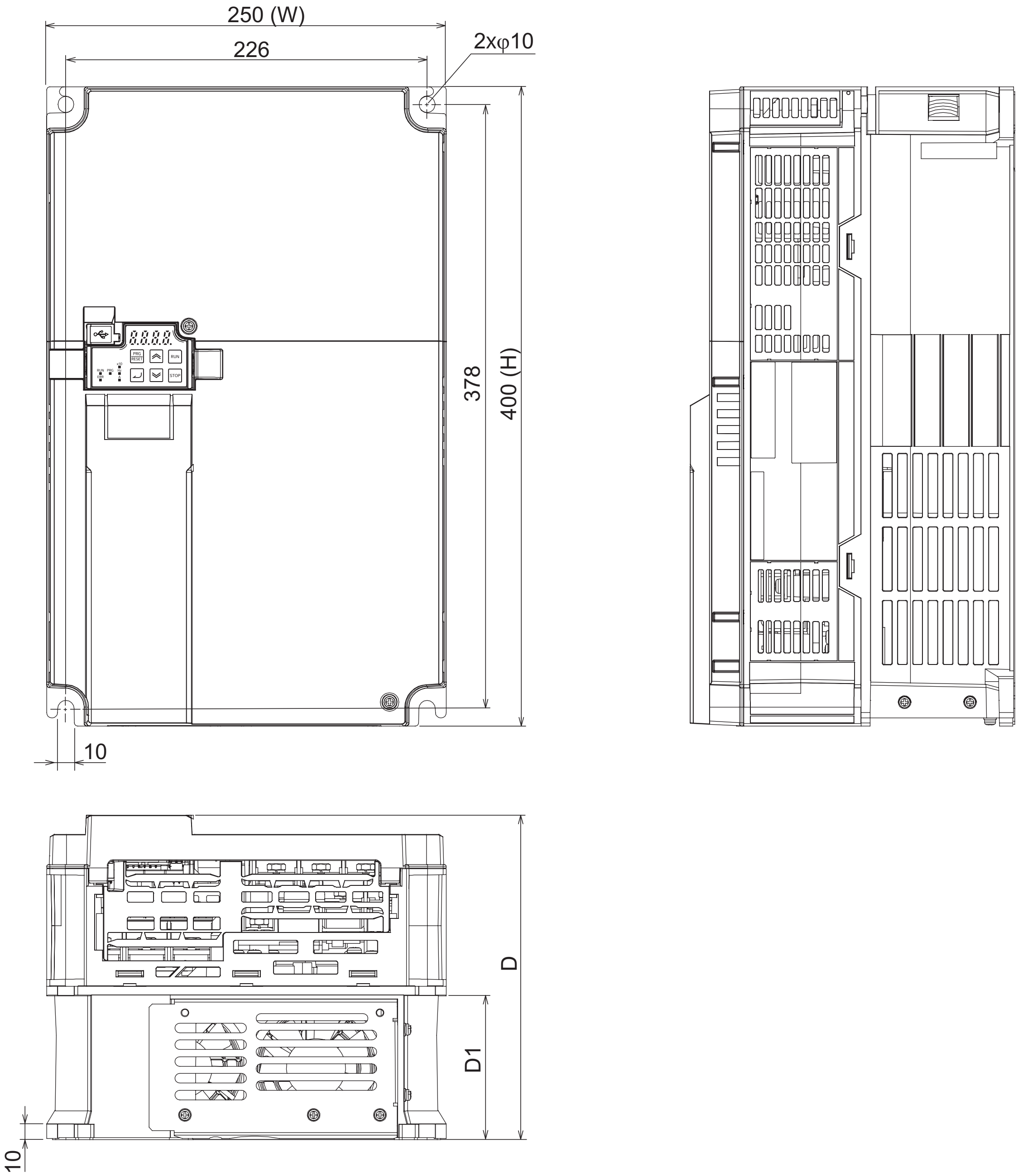




Power supply	Model	W [mm]	H [mm]	D [mm]	D1 [mm]
Single-phase 200 V	3G3M1-AB037				
Three-phase 200 V	3G3M1-A2055 3G3M1-A2075	180	220	171	87.7
Three-phase 400 V	3G3M1-A4055 3G3M1-A4075				



Power supply	Model	W [mm]	H [mm]	D [mm]	D1 [mm]
Three-phase 200 V	3G3M1-A2110 3G3M1-A2150	220	260	203	90
Three-phase 400 V	3G3M1-A4110 3G3M1-A4150				



Power supply	Model	W [mm]	H [mm]	D [mm]	D1 [mm]
Three-phase 200 V	3G3M1-A2185	250	400	203	90
Three-phase 400 V	3G3M1-A4185 3G3M1-A4220				

1-4 Restrictions

Availability of Functions by Individual Control Method

Available functions are restricted depending on the selected control method.
“15:PM Vector control without speed and pole position sensor” and “16:PM Vector control with speed and pole position sensor” can be set to only 1st motor control.

Function name	1st Drive Control Selection(F42)/2nd Drive Control Selection(A14)							
	0: IM V/f control	1: IM Dynamic torque vector control	3: IM V/f control with speed sensor	4: IM Dynamic torque vector control with speed sensor	5: IM Vector control without speed sensor	6: IM Vector control with speed sensor	15: PM Vector control without speed and pole position sensor	16: PM Vector control with speed and pole position sensor
Torque boost manual adjustment	Available	Not available	Available	Available	Not available	Not available	Not available	Not available
Invalidation of automatic voltage control (AVR)	Available	Not available	Available	Available	Not available	Not available	Not available	Not available
Energy-saving operation mode	Available	Available	Available	Available	Not available	Available	Not available	Not available
Motor sound (Tone)	Not available	Not available	Not available	Not available	Available	Available	Available	Available
Invalidation of slip compensation	Available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
DC injection braking	Available	Available	Available	Available	Available	Available	Not available	Not available

Function name	1st Drive Control Selection(F42)/2nd Drive Control Selection(A14)							
	0: IM V/f control	1: IM Dynamic torque vector control	3: IM V/f control with speed sensor	4: IM Dynamic torque vector control with speed sensor	5: IM Vector control without speed sensor	6: IM Vector control with speed sensor	15: PM Vector control without speed and pole position sensor	16: PM Vector control with speed and pole position sensor
Startup DC injection braking	Available	Available	Available	Available	Not available	Not available	Not available	Not available
Frequency pull-in restart	Available	Available	Not available	Not available	Available	Not available	Not available	Not available
Current limiter, instantaneous overcurrent limiting	Available	Available	Available	Available	Not available	Not available	Not available	Not available
Torque limit	Available	Available	Available	Available	Available	Available	Available	Available
Torque control	Not available	Not available	Not available	Not available	Available	Available	Not available	Available
Torque bias	Not available	Not available	Not available	Not available	Available	Available	Available	Available
Automatic speed control (ASR), Notch filter	Not available	Not available	Not available	Not available	Available	Available	Available	Available
Zero speed control	Not available	Not available	Not available	Not available	Available	Available	Not available	Available
Servo lock	Not available	Not available	Not available	Not available	Not available	Available	Not available	Available
Deceleration characteristics (heavy brake)	Available	Available	Available	Available	Not available	Available	Not available	Not available

Function name	1st Drive Control Selection(F42)/2nd Drive Control Selection(A14)							
	0: IM V/f control	1: IM Dynamic torque vector control	3: IM V/f control with speed sensor	4: IM Dynamic torque vector control with speed sensor	5: IM Vector control without speed sensor	6: IM Vector control with speed sensor	15: PM Vector control without speed and pole position sensor	16: PM Vector control with speed and pole position sensor
Pre-excitation	Not available	Not available	Not available	Not available	Available	Available	Not available	Not available
Overload stop (contact stop)	Available	Available	Available	Available	Not available	Not available	Not available	Not available
Second control switch	Available	Available	Available	Available	Available	Available	Not available	Not available
Brake control	Available	Available	Available	Available	Available	Available	Not available	Available

Carrier Frequency Setting and Derating of Rated Output Current

Derating of the rated output current of the inverter may be required when a high carrier frequency is set, depending on the heavy/light load mode selection and operating temperature.
Use the inverter in an appropriate environment according to *A-1 Derating Table* on page A-2.

2

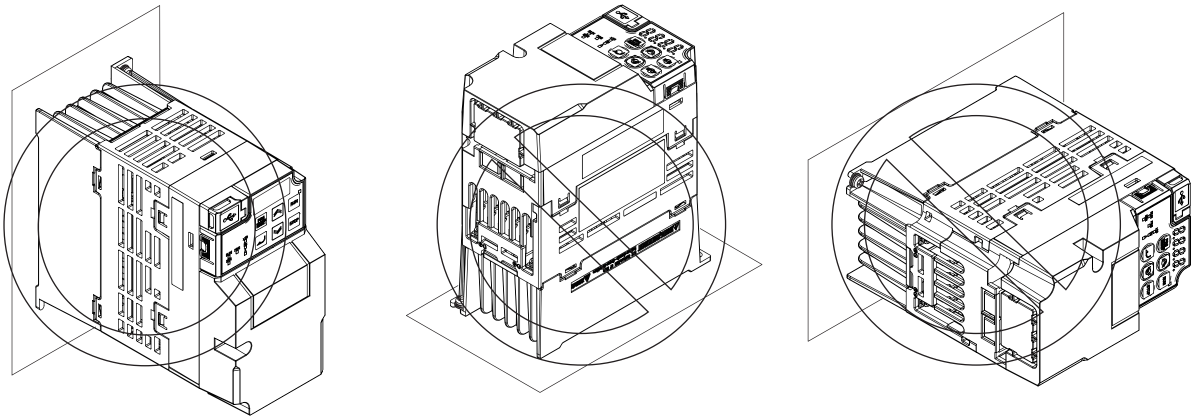
Design

This section describes the installation environment and wiring methods.

2-1 Installation

2-1-1 Inverter Installation

Mount the 3G3M1 Series Inverter vertically on a wall with the product's longer sides upright so the model can be read correctly.
The material of the wall must be inflammable and capable of bearing weight such as a metal plate.



For the mounting dimensions, refer to *1-3-2 External Dimensions* on page 1-18.

2-1-2 Installation Environment

Operating Environment Conditions

Install the inverter in a location that meets the following conditions.

Operating ambient temperature	Operating ambient humidity
−10 to 50°C	5% to 95% (with no condensation)

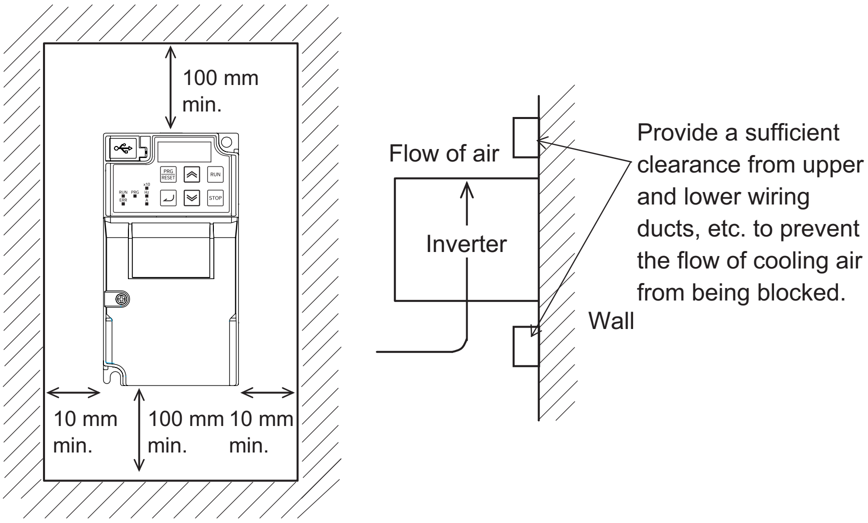
- Measure and check the ambient temperature at a point approx. 1 cm away from the center bottom of the inverter.
- For side-by-side installation, derating of the rated output current of the inverter may be required even at an ambient temperature of 40°C or lower.
- The inverter life (in particular, capacitor life) will be significantly shortened if the inverter is used at a higher ambient temperature.
- Do not install the inverter in hot and humid locations subject to condensation.
- Avoid installing the inverter in a dirty environment subject to oil mist, dust, or other airborne particles. Install the inverter in a clean place, or in a full-enclosure type panel.
- Take measures during installation and operation to prevent foreign objects such as metal particles, oil, and water from entering the inverter.
- Do not install the inverter in locations subject to direct sunlight.
- Do not install the inverter in locations subject to corrosive or flammable gases.

Installation Conditions

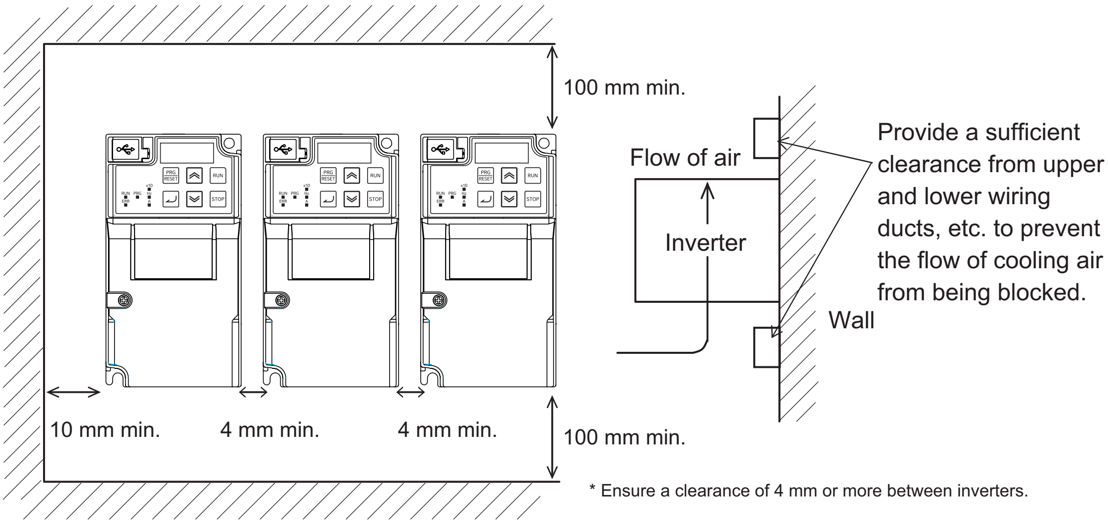
Keep the inverter clear of heating elements such as a braking resistor or reactor.

If the inverter is installed in a control panel, take into consideration dimensions and ventilation to keep the ambient temperature within the range of the specifications.
To allow heat dispersion from inside the inverter (approx. 150°C or lower), provide the clearance specified in the figure below during installation.

● Standard installation



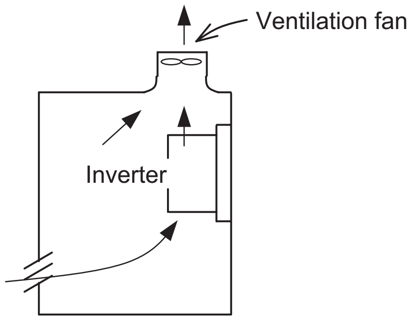
● Side-by-side installation



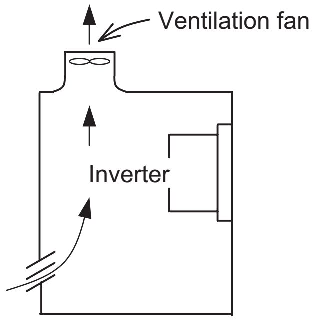
* Ensure a clearance of 4 mm or more between inverters.

Ambient Temperature Control

To ensure reliable operation, use the inverter in an environment subject to minimal temperature rise as much as possible.
If you install a ventilation fan in a control panel where several inverters are installed, be careful about the layout of the inverters and the air intake and ventilation apertures.
Remember that poor air circulation around inverters causes an internal temperature rise, which may inversely affect the internal components of the inverters.



(Correct example)



(Incorrect example)

Entry of Foreign Objects during Installation

Place a cover over the inverter or take other preventative measures to prevent foreign objects, such as drill filings, from entering the inverter during installation.
Be sure to remove the cover after installation is complete. Using the inverter with the cover placed results in poor ventilation, which causes the inverter to overheat.

2-2 Removal of Each Part

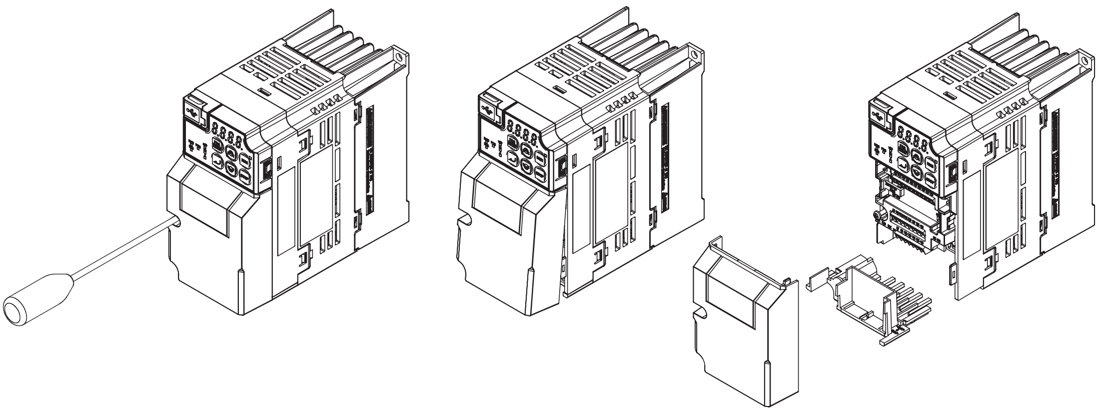
2-2-1 Removing Covers

Before wiring each terminal block, you need to remove the surface cover (terminal block cover and the backing plate).
This section describes how to remove these covers.

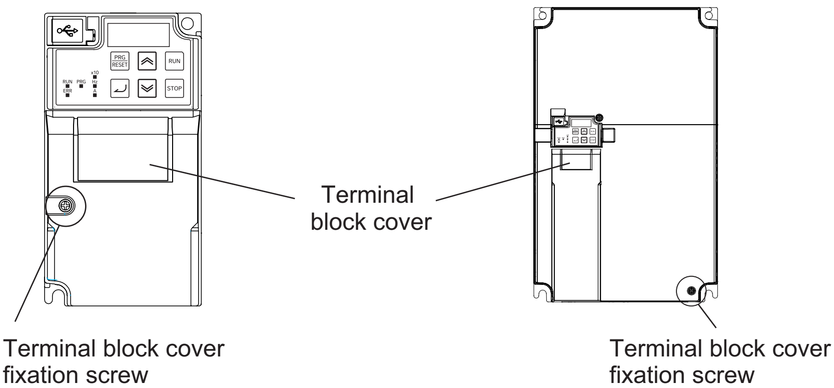
Removing Terminal Block Cover

1 Loosen the terminal block cover fixation screw(s).

2 Remove the terminal block cover from the bottom.



You can find one terminal block cover fixation screw at left center for inverters with a capacity of 0.75 kW or lower, center for inverters with a capacity of 1.5 to 15 kW, and bottom right for inverters with a capacity of 18.5 kW or higher.

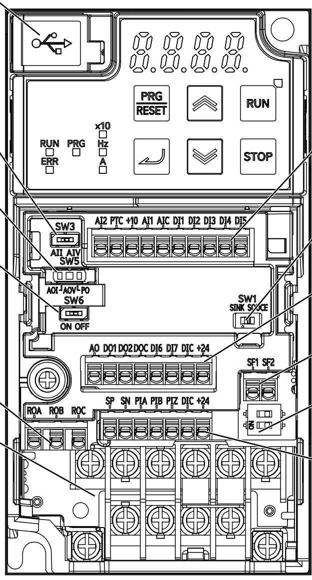


Installing Terminal Block Cover

To install the terminal block cover, reverse the removal procedure.
Install the terminal block cover on the inverter from the top and press it until you here a click.
Tighten the terminal block cover fixing screws with the tightening torque of 0.3 Nm.

2-2-2 Terminal Blocks

Removing the terminal block cover and each connector cover reveals terminal blocks, connectors, and switches arranged as shown below.



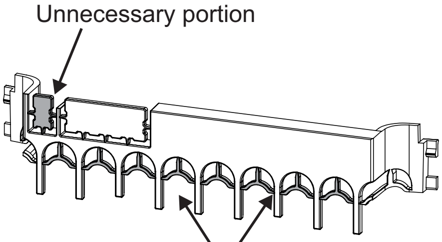
Name	Description
Digital input sink/source selector switch (SW1)	The switch for switching which of sink or source the digital input terminals DI1 to DI7 are to be used for. (Factory default setting is SINK side)
Analog input selector switch (SW3)	The switch for switching the input type of terminal AI2. (Factory default setting is AII side) When set to the AII side, input becomes analog current input. When set to the AIV side, input becomes analog voltage input.
Analog output selector switch (SW5)	The switch for switching the output type of terminal AO. (Factory default setting is AOV side) When set to the AOI side, output becomes analog current output. When set to the AOV side, output becomes analog voltage output. When set to the PO side, output becomes pulse output.
Terminating resistor selector switch (SW6)	The switch for switching ON/OFF the RS-485 terminal on the control circuit terminal block. When ON, the terminal is connected to the built-in 110-Ω terminating resistor. (Factory default setting is OFF side)
Safety function selector switch (SW9)	Turn this switch OFF to use the safety function. Before you turn ON/OFF this switch, be sure to turn off the power supply. For details, refer to *7-6 Safety Function* on page 7-68. (Factory default setting is ON side (safety function disabled))
USB connector	The Micro-B type USB connector for connecting a computer. Use this connector to connect the inverter to the Inverter/Servo support tool Sysmac Studio.
Control circuit terminal block A, B, C	The terminal block for connecting various digital/analog I/O devices used for inverter control.
Safety input terminal block	The terminal block for connecting the safety input signal.
Relay output terminal block	The SPDT contact terminal block for relay output.
Main circuit terminal block	The terminal block for connecting the main power supply for the inverter, outputs to the motor, braking resistor, etc.

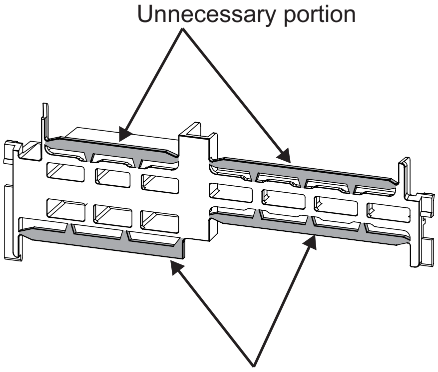
Note For the description of the data display and operation keys, refer to *Section 3 Operation and Test Run* on page 3-1.

2-2-3 Preparing Backing Plate

On some models, sometimes there is not enough space for wiring the main circuit. If this happens, before wiring, cut off the connecting points between the backing plate and unnecessary portions with nippers or a wire cutter.

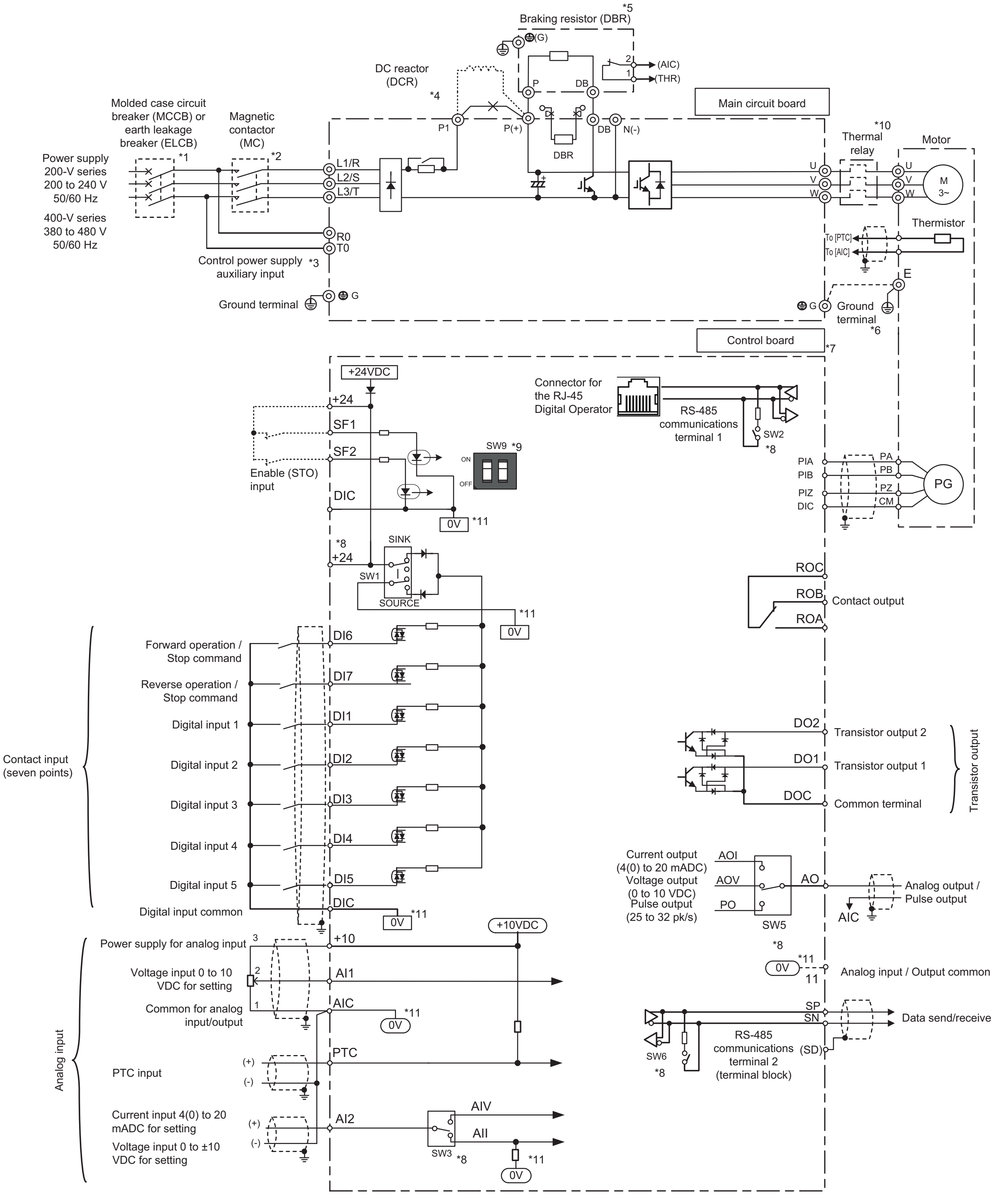
Note that IP20 protection is no longer ensured when using the product with backing plate removed.





2-3 Wiring

2-3-1 Standard Connection Diagram



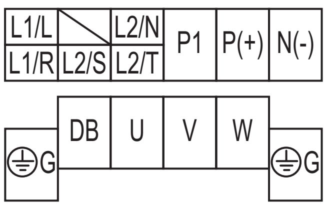
*1. To protect the wiring, install a molded case circuit breaker (MCCB) or earth leakage circuit breaker (ELCB) (with overcurrent protection function) recommended for each inverter on the inverter input side (primary side). Do not use circuit breakers whose rated current exceeds recommended values.

*2. The molded case circuit breaker and earth leakage circuit breaker are also used for insulation from the inverter's power supply. For this reason, install a magnetic contactor (MC) recommended for each inverter as required. When installing a magnetic contactor and solenoid or other coil near an inverter, connect surge absorbers in parallel.
*3. To enable a batch alarm signal when the protection function is activated even if the main power supply of the inverter is cut off or to display the Digital Operator at all times, connect these terminals to the power supply. (3G3M1-A2185 or later or 3G3M1-A4185 or later products) The inverter operates even when these terminals are not connected to the power supply.
*4. When connecting the optional DC reactor (DCR), remove the short-circuit bar between the main circuit terminals P1 and P(+) of the inverter before connecting.
When the capacity of the power transformer is 500 kVA or more and 10 times or more than the rated capacity of the inverter, or when a thyristor load is connected, use a DC reactor (DCR).
*5. As a transistor for braking is built into the inverter, the braking resistor can be directly connected between P(+) and DB.
*6. The terminal for grounding the motor. Connect this terminal, as required.
*7. Use twisted wire or shield wire for the control signal wire.
Generally, shield wire is grounded. However, when inductive noise from an external source is large, the influence of noise can sometimes be suppressed by connecting the shield wire to a DIC. Separate control signal wire as far as possible (at least 10 cm is recommended) from the wiring of the main circuit, and do not pass control signal wire through the same wiring duct. When wires cross, be sure to cross them so that they are almost vertical to the wiring of the main circuit.
*8. This switch on the printed circuit board is for specifying the operation setting of the inverter. For details, refer to *2-2-2 Terminal Blocks* on page 2-6.
*9. Safety function terminals SF1 and SF2 are disabled at SW9 (double-pole switch) on the printed circuit board before shipment from the factory. When using the SF1 and SF2 terminal functions, be sure to turn each SW9 switch OFF before connecting to these terminals.
*10. Cut off the molded case circuit breaker (MCCB) or magnetic contactor (MC) at the auxiliary contact (manual reset) of the thermal relay.
*11. $\boxed{0V}$ and (0V) are separated and insulated.

2-3-2 Arrangement and Function of Main Circuit Terminal Block

The table below shows the arrangement of the main circuit terminal block and description of each terminal.

Main Circuit Terminal Block



The terminal arrangement shown on the left is an example for the inverters with a capacity of 0.75 kW or lower.

Terminal symbol		Terminal name	Description
L1/R	L1/L	Main power supply input terminal	Connect the AC input power supply. For single-phase 200-V type Inverters (3G3M1-AB□□□), connect these to the L1/L and L2/N terminals, respectively.
L2/S			
L3/T	L2/N		
U		Inverter output terminal	Connect a three-phase motor.
V			
W			

Terminal symbol	Terminal name	Description
P1 P(+)	DC reactor connection terminal	Remove the short-circuit bar between the terminals P1 and P(+), and connect an optional DC reactor.
P(+) DB	Braking resistor connection terminal	Connect an optional braking resistor (if a braking torque is required).
P(+) N(-)	Regenerative braking unit connection terminal	Connect optional regenerative braking units (if a braking torque is required and that produced by the built-in braking circuit is insufficient).
R0, T0	Control power supply auxiliary input	To hold a batch alarm signal when the protection function is activated even if the main power supply of the inverter is cut off or to display the Digital Operator at all times, connect these terminals to the power supply (at a capacity of 1.85 kW or more, for details, refer to *2-3-4 Wiring for Main Circuit Terminals* on page 2-13).
G ⏚	Ground terminal	This is the ground terminal. Connect this terminal to the ground. 200-V class should be connected under type-D grounding conditions; 400-V class should be connected under type-C grounding conditions.

2-3-3 Arrangement and Function of Control Circuit Terminal Block

The table below shows the arrangement of the control circuit terminal block, and description and specifications of each terminal.

Control Circuit Terminal Block

AI2	PTC	+10	AI1	AIC	DI1	DI2	DI3	DI4	DI5

AO	DO1	DO2	DOC	DI6	DI7	DIC	+24

ROA	ROB	ROC

SP	SN	PIA	PIB	PIZ	DIC	+24

SF1	SF2

Item		Terminal symbol		Terminal name	Description	Specifications
Analog	Input	+10		Power supply for analog input	This is a 10 VDC power supply for the AI1 terminal.	Maximum allowable current: 10 mA
		AI1		Analog voltage input	This is a -10 to 10 VDC analog voltage input.	Input impedance: 22 kΩ Allowable input voltage range: -15 to 10 VDC
		AI2	(AII)	Analog current input	This is a 4 to 20 mA DC analog current input.	Input impedance: 250 Ω Allowable input range: 0 to 30 mA
			(AIV)	Analog voltage input	This is a 0 to 10 VDC analog voltage input.	Input impedance: 22 kΩ Allowable input voltage range: -15 to 10 VDC
		AIC		Analog input common	Common terminal for the analog input.	
		PTC		External thermistor input	Connect an external thermistor between the PTC and the AIC, and when an abnormal temperature is reached, an inverter trip is generated. (Set the inverter trip level at parameter H27.)	PTC type
	Output	AO	(AOV)	Multi-function analog output (Voltage)	This terminal can output the specified signal as a 0 to 10 VDC voltage signal.	Input impedance: Approx. 5 kΩ
			(AOI)	Multi-function analog output (Current)	This terminal can output the specified signal as a 4 to 20 mA current signal.	Input impedance: Approx. 500 Ω
			(PO)	Multi-function analog output (Pulse output)	Output a pulse.	Output pulse: 32 kHz max. Output voltage: 11 VDC Allowable current: 2 mA max.

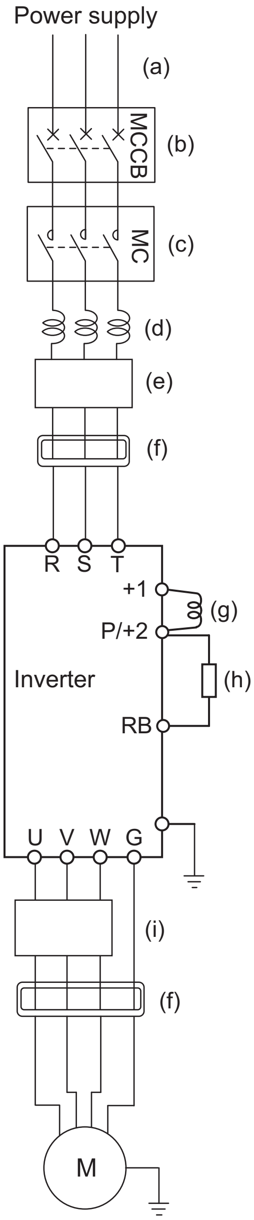
Item			Terminal symbol	Terminal name	Description	Specifications
Digital	Power supply		DIC	Input signal common	Common terminal for the digital input.	
	Input	Contact	DI1 DI2 DI3 DI4 DI5 DI6 DI7	Multifunction input terminal	Select 7 functions from among 101 functions, and allocate them to terminals DI1 to DI7. These terminals support both the sink logic and the source logic. For details on the connection, refer to *Multifunction Input Terminals and Programmable Controller Connection* on page 2-51.	Voltage between each input terminal and the terminal DIC ON voltage: 20 V min. OFF voltage: 2 V max. Allowable voltage: 27 VDC max. Load current (DI1, DI2): 2.5 to 16 mA (at 27 V) Load current (DI3 to DI7): 2.5 to 5 mA (at 27 V) Internal resistance: 5.4 kΩ
			SF1 SF2	Safety input	Turn ON the Safety Function Selector Switch to enable this terminal. SF1 (Safety input 1) SF2 (Safety input 2)	Voltage between each input terminal and the terminal DIC ON voltage: 20 V min. OFF voltage: 2 V max. Allowable voltage: 27 VDC max. Load current: 2.5 to 5 mA (at 27 V) Internal resistance: 6.6 kΩ
		Pulse	PIA PIB PIZ	Pulse input	This is pulse input for frequency setting. This terminal accepts 5 to 24 VDC input signals.	Input pulse: 32 kHz max. Internal resistance: 7.2 kΩ Voltage between input and DIC: 5 to 24 VDC ON voltage: 4 V min. OFF voltage: 2 V max. Allowable voltage: 27 VDC max.
	Output	Open collector	+24	Power supply terminal for output signal	This is a 24 VDC power supply for the output signal.	Allowable current: 100 mA max.
			DOC	Output signal common	Common terminal for multifunction output terminals DO1 and DO2.	Allowable current: 100 mA max.
			DO1 DO2	Multifunction output terminal	Select 2 functions from among 92 functions, and allocate them to terminals DO1 and DO2. These terminals support both the sink logic and the source logic. For details on the connection, refer to *Multifunction Output Terminals and Programmable Controller Connection* on page 2-52.	Open collector output Between each terminal and DOC Allowable voltage: 48 VDC max. Allowable current: 50 mA max. Voltage drop at power-on: 4 V max.

Item	Terminal symbol	Terminal name	Description	Specifications
Serial communications	SP SN	Modbus terminal (RS-485)	RS-485 terminal SP RS-485 differential (+) signal SN RS-485 differential (−) signal	Speed: 115.2 kbps max. Cable length: 500 m max. Built-in terminating resistor: 110 Ω Switching via slide switch
Multi-function relay output	ROA ROB ROC	Relay output terminal Relay output common	Select the desired function from among 92 functions, and allocate it to these terminals. This is SPDT contact output. Factory default values are NO contact between ROA-ROC and NC contact between ROB-ROC.	250 VAC, 0.3 A, cosφ=0.3/48 VDC, 0.5 A

2-3-4 Wiring for Main Circuit Terminals

Main Circuit Configuration Diagram

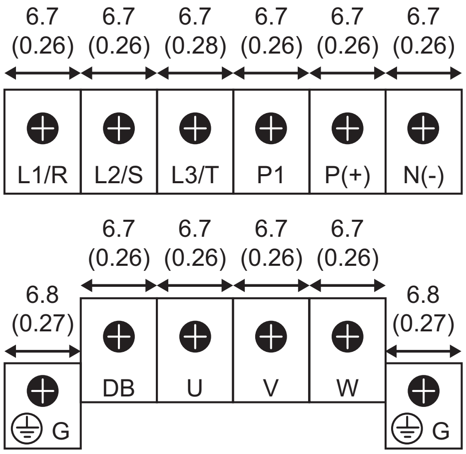
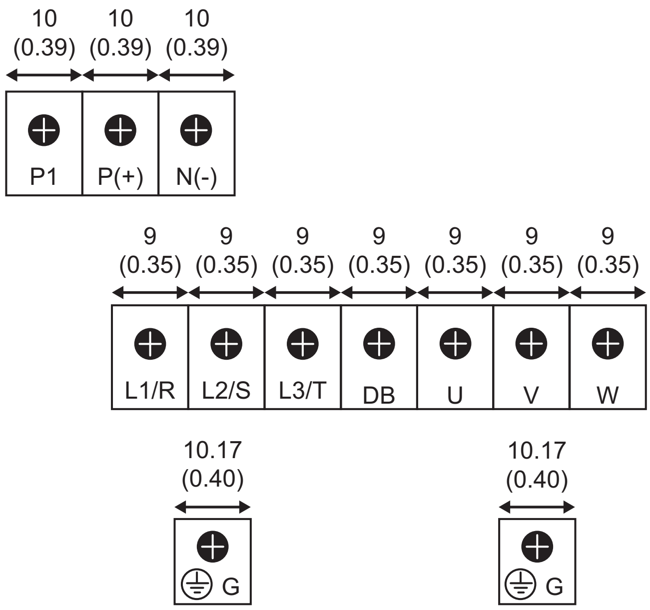
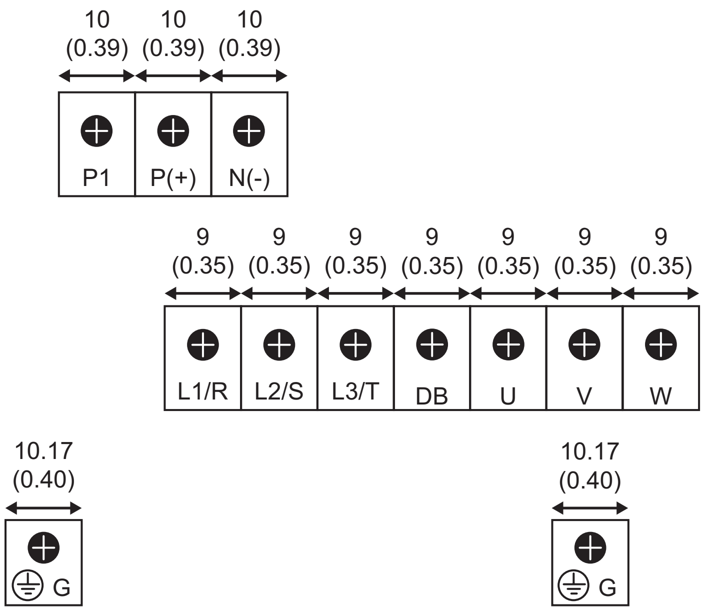
The diagram below shows the configuration of the inverter main circuit. The function of each peripheral component is also described.

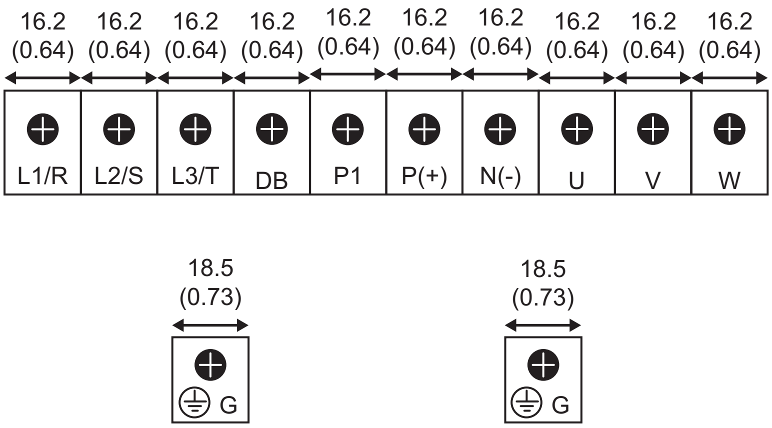
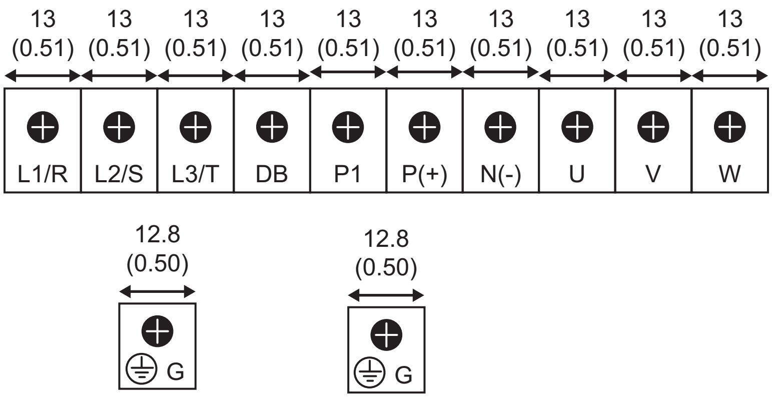
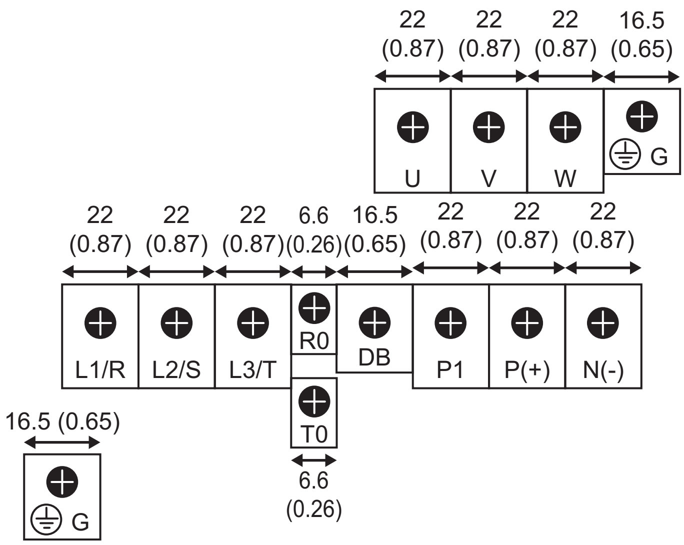


Name	Function
(a) (b) (c)	Refer to *Recommended Cable Size, Wiring Device, and Crimp Terminal* on page 2-16.
(d) AC reactor	This is used as a harmonic suppression measure. It also helps improve the power factor. The AC reactor is used when the power supply voltage unbalance factor is 3% or more, the inverter capacity is 500 kVA or more, or rapid change in the power supply voltage occurs to reduce its effect.
(e) Input noise filter	This filter reduces the conductive noise generated in the inverter and transmitted via wires. Connect it to the primary side (input side) of the inverter.
(f) Radio noise filter	The inverter in operation may cause noise through the power supply wiring etc., which could affect radio receivers or other equipment nearby. This filter reduces such noise (radiated noise).
(g) DC reactor	This reactor helps suppress harmonics generated by the inverter.
(h) Braking resistor	These increase the amount of regenerative energy absorption when the inverter applies motor braking and are used to decrease the speed of an elevator or load with a large moment of inertia. All models of the 3G3M1 Series Inverter have built-in regenerative braking processing circuit. The regenerative braking unit is necessary only if a large braking torque is required and the built-in regenerative braking processing circuit cannot allow it.
(j) Output noise filter	This filter is installed between the inverter and the motor to reduce the radiated noise emitted from cables. It is used to reduce radio and television interference and prevent meter and sensor malfunction.

Arrangement of Main Circuit Terminals

The arrangement of terminals on the inverter main circuit terminal block is shown below.

Applicable model	Terminal arrangement
3G3M1-AB001/ AB002/AB004/AB007 3G3M1-A2001/ A2002/A2004/A2007	 (For single-phase class, connect L1/L to L1/R and L2/N to L3/T.)
3G3M1-AB015 3G3M1-A2015/A2022 3G3M1-A4004/ A4007/A4015/A4022	 (For single-phase class, connect L1/L to L1/R and L2/N to L3/T.)
3G3M1-AB022 3G3M1-A2037 3G3M1-A4030/A4040	 (For single-phase class, connect L1/L to L1/R and L2/N to L3/T.)

Applicable model	Terminal arrangement
3G3M1-AB037 3G3M1-A2055/A2075 3G3M1-A4055/A4075	 (For single-phase class, connect L1/L to L1/R and L2/N to L3/T.)
3G3M1-A2110/A2150 3G3M1-A4110/A4150	
3G3M1-A2185 3G3M1-A4185/A4220	

Recommended Cable Size, Wiring Device, and Crimp Terminal

For inverter wiring, crimp terminal, and terminal screw tightening torque, refer to the table below.

- Each table shows an example of connecting the standard three-phase motor with four poles to an inverter.
- For the molded case circuit breaker (MCCB), select an appropriate product in consideration of the breaking capacity.

- For compliance with the UL standard requirements, be sure to perform wiring according to *2-4-3 UL/cUL Standards Cautions* on page 2-74, which includes the use of UL-compliant specified fuses and specified wiring materials.
- Tighten the terminal block screws with the specified torque. Weak tightening may result in a short-circuiting accident or fire. Conversely, overtightening these screws may cause damage to the terminal block or the inverter.

● Three-phase 200-V class (Panel internal temperature 50°C or less)

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	0.6	2.0	2.0	2.0	1.1
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	0.9	2.0	2.0	2.0	1.8
-	3G3M1-A2002	0.4	2.0	2.0	2.0	1.6	2.0	2.0	2.0	2.6
3G3M1-A2004	-		2.0	2.0	2.0	1.6	2.0	2.0	2.0	3.1
-	3G3M1-A2004	0.75	2.0	2.0	2.0	3.0	2.0	2.0	2.0	4.9
3G3M1-A2007	-		2.0	2.0	2.0	3.0	2.0	2.0	2.0	5.3
-	3G3M1-A2007	1.1	2.0	2.0	2.0	4.3	2.0	2.0	2.0	6.7
3G3M1-A2015	-	1.5	2.0	2.0	2.0	5.7	2.0	2.0	2.0	9.5
-	3G3M1-A2015	2.2	2.0	2.0	2.0	8.3	2.0	2.0	2.0	12.8
3G3M1-A2022	-		2.0	2.0	2.0	8.3	2.0	2.0	2.0	13.2
-	3G3M1-A2022	3	2.0	2.0	2.0	11.7	3.5	2.0	2.0	17.9
3G3M1-A2037	-	3.7	2.0	2.0	2.0	14.0	5.5	2.0	2.0	22.2
-	3G3M1-A2037	5.5	3.5	2.0	2.0	19.9	8.0	3.5	2.0	28.5
3G3M1-A2055	-		5.5	2.0	2.0	21.1	8.0	3.5	3.5	31.5
3G3M1-A2075	3G3M1-A2055	7.5	8.0	3.5	2.0	28.8	14.0	5.5	5.5	42.7
3G3M1-A2110	3G3M1-A2075	11	14.0	5.5	5.5	42.2	22.1	14.0	8.0	60.7
3G3M1-A2150	3G3M1-A2110	15	22.0	14.0	8.0	57.6	38.0	14.0	14.0	80.0
3G3M1-A2220	3G3M1-A2150	18.5	38.0[*1]	14.0	14.0	71.0	60.0[*2]	22.0	14.0	97.0
-	3G3M1-A2220	22	38.0[*1]	22.0	14.0	84.4	60.0[*2]	38.0[*1]	22.0	112.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	1.0	-	-	-	-
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	1.6	2.0	2.0	2.0	1.3

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
-	3G3M1-A2002	0.4	-	-	-	-	2.0	2.0	2.0	2.0
3G3M1-A2004	-		2.0	2.0	2.0	3.0	-	-	-	-
-	3G3M1-A2004	0.75	-	-	-	-	2.0	2.0	2.0	3.5
3G3M1-A2007	-		2.0	2.0	2.0	5.0	-	-	-	-
-	3G3M1-A2007	1.1	-	-	-	-	2.0	2.0	2.0	6.0
3G3M1-A2015	-	1.5	2.0	2.0	2.0	8.0	-	-	-	-
-	3G3M1-A2015	2.2	-	-	-	-	2.0	2.0	2.0	9.6
3G3M1-A2022	-		2.0	2.0	2.0	11.0	-	-	-	-
-	3G3M1-A2022	3	-	-	-	-	2.0	2.0	2.0	12.0
3G3M1-A2037	-	3.7	3.5	2.0	2.0	17.5	-	-	-	-
-	3G3M1-A2037	5.5	-	-	-	-	3.5	2.0	2.0	19.6
3G3M1-A2055	-		5.5	3.5	2.0	25.0	-	-	-	-
3G3M1-A2075	3G3M1-A2055	7.5	8.0	3.5	3.5	33.0	8.0	3.5	2.0	30.0
3G3M1-A2110	3G3M1-A2075	11	14.0	8.0	5.5	47.0	14.0	5.5	3.5	40.0
3G3M1-A2150	3G3M1-A2110	15	22.0	14.0	8.0	60.0	22.0	14.0	5.5	56.0
3G3M1-A2220	3G3M1-A2150	18.5	38.0[*1]	14.0	14.0	76.0	38.0[*1]	14.0	8.0	69.0
-	3G3M1-A2220	22	-	-	-	-	38.0[*1]	22.0	14.0	88.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	0.7
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	1.1
-	3G3M1-A2002	0.4	2.0	2.0	2.0	2.0
3G3M1-A2004	-		2.0	2.0	2.0	2.0
-	3G3M1-A2004	0.75	2.0	2.0	2.0	3.7
3G3M1-A2007	-		2.0	2.0	2.0	3.7
-	3G3M1-A2007	1.1	2.0	2.0	2.0	5.3
3G3M1-A2015	-	1.5	2.0	2.0	2.0	7.0
-	3G3M1-A2015	2.2	2.0	2.0	2.0	10.2
3G3M1-A2022	-		2.0	2.0	2.0	10.2
-	3G3M1-A2022	3	2.0	2.0	2.0	14.3
3G3M1-A2037	-	3.7	3.5	2.0	2.0	17.1
-	3G3M1-A2037	5.5	5.5	3.5	2.0	24.4
3G3M1-A2055	-		5.5	3.5	2.0	25.8

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A2075	3G3M1-A2055	7.5	14.0	5.5	3.5	35.3
3G3M1-A2110	3G3M1-A2075	11	22.0	8.0	5.5	51.7
3G3M1-A2150	3G3M1-A2110	15	38.0	14.0	14.0	70.5
3G3M1-A2220	3G3M1-A2150	18.5	38.0*1	22.0	14.0	87.0
-	3G3M1-A2220	22	60.0*2	22.0	22.0	103.4

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	0.3	-	-	-	-
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	0.4	2.0	2.0	2.0	0.3
-	3G3M1-A2002	0.4	-	-	-	-	2.0	2.0	2.0	0.4
3G3M1-A2004	-		2.0	2.0	2.0	0.5	-	-	-	-
-	3G3M1-A2004	0.75	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-A2007	-		2.0	2.0	2.0	0.7	-	-	-	-
-	3G3M1-A2007	1.1	-	-	-	-	2.0	2.0	2.0	0.8
3G3M1-A2015	-	1.5	2.0	2.0	2.0	1.4	-	-	-	-
-	3G3M1-A2015	2.2	-	-	-	-	2.0	2.0	2.0	1.5
3G3M1-A2022	-		2.0	2.0	2.0	1.7	-	-	-	-
-	3G3M1-A2022	3	-	-	-	-	2.0	2.0	2.0	1.7
3G3M1-A2037	-	3.7	2.0	2.0	2.0	2.4	-	-	-	-
-	3G3M1-A2037	5.5	-	-	-	-	2.0	2.0	2.0	2.5
3G3M1-A2055	-		2.0	2.0	2.0	3.8	-	-	-	-
3G3M1-A2075	3G3M1-A2055	7.5	2.0	2.0	2.0	5.0	2.0	2.0	2.0	3.8
3G3M1-A2110	3G3M1-A2075	11	2.0	2.0	2.0	7.5	2.0	2.0	2.0	5.3
3G3M1-A2150	3G3M1-A2110	15	2.0	2.0	2.0	9.4	2.0	2.0	2.0	7.5
3G3M1-A2220	3G3M1-A2150	18.5	2.0	2.0	2.0	12.7	2.0	2.0	2.0	9.0
-	3G3M1-A2220	22	2.0	2.0	2.0	13.8	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
3G3M1-A2001	-	0.1	2.0	2.0	2.0
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0
-	3G3M1-A2002	0.4	2.0	2.0	2.0
3G3M1-A2004	-		2.0	2.0	2.0
-	3G3M1-A2004	0.75	2.0	2.0	2.0
3G3M1-A2007	-		2.0	2.0	2.0
-	3G3M1-A2007	1.1	2.0	2.0	2.0
3G3M1-A2015	-	1.5	2.0	2.0	2.0
-	3G3M1-A2015	2.2	2.0	2.0	2.0
3G3M1-A2022	-		2.0	2.0	2.0
-	3G3M1-A2022	3	2.0	2.0	2.0
3G3M1-A2037	-	3.7	2.0	2.0	2.0
-	3G3M1-A2037	5.5	3.5	3.5	3.5
3G3M1-A2055	-		3.5	3.5	3.5
3G3M1-A2075	3G3M1-A2055	7.5	5.5	5.5	5.5
3G3M1-A2110	3G3M1-A2075	11	5.5	5.5	5.5
3G3M1-A2150	3G3M1-A2110	15	5.5	5.5	5.5
3G3M1-A2220	3G3M1-A2150	18.5	8.0	8.0	8.0
-	3G3M1-A2220	22	8.0	8.0	8.0

● Three-phase 400-V class (Panel internal temperature 50°C or less)

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor (DCR)			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	0.9	2.0	2.0	2.0	1.7
-	3G3M1-A4004	0.75	2.0	2.0	2.0	1.5	2.0	2.0	2.0	2.7
3G3M1-A4007	-		2.0	2.0	2.0	1.6	2.0	2.0	2.0	3.1
-	3G3M1-A4007	1.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	3.9
3G3M1-A4015	-	1.5	2.0	2.0	2.0	3.0	2.0	2.0	2.0	5.9
-	3G3M1-A4015	2.2	2.0	2.0	2.0	4.2	2.0	2.0	2.0	7.3
3G3M1-A4022	-		2.0	2.0	2.0	4.4	2.0	2.0	2.0	8.2
-	3G3M1-A4022	3	2.0	2.0	2.0	5.8	2.0	2.0	2.0	11.3
3G3M1-A4030	-									
-	3G3M1-A4030	3.7	2.0	2.0	2.0	7.3	2.0	2.0	2.0	13.0
3G3M1-A4040	-									

Model		Maxi-mum appli-cable motor ca-paci-ty [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor (DCR)			
HHD mode	HND mode		Allowable tempera-ture (Note 1)			Cur-rent value [A]	Allowable tempera-ture (Note 1)			Cur-rent value [A]
			60°C	75°C	90°C		60°C	75°C	90°C	
-	3G3M1-A4040	5.5	2.0	2.0	2.0	10.1	3.5	2.0	2.0	16.8
3G3M1-A4055	-		2.0	2.0	2.0	10.6	3.5	2.0	2.0	17.3
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0	14.4	5.5	2.0	2.0	23.2
3G3M1-A4110	3G3M1-A4075	11	5.5	2.0	2.0	21.1	8.0	3.5	3.5	33.0
3G3M1-A4150	3G3M1-A4110	15	8.0	3.5	2.0	28.8	14.0	5.5	5.5	43.8
3G3M1-A4185	3G3M1-A4150	18.5	14.0	5.5	3.5	35.5	22.0	8.0	5.5	52.3
3G3M1-A4220	3G3M1-A4185	22	14.0	5.5	5.5	42.2	22.0	14.0	8.0	60.6
-	3G3M1-A4220	30	22.0	14.0	8.0	57.0	38.0[*1]	14.0	14.0	77.9

Model		Maxi-mum appli-cable motor ca-paci-ty [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
HHD mode	HND mode		Allowable tempera-ture (Note 1)			Cur-rent value [A]	Allowable tempera-ture (Note 1)			Cur-rent value [A]
			60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	1.8	-	-	-	-
-	3G3M1-A4004	0.75	-	-	-	-	2.0	2.0	2.0	2.1
3G3M1-A4007	-		2.0	2.0	2.0	3.4	-	-	-	-
-	3G3M1-A4007	1.1	-	-	-	-	2.0	2.0	2.0	4.1
3G3M1-A4015	-	1.5	2.0	2.0	2.0	4.8	-	-	-	-
-	3G3M1-A4015	2.2	-	-	-	-	2.0	2.0	2.0	5.5
3G3M1-A4022	-		2.0	2.0	2.0	5.5	-	-	-	-
-	3G3M1-A4022	3	-	-	-	-	2.0	2.0	2.0	6.9
3G3M1-A4030	-									
-	3G3M1-A4030	3.7	2.0	2.0	2.0	9.2	-	-	-	-
3G3M1-A4040	-									
-	3G3M1-A4040	5.5	-	-	-	-	2.0	2.0	2.0	11.1
3G3M1-A4055	-		2.0	2.0	2.0	14.8	-	-	-	-
3G3M1-A4075	3G3M1-A4055	7.5	3.5	2.0	2.0	18.0	3.5	2.0	2.0	17.5
3G3M1-A4110	3G3M1-A4075	11	5.5	2.0	2.0	24.0	5.5	2.0	2.0	23.0
3G3M1-A4150	3G3M1-A4110	15	8.0	3.5	2.0	31.0	8.0	5.5	3.5	31.0
3G3M1-A4185	3G3M1-A4150	18.5	14.0	5.5	3.5	39.0	14.0	5.5	3.5	38.0
3G3M1-A4220	3G3M1-A4185	22	14.0	8.0	5.5	45.0	14.0	8.0	5.5	45.0
-	3G3M1-A4220	30	-	-	-	-	22.0	14.0	8.0	60.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	1.0
-	3G3M1-A4004	0.75	2.0	2.0	2.0	1.8
3G3M1-A4007	-		2.0	2.0	2.0	2.0
-	3G3M1-A4007	1.1	2.0	2.0	2.0	2.6
3G3M1-A4015	-	1.5	2.0	2.0	2.0	3.7
-	3G3M1-A4015	2.2	2.0	2.0	2.0	5.1
3G3M1-A4022	-		2.0	2.0	2.0	5.4
-	3G3M1-A4022	3	2.0	2.0	2.0	7.1
3G3M1-A4030	-					
-	3G3M1-A4030	3.7	2.0	2.0	2.0	8.9
3G3M1-A4040	-					
-	3G3M1-A4040	5.5	2.0	2.0	2.0	12.4
3G3M1-A4055	-		2.0	2.0	2.0	13.0
3G3M1-A4075	3G3M1-A4055	7.5	3.5	2.0	2.0	17.6
3G3M1-A4110	3G3M1-A4075	11	5.5	3.5	2.0	25.8
3G3M1-A4150	3G3M1-A4110	15	14.0	5.5	3.5	35.3
3G3M1-A4185	3G3M1-A4150	18.5	14.0	5.5	5.5	43.5
3G3M1-A4220	3G3M1-A4185	22	22.0	8.0	5.5	51.7
-	3G3M1-A4220	30	38.0*1	14.0	8.0	69.8

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	0.4	-	-	-	-
-	3G3M1-A4004	0.75	-	-	-	-	2.0	2.0	2.0	0.4
3G3M1-A4007	-		2.0	2.0	2.0	0.5	-	-	-	-
-	3G3M1-A4007	1.1	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-A4015	-	1.5	2.0	2.0	2.0	0.7	-	-	-	-
-	3G3M1-A4015	2.2	-	-	-	-	2.0	2.0	2.0	0.8
3G3M1-A4022	-		2.0	2.0	2.0	0.9	-	-	-	-
-	3G3M1-A4022	3	-	-	-	-	2.0	2.0	2.0	0.9
3G3M1-A4030	-									
-	3G3M1-A4030	3.7	2.0	2.0	2.0	1.2	-	-	-	-
3G3M1-A4040	-									

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
-	3G3M1-A4040	5.5	-	-	-	-	2.0	2.0	2.0	1.3
3G3M1-A4055	-		2.0	2.0	2.0	1.9	-	-	-	-
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0	2.5	2.0	2.0	2.0	1.9
3G3M1-A4110	3G3M1-A4075	11	2.0	2.0	2.0	3.8	2.0	2.0	2.0	2.7
3G3M1-A4150	3G3M1-A4110	15	2.0	2.0	2.0	4.7	2.0	2.0	2.0	3.8
3G3M1-A4185	3G3M1-A4150	18.5	2.0	2.0	2.0	6.5	2.0	2.0	2.0	4.5
3G3M1-A4220	3G3M1-A4185	22	2.0	2.0	2.0	7.1	2.0	2.0	2.0	6.2
-	3G3M1-A4220	30	-	-	-	-	2.0	2.0	2.0	7.2

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
3G3M1-A4004	-	0.4	2.0	2.0	2.0
-	3G3M1-A4004	0.75	2.0	2.0	2.0
3G3M1-A4007	-		2.0	2.0	2.0
-	3G3M1-A4007	1.1	2.0	2.0	2.0
3G3M1-A4015	-	1.5	2.0	2.0	2.0
-	3G3M1-A4015	2.2	2.0	2.0	2.0
3G3M1-A4022	-		2.0	2.0	2.0
-	3G3M1-A4022	3	2.0	2.0	2.0
3G3M1-A4030	-				
-	3G3M1-A4030	3.7	2.0	2.0	2.0
3G3M1-A4040	-				
-	3G3M1-A4040	5.5	2.0	2.0	2.0
3G3M1-A4055	-		2.0	2.0	2.0
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0
3G3M1-A4110	3G3M1-A4075	11	3.5	3.5	3.5
3G3M1-A4150	3G3M1-A4110	15	5.5	5.5	5.5
3G3M1-A4185	3G3M1-A4150	18.5	5.5	5.5	5.5
3G3M1-A4220	3G3M1-A4185	22	5.5	5.5	5.5
-	3G3M1-A4220	30	8.0	8.0	8.0

● Single-phase 200-V class (Panel internal temperature 50°C or less)

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor (DCR)			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	1.1	2.0	2.0	2.0	1.8
-	3G3M1-AB001	0.2	2.0	2.0	2.0	2.7	2.0	2.0	2.0	2.0
3G3M1-AB002	-		2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.3
-	3G3M1-AB002	0.4	2.0	2.0	2.0	3.7	2.0	2.0	2.0	3.6
3G3M1-AB004	-		2.0	2.0	2.0	3.5	2.0	2.0	2.0	5.4
-	3G3M1-AB004	0.55	2.0	2.0	2.0	4.6	2.0	2.0	2.0	7.3
3G3M1-AB007	-	0.75	2.0	2.0	2.0	6.4	2.0	2.0	2.0	9.7
-	3G3M1-AB007	1.1	2.0	2.0	2.0	9.4	2.0	2.0	2.0	13.8
3G3M1-AB015	-	1.5	2.0	2.0	2.0	11.6	3.5	2.0	2.0	16.4
-	3G3M1-AB015	2.2	3.5	2.0	2.0	17.9	3.5	2.0	2.0	20.2
3G3M1-AB022	-		3.5	2.0	2.0	17.5	5.5	2.0	2.0	22.0
-	3G3M1-AB022	3	5.5	3.5	2.0	25.0	5.5	2.0	2.0	24.0
3G3M1-AB037	-	3.7	8.0	3.5	3.5	31.8	14.0	8.0	5.5	45.4

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	1.0	-	-	-	-
-	3G3M1-AB001	0.2	-	-	-	-	2.0	2.0	2.0	1.2
3G3M1-AB002	-		2.0	2.0	2.0	1.6	-	-	-	-
-	3G3M1-AB002	0.4	-	-	-	-	2.0	2.0	2.0	1.9
3G3M1-AB004	-		2.0	2.0	2.0	3.0	-	-	-	-
-	3G3M1-AB004	0.55	-	-	-	-	2.0	2.0	2.0	3.5
3G3M1-AB007	-	0.75	2.0	2.0	2.0	5.0	-	-	-	-
-	3G3M1-AB007	1.1	-	-	-	-	2.0	2.0	2.0	6.0
3G3M1-AB015	-	1.5	2.0	2.0	2.0	8.0	-	-	-	-
-	3G3M1-AB015	2.2	-	-	-	-	2.0	2.0	2.0	9.6
3G3M1-AB022	-		2.0	2.0	2.0	11.0	-	-	-	-
-	3G3M1-AB022	3	-	-	-	-	2.0	2.0	2.0	12.0
3G3M1-AB037	-	3.7	3.5	2.0	2.0	17.5	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	1.3
-	3G3M1-AB001	0.2	2.0	2.0	2.0	2.7
3G3M1-AB002	-		2.0	2.0	2.0	2.4
-	3G3M1-AB002	0.4	2.0	2.0	2.0	4.5
3G3M1-AB004	-		2.0	2.0	2.0	4.3
-	3G3M1-AB004	0.55	2.0	2.0	2.0	5.6
3G3M1-AB007	-	0.75	2.0	2.0	2.0	7.8
-	3G3M1-AB007	1.1	2.0	2.0	2.0	11.5
3G3M1-AB015	-	1.5	2.0	2.0	2.0	14.2
-	3G3M1-AB015	2.2	5.5	2.0	2.0	21.9
3G3M1-AB022	-		3.5	2.0	2.0	21
-	3G3M1-AB022	3	8.0	3.5	2.0	30.6
3G3M1-AB037	-	3.7	14.0	5.5	3.5	38.9

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	0.3	-	-	-	-
-	3G3M1-AB001	0.2	-	-	-	-	2.0	2.0	2.0	0.3
3G3M1-AB002	-		2.0	2.0	2.0	0.4	-	-	-	-
-	3G3M1-AB002	0.4	-	-	-	-	2.0	2.0	2.0	0.4
3G3M1-AB004	-		2.0	2.0	2.0	0.5	-	-	-	-
-	3G3M1-AB004	0.55	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-AB007	-	0.75	2.0	2.0	2.0	0.7	-	-	-	-
-	3G3M1-AB007	1.1	-	-	-	-	2.0	2.0	2.0	1.1
3G3M1-AB015	-	1.5	2.0	2.0	2.0	1.4	-	-	-	-
-	3G3M1-AB015	2.2	-	-	-	-	2.0	2.0	2.0	1.5
3G3M1-AB022	-		2.0	2.0	2.0	1.7	-	-	-	-
-	3G3M1-AB022	3	-	-	-	-	2.0	2.0	2.0	1.9
3G3M1-AB037	-	3.7	2.0	2.0	2.0	2.4	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
3G3M1-AB001	-	0.1	2.0	2.0	2.0
-	3G3M1-AB001	0.2	2.0	2.0	2.0
3G3M1-AB002	-		2.0	2.0	2.0
-	3G3M1-AB002	0.4	2.0	2.0	2.0
3G3M1-AB004	-		2.0	2.0	2.0
-	3G3M1-AB004	0.55	2.0	2.0	2.0
3G3M1-AB007	-	0.75	2.0	2.0	2.0
-	3G3M1-AB007	1.1	2.0	2.0	2.0
3G3M1-AB015	-	1.5	2.0	2.0	2.0
-	3G3M1-AB015	2.2	2.0	2.0	2.0
3G3M1-AB022	-		2.0	2.0	2.0
-	3G3M1-AB022	3	2.0	2.0	2.0
3G3M1-AB037	-	3.7	3.5	3.5	3.5

● **Three-phase 200-V class (Panel internal temperature 40°C or less)**

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	0.6	2.0	2.0	2.0	1.1
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	0.9	2.0	2.0	2.0	1.8
-	3G3M1-A2002	0.4	2.0	2.0	2.0	1.6	2.0	2.0	2.0	2.6
3G3M1-A2004	-		2.0	2.0	2.0	1.6	2.0	2.0	2.0	3.1
-	3G3M1-A2004	0.75	2.0	2.0	2.0	3.0	2.0	2.0	2.0	4.9
3G3M1-A2007	-		2.0	2.0	2.0	3.0	2.0	2.0	2.0	5.3
-	3G3M1-A2007	1.1	2.0	2.0	2.0	4.3	2.0	2.0	2.0	6.7
3G3M1-A2015	-	1.5	2.0	2.0	2.0	5.7	2.0	2.0	2.0	9.5
-	3G3M1-A2015	2.2	2.0	2.0	2.0	8.3	2.0	2.0	2.0	12.8
3G3M1-A2022	-		2.0	2.0	2.0	8.3	2.0	2.0	2.0	13.2
-	3G3M1-A2022	3	2.0	2.0	2.0	11.7	2.0	2.0	2.0	17.9
3G3M1-A2037	-	3.7	2.0	2.0	2.0	14.0	3.5	2.0	2.0	22.2
-	3G3M1-A2037	5.5	2.0	2.0	2.0	19.9	3.5	2.0	2.0	28.5
3G3M1-A2055	-		2.0	2.0	2.0	21.1	5.5	3.5	2.0	31.5
3G3M1-A2075	3G3M1-A2055	7.5	3.5	2.0	2.0	28.8	8.0	5.5	3.5	42.7
3G3M1-A2110	3G3M1-A2075	11	8.0	5.5	3.5	42.2	14.0	8.0	5.5	60.7
3G3M1-A2150	3G3M1-A2110	15	14.0	8.0	5.5	57.6	22.0	14.0	14.0	80.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2185	3G3M1-A2150	18.5	14.0	14.0	8.0	71.0	38.0*1	22.0	14.0	97.0
-	3G3M1-A2185	22	22.0	14.0	14.0	84.4	38.0*1	22.0	14.0	112.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	1.0	-	-	-	-
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	1.6	2.0	2.0	2.0	1.3
-	3G3M1-A2002	0.4	-	-	-	-	2.0	2.0	2.0	2.0
3G3M1-A2004	-		2.0	2.0	2.0	3.0	-	-	-	-
-	3G3M1-A2004	0.75	-	-	-	-	2.0	2.0	2.0	3.5
3G3M1-A2007	-		2.0	2.0	2.0	5.0	-	-	-	-
-	3G3M1-A2007	1.1	-	-	-	-	2.0	2.0	2.0	6.0
3G3M1-A2015	-	1.5	2.0	2.0	2.0	8.0	-	-	-	-
-	3G3M1-A2015	2.2	-	-	-	-	2.0	2.0	2.0	9.6
3G3M1-A2022	-		2.0	2.0	2.0	11.0	-	-	-	-
-	3G3M1-A2022	3	-	-	-	-	2.0	2.0	2.0	12.0
3G3M1-A2037	-	3.7	2.0	2.0	2.0	17.5	-	-	-	-
-	3G3M1-A2037	5.5	-	-	-	-	2.0	2.0	2.0	19.6
3G3M1-A2055	-		3.5	2.0	2.0	25.0	-	-	-	-
3G3M1-A2075	3G3M1-A2055	7.5	5.5	3.5	2.0	33.0	3.5	3.5	2.0	30.0
3G3M1-A2110	3G3M1-A2075	11	8.0	5.5	3.5	47.0	5.5	5.5	3.5	40.0
3G3M1-A2150	3G3M1-A2110	15	14.0	8.0	5.5	60.0	14.0	8.0	5.5	56.0
3G3M1-A2185	3G3M1-A2150	18.5	22.0	14.0	8.0	76.0	14.0	14.0	8.0	69.0
-	3G3M1-A2185	22	22.0	14.0	14.0	90.0	22.0	14.0	14.0	88.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	0.7

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	1.1
-	3G3M1-A2002	0.4	2.0	2.0	2.0	2.0
3G3M1-A2004	-		2.0	2.0	2.0	2.0
-	3G3M1-A2004	0.75	2.0	2.0	2.0	3.7
3G3M1-A2007	-		2.0	2.0	2.0	3.7
-	3G3M1-A2007	1.1	2.0	2.0	2.0	5.3
3G3M1-A2015	-	1.5	2.0	2.0	2.0	7.0
-	3G3M1-A2015	2.2	2.0	2.0	2.0	10.2
3G3M1-A2022	-		2.0	2.0	2.0	10.2
-	3G3M1-A2022	3	2.0	2.0	2.0	14.3
3G3M1-A2037	-	3.7	2.0	2.0	2.0	17.1
-	3G3M1-A2037	5.5	3.5	2.0	2.0	24.4
3G3M1-A2055	-		3.5	2.0	2.0	25.8
3G3M1-A2075	3G3M1-A2055	7.5	5.5	3.5	3.5	35.3
3G3M1-A2110	3G3M1-A2075	11	14.0	5.5	5.5	51.7
3G3M1-A2150	3G3M1-A2110	15	14.0	14.0	8.0	70.5
3G3M1-A2185	3G3M1-A2150	18.5	22.0	14.0	14.0	87.0
-	3G3M1-A2185	22	38.0*1	22.0	14.0	103.4

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A2001	-	0.1	2.0	2.0	2.0	0.3	-	-	-	-
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0	0.4	2.0	2.0	2.0	0.3
-	3G3M1-A2002	0.4	-	-	-	-	2.0	2.0	2.0	0.4
3G3M1-A2004	-		2.0	2.0	2.0	0.5	-	-	-	-
-	3G3M1-A2004	0.75	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-A2007	-		2.0	2.0	2.0	0.7	-	-	-	-
-	3G3M1-A2007	1.1	-	-	-	-	2.0	2.0	2.0	0.8
3G3M1-A2015	-	1.5	2.0	2.0	2.0	1.4	-	-	-	-
-	3G3M1-A2015	2.2	-	-	-	-	2.0	2.0	2.0	1.5
3G3M1-A2022	-		2.0	2.0	2.0	1.7	-	-	-	-
-	3G3M1-A2022	3	-	-	-	-	2.0	2.0	2.0	1.7
3G3M1-A2037	-	3.7	2.0	2.0	2.0	2.4	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
HHD mode	HND mode		Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
			60°C	75°C	90°C		60°C	75°C	90°C	
-	3G3M1-A2037	5.5	-	-	-	-	2.0	2.0	2.0	2.5
3G3M1-A2055	-		2.0	2.0	2.0	3.8	-	-	-	-
3G3M1-A2075	3G3M1-A2055	7.5	2.0	2.0	2.0	5.0	2.0	2.0	2.0	3.8
3G3M1-A2110	3G3M1-A2075	11	2.0	2.0	2.0	7.5	2.0	2.0	2.0	5.3
3G3M1-A2150	3G3M1-A2110	15	2.0	2.0	2.0	9.4	2.0	2.0	2.0	7.5
3G3M1-A2185	3G3M1-A2150	18.5	2.0	2.0	2.0	12.7	2.0	2.0	2.0	9.0
-	3G3M1-A2185	22	2.0	2.0	2.0	13.8	2.0	2.0	2.0	12.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
3G3M1-A2001	-	0.1	2.0	2.0	2.0
3G3M1-A2002	3G3M1-A2001	0.2	2.0	2.0	2.0
-	3G3M1-A2002	0.4	2.0	2.0	2.0
3G3M1-A2004	-		2.0	2.0	2.0
-	3G3M1-A2004	0.75	2.0	2.0	2.0
3G3M1-A2007	-		2.0	2.0	2.0
-	3G3M1-A2007	1.1	2.0	2.0	2.0
3G3M1-A2015	-	1.5	2.0	2.0	2.0
-	3G3M1-A2015	2.2	2.0	2.0	2.0
3G3M1-A2022	-		2.0	2.0	2.0
-	3G3M1-A2022	3	2.0	2.0	2.0
3G3M1-A2037	-	3.7	2.0	2.0	2.0
-	3G3M1-A2037	5.5	3.5	3.5	3.5
3G3M1-A2055	-		3.5	3.5	3.5
3G3M1-A2075	3G3M1-A2055	7.5	5.5	5.5	5.5
3G3M1-A2110	3G3M1-A2075	11	5.5	5.5	5.5
3G3M1-A2150	3G3M1-A2110	15	5.5	5.5	5.5
3G3M1-A2220	3G3M1-A2150	18.5	8.0	8.0	8.0
-	3G3M1-A2185	22	8.0	8.0	8.0

● Three-phase 400-V class (Panel internal temperature 40°C or less)

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor (DCR)			
HHD mode	HND mode		Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
			60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	0.9	2.0	2.0	2.0	1.7
-	3G3M1-A4004	0.75	2.0	2.0	2.0	1.5	2.0	2.0	2.0	2.7
3G3M1-A4007	-		2.0	2.0	2.0	1.6	2.0	2.0	2.0	3.1
-	3G3M1-A4007	1.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	3.9
3G3M1-A4015	-	1.5	2.0	2.0	2.0	3.0	2.0	2.0	2.0	5.9
-	3G3M1-A4015	2.2	2.0	2.0	2.0	4.2	2.0	2.0	2.0	7.3
3G3M1-A4022	-		2.0	2.0	2.0	4.4	2.0	2.0	2.0	8.2
-	3G3M1-A4022	3	2.0	2.0	2.0	5.8	2.0	2.0	2.0	11.3
3G3M1-A4030	-									
-	3G3M1-A4030	3.7	2.0	2.0	2.0	7.3	2.0	2.0	2.0	13.0
3G3M1-A4040	-									
-	3G3M1-A4040	5.5	2.0	2.0	2.0	10.1	2.0	2.0	2.0	16.8
3G3M1-A4055	-		2.0	2.0	2.0	10.6	2.0	2.0	2.0	17.3
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0	14.4	3.5	2.0	2.0	23.2
3G3M1-A4110	3G3M1-A4075	11	2.0	2.0	2.0	21.1	5.5	3.5	2.0	33.0
3G3M1-A4150	3G3M1-A4110	15	3.5	2.0	2.0	28.8	8.0	5.5	3.5	43.8
3G3M1-A4185	3G3M1-A4150	18.5	5.5	3.5	3.5	35.5	14.0	8.0	5.5	52.3
3G3M1-A4220	3G3M1-A4185	22	8.0	5.5	3.5	42.2	14.0	8.0	5.5	60.6
-	3G3M1-A4220	30	14.0	8.0	5.5	57.0	22.0	14.0	8.0	77.9

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
HHD mode	HND mode		Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
			60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	1.8	-	-	-	-
-	3G3M1-A4004	0.75	-	-	-	-	2.0	2.0	2.0	2.1
3G3M1-A4007	-		2.0	2.0	2.0	3.4	-	-	-	-
-	3G3M1-A4007	1.1	-	-	-	-	2.0	2.0	2.0	4.1
3G3M1-A4015	-	1.5	2.0	2.0	2.0	4.8	-	-	-	-
-	3G3M1-A4015	2.2	-	-	-	-	2.0	2.0	2.0	5.5
3G3M1-A4022	-		2.0	2.0	2.0	5.5	-	-	-	-
-	3G3M1-A4022	3	-	-	-	-	2.0	2.0	2.0	6.9
3G3M1-A4030	-									
-	3G3M1-A4030	3.7	2.0	2.0	2.0	9.2	-	-	-	-
3G3M1-A4040	-									

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
-	3G3M1-A4040	5.5	-	-	-	-	2.0	2.0	2.0	11.1
3G3M1-A4055	-		2.0	2.0	2.0	14.8	-	-	-	-
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0	18.0	2.0	2.0	2.0	17.5
3G3M1-A4110	3G3M1-A4075	11	3.5	2.0	2.0	24.0	3.5	2.0	2.0	23.0
3G3M1-A4150	3G3M1-A4110	15	5.5	3.5	2.0	31.0	5.5	3.5	2.0	31.0
3G3M1-A4185	3G3M1-A4150	18.5	5.5	3.5	3.5	39.0	5.5	3.5	3.5	38.0
3G3M1-A4220	3G3M1-A4185	22	8.0	5.5	3.5	45.0	8.0	5.5	3.5	45.0
-	3G3M1-A4220	30	-	-	-	-	14.0	8.0	5.5	60.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor (DCR)			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HD mode	ND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	3G3M1-A4004	0.75	2.0	2.0	2.0	1.5	2.0	2.0	2.0	2.7
3G3M1-A4007	-	1.1	2.0	2.0	2.0	2.1	2.0	2.0	2.0	3.9
-	3G3M1-A4007	1.5	2.0	2.0	2.0	2.9	2.0	2.0	2.0	4.8
3G3M1-A4015	3G3M1-A4015	2.2	2.0	2.0	2.0	4.2	2.0	2.0	2.0	7.3
3G3M1-A4022	3G3M1-A4022	3	2.0	2.0	2.0	5.8	2.0	2.0	2.0	11.3
3G3M1-A4030	3G3M1-A4030	5.5	2.0	2.0	2.0	10.1	2.0	2.0	2.0	16.8
3G3M1-A4040	3G3M1-A4040									
3G3M1-A4055	-	7.5	2.0	2.0	2.0	14.4	3.5	2.0	2.0	23.2
3G3M1-A4075	3G3M1-A4055	11	2.0	2.0	2.0	21.1	5.5	3.5	2.0	33.0
3G3M1-A4110	3G3M1-A4075	15	3.5	2.0	2.0	28.8	8.0	5.5	3.5	43.8
3G3M1-A4150	3G3M1-A4110	18.5	5.5	3.5	3.5	35.5	14.0	8.0	5.5	52.3
3G3M1-A4185	3G3M1-A4150	22	8.0	5.5	3.5	42.2	14.0	8.0	5.5	60.6
3G3M1-A4220	3G3M1-A4185	30	14.0	8.0	5.5	57.0	22.0	14.0	8.0	77.9
-	3G3M1-A4220	37	14.0	14.0	8.0	68.5	38[*1]	14.0	14.0	94.3

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HD mode				ND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HD mode	ND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	3G3M1-A4004	0.75	2.0	2.0	2.0	1.8	2.0	2.0	2.0	2.1
3G3M1-A4007	-	1.1	2.0	2.0	2.0	3.4	-	-	-	-
-	3G3M1-A4007	1.5	-	-	-	-	2.0	2.0	2.0	4.1
3G3M1-A4015	3G3M1-A4015	2.2	2.0	2.0	2.0	5.0	2.0	2.0	2.0	5.5
3G3M1-A4022	3G3M1-A4022	3	2.0	2.0	2.0	6.3	2.0	2.0	2.0	6.9
3G3M1-A4030	3G3M1-A4030	5.5	2.0	2.0	2.0	11.1	2.0	2.0	2.0	12.0
3G3M1-A4040	3G3M1-A4040									
3G3M1-A4055	-	7.5	2.0	2.0	2.0	17.5	-	-	-	-
3G3M1-A4075	3G3M1-A4055	11	3.5	2.0	2.0	23.0	2.0	2.0	2.0	21.5
3G3M1-A4110	3G3M1-A4075	15	5.5	3.5	2.0	31.0	3.5	2.0	2.0	28.5
3G3M1-A4150	3G3M1-A4110	18.5	5.5	3.5	3.5	38.0	5.5	3.5	3.5	37.0
3G3M1-A4185	3G3M1-A4150	22	8.0	5.5	3.5	45.0	8.0	5.5	3.5	44.0
3G3M1-A4220	3G3M1-A4185	30	14.0	8.0	5.5	60.0	14.0	8.0	5.5	59.0
-	3G3M1-A4220	37	-	-	-	-	22.0	14.0	8.0	72.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	1.0
-	3G3M1-A4004	0.75	2.0	2.0	2.0	1.8
3G3M1-A4007	-		2.0	2.0	2.0	2.0
-	3G3M1-A4007	1.1	2.0	2.0	2.0	2.6
3G3M1-A4015	-	1.5	2.0	2.0	2.0	3.7
-	3G3M1-A4015	2.2	2.0	2.0	2.0	5.1
3G3M1-A4022	-		2.0	2.0	2.0	5.4
-	3G3M1-A4022	3	2.0	2.0	2.0	7.1
3G3M1-A4030	-					
-	3G3M1-A4030	3.7	2.0	2.0	2.0	8.9
3G3M1-A4040	-					
-	3G3M1-A4040	5.5	2.0	2.0	2.0	12.4
3G3M1-A4055	-		2.0	2.0	2.0	13.0
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0	17.6
3G3M1-A4110	3G3M1-A4075	11	3.5	2.0	2.0	25.8
3G3M1-A4150	3G3M1-A4110	15	5.5	3.5	3.5	35.3
3G3M1-A4185	3G3M1-A4150	18.5	8.0	5.5	3.5	43.5

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-A4220	3G3M1-A4185	22	14.0	5.5	5.5	51.7
-	3G3M1-A4220	30	14.0	14.0	8.0	69.8

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	-	0.4	2.0	2.0	2.0	0.4	-	-	-	-
-	3G3M1-A4004	0.75	-	-	-	-	2.0	2.0	2.0	0.4
3G3M1-A4007	-		2.0	2.0	2.0	0.5	-	-	-	-
-	3G3M1-A4007	1.1	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-A4015	-	1.5	2.0	2.0	2.0	0.7	-	-	-	-
-	3G3M1-A4015	2.2	-	-	-	-	2.0	2.0	2.0	0.8
3G3M1-A4022	-		2.0	2.0	2.0	0.9	-	-	-	-
-	3G3M1-A4022	3	-	-	-	-	2.0	2.0	2.0	0.9
3G3M1-A4030	-									
-	3G3M1-A4030	3.7	2.0	2.0	2.0	1.2	-	-	-	-
3G3M1-A4040	-									
-	3G3M1-A4040	5.5	-	-	-	-	2.0	2.0	2.0	1.3
3G3M1-A4055	-		2.0	2.0	2.0	1.9	-	-	-	-
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0	2.5	2.0	2.0	2.0	1.9
3G3M1-A4110	3G3M1-A4075	11	2.0	2.0	2.0	3.8	2.0	2.0	2.0	2.7
3G3M1-A4150	3G3M1-A4110	15	2.0	2.0	2.0	4.7	2.0	2.0	2.0	3.8
3G3M1-A4185	3G3M1-A4150	18.5	2.0	2.0	2.0	6.5	2.0	2.0	2.0	4.5
3G3M1-A4220	3G3M1-A4185	22	2.0	2.0	2.0	7.1	2.0	2.0	2.0	6.2
-	3G3M1-A4220	30	-	-	-	-	2.0	2.0	2.0	7.2

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
3G3M1-A4004	-	0.4	2.0	2.0	2.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
-	3G3M1-A4004	0.75	2.0	2.0	2.0
3G3M1-A4007	-		2.0	2.0	2.0
-	3G3M1-A4007	1.1	2.0	2.0	2.0
3G3M1-A4015	-	1.5	2.0	2.0	2.0
-	3G3M1-A4015	2.2	2.0	2.0	2.0
3G3M1-A4022	-		2.0	2.0	2.0
-	3G3M1-A4022	3	2.0	2.0	2.0
3G3M1-A4030	-				
-	3G3M1-A4030	3.7	2.0	2.0	2.0
3G3M1-A4040	-				
-	3G3M1-A4040	5.5	2.0	2.0	2.0
3G3M1-A4055	-		2.0	2.0	2.0
3G3M1-A4075	3G3M1-A4055	7.5	2.0	2.0	2.0
3G3M1-A4110	3G3M1-A4075	11	3.5	3.5	3.5
3G3M1-A4150	3G3M1-A4110	15	5.5	5.5	5.5
3G3M1-A4185	3G3M1-A4150	18.5	5.5	5.5	5.5
3G3M1-A4220	3G3M1-A4185	22	5.5	5.5	5.5
-	3G3M1-A4220	30	8.0	8.0	8.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HD mode	ND mode		60°C	75°C	90°C	
3G3M1-A4004	3G3M1-A4004	0.75	2.0	2.0	2.0	1.8
3G3M1-A4007	-	1.1	2.0	2.0	2.0	2.6
-	3G3M1-A4007	1.5	2.0	2.0	2.0	3.6
3G3M1-A4015	3G3M1-A4015	2.2	2.0	2.0	2.0	5.1
3G3M1-A4022	3G3M1-A4022	3	2.0	2.0	2.0	7.1
3G3M1-A4030	3G3M1-A4030	5.5	2.0	2.0	2.0	12.4
3G3M1-A4040	3G3M1-A4040					
3G3M1-A4055	-	7.5	2.0	2.0	2.0	17.6
3G3M1-A4075	3G3M1-A4055	11	3.5	2.0	2.0	25.8
3G3M1-A4110	3G3M1-A4075	15	5.5	3.5	3.5	35.3
3G3M1-A4150	3G3M1-A4110	18.5	8.0	5.5	3.5	43.5
3G3M1-A4185	3G3M1-A4150	22	14.0	5.5	5.5	51.7
3G3M1-A4220	3G3M1-A4185	30	14.0	14.0	8.0	69.8

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HD mode	ND mode		60°C	75°C	90°C	
-	3G3M1-A4220	37	22.0	14.0	14.0	83.9

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HD mode				ND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HD mode	ND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-A4004	3G3M1-A4004	0.75	2.0	2.0	2.0	0.4	2.0	2.0	2.0	0.4
3G3M1-A4007	-	1.1	2.0	2.0	2.0	0.6	-	-	-	-
-	3G3M1-A4007	1.5	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-A4015	3G3M1-A4015	2.2	2.0	2.0	2.0	0.8	2.0	2.0	2.0	0.8
3G3M1-A4022	3G3M1-A4022	3	2.0	2.0	2.0	0.9	2.0	2.0	2.0	0.9
3G3M1-A4030	3G3M1-A4030	5.5	2.0	2.0	2.0	1.3	2.0	2.0	2.0	1.3
3G3M1-A4040	3G3M1-A4040									
3G3M1-A4055	-	7.5	2.0	2.0	2.0	1.9	-	-	-	-
3G3M1-A4075	3G3M1-A4055	11	2.0	2.0	2.0	2.7	2.0	2.0	2.0	2.3
3G3M1-A4110	3G3M1-A4075	15	2.0	2.0	2.0	3.8	2.0	2.0	2.0	3.1
3G3M1-A4150	3G3M1-A4110	18.5	2.0	2.0	2.0	4.5	2.0	2.0	2.0	4.2
3G3M1-A4185	3G3M1-A4150	22	2.0	2.0	2.0	6.2	2.0	2.0	2.0	4.9
3G3M1-A4220	3G3M1-A4185	30	2.0	2.0	2.0	7.2	2.0	2.0	2.0	7.2
-	3G3M1-A4220	37	-	-	-	-	2.0	2.0	2.0	8.0

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HD mode	ND mode		60°C	75°C	90°C
3G3M1-A4004	3G3M1-A4004	0.75	2.0	2.0	2.0
3G3M1-A4007	-	1.1	2.0	2.0	2.0
-	3G3M1-A4007	1.5	2.0	2.0	2.0
3G3M1-A4015	3G3M1-A4015	2.2	2.0	2.0	2.0
3G3M1-A4022	3G3M1-A4022	3	2.0	2.0	2.0
3G3M1-A4030	3G3M1-A4030	5.5	2.0	2.0	2.0
3G3M1-A4040	3G3M1-A4040				

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HD mode	ND mode		60°C	75°C	90°C
3G3M1-A4055	-	7.5	2.0	2.0	2.0
3G3M1-A4075	3G3M1-A4055	11	3.5	3.5	3.5
3G3M1-A4110	3G3M1-A4075	15	5.5	5.5	5.5
3G3M1-A4150	3G3M1-A4110	18.5	5.5	5.5	5.5
3G3M1-A4185	3G3M1-A4150	22	5.5	5.5	5.5
3G3M1-A4220	3G3M1-A4185	30	8.0	8.0	8.0
-	3G3M1-A4220	37	8.0	8.0	8.0

● Single-phase 200-V class (Panel internal temperature 40°C or less)

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Main power supply input (L1/R, L2/S, L3/T)							
			When DC reactor (DCR) is used				Without DC reactor (DCR)			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	1.1	2.0	2.0	2.0	1.8
-	3G3M1-AB001	0.2	2.0	2.0	2.0	2.2	2.0	2.0	2.0	3.3
3G3M1-AB002	-		2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.3
-	3G3M1-AB002	0.4	2.0	2.0	2.0	3.7	2.0	2.0	2.0	4.9
3G3M1-AB004	-		2.0	2.0	2.0	3.5	2.0	2.0	2.0	5.4
-	3G3M1-AB004	0.55	2.0	2.0	2.0	4.6	2.0	2.0	2.0	7.3
3G3M1-AB007	-	0.75	2.0	2.0	2.0	6.4	2.0	2.0	2.0	9.7
-	3G3M1-AB007	1.1	2.0	2.0	2.0	9.4	2.0	2.0	2.0	13.8
3G3M1-AB015	-	1.5	2.0	2.0	2.0	11.6	2.0	2.0	2.0	16.4
-	3G3M1-AB015	2.2	2.0	2.0	2.0	17.9	2.0	2.0	2.0	20.2
3G3M1-AB022	-		2.0	2.0	2.0	17.5	2.0	2.0	2.0	22.0
-	3G3M1-AB022	3	3.5	2.0	2.0	25.0	3.5	2.0	2.0	26.0
3G3M1-AB037	-	3.7	5.5	3.5	2.0	31.8	8.0	5.5	3.5	45.4

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	1.0	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Inverter output (U, V, W)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
-	3G3M1-AB001	0.2	-	-	-	-	2.0	2.0	2.0	1.2
3G3M1-AB002	-		2.0	2.0	2.0	1.6	-	-	-	-
-	3G3M1-AB002	0.4	-	-	-	-	2.0	2.0	2.0	1.9
3G3M1-AB004	-		2.0	2.0	2.0	3.0	-	-	-	-
-	3G3M1-AB004	0.55	-	-	-	-	2.0	2.0	2.0	3.5
3G3M1-AB007	-	0.75	2.0	2.0	2.0	5.0	-	-	-	-
-	3G3M1-AB007	1.1	-	-	-	-	2.0	2.0	2.0	6.0
3G3M1-AB015	-	1.5	2.0	2.0	2.0	8.0	-	-	-	-
-	3G3M1-AB015	2.2	-	-	-	-	2.0	2.0	2.0	9.6
3G3M1-AB022	-		2.0	2.0	2.0	11.0	-	-	-	-
-	3G3M1-AB022	3	-	-	-	-	2.0	2.0	2.0	12.0
3G3M1-AB037	-	3.7	2.0	2.0	2.0	17.5	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]			
			DC reactor connection (P1, P(+))			
			Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	1.3
-	3G3M1-AB001	0.2	2.0	2.0	2.0	2.7
3G3M1-AB002	-		2.0	2.0	2.0	2.4
-	3G3M1-AB002	0.4	2.0	2.0	2.0	4.5
3G3M1-AB004	-		2.0	2.0	2.0	4.3
-	3G3M1-AB004	0.55	2.0	2.0	2.0	5.6
3G3M1-AB007	-	0.75	2.0	2.0	2.0	7.8
-	3G3M1-AB007	1.1	2.0	2.0	2.0	11.5
3G3M1-AB015	-	1.5	2.0	2.0	2.0	14.2
-	3G3M1-AB015	2.2	2.0	2.0	2.0	21.9
3G3M1-AB022	-		2.0	2.0	2.0	21.4
-	3G3M1-AB022	3	2.0	2.0	2.0	30.6
3G3M1-AB037	-	3.7	5.5	3.5	3.5	38.9

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]							
			Brake resistance connection (P(+), DB)							
			HHD mode				HND mode			
			Allowable temperature (Note 1)			Current value [A]	Allowable temperature (Note 1)			Current value [A]
HHD mode	HND mode		60°C	75°C	90°C		60°C	75°C	90°C	
3G3M1-AB001	-	0.1	2.0	2.0	2.0	0.3	-	-	-	-
-	3G3M1-AB001	0.2	-	-	-	-	2.0	2.0	2.0	0.2
3G3M1-AB002	-		2.0	2.0	2.0	0.4	-	-	-	-
-	3G3M1-AB002	0.4	-	-	-	-	2.0	2.0	2.0	0.4
3G3M1-AB004	-		2.0	2.0	2.0	0.5	-	-	-	-
-	3G3M1-AB004	0.55	-	-	-	-	2.0	2.0	2.0	0.6
3G3M1-AB007	-	0.75	2.0	2.0	2.0	0.7	-	-	-	-
-	3G3M1-AB007	1.1	-	-	-	-	2.0	2.0	2.0	1.1
3G3M1-AB015	-	1.5	2.0	2.0	2.0	1.4	-	-	-	-
-	3G3M1-AB015	2.2	-	-	-	-	2.0	2.0	2.0	1.5
3G3M1-AB022	-		2.0	2.0	2.0	1.7	-	-	-	-
-	3G3M1-AB022	3	-	-	-	-	2.0	2.0	2.0	1.9
3G3M1-AB037	-	3.7	2.0	2.0	2.0	2.4	-	-	-	-

Model		Maximum applicable motor capacity [kW]	Recommended wire size [mm2]		
			Inverter ground (G)		
			Allowable temperature (Note 1)		
HHD mode	HND mode		60°C	75°C	90°C
3G3M1-AB001	-	0.1	2.0	2.0	2.0
-	3G3M1-AB001	0.2	2.0	2.0	2.0
3G3M1-AB002	-		2.0	2.0	2.0
-	3G3M1-AB002	0.4	2.0	2.0	2.0
3G3M1-AB004	-		2.0	2.0	2.0
-	3G3M1-AB004	0.55	2.0	2.0	2.0
3G3M1-AB007	-	0.75	2.0	2.0	2.0
-	3G3M1-AB007	1.1	2.0	2.0	2.0
3G3M1-AB015	-	1.5	2.0	2.0	2.0
-	3G3M1-AB015	2.2	2.0	2.0	2.0
3G3M1-AB022	-		2.0	2.0	2.0
-	3G3M1-AB022	3	2.0	2.0	2.0
3G3M1-AB037	-	3.7	3.5	3.5	3.5

Note 1: At an allowable temperature of 60°C, use 600 V IV insulated wire, at 75°C 600 V HIV insulated wire, and at 90°C 600 V crosslinked polyethylene insulated wire.

Note 2: When the recommended wire size is 38 mm^2, use crimped terminal model No. 38-6 made by J.S.T. Mfg. Co., Ltd. or an equivalent product (*1 in table).

Note 3: When the recommended wire size is 60 mm^2, use crimped terminal model No. 60-6 made by J.S.T. Mfg. Co., Ltd. or an equivalent product (*2 in table).

● Tightening torque

Model		Screw specification					
		Main circuit		For ground		Control power supply auxiliary input (R0, T0)	
		Terminal screw size	Tightening torque [N·m]	Terminal screw size	Tightening torque [N·m]	Terminal screw size	Tightening torque [N·m]
Three-phase 200 V	3G3M1-A2001	M3.5	0.8	M3.5	1.2	-	-
	3G3M1-A2002						
	3G3M1-A2004						
	3G3M1-A2007						
	3G3M1-A2015	M4	1.2	M4	1.8	-	-
	3G3M1-A2022						
	3G3M1-A2037						
	3G3M1-A2055	M5	3	M5	3	-	-
	3G3M1-A2075						
	3G3M1-A2110	M6	3	M6	3	-	-
	3G3M1-A2150						
	3G3M1-A2185	M6 (No. 3)	5.8	M6 (No. 3)	5.8	M3.5	1.2
Three-phase 400 V	3G3M1-A4004	M4	1.2	M4	1.8	-	-
	3G3M1-A4007						
	3G3M1-A4015						
	3G3M1-A4022						
	3G3M1-A4030						
	3G3M1-A4040						
	3G3M1-A4055	M5	3	M5	3	-	-
	3G3M1-A4075						
	3G3M1-A4110	M6	3	M6	3	-	-
	3G3M1-A4150						
	3G3M1-A4185	M6 (No. 3)	5.8	M6 (No. 3)	5.8	M3.5	1.2
	3G3M1-A4220						
Single-phase 200 V	3G3M1-AB001	M3.5	0.8	M3.5	1.2	-	-
	3G3M1-AB002						
	3G3M1-AB004						
	3G3M1-AB007						
	3G3M1-AB015	M4	1.2	M4	1.8	-	-
	3G3M1-AB022						
	3G3M1-AB037	M5	3	M5	3	-	-

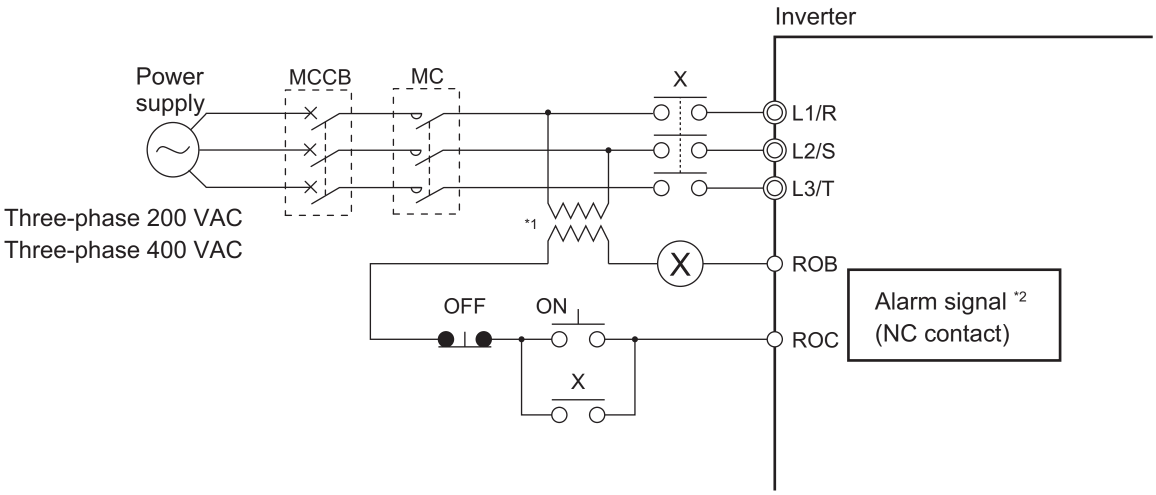
Wiring for Main Power Supply Input Terminals (L1/R, L2/S, L3/T)

The following describes the wiring for the main power supply input terminals and for peripheral equipment.

● Installing molded case circuit breaker

If the inverter's protective function is activated, the inverter internal circuit may be damaged depending on the condition.
Be sure to connect the main power supply input terminals (L1/R, L2/S, L3/T) to the power supply via a molded case circuit breaker (MCCB) according to each inverter.

- When using multiple inverters, install one MCCB per inverter.
- Determine the capacity of the MCCB according to the molded case circuit breaker (MCCB) value shown in the previous table.
- Determine the time characteristic of the MCCB upon due consideration of the time characteristic of the inverter's overheat protection function (150% of the rated output current for one minute).
- If you must share one MCCB with multiple inverters or other equipment, construct a sequence that turns OFF the power supply via the alarm output signal, as shown in the figure below.



*1. For 400-V class, connect a 400/200-V transformer.
*2. Set the Output Terminal [ROA, ROB] Function Selection (E27) to "1099: AL (Alarm signal)."

● Installing earth leakage breaker

When selecting the earth leakage breaker to use between the power supply and the main power supply input terminals (L1/R, L2/S, L3/T), consider the following.

High-frequency leakage current from inverter
The inverter produces a high-frequency leakage current due to its high-speed output switching.
In general, a leakage current of approx. 100 mA will flow for the power cable length of 1 m per inverter. Moreover, an additional leakage current of approx. 5 mA will flow with the increasing length by 1 m.
Therefore, an earth leakage breaker to use in the power input section must be dedicated for the inverter, which removes high-frequency leakage current and detects only the leakage current in a frequency range that is dangerous to the human body.

- Select a special earth leakage breaker for the inverter with a sensitivity current rating of 10 mA or higher per inverter.

- If you use a general earth leakage breaker (which detects high-frequency leakage current), select one with a sensitivity current rating of 200 mA or higher per inverter and an operation time of 0.1 s or longer.

Leakage current from EMC noise filter
The EMC noise filter is designed to comply with European CE standards.
Specifically, it is designed to meet the neutral-point grounding requirement of the European power supply specifications. Therefore, using the EMC noise filter with the phase S grounding causes an increase of leakage current.
For use with the phase S grounding, it is recommended to use the Input Noise Filter.

- OMRON currently plans to support the EMC noise filters for the 3G3M1 Series.

● Installing magnetic contactor

To shut off the main circuit power supply with a sequence, you can use a magnetic contactor (MC) on the inverter side closer than a molded case circuit breaker (MCCB).

- Do not attempt to run/stop the inverter by turning ON/OFF a magnetic contactor.
  Instead, use the RUN command signal (FW/RV) via the control circuit terminal block of the inverter.
- Construct a sequence that turns OFF the power supply via the alarm output signal of the inverter.
- To use one or more braking resistors/regenerative braking units, construct a sequence that turns OFF a magnetic contactor via a thermal relay contact in each unit.

● Inrush current flow when the inverter power supply is turned ON

When the inverter power supply is turned ON, the charging current, which is called inrush current, flows in the main circuit board capacitor.
The table below shows the reference values at a power supply voltage of 200 V or 400 V when the power supply impedance is low. Take this into consideration when selecting the inverter power supply.

- With a low-speed no-fuse breaker, an inrush current 10 times the rated current can flow for 20 ms.
- To turn ON the power supply for multiple inverters simultaneously, select a no-fuse breaker whose 20-ms allowable current rating is greater than the total inrush current of the inverters.

Single-phase/Three-phase 200-V class	
3G3M1-□	Inrush current value (Ao-p)
A2001 to A2037 AB001 to AB022	12
A2055, A2075, AB037	126
A2110, A2150	251
A2185	145

Three-phase 400-V class	
3G3M1-□	Inrush current value (Ao-p)
A4004 to A4040	13
A4055, A4075	41
A4110, A4150	81
A4185, A4220	148

● Main power supply phase loss and single-phase input

To use a single-phase power supply, use a single-phase 200-V class inverter.
Using a single-phase power supply to supply power to a three-phase 200-V or three-phase 400-V class inverter may cause damage to the inverter.
Be sure to check that the three-phase power supply is wired properly before using the inverter.

● Power supply environment

In the following cases, the internal converter module (rectifier) may be damaged.
Take countermeasures such as installing an AC reactor on the main circuit input side of the inverter.

- The power supply voltage unbalance factor is 3% or more.
- The power supply capacity is at least 10 times larger than the inverter capacity and, at the same time, 500 kVA or more.
- Rapid change in the power supply voltage occurs.

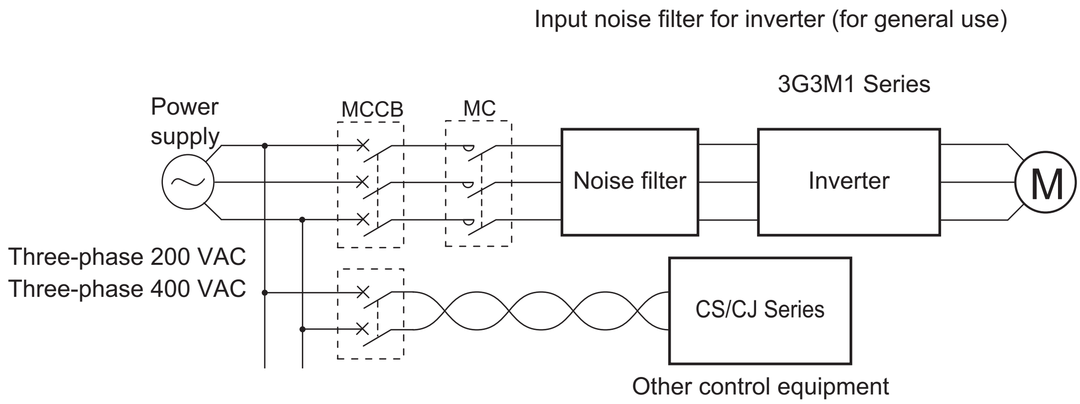
Example) When the phase advance capacitor is turned ON/OFF, the inverter may detect an overvoltage or the rectifier may be damaged.

● Installing input surge absorber

When using an inductive load (such as a magnetic contactor, magnetic relay, magnetic valve, solenoid, or electromagnetic brake), use a surge absorber or diode together.

● Installing input noise filter

The inverter performs high-speed output switching, which may cause the noise flow from the inverter to power supply lines that negatively affects on peripheral equipment.
Therefore, it is recommended to use an input noise filter to reduce noise flowing out to power supply lines.
This also helps reduce noise that enters the inverter from power supply lines.

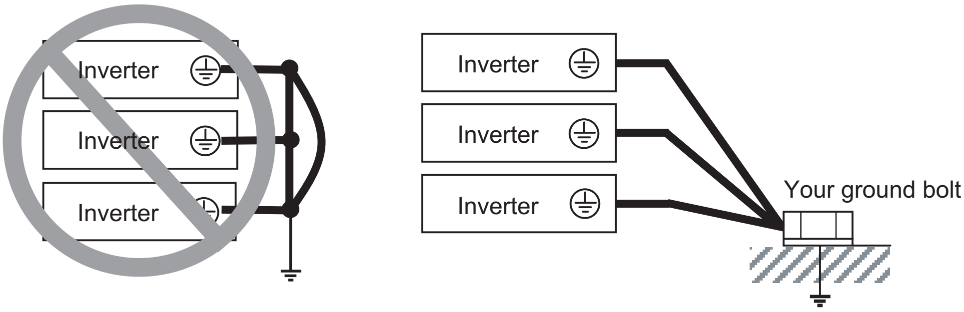


Wiring for Ground Terminal (G ⏚)

To prevent electric shock, be sure to ground the inverter and the motor.
The 200-V class should be connected to the ground terminal under type-D grounding conditions (conventional type 3 grounding conditions: 100 Ω or less ground resistance), the 400-V class should be connected to the ground terminal under type-C grounding conditions (conventional special type 3 grounding conditions: 10 Ω or less ground resistance).

For the ground cable, use the applicable cable or a cable with a larger diameter. Make the cable length as short as possible.

When several inverters are connected, the ground cable must not be connected across several inverters or looped. Otherwise, the inverters and peripheral control equipment may malfunction.

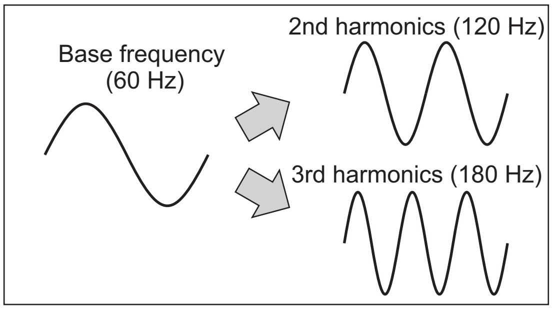


Harmonic Current Measures and DC/AC Reactor Wiring (P1, P(+))

In recent years, there is an increasing concern about harmonic currents generated from industrial machinery.
Harmonic measures must be implemented as *Guideline of Countermeasures Taken by Users against Higher Harmonics Received at High Voltages or Extremely High Voltages* was established by the Ministry of International Trade and Industry (current: Ministry of Economy, Trade and Industry) in September, 1994.
The following provides an overview of harmonics and measures against harmonics implemented in this inverter.

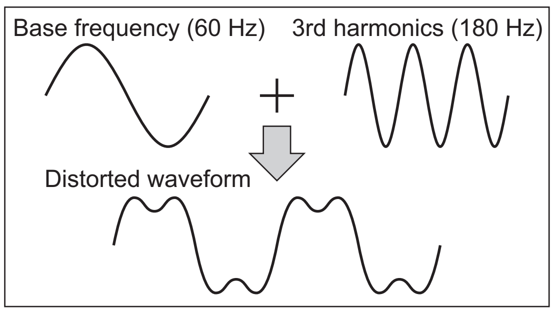
● Harmonics

The voltage or current whose frequency is an integral multiple of certain standard frequency (base frequency) is called a harmonic.
If a commercial power supply frequency of 60 Hz (50 Hz) is the reference frequency, the harmonics of that signal is:
x2 = 120 Hz (100 Hz),
x3 = 180 Hz (150 Hz),
and so on.



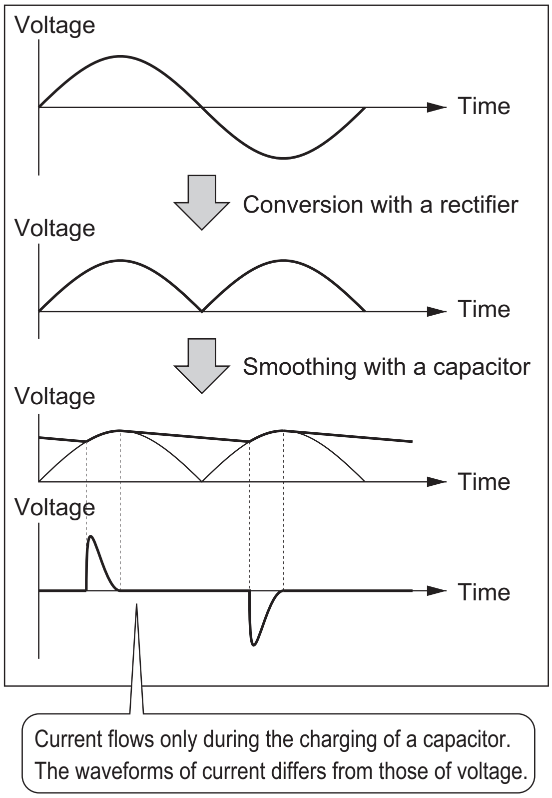
● Reason why harmonics cause problems

As the number of harmonics increases, the waveform of the commercial supply has more distortion. This distortion causes the malfunction of the connected equipment or leads to abnormal heat generation.



● Causes of harmonics

- General electrical equipment internally converts AC input power (commercial power) into DC power. At this time, harmonic currents occur because of the difference in the current flow direction between AC power and DC power.
- In an AC-to-DC power conversion, the rectifier converts the input power into a unidirectional voltage, which is then smoothened by the capacitor. As a result, the current charged into the capacitor has a waveform that contains harmonic components.
- This inverter also performs an AC-to-DC conversion as with other electrical equipment, which allows current with harmonic components to flow. In particular, the inverter has more current than other equipment, so the number of harmonic components in current is larger.



● DC/AC reactor

To suppress harmonic currents, use the DC (direct current) and AC (alternating current) reactors.
The DC/AC reactor functions to suppress a steep change in the current.
The DC reactor has a higher harmonics suppression ability, so even higher suppression ability can be expected when used in conjunction with the AC reactor.
Suppressing harmonic currents also leads to the improvement in the power factor on the input or output side of the inverter.

● Before wiring

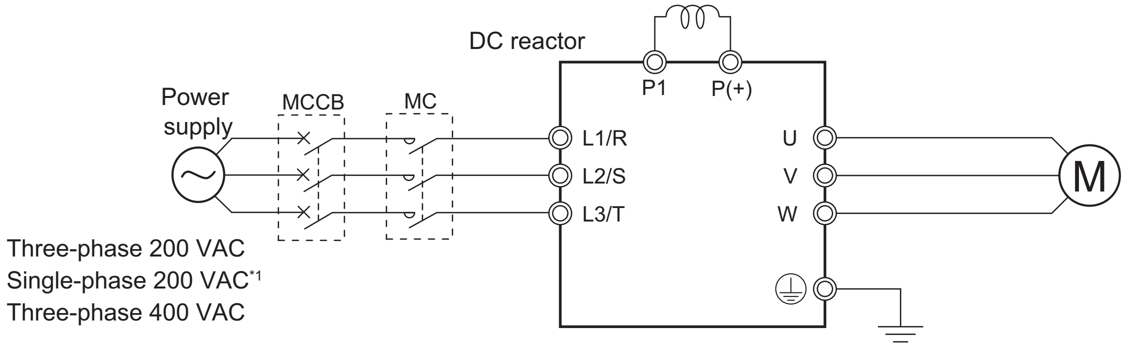
The DC reactor is connected to the DC power supply located inside the inverter.
Before wiring, be sure to turn OFF the power supply and make sure that the charge indicator is not lit.
Do not touch the interior of the inverter during inverter operation. Doing so may result in electric shock or burn injury.

By factory default, a short-circuit bar is connected between the terminals P1 and P(+). Before connecting the DC reactor, remove this short-circuit bar.
Note that the length of the DC reactor connection cable must be 10 m or shorter.

Remove the short-circuit bar only if you connect the DC reactor for use.
If you remove the short-circuit bar with the DC reactor unconnected, the inverter cannot operate because no power is supplied to its main circuit.

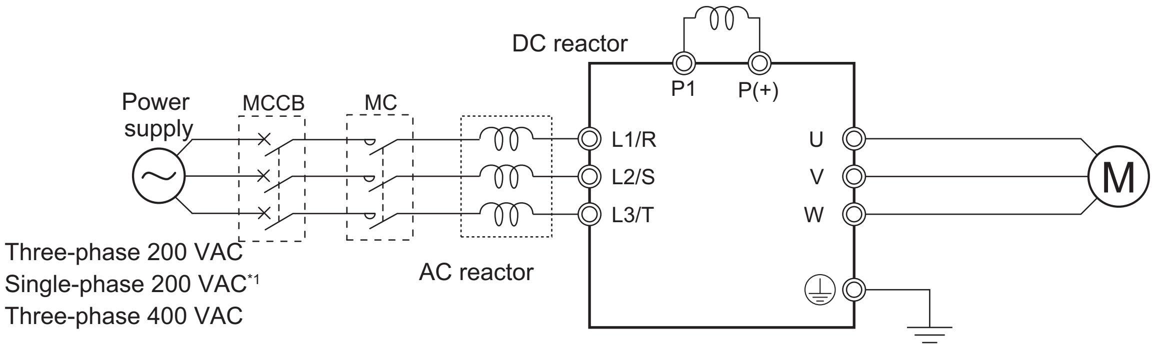
● Wiring method

With DC reactor



*1. Connect to the terminals L1/L and L2/N on the single-phase 200-VAC inverter.

With DC reactor and AC reactor



*1. Connect to the terminals L1/L and L2/N on the single-phase 200-VAC inverter.

● Effect of reactors

Through the use of the DC/AC reactor, the rate of harmonic current occurrences can be reduced as shown in the table of typical examples below (excerpt from a JEMA document).

Measure against harmonics	Harmonic current occurrence rate [%]							
	5th	7th	11th	13th	17th	19th	23th	25th
None (Inverter only)	65	41	8.5	7.7	4.3	3.1	2.6	1.8
AC reactor	38	14.5	7.4	3.4	3.2	1.9	1.7	1.3
DC reactor	30	13	8.4	5	4.7	3.2	3.0	2.2
With DC and AC reactors	28	9.1	7.2	4.1	3.2	2.4	1.6	1.4

● Guideline for reactor selection

When implementing measures against harmonics, first install a DC reactor and evaluate its effect. Then, if further reduction is required, add an AC reactor.

To implement harmonic countermeasures in consideration of the power supply environment (such as rapid change in the power supply voltage), first install an AC reactor and evaluate its effect. If further reduction is required, add a DC reactor.

If you have multiple inverters and use the AC reactor, use one AC reactor for each inverter. Using only one AC reactor for more than one inverter does not provide sufficient reduction

Wiring for Inverter Output Terminals (U, V, W)

The following describes the wiring for the inverter output terminals (U, V, W).

● Never connect power supply to output terminals

Never connect the power supply to the output terminals U, V, W.
The inverter is damaged internally if power supply voltage is applied to the output terminals.

● Never short or ground output terminals

Do not touch the output terminals with bare hand or contact the output wires with the inverter's case. Doing so may result in electric shock or ground fault.
Be careful not to short the output wires.

● Do not use phase advance capacitors and noise filters for general-purpose power supplies or for the input side

Never connect a phase advance capacitor or LC/RC noise filter for general-purpose power supplies to the output circuit.
Doing so may result in damage to the inverter or burnout of these parts.

● Do not use magnetic switches

Do not connect any magnetic switch or magnet contactor to the output circuit.
If a load is connected to the inverter when running, the inverter's overcurrent protection circuit is activated due to the inrush current.

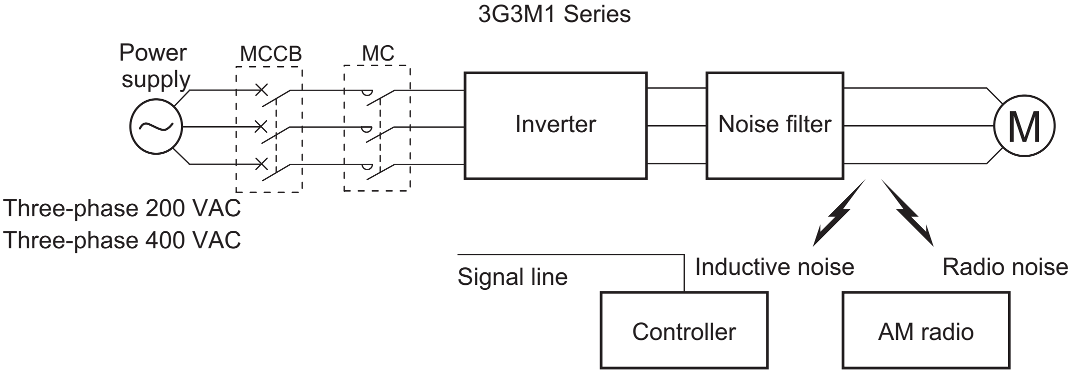
● Precautions for connecting more than one motor to inverter's output terminals

If connecting more than one motors to the output terminals of the inverter, note the following three points.

- Make sure that the rated current of the inverter is higher than the sum of the rated current values of the connected motors.
- The inverter cannot provide overload protection for individual motors, because it only detects a sum of the current values for all the connected motors.
  Install a thermal relay for each motor. The RC value of each thermal relay must be 1.1 times larger than the rated current of the motor.
- Set the inverter to detect only overloading that occurred in it by setting the Electronic Thermal Level to the rated output current of the inverter.

● Installing output noise filter

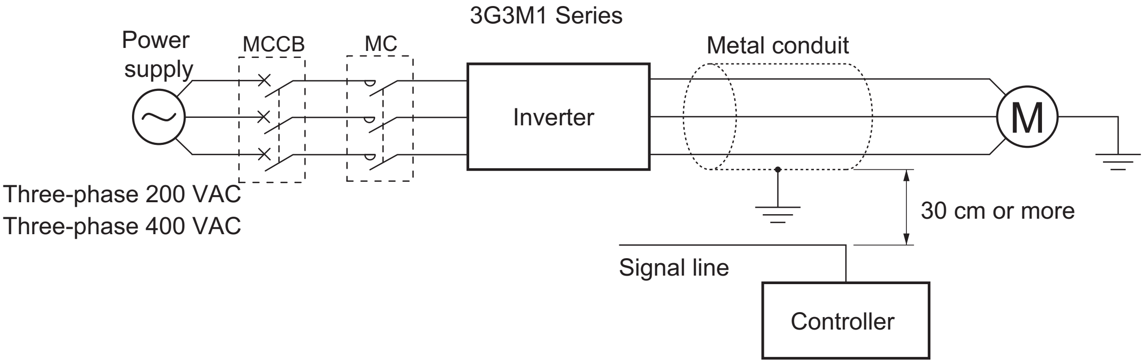
Connecting a noise filter to the output side of the inverter enables the reduction of radio noise and inductive noise.



Noise	Description
Inductive noise	Produced by electromagnetic induction, this noise causes malfunction of control equipment due to noise in signal lines.
Radio noise	The electromagnetic waves emitted from the inverter body or cables cause noise in radio receivers.

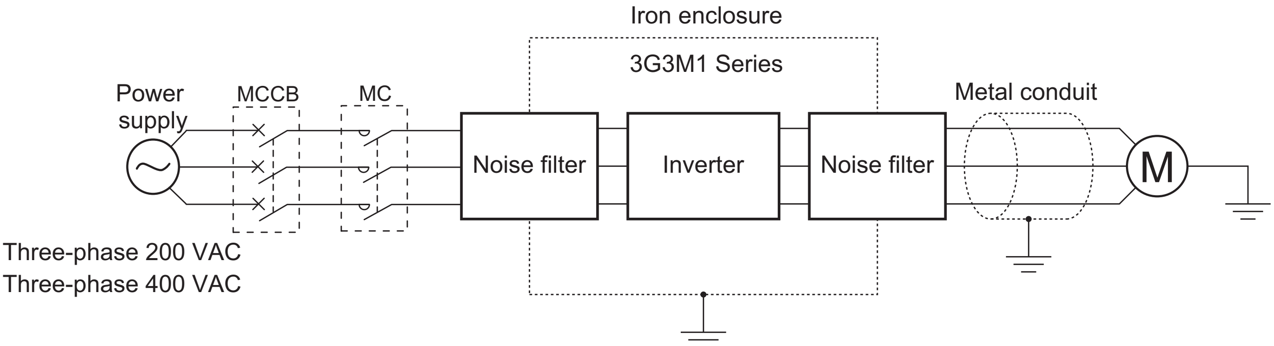
● Measures against inductive noise

In addition to the noise filter described above, you can suppress the inductive noise produced on the output side by connecting a bundle of wires through a grounded metal conduit.
Moreover, moving the conduit 30 cm or more away from signal lines helps the reduction of inductive noise.



● Measures against radio noise

Besides the I/O wires, radio noise is radiated from the inverter itself.
This radio noise can be reduced by installing noise filters on both the input and output sides of the inverter and by installing and shielding the inverter body in a grounded iron enclosure etc.
Keep the cables between the inverter and the motor as short as possible.



● Cable length between inverter and motor

If the length of the cables between the inverter and the motor is long, consider how to address the following problems.

- Voltage drop in output cables
  As the cable length between the inverter and the motor increases, the resistance in the cables becomes higher and accordingly the amount of voltage drop in the inverter output voltage becomes larger. This causes a decrease in the voltage that is applied to the motor, which results in a low output torque.
  If the cables are long, take measures to reduce the resistance, for example, by selecting cables whose wire diameter is larger than specified.
- Surge in long cables
  If the cable length exceeds 20 m, a surge voltage (approx. 1200 V max. for 400-V class) may be generated at the motor terminal depending on the stray capacitance or inductance of the cable, which may result in motor burnout.
  In particular, when using a 400-V class inverter with a cable length of over 20 m, it is recommended to use a dedicated inverter motor. Dedicated inverter motors are designed to support the above surge voltage level.
- Leakage current from output cables
  As the cable length between the inverter and the motor increases, stray capacitance increases between the inverter output and the ground. The increase in the stray capacitance on the output side of the inverter causes an increase of the high-frequency leakage current.
  This high-frequency leakage current may negatively affect on the current detector in the inverter output section or peripheral equipment.
  It is recommended to keep the wiring distance between the inverter and the motor at 100 m or shorter. If your system configuration requires the wiring distance of over 100 m, take measures to decrease the stray capacitance. The applicable measures are such as not wiring in a metal duct and using a separate cable for each phase.
  In addition, set a carrier frequency appropriate for the wiring distance between the inverter and the motor according to the table below.

Capacity	Wiring distance between inverter and motor
3.7 kW max.	50 m max.
5.5 kW min.	100 m max.

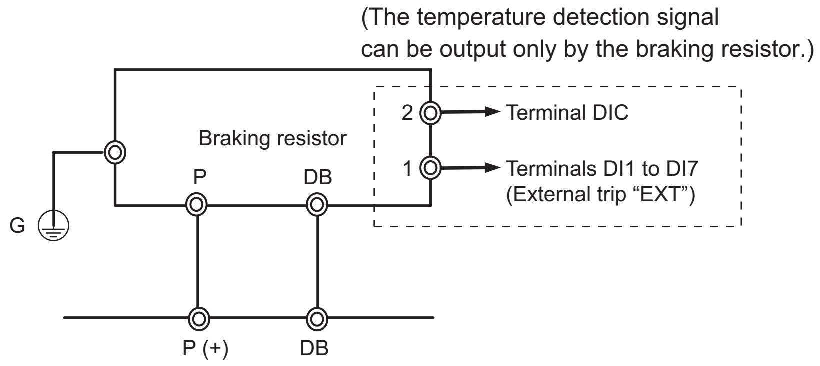
External Braking Resistor Connection Terminal (P(+), DB)

When driving a load with a large inertia or a vertical axis, regenerated energy is fed back to the inverter when it is decelerating or generating downward movement.
If the amount of regenerative energy exceeds the amount allowable for the inverter, an overvoltage is detected. Use braking resistors or regenerative braking units to prevent this.

● Using built-in regenerative braking circuit

All models of the 3G3M1 Series Inverter have built-in regenerative braking circuit.
To improve the braking capacity, connect the optional external braking resistor to these terminals (P(+), DB).

- Wiring diagram



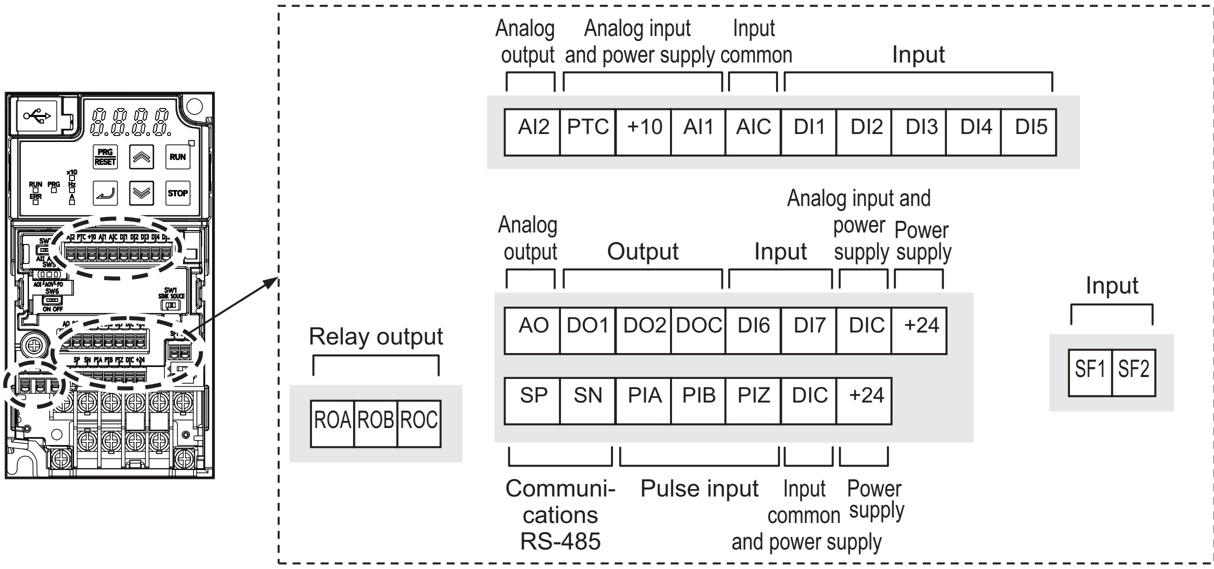
2-3-5 Wiring for Control Circuit Terminals

Wiring for Control Circuit Terminals

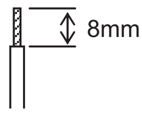
- The AIC terminal (common terminal of the analog input), DIC terminal (common terminal of the analog input) and DOC terminal (common terminal of the digital output) are mutually insulated from each other.
  Do not short-circuit or ground these common terminals.
  In addition, do not ground these common terminals via external equipment.
  When finished wiring, check the external equipment ground conditions.
- For wiring to the control circuit terminals, use twisted-pair shielded cables (recommended diameter: 0.75 mm^2). Connect the sheathed shielded cable to each common terminal. The cable length should be 20 m or shorter.
- Twist a cable connected to the terminal PTC (thermistor input) with a cable of the terminal AIC individually, and separate them from other AIC common cables. Since the current flowing through the thermistor is weak, separate the thermistor cable from main circuit cable (power cable). The thermistor connection cable should be 20 m or shorter.
- To use a relay for a multifunction output terminal, connect a surge-absorbing diode in parallel with the coil.
- The control circuit terminal block has three rows of terminals. Start wiring from the lower terminals. Wiring from the upper terminals makes it difficult to wire the lower terminals.

Arrangement of Control Circuit Terminal Blocks

The arrangement of terminals on the control circuit terminal block is shown below.



	Applicable wire		
	Solid wire mm^2 (AWG)	Stranded wire mm^2 (AWG)	Ferrule mm^2 (AWG)
Other than below	0.2 to 1.5 (AWG24 to 16)	0.2 to 1.0 (AWG24 to 17)	0.25 to 0.75 (AWG24 to 18)
ROA/ROB/ROC SF1/SF2	0.2 to 1.5 (AWG24 to 16)	0.2 to 1.0 (AWG24 to 17)	0.25 to 0.75 (AWG24 to 18)

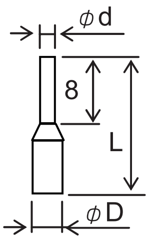


Sheath strip length should be approx. 8 mm for solid/stranded wire

Recommended Terminal

To improve ease of wiring and reliability in connection, it is recommended to use ferrules with the following specifications for signal wires.

Wire size mm^2 (AWG)	Ferrule type*1	L [mm]	ϕd [mm]	ϕD [mm]
0.25 (24)	AI 0.25-8YE	12.5	0.8	2.0
0.34 (22)	AI 0.34-8TQ	12.5	0.8	2.0
0.5 (20)	AI 0.5-8WH	14	1.1	2.5
0.75 (18)	AI 0.75-8GY	14	1.3	2.8



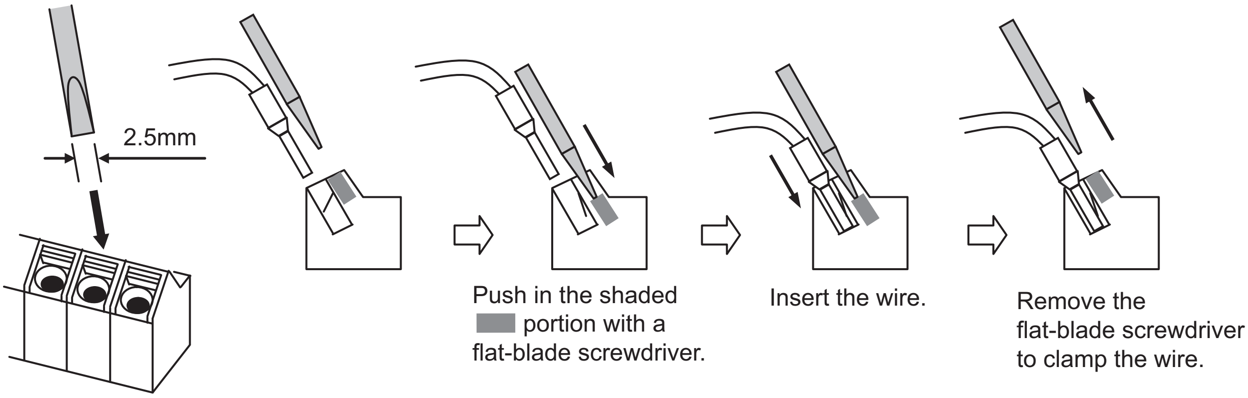
*1. Manufacturer: PHOENIX CONTACT
Crimping tool: CRIMPFOX 6

Wiring Method

1. Push in the orange colored portion of the control circuit terminal block with a flat-blade screwdriver (blade width: 2.5 mm max.) to open the wire insertion hole.

2. With the flat-blade screwdriver pushed in, insert the wire or ferrule into the wire insertion (round) hole.

3. Remove the flat-blade screwdriver to clamp the wire.



Note To disconnect, pull out the wire with the shaded (▬) portion pushed in with a flat-blade screwdriver.

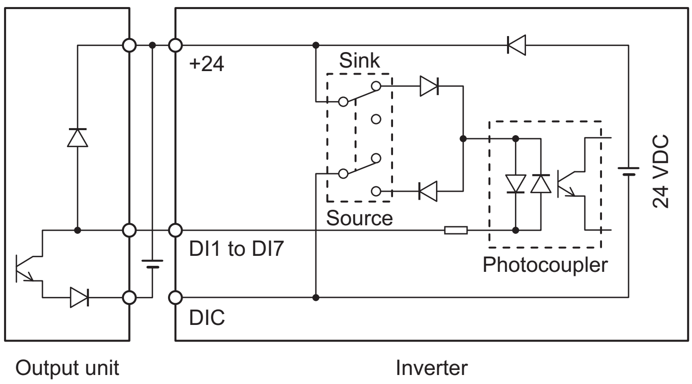
Selecting Input Control Logic

By factory default, the multifunction input terminals are set to sink logic (NPN).
To change the input control logic to source logic (PNP), switch SW1 on the control printed circuit board to the SOURCE side.

Multifunction Input Terminals and Programmable Controller Connection

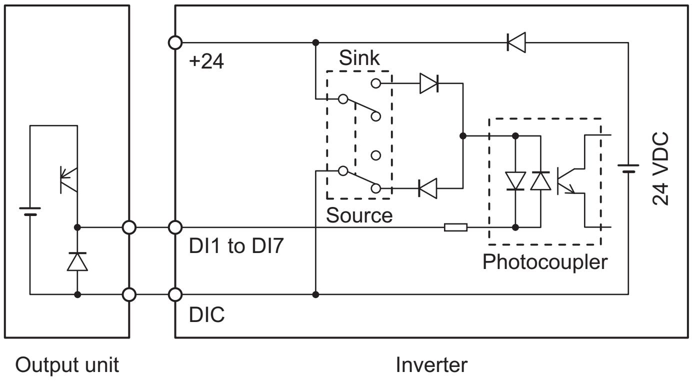
● Sink logic

On products not provided with a selector switch when an external power supply is used, DIC must never be wired to the 0 V or SC terminal on the PLC to prevent a connection that will allow the external power supply to be charged by the internal 24 VDC voltage of the inverter. When the inverter malfunctions, for example, due to the voltage difference with the external power supply, review the DIC connection destination.



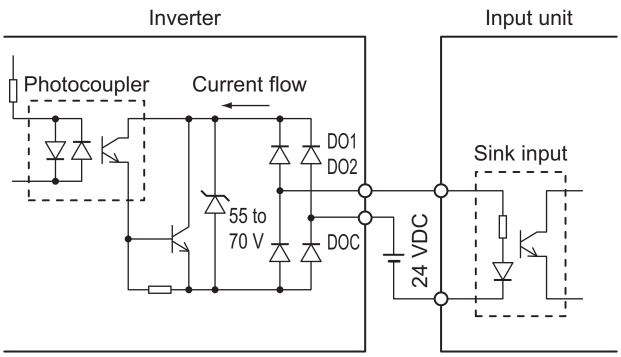
● Source logic

With use by an external power supply using source logic, take care not to connect the 24 V terminal to the external power supply or the PLC on the other side. A malfunction might arise due to the voltage difference between the internal power supply and the external power supply.

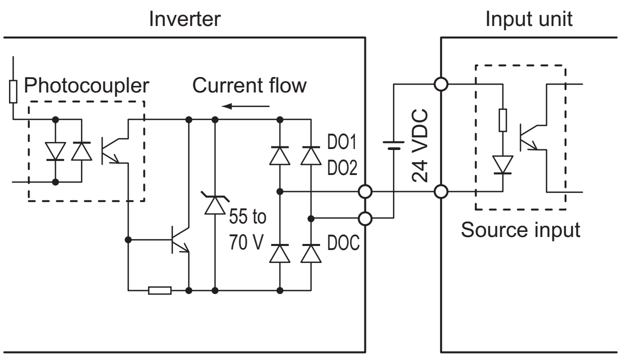


Multifunction Output Terminals and Programmable Controller Connection

● Sink logic



● Source logic



2-3-6 Recommended Encoder and Its Wiring

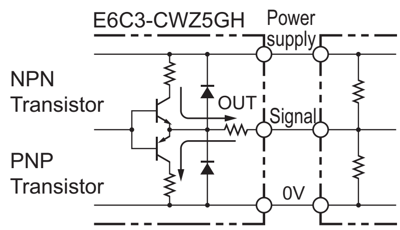
For the pulse train input function of the 3G3M1 Series inverter, be sure to use a complementary output type encoder.

In addition, for encoder cable connection, always use a shielded cable and connect it to the DIC terminal of the inverter's control circuit terminal block.

If an open collector output encoder is used, the inverter may not recognize the rotation in the forward or reverse direction. This is because, as the length of the encoder cable increases, its stray capacitance becomes larger, which causes the inverter to falsely recognize the crosstalk signal from the encoder.

● Complementary output

Complementary output is a method of outputting via two transistors.
The wiring is connected to the 0 V side when output is ON and to the power supply side when output is OFF.
This design does not allow the wiring to be left open (at high impedance) as in the case of open collector output encoders.
Therefore, this provides a stable output from the encoder.



● Recommended product

E6C3-CWZ5GH (Manufacturer: OMRON)

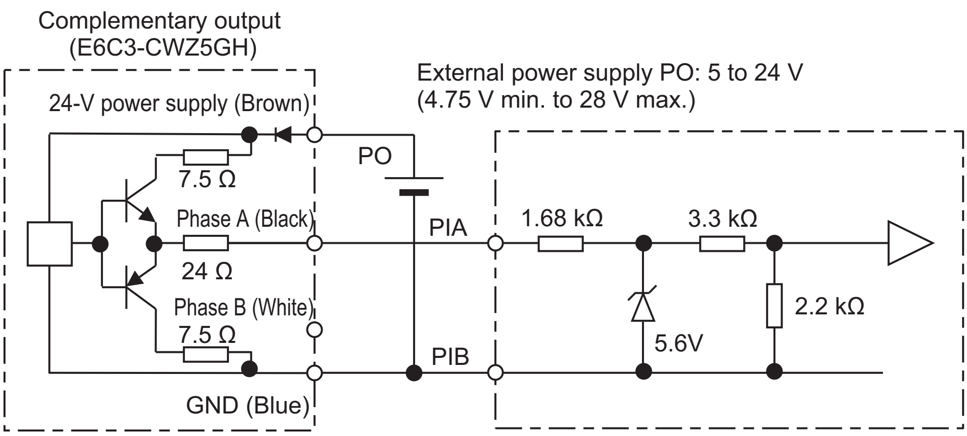
Encoder Input

For pulse train input, use the pulse train input PIA and PIB terminals of the control circuit terminals. Be sure to use a complementary output type encoder.

Wiring for Phase A and B 90° Phase Difference Pulse Train (d14 = 2 or 3)

Connect the phase A and B 90° phase difference pulse train as shown in the diagram below.

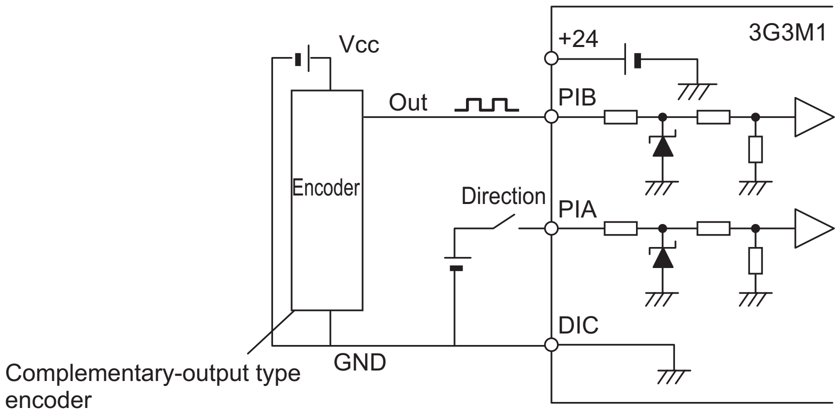
- Connect the phase A signal to the pulse input PIA terminal and the phase B signal to the pulse train input PIB terminal.
- The +24 V terminal of the inverter control circuit terminal block is for a 100 mA maximum 24 V power supply. This terminal can be used for the encoder power supply if the consumption current for the input terminals in use and the encoder power supply is allowable. However, note that this terminal must be isolated from any 24 V system power supply for other than the encoder and inverter.

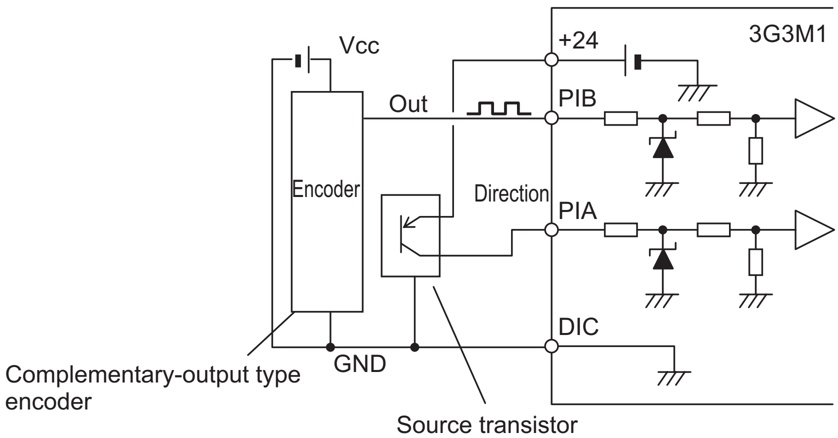


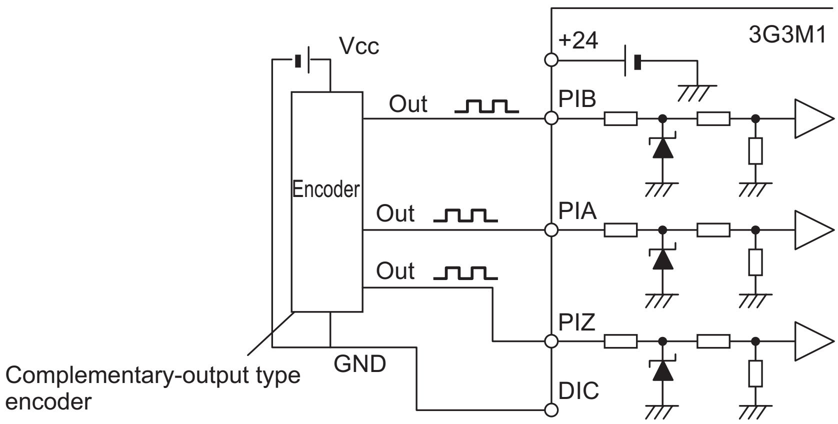
Wiring for Single-phase Pulse Signal and Direction Signal (d14 = 0)

Connect the single-phase pulse signal or single-phase pulse + direction signal as shown in the diagram below.

- Connect the direction signal to the pulse train input PIA terminal and the single-phase pulse to the pulse train input PIB terminal.
- The +24 V terminal of the inverter control circuit terminal block is for a 100 mA maximum 24 V power supply. This terminal can be used for the encoder power supply if the consumption current for the input terminals in use and the encoder power supply is allowable. However, note that this terminal must be isolated from any 24 V system power supply for other than the encoder and inverter.







Wiring for Forward Rotation Pulse/Reverse Rotation Pulse (d14 = 1)

Connect the forward rotation pulse/reverse rotation pulse as shown in the diagram below.

- Connect the forward rotation pulse to the pulse train input PIA terminal and the reverse rotation pulse to the pulse train input PIB terminal.
- The +24 V terminal of the inverter control circuit terminal block is for a 100 mA maximum 24 V power supply. This terminal can be used for the encoder power supply if the consumption current for the input terminals in use and the encoder power supply is allowable. However, note that this terminal must be isolated from any 24 V system power supply for other than the encoder and inverter.

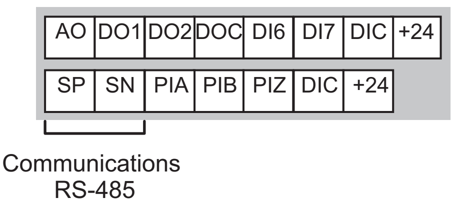
2-3-7 Wiring for RS-485 Communications Terminal Block

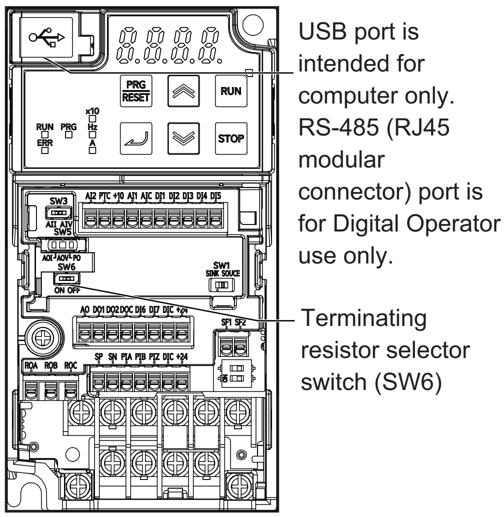
This inverter has RS-485 communications terminals on its control circuit terminal block.
It uses the Modbus communication protocol to establish communications with external controllers.
This section describes the wiring procedure for the RS-485 communications terminal block and the installation of the terminating resistor.

Wiring for RS-485 Communications Terminal Block

On the control circuit terminal block, the following RS-485 communications terminals are provided.

Terminal symbol	Terminal name	Function
SN	Modbus terminal (RS-485)	Negative-side send/receive terminal for RS-485 communications.
SP	Modbus terminal (RS-485)	Positive-side send/receive terminal for RS-485 communications.

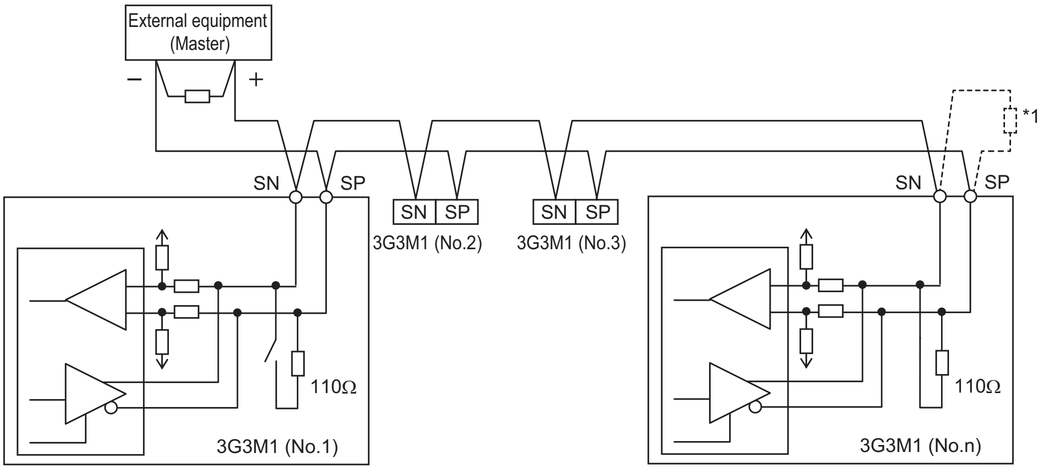




Terminating Resistor Setting

Connect the inverters parallel to each other as shown below and, only on the terminal inverter, turn ON the terminating resistor selector switch.
Even if you have only one inverter connected, turn ON the terminating resistor selector switch.

Selecting a terminating resistor appropriate to the cable impedance improves the terminating effect.
For this inverter, however, turning ON the terminating resistor selector switch enables the built-in terminating resistor (112 Ω).



*1. If the communications are unstable, install a terminating resistor appropriate to the impedance of the cable to each cable end. The resistance of the terminating resistor built into this inverter is 110 Ω.

2-3-8 Safety Function

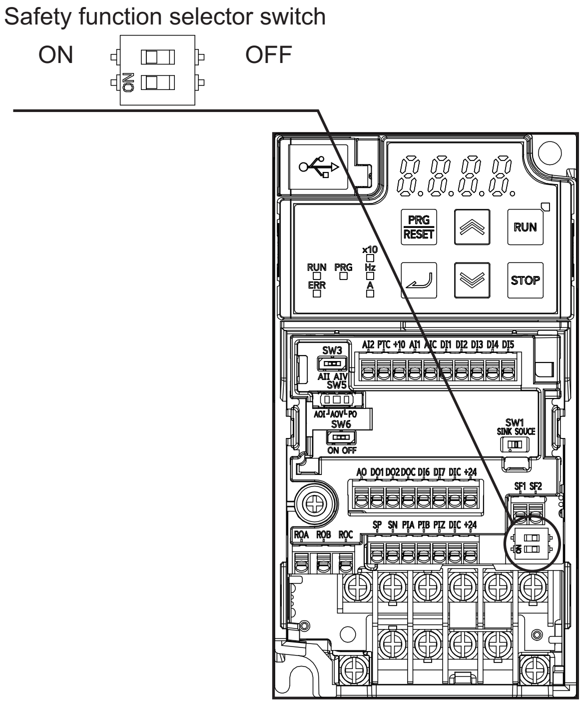
The safety function is designed so that the safety stop function of category 0 (uncontrolled stop) specified in IEC 60204-1 is used to meet the safety standards of PL-e under ISO 13849-1.
The safety input function allows the inverter output when current flows in both the terminals SF1 and SF2.
When the safety input function is activated, in compliance with the above standards, the output transistor operation of the inverter
is stopped safely (by shutting off its output). As a result, the motor stops with free run.
For details, refer to *7-6 Safety Function* on page 7-68.

Note This inverter meets ISO13849-1 PLc when the EDM function is disabled.

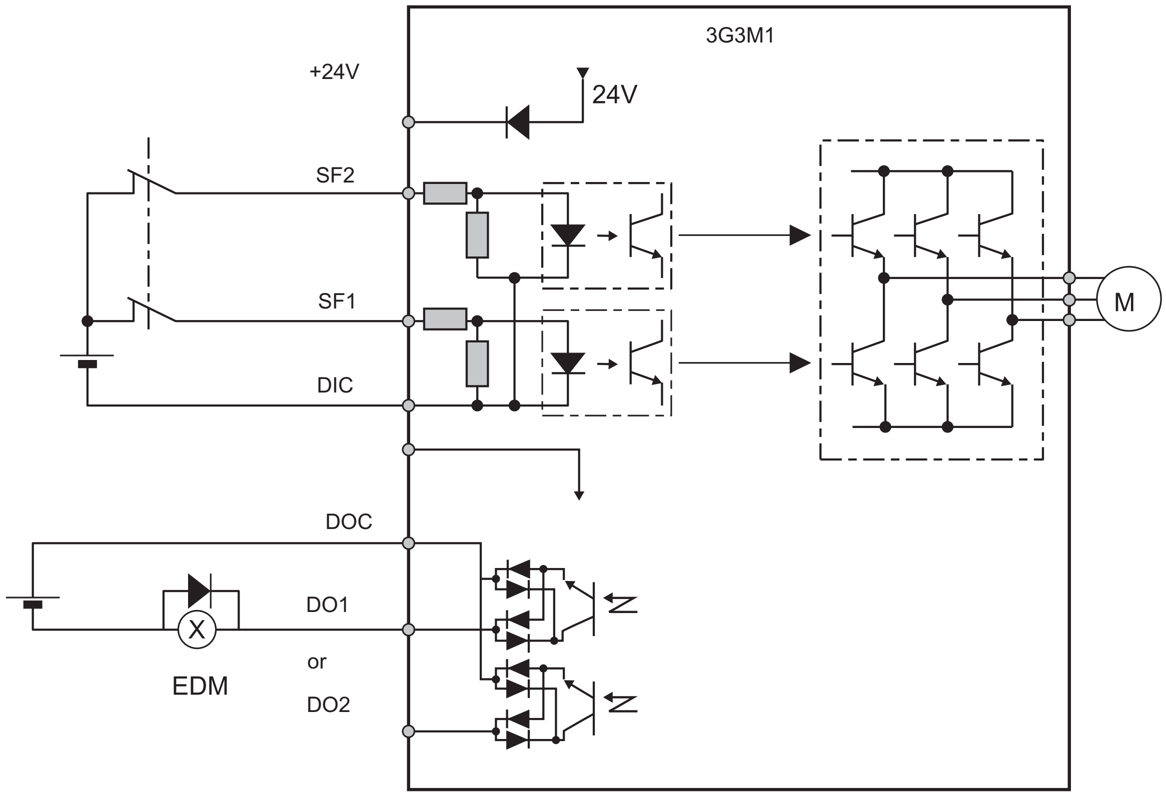
Safety Function Settings

To use the safety function, it must be set beforehand. By default, the safety function is disabled.
Use of the safety function is enabled by turning SW9 OFF.
Turn OFF both of the safety function selector switch SW9 when the inverter power supply is turned OFF. When using EDM output (safety monitor output), set “102: EDM (safety monitor)” at the multi-function output terminal.

When the safety function is used→Both OFF
When the safety function is not used→Both ON
When only one is ON, the logic of the SF1 and SF2 signals no longer matches and this causes an ECF alarm.



Wiring Example



In the factory default state, operation is always enabled by the short-circuit bars as shown in the figure above.

For details on connection with safety devices, refer to *7-6 Safety Function* on page 7-68.

2-4 Others

2-4-1 Korean Radio Regulations (KC)

사용자 안내문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서
가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

Guide for Users
This equipment has been evaluated for conformity in a commercial environment.
When used in a residential environment, it may cause radio interference.

2-4-2 Compliance with EU Directives and UKCA

This section provides conditions that must be met for compliance with European EU Directives.
Take measures to meet the conditions shown here for the entire system as well as peripheral equipment.
For the system that incorporates this inverter, perform the final compliance verification separately on the whole system.

Directives and Legislation

EU Declaration of Conformity
OMRON declares that 3G3M1 Series conform with the requirements of the following EU Directive EMC Directive 2014/30/EU Machinery Directive 2006/42/EC
UKCA Declaration of Conformity
OMRON declares that 3G3M1 Series conform with the requirements of the following UK legislation (2016 No.1091) Electromagnetic Compatibility Regulations (2008 No.1597) Supply of Machinery (Safety) Regulations

Applicable Standards

The 3G3M1 Series complies with the following standards.

Standard	Applicable standard
EMC	EN 61800-3:2004/A1:2012
Electrical Safety (Machinery Directive/LVD)	EN 61800-5-1:2007/A1:2017
Functional Safety (Machinery Directive)	The safety functions in 3G3M1 Series are designed and manufactured in accordance with the following standards: • EN 61800-5-2: 2017 • EN ISO 13849-1: 2015, PL e / Safety category 3

- This product is designed for industrial environments.
  If used in a residential environment, it may cause radio interference. In that case, it is necessary to take appropriate measures against radio interference.
- This product is not intended to be connected to a power grid that supplies residential facilities.

Concepts of Compliance

● EMC

OMRON products are the electrical devices incorporated and used in various machines or manufacturing equipment. For this reason, OMRON makes efforts to manufacture products that meet the related EMC standards so that the machines or equipment in which they are incorporated can easily comply with the EMC standards.
The 3G3M1 Series Inverter complies with EN61800-3 when installed and wired to equipment according to the methods described below. However, the customer's machines and equipment vary in type, and in addition, EMC performance depends on the configuration and electrical characteristics of mechanical parts, and the configuration, wiring and location of the control panel. This does not allow OMRON to verify compliance under the customer's usage conditions.
Please perform the final verification on the EMC compliance of your machines or the entire system at your own responsibility.

⚠ WARNING
There are conditions for compliance with the EU Low Voltage Directive and Machinery Directive. Strictly observe the conditions listed in the instruction manual or user's manual. Not doing so may result in a serious injury due to an electric shock or fire.

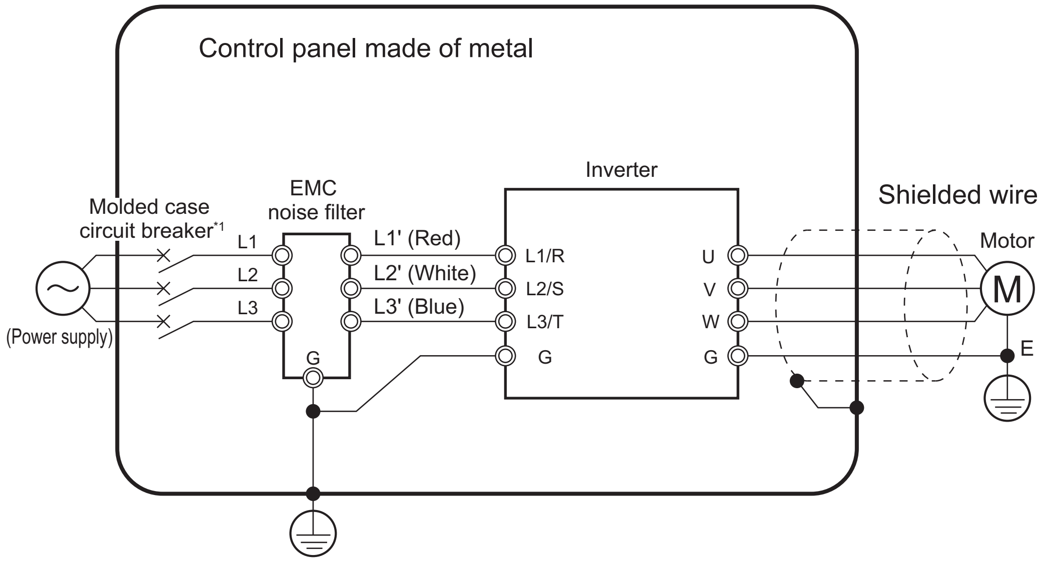
● EMC noise filters

OMRON is currently preparing a line up of EMC noise filters.

● Wiring for power supply

Keep the ground cable as short as possible.
Place the inverter and the noise filter on the same earth (ground) plate.
Always connect the power supply input terminals (L1/R, L2/S, L3/T) of the inverter to the power supply via an EMC noise filter.
Keep the cable between the inverter and the EMC noise filter as short as possible (40 cm maximum).

Connection Example



● Wiring between inverter and motor

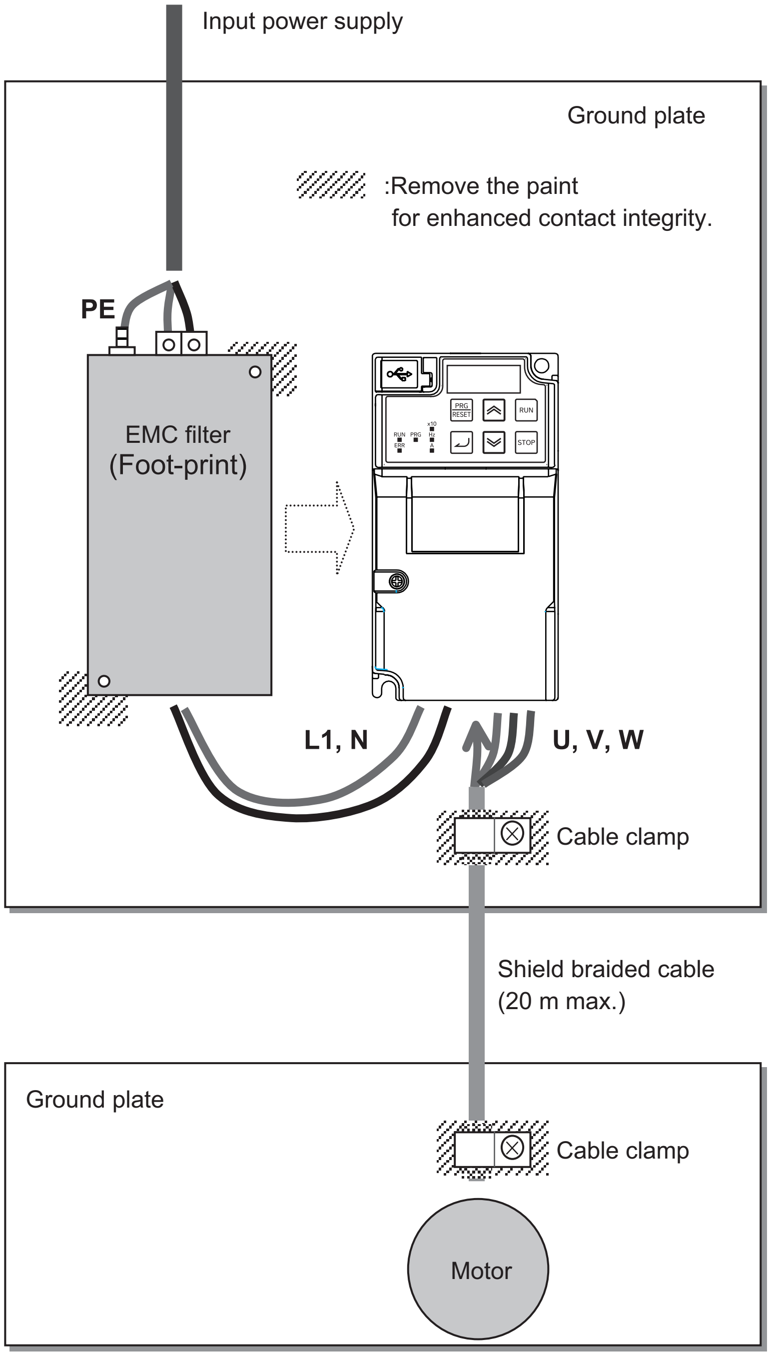
For cables between the inverter and motor, be sure to use shield braided cables.
Keep the cables as short as possible.

● Measures against noise for compliance with EMC Directive

- Keep the power cable of the inverter and the EMC noise filter wiring as short as possible. Use a shield braided cable.
- For the shield braided cable, use a tinned copper shielded cable with a shield factor of 85%.
- Be sure to connect the ground cable separately from the shielded cable. Use the ground cable as thick and short as possible to wire.
- Use shield braided cables for connection between the inverter and the motor. Keep the cables as short as possible at a length 20 m or less, with the cable shield grounded at each end. Installing a clamp filter near the inverter output terminals is an effective countermeasure.
- Ground the motor frame, the shield of the motor cable, and the terminal housing adequately. The motor terminal housing may not contact with the chassis due to the rubber bushing or the screw hole for motor ground terminal may be coated. Check the contact performance. If there is any problem, take measures to enhance contact performance.
- Use shielded cables for wiring to the control circuit terminal blocks and communications lines and ground the shield of each cable on the inverter side. Grounding the cables at each end may increase the effect.
- Connect the cable shield directly to a ground plate with a conductive cable clamp. At this time, keep the shield strip length as short as possible.
- Make the contact area between the EMC noise filter/inverter and the ground plate as large as possible to enhance contact performance. At this time, remove the paint etc. from the ground plate.
- For the metal control panel door, use a conductive gasket to improve the shielding effect.
- In the same control panel, do not install equipment that generates non-EMC-compliant electromagnetic waves.
- Avoid conductor loops that encompass large areas.

- As a measure against harmonic distortion, an AC/DC reactor or harmonic suppression equipment is required.
- Avoid placing noise-generating cables (such as power cables and motor cables of the inverter) in parallel with signal cables and allow a clearance of at least 25 cm between them.
  If you cannot avoid crossing two types of cables, keep them at right angles to each other.

● Wiring example for single-phase 200-V class



● Low-voltage directive (electrical safety)

The 3G3M1 Series Inverter complies with EN61800-5-1 when installed and wired to equipment according to the methods described below.

- The 3G3M1 Series Inverter is an open type device. Be sure to install it inside the control panel.

- The power supply and voltage (SELV) with reinforced or double insulation should be used for wiring to the control circuit terminals.
- To satisfy electrical safety requirements, the inverter must be protected with fuses or a molded case circuit breaker (MCCB) in case a short-circuiting accident occurs. Be sure to install fuses or a molded case circuit breaker (MCCB) on the power supply side of the inverter.
  The fuses, if used, should be one of the UL-compliant Class-J product listed in *2-4-3 UL/cUL Standards Cautions* on page 2-74.
- Use one molded case circuit breaker (MCCB), or one set of fuses, per inverter.
- Use the crimp terminal with an insulation sleeve to connect to the main circuit terminals.

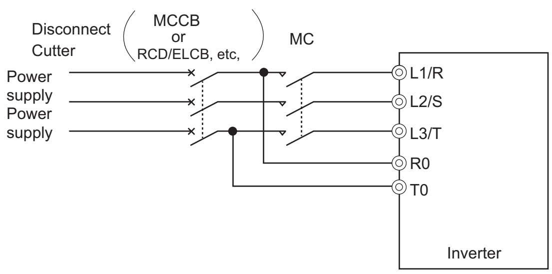
● Compliance with EU Low Voltage Directive

- **Be sure to ground the ground terminal ⏚ G. Do not use only an earth leakage circuit breaker* (RCD: Residual-current-operated protective device/ELCB: Earth Leakage Circuit Breaker) as protection against electric shock. Also, use ground cable of the size of the power line or larger diameter.**
  ***With overcurrent protection function**
- **To protect against high voltage that accompanies inverter damage and the risk of accidents, install a fuse having the rating specified in the table below on the power supply side.**
  - Breaking capacity 10 kA or more, rated voltage 500 V or less

<table>
<tr><th>Power supply line</th><th>Standard applicable motor (kW)</th><th>Inverter model</th><th>Specifications</th><th>Fuse rating (A)</th></tr>
<tr><td rowspan="24">Three-phase 200 V</td><td>0.1</td><td rowspan="2">3G3M1-A2001</td><td>HHD</td><td rowspan="2">50 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">0.2</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2002</td><td>HHD</td><td rowspan="2">50 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">0.4</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2004</td><td>HHD</td><td rowspan="2">50 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">0.75</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2007</td><td>HHD</td><td rowspan="2">50 (IEC 60269-4)</td></tr>
<tr><td>1.1</td><td>HND</td></tr>
<tr><td>1.5</td><td rowspan="2">3G3M1-A2015</td><td>HHD</td><td rowspan="2">80 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">2.2</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2022</td><td>HHD</td><td rowspan="2">125 (IEC 60269-4)</td></tr>
<tr><td>3</td><td>HND</td></tr>
<tr><td>3.7</td><td rowspan="2">3G3M1-A2037</td><td>HHD</td><td rowspan="2">125 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">5.5</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2055</td><td>HHD</td><td rowspan="2">160 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">7.5</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2075</td><td>HHD</td><td rowspan="2">200 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">11</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2110</td><td>HHD</td><td rowspan="2">200 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">15</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2150</td><td>HHD</td><td rowspan="2">250 (IEC 60269-4)</td></tr>
<tr><td rowspan="2">18.5</td><td>HND</td></tr>
<tr><td rowspan="2">3G3M1-A2185</td><td>HHD</td><td rowspan="2">250 (IEC 60269-4)</td></tr>
<tr><td>22</td><td>HND</td></tr>
</table>

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Fuse rating (A)
Three-phase 400 V	0.4	3G3M1-A4004	HHD	50 (IEC 60269-4)
	0.75		HND	
			HD	
			ND	
		3G3M1-A4007	HHD	50 (IEC 60269-4)
	1.1		HND	
			HD	
	1.5		ND	
		3G3M1-A4015	HHD	50 (IEC 60269-4)
	2.2		HND	
			HD	
			ND	
		3G3M1-A4022	HHD	63 (IEC 60269-4)
	3.0		HND	
			HD	
			ND	
		3G3M1-A4030	HHD	63 (IEC 60269-4)
	4.0		HND	
			HD	
			ND	
		3G3M1-A4040	HHD	63 (IEC 60269-4)
	5.5		HND	
			HD	
			ND	
		3G3M1-A4055	HHD	100 (IEC 60269-4)
	7.5		HND	
			HD	
		3G3M1-A4075	HHD	100 (IEC 60269-4)
	11	3G3M1-A4055	ND	100 (IEC 60269-4)
		3G3M1-A4075	HND	100 (IEC 60269-4)
			HD	
		3G3M1-A4110	HHD	125 (IEC 60269-4)
	15	3G3M1-A4075	ND	100 (IEC 60269-4)
		3G3M1-A4110	HND	125 (IEC 60269-4)
			HD	
		3G3M1-A4150	HHD	160 (IEC 60269-4)

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Fuse rating (A)
Three-phase 400 V	18.5	3G3M1-A4110	ND	125 (IEC 60269-4)
		3G3M1-A4150	HND	160 (IEC 60269-4)
			HD	
		3G3M1-A4185	HHD	160 (IEC 60269-4)
	22	3G3M1-A4150	ND	160 (IEC 60269-4)
		3G3M1-A4185	HND	160 (IEC 60269-4)
			HD	
		3G3M1-A4220	HHD	200 (IEC 60269-4)
	30	3G3M1-A4185	ND	160 (IEC 60269-4)
		3G3M1-A4220	HND	200 (IEC 60269-4)
			HD	
	37		ND	
Single-phase 200 V	0.1	3G3M1-AB001	HHD	50 (IEC 60269-4)
	0.2		HND	
		3G3M1-AB002	HHD	50 (IEC 60269-4)
	0.4		HND	
		3G3M1-AB004	HHD	50 (IEC 60269-4)
	0.55		HND	
	0.75	3G3M1-AB007	HHD	50 (IEC 60269-4)
	1.1		HND	
	1.5	3G3M1-AB015	HHD	125 (IEC 60269-4)
	2.2		HND	
		3G3M1-AB022	HHD	125 (IEC 60269-4)
	3		HND	
	3.7	3G3M1-AB037	HHD	160 (IEC 60269-4)



- **Use a molded case circuit breaker (MCCB), residual current device (RCD) or earth leakage circuit breaker (ELCB), and magnetic contactor (MC) that are compliance with EN or IEC Standards.**
- **When using a residual current device (RCD) or earth leakage circuit breaker (ELCB) as protection against electric shock through direct or indirect contact with the power line or node, be sure to install a RCD or ELCB of type B (DC capable) model on the input side (primary side) of the inverter.**

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB)*1		Earth leakage circuit breaker (RCD/ELCB)*1			
				Rated current		Rated current		Sensitivity current*2	Max. fault loop impedance
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor		
Three-phase 200 V	0.1	3G3M1-A2001	HHD	5	5	5	5	30 mA	200 Ω
	0.2		HND						
		3G3M1-A2002	HHD						
	0.4		HND						
		3G3M1-A2004	HHD						
	0.75		HND		10		10		
		3G3M1-A2007	HHD						
	1.1		HND	10		10			
	1.5	3G3M1-A2015	HHD		15		15		
	2.2		HND		20		20		
		3G3M1-A2022	HHD						
	3		HND	20	30	20	30		
	3.7	3G3M1-A2037	HHD						
	5.5		HND	30	40	30	40		
		3G3M1-A2055	HHD		50		50		
	7.5		HND	40	75	40	75		
		3G3M1-A2075	HHD						
	11		HND	50	100	50	100		
		3G3M1-A2110	HHD						
	15		HND	75	125	75	125		
		3G3M1-A2150	HHD						
	18.5		HND	100	150	100	150		
		3G3M1-A2185	HHD						
	22		HND		175		175		

*1. The frame size and model of MCCB, RCD or ELCB (with overcurrent protection function) change according to the capacity of the power transformer. For details on selection method, refer to related technical data.

*2. The sensitivity current setting of the TT system differs according to each country. Follow the instructions of the relevant authority.

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB)*1 Rated current: With DC reactor	Molded case circuit breaker (MCCB)*1 Rated current: Without DC reactor	Earth leakage circuit breaker (RCD/ELCB)*1 Rated current: With DC reactor	Earth leakage circuit breaker (RCD/ELCB)*1 Rated current: Without DC reactor	Earth leakage circuit breaker (RCD/ELCB)*1 Sensitivity current*2	Earth leakage circuit breaker (RCD/ELCB)*1 Max. fault loop impedance
Three-phase 400 V	0.4	3G3M1-A4004	HHD	5	5	5	5	30 mA	20 Ω
	0.75		HND						
			HD						
			ND						
		3G3M1-A4007	HHD						
	1.1		HND						
			HD						
	1.5		ND						
		3G3M1-A4015	HHD		10		10		
	2.2		HND						
			HD						
			ND						
		3G3M1-A4022	HHD	10	15	10	15		
	3.0		HND						
			HD						
			ND						
		3G3M1-A4030	HHD						
	4.0		HND		20		20		
			HD						
			ND						
		3G3M1-A4040	HHD						
	5.5		HND	15	30	15	30		
			HD						
			ND						
		3G3M1-A4055	HHD						
	7.5		HND	20	40	20	40		
		3G3M1-A4075	HD						
			HHD						
	11	3G3M1-A4055	ND	30	50	30	50		
		3G3M1-A4075	HND						
			HD						
		3G3M1-A4110	HHD						

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB)*1		Earth leakage circuit breaker (RCD/ELCB)*1			
				Rated current		Rated current		Sensitivity current*2	Max. fault loop impedance
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor		
Three-phase 400 V	15	3G3M1-A4075	ND	40	60	40	60	100 mA	20 Ω
		3G3M1-A4110	HND						
			HD						
		3G3M1-A4150	HHD						
	18.5	3G3M1-A4110	ND		75		75		
		3G3M1-A4150	HND						
			HD						
		3G3M1-A4185	HHD						
	22	3G3M1-A4150	ND	50	100	50	100		
		3G3M1-A4185	HND						
			HD						
		3G3M1-A4220	HHD						
	30	3G3M1-A4185	ND	75	125	75	125		
		3G3M1-A4220	HND						
			HD						
	37		ND	100		100			

*1. The frame size and model of MCCB, RCD or ELCB (with overcurrent protection function) change according to the capacity of the power transformer. For details on selection method, refer to related technical data.

*2. The sensitivity current setting of the TT system differs according to each country. Follow the instructions of the relevant authority.

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB)*1		Earth leakage circuit breaker (RCD/ELCB)*1			
				Rated current		Rated current		Sensitivity current*2	Max. fault loop impedance
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor		
Single-phase 200 V	0.1	3G3M1-AB001	HHD	5	5	5	5	30 mA	200 Ω
	0.2		HND						
		3G3M1-AB002	HHD						
	0.4		HND		10		10		
		3G3M1-AB004	HHD						
	0.55		HND	10		10			
	0.75	3G3M1-AB007	HHD		15		15		
	1.1		HND	15	20	15	20		
	1.5	3G3M1-AB015	HHD						
	2.2		HND	30	30	30	30		
		3G3M1-AB022	HHD						
	3		HND		40		40		
	3.7	3G3M1-AB037	HHD	40	60	40	60		

*1. The frame size and model of MCCB, RCD or ELCB (with overcurrent protection function) change according to the capacity of the power transformer. For details on selection method, refer to related technical data.

*2. The sensitivity current setting of the TT system differs according to each country. Follow the instructions of the relevant authority.

- **Use the inverter in an environment that does not exceed pollution degree 2. In pollution degree 3 or 4 environments, install the inverter in a panel that satisfies IP rating IP54 or higher.**
- **To prevent operators from electric shock caused by live parts, install the inverter, AC reactor (ACR) or DC reactor (DCR), and input filter or output filter inside a panel with IP2X or higher. When an operator can easily touch the panel, ensure that the protection grade of the top surface of the panel is IP4X or higher.**
- **Do not directly connect copper wire to the ground terminal. Use tin-plated or equivalent-plated crimped terminals for connections.**
- **When the inverter is used at locations 2,000 m or higher above sea level, the insulation of the control circuit is the basic insulation. The inverter cannot be used at locations 3,000 m above sea level.**
- **Use wires stipulated in IEC60364-5-52.**

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB) or earth leakage circuit breaker (RCD/ELCB) rated current*1		Recommended wire size (mm^2)								
						For main circuit							For control circuit terminal	Control power supply auxiliary input R0, T0
						Main power supply input [L1/R, L2/S, L3/T]*2		Inverter ground [⏚]*2*3		Inverter output [U, V, W]*2	For DC reactor connection [P1, P(+)]	For braking resistor connection [P(+), DB]*2		
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor	With DC reactor	Without DC reactor					
Three-phase 200 V	0.1	3G3M1-A2001	HHD	5	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0.75	-
	0.2		HND											
		3G3M1-A2002	HHD											
	0.4		HND											
		3G3M1-A2004	HHD											
	0.75		HND		10									
		3G3M1-A2007	HHD											
	1.1		HND	10										
	1.5	3G3M1-A2015	HHD		15									
	2.2		HND		20									
		3G3M1-A2022	HHD											
	3		HND	20	30									
	3.7	3G3M1-A2037	HHD				4		4					
	5.5		HND	30	40		6		6		4			
		3G3M1-A2055	HHD		50	4		4		4				
	7.5		HND	40	75	6	10	6	10	6	10			
		3G3M1-A2075	HHD											
	11		HND	50	100	10	16	10	16	10	16			
		3G3M1-A2110	HHD											
	15		HND	75	125	16	25	16		16	25			
		3G3M1-A2150	HHD											
	18.5		HND	100	150	25	35			25	35			
		3G3M1-A2185	HHD											2.5
	22		HND		175	35	50		25	35				

*1. The frame size and model of MCCB, RCD or ELCB (with overcurrent protection function) change according to the capacity of the power transformer. For details on selection method, refer to related technical data.

*2. The recommended size of wire to the main circuit terminal is the size when PVC wire having an allowable temperature of 70°C and a rated voltage of 600 V is used, and the ambient temperature is 40°C.

*3. Only one wire of recommended size can be connected to the ground terminal.

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB) or earth leakage circuit breaker (RCD/ELCB) rated current*1		Recommended wire size (mm^2)								
						For main circuit							For control circuit terminal	Control power supply auxiliary input R0, T0
						Main power supply input [L1/R, L2/S, L3/T]*2		Inverter ground [⏚]*2*3		Inverter output [U, V, W]*2	For DC reactor connection [P1, P(+)]	For braking resistor connection [P(+), DB]*2		
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor	With DC reactor	Without DC reactor					
Three-phase 400 V	0.4	3G3M1-A4004	HHD	5	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0.75	-
	0.75		HND											
			HD											
			ND											
		3G3M1-A4007	HHD											
	1.1		HND											
			HD											
	1.5		ND											
		3G3M1-A4015	HHD		10									
	2.2		HND											
			HD											
			ND											
		3G3M1-A4022	HHD	10	15									
	3.0		HND											
			HD											
			ND											
		3G3M1-A4030	HHD											
	4.0		HND		20									
			HD											
			ND											
		3G3M1-A4040	HHD											
	5.5		HND	15	30									
			HD											
			ND											
		3G3M1-A4055	HHD											
	7.5		HND	20	40		4		4					
			HD											
		3G3M1-A4075	HHD											

Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB) or earth leakage circuit breaker (RCD/ELCB) rated current*1		Recommended wire size (mm²)								
						For main circuit							For control circuit terminal	Control power supply auxiliary input R0, T0
						Main power supply input [L1/R, L2/S, L3/T]*2		Inverter ground [⏚]*2*3		Inverter output [U, V, W]*2	For DC reactor connection [P1, P(+)]	For braking resistor connection [P(+), DB]*2		
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor	With DC reactor	Without DC reactor					
Three-phase 400 V	11	3G3M1-A4055	ND	30	50	4	6	4	6	4	4	2.5	0.75	-
		3G3M1-A4075	HND											
			HD											
		3G3M1-A4110	HHD				10		10					
	15	3G3M1-A4075	ND	40	69	6		6		6	10			
		3G3M1-A4110	HND											
			HD											
		3G3M1-A4150	HHD											
	18.5	3G3M1-A4110	ND		75	10	16	10	16	10				
		3G3M1-A4150	HND											
			HD											
		3G3M1-A4185	HHD											2.5
	22	3G3M1-A4075	ND	50	100						16			-
		3G3M1-A4185	HND											2.5
			HD											
		3G3M1-A4220	HHD											
	30	3G3M1-A4185	ND	75	125	16	25	16		16	25			
		3G3M1-A4220	HND											
			HD											
	37		ND	100		25	35			25				

*1. The frame size and model of MCCB, RCD or ELCB (with overcurrent protection function) change according to the capacity of the power transformer. For details on selection method, refer to related technical data.

*2. The recommended size of wire to the main circuit terminal is the size when PVC wire having an allowable temperature of 70°C and a rated voltage of 600 V is used, and the ambient temperature is 40°C.

*3. Only one wire of recommended size can be connected to the ground terminal.

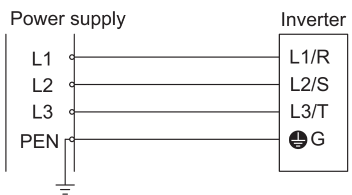
Power supply line	Standard applicable motor (kW)	Inverter model	Specifications	Molded case circuit breaker (MCCB) or earth leakage circuit breaker (RCD/ELCB) rated current*1		Recommended wire size (mm²)								
						For main circuit							For control circuit terminal	Control power supply auxiliary input R0, T0
						Main power supply input [L1/R, L2/S, L3/T]*2		Inverter ground [⏚]*2*3		Inverter output [U, V, W]*2	For DC reactor connection [P1, P(+)]	For braking resistor connection [P(+), DB]*2		
				With DC reactor	Without DC reactor	With DC reactor	Without DC reactor	With DC reactor	Without DC reactor					
Single-phase 200 V	0.1	3G3M1-AB001	HHD	5	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0.75	-
	0.2		HND											
		3G3M1-AB002	HHD											
	0.4		HND		10									
		3G3M1-AB004	HHD											
	0.55		HND	10										
	0.75	3G3M1-AB007	HHD		15									
	1.1		HND	15	20									
	1.5	3G3M1-AB015	HHD											
	2.2		HND	30	30		4		4		4			
		3G3M1-AB022	HHD	20										
	3.0		HND	30	40	4		4			6			
	3.7	3G3M1-AB037	HHD	40	60	6	10	6	10		10			

*1. The frame size and model of MCCB, RCD or ELCB (with overcurrent protection function) change according to the capacity of the power transformer. For details on selection method, refer to related technical data.

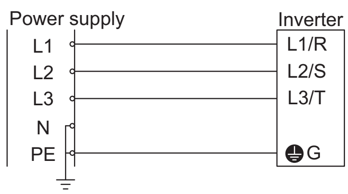
*2. The recommended size of wire to the main circuit terminal is the size when PVC wire having an allowable temperature of 70°C and a rated voltage of 600 V is used, and the ambient temperature is 40°C.

*3. Only one wire of recommended size can be connected to the ground terminal.

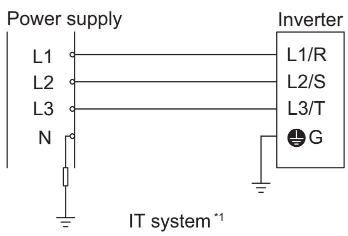
- **Use this product on the following power supply system.**



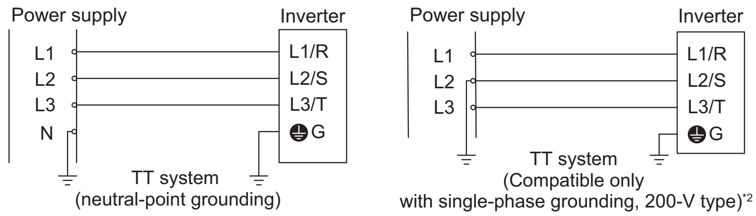
TN-C system



TN-S system



IT system *1



*1. The following IT system power supply is supported.

When the power supply system is not grounded at all	The insulation between the control interface and the main circuit of the inverter is the basic insulation. Accordingly, do not connect the SELV circuit directly from an external controller. (Connect using additional insulation.) Install a ground fault detector, and cut off the power supply within five seconds of a ground fault.
When the neutral point is grounded through an impedance	
When a single phase of the power supply is grounded through an impedance	Not supported.

*2. TT systems to which a single phase of a 400 V power supply is directly grounded are not supported.

- **A solid-state motor overload protection function (motor overload protection by electronic thermal relay) is mounted on each model. The protection level can be set at function codes F10 to F12.**

Compliance with EMC Directive and Low Voltage Directive

(Manufacturer)
OMRON Corporation (Manufacturer)
Shiokoji Horikawa, Shimogyo-ku, Kyoto 600-8530 Japan

(Importer)
OMRON Europe B.V. (Importer in EU)
Wegalaan 67-69, 2132 JD Hoofddorp, The Netherlands

Cautions when exporting to Europe
- Not all OMRON products in Europe are imported through the above importer. When a different importer is exporting OMRON products to Europe, those importer is responsible to clarify their name and address as an importer and clearly indicate to the customer.

Compliance with UKCA

The UK legislation require clear indication of the name and address of the manufacturer and importer is compulsory. The importer must clearly indicate the importer name and address to the customer.

(Manufacturer)
OMRON Corporation (Manufacturer)
Shiokoji Horikawa, Shimogyo-ku, Kyoto 600-8530 Japan

(UKCA Contact)

Omron Electronics LTD.
Opal Drive, Fox Milne, MK15 0DG, Milton Keynes, United Kingdom

Ecodesign Directive

We provide the VSD efficiency information regarding to motor regulation.
For details, please visit the following website.
https://industrial.omron.eu/en/company-info/environmental/ecodesign-directive

2-4-3 UL/cUL Standards Cautions

The warnings and instructions in this section summarizes the procedures necessary to ensure an inverter installation complies with Underwriters Laboratories guidelines.
Applicable Standards: UL61800-5-1, C22.2 No.274-17

- Use UL certified 60/75°C Cu wire only.
- Use Class1 wire for control circuits.
- This inverter is suitable for use on circuits where the delivering current is limited to 100 kA or less when protected by external Semiconductor Fuse with UL recognition. See next section for details of fuses.
- This inverter should be installed in an environment of pollution degree 2 and an overvoltage class III.
- Maximum surrounding air temperature is as below.

Inverter Type	HHD/HND	HD/ND
3G3M1-A2001, 3G3M1-A2002, 3G3M1-A2004, 3G3M1-A2007, 3G3M1-A2015 3G3M1-A2055, 3G3M1-A2075, 3G3M1-A2110, 3G3M1-A2150, 3G3M1-A2185	50°C	-
3G3M1-A4004, 3G3M1-A4007, 3G3M1-A4015 3G3M1-A4055, 3G3M1-A4075, 3G3M1-A4110, 3G3M1-A4150, 3G3M1-A4185, 3G3M1-A4220, 3G3M1-AB001, 3G3M1-AB002	50°C	40°C
3G3M1-AB037	50°C	-

Inverter Type	HHD	HND/HD/ND
3G3M1-A2022, 3G3M1-A2037 3G3M1-A4022, 3G3M1-A4030, 3G3M1-A4040 3G3M1-AB004, 3G3M1-AB007, 3G3M1-AB015, 3G3M1-AB022	50°C	40°C

- Set motor (electronic thermal) protection levels using parameters F10 to F12. (For details, refer to *5-3-3 Motor Electronic Thermal Function* on page 5-20.)
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electric Code and any additional local codes.
  The inverter does not have motor overheat protection built in.

Main Circuit Terminal Block Screw Sizes, Tightening Torque and Wire Sizes

Power supply system	Standard applicable motor (kW)	Inverter Model	HHD/HD/HND/ND modes	Tightening torque lb-in (N・m)			Wire size AWG (mm^2)							
				Main circuit	Inverter size	Control circuit auxiliary input	Main circuit copper wire						⏚G	Control circuit auxiliary input
							L1/R, L2/S, L3/T			U, V, W			Inverter size	
							60-C copper wire	75-C copper wire	Remarks	60-C copper wire	75-C copper wire	Remarks		
Three-phase 200 V	0.1	3G3M1-A2001	HHD	10.6 (1.2)	15.9 (1.8)	-	14 (2.1)	14 (2.1)	*3	14 (2.1)	14 (2.1)	*3	14 (2.1)	-
	0.2	3G3M1-A2001	HND											
		3G3M1-A2002	HHD											
	0.4	3G3M1-A2002	HND											
		3G3M1-A2004	HHD											
	0.75	3G3M1-A2004	HND											
		3G3M1-A2007	HHD											
	1.1	3G3M1-A2007	HND											
	1.5	3G3M1-A2015	HHD											
	2.2	3G3M1-A2015	HND										12 (3.3)	
		3G3M1-A2022	HHD											
	3	3G3M1-A2022	HND											

Power supply system	Standard applicable motor (kW)	Inverter Model	HHD/HD/HND/ND modes	Tightening torque lb-in (N・m)			Wire size AWG (mm²)							
				Main circuit	Inverter size	Control circuit auxiliary input	Main circuit copper wire						⏚G	Control circuit auxiliary input
							L1/R, L2/S, L3/T			U, V, W				
							60-C copper wire	75-C copper wire	Remarks	60-C copper wire	75-C copper wire	Remarks	Inverter size	
Three-phase 200 V	3.7	3G3M1-A2037	HHD	10.6 (1.2)	15.9 (1.8)	-	14 (2.1)	14 (2.1)	*3	12 (3.3)	12 (3.3)	*3	10 (5.3)	-
	5.5	3G3M1-A2037	HND				10 (5.3)	10 (5.3)					8 (8.4)	
		3G3M1-A2055	HHD	27 (3)	27 (3)		8 (8.4)	8 (8.4)		10 (5.3)	10 (5.3)			
	7.5	3G3M1-A2055	HND				6 (13.3)							
		3G3M1-A2075	HHD							8 (8.4)	8 (8.4)			
	11	3G3M1-A2075	HND				4 (21.2)	6 (13.3)					6 (13.3)	
		3G3M1-A2110	HHD	51.3 (5.8)	51.3 (5.8)					6 (13.3)				
	15	3G3M1-A2110	HND				3 (26.7)	4 (21.2)		4 (21.2)	6 (13.3)			
		3G3M1-A2150	HHD											
	18.5	3G3M1-A2150	HND				1 (42.4)	3 (26.7)			4 (21.2)			
		3G3M1-A2185	HHD			10.6 (1.2)				3 (26.7)				14 (2.1)*1*2
	22	3G3M1-A2185	HND				-	2 (33.6)	*2, *3	2 (33.6)	3 (26.7)			

Power supply system	Standard applicable motor (kW)	Inverter Model	HHD/HD/HND/ND modes	Tightening torque lb-in (N・m)			Wire size AWG (mm^2)							
				Main circuit	Inverter size	Control circuit auxiliary input	Main circuit copper wire						⏚G	Control circuit auxiliary input
							L1/R, L2/S, L3/T			U, V, W				
							60-C copper wire	75-C copper wire	Remarks	60-C copper wire	75-C copper wire	Remarks	Inverter size	
Three-phase 400 V	0.4	3G3M1-A4004	HHD	10.6 (1.2)	15.9 (1.8)	-	14 (2.1)	14 (2.1)	*3	14 (2.1)	14 (2.1)	*3	14 (2.1)	-
	0.75	3G3M1-A4004	HD/HND											
		3G3M1-A4004	ND											
		3G3M1-A4007	HHD											
	1.1	3G3M1-A4007	HD/HND											
	1.5	3G3M1-A4007	ND											
		3G3M1-A4015	HHD											
	2.2	3G3M1-A4015	HD/HND										12 (3.3)	
		3G3M1-A4015	ND											
		3G3M1-A4022	HHD											
	3	3G3M1-A4022	ND											
		3G3M1-A4022	HD/HND											
		3G3M1-A4030	HHD											
	4	3G3M1-A4030	ND/HD/HND											
		3G3M1-A4040	HHD										10 (5.3)	
	5.5	3G3M1-A4040	ND				12 (3.3)	12 (3.3)						
		3G3M1-A4040	HD/HND											
		3G3M1-A4055	HHD	27 (3)	27 (3)									

Power supply system	Standard applicable motor (kW)	Inverter Model	HHD/HD/HND/ND modes	Tightening torque lb-in (N・m)			Wire size AWG (mm²)							
							Main circuit copper wire						⏚G	Control circuit auxiliary input
							L1/R, L2/S, L3/T			U, V, W				
				Main circuit	Inverter size	Control circuit auxiliary input	60-C copper wire	75-C copper wire	Remarks	60-C copper wire	75-C copper wire	Remarks	Inverter size	
Three-phase 400 V	7.5	3G3M1-A4055	HD/HND	27 (3)	27 (3)	-	10 (5.3)	10 (5.3)	*3	12 (3.3)	12 (3.3)	*3	10 (5.3)	-
		3G3M1-A4075	HHD											
	11	3G3M1-A4055	ND				8 (8.4)	8 (8.4)		10 (5.3)	10 (5.3)		8 (8.4)	
		3G3M1-A4075	HD/HND											
		3G3M1-A4110	HHD	51.3 (5.8)	51.3 (5.8)									
	15	3G3M1-A4075	ND	27 (3)	27 (3)		6 (13.3)							
		3G3M1-A4110	HD/HND	51.3 (5.8)	51.3 (5.8)					8 (8.4)	8 (8.4)			
		3G3M1-A4150	HHD											
	18.5	3G3M1-A4110	ND					6 (13.3)		6 (13.3)			6 (13.3)	14 (2.1)*1*2
		3G3M1-A4150	HD/HND											
		3G3M1-A4185	HHD			10.6 (1.2)					6 (13.3)			
	22	3G3M1-A4150	ND				4 (21.2)							
		3G3M1-A4185	HD/HND											
		3G3M1-A4220	HHD											
	30	3G3M1-A4185	ND				3 (26.7)	4 (21.2)		4 (21.2)				
		3G3M1-A4220	HD/HND											
	37	3G3M1-A4220	ND				2 (33.6)	3 (26.7)		3 (26.7)	4 (21.2)			

Power supply system	Standard applicable motor (kW)	Inverter Model	HHD/HD/HND/ND modes	Tightening torque lb-in (N・m)			Wire size AWG (mm^2)							
				Main circuit	Inverter size	Control circuit auxiliary input	Main circuit copper wire						⏚G	Control circuit auxiliary input
							L1/R, L2/S, L3/T			U, V, W				
							60-C copper wire	75-C copper wire	Remarks	60-C copper wire	75-C copper wire	Remarks	Inverter size	
Single-phase 200 V	0.1	3G3M1-AB001	HHD	7.1 (0.8)	10.6 (1.2)	-	14 (2.1)	14 (2.1)	*3	14 (2.1)	14 (2.1)	*3	14 (2.1)	-
	0.2	3G3M1-AB001	HND											
		3G3M1-AB002	HHD											
	0.4	3G3M1-AB002	HND											
		3G3M1-AB004	HHD											
	0.75	3G3M1-AB004	HND										12 (3.3)	
		3G3M1-AB007	HHD											
	1.1	3G3M1-AB007	HND										10 (5.3)	
	1.5	3G3M1-AB015	HHD	10.6 (1.2)	15.9 (1.8)		12 (3.3)	12 (3.3)						
	2.2	3G3M1-AB015	HND				10 (5.3)	10 (5.3)						
		3G3M1-AB022	HHD											
	3	3G3M1-AB022	HND											
	3.7	3G3M1-AB037	HHD	27 (3)	27 (3)		6 (13.3)	8 (8.4)		12 (3.3)	12 (3.3)		8 (8.4)	

*1. Wires can be connected without any terminal treatment.

*2. Only 75°C (167°F) Cu wiring can be used.

*3. Shows common wiring sizes for UL Open Type and Enclosed Type. Please contact us separately if dedicated UL Open Type wiring sizes are required.

Fuse Size

Power supply voltage	Standard applicable motor (kW)	Inverter model	HHD/HD/HND/ND mode	Semiconductor protection fuse product number, manufacturer: Mersen / Bussmann (Eaton)
Three-phase 200 V	0.1	3G3M1-A2001	HHD	PC30UD69V50□/170M3458
	0.2	3G3M1-A2001	HND	
		3G3M1-A2002	HHD	PC30UD69V50□/170M3458
	0.4	3G3M1-A2002	HND	
		3G3M1-A2004	HHD	PC30UD69V50□/170M3458
	0.75	3G3M1-A2004	HND	
		3G3M1-A2007	HHD	PC30UD69V50□/170M3460
	1.1	3G3M1-A2007	HND	
	1.5	3G3M1-A2015	HHD	PC30UD69V80□/170M3462
	2.2	3G3M1-A2015	HND	
		3G3M1-A2022	HHD	PC30UD69V125□/170M3462
	3	3G3M1-A2022	HND	
	3.7	3G3M1-A2037	HHD	PC30UD69V125□/170M3463
	5.5	3G3M1-A2037	HND	
		3G3M1-A2055	HHD	PC30UD69V160□/170M3464
	7.5	3G3M1-A2055	HND	
		3G3M1-A2075	HHD	PC30UD69V200□/170M3465
	11	3G3M1-A2075	HND	
		3G3M1-A2110	HHD	PC30UD69V200□/170M3465
	15	3G3M1-A2110	HND	
		3G3M1-A2150	HHD	PC30UD69V250□/170M3466
	18.5	3G3M1-A2150	HND	
		3G3M1-A2185	HHD	PC30UD69V250□/170M3466
	22	3G3M1-A2185	HND	

Power supply voltage	Standard applicable motor (kW)	Inverter model	HHD/HD/HND/ND mode	Semiconductor protection fuse product number, manufacturer: Mersen / Bussmann (Eaton)
Three-phase 400 V	0.4	3G3M1-A4004	HHD	PC30UD69V50□/170M3458
	0.75	3G3M1-A4004	HD/HND	
		3G3M1-A4004	ND	
		3G3M1-A4007	HHD	PC30UD69V50□/170M3458
	1.1	3G3M1-A4007	HD/HND	
	1.5	3G3M1-A4007	ND	
		3G3M1-A4015	HHD	PC30UD69V50□/170M3459
	2.2	3G3M1-A4015	HD/HND	
		3G3M1-A4015	ND	
		3G3M1-A4022	HHD	PC30UD69V63□/170M3460
	3	3G3M1-A4022	HD/HND	
		3G3M1-A4022	ND	
	3.7	3G3M1-A4040	HHD	PC30UD69V63□/170M3461
	5.5	3G3M1-A4040	HD/HND	
		3G3M1-A4040	ND	
		3G3M1-A4055	HHD	PC30UD69V100□/170M3462
	7.5	3G3M1-A4055	HD/HND	
		3G3M1-A4075	HHD	PC30UD69V100□/170M3462
	11	3G3M1-A4075	ND	PC30UD69V100□/170M3462
		3G3M1-A4075	HD/HND	PC30UD69V100□/170M3462
		3G3M1-A4110	HHD	PC30UD69V125□/170M3463
	15	3G3M1-A4075	ND	PC30UD69V100□/170M3462
		3G3M1-A4110	HD/HND	PC30UD69V125□/170M3463
		3G3M1-A4150	HHD	PC30UD69V160□/170M3464
	18.5	3G3M1-A4110	ND	PC30UD69V125□/170M3463
		3G3M1-A4150	HD/HND	PC30UD69V160□/170M3464
		3G3M1-A4185	HHD	PC30UD69V160□/170M3464
	22	3G3M1-A4150	ND	PC30UD69V160□/170M3464
		3G3M1-A4185	HD/HND	PC30UD69V160□/170M3464
		3G3M1-A4220	HHD	PC30UD69V200□/170M3465
	30	3G3M1-A4185	ND	PC30UD69V160□/170M3464
		3G3M1-A4220	HD/HND	PC30UD69V200□/170M3465
	37	3G3M1-A4220	ND	

Power supply voltage	Standard applicable motor (kW)	Inverter model	HHD/HD/HND/ND mode	Semiconductor protection fuse product number, manufacturer: Mersen / Bussmann (Eaton)
Single-phase 200 V	0.1	3G3M1-AB001	HHD	PC30UD69V50□/170M3458
	0.2	3G3M1-AB001	HND	
		3G3M1-AB002	HHD	PC30UD69V50□/170M3458
	0.4	3G3M1-AB002	HND	
		3G3M1-AB004	HHD	PC30UD69V50□/170M3458
	0.75	3G3M1-AB004	HND	
		3G3M1-AB007	HHD	PC30UD69V50□/170M3460
	1.1	3G3M1-AB007	HND	
	1.5	3G3M1-AB015	HHD	PC30UD69V125□/170M3462
	2.2	3G3M1-AB015	HND	
		3G3M1-AB022	HHD	PC30UD69V125□/170M3463
	3	3G3M1-AB022	HND	
	3.7	3G3M1-AB037	HHD	PC30UD69V160□/170M3464

3

Operation and Test Run

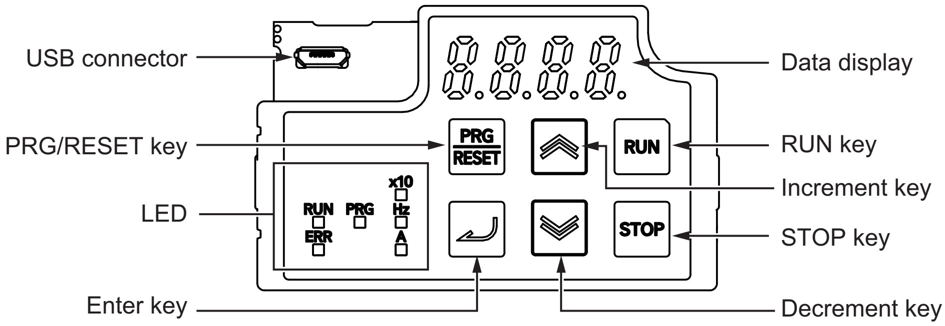
This section describes the part names and key operations of the Digital Operator, and the operation method of this product as well as the test run procedure.

3-1 Operation of Operator

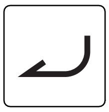
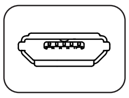
The Operator is a display operation panel for the 3G3M1 Series Inverter.

3-1-1 Part Names and Descriptions

The table below shows the name and function of each part of the Operator.



Display	Name	Description
ERR	Error LED	Lights (red) when the inverter trips. For how to reset a trip error state, refer to *How to Reset a Trip State* on page 9-2.
PRG	Program LED	Lights (green) when editable data (set value) is displayed on the data display.
RUN	RUN LED	Lights (green) when the inverter is running (during output to the motor). Lights during deceleration after RUN command OFF. Goes out while the RUN command is ON at Frequency Reference 0 Hz as there is no output (excluding Zero Speed Control).
Hz	Monitor LED (Hz)	Lights (green) when a frequency value is displayed on the da-ta display.
A	Monitor LED (A)	Lights (green) when a current value is displayed on the data display.
x10	x10 LED	This x10 LED lights (green) when the displayed data exceeds 9999. "Currently displayed data x 10" is the actual data.
8.8.8.8.	Data display	Displays (in red) various data such as a parameter value, fre-quency value, or set value.
RUN	RUN command LED indicator LED (top right)	Lights (green) when the Run command is set to Digital Oper-ator, and flashes (green) when the RUN key is enabled by the forced operator function. (This indicates that the RUN key is enabled on the Digital Op-erator.)
	RUN key	Starts inverter operation. Note that this key is enabled when the RUN command is set to Digital Operator.
STOP	STOP key	Stops the inverter (deceleration stop).

Display	Name	Description	
	PRG/RESET key	In Operation mode:	Pressing this key switches the mode to the Program mode.
		In Program mode:	Pressing this key switches the mode to the Operation mode.
		In Alarm mode:	Pressing this key after removing the cause of the alarm cancels the alarm and switches the mode to the Operation mode.
	Enter key	In Operation mode:	Switches the monitor items (output frequency, output current, output voltage, etc.) for the operation status.
		In Program mode:	Confirms the parameter display and data.
		In Alarm mode:	Switches to the display of the alarm details information.
	Increment key	Increases the parameter number or the set data value.	
	Decrement key	Decreases the parameter number or the set data value.	
	USB connector	The connector (mini-B type) for connecting a computer. Used to connect to the automation software Sysmac Studio.	

3-1-2 Key Operation Method

This section explains how to use the Digital Operator keys in a typical operation (when the Display Selections “Complete display”).

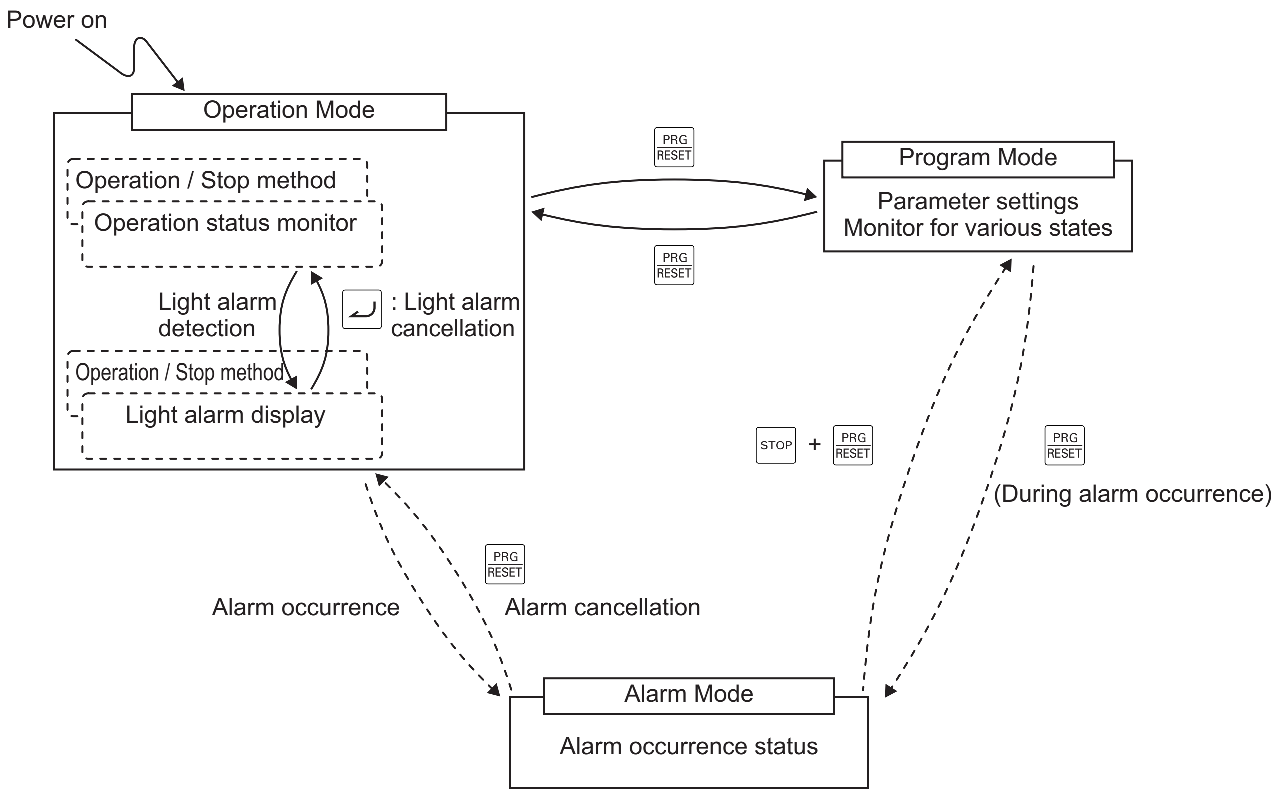
This operation will be the same even if you select a setting other than Complete display in the Operator Display Selection (E52), although the number of parameters that you will see on the display differs.

There are three operation modes displayed on the Digital Operator as shown in the following table.

Operation mode	Overview of each mode
Operation mode	This mode is automatically entered after the power is turned ON. In this mode, the set frequency/PID process commands and other information can be set, and RUN/STOP command operations are possible by the RUN / STOP keys. Operation status can be monitored in real time. When a light alarm occurs, the display switches to the light alarm display (L-AL).
Program mode	In this mode, parameter data can be set, and inverter status, various maintenance related information and other information can be checked.

Operation mode	Overview of each mode
Alarm mode	In this mode, alarm codes can be displayed when an alarm occurs, and various alarm related information can be checked. For details on the alarm codes, refer to *9-1 Alarm Display and Remedies* on page 9-2.

Transition through these modes by the following key operations.



If the Operator is not operated for five minutes, the display automatically changes to the initial screen.

Operation Mode

In the Operation mode, the following items can be monitored. After the power is turned ON, items set at parameter E43 are displayed. Monitor items can be switched by pressing the ↵ key.

If the Operator is not operated for five minutes, the display automatically changes to the initial screen selected by E43.

Monitor item		Unit LED display □ Not lit ■ Lit	Unit	Outline of display value	Function code E43 data
Speed Monitor		The following display formats can be selected by the function code E48.			0
	Output frequency 1 (Before slip compensation)	■Hz □A	Hz	Display value = Output frequency (Hz)	(E48=0)
	Output frequency 2 (After slip compensation)	■Hz □A	Hz	Display value = Output frequency (Hz)	(E48=1)
	Set frequency	■Hz □A	Hz	Display value = Set frequency (Hz)	(E48=2)
	Motor rotation speed	■Hz ■A	min^{-1}	Display value = Output frequency (Hz) x 120/number of motor poles	(E48=3)
	Load shaft speed	■Hz ■A	min^{-1}	Display value = Output frequency (Hz) x E50/E39	(E48=4)
	Feed speed	□Hz □A	m/min	Display value = Output frequency (Hz) x E50/E39	(E48=5)
	Transport time for specified length	■Hz ■A	min	Display value = E50/(output frequency (Hz) x E39)	(E48=6)
	Speed (%)	□Hz □A	%	Display value = Output frequency (Hz)/maximum frequency (Hz) x 100	(E48=7)
Output current		□Hz ■A	A	Inverter output current effective value	3
Input power		□Hz □A	kW	Inverter input power value	9
Calculated torque*1		□Hz □A	%	Generated motor torque (calculated value)	8
Output voltage*2		□Hz □A	V	Inverter output voltage effective value	4
Motor output		□Hz □A	%	Motor output (kW)	16
Load rate*3		□Hz □A	%	Load rate of motor is displayed as a percentage with the rated value taken to be 100%	15
PID process command*4*5		□Hz □A	-	The PID process command or PID feedback value is displayed after conversion to the physical quantity of the control target	10
PID feedback value*4*5		□Hz □A	-		12
PID deviation*4*5		□Hz □A	-	The deviation between the PID process command and PID feedback value is displayed after conversion to the physical quantity of the control target	29
PID output*4*6		□Hz □A	%	PID output is displayed as a percentage with 1st Maximum Output Frequency (F03) taken to be 100%	14
Timer*9		□Hz □A	s	Remaining time when timed operation is enabled	13

Monitor item	Unit LED display □ Not lit ■ Lit	Unit	Outline of display value	Function code E43 data
Analog input monitor*7	□Hz □A	-	The analog input of the inverter is displayed after conversion to the desired display	17
Current position*10	□Hz □A	-	The upper four digits and lower four digits of the current position user value (hexadecimal) are displayed alternately	21
Position error*10	□Hz □A	-	The upper four digits (signed) and lower four digits of the position deviation user value (hexadecimal) are displayed alternately	22
Target position*10	□Hz □A	-	The upper four digits (signed) and lower four digits of the target position user value (hexadecimal) are displayed alternately	28
Torque current*8	□Hz □A	%	The torque current command value or torque current calculated value is displayed	23
Magnetic flux command value*8	□Hz □A	%	The magnetic flux command value is displayed	24
Input watt-hour	□Hz □A	kWh	Display value = Input watt-hour (kWh)/100	25
Torque bias	□Hz □A	%	The torque bias value is displayed	30

*1. 100% is the motor rated torque.
*2. In the output voltage display, V is displayed at the lowermost digit of the LED monitor in place of unit symbol V (volt).
*3. In the load rate display, the icon is displayed at the lowermost digit of the LED monitor in place of %.
*4. Displayed only when performing PID control (J01=1, 2 or 3).
*5. The dot at the lowermost digit of the LED monitor flashes in the PID process command/PID output display.
*6. The dot at the lowermost digit of the LED monitor lights in the PID feedback value display.
*7. The analog input monitor is displayed only when the analog input monitor for display is set to enabled at E61 to E63 terminal function selection. The value converted by Input Terminal [AI1] Analog Input Adjustment Maximum Scale (C59), Input Terminal [AI1] Analog Input Adjustment Minimum Scale (C60), Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AII) (C65), Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AII) (C66), Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AIV) (C71) and Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AIV) (C72) is displayed.
*8. 0 (zero) is displayed during V/f control.
*9. Only (C21=3) is displayed when performing timed operation.
*10. Displayed when the position control function is enabled.

Select the monitor information to be displayed on the Digital Operator LED when the inverter is stopped. When “0: Set frequency display” is set at Operator Display when Stopped Selection (E44), the set frequency is displayed, and when “1: Output frequency display” is set, the output frequency is displayed.
The display format is that selected at Operator Display Speed Monitor Item Selection (E48).

Parameter No.	Function name	Data	Default data	Unit
E44	Operator Display when Stopped Selection	0: Specified value 1: Output value	0	-

In 2nd control, each of A60 and A61 are used for E50 and E39.

Parameter No.	Function name	Data	Default data	Unit
E50	1st Frequency Conversion Coefficient	0.01 to 600.00	30.00	-
A60	2nd Speed Conversion Coefficient	0.00: Using E50 value 0.01 to 600.00	0.00	-
E39	Display Coefficient 1 for Transport Time / Auxiliary Display Coefficient 1 for Speed Monitor	0.000 to 9999	1.000	-
A61	2nd Display Coefficient for Transport time / Auxiliary Display Coefficient for Speed Monitor	0.000 to 9999	1.000	-

A filter can be applied to the display of the operation status monitor of the output frequency, output current and other information on the touch panel at Operator Display Filter (E42). When load fluctuations, for example, cause variance in the monitor values making them difficult to see, set a larger value.

Parameter No.	Function name	Data	Default data	Unit
E42	Operator Display Filter	0.0 to 5.0 s	0.5	-

Program Mode

The Program mode has functions, for example, for setting and checking parameters, and for monitoring maintenance-related information and input/output (I/O) terminal information.
The digit (number) on the left end displayed on the Digital Operator LED indicates the menu No., and the remaining three digits indicate menu content.
From the second time onwards that the Program mode is entered, the menu that was active when the Program mode was previously exited is displayed.

Menu	LED display	Main function	
Data setting	1.F__	F group parameters	Display/ change of parameters
	1.E__	E group parameters	
	1.E1_	E1 group parameters	
	1.C__	C group parameters	
	1.P__	P group parameters	
	1.H__	H group parameters	
	1.H1_	H1 group parameters	
	1.H3_	H3 group parameters	
	1.H4_	H4 group parameters	
	1.A__	A group parameters	
	1.b__	b group parameters	
	1.r__	r group parameters	
	1.J__	J group parameters	
	1.J1_	J1 group parameters	
	1.d__	d group parameters	
	1.d1_	d1 group parameters	
	1.d2_	d2 group parameters	
	1.y__	y group parameters	
Data check	2.rEP	Display/change of changed parameters	
Operation monitor	3.oPE	Operation status display	
I/O check	4.i_o	DIO, AIO status display	
Maintenance	5.CHE	Maintenance information display	
Alarm information	6.AL	Alarm information display	
User preferences (user parameters)	0.FnC	Display/change of user preferences (user parameters)*1	

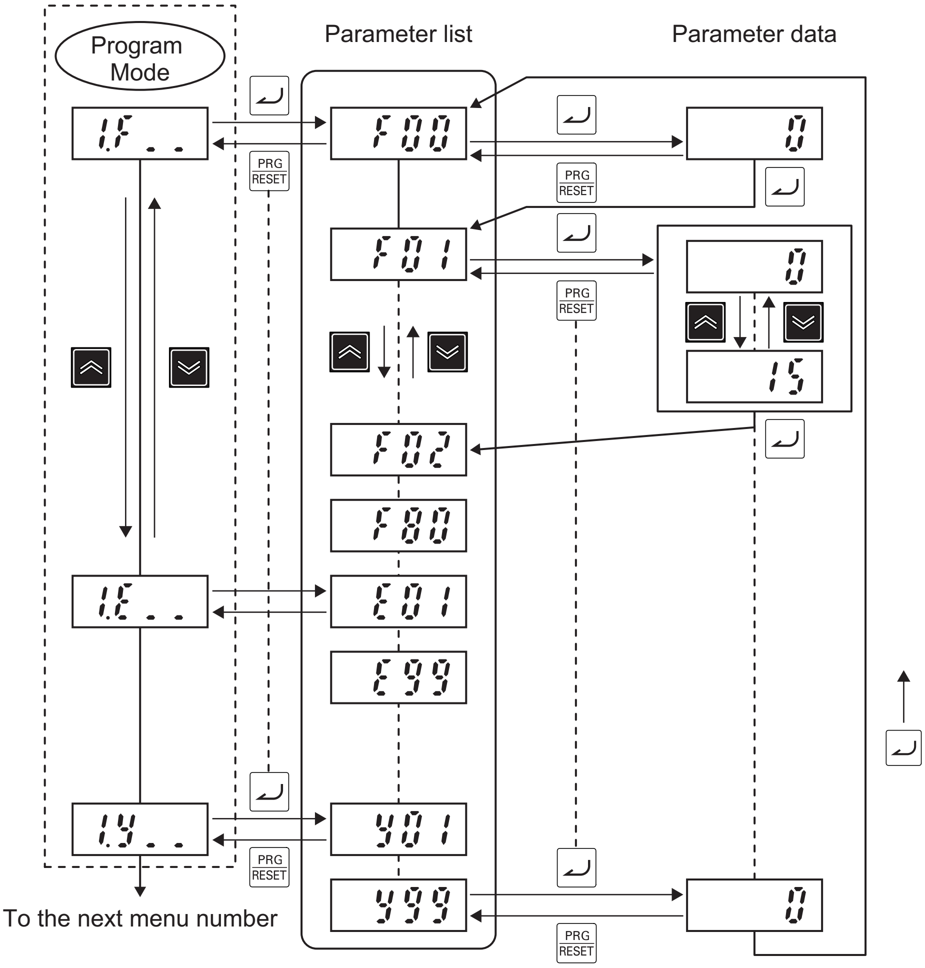
*1. When there are no parameters registered as user preferences, the menu item is hidden.

The menu to display can be selected at Operator Display Selection (E52). For details, refer to *5-1-1 Display Selection* on page 5-3.

● Data setting

All parameters can be set at menu No. 1 “Data setting: 1.F . . to 1.Y . .” in the Program mode.

To set parameters at menu No. 1 “Data setting,” Operator Display Selection (E52) must be set to “0: Parameter data setting mode (menu 0 and menu 1)” or “2: Full menu mode.”
The following figure shows transition through “Data setting.”



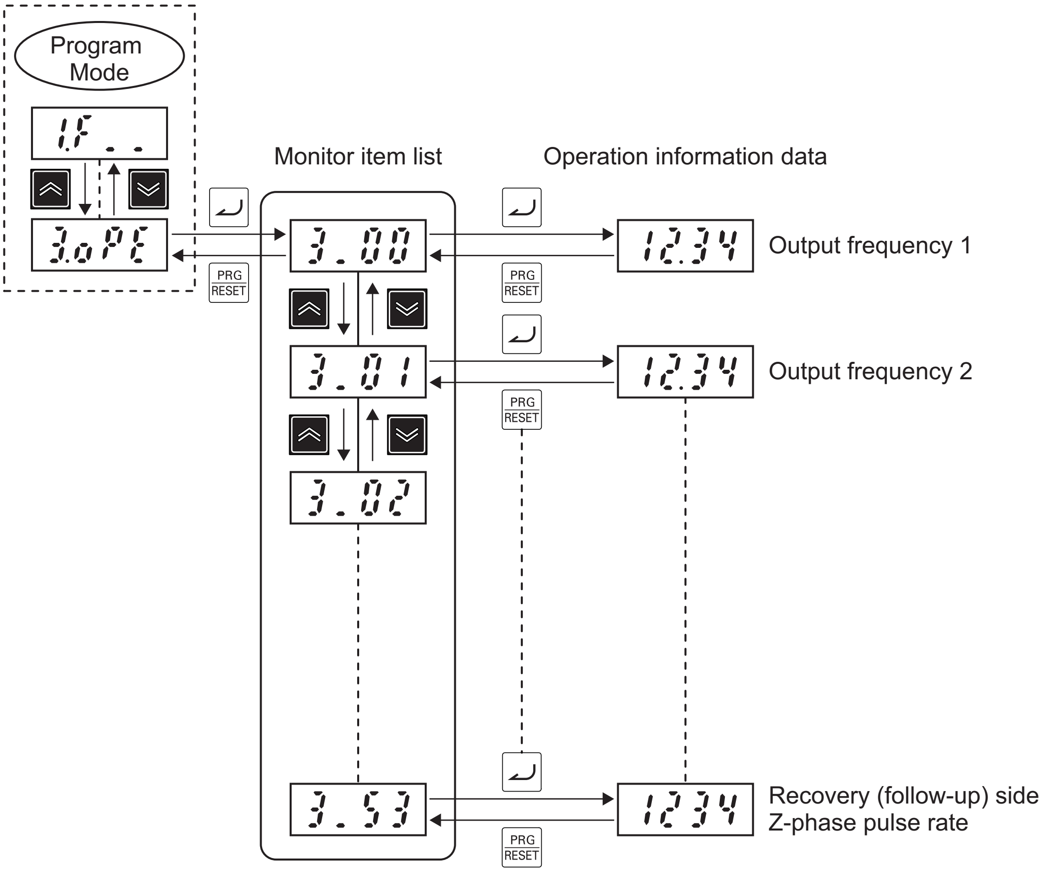
● Data check

After parameters have been changed, they can be checked at menu No. 2 “Data check: 2.rEP” in the Program mode. Only parameters that have been changed from their factory default values are displayed on the LED monitor. The data of displayed parameters can also be referenced and changed. To monitor parameter data at menu No. 2 “Data check,” Operator Display Selection (E52) must be set to “1: Parameter data check mode (menu 2)” or “2: Full menu mode.”
Transitioning through “Data check” is the same as for Data setting.

● Operation monitor

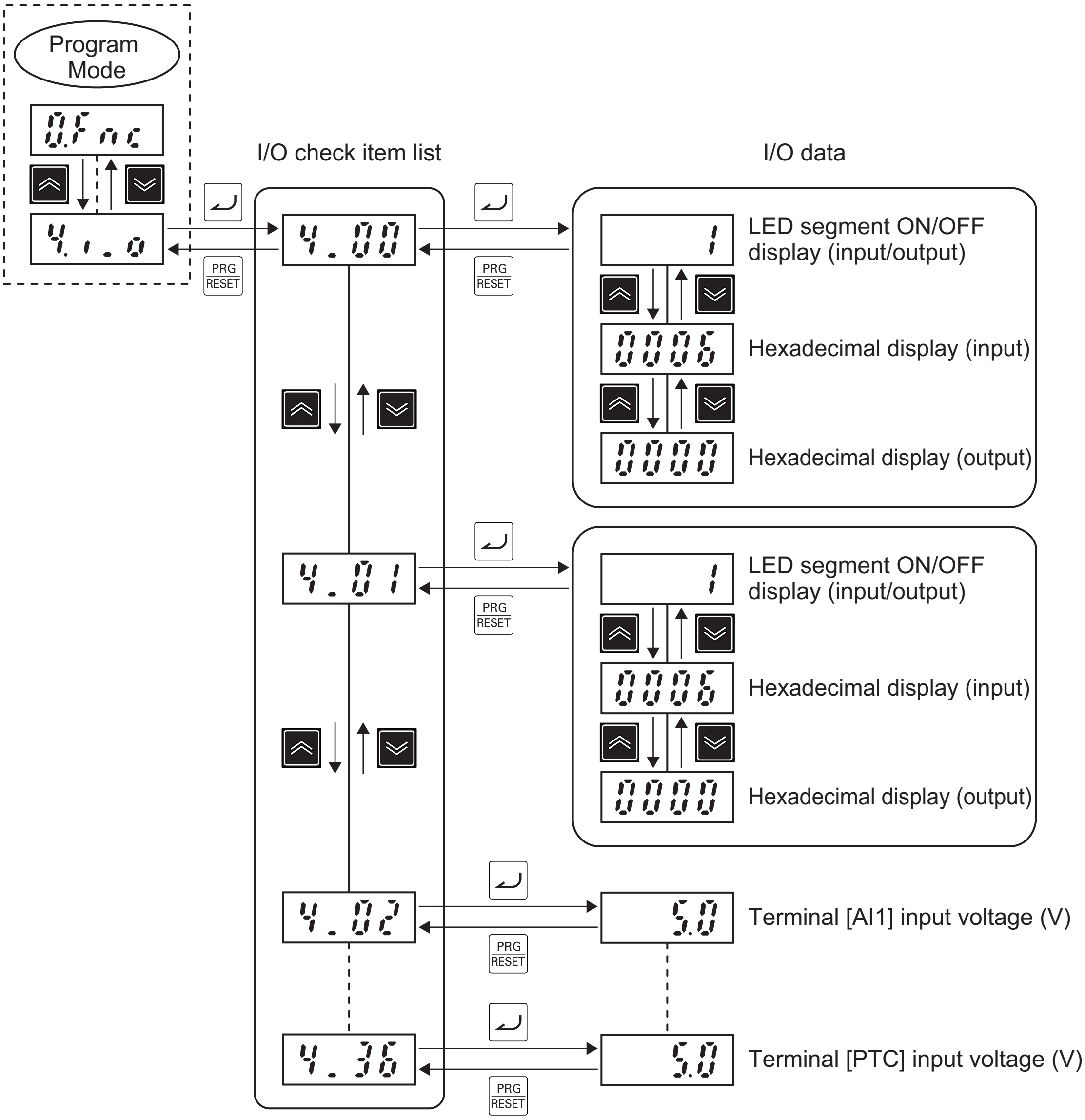
Menu No. 3 “Operation monitor: 3.oPE” is used to check the operation status in maintenance and test runs, for example.
For details on “Operation monitor” display items, refer to *7-1-1 Operation Monitor* on page 7-3.

The following figure shows transition through “Operation monitor.”



● I/O check

When menu No. 4 “I/O check: 4.i.o” is used, the I/O signal status of external signals can be displayed on the LED monitor without the need to use a measuring instrument. External signals that can be displayed are digital I/O signals and analog I/O signals.
For details on “I/O check” display items, refer to *7-1-2 I/O check* on page 7-9.
The following figure shows transition through “I/O check.”

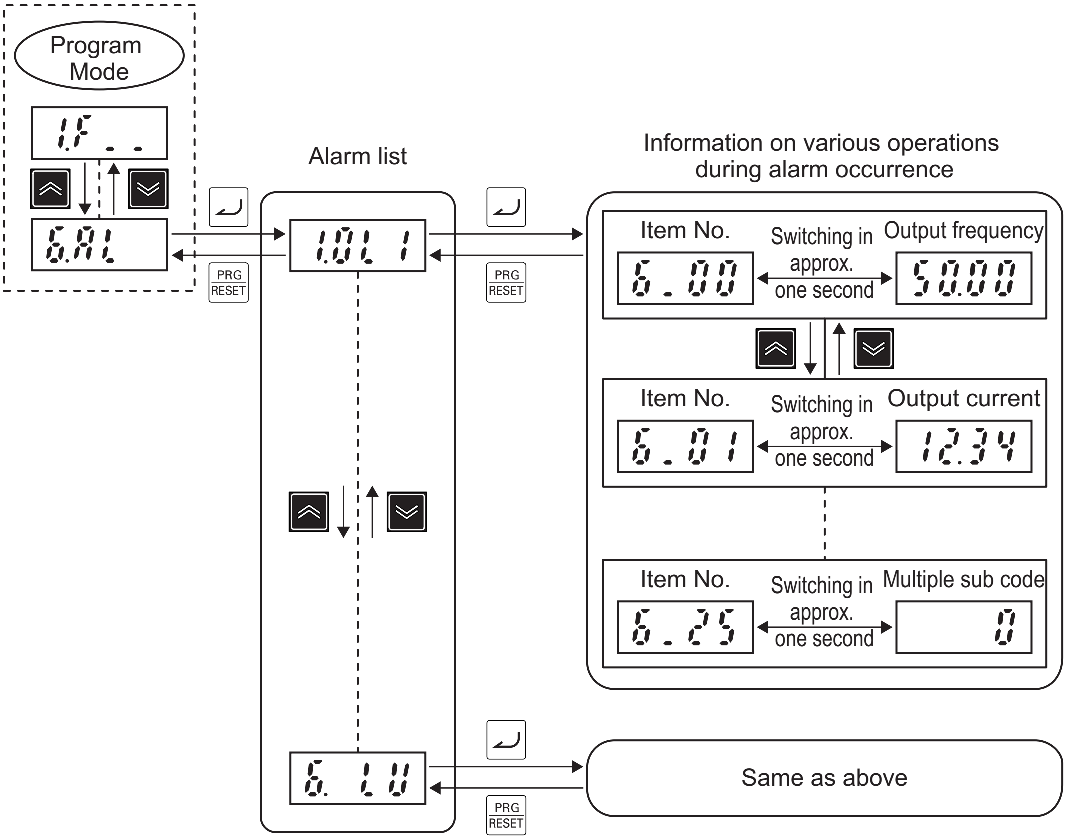


● Maintenance information

Menu No. 5 "Maintenance information: 5.CHE" displays information that is required when performing maintenance on the inverter.
For details on "Maintenance information" display items, refer to *7-1-3 Maintenance Information* on page 7-11.
Transitioning through "Maintenance information" is the same as for "Operation monitor."

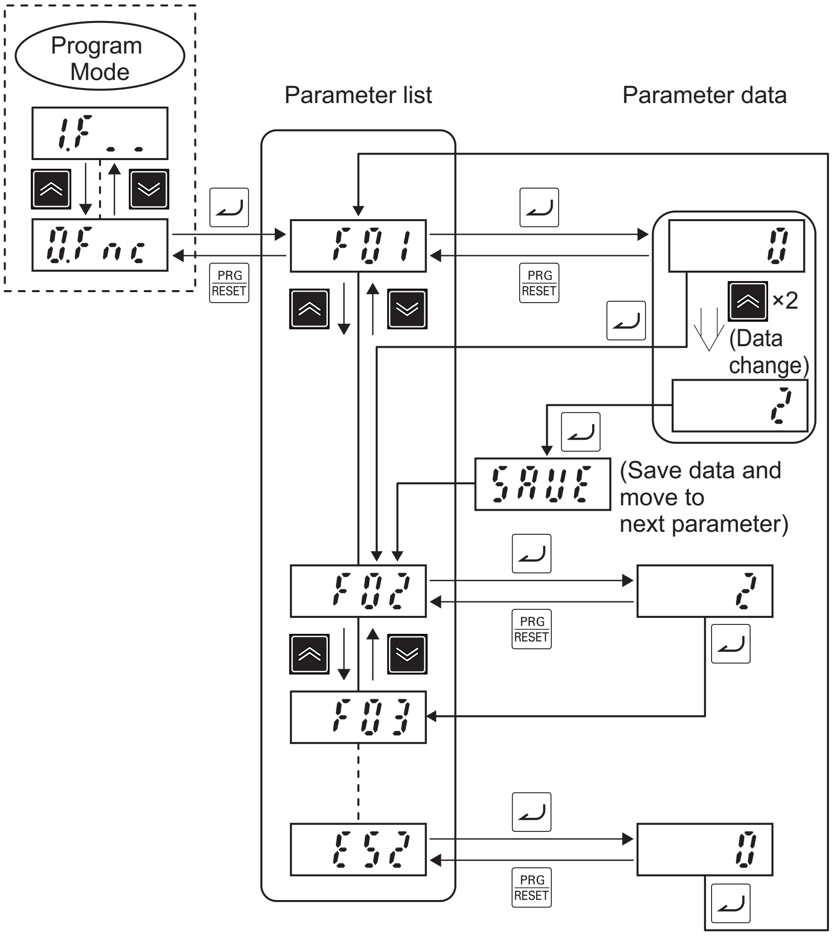
● Alarm information

Menu No. 6 "Alarm information: 6.AL" indicates by alarm code which protection functions were activated in the past six instances. Alarm information indicating the status of the inverter when each alarm occurred also can be displayed.
For details on "Alarm information" display items, refer to *7-1-4 Alarm information* on page 7-15.
The following figure shows transition through "Alarm information."



● User preferences (user parameters)

Only parameters registered as user preferences at menu No. 0 “User preferences (user parameters)” can be displayed, and the data of these parameters can be set.
To display parameters at menu No. 0 “User preferences (user parameters),” Operator Display Selection (E52) must be set to “0: Parameter data setting mode (menu 0 and menu 1)” or “2: Full menu mode.”
For details on registering user preferences (user parameters), refer to *7-7-8 User Parameter Setting Function* on page 7-79.
The following figure shows transition through “User preferences (user parameters).”



Alarm Mode

When a protection function is activated and an alarm is generated, the inverter automatically transitions to the Alarm mode, and the alarm code of the alarm that occurred is displayed on the LED monitor.

To clear the alarm, remove the cause of the alarm and then press the PRG/RESET key. The inverter returns to the Operation mode. Clearing of alarms by the PRG/RESET key is enabled only when an alarm code is displayed.

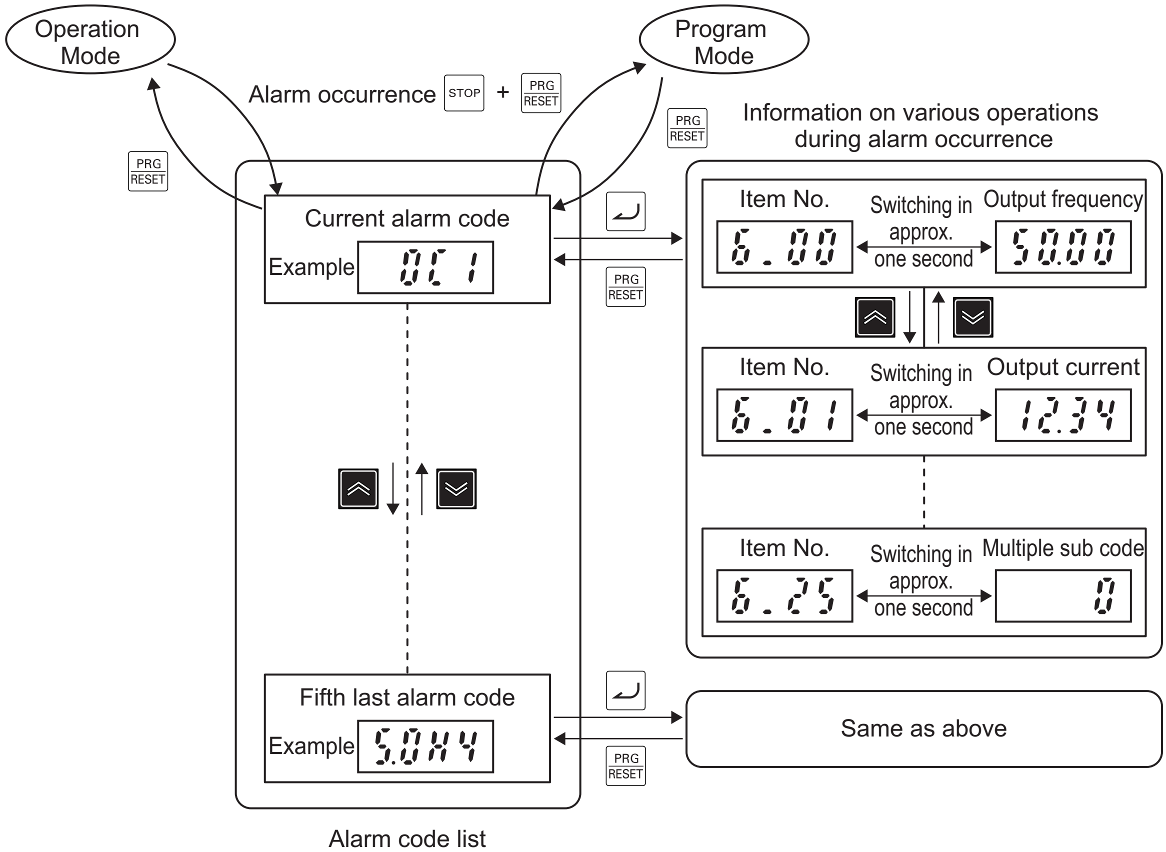
In addition to the current alarm code, alarm codes for the past five instances can be displayed. Past alarm codes are displayed by pressing the ∧ / ∨ keys with the current alarm code displayed.

When the ↵ key is pressed with an alarm code displayed, various operation information such as the output frequency and output current at the time the alarm occurred can be checked. For the various operation information, the item No. and data are displayed alternately.

The multiple sets of various operation information can be switched by the ∧ / ∨ keys. Details of operation information are the same as menu No. 6 “Alarm information” in the Program mode. Refer to *7-1-4 Alarm information* on page 7-15.

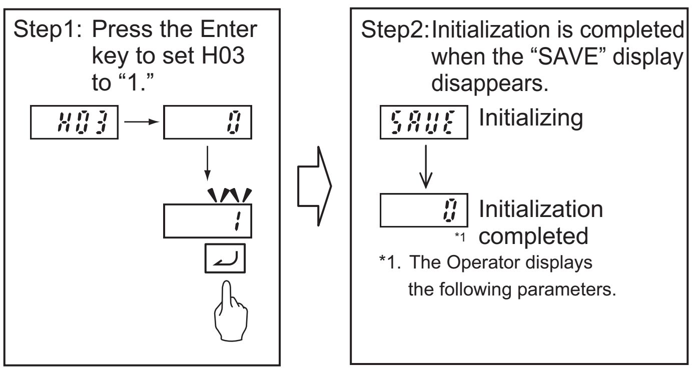
When operation information is displayed, the display returns to the alarm code by pressing the PRG/RESET key.

The mode transitions to the Program mode and parameter data can be corrected by simultaneously pressing the "STOP key + PRG/RESET key" with an alarm displayed.



Parameter Initialization

The set values of parameters can be initialized and returned to their factory default settings. The fault monitor can also be cleared.
For details on parameter initialization, refer to *5-1-2 Data Initialization* on page 5-4.
The following figure shows the steps of parameter initialization.
Initialization is executed when "1: Initialize all parameters" is set at Data Initialization (H03).



To change the data of parameter H03, the "STOP key + ⋀ / ⋁ keys" must be pressed simultaneously.

Mock Alarm

Occurrence of an alarm can be simulated to check external sequences during inverter setup.
By setting 1 to Mock Alarm (H45), mock alarm display "Err" is displayed on the LED monitor and the alarm signal "AL" is turned ON. Output terminal can be checked by allocating "99: AL (Alarm signal)" to output terminal function selection (E20 to E21, E27).

To change the data of H45, the "STOP key + ⋀ key" must be pressed simultaneously. After a mock alarm is generated, the data of H45 automatically returns to 0 and the alarm can be reset.

Also when clearing the alarm data of the mock alarm after setup is ended, H03 is used in the same way as when clearing the alarm data of alarms that occur during regular operation (to change the data of H03, the "STOP key + ⋀ key" must be pressed simultaneously). After alarm data is cleared, the data of H03 automatically returns to 0.

Parameter No.	Function name	Data	Default data	Unit
H45	Mock Alarm	0: Disable 1: Enable (Generate mock alarm)	0	-

3-2 Connecting Sysmac Studio

Inverter parameters can be edited, data can be monitored and other operations are possible in the automation software Sysmac Studio.
This section describes how to connect the inverter to Sysmac Studio.

1. Connect the USB cable to the USB connector, and connect the inverter to the PC.
2. Start up Sysmac Studio, and select new project.
   Select “Drive” at Category, specify the inverter to connect to the device, and click “Create.”
3. Right-click on the target inverter in the tree, and select “Communication Settings.”
   Check that “Connect directly by USB” is set, and select the USB port to which the cable is connected at Select Port.
4. Right-click on the target inverter in the tree, and select “Online.”

For details on how to connect Sysmac Studio and it's function, refer to *Related Manuals* on page 30.

3-3 Flow of Test Run

Perform a test run of the inverter according to the following flow.

Item	Description	Reference
Installation	Install the inverter according to the installation conditions.	*2-1-1 Inverter Installation* on page 2-2
Wiring and connections	Connect the inverter to the power supply and peripheral equipment.	*2-3 Wiring* on page 2-8
Power-on	Check the points mentioned in the next page before turning the power supply ON.	*3-4 Operation Items for Test Run* on page 3-18
Display status checks	Check that no error is occurring on the inverter.	*Section 9 Troubleshooting* on page 9-1
Parameter initialization	Initialize inverter parameters.	*5-1 Display and Initialization* on page 5-3
Parameter setting	Set the parameters required for the test run.	*5-3 Motor Parameter Settings* on page 5-19 *5-4 RUN command* on page 5-25
No-load run	Run the motor in a no-load state via Digital Operator.	*3-1 Operation of Operator* on page 3-2
Load run	Operate the inverter via Digital Operator with the mechanical system connected.	*3-1 Operation of Operator* on page 3-2
Operation	Basic settings (operation by the basic settings required to operate and stop the inverter)	*Section 5 Basic Settings* on page 5-1
	Vector control (operation using vector control and other functions)	*Section 6 Vector Control and Applied Functions* on page 6-1

3-4 Operation Items for Test Run

The following describes the operation items for the test run.

Installation

Check that the inverter meets the installation conditions.
For details on installing the inverter, refer to *2-1 Installation* on page 2-2.

Wiring and Connections

Select peripheral equipment according to the specifications and wire the cables securely.
For details on wiring the inverter, refer to *2-3 Wiring* on page 2-8.

Power-on

● Points to be checked before turning ON the power

Check that the power supply voltage is appropriate and that the power supply input terminals (L1/R, L2/S, L3/T) are securely wired.
The rated input voltage of the 3G3M1 Series Inverter is as follows.

Model	Power supply voltage
3G3M1-A2□	Three-phase 200 to 240 VAC
3G3M1-A4□	Three-phase 380 to 480 VAC
3G3M1-AB□	Single-phase 200 to 240 VAC

Check that the motor is securely connected to the motor output terminals (W, V, U).
Check that the controller is securely wired to the control circuit terminals. In addition, turn OFF all control terminals.
Set the motor in a no-load state (not connected to the mechanical system).

● Power-on

If no problem is found in the above checks, turn the power supply ON.

Display Status Checks

If no problem is found at power-on, the display status will be as follows.

Name	Display status
RUN LED	Not lit (Lit during RUN)
ERR LED	Not lit
PRG LED	Not lit
x10 LED	Not lit
Hz LED	Lit
A LED	Not lit

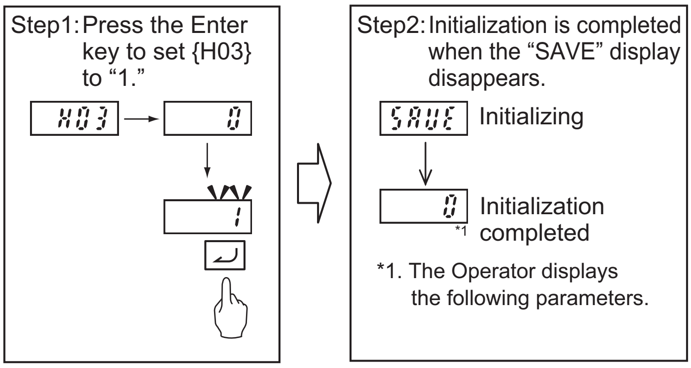
Name	Display status
Data display	During a stop, the set frequency (flashes), and during a run, the output frequency (lit)
RUN command LED indicator	Lit when Operator is selected at F02

If any problem is found, the display status will be as follows.
Refer to *Section 9 Troubleshooting* on page 9-1for countermeasures.

Name	Display status
RUN LED	Not lit
ERR LED	Lit
PRG LED	Not lit
x10 LED	Not lit
Hz LED	Lit
A LED	Not lit
Data display	Fault code (high-speed flashing)
RUN command LED indicator	Lit when Operator is selected at F02

Parameter Initialization

The set values of parameters can be initialized and returned to their factory default settings. The fault monitor can also be cleared.
The following figure shows the steps of parameter initialization.
Initialization is executed when “1: Initialize all parameters” is set at Data Initialization (H03).
For details on parameter initialization, refer to *5-1 Display and Initialization* on page 5-3.



To change the data of parameter H03, the “STOP key + ⋀ / ⋁ keys” must be pressed simultaneously.

Parameter Setting

To operate the inverter, two commands are required: the RUN command and the frequency reference. Set 1st RUN Command Selection (F02) and 1st Frequency Reference Selection (F01). For the test run, set 1st Frequency Reference Selection (F01) to “0” and 1st RUN Command Selection (F02) to “2” so as to operate the inverter via the Digital Operator.
Next, set the 1st Motor Pole Number (P01) and 1st Motor Capacity (P02) for of applicable motor. These values will be used as the reference values for the automatic torque boost, motor protection and torque limit functions. Refer to *5-3-1 Induction Motor Basic Settings* on page 5-19, *5-3-2 Base*

Frequency and Maximum Frequency of Motor on page 5-19 and *6-1-2 Basic Motor Parameter Settings* on page 6-4.
Execute auto-tuning. (Refer to *6-8-1 Motor Off-line Auto-tuning* on page 6-65.)
Then set the rated current value of the motor at 1st Motor Electronic Thermal Level (F11).
Set the value correctly according to the motor in use.

Parameter No.	Function name	Set value	Default data	Unit
F01	1st Frequency Reference Selection	0 to 15 0: Operator (and keys) 1: Analog voltage input (terminal AI1) 2: Analog current input (terminal AI2 (AII)) 3: Analog voltage input (terminal AI1) + analog current input (terminal AI2 (AII)) 5: Analog voltage input (terminal AI2 (AIV)) 7: UP/DOWN control 8: Digital Operator (and keys) (balancelessbumpless switching available) 10: Pattern operation 12: Pulse train input 13: Calculation result 14: RS-485 communication 15: Fieldbus (Reserved)	0	-
F02	1st RUN Command Selection	0: Operator (Direction of rotation input: terminal block) 1: External signal (Digital input) 2: Operator (Forward rotation) 3: Operator (Reverse rotation) 4: RS-485 communication 5: Fieldbus (Reserved)	2	-
P01	1st Motor Pole Number	2 to 128 poles	4	Pole
P02	1st Motor Capacity	0.01 to 1000 kW	Dependent on capacity	kW
F11	1st Motor Electronic Thermal Level	0.00 ; 0.01 to 118.8 0.00 : Disable 0.01 to 118.8 A * Setting range from 1%(HHD) to 135%(ND) of the rated inverter current.	Dependent on capacity	A

No-Load Run

In a motor no-load state (not connected to the mechanical system), rotate the motor via the Digital Operator.

● Forward/reverse rotation via Digital Operator

Follow the steps below to rotate the motor in the forward or reverse direction via Digital Operator.

1. Set 1st Frequency Reference Selection (F01).
   Set “0: Operator” at 1st Frequency Reference Selection (F01).
2. Set 1st RUN Command Selection (F02).
   Set forward rotation (2: Touch panel operation (forward)) or reverse rotation (3: Touch panel operation (reverse)) at 1st RUN Command Selection (F02).
3. Set the output frequency.
   Set the set frequency by the [▲] / [▼] keys with the set frequency “0.00” displayed flashing.
   Initially, it is recommended to set a low speed of about 5 Hz for safety.
4. Press the [RUN] key.
   The motor starts rotating with the RUN LED lit.
5. Check that there is no problem with the output frequency, motor rotation direction or inverter operation displayed on the Digital Operator.
   For the rotation direction of motor, refer to rotation direction (monitor mode: 3_06).

Parameter No.	Function name	Set value	Default data	Unit
C99	1st Frequency Reference/1st Multi-step Frequency Reference 0	0.0 to 590.00 Hz	0	Hz
F02	1st RUN Command Selection	0: Operator (Direction of rotation input: terminal block) 1: External signal (Digital input) 2: Operator (Forward rotation) 3: Operator (Reverse rotation) 4: RS-485 communication 5: Fieldbus (Reserved)	2	-

Monitor mode	Name	Data
3_00	Output frequency 1	0.00 to 99.99 to 590.0 [Hz]
3_06	Rotation direction	F: During forward rotation r: During reverse rotation - - - -: During stop

Key operation	Data display example	Description
PRG RESET	0.00	When the output frequency “0.00” is not displayed, press the [PRG RESET] key to display the output frequency.
RUN	6.00	Press the [RUN] key. The monitor value of the frequency reference is displayed on the data display.

● Stopping the motor

After rotating the motor with no-load in the forward or reverse direction via the Digital Operator, press the STOP key. The motor stops rotating.

Load Run

If no problem is found during a no-load run, connect the mechanical system and run the inverter with a load via the Digital Operator.

● Connecting the mechanical system

Before connecting the mechanical system, make sure that the motor has stopped completely.
Then, connect the mechanical system to the motor securely to prevent the mounting screws from loosening.

● Operation via Digital Operator

In case of unexpected abnormal inverter operation, be prepared to press the STOP key on the Digital Operator.
In the same way as during a no-load run, operate the machine at low speed and then decelerate to stop via the Digital Operator.

● RUN mode checks

After checking that the machine moves in the correct direction and smoothly at low speed, set a larger output frequency.
Check that there is no mechanical vibration and noise by altering the output frequency setting and forward rotation (2: Touch panel operation (forward)) and reverse rotation (3: Touch panel operation (reverse)) at 1st RUN Command Selection (F02).
Also, check the current, load rate and voltage values at Output current effective value (monitor mode: 3_02), Motor Electronic Thermal (monitor mode: 5_62) and Main Circuit DC Voltage (monitor mode: 5_01).
Check that the output current is up to 150% of the motor rated current.
Also, check that the electronic thermal load rate is sufficiently low to reach 100%.
Check that the DC voltage for 200-V class and for 400-V class is sufficiently low to reach 390 VDC and 780 VDC, respectively.

Operation

To operate the inverter by only basic parameters, refer to *Section 5 Basic Settings* on page 5-1.
To use applied functions such as sensorless vector control, V/f control with speed feedback, torque control, and simple position control, in addition to *Section 5 Basic Settings* on page 5-1, refer to *Section 6 Vector Control and Applied Functions* on page 6-1.

4

Parameter List

4-1 List of Monitors by Group

When monitoring on the Digital Operator, refer to *7-1 Monitor Mode* on page 7-3.
The following table shows the parameters that allow monitoring of Sysmac Studio.
Enabled and disabled states for each control mode within the data range of the parameters are indicated by the icon.

Symbol	Control method (F42/A14)
V/f	0: IM V/f control
DTV	1: IM Dynamic torque vector control
PG V/f	3: IM V/f control with speed sensor
PG DTV	4: IM Dynamic torque vector control with speed sensor
SLV	5: IM Vector control without speed sensor
PGV	6: IM Vector control with speed sensor
PM SLV	15: PM Vector control without speed and pole position sensor
PM PGV	16: PM Vector control with speed and pole position sensor

V/f : Enabled V/f : Disabled

4-1-1 Parameter M (Monitor 1)

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M01	Frequency Reference at Final	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767 +20000 or -20000 = maximum output frequency	0	-	-
M02	Torque Reference Monitor at Last	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M03	Torque Current Command at Final	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M04	Magnetic Flux Command Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M05	Frequency Reference at Final	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M06	Output Frequency 1 without Slip Compensation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767 +20000 or -20000 = maximum output frequency	0	-	-
M07	Torque Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M08	Torque Current Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M09	Output Frequency without Slip Compensation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
M10	Input Power	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 399.99	0	-	%
M11	Output Current Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 399.99 %	0	-	%
M12	Output Voltage Monitor	V/f PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1000.0 V	0	-	V
M13	Operation Command at Final	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: - Bit11: EN Bit10: - Bit9: - Bit8: - Bit7: - Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M14	Operation Status 1 Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-
M15	Output Terminal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: - Bit14: - Bit13: - Bit12: - Bit11: - Bit10: - Bit9: - Bit8: RO Bit7: - Bit6: - Bit5: - Bit4: - Bit3: - Bit2: - Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M16	Latest Alarm Contents	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (00 Hex): No alarm 1 (01 Hex): OC1 Overcurrent protection (during acceleration) 2 (02 Hex): OC2 Overcurrent protection (during deceleration) 3 (03 Hex): OC3 Overcurrent protection (during constant speed operation) 6 (06 Hex): OU1 Overvoltage protection (during acceleration) 7 (07 Hex): OU2 Overvoltage protection (during deceleration) 8 (08 Hex): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0A Hex): LU Undervoltage protection 11 (0B Hex): Lin Input phase loss protection 16 (10 Hex): PbF Inrush Current Prevention Circuit Error 17 (11 Hex): OH1 Heat sink overheat 18 (12 Hex): OH2 External alarm input 19 (13 Hex): OH3 Inverter internal overheat 20 (14 Hex): OH4 Motor protection (PTC thermistor) 22 (16 Hex): dbH Braking resistor overheat 23 (17 Hex): OL1 Motor 1 overload 24 (18 Hex): OL2 Motor 2 overload 25 (19 Hex): OLU Inverter overload 27 (1B Hex): OS Over speed protection 28 (1C Hex): Pg PG disconnection	0	-	-

4-1 List of Monitors by Group

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4-1-1 Parameter M (Monitor 1)

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M16	Latest Alarm Contents	31 (1F Hex): Er1 Memory error 32 (20 Hex): Er2 Operator communications error 33 (21 Hex): Er3 CPU error 34 (22 Hex): Er4 Option card 36 (24 Hex): Er6 Operation protection 37 (25 Hex): Er7 Tuning error 42 (2A Hex): Erd Detection of step-out 46 (2E Hex): OPL Output phase loss protection 47 (2F Hex): ErE Following error (excessive speed deviation) 50 (32 Hex): ErC Magnetic pole position detection error 51 (33 Hex): ErF Data save error in case of undervoltage 52 (34 Hex): d0 Excessive positioning deviation 53 (35 Hex): ErP RS-485 communications error (Option card) 56 (38 Hex): Ero Position control error 57 (39 Hex): ECF EN circuit failure 58 (3A Hex): CoF PID feedback disconnection detected 59 (3B Hex): dbA DB transistor trouble 65 (41 Hex): Reserved 68 (44 Hex): ErU Support tool communication disconnection 70 (46 Hex): OH6 Charging resistor overheat 253 (FD Hex): Lok Locked by password 254 (FE Hex): Err Mock alarm (Subcode = 9998)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M17	Last Alarm Contents	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (00 Hex): No alarm 1 (01 Hex): OC1 Overcurrent protection (during acceleration) 2 (02 Hex): OC2 Overcurrent protection (during deceleration) 3 (03 Hex): OC3 Overcurrent protection (during constant speed operation) 6 (06 Hex): OU1 Overvoltage protection (during acceleration) 7 (07 Hex): OU2 Overvoltage protection (during deceleration) 8 (08 Hex): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0A Hex): LU Undervoltage protection 11 (0B Hex): Lin Input phase loss protection 16 (10 Hex): PbF Inrush Current Prevention Circuit Error 17 (11 Hex): OH1 Heat sink overheat 18 (12 Hex): OH2 External alarm input 19 (13 Hex): OH3 Inverter internal overheat 20 (14 Hex): OH4 Motor protection (PTC thermistor) 22 (16 Hex): dbH Braking resistor overheat 23 (17 Hex): OL1 Motor 1 overload 24 (18 Hex): OL2 Motor 2 overload 25 (19 Hex): OLU Inverter overload 27 (1B Hex): OS Over speed protection 28 (1C Hex): Pg PG disconnection	0	-	-

4-1 List of Monitors by Group

4

4-1-1 Parameter M (Monitor 1)

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M17	Last Alarm Contents	31 (1F Hex): Er1 Memory error 32 (20 Hex): Er2 Operator communications error 33 (21 Hex): Er3 CPU error 34 (22 Hex): Er4 Option card 36 (24 Hex): Er6 Operation protection 37 (25 Hex): Er7 Tuning error 42 (2A Hex): Erd Detection of step-out 46 (2E Hex): OPL Output phase loss protection 47 (2F Hex): ErE Following error (excessive speed deviation) 50 (32 Hex): ErC Magnetic pole position detection error 51 (33 Hex): ErF Data save error in case of undervoltage 52 (34 Hex): d0 Excessive positioning deviation 53 (35 Hex): ErP RS-485 communications error (Option card) 56 (38 Hex): Ero Position control error 57 (39 Hex): ECF EN circuit failure 58 (3A Hex): CoF PID feedback disconnection detected 59 (3B Hex): dbA DB transistor trouble 65 (41 Hex): Reserved 68 (44 Hex): ErU Support tool communication disconnection 70 (46 Hex): OH6 Charging resistor overheat 253 (FD Hex): Lok Locked by password 254 (FE Hex): Err Mock alarm (Subcode = 9998)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M18	Second Last Alarm Contents	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (00 Hex): No alarm 1 (01 Hex): OC1 Overcurrent protection (during acceleration) 2 (02 Hex): OC2 Overcurrent protection (during deceleration) 3 (03 Hex): OC3 Overcurrent protection (during constant speed operation) 6 (06 Hex): OU1 Overvoltage protection (during acceleration) 7 (07 Hex): OU2 Overvoltage protection (during deceleration) 8 (08 Hex): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0A Hex): LU Undervoltage protection 11 (0B Hex): Lin Input phase loss protection 16 (10 Hex): PbF Inrush Current Prevention Circuit Error 17 (11 Hex): OH1 Heat sink overheat 18 (12 Hex): OH2 External alarm input 19 (13 Hex): OH3 Inverter internal overheat 20 (14 Hex): OH4 Motor protection (PTC thermistor) 22 (16 Hex): dbH Braking resistor overheat 23 (17 Hex): OL1 Motor 1 overload 24 (18 Hex): OL2 Motor 2 overload 25 (19 Hex): OLU Inverter overload 27 (1B Hex): OS Over speed protection 28 (1C Hex): Pg PG disconnection	0	-	-

4-1 List of Monitors by Group

4

4-1-1 Parameter M (Monitor 1)

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M18	Second Last Alarm Contents	31 (1F Hex): Er1 Memory error 32 (20 Hex): Er2 Operator communications error 33 (21 Hex): Er3 CPU error 34 (22 Hex): Er4 Option card 36 (24 Hex): Er6 Operation protection 37 (25 Hex): Er7 Tuning error 42 (2A Hex): Erd Detection of step-out 46 (2E Hex): OPL Output phase loss protection 47 (2F Hex): ErE Following error (excessive speed deviation) 50 (32 Hex): ErC Magnetic pole position detection error 51 (33 Hex): ErF Data save error in case of undervoltage 52 (34 Hex): d0 Excessive positioning deviation 53 (35 Hex): ErP RS-485 communications error (Option card) 56 (38 Hex): Ero Position control error 57 (39 Hex): ECF EN circuit failure 58 (3A Hex): CoF PID feedback disconnection detected 59 (3B Hex): dbA DB transistor trouble 65 (41 Hex): Reserved 68 (44 Hex): ErU Support tool communication disconnection 70 (46 Hex): OH6 Charging resistor overheat 253 (FD Hex): Lok Locked by password 254 (FE Hex): Err Mock alarm (Subcode = 9998)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M19	Third Last Alarm Contents	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (00 Hex): No alarm 1 (01 Hex): OC1 Overcurrent protection (during acceleration) 2 (02 Hex): OC2 Overcurrent protection (during deceleration) 3 (03 Hex): OC3 Overcurrent protection (during constant speed operation) 6 (06 Hex): OU1 Overvoltage protection (during acceleration) 7 (07 Hex): OU2 Overvoltage protection (during deceleration) 8 (08 Hex): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0A Hex): LU Undervoltage protection 11 (0B Hex): Lin Input phase loss protection 16 (10 Hex): PbF Inrush Current Prevention Circuit Error 17 (11 Hex): OH1 Heat sink overheat 18 (12 Hex): OH2 External alarm input 19 (13 Hex): OH3 Inverter internal overheat 20 (14 Hex): OH4 Motor protection (PTC thermistor) 22 (16 Hex): dbH Braking resistor overheat 23 (17 Hex): OL1 Motor 1 overload 24 (18 Hex): OL2 Motor 2 overload 25 (19 Hex): OLU Inverter overload 27 (1B Hex): OS Over speed protection 28 (1C Hex): Pg PG disconnection	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M19	Third Last Alarm Contents	31 (1F Hex): Er1 Memory error 32 (20 Hex): Er2 Operator communications error 33 (21 Hex): Er3 CPU error 34 (22 Hex): Er4 Option card 36 (24 Hex): Er6 Operation protection 37 (25 Hex): Er7 Tuning error 42 (2A Hex): Erd Detection of step-out 46 (2E Hex): OPL Output phase loss protection 47 (2F Hex): ErE Following error (excessive speed deviation) 50 (32 Hex): ErC Magnetic pole position detection error 51 (33 Hex): ErF Data save error in case of undervoltage 52 (34 Hex): d0 Excessive positioning deviation 53 (35 Hex): ErP RS-485 communications error (Option card) 56 (38 Hex): Ero Position control error 57 (39 Hex): ECF EN circuit failure 58 (3A Hex): CoF PID feedback disconnected detected 59 (3B Hex): dbA DB transistor trouble 65 (41 Hex): Reserved 68 (44 Hex): ErU Support tool communication disconnection 70 (46 Hex): OH6 Charging resistor overheat 253 (FD Hex): Lok Locked by password 254 (FE Hex): Err Mock alarm (Subcode = 9998)	0	-	-
M20	Cumulative Operation Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
M21	Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1,000 V	0	-	V

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M25	ROM Version	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	100	-	-
M26	Transmission Error Transaction Code for RS-485 Port1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: Improper FC (Non-existent parameter block specified) [RTU] 2: Improper address (Non-existent parameter number specified) [RTU] 3: Improper data (Range error) [RTU] 7: NAK (Link priority, no right, write disabled) [RTU] 71: Checksum error, CRC error 72: Parity error 73: Framing error, overrun error, buffer full	0	-	-
M27	Final Frequency Reference Monitor on Alarm Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	-
M28	Final Torque Command Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M29	Final Torque Current Command Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M30	Final Magnetic flux command Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M31	Final Frequency Reference Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz
M32	Output Frequency Monitor on Alarm without Slip Compensation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	-
M33	Output Torque Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M34	Torque Current Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M35	Output Frequency Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
M36	Input Power Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 399.99	0	-	%
M37	Output Current Effective Value Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 399.99 %	0	-	%
M38	Output Voltage Effective Value Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1000.0 V	0	-	V
M39	Operation Command Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 0: FWD Bit 1: REV Bit 2: DI1 Bit 3: DI2 Bit 4: DI3 Bit 5: DI4 Bit 6: DI5 Bit 7: --- Bit 8: --- Bit 9: --- Bit 10: --- Bit 11: EN Bit 12: --- Bit 13: DI6 Bit 14: DI7 Bit 15: RST	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M40	Operation Status 1 Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During Para-merter data writing) Bit14: - Bit13: - Bit12: RL (Communications ef-fective) Bit11: ALM (Alarm relay) Bit10: DEC (During decelera-tion) Bit9: ACC (During accelera-tion) Bit8: IL (During current limit-ing) Bit7: VL (During voltage limit-ing) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse op-eration) Bit0: FWD (During forward op-eration)	0	-	-
M41	Latest Output Terminal Informa-tion Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-
M42	Cumulative Operation Time Moni-tor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655,350 hour	0	-	h

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M43	Main Circuit DC Voltage Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1,000 V	0	-	V
M44	Inverter Internal Air Temperature Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC
M45	Heat Sink Temperature Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC
M46	Life of Main Circuit Capacitor Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0	0	-	%
M47	Life of PC Board Electrolytic Capacitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535 (in 10 hours)	0	-	10 hex
M48	Life of Cooling Fan	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9,999 (in 10 hours)	0	-	10 hex
M49	Input Terminal [AI1] Input Voltage Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767 20000: 10 V	0	-	-
M50	Input Terminal [AI2] Input Current (AII) Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 32767 0: 0 A 20000: 20 mA	0	-	-
M54	Input Terminal [AI2] Input Voltage (AIV) Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767 20000: 10 V	0	-	-
M56	Input Terminal [PTC] Input Voltage Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767 20000: 10 V	0	-	-
M57	Electric Angle Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 359.9º	0	-	deg

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M58	Rotor Angle Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 359.9º	0	-	deg
M59	Motor Electronic Thermal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100%	0	-	%
M61	Inverter Internal Air Temperature Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -3276.8～3276.7	0	-	degC
M62	Fin Temperature Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -3276.8～3276.7	0	-	degC
M63	Load Factor Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	%
M64	Motor Output Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67 % of rated power	0	-	%
M65	Motor Output Monitor on Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	-
M66	Speed Detection Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	-
M67	Transmission Error Transaction Code for RS485 Port	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: Improper FC (Non-existent parameter block specified) [RTU] 2: Improper address (Non-existent parameter number specified) [RTU] 3: Improper data (Range error) [RTU] 7: NAK (Link priority, no right, write disabled) [RTU] 71: Checksum error, CRC error 72: Parity error 73: Framing error, overrun error, buffer full	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M68	Do not use	-	-	-	-
M69	Inverter Rated Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 9999A	0	-	A
M70	Running Status 3 Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: OL (Overload warning) Bit13: LOC (Light load detection) Bit12: OL2 (Overload warning 2) Bit11: OLP (During active drive) Bit10: LIFE (Life warning) Bit9: OHF (Fin Overheat warning) Bit8: TRY (During retry) Bit7: FAN (Fan operation signal) Bit6: REF (RUN command source) Bit5: THM (Thermal warning) Bit4: IPF (During restart after instantaneous power failure) Bit3: SETM (2nd motor selection) Bit2: IRDY (Operation ready) Bit1: FDT1 (Over set Frequency arrival) Bit0: FAR1 (Constant speed arrival)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M71	Input Terminal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: - Bit11: EN Bit10: - Bit9: - Bit8: - Bit7: - Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-
M72	Do not use	-	-	-	-
M73	PID Output Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767 -20,000 = -100%, 20,000 = 100%	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M74	Running Status 2 Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: Motor type 1: PM motor 0: Induction motor Bit14: During EN circuit diagnosis Bit7: During speed control (1 during control) Bit5 to 4: Selected motor 00: 1st motor 01: 2nd motor 10: Reserved 11: Reserved Bit3 to 0: Control method 0000: V/f control without slip compensation 0001: Dynamic torque vector control 0010: V/f control with slip compensation 0011: V/f control with speed sensor 0100: Dynamic torque vector control with speed sensor 0101: Vector control without speed sensor 0110: Vector control with speed sensor 0111: Torque control (Vector control without speed sensor) 1000: Torque control (Vector control with speed sensor)	0	-	-
M76	Service Life of Main Circuit Capacitor Elapsed Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535 (in 10 hours)	0	-	10 hex
M77	Service Life of Main Circuit Capacitor Remaining Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535 (in 10 hours)	0	-	10 hex
M78	Rotation Speed Command Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	r/min
M79	Rotation Speed Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	r/min

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M81	1st Remaining Time before the Next Motor Maintenance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535 (in 10 hours)	0	-	10 hex
M84	Torque Command at Final	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327 to 327	0	-	%
M85	1st Remaining Startup Times before the Next Motor Maintenance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M86	Latest Light Alarm Factor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (0x00 Hex): No alarm 17 (0x11 Hex): OH1 Heat sink overheat 18 (0x12 Hex): OH2 External alarm input 19 (0x13 Hex): OH3 Inverter internal overheat 22 (0x16 Hex): dbH Braking resistor overheat 23 (0x17 Hex): OL1 Motor 1 overload 24 (0x18 Hex): OL2 Motor 2 overload 34 (0x22 Hex): Er4 Option card communications error 35 (0x23 Hex): Er5 Option card error 47 (0x2F Hex): ErE Following error (excessive speed deviation) 53 (0x35 Hex): ErP RS-485 communications error (Option card) 56 (0x38 Hex): Ero Position control error 58 (0x3A Hex): CoF PID feedback disconnection detected 100 (0x64 Hex): FAL Detect DC fan lock 101 (0x65 Hex): OL Motor overload early warning 102 (0x66 Hex): OH Heat sink overheat early warning 103 (0x67 Hex): LiF Lifetime alarm 104 (0x68 Hex): rEF Reference loss 105 (0x69 Hex): Pid PID alarm 106 (0x6A Hex): UTL Low output torque detection 107 (0x6B Hex): PTC PTC thermistor activated 108 (0x6C Hex): rTE Inverter life (Cumulative run time) 109 (0x6D Hex): CnT (Inverter life, Number of startups)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M87	Light Alarm Factor Last	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (0x00 Hex): No alarm 17 (0x11 Hex): OH1 Heat sink overheat 18 (0x12 Hex): OH2 External alarm input 19 (0x13 Hex): OH3 Inverter internal overheat 22 (0x16 Hex): dbH Braking resistor overheat 23 (0x17 Hex): OL1 Motor 1 overload 24 (0x18 Hex): OL2 Motor 2 overload 34 (0x22 Hex): Er4 Option card communications error 35 (0x23 Hex): Er5 Option card error 47 (0x2F Hex): ErE Following error (excessive speed deviation) 53 (0x35 Hex): ErP RS-485 communications error (Option card) 56 (0x38 Hex): Ero Position control error 58 (0x3A Hex): CoF PID feedback disconnection detected 100 (0x64 Hex): FAL Detect DC fan lock 101 (0x65 Hex): OL Motor overload early warning 102 (0x66 Hex): OH Heat sink overheat early warning 103 (0x67 Hex): LiF Lifetime alarm 104 (0x68 Hex): rEF Reference loss 105 (0x69 Hex): Pid PID alarm 106 (0x6A Hex): UTL Low output torque detection 107 (0x6B Hex): PTC PTC thermistor activated 108 (0x6C Hex): rTE Inverter life (Cumulative run time) 109 (0x6D Hex): CnT (Inverter life, Number of startups)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M88	Light Alarm Factor 2nd Last	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (0x00 Hex): No alarm 17 (0x11 Hex): OH1 Heat sink overheat 18 (0x12 Hex): OH2 External alarm input 19 (0x13 Hex): OH3 Inverter internal overheat 22 (0x16 Hex): dbH Braking resistor overheat 23 (0x17 Hex): OL1 Motor 1 overload 24 (0x18 Hex): OL2 Motor 2 overload 34 (0x22 Hex): Er4 Option card communications error 35 (0x23 Hex): Er5 Option card error 47 (0x2F Hex): ErE Following error (excessive speed deviation) 53 (0x35 Hex): ErP RS-485 communications error (Option card) 56 (0x38 Hex): Ero Position control error 58 (0x3A Hex): CoF PID feedback disconnection detected 100 (0x64 Hex): FAL Detect DC fan lock 101 (0x65 Hex): OL Motor overload early warning 102 (0x66 Hex): OH Heat sink overheat early warning 103 (0x67 Hex): LiF Lifetime alarm 104 (0x68 Hex): rEF Reference loss 105 (0x69 Hex): Pid PID alarm 106 (0x6A Hex): UTL Low output torque detection 107 (0x6B Hex): PTC PTC thermistor activated 108 (0x6C Hex): rTE Inverter life (Cumulative run time) 109 (0x6D Hex): CnT (Inverter life, Number of startups)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M89	Light Alarm Factor 3rd Last	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (0x00 Hex): No alarm 17 (0x11 Hex): OH1 Heat sink overheat 18 (0x12 Hex): OH2 External alarm input 19 (0x13 Hex): OH3 Inverter internal overheat 22 (0x16 Hex): dbH Braking resistor overheat 23 (0x17 Hex): OL1 Motor 1 overload 24 (0x18 Hex): OL2 Motor 2 overload 34 (0x22 Hex): Er4 Option card communications error 35 (0x23 Hex): Er5 Option card error 47 (0x2F Hex): ErE Following error (excessive speed deviation) 53 (0x35 Hex): ErP RS-485 communications error (Option card) 56 (0x38 Hex): Ero Position control error 58 (0x3A Hex): CoF PID feedback disconnection detected 100 (0x64 Hex): FAL Detect DC fan lock 101 (0x65 Hex): OL Motor overload early warning 102 (0x66 Hex): OH Heat sink overheat early warning 103 (0x67 Hex): LiF Lifetime alarm 104 (0x68 Hex): rEF Reference loss 105 (0x69 Hex): Pid PID alarm 106 (0x6A Hex): UTL Low output torque detection 107 (0x6B Hex): PTC PTC thermistor activated 108 (0x6C Hex): rTE Inverter life (Cumulative run time) 109 (0x6D Hex): CnT (Inverter life, Number of startups)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M95	Cumulative Running Time at Tripping	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
M96	Fourth Last Alarm Contents	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (00 Hex): No alarm 1 (01 Hex): OC1 Overcurrent protection (during acceleration) 2 (02 Hex): OC2 Overcurrent protection (during deceleration) 3 (03 Hex): OC3 Overcurrent protection (during constant speed operation) 6 (06 Hex): OU1 Overvoltage protection (during acceleration) 7 (07 Hex): OU2 Overvoltage protection (during deceleration) 8 (08 Hex): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0A Hex): LU Undervoltage protection 11 (0B Hex): Lin Input phase loss protection 16 (10 Hex): PbF Inrush Current Prevention Circuit Error 17 (11 Hex): OH1 Heat sink overheat 18 (12 Hex): OH2 External alarm input 19 (13 Hex): OH3 Inverter internal overheat 20 (14 Hex): OH4 Motor protection (PTC thermistor) 22 (16 Hex): dbH Braking resistor overheat 23 (17 Hex): OL1 Motor 1 overload 24 (18 Hex): OL2 Motor 2 overload 25 (19 Hex): OLU Inverter overload 27 (1B Hex): OS Over speed protection 28 (1C Hex): Pg PG disconnection	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M96	Fourth Last Alarm Contents	31 (1F Hex): Er1 Memory error 32 (20 Hex): Er2 Operator communications error 33 (21 Hex): Er3 CPU error 34 (22 Hex): Er4 Option card 36 (24 Hex): Er6 Operation protection 37 (25 Hex): Er7 Tuning error 42 (2A Hex): Erd Detection of step-out 46 (2E Hex): OPL Output phase loss protection 47 (2F Hex): ErE Following error (excessive speed deviation) 50 (32 Hex): ErC Magnetic pole position detection error 51 (33 Hex): ErF Data save error in case of undervoltage 52 (34 Hex): d0 Excessive positioning deviation 53 (35 Hex): ErP RS-485 communications error (Option card) 56 (38 Hex): Ero Position control error 57 (39 Hex): ECF EN circuit failure 58 (3A Hex): CoF PID feedback disconnection detected 59 (3B Hex): dbA DB transistor trouble 65 (41 Hex): Reserved 68 (44 Hex): ErU Support tool communication disconnection 70 (46 Hex): OH6 Charging resistor overheat 253 (FD Hex): Lok Locked by password 254 (FE Hex): Err Mock alarm (Subcode = 9998)	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M97	Fifth Last Alarm Contents	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 (00 Hex): No alarm 1 (01 Hex): OC1 Overcurrent protection (during acceleration) 2 (02 Hex): OC2 Overcurrent protection (during deceleration) 3 (03 Hex): OC3 Overcurrent protection (during constant speed operation) 6 (06 Hex): OU1 Overvoltage protection (during acceleration) 7 (07 Hex): OU2 Overvoltage protection (during deceleration) 8 (08 Hex): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0A Hex): LU Undervoltage protection 11 (0B Hex): Lin Input phase loss protection 16 (10 Hex): PbF Inrush Current Prevention Circuit Error 17 (11 Hex): OH1 Heat sink overheat 18 (12 Hex): OH2 External alarm input 19 (13 Hex): OH3 Inverter internal overheat 20 (14 Hex): OH4 Motor protection (PTC thermistor) 22 (16 Hex): dbH Braking resistor overheat 23 (17 Hex): OL1 Motor 1 overload 24 (18 Hex): OL2 Motor 2 overload 25 (19 Hex): OLU Inverter overload 27 (1B Hex): OS Over speed protection 28 (1C Hex): Pg PG disconnection	0	-	-

Parameter No.	Function name	Monitor or data range	Default data	Setting during RUN	Unit
M97	Fifth Last Alarm Contents	31 (1F Hex): Er1 Memory error 32 (20 Hex): Er2 Operator communications error 33 (21 Hex): Er3 CPU error 34 (22 Hex): Er4 Option card 36 (24 Hex): Er6 Operation protection 37 (25 Hex): Er7 Tuning error 42 (2A Hex): Erd Detection of step-out 46 (2E Hex): OPL Output phase loss protection 47 (2F Hex): ErE Following error (excessive speed deviation) 50 (32 Hex): ErC Magnetic pole position detection error 51 (33 Hex): ErF Data save error in case of undervoltage 52 (34 Hex): d0 Excessive positioning deviation 53 (35 Hex): ErP RS-485 communications error (Option card) 56 (38 Hex): Ero Position control error 57 (39 Hex): ECF EN circuit failure 58 (3A Hex): CoF PID feedback disconnection detected 59 (3B Hex): dbA DB transistor trouble 65 (41 Hex): Reserved 68 (44 Hex): ErU Support tool communication disconnection 70 (46 Hex): OH6 Charging resistor overheat 253 (FD Hex): Lok Locked by password 254 (FE Hex): Err Mock alarm (Subcode = 9998)	0	-	-
M114	Do not use	-	-	-	-
M115	PID Output Non Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -150.0 to 150.0	0	-	%

4-1-2 Parameter W (Monitor 2)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W01	Running Status 1 Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During Parameter code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-
W02	Frequency Reference Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz
W03	Output Frequency Monitor before Slip Compensation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
W04	Output Frequency after Slip Compensation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz
W05	Output Current Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 A	0	-	A
W06	Output Voltage Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1000.0 V	0	-	V

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W07	Output Torque Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
W08	Rotate Speed Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990	0	-	r/min
W09	Load Shaft Speed	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990	0	-	r/min
W10	Feed Speed	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990	0	-	m/min
W11	PID Process Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 9990.00	0	-	-
W12	PID Feedback Value Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 9990.00	0	-	-
W13	Analog Torque Limit Value Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -300 to 300 %	300	-	%
W14	Do not use	-	-	-	-
W15	Ratio value Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 200.00	0	-	%
W16	Motor Speed Set Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990	0	-	r/min
W17	Load Shaft Set Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990	0	-	r/min
W18	Feed Speed Set Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990	0	-	m/min
W19	Transport Time Set Value for Specified Length	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990 min	999.9	-	min

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W20	Transport Time for Specified Length	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99990 min	999.9	-	min
W21	Power Consumption Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 9999 kW	0	-	kW
W22	Motor Output Power Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 9999kW	0	-	kW
W23	Load Rate Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
W24	Torque Current Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
W25	Output Current Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 3276.7 A	0	-	A
W26	Magnetic Flux Command Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
W27	Timed Operation Remaining Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999 s	0	-	s
W28	RUN Command Source Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 23	0	-	-
W29	Frequency and PID Command Source Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 39	0	-	-
W30	Speed in Percentage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00	0	-	%
W31	Speed Set Value in Percentage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00	0	-	%

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W32	PID Output Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -150.00 to 150.00	0	-	%
W33	Analog Input Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -9990 to 0.00 to 9990	0	-	-
W40	Input Terminal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: EN2 Bit11: EN1 Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: DI7 Bit0: DI6	0	-	-
W41	Output Signal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W42	Communications Input Signal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-
W43	Communications Control Output Signal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-
W44	Input Terminal [AI1] Input Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -12.0 to 12.0	0	-	V
W45	Input Terminal [AI2]AII Input Current (AII)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 30.0 mA	0	-	mA
W46	Output Terminal [AO]AOV Output Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -0.0 to 12.0 V	0	-	V

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W48	Output Terminal [AO]PO Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 32,000 p/s	0	-	p/s
W49	Input Terminal [AI2] Input Voltage (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -0.0 to 12.0 V	0	-	V
W50	Output Terminal [AO]AOI Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 30.0 mA 999: Disable	32767	-	mA
W53	Pulse Input (A/B Phase of Ch1 Side)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV —	0	-	kp/s
W54	Pulse Input (Z Phase of Ch1 Side)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV —	0	-	p/s
W55	Reserved	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	-	kp/s
W56	Reserved	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 16,000 p/s	0	-	p/s
W57	Do not use	-	-	-	-
W58	Do not use	-	-	-	-
W59	Do not use	-	-	-	-
W60	Do not use	-	-	-	-
W61	Do not use	-	-	-	-
W62	Do not use	-	-	-	-
W63	Do not use	-	-	-	-
W66	Do not use	-	-	-	-
W67	Cumulative Run Time of Capacitors on Printed Circuit Boards	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999 (in 10 hours)	0	-	10 hex
W68	Cumulative Run Time of Cooling Fan	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999 (in 10 hours)	0	-	10 hex
W70	Total Power ON Time Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W71	Do not use	-	-	-	-
W72	Internal Air Highest Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	degC
W73	Heat Sink Maximum Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	degC
W74	Maximum Effective Current Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 9999 A	0	-	A
W75	Main Circuit Capacitor's Capacitor Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.0	0	-	%
W76	Cumulative Run Time of Electro-lytic Capacitors on PC Board	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535 hour	0	-	h
W77	Cumulative Run Time of Cooling Fan	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535 hour	0	-	h
W78	Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-
W79	Cumulative Operation Time of Motor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535 hour	0	-	h
W81	Integrated Power Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 999900.0	0	-	kWh
W82	Data Used Integrating Electric Power	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 9999	0	-	-
W83	Number of Operator Comm Errors	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W84	Contents of Operator Comm error	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 127 1: Improper FC [RTU] 2: Improper address (function code error) [RTU] 3: Improper data (range error) [RTU] 7: NAK (link priority ; no right ; write disabled) [RTU] 71: Checksum error ; CRC error 72: Parity error 73: Framing error ; overrun error ; buffer full	0	-	-
W85	Number of RS-485 Errors	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
W94	Contents of RS-485 Error	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: Improper FC [RTU] 2: Improper address (function code error) [RTU] 3: Improper data (range error) [RTU] 7: NAK (link priority, no right, write disabled) [RTU] 71: Checksum error, CRC error 72: Parity error 73: Framing error, overrun error, buffer full	0	-	-
W118	Torque Bias Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
W131	PIC Control PID Deviation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	-	-
W132	PIC Control PID Deviation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767 -20000 = -100% +20000 = +100%	0	-	-
W135	Input Power Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 6553.5 kW	0	-	kW

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W136	Input Terminal [AI1] Input Voltage (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -1024 to 1023 (1023 ＝ 10.9V)	0	-	-
W137	Input Terminal [AI2] Input Current (AII)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1023 (1023 ＝ 23.3mA)	0	-	-
W138	Input Terminal [AI2] Input Voltage (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1023 (1023 ＝ 10.9V)	0	-	-
W139	Pulse Train Frequency Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -163.84 to 163.83 %	0	-	%
W142	Feedback Current Position Monitor (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W143	Feedback Current Position Monitor (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W144	Target Position Monitor (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W145	Target Position Monitor (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W146	Position Deviation Monitor (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W147	Position Deviation Monitor (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W148	Touch Probe 1 Positive Edge (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W149	Touch Probe 1 Positive Edge (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W150	Touch Probe 2 Positive Edge (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W151	Touch Probe 2 Positive Edge (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-
W152	Touch Probe Status	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: Touch probe 2 PLc Bit8: Touch probe 2 Enb Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: Touch probe 1 PLc Bit0: Touch probe 1 Enb	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
W161	Braking Resistor Thermal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0%	0.0	-	%
W178	Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 (1.00 = 10000 times)	0.00	-	-
W179	Total RUN Time Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
W180	Tuning Progress	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	0	-	%
W202	Do not use	-	-	-	-
W203	Do not use	-	-	-	-

4-1-3 Parameter z (Alarm Information 1)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z00	Second Last Alarm Info. Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
Z01	Second Last Alarm Info. Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 A	0	-	A
Z02	Second Last Alarm Info. Output Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1000 V	0	-	V
Z03	Second Last Alarm Info. Torque Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
Z04	Second Last Alarm Info. Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z05	Second Last Alarm Info. Running Status	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-
Z06	Second Last Alarm Info. Cumulative Ope. Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655,350 hour	0	-	h
Z07	Second Last Alarm Info. Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-
Z08	Second Last Alarm Info. Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1,000.0 V	0.0	-	V
Z09	Second Last Alarm Info. Internal Air Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC
Z10	Second Last Alarm Info. Heat Sink Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z11	Second Last Alarm Info. Input Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: EN2 Bit11: EN1 Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: DI7 Bit0: DI6	0	-	-
Z12	Second Last Alarm Info. Output Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z13	Second Last Alarm Info. Input Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-
Z14	Second Last Alarm Info. Output Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z16	Second Last Alarm Info. Running Status 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: Motor type 1: PM motor 0: Induction motor Bit14: During EN circuit diagnosis Bit7: During speed control (1 during control) Bit5 to 4: Selected motor 00: 1st motor 01: 2nd motor 10: Reserved 11: Reserved Bit3 to 0: Control method 0000: V/f control without slip compensation 0001: Dynamic torque vector control 0010: V/f control with slip compensation 0011: V/f control with speed sensor 0100: Dynamic torque vector control with speed sensor 0101: Vector control without speed sensor 0110: Vector control with speed sensor 0111: Torque control (Vector control without speed sensor) 1000: Torque control (Vector control with speed sensor)	0	-	-
Z17	Second Last Alarm Info. Speed Detection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z18	Second Last Alarm Info. Running Status 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: OL (Overload warning) Bit13: LOC (Light load detection) Bit12: OL2 (Overload warning 2) Bit11: OLP (During active drive) Bit10: LIFE (Life warning) Bit9: OHF (Fin Overheat warning) Bit8: TRY (During retry) Bit7: FAN (Fan operation signal) Bit6: REF (RUN command source) Bit5: THM (Thermal warning) Bit4: IPF (During restart after instantaneous power failure) Bit3: SETM (2nd motor selection) Bit2: IRDY (Operation ready) Bit1: FDT1 (Over set Frequency arrival) Bit0: FAR1 (Constant speed arrival)	0	-	-
Z40	1st Cumulative Run Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535 (in 10 hours)	0	-	10 hex
Z41	2nd Cumulative Run Time of motor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535 (in 10 hours)	0	-	10 hex
Z44	2nd Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-
Z50	Third Last Alarm Info. Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
Z51	Third Last Alarm Info. Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 A	0	-	A

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z52	Third Last Alarm Info. Output Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1000 V	0	-	V
Z53	Third Last Alarm Info. Torque Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
Z54	Third Last Alarm Info. Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz
Z55	Third Last Alarm Info. Running Status	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-
Z56	Third Last Alarm Info. Cumulative Ope. Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
Z57	Third Last Alarm Info. Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z58	Third Last Alarm Info. Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1,000.0 V	0.0	-	V
Z59	Third Last Alarm Info. Internal Air Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	degC
Z60	Third Last Alarm Info. Heat Sink Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC
Z61	Third Last Alarm Info. Input Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: EN2 Bit11: EN1 Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: DI7 Bit0: DI6	0	-	-
Z62	Third Last Alarm Info. Output Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z63	Third Last Alarm Info. Input Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-
Z64	Third Last Alarm Info. Output Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z66	Third Last Alarm Info. Running Status 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: Motor type 1: PM motor 0: Induction motor Bit14: During EN circuit diagnosis Bit7: During speed control (1 during control) Bit5 to 4: Selected motor 00: 1st motor 01: 2nd motor 10: Reserved 11: Reserved Bit3 to 0: Control method 0000: V/f control without slip compensation 0001: Dynamic torque vector control 0010: V/f control with slip compensation 0011: V/f control with speed sensor 0100: Dynamic torque vector control with speed sensor 0101: Vector control without speed sensor 0110: Vector control with speed sensor 0111: Torque control (Vector control without speed sensor) 1000: Torque control (Vector control with speed sensor)	0	-	-
Z67	Third Last Alarm Info. Speed Detection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
Z68	Third Last Alarm Info. Running Status 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: OL (Overload warning) Bit13: LOC (Light load detection) Bit12: OL2 (Overload warning 2) Bit11: OLP (During active drive) Bit10: LIFE (Life warning) Bit9: OHF (Fin Overheat warning) Bit8: TRY (During retry) Bit7: FAN (Fan operation signal) Bit6: REF (RUN command source) Bit5: THM (Thermal warning) Bit4: IPF (During restart after instantaneous power failure) Bit3: SETM (2nd motor selection) Bit2: IRDY (Operation ready) Bit1: FDT1 (Over set Frequency arrival) Bit0: FAR1 (Constant speed arrival)	0	-	-
Z84	Output Current Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 A	0	-	A

4-1-4 Parameter X (Alarm Information 2)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X01	Latest Multiple Alarm1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-
X02	Latest Multiple Alarm2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-
X03	Latest Alarm Sub Code 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X04	Latest Multiple Alarm Sub Code 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
X05	Last Alarm History/Number of Consecutive Same Alarms	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF hex (MSB: 00 to FF hex, LSB:00 to FE hex) MSB: Number of alarm LSB: 00 to FE hex 00 hex (0) : No alarm 01 hex (1) : OC1 Overcurrent protection (during acceleration) 02 hex (2) : OC2 Overcurrent protection (during deceleration) 03 hex (3) : OC3 Overcurrent protection (during constant speed operation) 06 hex (4) : OU1 Overvoltage protection (during acceleration) 07 hex (7) : OU2 Overvoltage protection (during deceleration) 08 hex (8) : OU3 Overvoltage protection (during constant speed operation or stopping) 0A hex (10) : LU Undervoltage protection 0B hex (11) : Lin Input phase loss protection 10 hex (16) : PbF Inrush current avoidance circuit error 11 hex (17) : OH1 Heat sink overheat 12 hex (18) : OH2 External alarm input 13 hex (19) : OH3 Inverter internal overheat 14 hex (20) : OH4 Motor protection (PTC thermistor) 16 hex (22) : dbH Braking resistor overheat 17 hex (23) : OL1 Motor 1 overload 18 hex (24) : OL2 Motor 2 overload	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X05	Last Alarm History/Number of Consecutive Same Alarms	19 hex (25) : OLU Inverter overload 1B hex (27) : OS Over speed protection 1C hex (28) : Pg PG disconnection 1F hex (31) : Er1 Memory error 20 hex (32) : Er2 Operator communications 23 hex (35) : Er5 Option card error 24 hex (36) : Er6 Operation protection 25 hex (37) : Er7 Tuning error 2A hex (42) : Erd Detection of step-out 2E hex (46) : OPL Output phase loss protection 2F hex (47) : ErE Following error (excessive speed deviation) 32 hex (50) : ErC Magnetic pole position detection error 33 hex (51) : ErF Data save error in case of undervoltage 34 hex (52) : d0 Excessive positioning deviation 35 hex (53) : ErP (RS-485 communications error, Option card) 38 hex (56) : Ero Position control error 39 hex (57) : ECF EN circuit failure 3A hex (58) : CoF PID feedback disconnection detected 3B hex (59) : dbA Braking resistor overheat 44 hex (68) : ErU Support tool communication disconnection 46 hex (70) : OH6 Inrush current prevention resistor overheat FD hex (253) : Lok Locked by password FE hex (254) : Err Mock alarm (Subcode = 9998)	0	-	-
X06	Last Multiple Alarm 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X07	Last Multiple Alarm 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-
X08	Last Alarm Sub Code 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
X09	Last Multiple Alarm Sub Code	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
X10	Second Last Alarm History/ Number of Consecutive Same Alarms	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF hex (MSB: 00 to FF hex, LSB:00 to FE hex) MSB: Number of alarm LSB: 00 to FE hex 00 hex (0) : No alarm 01 hex (1) : OC1 Overcurrent protection (during acceleration) 02 hex (2) : OC2 Overcurrent protection (during deceleration) 03 hex (3) : OC3 Overcurrent protection (during constant speed operation) 06 hex (4) : OU1 Overvoltage protection (during acceleration) 07 hex (7) : OU2 Overvoltage protection (during deceleration) 08 hex (8) : OU3 Overvoltage protection (during constant speed operation or stopping) 0A hex (10) : LU Undervoltage protection	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X10	Second Last Alarm History/ Number of Consecutive Same Alarms	0B hex (11) : Lin Input phase loss protection 10 hex (16) : PbF Inrush current avoidance circuit error 11 hex (17) : OH1 Heat sink overheat 12 hex (18) : OH2 External alarm input 13 hex (19) : OH3 Inverter internal overheat 14 hex (20) : OH4 Motor protection (PTC thermistor) 16 hex (22) : dbH Braking resistor overheat 17 hex (23) : OL1 Motor 1 overload 18 hex (24) : OL2 Motor 2 overload 19 hex (25) : OLU Inverter overload 1B hex (27) : OS Over speed protection 1C hex (28) : Pg PG disconnection 1F hex (31) : Er1 Memory error 20 hex (32) : Er2 Operator communications 23 hex (35) : Er5 Option card error 24 hex (36) : Er6 Operation protection 25 hex (37) : Er7 Tuning error 2A hex (42) : Erd Detection of step-out 2E hex (46) : OPL Output phase loss protection 2F hex (47) : ErE Following error (excessive speed deviation)	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X10	Second Last Alarm History/ Number of Consecutive Same Alarms	32 hex (50) : ErC Magnetic pole position detection error 33 hex (51) : ErF Data save error in case of undervoltage 34 hex (52) : d0 Excessive positioning deviation 35 hex (53) : ErP (RS-485 communications error, Option card) 38 hex (56) : Ero Position control error 39 hex (57) : ECF EN circuit failure 3A hex (58) : CoF PID feedback disconnection detected 3B hex (59) : dbA Braking resistor overheat 44 hex (68) : ErU Support tool communication disconnection 46 hex (70) : OH6 Inrush current prevention resistor overheat FD hex (253) : Lok Locked by password FE hex (254) : Err Mock alarm (Subcode = 9998)	0	-	-
X11	Second last Multiple Alarm2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-
X12	Second Last Multiple Alarm3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-
X13	Second Last Alarm Sub Code	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
X14	Second Last Multiple Alarm Sub Code	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X15	Third Last Alarm History/Number of Consecutive Same Alarms	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF hex (MSB: 00 to FF hex, LSB:00 to FE hex) MSB: Number of alarm LSB: 00 to FE hex 00 hex (0) : No alarm 01 hex (1) : OC1 Overcurrent protection (during acceleration) 02 hex (2) : OC2 Overcurrent protection (during deceleration) 03 hex (3) : OC3 Overcurrent protection (during constant speed operation) 06 hex (4) : OU1 Overvoltage protection (during acceleration) 07 hex (7) : OU2 Overvoltage protection (during deceleration) 08 hex (8) : OU3 Overvoltage protection (during constant speed operation or stopping) 0A hex (10) : LU Undervoltage protection 0B hex (11) : Lin Input phase loss protection 10 hex (16) : PbF Inrush current avoidance circuit error 11 hex (17) : OH1 Heat sink overheat 12 hex (18) : OH2 External alarm input 13 hex (19) : OH3 Inverter internal overheat 14 hex (20) : OH4 Motor protection (PTC thermistor) 16 hex (22) : dbH Braking resistor overheat 17 hex (23) : OL1 Motor 1 overload 18 hex (24) : OL2 Motor 2 overload 19 hex (25) : OLU Inverter overload	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X15	Third Last Alarm History/Number of Consecutive Same Alarms	1B hex (27) : OS Over speed protection 1C hex (28) : Pg PG disconnection 1F hex (31) : Er1 Memory error 20 hex (32) : Er2 Operator communications 23 hex (35) : Er5 Option card error 24 hex (36) : Er6 Operation protection 25 hex (37) : Er7 Tuning error 2A hex (42) : Erd Detection of step-out 2E hex (46) : OPL Output phase loss protection 2F hex (47) : ErE Following error (excessive speed deviation) 32 hex (50) : ErC Magnetic pole position detection error 33 hex (51) : ErF Data save error in case of undervoltage 34 hex (52) : d0 Excessive positioning deviation 35 hex (53) : ErP (RS-485 communications error, Option card) 38 hex (56) : Ero Position control error 39 hex (57) : ECF EN circuit failure 3A hex (58) : CoF PID feedback disconnection detected 3B hex (59) : dbA Braking resistor overheat 44 hex (68) : ErU Support tool communication disconnection 46 hex (70) : OH6 Inrush current prevention resistor overheat FD hex (253) : Lok Locked by password FE hex (254) : Err Mock alarm (Subcode = 9998)	0	-	-
X16	Third Last Multiple Alarm 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X17	Third Last Multiple Alarm 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	-	-
X18	Third Last Alarm Sub Code 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
X19	Third Last Multiple Alarm Sub Code 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	-
X20	Latest Alarm Info. Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
X21	Latest Alarm Info. Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99A	0	-	A
X22	Latest Alarm Info. Output Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1000 A	0	-	V
X23	Latest Alarm Info. Torque Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%
X24	Latest Alarm Info. Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X25	Latest Alarm Info. Running Status 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-
X26	Latest Alarm Info. Cumulative Ope. time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X27	Latest Alarm Info. Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-
X28	Latest Alarm Info. Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1,000.0 V	0.0	-	V
X29	Latest Alarm Info. Internal Air Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	degC
X30	Latest Alarm Info. Heat Sink Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X31	Latest Alarm Info. Input Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: EN2 Bit11: EN1 Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: DI7 Bit0: DI6	0	-	-
X32	Latest Alarm Info. Output Termi-nal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X33	Latest Alarm Info. Input Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-
X34	Latest Alarm Info. Output Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-
X35	Latest Alarm Info. Input Power	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 9999 kW	0	-	kW

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X36	Latest Alarm Info. Running Status 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: Motor type 1: PM motor 0: Induction motor Bit14: During EN circuit diagnosis Bit7: During speed control (1 during control) Bit5 to 4: Selected motor 00: 1st motor 01: 2nd motor 10: Reserved 11: Reserved Bit3 to 0: Control method 0000: V/f control without slip compensation 0001: Dynamic torque vector control 0010: V/f control with slip compensation 0011: V/f control with speed sensor 0100: Dynamic torque vector control with speed sensor 0101: Vector control without speed sensor 0110: Vector control with speed sensor 0111: Torque control (Vector control without speed sensor) 1000: Torque control (Vector control with speed sensor)	0	-	-
X37	Latest Alarm Info. Speed Detection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X38	Latest Alarm Info. Running Status 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: OL (Overload warning) Bit13: LOC (Light load detection) Bit12: OL2 (Overload warning 2) Bit11: OLP (During active drive) Bit11: OLP (During active drive) Bit10: LIFE (Life warning) Bit9: OHF (Fin Overheat warning) Bit8: TRY (During retry) Bit7: FAN (Fan operation signal) Bit6: REF (RUN command source) Bit5: THM (Thermal warning) Bit4: IPF (During restart after instantaneous power failure) Bit3: SETM (2nd motor selection) Bit2: IRDY (Operation ready) Bit1: FDT1 (Over set Frequency arrival) Bit0: FAR1 (Constant speed arrival)	0	-	-
X49	Fault Counter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65535	0	-	-
X60	Last Info. Alarm Info. Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
X61	Last Alarm Info. Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99A	0	-	A
X62	Last Alarm Info. Output Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 1000 V	0	-	V
X63	Last Alarm Info. Torque Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999 to 999	0	-	%

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X64	Last Alarm Info. Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35	0	-	Hz
X65	Last Alarm Info. Running Status	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-
X66	Last Alarm Info. Cumulative Ope. Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X67	Last Alarm Info. Number of Startups	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	-	-
X68	Last Alarm Info. Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1,000.0 V	0.0	-	V
X69	Last Alarm Info Internal Air Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	degC

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X70	Last Alarm Info. Heat Sink Temperature	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	-	degC
X71	Last Alarm Info. Input Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: EN2 Bit11: EN1 Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: DI7 Bit0: DI6	0	-	-
X72	Last Alarm Info. Output Terminal	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X73	Last Alarm Info. Input Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-	-
X74	Last Alarm Info. Output Terminal via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X76	Last Alarm Info. Running Status 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: Motor type 1: PM motor 0: Induction motor Bit14: During EN circuit diagnosis Bit7: During speed control (1 during control) Bit5 to 4: Selected motor 00: 1st motor 01: 2nd motor 10: Reserved 11: Reserved Bit3 to 0: Control method 0000: V/f control without slip compensation 0001: Dynamic torque vector control 0010: V/f control with slip compensation 0011: V/f control with speed sensor 0100: Dynamic torque vector control with speed sensor 0101: Vector control without speed sensor 0110: Vector control with speed sensor 0111: Torque control (Vector control without speed sensor) 1000: Torque control (Vector control with speed sensor)	0	-	-
X77	Last Alarm Info. Speed Detection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X78	Last Alarm Info. Running Status 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: OL (Overload warning) Bit13: LOC (Light load detection) Bit12: OL2 (Overload warning 2) Bit11: OLP (During active drive) Bit11: OLP (During active drive) Bit10: LIFE (Life warning) Bit9: OHF (Fin Overheat warning) Bit8: TRY (During retry) Bit7: FAN (Fan operation signal) Bit6: REF (RUN command source) Bit5: THM (Thermal warning) Bit4: IPF (During restart after instantaneous power failure) Bit3: SETM (2nd motor selection) Bit2: IRDY (Operation ready) Bit1: FDT1 (Over set Frequency arrival) Bit0: FAR1 (Constant speed arrival)	0	-	-
X97	Input Input Terminal [PTC] Input Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -0.0 to 12.0	0	-	V
X108	Latest Alarm Info. Cumulative Running Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X118	Last Alarm Info. Cumulative Running Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X128	Second last Alarm Info. Cumulative Running Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X138	Third last Alarm Info. Cumulative Running Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X140	4th last Alarm History/Number of Consecutive Same Alarms	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF hex (MSB: 00 to FF hex, LSB:00 to FE hex) MSB: Number of alarm LSB: 00 to FE hex 00 hex (0) : No alarm 01 hex (1) : OC1 Overcurrent protection (during acceleration) 02 hex (2) : OC2 Overcurrent protection (during deceleration) 03 hex (3) : OC3 Overcurrent protection (during constant speed operation) 06 hex (4) : OU1 Overvoltage protection (during acceleration) 07 hex (7) : OU2 Overvoltage protection (during deceleration) 08 hex (8) : OU3 Overvoltage protection (during constant speed operation or stopping) 0A hex (10) : LU Undervoltage protection 0B hex (11) : Lin Input phase loss protection 10 hex (16) : PbF Inrush current avoidance circuit error 11 hex (17) : OH1 Heat sink overheat 12 hex (18) : OH2 External alarm input 13 hex (19) : OH3 Inverter internal overheat 14 hex (20) : OH4 Motor protection (PTC thermistor) 16 hex (22) : dbH Braking resistor overheat 17 hex (23) : OL1 Motor 1 overload	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X140	4th last Alarm History/Number of Consecutive Same Alarms	18 hex (24) : OL2 Motor 2 overload 19 hex (25) : OLU Inverter overload 1B hex (27) : OS Over speed protection 1C hex (28) : Pg PG disconnection 1F hex (31) : Er1 Memory error 20 hex (32) : Er2 Operator communications 23 hex (35) : Er5 Option card error 24 hex (36) : Er6 Operation protection 25 hex (37) : Er7 Tuning error 2A hex (42) : Erd Detection of step-out 2E hex (46) : OPL Output phase loss protection 2F hex (47) : ErE Following error (excessive speed deviation) 32 hex (50) : ErC Magnetic pole position detection error 33 hex (51) : ErF Data save error in case of undervoltage 34 hex (52) : d0 Excessive positioning deviation 35 hex (53) : ErP (RS-485 communications error, Option card) 38 hex (56) : Ero Position control error 39 hex (57) : ECF EN circuit failure 3A hex (58) : CoF PID feedback disconnection detected 3B hex (59) : dbA Braking resistor overheat 44 hex (68) : ErU Support tool communication disconnection 46 hex (70) : OH6 Inrush current prevention resistor overheat FD hex (253) : Lok Locked by password FE hex (254) : Err Mock alarm (Subcode = 9998)	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X141	Fourth last Alarm Info. Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz
X142	Fourth last Alarm Info. Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 A	0	-	A
X143	Fourth Last Alarm Info. Cumulative Ope. time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X144	Fourth Last Alarm Info. Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1,000.0 V	0.0	-	V
X148	Fourth Last Alarm Info. Cumulative Running Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X149	Fourth Last Alarm Info. Running Status	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X150	5th last Alarm History/Number of Consecutive Same Alarms	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF hex (MSB: 00 to FF hex, LSB:00 to FE hex) MSB: Number of alarm LSB: 00 to FE hex 00 hex (0) : No alarm 01 hex (1) : OC1 Overcurrent protection (during acceleration) 02 hex (2) : OC2 Overcurrent protection (during deceleration) 03 hex (3) : OC3 Overcurrent protection (during constant speed operation) 06 hex (4) : OU1 Overvoltage protection (during acceleration) 07 hex (7) : OU2 Overvoltage protection (during deceleration) 08 hex (8) : OU3 Overvoltage protection (during constant speed operation or stopping) 0A hex (10) : LU Undervoltage protection 0B hex (11) : Lin Input phase loss protection 10 hex (16) : PbF Inrush current avoidance circuit error 11 hex (17) : OH1 Heat sink overheat 12 hex (18) : OH2 External alarm input 13 hex (19) : OH3 Inverter internal overheat 14 hex (20) : OH4 Motor protection (PTC thermistor) 16 hex (22) : dbH Braking resistor overheat 17 hex (23) : OL1 Motor 1 overload 18 hex (24) : OL2 Motor 2 overload	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X150	5th last Alarm History/Number of Consecutive Same Alarms	19 hex (25) : OLU Inverter overload 1B hex (27) : OS Over speed protection 1C hex (28) : Pg PG disconnection 1F hex (31) : Er1 Memory error 20 hex (32) : Er2 Operator communications 23 hex (35) : Er5 Option card error 24 hex (36) : Er6 Operation protection 25 hex (37) : Er7 Tuning error 2A hex (42) : Erd Detection of step-out 2E hex (46) : OPL Output phase loss protection 2F hex (47) : ErE Following error (excessive speed deviation) 32 hex (50) : ErC Magnetic pole position detection error 33 hex (51) : ErF Data save error in case of undervoltage 34 hex (52) : d0 Excessive positioning deviation 35 hex (53) : ErP (RS-485 communications error, Option card) 38 hex (56) : Ero Position control error 39 hex (57) : ECF EN circuit failure 3A hex (58) : CoF PID feedback disconnection detected 3B hex (59) : dbA Braking resistor overheat 44 hex (68) : ErU Support tool communication disconnection 46 hex (70) : OH6 Inrush current prevention resistor overheat FD hex (253) : Lok Locked by password FE hex (254) : Err Mock alarm (Subcode = 9998)	0	-	-
X151	Fifth Last Alarm Info. Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	-	Hz

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X152	Fifth Last Alarm Info. Output Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 A	0	-	A
X153	Fifth Last Alarm Info. Cumulative Ope. Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X154	Fifth last Alarm Info. Main Circuit DC Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 1,000.0 V	0.0	-	V
X158	Fifth last Alarm Info. Cumulative Running time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 655350 hour	0	-	h
X159	Fifth Last Alarm Info. Running Status	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: BUSY (During function code data writing) Bit14: - Bit13: - Bit12: RL (Communications effective) Bit11: ALM (Alarm relay) Bit10: DEC (During deceleration) Bit9: ACC (During acceleration) Bit8: IL (During current limiting) Bit7: VL (During voltage limiting) Bit6: TL (Torque limiting) Bit5: NUV (Main circuit DC voltage established) Bit4: BRK (During braking) Bit3: INT (Inverter shut down) Bit2: EXT (During DC braking or during pre-exciting) Bit1: REV (During reverse operation) Bit0: FWD (During forward operation)	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X00	Latest Alarm History/Number of Consecutive Same Alarms	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF hex (MSB: 00 to FF hex, LSB:00 to FE hex) MSB: Number of alarm ("00 hex") LSB: 00 to FE hex 00 hex (0) : No alarm 01 hex (1) : OC1 Overcurrent protection (during acceleration) 02 hex (2) : OC2 Overcurrent protection (during deceleration) 03 hex (3) : OC3 Overcurrent protection (during constant speed operation) 06 hex (4) : OU1 Overvoltage protection (during acceleration) 07 hex (7) : OU2 Overvoltage protection (during deceleration) 08 hex (8) : OU3 Overvoltage protection (during constant speed operation or stopping) 0A hex (10) : LU Undervoltage protection 0B hex (11) : Lin Input phase loss protection 10 hex (16) : PbF Inrush current avoidance circuit error 11 hex (17) : OH1 Heat sink overheat 12 hex (18) : OH2 External alarm input 13 hex (19) : OH3 Inverter internal overheat 14 hex (20) : OH4 Motor protection (PTC thermistor) 16 hex (22) : dbH Braking resistor overheat 17 hex (23) : OL1 Motor 1 overload 18 hex (24) : OL2 Motor 2 overload	0	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit
X00	Latest Alarm History/Number of Consecutive Same Alarms	19 hex (25) : OLU Inverter overload 1B hex (27) : OS Over speed protection 1C hex (28) : Pg PG disconnection 1F hex (31) : Er1 Memory error 20 hex (32) : Er2 Operator communications 23 hex (35) : Er5 Option card error 24 hex (36) : Er6 Operation protection 25 hex (37) : Er7 Tuning error 2A hex (42) : Erd Detection of step-out 2E hex (46) : OPL Output phase loss protection 2F hex (47) : ErE Following error (excessive speed deviation) 32 hex (50) : ErC Magnetic pole position detection error 33 hex (51) : ErF Data save error in case of undervoltage 34 hex (52) : d0 Excessive positioning deviation 35 hex (53) : ErP (RS-485 communications error, Option card) 38 hex (56) : Ero Position control error 39 hex (57) : ECF EN circuit failure 3A hex (58) : CoF PID feedback disconnection detected 3B hex (59) : dbA Braking resistor overheat 44 hex (68) : ErU Support tool communication disconnection 46 hex (70) : OH6 Inrush current prevention resistor overheat FD hex (253) : Lok Locked by password FE hex (254) : Err Mock alarm (Subcode = 9998)	0	-	-

4-2 List of Parameters by Group

The parameters that are displayed are limited by the setting of Operator (Menu display mode) (E52). To display all parameters, set Operator (Menu display mode) to “2: Full menu mode.” (The default setting for Operator (Menu display mode) (E52) is “2: Full menu mode”.)
Enabled and disabled states for each control mode within the data range of the parameters are indicated by the icon.

Symbol	Control method (F42/A14)
V/f	0: IM V/f control
DTV	1: IM Dynamic torque vector control
PG V/f	3: IM V/f control with speed sensor
PG DTV	4: IM Dynamic torque vector control with speed sensor
SLV	5: IM Vector control without speed sensor
PGV	6: IM Vector control with speed sensor
PM SLV	15: PM Vector control without speed and pole position sensor
PM PGV	16: PM Vector control with speed and pole position sensor

V/f: Enabled V/f: Disabled

4-2-1 Parameter F (Basic Functions)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F00	Operator Protection Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable parameter protection, enable Up/Down keys 1: Enable parameter protection, enable Up/Down keys 2: Disable parameter protection, disable Up/Down keys 3: Enable parameter protection, disable Up/Down keys	0	Available	-	page 7-73

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F01	1st Frequency Reference Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 15 0: Operator (UP and DOWN keys) 1: Analog voltage input (terminal AI1) 2: Analog current input (terminal AI2 (AII)) 3: Analog voltage input (terminal AI1) + analog current input (terminal AI2 (AII)) 5: Analog voltage input (terminal AI2 (AIV)) 7: UP/DOWN control 8: Digital Operator (UP and DOWN keys)(balanceless-bumpless switching available) 10: Pattern operation 12: Pulse train input 13: Calculation result 14: RS-485 communication 15: Fieldbus (Reserved)	0	-	-	page 5-27
F02	1st RUN Command Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Operator (Direction of rotation input: terminal block) 1: External signal (Digital input) 2: Operator (Forward rotation) 3: Operator (Reverse rotation) 4: RS-485 communication 5: Fieldbus (Reserved)	2	-	-	page 5-25
F03	1st Maximum Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 5.0 to 590.0 Hz	60.0	-	Hz	page 5-19
F04	1st Base Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 5.0 to 590.0 Hz	50.0	-	Hz	page 5-19
F05	1st Rated Voltage at Base Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	200	-	V	page 5-19

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F06	1st Rated Voltage at Maximum Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	200	-	V	page 5-19
F07	1st Acceleration Time 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Available	s	page 5-39
F08	1st Deceleration Time 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Available	s	page 5-39
F09	1st Manual Torque Boost Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 20.0 % Percentage of 1st Rated Voltage at Base Frequency(F05)	1.9	Available	%	page 5-73
F10	1st Motor Electronic Thermal Characteristic Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor non-ventilated motor or motor with separately powered cooling fan	1	Available	-	page 5-20
F11	1st Motor Electronic Thermal Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 ; 0.01 to 118.8 0.00 : Disable 0.01 to 118.8 A * Setting range from 1%(HHD) to 135%(ND) of the rated inverter current.	21	Available	A	page 5-20
F12	1st Motor Electronic Thermal Time Constant	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.5 to 75.0 min	5	Available	min	page 5-20

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F14	Power Interruption Restart Mode Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Immediately trip(Free run stop) 1: Trip after a recovery from power failure(Free run stop) 2: Trip after decelerate-to-stop 3: Continue to run 4: Restart at the frequency selected by E152 6: Decelerate-to-stop(w/o trip)	1	Available	-	page 7-47
F15	1st Frequency Upper Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	70.00	Available	Hz	page 5-32
F16	1st Frequency Lower Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-32
F18	Input Terminal [AI1, AI2] Bias for 1st Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -100.00 to 100.00 %	0.00	Available	%	page 7-34
F20	1st DC Injection Braking Start Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 Hz	0.0	Available	Hz	page 7-63
F21	1st DC Injection Braking Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100% (HHD mode) 0 to 80% (HND/HD mode) 0 to 60% (ND mode) Based on inverter rated current	0	Available	%	page 7-63
F22	1st DC Injection Braking Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable 0.01 to 30.00 s	0.00	Available	s	page 7-63
F23	1st Starting Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 Hz	0.5	Available	Hz	page 7-110
F24	1st Starting Frequency (Holding time)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 10.00 s	0.00	Available	s	page 7-110

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F25	1st Stop Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 Hz	0.2	Availa-ble	Hz	page 7-110
F26	Carrier Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: 0.75 kHz 1: 1 kHz 2: 2 kHz 3: 3 kHz 4: 4 kHz 5: 5 kHz 6: 6 kHz 7: 7 kHz 8: 8 kHz 9: 9 kHz 10: 10 kHz 11: 11 kHz 12: 12 kHz 13: 13 kHz 14: 14 kHz 15: 15 kHz 16: 16 kHz	2	Availa-ble	kHz	page 7-109
F27	Motor Sound Tone	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Level 0 (Disable) 1: Level 1 2: Level 2 3: Level 3	0	Availa-ble	-	page 7-109
F29	Output Terminal [AO] Mode Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Output in voltage (0 to 10 VDC) 1: Output in current (4 to 20mADC) 2: Output in current (0 to 20mADC) 3: Pulse output	0	Availa-ble	-	page 7-44
F30	Output Terminal [AO] Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	Availa-ble	%	page 7-44

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F31	Output Terminal [AO] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Output frequency1 (before slip compensation) 1: Output frequency2 (after slip compensation) 2: Output current 3: Output voltage 4: Output torque 5: Load ratio 6: Power consumption 7: PID feedback 8: Actual/Estimated speed 9: Main Circuit DC Voltage 10: Communication data AO 13: Motor output 14: Calibration (+) 15: PID command (SV) 16: PID output (MV) 17: Position error in master-follower operation (Bipolar) 18: Heatsink temperature 21: PG feedback value 27: Thermal load ratio 28: Internal Acc/Dec frequency 29: Output torque (Bipolar)	0	Availa-ble	-	page 7-44
F33	Output Terminal [AO] Pulse Rate (PO)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 25 to 32000 p/s Pulse rate at 100% output	1440	Availa-ble	p/s	page 7-44
F37	1st V/f Characteristics Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Variable torque load 1: Constant torque load	1	-	-	page 5-10
F38	1st Overload Early Warning Detection Timer / Low Current detection level (OL, LOC)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Detected/Estimated speed 1: Reference speed	0	-	-	page 7-110
F39	Display Coefficient 1 for Transport Time / Auxiliary Display Coef-ficient 1 for Speed Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 10.00 s	0.00	Availa-ble	s	page 7-110
F40	Torque Limit 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	300	Availa-ble	%	page 6-81

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F41	Torque Limit 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	300	Availa-ble	%	page 6-81
F42	1st Drive Control Se-lection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 16 0 : IM V/f control 1 : IM Dynamic torque vector control 3 : IM V/f control with speed sensor 4 : IM Dynamic torque vector control with speed sensor 5 : IM Vector control without speed sensor 6 : IM Vector control with speed sensor 15 : PM Vector control without speed and pole position sen-sor 16 : PM Vector control with speed and pole position sen-sor	0	-	-	page 5-10 page 6-16 page 6-11 page 6-21
F43	1st Overload Protect Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable at constant speed 2: Enable during ACC/ constant speed operation	2	Availa-ble	-	page 7-81
F44	1st Overload Protect Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 20 to 200% 100% = Rated output current of inverter (Default: 180% for HHD mode and 130% for ND mode)	180	Availa-ble	%	page 7-81
F50	Electronic Thermal for Braking Resistor Dis-charging Capacity	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 9,000 kWs 32,767: Disable	32767	Availa-ble	kWs	page 5-75
F51	Electronic Thermal for Braking Resistor Al-lowable Average Loss	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 99.99 kW	0.001	Availa-ble	kW	page 5-75

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
F52	Braking Resistor Resistance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 999 Ω	0.01	Available	ohm	page 5-75
F58	Output Terminal [AO] Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 5.00 s	0.00	Available	s	page 7-44
F59	Output Terminal [AO] Bias	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -100.0 to 100.0 %	0.0	Available	%	page 7-44
F80	Load Mode Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: HHD 1: HND 3: HD (only for 400 V) 4: ND (only for 400 V)	0	-	-	page 5-12

4-2-2 Parameter E (Terminal Functions)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E01	Input Terminal [DI1] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	0	-	-	page 7-22
E02	Input Terminal [DI2] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	1	-	-	page 7-22
E03	Input Terminal [DI3] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	2	-	-	page 7-22
E04	Input Terminal [DI4] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	7	-	-	page 7-22

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E05	Input Terminal [DI5] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	8	-	-	page 7-22
E10	2nd Acceleration Time 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Availa-ble	s	page 5-39 page 5-43
E11	2nd Deceleration Time 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Availa-ble	s	page 5-39 page 5-43
E12	1st Acceleration Time 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Availa-ble	s	page 5-43
E13	1st Deceleration Time 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Availa-ble	s	page 5-43
E14	2nd Acceleration Time 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Availa-ble	s	page 5-43
E15	2nd Deceleration Time 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000.00 s	6.00	Availa-ble	s	page 5-43
E16	Torque Limit 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	300	Availa-ble	%	page 6-81
E17	Torque Limit 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	300	Availa-ble	%	page 6-81
E20	Output Terminal [DO1] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 241 normally-open output, 1000 to 1241 normally-close output Refer to the manual for the contents of function assign-ment.	0	-	-	page 7-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E21	Output Terminal [DO2] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 241 normally-open output, 1000 to 1241 normally-close output Refer to the manual for the contents of function assignment.	7	-	-	page 7-27
E27	Output Terminal [ROA, ROB] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 241 normally-open output, 1000 to 1241 normally-close output Refer to the manual for the contents of function assignment.	99	-	-	page 7-27
E29	Frequency Arrival 2 ON Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 10.00 s	0.1	Available	s	page 7-87
E30	Frequency Arrival Detection Width (FAR1/FAR2/FAR3/FDT3/FDT4)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 10.0 Hz	2.5	Available	Hz	page 7-87
E31	Frequency Detection Level1 (FDT1/FDT3)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	60.0	Available	Hz	page 7-87
E32	Frequency Detection Hysteresis Width (FDT1/ FDT2)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	1	Available	Hz	page 7-87
E34	Overload early warning 2 Level (OL2)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated inverter current.	21	Available	A	page 5-23 page 7-81
E35	Overload early warning 2 Detection Timer (OL2)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 600.00 s	10	Available	s	page 7-81

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E36	Frequency Detection Level 2 (FDT2/FDT4)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	60.0	Availa-ble	Hz	page 7-87
E37	1st Overload Early Warning Detection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated in-verter current.	21	Availa-ble	A	page 7-81
E38	1st Overload Early Warning Detection Timer / Low Current detection level (OL, LOC)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 600.00 s	10	Availa-ble	s	page 7-81
E39	Display Coefficient 1 for Transport Time / Auxiliary Display Coef-ficient 1 for Speed Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 9999	1	Availa-ble	-	page 7-75
E42	Operator Display Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 5.0 s	0.5	Availa-ble	s	page 3-3

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E43	Operator Display Selection during Run	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Speed monitor (Selectable with E048) 3: Output current 4: Output voltage 8: Calculated torque 9: Input power 10: PID process command 12: PID feedback 13: Timer value 14: PID output 15: Load factor 16: Motor output 17: Analog signal input monitor 21: Current position 22: Position error 23: Torque current (%) 24: Magnetic flux command (%) 25: Input watt-hour 28: Target position 29: PID deviation 30: Torque bias 32: Reserved	0	Available	-	page 7-75
E44	Operator Display when Stopped Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Specified value 1: Output value	0	Available	-	page 7-75
E48	Operator Display Speed Monitor Item Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Output frequency 1 (Before slip compensation) 1: Output frequency 2 (After slip compensation) 2: Reference frequency 3: Motor rotation speed 4: Load rotation speed 5: Feed speed 6: Transport time for specified length 7: Speed (%)	0	Available	-	page 7-75
E49	Torque Command Monitor Polarity Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Torque polarity 1: Plus for driving Minus for braking	1	Available	-	page 6-83

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E50	1st Frequency Conversion Coefficient	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 600.00	30	Available	-	page 6-78 page 7-75
E51	Display Coefficient for Integrated Power	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000: Cancel and reset 0.001 to 9999	0.01	Available	-	page 7-11
E52	Operator Display Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Display favorite parameters and all parameters 1: Display change parameters 2: Display all parameters	2	Available	-	page 5-3
E55	2nd Overload Warning Detection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated inverter current.	21	Available	A	page 7-81
E56	2nd Overload Early Warning Detection Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 600.00 s	10	Available	s	page 7-81
E61	Input Terminal [AI1] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Frequency command 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID command 5: PID feedback 6: Ratio setting 7: Analog torque limiter 9: Torque bias 10: Torque command 11: Torque current command 17: Speed limit for forward rotation 18: Speed limit for reverse rotation 20: Analog signal input monitor 21: PID feed forward	0	-	-	page 6-81

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E62	Input Terminal [AI2] Function Selection （AII）	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Frequency command 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID process command 5: PID feedback value 6: Ratio setting 7: Analog torque limiter 9: Torque bias 10: Torque command 11: Torque current command 17: Speed limit for forward rotation 18: Speed limit for reverse rotation 20: Analog signal input monitor 21: PID feed forward	0	-	-	page 6-81
E63	Input Terminal [AI2] Function Selection （AIV）	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Frequency command 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID command 5: PID feedback 6: Ratio setting 7: Analog torque limiter 9: Torque bias 10: Torque command 11: Torque current command 17: Speed limit for forward rotation 18: Speed limit for reverse rotation 20: Analog signal input (monitor) 21: PID feed forward	0	-	-	page 6-81
E64	Operator Reference Frequency Saving Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Automatic saving (when main power is turned OFF) 1: Saving by Up/Down key and ENTER key	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E65	Reference Loss Detection Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Decelerate to stop 20 to 120 %: Continuous operation frequency ratio 999: Disable	32767	Available	%	page 5-27
E76	Main Circuit DC Voltage Low-voltage Detection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 200 to 400V (200Vseries) 400 to 800V (400Vseries)	235	Available	V	page 7-103
E78	Overtorque/Undertorque Detection Level at Forward Power Running	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	Available	%	page 6-85
E79	Torque detection 1 Detection Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 600.00 s	10	Available	s	page 6-85
E80	Overtorque/Undertorque Detection Level at Reverse Regeneration	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	Available	%	page 6-85
E98	Input Terminal [DI6] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	98	-	-	page 7-22
E99	Input Terminal [DI7] Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 188 normally-open input, 1000 to 1188 normally-close input	99	-	-	page 7-22
E102	2nd RUN Command Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Operator 1: Terminal command FW or RV 2: Operator (Forward direction) 3: Operator (Reverse direction) 4: RS-485 communication 5: Fieldbus (Reserved)	2	-	-	page 5-25

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E103	Acceleration Stop Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable 0.01 to 590.00 Hz	0.0	-	Hz	page 5-42
E104	Acceleration Stop Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 60.0 s	0.00	-	s	page 5-42
E105	Deceleration Stop Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable 0.01 to 590.00 Hz	0.00	-	Hz	page 5-42
E106	Deceleration Stop Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 60.0 s	0.0	-	s	page 5-42
E107	Multi-step Frequency Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Binary (CF1 to CF4) 1: Bit (SF1 to SF7)	0	-	-	page 5-57
E109	2nd Frequency Reference/2nd Multi-step Frequency Reference 0	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.00 Hz	0.00	Available	Hz	page 5-27
E111	Jogging Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Free run stop on jogging stop, disabled in operation 1: Deceleration stop on jogging stop, disabled in operation 2: DC injection braking on jogging stop, disabled in operation 3: Free run stop on jogging stop, enabled in operation 4: Deceleration stop on jogging stop, enabled in operation 5: DC injection braking on jogging stop, enabled in operation	4	-	-	page 5-60
E112	1st Torque Boost Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Manual torque boost 1: Automatic torque boost	1	-	-	page 5-73

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E113	2nd Torque Boost Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Manual torque boost 1: Automatic torque boost	1	-	-	page 5-73
E114	DC Injection Braking Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: External DC injection braking 1: External DC injection braking/setting frequency 2: Setting frequency	0	-	-	page 7-63
E115	External DC Injection Braking Edge/Level Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Edge operation 1: Level operation	1	-	-	page 7-63
E117	2nd Frequency Upper Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz Internal resolution is 0.1 steps.	70.00	-	Hz	page 5-32
E118	2nd Frequency Lower Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz Internal resolution is 0.1 steps.	0.00	-	Hz	page 5-32
E119	PID Control Feedback Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Analog input 2: RS-485 communications 3: Pulse train input	0	-	-	page 7-118
E120	PID Control PID Output Variable Range for Process Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 100.0	0.0	-	%	page 7-118
E121	PID Control PID Feedforward Selection for Process Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Input terminal (AI1, AI2)	0	-	-	page 7-118
E122	1st AVR Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	-	-	page 7-117

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E123	2nd AVR Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	-	-	page 7-117
E124	Energy-saving Operation Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Normal operation 1: Energy-saving operation	0	-	-	page 7-136
E125	1st 2-step Acceleration/ Deceleration switching Condition Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Switching by 2CH terminal 1: Switching by setting 2: Forward and reverse 3: Switching by RT1, RT2 terminals	0	-	-	page 5-43
E126	2nd 2-step Acceleration/Deceleration Switching Condition Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Switching by 2CH terminal 1: Switching by setting 2: Forward and reverse 3: Switching by RT1, RT2 terminals	0	-	-	page 5-43
E127	1st 2-step Acceleration Switching Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	-	Hz	page 5-43
E128	2nd 2-step Acceleration Switching Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	-	Hz	page 5-43
E129	1st 2-step Deceleration Switching Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	-	Hz	page 5-43
E130	2nd 2-step Deceleration Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	-	Hz	page 5-43

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E131	Frequency Calculation Operation Target 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Up/Down keys on Operator 1: Voltage input to terminal [AI1] 2: Current input to terminal [AI2](AII) 3: Voltage input to terminal [AI2](AIV) 5: Pulse train input 6: RS-485 communication 7: Fieldbus (Reserved)	1	-	-	page 7-115
E132	Frequency Calculation Operation Target 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Up/Down keys on Operator 1: Voltage input to terminal [AI1] 2: Current input to terminal [AI2](AII) 3: Voltage input to terminal [AI2](AIV) 5: Pulse train input 6: RS-485 communication 7: Fieldbus (Reserved)	2	-	-	page 7-115
E133	Frequency Calculation Operator Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Addition (E131 + E132) 1: Subtraction (E131 - E132) 2: Multiplication (E131 x E132)	0	-	-	page 7-115
E134	Frequency Addition Amount	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	-	Hz	page 7-116
E135	Frequency Addition Sign Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Frequency command + E134 1: Frequency command - E134	0	-	-	page 7-116
E139	Overvoltage/Overcurrent Restart Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Trip immediately 4: Restart at the frequency selected by E152	0	-	-	page 7-56

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E146	2nd Overload Protect Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable at constant speed 2: Enable during ACC/ constant speed operation	2	Availa-ble	-	page 7-81
E147	2nd Overload Protect Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 20 to 200 % The data is interpreted as the rated output current of the in-verter for 100%.	180	Availa-ble	%	page 7-81
E152	Starting Frequency Selection at Frequen-cy Pull-in Restart	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Frequency at which the power failure occurred 1: Maximum output frequency 2: Reference frequency 3: Starting frequency	3	-	-	page 7-47
E154	RUN Time Over (RNT)/Power ON Time Over (ONT) Detection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	0	-	10 hex	page 7-90
E157	Analog Input [AI1] De-tection Upper Limit Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	100	Availa-ble	%	page 7-100
E158	Analog Input [AI1] De-tection Lower Limit Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	0	Availa-ble	%	page 7-100
E159	Analog Input [AI1] Level Detection Hyste-resis Width	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 10 %	0	Availa-ble	%	page 7-100
E160	Analog Input [AI2] De-tection Upper Limit Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	100	Availa-ble	%	page 7-100
E161	Analog Input [AI2] De-tection Lower Limit Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	0	Availa-ble	%	page 7-100
E162	Analog Input [AI2] Level Detection Hyste-resis Width	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 10 %	0	Availa-ble	%	page 7-100

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E163	Analog Operation Level at [AI1] Disconnection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -100 to 100 % 999: Disable	32767	-	%	page 7-100
E164	Analog Operation Level at [AI2] Disconnection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 % 999: Disable	32767	-	%	page 7-100
E165	Carrier Frequency Automatic Reduction Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	-	-	page 7-110
E166	Non-linear V/f Frequency 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E167	Non-linear V/f Voltage 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10
E168	Non-linear V/f Frequency 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E169	Non-linear V/f Voltage 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10
E170	Non-linear V/f Frequency 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E171	Non-linear V/f Voltage 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E172	Non-linear V/f Frequency 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E173	Non-linear V/f Voltage 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10
E174	Non-linear V/f Frequency 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E175	Non-linear V/f Voltage 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10
E176	Non-linear V/f Frequency 6	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E177	Non-linear V/f Voltage 6	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10
E178	Non-linear V/f Frequency 7	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 0.1 to 590.0 Hz	0.0	-	Hz	page 5-10
E179	Non-linear V/f Voltage 7	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series)	0	-	V	page 5-10

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
E181	Acceleration Wait Time on Brake Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.000	-	s	page 6-76
E184	Low Current Detection Condition Selection (LOC)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Output during acceleration/ deceleration and constant-speed operation 1: Output only during constant-speed operation	1	-	-	page 7-99
E185	Overload Warning Detection Condition Selection (OL1, OL2)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Output during acceleration/ deceleration and constant-speed operation 1: Output only during constant-speed operation	1	-	-	page 7-81
E196	Overtorque/Undertorque Detection Level Reverse Power Running	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	-	%	page 6-85
E197	Overtorquee/Undertorque Detection Level Forward Regeneration	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	-	%	page 6-85
E198	Overtorque/Undertorque Detection Condition Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Output during acceleration/ deceleration and constant-speed operation 1: Output only during constant-speed operation	0	-	-	page 6-85
E199	0Hz Detection Output Detection Level (ZS)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 Hz	0	-	Hz	page 5-71

4-2-3 Parameter C (Frequency Reference and Analog Input Functions)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C01	Jump Frequency 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	0.0	Available	Hz	page 7-113

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C02	Jump Frequency 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	0.0	Available	Hz	page 7-113
C03	Jump Frequency 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	0.0	Available	Hz	page 7-113
C04	Jump Frequency Skip Width	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 30.0 Hz	3.0	Available	Hz	page 7-113
C05	Multi-step Frequency Reference 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C06	Multi-step Frequency Reference 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C07	Multi-step Frequency Reference 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C08	Multi-step Frequency Reference 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C09	Multi-step Frequency Reference 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C10	Multi-step Frequency Reference 6	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C11	Multi-step Frequency Reference 7	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C12	Multi-step Frequency Reference 8	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57
C13	Multi-step Frequency Reference 9	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Available	Hz	page 5-57

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C14	Multi-step Frequency Reference 10	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-57
C15	Multi-step Frequency Reference 11	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-57
C16	Multi-step Frequency Reference 12	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-57
C17	Multi-step Frequency Reference 13	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-57
C18	Multi-step Frequency Reference 14	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-57
C19	Multi-step Frequency Reference 15	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-57
C20	Jogging Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 590.00 Hz	0.00	Availa-ble	Hz	page 5-60
C21	Pattern Operation / Timed Operation Mode Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: 1 cycle operation (Pattern operation) 1: Repetition operation (Pat-tern operation) 2: Constant speed operation (Pattern operation) after 1 cy-cle operation 3: Timed operation	0	-	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C22	Pattern Operation Stage 1 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C23	Pattern Operation Stage 2 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14:Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C24	Pattern Operation Stage 3 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Availa-ble	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C25	Pattern Operation Stage 4 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C26	Pattern Operation Stage 5 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Availa-ble	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C27	Pattern Operation Stage 6 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C28	Pattern Operation Stage 7 Operation Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/ Deceleration time selection 0: 1st Acceleration Time 1(F007)/1st Deceleration Time 1(F008) 1: 2nd Acceleration Time 1(E010)/2nd Deceleration Time 1(E011) 2: 1st Acceleration Time 2(E012)/1st Deceleration Time 2(E013) 3: 2nd Acceleration Time 2(E014)/2nd Deceleration Time 2(E015) Bit 11 to 10: Minimum unit of operation time 0: 0.01 1: 0.1 2: 1 3: 10 Bit 9 to 0: Data part of operation time 0000 to 03E7 hex (0.00 to 9.99) if Minimum unit is 0: 0.01 0064 to 03E7 hex (10.0 to 99.9) if Minimum unit is 1: 0.1*1 0064 to 03E7 hex (100 to 999) if Minimum unit is 2: 1*1 0064 to 0258 hex (1,000 to 6,000) if Minimum unit is 3: 10*2 *1. 0000 to 0063 hex and 03E8 to 03FF hex cannot be set. *2. 0000 to 0063 hex and 0259 to 03FF hex cannot be set.	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C30	2nd Frequency Reference Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Operator (Up/Down keys) (balancelessbumpless switching unavailable) 1: Analog voltage input (terminal AI1) 2: Analog current input (terminalAI2 (AII)) 3: Analog voltage input (terminal AI1) + analog current input (terminal AI2 (AII)) 5: Analog voltage input (terminal AI2 (AIV)) 7: UP/DWN control 8: Operator (UP and DOWN keys) (balancelessbumpless switching available) 10: Pattern operation/ timed operation 12: Pulse train input 13: Calculation result 14: RS-485 communication 15: Fieldbus (Reserved)	2	-	-	page 5-27
C31	Input Terminal [AI1] Offset	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -5.0 to 5.0 %	0.0	Available	%	page 7-34 page 7-118
C32	Input Terminal [AI1] Gain（Command）	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 400.00 %	100.00	Available	%	page 7-34 page 7-118
C33	Input Terminal [AI1] Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 5.00 s	0.05	Available	s	page 7-118
C34	Input Terminal [AI1] Gain (Analog Input)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	100.00	Available	%	page 7-34 page 7-118
C35	Input Terminal [AI1] Polarity Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Bipolar 1: Unipolar	1	-	-	page 7-34 page 7-118
C36	Input Terminal [AI2] Offset （AII）	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -5.0 to 5.0 %	0.0	Available	%	page 7-34 page 7-118

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C37	Input Terminal [AI2] Gain （AII Command）	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 400.00 %	100.00	Available	%	page 7-34 page 7-118
C38	Input Terminal [AI2] Filter (AII)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 5.00 s	0.05	Available	s	page 7-118
C39	Input Terminal [AI2] Gain (AII Analog Input)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	100.00	Available	%	page 7-34 page 7-118
C40	Input Terminal [AI2] Operation Selection (AII)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: 4 to 20mA Unipolar 1: 0 to 20mA Unipolar 10: 4 to 20mA Bipolar 11: 0 to 20mA Bipolar	0	-	-	page 7-34 page 7-118
C41	Input Terminal [AI2] Offset （AIV）	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -5.0 to 5.0 %	0.0	Available	%	page 7-34 page 7-118
C42	Input Terminal [AI2] Gain (AIV Command)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 400.00 %	100.00	Available	%	page 7-34 page 7-118
C43	Input Terminal [AI2] Filter (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 5.00 s	0.05	Available	s	page 7-118
C44	Input Terminal [AI2] Gain (AIV Analog Input)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	100.00	Available	%	page 7-34 page 7-118
C45	Input Terminal [AI2] Polarity Selection (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Bipolar 1: Unipolar	1	-	-	page 7-34 page 7-118
C50	Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	0.00	Available	%	page 7-34
C53	Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Normal 1: Inverse	0	Available	-	page 7-41

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C54	Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Normal 1: Inverse	0	Available	-	page 7-41
C55	Input Terminal [AI1] Bias (Command)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -200.00 to 200.00 %	0.00	Available	%	page 7-34 page 7-118
C56	Input Terminal [AI1] Bias (Analog Input)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	0.00	Available	%	page 7-34
C58	Do not use	-	-	-	-	-
C59	Input Terminal [AI1] Analog Input Adjustment Maximum Scale	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9,990.00	100	-	-	page 7-118
C60	Input Terminal [AI1] Analog Input Adjustment Minimum Scale	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9,990.00	0	-	-	page 7-34 page 7-118
C61	Input Terminal [AI2] Bias (AII Command)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -200.00 to 200.00 %	0.00	Available	%	page 7-34 page 7-118
C62	Input Terminal [AI2] Bias (AII Analog Input)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	0.00	Available	%	page 7-34
C64	Do not use	-	-	-	-	-
C65	Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AII)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	100	-	-	page 7-118
C66	Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AII)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	-	-	page 7-118
C67	Input Terminal [AI2] Bias (AIV Command)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -200.00 to 200.00 %	0.00	Available	%	page 7-34 page 7-118
C68	Input Terminal [AI2] Bias (AIV Analog Input)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	0.00	Available	%	page 7-34 page 7-118
C70	Do not use	-	-	-	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
C71	Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	100	-	-	page 7-118
C72	Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AIV)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	-	-	page 7-118
C89	Set-point Factor Numerator via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	1	Available	-	page 8-166
C90	Set-point Factor Denominator via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	1	Available	-	page 8-166
C99	1st Frequency Reference/1st Multi-step Frequency Reference 0	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.00 Hz	0.00	Available	Hz	page 5-27

4-2-4 Parameter P (Motor 1 Parameter)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
P01	1st Motor Pole Number	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 2 to 128 poles	4	-	Pole	page 5-19 page 6-4
P02	1st Motor Capacity	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 1000 kW	5.50	-	kW	page 5-19 page 6-4
P03	1st Motor Rated Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0 A	21	-	A	page 6-4

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
P04	1st Auto Tuning Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Tune the motor parameters while stopped 2: Tune the motor parameters while rotating 4: Tune the PM motor magnetic pole position offset while rotating 5: Tune the motor %R1 and %X while stopped	0	-	-	page 6-65
P05	1st Online Tuning Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	0	Available	-	page 6-71
P06	1st Motor Armature Resistance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0 A	10.55	-	A	page 6-6
P07	1st Motor Parameter %R1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 50.00 %	3.17	Available	%	page 6-65
P08	1st Motor Parameter %X	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 50.00 %	11.47	Available	%	page 6-65
P09	1st Slip Compensation Gain for Driving	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 200.0 %	100.0	Available	%	page 5-16
P10	1st Slip Compensation Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 10.00 s	0.12	Available	s	page 5-16
P11	1st Slip Compensation Gain for Braking	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 200.0 %	100.0	Available	%	page 5-16
P12	1st Rated Slip Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 15.00 Hz	1	-	Hz	page 5-16
P13	1st Iron Loss Factor 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 20.00 %	2.86	Available	%	page 6-6

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
P16	1st Magnetic Saturation Factor 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	92	Available	%	page 6-65
P17	1st Magnetic Saturation Factor 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	84.2	Available	%	page 6-65
P18	1st Magnetic Saturation Factor 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	70.5	Available	%	page 6-65
P19	1st Magnetic Saturation Factor 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	58.3	Available	%	page 6-65
P20	1st Magnetic Saturation Factor 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	46.1	Available	%	page 6-65
P30	1st PM Motor Starting Method	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Pull-in by current 1: IPM motor type 1 2: SPM motor type 3: Pull-in by current for IPM motor 4: IPM motor type 2	1	-	-	page 6-6 page 6-22
P40	Do not use	-	-	-	-	-
P41	Do not use	-	-	-	-	-
P53	1st Motor %X Correction Factor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	Available	%	page 6-65
P55	1st Motor Torque Current under Vector Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0 A	16.71	-	A	page 6-6
P56	1st Induced Voltage Factor under Vector Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 50 to 100 %	95	-	%	page 6-6
P57	Do not use	-	-	-	-	-
P60	1st PM Motor Armature Resistance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 50.00 ohm	0.253	-	ohm	page 6-65

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
P61	1st PM Motor d-axis Inductance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0mH	4.77	-	mH	page 6-65 page 6-22
P62	1st PM Motor q-axis Inductance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0mH	10.70	-	mH	page 6-65 page 6-22
P63	1st PM Motor Induced Voltage Ke	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 240 V (200 V class series) 0 to 500 V: (400 V class series) Voltage at rated speed	177	-	V	page 6-6
P64	1st PM Motor Iron Loss	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 20.0% 100% = Motor rated current Iron loss at rated speed	5.50	Available	%	page 6-6
P65	1st PM Motor d-axis Inductance Magnetic Saturation Correction	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0% 999: Factory default 100.0% = No magnetic saturation	32767	Available	%	page 6-6
P74	1st PM Motor Reference Current at Starting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 10 to 200% 100% = Motor rated current	80	Available	%	page 6-6 page 6-22
P83	Do not use	-	-	-	-	-
P84	Do not use	-	-	-	-	-
P85	1st PM Motor Flux Limitation Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 50.0 to 150.0% 999: Factory default	32767	Available	%	page 6-6
P86	Do not use	-	-	-	-	-
P87	1st PM Motor Reference Current for Magnetic Pole Detection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 200% Based on the rated current of the motor	60	-	%	page 6-6
P88	Do not use	-	-	-	-	-
P89	Do not use	-	-	-	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
P90	1st PM Motor Overcurrent Protection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 ; 0.01 to 500.0 0.00 : Disable 0.01 to 500.0 A	50.00	-	A	page 6-22
P95	1st PM Motor Magnetic Pole position Offset	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 359.9° 999: Offset not adjusted	32767	Available	deg	page 6-65

4-2-5 Parameter H (High Level Functions)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H03	Data Initialization	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Initialize all parameters 2: Initialize motor 1 parameters 3: Initialize motor 2 parameters 4: Restore user defined data 5: Initialize all parameters (except I/O and communications) 6: Reserved 7: Clear alarm history 8: Clear selection of favorite function code	0	-	-	page 5-4
H04	Retry Count at Trip	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1 to 20: Number of retries	0	Available	-	page 7-56
H05	Retry Standby Time at Trip	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.5 to 20.0 s	5	Available	s	page 7-56
H06	Cooling Fan Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Always Fan ON 1: ON/OFF control effective	0	Available	-	page 7-96

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H07	Acceleration/Deceleration Pattern Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (Linear acceleration/deceleration) 1: S-curve acceleration/deceleration (Weak) 2: S-curve acceleration/deceleration (Arbitrary: According to H057 to H060) 3: Curve acceleration/deceleration	0	Available	-	page 5-40
H08	Reverse Rotation Prevention Function	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Reverse rotation inhibited 2: Forward rotation inhibited	0	-	-	page 7-114
H09	Starting Mode Auto Search Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable only at restart after momentary power failure 2: Enable at normal start and restart after momentary power failure	0	-	-	page 7-47
H11	Stop Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Normal deceleration 1: Free run stop	0	Available	-	page 5-47
H12	Instantaneous Overcurrent Limiting Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	Available	-	page 7-85
H13	Power Interruption Restart Wait Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 100.0 s	0.5	Available	s	page 7-47
H14	Deceleration Setting During Current Limit for Restart Mode after Power Interruption	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Selected deceleration time 0.01 to 100.00 Hz/s 999: According to current limiter	32767	Available	Hz/s	page 7-47

4-2 List of Parameters by Group

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4-2-5 Parameter H (High Level Functions)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H15	Continuous Running Voltage Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 200 to 300 V (200 V class series) 400 to 600 V (400 V class series)	235	Available	V	page 7-47
H16	Allowable Time for Power Interruption Restart	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 30.0 s 999: Auto judgment	32767	Available	s	page 7-47
H18	Torque Control Operate Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (Speed control) 2: Torque current command input 3: Torque command input	0	-	-	page 6-31
H26	Thermistor Function Selection (MOH)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: PTC (Inverter immediately trips with OH4 displayed) 2: PTC (Inverter issues output signal MOH and continues to run)	0	Available	-	page 7-86
H27	1st Thermistor Error Detection Level (MOH)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 5.00 V	1.60	Available	V	page 7-86
H28	Droop Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -60.0 to 0.0 Hz	0	Available	Hz	page 7-145
H42	Main Circuit Capacitor Service Life Coefficient (Measurement Value)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Start measurement 1: Measurement failure 2 to 65535: Measurement value	0	Available	-	page 7-94
H43	Cumulative Run Time of Cooling Fan	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9,999 (in 10 hours)	0	Available	10 hex	page 7-97
H44	1st Startup Count for Motor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	Available	-	page 7-91

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H45	Mock Alarm	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable (Generate mock alarm)	0	Available	-	page 3-3
H46	Auto Search Delay Time 2 for Starting Mode	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 100.0 s	1.0	Available	s	page 7-47
H47	Main Circuit Capacitor Service Life Coefficient (Initial Value)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Start measurement 1: Measurement failure 2 to 65535: Measurement value	0	Available	-	page 7-94
H48	Cumulative Run Time of Capacitors on Printed Circuit Boards	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9,999 (in 10 hours)	0	Available	10 hex	page 7-97
H49	Auto Search Delay Time 1 for Starting Characteristic	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 10.0 s	0	Available	s	page 7-47
H54	Jogging Acceleration Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000 s	6.00	Available	s	page 5-60
H55	Jogging Deceleration Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000 s	6.00	Available	s	page 5-60
H56	Deceleration Time for Forced Stop	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000 s	6.00	Available	s	page 7-148
H57	S-curve Acceleration Range Frequency at Starting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	10	Available	%	page 5-40
H58	S-curve Acceleration Range Frequency at End	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	10	Available	%	page 5-40
H59	S-curve Deceleration Range Frequency at Starting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	10	Available	%	page 5-40

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H60	S-curve Deceleration Range Frequency at End	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100 %	10	Availa-ble	%	page 5-40
H61	UP/DOWN Control Ini-tial Value Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: 0.00Hz 1: Last UP/DOWN command value	1	-	-	page 7-116
H63	Frequency Lower Limit Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Frequency Command is the Frequency Lower Limit. 1: Frequency Command is 0Hz	0	Availa-ble	-	page 5-32
H64	Low Frequency during Protecting Overload	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Depends on Frequency Lower Limit(F16) 0.1 to 590.0 Hz	1.6	Availa-ble	Hz	page 7-81
H67	Auto Energy Saving Operation Condition Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Enable only at constant speed 1: Enable in all modes	0	Availa-ble	-	page 7-136
H68	1st Slip Compensation Operating Conditions Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Enable during acceleration/ deceleration, enable at base frequency or higher 1: Disable during acceleration/ deceleration, enable at base frequency or higher 2: Enable during acceleration/ deceleration, disable at base frequency or higher 3: Disable during acceleration/ deceleration, disable at base frequency or higher	0	-	-	page 5-16

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H69	Anti-regenerative Control Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 2: Torque limit control with forced stop after three times deceleration time has passed 3: Main Circuit DC Voltage control with forced stop after three times deceleration time has passed 4: Torque limit control without forced stop 5: Main Circuit DC Voltage control without force-to-stop	0	Available	-	page 7-84
H70	Overload Prevention Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Depend on selected deceleration time 0.01 to 100.00 Hz/s 999: Cancel	32767	Available	Hz/s	page 7-81
H71	Over-Excitation Control Selection during Deceleration Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	0	Available	-	page 7-117
H72	Do not use	-	-	-	-	-
H74	Torque Limit Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Torque limit 1: Torque current limit	1	-	-	page 6-81
H75	Torque Limit Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Four quadrants independent 1: Four quadrants identical	0	-	-	page 6-81
H76	Frequency Rising Limit for Torque Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	5	Available	Hz	page 6-81
H77	Service Life of Main Circuit Capacitor Remaining Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 8760 (in 10 hours)	8760	Available	10 hex	page 7-94
H78	1st Motor Maintenance Interval	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1 to 9999 (in 10 hours)	8760	Available	10 hex	page 7-91

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H79	1st Preset Startup Count for Motor Maintenance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1 to 65,535	0	Available	-	page 7-91
H80	1st Output Current Fluctuation Damping Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 1.00	0.20	Available	-	page 7-139
H81	Light Alarm Selection 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	Available	-	page 7-104
H82	Light Alarm Selection 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	Available	-	page 7-104
H84	Pre-excitation Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 100 to 400 %	100	Available	%	page 7-146
H85	Pre-excitation Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable 0.01 to 30.00 s	0.00	Available	s	page 7-146
H86	Do not use	-	-	-	-	-
H89	Motor Electronic Thermal Overload Protection Data Retention	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	Available	-	page 5-20
H90	Do not use	-	-	-	-	-
H91	Current Input Wire Break Detection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable alarm detection 0.1 to 60.0 s: Issue alarm after set time	0	Available	s	page 7-118
H92	Continuous Running at the Momentary Power Failure P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 10.000 999: Auto	32767	Available	-	page 7-47
H93	Continuous Running at the Momentary Power Failure Integral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.010 to 10.000 s 999: Auto	32767	Available	s	page 7-47

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H94	1st Cumulative Motor Run Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9,999 (in 10 hours)	0	-	10 hex	page 7-91
H95	DC Injection Braking Start Characteristic Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Slow response 1: Quick response	1	Availa-ble	-	page 7-63
H96	STOP Key Priority/ Start Check Function	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable STOP key priority, disable start check function 1: Enable STOP key priority, disable start check function 2: Disable STOP key priority, enable start check function 3: Enable STOP key priority, enable start check function	0	Availa-ble	-	page 7-79
H98	Protection/Mainte-nance Function Mode Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit7: Reserved Bit6: Braking transistor error detection 0: Disable 1: Enable Bit5: Detect charge register overheat 0: Enable 1: Disable Bit4: Judge main circuit capac-itor life 0: Disable 1: Enable Bit3: Main circuit capacitor life judgment selection 0: Factory default standard 1: User measurement value standard Bit0 to 2: Reserved	80	Availa-ble	-	page 7-154
H99	Password 2 Setting/ Verification	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	Availa-ble	-	page 7-76
H114	Anti-regenerative Con-trol Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 50.0 % 999: Auto	32767	Availa-ble	%	page 7-84
H130	Do not use	-	-	-	-	-

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H131	Do not use	-	-	-	-	-
H133	Do not use	-	-	-	-	-
H134	Do not use	-	-	-	-	-
H147	Speed Control Jogging Feed Forward Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 s	0	Available	s	page 5-60
H154	Torque Bias Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Invalid 1: Operator (H155 to H157) 2: Analog input 4: RS-485 communication 5: Fieldbus (Reserved)	0	-	-	page 6-33
H155	Torque Bias Level 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -300 to +300 %	0	Available	%	page 6-33
H156	Torque Bias Level 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -300 to +300 %	0	Available	%	page 6-33
H157	Torque Bias Level 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -300 to +300 %	0	Available	%	page 6-33
H158	Torque Bias Mechanical Loss Compensation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	0	Available	%	page 6-33
H159	Torque Bias Startup Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 1.00 s	0	-	s	page 6-33
H161	Torque Bias Shutdown Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 1.00 s	0	-	s	page 6-33
H162	Torque Bias Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	200	-	%	page 6-33
H173	Magnetic Flux Level at Light Load	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 10 to 100%	100	Available	%	page 7-146
H180	Brake Error Detection Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 10.00 s	1.00	Available	s	page 6-76

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H185	Do not use	-	-	-	-	-
H193	User Preference Dataset Registration	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Store	0	-	-	page 5-4
H194	User Preference Dataset Protection Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unprotected 1: Protected	0	Available	-	page 5-4
H195	DC Injection Braking Startup Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable 0.01 to 30.00 s Only motor 1 is effective	0	Available	s	page 7-63
H196	Do not use	-	-	-	-	-
H197	User password 1 Mode selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Display all, but prevent changes 1: Display and allow changes in quick-setup only 2: Do not use	0	Available	-	page 7-76
H198	User Password 1 Setting/Verification	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0	Available	-	page 7-76
H199	User Password 1 Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Protected	0	Available	-	page 7-76
H303	Co-Inverter Communication Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable 2: Enable (administrator)	0	-	-	page 8-28
H304	Co-inverter Communication Starting Station Number (Administrator)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 8 Need to be set in administrator(H303=2)	1	-	-	page 8-28

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H305	Co-inverter Communication Ending Station Number (Administrator)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 8 Need to be set in administrator(H303=2)	1	-	-	page 8-28
H306	Co-inverter Communication Start Selection (Administrator)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Input terminal[DI1] to [DI8] Co-inverter communication start (485) 1: Always ON Need to be set in administrator(H303=2)	0	-	-	page 8-28
H309	Output Terminal [DO1] ON Delay Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 s	0.00	-	s	page 5-67
H310	Output Terminal[DO1] OFF Delay Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 s	0.00	-	s	page 5-67
H311	Output Terminal[DO2] ON Delay Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 s	0.00	-	s	page 5-67
H312	Output Terminal[DO2] OFF Delay Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 s	0.00	-	s	page 5-67
H313	Output Terminal [ROA, ROB] ON Delay Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 s	0.00	-	s	page 5-67
H314	Output Terminal [ROA, ROB] OFF Delay Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 s	0.00	-	s	page 5-67
H315	Logical Expression 1 Operation Target 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Refer to other sheet 27,100,206,207,208 Can't be selected	0	-	-	page 7-92
H316	Logical Expression 1 Operation Target 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Refer to other sheet 27,100,206,207,208 Can't be selected	0	-	-	page 7-92

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H317	Logical Expression 1 Logical Operator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: AND 1: OR 2: XOR	0	-	-	page 7-92
H318	Logical Expression 2 Operation Target 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Refer to other sheet 27,100,206,207,208 Can't be selected	0	-	-	page 7-92
H319	Logical Expression 2 Operation Target 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Refer to other sheet 27,100,206,207,208 Can't be selected	0	-	-	page 7-92
H320	Logical Expression 2 Logical Operator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: AND 1: OR 2: XOR	0	-	-	page 7-92
H321	Logical Expression 3 Operation Target 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Refer to other sheet 27,100,206,207,208 Can't be selected	0	-	-	page 7-92
H322	Logical Expression 3 Operation Target 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Refer to other sheet 27,100,206,207,208 Can't be selected	0	-	-	page 7-92
H323	Logical Expression 3 Logical Operator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: AND 1: OR 2: XOR	0	-	-	page 7-92
H324	Input Terminal [DI1] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51
H325	Input Terminal [DI2] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H326	Input Terminal [DI3] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51
H327	Input Terminal [DI4] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51
H328	Input Terminal [DI5] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51
H329	Input Terminal [DI6] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51
H330	Input Terminal [DI7] Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 400 ms	1	-	ms	page 5-51
H332	Torque Reference Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Analog input 2: Operator (H333) 4: RS-485 communication 5: Fieldbus (Reserved)	0	-	-	page 6-31
H333	Torque Reference	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 200 %	0	Available	%	page 6-31
H334	Torque Bias Polarity Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: As signed 1: Depend on run direction	0	-	-	page 6-33
H339	Number of Sent Data of All Stations in Co-inverter Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 5	5	Available	-	page 8-28
H340	Recipient Station Number of All Stations in Co-inverter Communication 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 247	1	Available	-	page 8-28
H341	Recipient Register of All Stations in Co-inverter Communication 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H342	Sender Register of All Stations in Co-inverter Communication 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H343	Recipient Station Number of All Stations in Co-inverter Communication 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 247	2	Available	-	page 8-28
H344	Recipient Register of All Stations in Co-inverter Communication 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H345	Sender Register of All Stations in Co-inverter Communication 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H346	Recipient Station Number of All Stations in Co-inverter Communication 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 247	3	Available	-	page 8-28
H347	Recipient Register of All Stations in Co-inverter Communication 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H348	Sender Register of All Stations in Co-inverter Communication 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H349	Recipient Station Number of All Stations in Co-inverter Communication 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 247	4	Available	-	page 8-28
H350	Recipient Register of All Stations in Co-inverter Communication 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H351	Sender Register of All Stations in Co-inverter Communication 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28
H352	Recipient Station Number of All Stations in Co-inverter Communication 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 247	5	Available	-	page 8-28
H353	Recipient Register of All Stations in Co-inverter Communication 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Available	-	page 8-28

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H354	Sender Register of All Stations in Co-inverter Communication 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	Availa-ble	-	page 8-28
H355	Modbus Mapping Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Standard 1: Free mapping	0	-	-	page 8-23
H356	Modbus Mapping 1 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H357	Modbus Mapping 2 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H358	Modbus Mapping 3 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H359	Modbus Mapping 4 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H360	Modbus Mapping 5 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H361	Modbus Mapping 6 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H362	Modbus Mapping 7 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H363	Modbus Mapping 8 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H364	Modbus Mapping 9 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H365	Modbus Mapping 10 External Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H366	Modbus Mapping 1 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H367	Modbus Mapping 2 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H368	Modbus Mapping 3 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H369	Modbus Mapping 4 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H370	Modbus Mapping 5 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H371	Modbus Mapping 6 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H372	Modbus Mapping 7 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H373	Modbus Mapping 8 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H374	Modbus Mapping 9 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23
H375	Modbus Mapping 10 External Register Sign	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Unsigned 1: Signed	0	-	-	page 8-23

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H376	Modbus Mapping 1 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H377	Modbus Mapping 2 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H378	Modbus Mapping 3 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H379	Modbus Mapping 4 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H380	Modbus Mapping 5 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H381	Modbus Mapping 6 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H382	Modbus Mapping 7 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H383	Modbus Mapping 8 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H384	Modbus Mapping 9 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H385	Modbus Mapping 10 Scaling	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 65.53	1.000	-	-	page 8-23
H386	Modbus Mapping 1 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H387	Modbus Mapping 2 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H388	Modbus Mapping 3 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H389	Modbus Mapping 4 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H390	Modbus Mapping 5 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H391	Modbus Mapping 6 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H392	Modbus Mapping 7 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H393	Modbus Mapping 8 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H394	Modbus Mapping 9 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H395	Modbus Mapping 10 Internal Register	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0000 to FFFF Hex	0000 hex	-	-	page 8-23
H396	Modbus Mapping Endian Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Big endian 1: Little endian 2: Special endian	0	-	-	page 8-23
H411	Input Phase Loss Protection Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (Continue to run) 1: Enable (Trip)	1	Available	-	page 7-107
H412	Output Phase Loss Protection Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (Continue to run) 1: Enable (Trip)	0	Available	-	page 7-107

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H435	Touch Probe 1 Source	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: External Latch Input 1 (EXT1) 2: External Latch Input 2 (EXT2) 6: Phase Z	1	-	-	page 6-62
H436	Touch Probe 2 Source	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: External Latch Input 1 (EXT1) 2: External Latch Input 2 (EXT2) 6:Phase Z	2	-	-	page 6-62
H437	Touch Probe Function	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15 to 13: Fixed to 0 Bit12: Latch operation 2 0: Disable 1: Enable Bit11 to 10: Latch trigger 2 00: EXT2 01: Phase Z 10: H435/H436 (60D0 Hex) 11: Reserved (No-trigger) Bit9: Latch mode 2 0: Trigger First Event Mode 1: Continuous Mode Bit8: Latch function 2 0: Disable 1: Enable Bit7 to 5: Fixed to 0 Bit4: Latch operation 1 0: Disable 1: Enable Bit3 to 2: Latch trigger 1 00: EXT1 01: Phase Z 10: H435/H436 (60D0 Hex) 11: Reserved (No-trigger) Bit1: Latch mode 1 0: Trigger First Event Mode 1: Continuous Mode) Bit0: Latch function 1 0: Disable 1: Enable	0	Availa-ble	-	page 6-62

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
H438	Feedback Value Comparison Signal Off Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0%	100.0	-	%	page 7-118
H439	Feedback Value Comparison Signal On Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0%	0.0	-	%	page 7-118
H440	Free Run Stop Restart Allowable Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 30.0 s	30.0	-	s	page 7-59
H441	Free Run Stop Restart Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: Starting with matching frequency 2: Starting with active matching frequency	2	-	-	page 7-59
H442	Slip compensation Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	0	Available	-	page 5-16

4-2-6 Parameter A (Motor 2 Parameter)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A01	2nd Maximum Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 5.0 to 590.0 Hz	60.0	-	Hz	page 5-19
A02	2nd Base Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 5.0 to 590.0 Hz	50.0	-	Hz	page 5-19
A03	2nd Rated Voltage at Base Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	200	-	V	page 5-19

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A04	2nd Rated Voltage at Maximum Output Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	200	-	V	page 5-19
A05	2nd Manual Torque Boost Voltage	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 20.0 % Percentage with respect to 2nd rated voltage at base frequency (A003)	1.9	Available	%	page 5-73
A06	2nd Motor Electronic Thermal Characteristic selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor non-ventilated motor or motor with separately powered cooling fan	1	Available	-	page 5-20
A07	2nd Motor Electronic Thermal Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 ; 0.01 to 118.8 0.00 : Disable 0.01 to 118.8 A * Setting range from 1%(HHD) to 135%(ND) of the rated inverter current.	21	Available	A	page 5-20
A08	2nd Motor Electronic Thermal Time Constant	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.5 to 75.0 min	5	Available	min	page 5-20
A09	2nd DC Injection Braking Start Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 Hz	0.0	Available	Hz	page 7-63
A10	2nd DC Injection Braking Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 100% (HHD mode) 0 to 80% (HND/HD mode) 0 to 60% (ND mode) Based on inverter rated current	0	Available	%	page 7-63

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A11	2nd DC Injection Braking Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable 0.01 to 30.00 s	0.00	Available	s	page 7-63
A12	2nd Starting Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 Hz	0.5	Available	Hz	page 7-110
A13	2nd V/f Characteristics Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Variable torque load 1: Constant torque load	1	-	-	page 5-10
A14	2nd Drive Control Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: IM V/f control 1: IM Dynamic torque vector control without speed sensor 3: IM V/f control with speed sensor 4: IM Dynamic torque vector control with speed sensor 5: IM Vector control without speed sensor 6: IM Vector control with speed sensor	0	-	-	page 5-10 page 6-16 page 6-11 page 6-21
A15	2nd Motor Pole Number	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 2 to 128 poles	4	-	Pole	page 5-19
A16	2nd Motor Capacity	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 1000 kW	5.50	-	kW	page 5-19
A17	2nd Motor Rated Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 2000 A	21	-	A	page 6-4
A18	2nd Auto-tuning Selection Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Tune the motor parameters while stopped 2: Tune the motor parameters while rotating 5: Tune the motor %R1 and %X while stopped	0	-	-	page 6-65

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A19	2nd Online tuning Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	0	Availa-ble	-	page 6-71
A20	2nd Motor Armature Resistance	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0 A	10.55	-	A	page 6-6
A21	2nd Motor Motor Con-stant %R1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 50.00 %	3.17	Availa-ble	%	page 6-65
A22	2nd Motor Motor Con-stant %X	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 50.00 %	11.47	Availa-ble	%	page 6-65
A23	2nd Slip Compensa-tion Gain for Driving	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 200.0 %	100.0	Availa-ble	%	page 5-16
A24	2nd Slip Compensa-tion Response Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.01 to 10.00 s	0.12	Availa-ble	s	page 5-16
A25	2nd Slip Compensa-tion Gain for Braking	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 200.0 %	100.0	Availa-ble	%	page 5-16
A26	2nd Rated Slip Fre-quency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 15.00 Hz	1	-	Hz	page 5-16
A27	2nd Iron Loss Factor 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 20.00 %	2.86	Availa-ble	%	page 6-6
A30	2nd Magnetic Satura-tion Factor 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	92	Availa-ble	%	page 6-65
A31	2nd Magnetic Satura-tion Factor 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	84.2	Availa-ble	%	page 6-65
A32	2nd Magnetic Satura-tion Factor 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	70.5	Availa-ble	%	page 6-65

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A33	2nd Magnetic Saturation Factor 4	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	58.3	Available	%	page 6-65
A34	2nd Magnetic Saturation Factor 5	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 300.0 %	46.1	Available	%	page 6-65
A40	2nd Slip Compensation Operating Conditions Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Enable during acceleration/ deceleration, enable at base frequency or higher 1: Disable during acceleration/ deceleration, enable at base frequency or higher 2: Enable during acceleration/ deceleration, disable at base frequency or higher 3: Disable during acceleration/ deceleration, disable at base frequency or higher	0	-	-	page 5-16
A41	2nd Output Current Fluctuation Damping Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 1.00	0.20	Available	-	page 7-139
A43	Speed Control 2 Speed Command Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.02	Available	s	page 6-26
A44	Speed Control 2 Speed Detection Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.005	Available	s	page 6-26
A45	Speed Control 2 P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 200.0	10	Available	-	page 6-26
A46	Speed Control 2 I Integral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 9.999 s 999: Cancel integral term	0.1	Available	s	page 6-26
A47	Speed Control 2 FF Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 s	0	Available	s	page 6-26

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A48	Speed Control 2 Output Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.002	Available	s	page 6-26
A49	Speed Control 2 Notch Filter Resonance Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 500 Hz	200	Available	Hz	page 6-26
A50	Speed Control 2 Notch Filter Attenuation Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 40 dB	0	Available	dB	page 6-26
A51	2nd Cumulative Motor Run Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9,999 (in 10 hours)	0	-	10 hex	page 7-91
A52	2nd Startup Counter for Motor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 65,535	0	Available	-	page 7-91
A53	2nd Motor 2 %X Correction Factor 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 300 %	100	Available	%	page 6-65
A55	Torque Current for 2nd Vector Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 500.0 A	16.71	-	A	page 6-6
A56	Induced Voltage Factor for 2nd Vector Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 50 to 100 %	95	-	%	page 6-6
A57	Do not use	-	-	-	-	-
A60	2nd Speed Conversion Coefficient	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Using E50 value 0.01 to 600.00	0	Available	-	page 6-78 page 7-75
A61	2nd Display Coefficient for Transport time / Auxiliary Display Coefficient for Speed Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 9999	1	Available	-	page 7-75
A62	2nd Starting Frequency Holding Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 10.00 s	0.00	Available	s	page 7-110

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
A63	2nd Stop Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 Hz 999: According to F025	32767	Available	Hz	page 7-110
A64	2nd Stop Frequency Detection Method Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Detected speed 1: Reference speed 100: According to F38	100	-	-	page 7-110
A65	2nd Stop Frequency Holding Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 10.00 s	0.00	Available	s	page 7-110

4-2-7 Parameter b (Speed Control 3)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
b43	Speed Control 3 Speed Command Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.02	Available	s	page 6-26
b44	Speed Control 3 Speed Detection Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.005	Available	s	page 6-26
b45	Speed Control 3 P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 200.0	10	Available	-	page 6-26
b46	Speed Control 3 I Integral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 9.999 s 999: Disable	0.1	Available	s	page 6-26
b47	Speed Control 3 FF Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 s	0	Available	s	page 6-26
b48	Speed Control 3 Output Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.002	Available	s	page 6-26
b49	Speed Control 3 Notch Filter Resonance Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 500 Hz	200	Available	Hz	page 6-26

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
b50	Speed Control 3 Notch Filter Attenuation Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 40 dB	0	Available	dB	page 6-26

4-2-8 Parameter r (Speed Control 4)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
r43	Speed Control 4 Speed Command Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.02	Available	s	page 6-26
r44	Speed Control 4 Speed Detection Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.005	Available	s	page 6-26
r45	Speed Control 4 P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 200.0	10	Available	-	page 6-26
r46	Speed Control 4 I Integral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 9.999 s 999: Disable	0.1	Available	s	page 6-26
r47	Speed Control 4 FF Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 s	0	Available	s	page 6-26
r48	Speed Control 4 Output Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.002	Available	s	page 6-26
r49	Speed Control 4 Notch Filter Resonance Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 500 Hz	200	Available	Hz	page 6-26
r50	Speed Control 4 Notch Filter Attenuation Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 40 dB	0	Available	dB	page 6-26

4-2-9 Parameter J (Applied Functions 1)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
J01	PID Control Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Process normal operation 2: Process inverse operation 3: Dancer 4: Process normal operation, opposite operation available 5: Process inverse operation, opposite operation available	0	-	-	page 7-118
J02	PID Control PID Command Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Digital Operator (Up/Down keys) 1: Analog input 3: UP/DOWN control 4: RS-485 communications	0	-	-	page 7-118
J03	PID Control P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 30.000	0.1	Available	-	page 7-118
J04	PID Control I Integral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 3600.0 s	0	Available	s	page 7-118
J05	PID Control D Differential Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 600.00 s	0	Available	s	page 7-118
J06	PID Control Feedback Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 900.0 s	0.5	Available	s	page 7-118
J10	PID Control Anti-reset Windup Width	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 200 % Percentage of PID command	200	Available	%	page 7-118

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
J11	PID Control Select Warning Output Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Warning from absolute value 1: Warning from absolute value with hold 2: Warning from absolute value with latch 3: Warning from absolute value with hold and latch 4: Warning from PID error 5: Warning from PID error with hold 6: Warning from PID error with latch 7: Warning from PID error with hold and latch	0	Available	-	page 7-118
J12	PID Control Upper Limit of Warning (AH)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -100 % to 100 %	100	Available	%	page 7-118
J13	PID Control Lower Limit of Warning (AL)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -100 % to 100 %	0	Available	%	page 7-118
J15	PID Control Sleep Frequency for Process Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0: Disable 1.0 to 590.0 Hz	0	Available	Hz	page 7-118
J16	PID Control Sleep Timer for Process Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 60 s	30	Available	s	page 7-118
J17	PID Control Restart Frequency after Stopping for Process Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	0	Available	Hz	page 7-118
J18	PID Control PID Output Upper Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -150 to 150 % 999: Depends on setting of F15	32767	Available	%	page 7-118
J19	PID Control PID Output Lower Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -150 to 150 % 999: Depends on setting of F16	32767	Available	%	page 7-118

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
J23	PID Control Restart Feedback Deviation after Stopping for Process Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 100.0 %	0	Availa-ble	%	page 7-118
J24	PID Control Restart Delay Time after Stop-ping for Process Con-trol	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 3600 s	0	Availa-ble	s	page 7-118
J57	PID Control Operator PID Reference Posi-tion for Dancer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -100 to 0 to 100 %	0	Availa-ble	%	page 7-118
J58	PID Control PID Ref-erence Position Detec-tion Width for Dancer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable switching PID con-stant 1 to 100 % (Manually set val-ue)	0	Availa-ble	%	page 7-118
J59	PID Control P Gain 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 30.000	0.1	Availa-ble	-	page 7-118
J60	PID Control I Integral Time 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 3600.0 s	0	Availa-ble	s	page 7-118
J61	PID Control D Differ-ential Time 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 600.00 s	0	Availa-ble	s	page 7-118
J62	PID Control Block Se-lection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit1: PID output ratio selection 0: Ratio to frequency com-mand 1: Ratio to maximum frequen-cy Bit0: PID output polarity selec-tion 0: Plus (Addition) 1: Minus (Subtraction)	0	-	-	page 7-118
J63	Overload Stop Item Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Torque 1: Current	0	Availa-ble	-	page 7-148

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
J64	Overload Stop Detection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 20 to 200%	100	Available	%	page 7-148
J65	Overload Stop Mode Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Deceleration stop 2: Free run stop 3: Mechanical stop	0	-	-	page 7-148
J66	Overload Stop Operation Mode	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: During constant speed running and deceleration 1: During constant speed running 2: Anytime	0	Available	-	page 7-148
J67	Overload Stop Detection Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 600.00 s	0	Available	s	page 7-148
J68	Brake Control Brake-release Current	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 300.00 %	100.00	Available	%	page 6-76
J69	Brake Control Brake-release Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 25.0 Hz	1.0	Available	Hz	page 6-76
J70	Brake Control Brake-release Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	1.000	Available	s	page 6-76
J71	Brake Control Brake-applied Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 25.0 Hz	1.0	Available	Hz	page 6-76
J72	Brake Control Brake-applied Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	1.000	Available	s	page 6-76
J90	Overload Stop Function P gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 2.000 times 999: 0.050 times	32767	Available	-	page 7-148

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
J91	Overload Stop Function Integral time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 9.999 s 999: 0.025 s	32767	Available	s	page 7-148
J92	Overload Stop Function Current level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 50.0% to 150.0%	100	Available	%	page 7-148
J95	Brake control Brake-release Torque	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 300.00 %	100	Available	%	page 6-76
J96	Brake Control Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit6: Stop condition at Position control 0: BRK OFF 1: BRK ON Bit4: Brake-applied condition 0: Disable RUN command "OFF" 1: Enable RUN command "OFF" Bit3 to 1: Reserved Bit0: Speed detection/Speed command 0: Speed detection 1: Speed command	0	Available	-	page 6-76
J97	Servo Lock Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 9.999	0.01	Available	-	page 7-144
J98	Servo Lock Completion Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 1.000 s	0.1	Available	s	page 7-144
J99	Servo Lock Completion Range	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	10	Available	-	page 7-144
J105	Do not use	-	-	-	-	-
J106	PID Control Maximum Scale	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	100	-	-	page 7-118
J107	PID Control Minimum Scale	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	-	-	page 7-118

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
J136	PID Control Multistep PID Command 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	Availa-ble	-	page 7-118
J137	PID Control Multistep PID Command 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	Availa-ble	-	page 7-118
J138	PID Control Multistep PID Command 3	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -999.00 to 0.00 to 9990.00	0	Availa-ble	-	page 7-118

4-2-10 Parameter d (Applied Functions 2)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d01	Speed Control 1 Speed Command Fil-ter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.02	Availa-ble	s	page 6-26
d02	Speed Control 1 Speed Detection Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.005	Availa-ble	s	page 6-26
d03	Speed Control 1 P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 200.0	10	Availa-ble	-	page 6-26
d04	Speed Control 1 I Inte-gral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 9.999 s 999: Cancel integral term	0.1	Availa-ble	s	page 6-26
d05	Speed Control 1 FF Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 99.99 s	0	Availa-ble	s	page 6-26
d06	Speed Control 1 Out-put Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.002	Availa-ble	s	page 6-26
d07	Speed Control 1 Notch Filter Resonance Fre-quency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 500 Hz	200	Availa-ble	Hz	page 6-26

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d08	Speed Control 1 Notch Filter Attenuation Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 40 dB	0	Available	dB	page 6-26
d09	Speed Control Jogging Speed Command Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.02	Available	s	page 5-60
d10	Speed Control Jogging Speed Detection Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.005	Available	s	page 5-60
d11	Speed Control Jogging P Proportional Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 200.0	10	Available	-	page 5-60
d12	Speed Control Jogging I Integral Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.001 to 9.999 s 999: Cancel integral term	0.1	Available	s	page 5-60
d13	Speed Control Jogging Output Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.002	Available	s	page 5-60
d14	Input Terminal [PIA] [PIB] Pulse Input Format Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Pulse train signing/pulse train input 1: Forward/reverse rotation pulse 2: Quadrature A/B signal (B phase lead) 3: Quadrature A/B signal (A phase lead)	2	-	-	page 6-11 page 7-140
d15	Input Terminal [PIA] [PIB] Encoder Pulse Resolution	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 20 to 60000	1024	-	-	page 6-11 page 7-140
d16	Input Terminal [PIA] [PIB] Pulse Scaling Factor Denominator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 32767	1	Available	-	page 6-11 page 7-140
d17	Input Terminal [PIA] [PIB] Pulse Scaling Factor Numerator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 32767	1	Available	-	page 6-11 page 7-140

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d18	Input Terminal [PIA] [PIB] Pulse Train Filter Time Constant	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.005	Available	s	page 7-140
d21	Speed Agreement / Speed Deviation Error Hysteresis Width	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 50.0 %	10	Available	%	page 6-12
d22	Speed Agreement / Speed Deviation Error Detection Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 10.00 s	0.5	Available	s	page 6-12
d23	Speed Deviation Error Processing Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Continue to run 1 1: Stop with alarm 1 2: Stop with alarm 2 3: Continue to run 2 4: Stop with alarm 3 5: Stop with alarm 4	2	-	-	page 6-12
d24	Zero Speed Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable at startup, enable at stop 1: Enable at startup, enable at stop 2: Disable at startup, disable at stop	0	-	-	page 7-112
d25	Speed Control Speed Loop Switching Time at Parameter Change	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 1.000 s	0	Available	s	page 6-26
d32	Speed Limit 1 in Forward	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 110 %	100	Available	%	page 6-12
d33	Speed Limit 2 in Reverse	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 110 %	100	Available	%	page 6-12
d35	Over Speed Detection Level	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 120% 999: Depend on d032 and d033	32767	Available	%	page 6-12

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d41	Special Control Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (Normal control) 1: Enable (Peripheral speed constant control) 2: Do not use 3: Do not use 4: Do not use	0	-	-	page 6-78
d51	Do not use	-	-	-	-	-
d52	Do not use	-	-	-	-	-
d55	Do not use	-	-	-	-	-
d67	Motor Starting Mode Auto Search in Speed Sensor Vector Control	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable (Only at restart after momentary power failure) 2: Enable (At normal start and restart after momentary power failure)	1	-	-	page 7-47
d68	Do not use	-	-	-	-	-
d70	Speed Control Slip Frequency Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 100.00 %	100	Available	%	page 6-14
d71	Do not use	-	-	-	-	-
d72	Do not use	-	-	-	-	-
d73	Do not use	-	-	-	-	-
d74	Do not use	-	-	-	-	-
d75	Do not use	-	-	-	-	-
d76	Do not use	-	-	-	-	-
d77	Do not use	-	-	-	-	-
d78	Do not use	-	-	-	-	-
d79	Do not use	-	-	-	-	-
d80	1st PM Motor Magnetic Pole Position Pull-in Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 10.0Hz	1	Available	Hz	page 6-65
d81	Do not use	-	-	-	-	-
d82	Magnetic Flux Weakening Control Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	Available	-	page 6-16
d83	Magnetic Flux Weakening Lower Limit	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 10 to 70%	40	Available	%	page 6-16

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d84	Do not use	-	-	-	-	-
d85	Do not use	-	-	-	-	-
d86	Acc/Dec Output Frequency Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0	Available	s	page 5-39
d88	Do not use	-	-	-	-	-
d89	PM Motor High-efficiency Control Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Enable	1	-	-	page 6-22
d90	Magnetic Flux Level during Deceleration	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 100 to 300 %	120	Available	%	page 7-117
d91	Do not use	-	-	-	-	-
d92	Do not use	-	-	-	-	-
d93	Do not use	-	-	-	-	-
d94	Do not use	-	-	-	-	-
d95	Do not use	-	-	-	-	-
d96	Do not use	-	-	-	-	-
d97	Do not use	-	-	-	-	-
d98	Do not use	-	-	-	-	-
d99	Extension Function 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 3: Jogging Enable via communications Do not use other bits	8	Available	-	page 5-60
d190	Do not use	-	-	-	-	-
d192	Do not use	-	-	-	-	-
d198	Do not use	-	-	-	-	-
d201	Position Control Feed Forward Gain	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00: Disable feed-forward 0.01 to 1.50	0.00	Available	-	page 6-38 page 6-49
d202	Position Control Feed Forward Filter	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 5.000 s	0.500	Available	s	page 6-38 page 6-49
d203	Position Loop Gain 1	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 300.0	1.0	Available	-	page 6-38 page 6-49

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d204	Position Loop Gain 2	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 300.0	1.0	Availa-ble	-	page 6-38 page 6-49
d205	Position Loop Gain Switch Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 590.0 Hz	0.0	Availa-ble	Hz	page 6-38 page 6-49
d206	Electronic Gear De-nominator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 65535	1	-	-	page 6-39 page 6-49
d207	Electronic Gear Nu-merator	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 65535	1	-	-	page 6-39 page 6-49
d208	Orientation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Nearest direction (Valid for reverse rotation) 1: Command direction (Direc-tion of operation command source)	1	-	-	page 6-49
d209	Homing Operation Se-lection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit 7: Z phase correction 0: Disable 1: Enable Bit 4 to 6: Reserved Bit 3: Detection timing of hom-ing limit switch 0: By rising edge 1: By falling edge Bit 2: OT detected operation selection 0: Return at FOT/ROT detec-tion 1: Stop at OT detection (Can-cel homing) Bit 1: Homing Start direction 0: Forward direction 1: Reverse direction Bit 0: Homing shaft direction 0: Forward direction 1: Reverse direction	0	-	-	page 6-49

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d211	Homing Reference Signal Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Z phase 1: Origin limit input (ORL) 2: Overtravel input in the positive direction (FOT) 3: Overtravel input in the negative direction (ROT)	1	-	-	page 6-44
d212	Reference Signal for Homing Offset	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Z phase 1: Origin limit input (ORL) 2: Overtravel input in the positive direction (FOT) 3: Overtravel input in the negative direction (ROT) 4: Stopper (Hit and stop)	0	-	-	page 6-44
d213	Homing Frequency/ Orientation Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 590.0 Hz	5	Available	Hz	page 6-49
d214	Creep Frequency	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.1 to 590.0 Hz	0.5	Available	Hz	page 6-44
d215	Deceleration Time for Homing/Orientation	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 6000 s	6.00	Available	s	page 6-49
d220	Position Feedback Store Selection at Power Off	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Store at low voltage detected	0	Available	-	page 6-61
d221	Current Position Clear Signal Operation Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Edge 1: Level	0	Available	-	page 6-49
d222	Overtravel Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Invalid/Infinite rotation 1: Valid (Positioning at OT position at over traveling), normal PTP 2: Valid (Immediately stopped at over traveling), normal PTP	0	Available	-	page 6-43

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d223	Detection Level of Excessive Positioning Deviation (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (MSB: 0, LSB: 0) 1 to 268435455 (MSB: 0 to 4,095, LSB: 0 to 65,535)	0	Available	-	page 6-61
d224	Detection Level of Excessive Positioning Deviation (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable (MSB: 0, LSB: 0) 1 to 268435455 (MSB: 0 to 4,095, LSB: 0 to 65,535)	0	Available	-	page 6-61
d225	Software Overtravel Detection Position in the Positive Direction (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	4095	-	-	page 6-43
d226	Software Overtravel Detection Position in the Positive Direction (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	65535	-	-	page 6-43
d227	Software Overtravel Detection Position in the Negative Direction (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	-4096	-	-	page 6-43
d228	Software Overtravel Detection Position in the Negative Direction (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	1	-	-	page 6-43
d237	Positioning Data Type	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Absolute position (ABS) 1: Relative position (INC)	0	Available	-	page 6-49
d238	Position Data Determination Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.000 to 0.100 s	0.000	Available	s	page 6-49
d239	Positioning Completed Range	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0 to 9999	1	Available	-	page 6-49 page 6-58

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d240	Preset Position (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d241	Preset Position (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d242	Homing Offset (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d243	Homing Offset (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d244	Positioning Data 1 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d245	Positioning Data 1 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d246	Positioning Data 2 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d247	Positioning Data 2 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d248	Positioning Data 3 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d249	Positioning Data 3 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d250	Positioning Data 4 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d251	Positioning Data 4 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d252	Positioning Data 5 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d253	Positioning Data 5 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d254	Positioning Data 6 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d255	Positioning Data 6 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d256	Positioning Data 7 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d257	Positioning Data 7 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d258	Positioning Data 8 (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d259	Positioning Data 8 (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	Availa-ble	-	page 6-49
d277	Positioning Data Set-ting Selection via com-munication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable Communications Positioning Data (S20, S21) 1: Enable Communications Positioning Data (S20, S21)	0	Availa-ble	-	page 6-49
d278	Restarting Positioning Range Setting	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1～9999	0	Availa-ble	-	page 6-58
d280	Over Travel Forced Stop Operation Selec-tion	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Servo lock after decelera-tion stop 1: Er6 fault occurs after decel-eration stop	0	Availa-ble	-	page 6-43
d296	Current Reference Po-sition Monitor (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-	page 6-57

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
d297	Current Reference Position Monitor (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-	page 6-57
d298	Current Feedback Position Monitor (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-	page 6-57
d299	Current Feedback Position Monitor (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	0	-	-	page 6-57

4-2-11 Parameter y (RS-485 Communication Settings)

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
y11	RS-485 Communication Station No. Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 1 to 255	1	-	-	page 8-5
y12	Operation Selection on Communication Error	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Immediately trip with alarm ErP 1: Trip with alarm ErP after running for the period specified by timer y03 2: Retry during the period specified by timer y03. If the retry fails trip with alarm ErP. If it succeeds continue to run. 3: Continue to run 11: Trip with alarm ErP after deceleration stop 13: Free run stop 14: Deceleration stop	0	Available	-	page 8-5
y13	RS-485 Error Detection Timer	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.0 to 60.0 s	2	Available	s	page 8-5

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
y14	RS-485 Communication Baud Rate	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps 6: 76800 bps 7: 115200 bps	2	Available	-	page 8-5
y16	RS-485 Communication Parity Bit Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: None (Stop bit: 2 bits) 1: Even number parity (Stop bit: 1 bits) 2: Odd number parity (Stop bit: 1 bits) 3: None (Stop bit: 1 bits)	3	Available	-	page 8-5
y18	RS-485 Communication Timeout Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Not check of the time-out (OFF) 1 to 60 s	0	Available	s	page 8-5
y19	RS-485 Communication Response Interval Time	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 1.00 s	0.01	Available	s	page 8-5
y95	Data Clear Processing for Communications Error	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Do not clear the data of function codes S when a communications error occurs. (compatible with the conventional inverters) 1: Clear the data of function codes S001, S005, and S019 when a communications error occurs 2: Clear the run command assigned bit of function code S06 when a communications error occurs 3: Clear both data 1 and 2 above	0	Available	-	page 9-2

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
y97	Communication Data Storage Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Store into nonvolatile memory (Rewritable times are limited) 1: Write into temporary memory (Rewritable times are unlimited) 2: Save all data from temporary memory to nonvolatile memory (After all data is saved, return to Data 1)	1	Available	-	page 8-5
y99	Support Tool Link Function Selection	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Numerical setting and terminal command (including operation command) by related parameter settings 1: Numerical setting uses communications command (support tools) 2: Terminal setting uses communications command (support tools) 3: Both numerical setting and terminal command use communications command (support tools) Numerical setting means Frequency reference, torque command, or torque bias command.	0	Available	-	-

4-2-12 Parameter S (Via RS-485)

These parameters are exclusively for reading and writing via the RS-485 interface. These parameters are not displayed on the Digital Operator. To check these parameters, use Sysmac Studio.

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
S01	Frequency Reference	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767 +20,000 or -20,000 = Maximum output frequency	0	Available	-	page 5-27

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
S02	Torque Reference	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67 %	0	Availa-ble	%	page 6-31
S03	Torque Current Com-mand	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67 %	0	Availa-ble	%	page 6-31
S05	Frequency Reference	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0.00 to 655.35 Hz	0	Availa-ble	Hz	page 5-27
S06	Input Terminal Monitor	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	Availa-ble	-	page 5-25 page 5-49 page 7-22
S07	Communication Data Terminal [DO]	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	Availa-ble	-	page 7-152

Parameter No.	Function name	Monitor or Data Range	Default data	Setting during RUN	Unit	Page
S12	Communication Data Terminal [AO]	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767	0	Availa-ble	-	page 7-152
S13	PID Control PID Com-mand via Communica-tion	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767 -20,000 = -100%, 20,000 = 100%	0	Availa-ble	-	page 7-118
S14	Alarm Reset Com-mand	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV 0: Disable 1: Alarm reset	0	Availa-ble	-	page 5-49
S15	Torque Bias Value via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327.68 to 327.67	0	Availa-ble	%	page 6-33
S19	Speed Command via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32768 to 32767	0	Availa-ble	r/min	page 5-27
S20	Positioning Data via Communication (MSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV −268435455 to 268435455 (MSB: -4096 to 4095)	0	Availa-ble	-	page 6-41
S21	Positioning Data via Communication (LSB)	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV (LSB: 0 to 65535)	0	Availa-ble	-	page 6-41
S22	Torque Reference via Communication	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327 to 327 %	0	Availa-ble	%	page 6-31
S23	Torque Current Com-mand via Communica-tion	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327 to 327 %	0	Availa-ble	%	page 6-31
S24	Torque Bias Value	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -327 to 327 %	0	Availa-ble	%	page 6-33
S30	PID Control Feedback Value via Communica-tion	V/f DTV PG V/f PG DTV SLV PGV PM SLV PM PGV -32,768 to 32,767 -20,000 = -100%, 20,000 = 100%	0	Availa-ble	-	page 7-118

5

Basic Settings

This section describes the basic functions such as the RUN command.

5-1 Display and Initialization

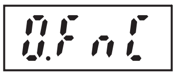
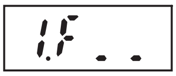
5-1-1 Display Selection

- The menus displayed in the Program mode can be selected. For an explanation on the menus, refer to *3-1-2 Key Operation Method* on page 3-3 (Program mode).
- To display all parameters, set “2: Display all parameters.”

Parameter No.	Function name	Data	Default data	Unit
E52	Operator Display Selection	0 to 2 0: Display favorite parameters and all parameters 1: Display change parameters 2: Display all parameters	2	-

Select the menu to display on the Digital Operator at E52. The following table shows the seven menus.

(OK: To be displayed)

Menu No.	LED monitor display	Display item	E52=0	E52=1	E52=3
0		User parameters	OK		OK
1		All parameters	OK		OK
2		Changed parameters*1		OK	OK
3		Operation status (Refer to *7-1-1 Operation Monitor* on page 7-3.)			OK
4		[DI], [AI], [DO], [AO] terminal status (Refer to *7-1-2 I/O check* on page 7-9.)			OK
5		Maintenance status (Refer to *7-1-3 Maintenance Information* on page 7-11.)			OK
6		Alarm information (Refer to *7-1-4 Alarm information* on page 7-15.)			OK

*1. Only parameters that are different from their factory default values are displayed. When no parameters have been changed, “F___” is displayed. Also, Data Initialization (03), Auto Tuning Function Selection (P04/A18) and User Preference Dataset Registration (H193) are not displayed in changed parameters.

*2. To register to favorite parameters, hold the ⏎ key down during display of a parameter. To indicate that a parameter has been registered as a favorite parameter, the decimal point LED of the uppermost digit lights. If the same operation is performed one more time, the parameter is removed from user preferences, and the decimal LED of the uppermost digit turns OFF.

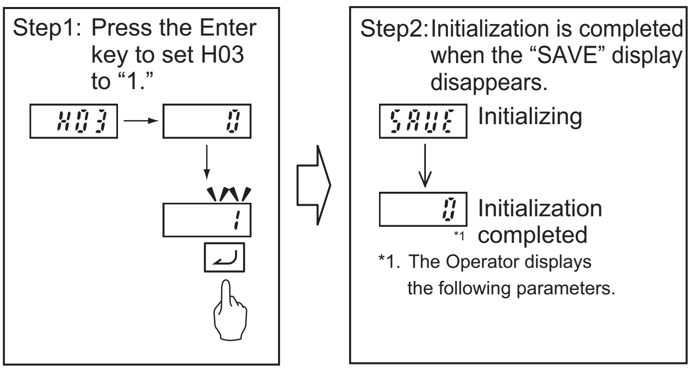
5-1-2 Data Initialization

- The parameter initialization function restores changed parameters to the factory default settings.
- It can also clear the fault monitor data.
- When the inverter is newly set after restoring parameters to the factory default settings, execute parameter initialization with "1: Initialize all parameters" set to Data Initialization (H03).
- Note that previous settings cannot be reverted to once the key is pressed with a value other than "0" is selected at Data Initialization (H03) to execute parameter initialization. After initialization ends, H03 returns to 0.

Parameter No.	Function name	Data	Default data	Unit
H03	Data Initialization	0 to 8 0: Disable 1: Initialize all parameters 2: Initialize motor 1 parameters 3: Initialize motor 2 parameters 4: Restore user defined data 5: Initialize all parameters (except I/O and communications) 6: Reserved 7: Clear alarm history 8: Clear selection of favorite function code	0	-

- Initialization cannot be executed if changes to the parameter used for initialization (H03) is prohibited by the setting of Operator Protection Function Selection (F00). To execute initialization, first disable prohibition of changing the parameter set value in Operator Protection Function Selection (F00). For details on Operator Protection Function Selection, refer to *7-7-1 Soft Lock Function (SFT)* on page 7-73.

- The parameter used for initialization (H03) is not displayed when "1: Display change parameters" is set to Operator Display Selection (E52). For details on Operator (Menu display mode), refer to *5-1-1 Display Selection* on page 5-3.
- During operation, initialization is not possible. Perform initialization after stopping inverter operation. Also, do not enter a RUN command as the inverter might operate unintentionally during initialization.
- Press the "STOP key + / key" simultaneously to change the parameter H03 value.



Initialize all parameters (H03 = 1)

- When “1: Initialize all parameters” is set to Data Initialization (H03), all parameters excluding the following are set to their default data (values at the time of shipment from the factory).

  Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42)
  Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47)
  Service Life of Main Circuit Capacitor Remaining Time (H77)
  Cumulative Run Time of Cooling Fan (H43)
  Cumulative Run Time of Capacitors on Printed Circuit Boards (H48)
  1st Startup Count for Motor (H44)
  2nd Startup Counter for Motor (A52)
  1st Cumulative Motor Run Time (H94)
  2nd Cumulative Motor Run Time (A51)
  User Preference Dataset Protection Function Selection (H194)
  Monitor Exclusive Parameters (M, W Parameters)

- Parameters are initialized even if they are protected by a password, and both passwords 1 and 2 are canceled. (Refer to *7-7-6 Password Function* on page 7-76.)
- User preference dataset saved by User Preference Dataset Registration (H193) are not initialized. (Refer to *5-1-3 User Preference Dataset (Registration/Protection)* on page 5-8.)

Initialize Motor 1 Parameters (H03 = 2)

- When “2: Initialize motor 1 parameters” is set to Data Initialization (H03), the following parameters are set to their default data (values at the time of shipment from the factory).
  1st Manual Torque Boost Voltage (F09)
  1st Motor Electronic Thermal Level (F11)
  1st Motor Pole Number (P01)
  1st Motor Rated Current (P03)
  1st Motor Armature Resistance (P06)
  1st Motor Parameter %R1 (P07)
  1st Motor Parameter %X (P08)
  1st Slip Compensation Gain for Braking (P11)
  1st Rated Slip Frequency (P12)
  1st Iron Loss Factor 1 (P13)
  1st Magnetic Saturation Factor 1 (P16)
  1st Magnetic Saturation Factor 2 (P17)
  1st Magnetic Saturation Factor 3 (P18)
  1st Magnetic Saturation Factor 4 (P19)
  1st Magnetic Saturation Factor 5 (P20)
  1st PM Motor Starting Method (P30)
  1st Motor Torque Current under Vector Control (P55)
  1st Induced Voltage Factor under Vector Control (P56)
  1st PM Motor Armature Resistance (P60)
  1st PM Motor d-axis Inductance (P61)
  1st PM Motor q-axis Inductance (P62)

1st PM Motor Induced Voltage Ke (P63)
1st PM Motor Iron Loss (P64)
1st PM Motor Reference Current for Magnetic Pole Detection (P87)
1st PM Motor Overcurrent Protection Level (P90)
Auto Search Delay Time 2 for Starting Mode (H46)
Magnetic Flux Level during Deceleration (d90)

Initialize Motor 2 Parameters (H03 = 3)

- When “3: Initialize motor 2 parameters” is set to Data Initialization (H03), the following parameters are set to their default data (values at the time of shipment from the factory).
  2nd Manual Torque Boost Voltage (A05)
  2nd Motor Electronic Thermal Level (A07)
  2nd Motor Pole Number (A15)
  2nd Motor Rated Current (A17)
  2nd Motor Armature Resistance (A20)
  2nd Motor Motor Constant %R1 (A21)
  2nd Motor Motor Constant %X (A22)
  2nd Slip Compensation Gain for Braking (A25)
  2nd Rated Slip Frequency (A26)
  2nd Iron Loss Factor 1 (A27)
  2nd Magnetic Saturation Factor 1 (A30)
  2nd Magnetic Saturation Factor 2 (A31)
  2nd Magnetic Saturation Factor 3 (A32)
  2nd Magnetic Saturation Factor 4 (A33)
  2nd Magnetic Saturation Factor 5 (A34)
  Torque Current for 2nd Vector Control (A55)
  Induced Voltage Factor for 2nd Vector Control (A56)

Restore User Defined Data (H03 = 4)

- When “4: Restore user defined data” is set to Data Initialization (H03), parameters are initialized using the user preference dataset saved at User Preference Dataset Registration (H193). When there are no user preference dataset, parameters are initialized using factory defaults. (Same operation as when Data Initialization (H03) is set to 1).
- User preference dataset saved by User Preference Dataset Registration (H193) are not initialized. (Refer to *5-1-3 User Preference Dataset (Registration/Protection)* on page 5-8.)
- The following parameters are not initialized.

  Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42)
  Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47)
  Service Life of Main Circuit Capacitor Remaining Time (H77)
  Cumulative Run Time of Cooling Fan (H43)
  Cumulative Run Time of Capacitors on Printed Circuit Boards (H48)
  1st Startup Count for Motor (H44)
  2nd Startup Counter for Motor (A52)

1st Cumulative Motor Run Time (H94)
2nd Cumulative Motor Run Time (A51)
User Preference Dataset Protection Function Selection (H194)
Monitor Exclusive Parameters (M, W Parameters)

Initialize All Parameters (Except I/O and Communications) (H03 = 5)

- When “5: Initialize all parameters (except I/O and communications)” is set to Data Initialization (H03), the following parameters excluding I/O and communications are initialized to their factory defaults.

  Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01～E05, E98, E99)
  Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection (E20, E21)
  Output Terminal [ROA, ROB] Function Selection (E27)
  RS-485 Communication Station No. Selection (y11)
  Operation Selection on Communication Error (y12)
  RS-485 Error Detection Timer (y13)
  RS-485 Communication Baud Rate (y14)
  RS-485 Communication Parity Bit Selection (y16)
  RS-485 Communication Timeout Time (y18)
  RS-485 Communication Response Interval Time (y19)
  Data Clear Processing for Communications Error (y95)

  Also, the following parameters are not initialized.

  Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42)
  Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47)
  Service Life of Main Circuit Capacitor Remaining Time (H77)
  Cumulative Run Time of Cooling Fan (H43)
  Cumulative Run Time of Capacitors on Printed Circuit Boards (H48)
  1st Startup Count for Motor (H44)
  2nd Startup Counter for Motor (A52)
  1st Cumulative Motor Run Time (H94)
  2nd Cumulative Motor Run Time (A51)
  User Preference Dataset Protection Function Selection (H194)
  Monitor Exclusive Parameters (M, W Parameters)

Clear Alarm History (H03 = 7)

- When “7: Clear alarm history” is set to Data Initialization (H03), the alarm history and data at the time of the alarm, multiple alarm information, light alarm history, and number of occurrences are cleared to set to an alarm non-occurring state.
- The alarm information of parameters (refer to *7-1-4 Alarm information* on page 7-15) is initialized.

Clear Selection of Favorite Function Code (H03 = 8)

- When “8: Clear selection of favorite function code” is set to Data Initialization (H03), the registered state of favorite parameters is cleared (canceled). The values of parameters registered as favorite parameters are not initialized. For details on registering favorite parameters, refer to *7-7-8 User Parameter Setting Function* on page 7-79.
- To register to favorite parameters, hold the key down during display of a parameter. To indicate that a parameter has been registered as a favorite parameter, the decimal point LED of the uppermost digit lights. If the same operation is performed one more time, the parameter is removed from user preferences, and the decimal LED of the uppermost digit turns OFF.

5-1-3 User Preference Dataset (Registration/Protection)

Set User Preference Dataset Registration/Protection by the following parameters. When “4: Restore user defined data” is set to Data Initialization (H03), parameters are initialized using the saved user preference datasets.

Parameter No.	Function name	Data	Default data	Unit
H193	User Preference Dataset Registration	0: Disable 1: Store	0	-
H194	User Preference Dataset Protection Function Selection	0: Unprotected 1: Protected	0	-
Related function		Data Initialization (H03)		

- The set values of parameters that have been changed from the factory defaults can be saved (registered) as user preference dataset. For parameters also that have not been changed from the factory defaults, factory defaults can be saved (registered) as user preference dataset. Note, however, that the following parameters are not targeted for saving as user preference datasets.

  Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42)
  Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47)
  Service Life of Main Circuit Capacitor Remaining Time (H77)
  Cumulative Run Time of Cooling Fan (H43)
  Cumulative Run Time of Capacitors on Printed Circuit Boards (H48)
  1st Startup Count for Motor (H44)
  2nd Startup Counter for Motor (A52)
  1st Cumulative Motor Run Time (H94)
  2nd Cumulative Motor Run Time (A51)
  User Preference Dataset Protection Function Selection (H194)
  Monitor Exclusive Parameters (M, W Parameters)

- Save user preference dataset by the following procedure. To change User Preference Dataset Registration (H193) and User Preference Dataset Protection Function Selection (H194), the “STOP key + / key” must be pressed simultaneously with each of the parameter values displayed.

  Step 1: Set “0: Unprotected” (default value) to User Preference Dataset Protection Function Selection (H194).

Step 2: Select User Preference Dataset Registration (H193). “0: Disable” is displayed as the value of H193.
Step 3: When User Preference Dataset Registration (H193) is set to “1: Protected,” registration of the user preference dataset is started. During registration, “SAVE” is displayed, and the value returns to 0 when registration is completed.
Step 4: To protect the user preference dataset, set “1: Protected (save prohibited)” to User Preference Dataset Protection Function Selection (H194).

- To set all user preference datasets to the factory defaults, initialize parameters by Data Initialization (H03) “1: Initialize all parameters,” and then register the datasets by User Preference Dataset Registration (H193).

5-2 Setting V/f Control

5-2-1 Motor Control Method (V/f Characteristics)

- V/f control is a method of controlling a motor by setting the output voltage and frequency of the inverter as V/f characteristics. This is effective for using the inverter easily.
- Set 0 and 3 at Drive Control Selection and select the V/f characteristics (output voltage and output frequency).

Parameter No.	Function name	Data	Default data	Unit
F42/A14	1st Drive Control Selection/2nd Drive Control Selection*1	0: IM V/f control 3: IM V/f control with speed sensor	0	-
F37/A13	1st V/f Characteristics Selection/2nd V/f Characteristics Selection	0: Variable torque load 1: Constant torque load	1	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

V/f Control (Induction Motor) (F42/A14 = 0)

V/f control outputs the voltage and frequency according to a preset V/f pattern to operate the motor. Also, slip compensation function enabled/disabled can be switched by Slip compensation Function Selection (H442). For details on slip compensation, refer to *5-2-3 Slip Compensation* on page 5-16.

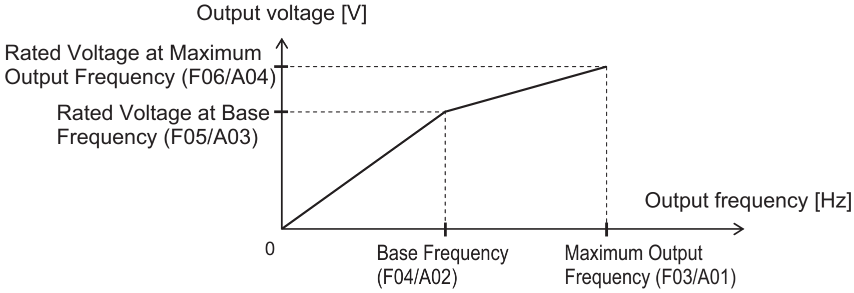
V/f Control with Speed Sensor (Induction Motor) (F42/A14 = 3)

When a load is applied to an induction motor, slip occurs according to characteristics of the motor and this results in a drop in motor rotation speed.
With V/f control with speed sensor, the motor rotation speed is detected by an encoder mounted on the motor shaft, and the slip frequency is compensated by PI control so that the motor rotation speed matches the speed equivalent to the instructed speed. As a result, the speed control accuracy of the motor is improved.

Constant Torque Characteristics (F37/A13 = 1)

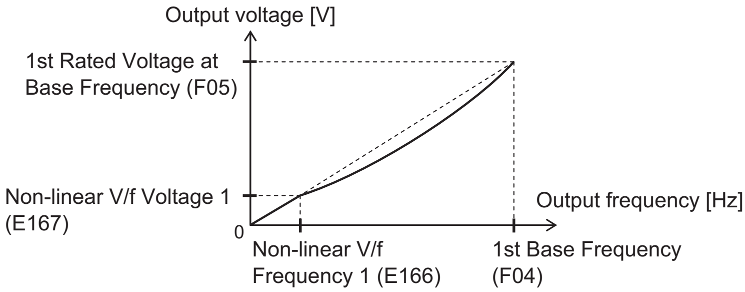
This setting is suitable for cart, conveyor, overhead traveling crane, and other applications where a torque is required, independent of the motor rotation speed.
It enables the output of a constant torque based on the frequency, according to the V/f characteristics that represent the proportional relationship between the output frequency and the output voltage.
For the base frequency, set the rated frequency of the motor.

For the maximum frequency, set the highest frequency at which control is performed on the inverter. Note that this must be within the maximum frequency of the motor.



Reducing Torque Characteristics (F37/A13 = 0)

This setting is suitable for fan, pump, and other applications that do not require large torque at low speeds.
It provides high efficiency, reduced noise and vibration as the output voltage is reduced in the low speed range.
By using the non-linear V/f function, a sufficient startup torque can also be secured as constant torque characteristics up to specified speeds.



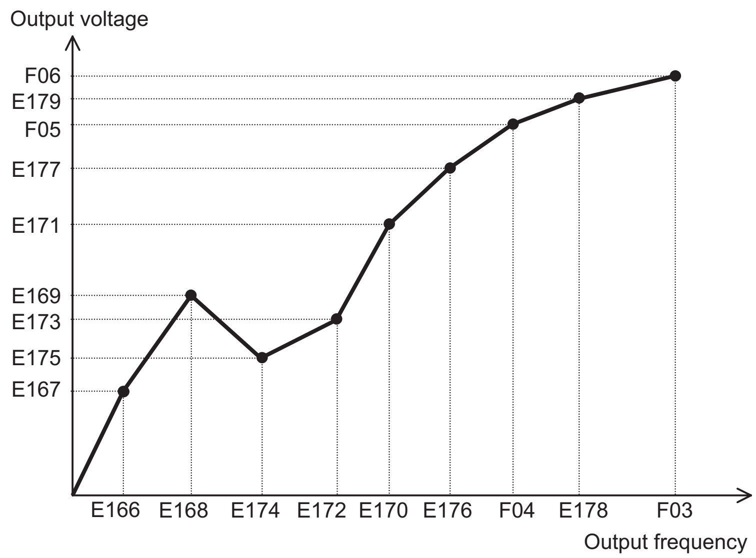
Reducing torque characteristics using non-linear V/f

Reducing torque characteristics are characteristics to the power of two.

Broken Line V/f Function

- With the non-linear V/f function, V/f characteristics at a total of nine points can be configured as desired by setting the voltage and frequency of seven points in addition to base voltage/frequency and maximum voltage/frequency. When the non-linear V/f function is not used, set “0.0” to the non-linear V/f frequency 1 to 7 that is not to be used.
- Frequency is not in parameter No. order but in order of the size of the set value. (Refer to the figure below.)
- The non-linear V/f function can be jointly used with torque boost, reducing torque characteristics and automatic energy saving operation.

Parameter No.	Function name	Data	Description	Default data	Unit
E166	Non-linear V/f Frequency 1	0.0: Disable 0.1 to 590.0 Hz	Sets the frequency at each break point.	0.0	Hz
E168	Non-linear V/f Frequency 2				
E170	Non-linear V/f Frequency 3				
E172	Non-linear V/f Frequency 4				
E174	Non-linear V/f Frequency 5				
E176	Non-linear V/f Frequency 6				
E178	Non-linear V/f Frequency 7				
E167	Non-linear V/f Voltage 1	0 to 240 V (200-V class) 0 to 500 V (400-V class)	Sets the voltage at each break point.	0	V
E169	Non-linear V/f Voltage 2				
E171	Non-linear V/f Voltage 3				
E173	Non-linear V/f Voltage 4				
E175	Non-linear V/f Voltage 5				
E177	Non-linear V/f Voltage 6				
E179	Non-linear V/f Voltage 7				



5-2-2 Load Mode Selection

Select either of the heavy load mode (HHD/HD) or the light load mode (HND/ND) according to the application.

Parameter No.	Function name	Data	Default data	Unit
F80	Load Mode Selection	0: HHD 1: HND 3: HD (only for 400 V) 4: ND (only for 400 V)	0	-
Related function		F42/A14, F09/A05, F44/E147, F26, F21/A10		

- Load modes that can be selected differ depending on the voltage specifications and capacity of the inverter.

	HHD F80 = 0	HND F80=1	HD F80=3	ND F80=4
Three-phase 200 V full capacity	OK	OK	-	-
Three-phase 400 V full capacity	OK	OK	OK	OK
Single-phase 200 V (2.2 k or less)	OK	OK	-	-
Single-phase 200 V (3.7 kW)	OK	-	-	-

- For loads (such as fans and pumps) that do not require frequent use of the inverter above the rated torque, the light load mode can be selected. The rated current of the inverter increases above that of the heavy load mode, which enables the inverter to drive a motor one size larger. For details on rated current specifications, refer to *1-3-1 Standard Specifications* on page 1-11. The overload capacity differs as shown in the following table on each specification type.

F80 data	Specification type		Continuous rated current level	Ambient temperature	Overload capacity
0	Heavy load mode	HHD	Motor of same capacity as inverter capacity can be driven	Up to 50°C	150% 1 min 200% 0.5 s
3 (only for 400 V)		HD	Motor of capacity one size larger than the inverter capacity can be driven	Up to 40°C	150% 1 min
1	Light load mode	HND	Motor of capacity one size larger than the inverter capacity can be driven	Up to 50°C	120% 1 min
4 (only for 400 V)		HD	Motor of capacity one to two sizes larger than the inverter capacity can be driven	Up to 40°C	120% 1 min

Related Parameters

- Some parameters are restricted by changing the setting of Load Mode Selection (F80).

● When Drive Control Selection (F42/A14) = 0 to 6 (induction motor)

- The set values of the following parameters are overwritten with the following values according to the new settings after changing Load Mode Selection (F80).
  - Manual Torque Boost Voltage (F09/A05), Overload Protect Level (F44/E147)
- The upper limit values of the following parameters change according to the new settings after changing Load Mode Selection (F80). When the set values exceed the upper limit, they are overwritten with the upper limit.
  - Carrier Frequency (F26), DC Injection Braking Level (F21/A10)

Power supply	Model	Capacity [kW]	Manual Torque Boost Voltage (F09/A05)				Overload Protect Level (F44/E147)				Carrier Frequency (F26)				DC Injection Braking Level (F21/A10)			
			Set value				Set value				Maximum value (*1)				Maximum value (*1)			
			Load Mode Selection (F80)				Load Mode Selection (F80)				Load Mode Selection (F80)				Load Mode Selection (F80)			
			0: HHD	1: HND	3: HD	4: ND	0: HHD	1: HND	3: HD	4: ND	0: HHD	1: HND	3: HD	4: ND	0: HHD	1: HND	3: HD	4: ND
Three-phase 200 V	3G3M1-A2001	0.1	8.4	6.7	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2002	0.2	8.4	6.7	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2004	0.4	7.1	4.0	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2007	0.75	3.8	2.6	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2015	1.5	3.0	2.4	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2022	2.2	2.5	2.1	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-A2037	3.7	2.4	2.0	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-A2055	5.5	1.9	1.9	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2075	7.5	1.8	1.8	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2110	11	1.3	1.3	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2150	15	1.2	1.2	-	-	180	130	-	-	16	16	-	-	100	80	-	-
	3G3M1-A2185	18.5	0.9	0.9	-	-	160	130	-	-	16	16	-	-	100	80	-	-

Power supply	Model	Capacity [kW]	Manual Torque Boost Voltage (F09/A05)				Overload Protect Level (F44/E147)				Carrier Frequency (F26)				DC Injection Braking Level (F21/A10)			
			Set value				Set value				Maximum value (*1)				Maximum value (*1)			
			Load Mode Selection (F80)				Load Mode Selection (F80)				Load Mode Selection (F80)				Load Mode Selection (F80)			
			0: HHD	1: HND	3: HD	4: ND	0: HHD	1: HND	3: HD	4: ND	0: HHD	1: HND	3: HD	4: ND	0: HHD	1: HND	3: HD	4: ND
Three-phase 400 V	3G3M1-A4004	0.4	7.1	4.0	7.1	4.0	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4007	0.75	3.8	2.6	3.8	2.6	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4015	1.5	3.0	2.4	3.0	2.4	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4022	2.2	2.5	2.1	2.5	2.1	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4030	3.0	2.5	2.1	2.5	2.1	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4040	4.0	2.4	2.0	2.4	2.0	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4055	5.5	1.9	1.9	1.9	1.9	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4075	7.5	1.8	1.8	1.8	1.8	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4110	11	1.3	1.3	1.3	1.3	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4150	15	1.2	1.2	1.2	1.2	180	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4185	18.5	0.9	0.9	0.9	0.9	160	130	160	130	16	16	16	10	100	80	80	60
	3G3M1-A4220	22	0.9	0.9	0.9	0.9	160	130	160	130	16	10	10	6	100	80	80	60
Single-phase 200 V	3G3M1-AB001	0.1	8.4	6.7	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-AB002	0.2	8.4	6.7	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-AB004	0.4	7.1	4.0	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-AB007	0.75	3.8	2.6	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-AB015	1.5	3.0	2.4	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-AB022	2.2	2.5	2.1	-	-	180	130	-	-	16	10	-	-	100	80	-	-
	3G3M1-AB037	3.7	2.4	-	-	-	180	-	-	-	16	-	-	-	100	-	-	-

● When Drive Control Selection (F42) = 15, 16 (synchronous motor)

- The set values of the following parameters are overwritten with the following values according to the new settings after changing Load Mode Selection (F80).
  - Manual Torque Boost Voltage (F09)

Power supply	Model	Capacity [kW]	Manual Torque Boost Voltage (F09) Set value Load Mode Selection (F80)			
			0: HHD	1: HND	3: HD	4: ND
Three-phase 200 V	3G3M1-A2001	0.1	8.4	6.7	-	-
	3G3M1-A2002	0.2	8.4	6.7	-	-
	3G3M1-A2004	0.4	7.1	4.0	-	-
	3G3M1-A2007	0.75	6.8	3.5	-	-
	3G3M1-A2015	1.5	6.8	4.9	-	-
	3G3M1-A2022	2.2	6.8	4.5	-	-
	3G3M1-A2037	3.7	5.5	4.1	-	-
	3G3M1-A2055	5.5	4.9	3.4	-	-
	3G3M1-A2075	7.5	4.4	2.7	-	-
	3G3M1-A2110	11	3.5	2.1	-	-
	3G3M1-A2150	15	2.8	1.6	-	-
	3G3M1-A2185	18.5	2.2	1.3	-	-
Three-phase 400 V	3G3M1-A4004	0.4	7.1	4.0	7.1	4.0
	3G3M1-A4007	0.75	6.8	3.5	6.8	3.5
	3G3M1-A4015	1.5	6.8	4.9	6.8	4.9
	3G3M1-A4022	2.2	6.8	4.5	6.8	4.5
	3G3M1-A4030	3.0	6.8	4.5	6.8	4.5
	3G3M1-A4040	4.0	5.5	4.1	5.5	4.1
	3G3M1-A4055	5.5	4.9	3.4	4.9	3.4
	3G3M1-A4075	7.5	4.4	2.7	4.4	2.7
	3G3M1-A4110	11	3.5	2.1	3.5	2.1
	3G3M1-A4150	15	2.8	1.6	2.8	1.6
	3G3M1-A4185	18.5	2.2	1.3	2.2	1.3
	3G3M1-A4220	22	2.2	1.1	2.2	1.1
Single-phase 200 V	3G3M1-AB001	0.1	8.4	6.7	-	-
	3G3M1-AB002	0.2	8.4	6.7	-	-
	3G3M1-AB004	0.4	7.1	4.0	-	-
	3G3M1-AB007	0.75	6.8	3.5	-	-
	3G3M1-AB015	1.5	6.8	4.9	-	-
	3G3M1-AB022	2.2	6.8	4.5	-	-
	3G3M1-AB037	3.7	5.5	-	-	-

5-2-3 Slip Compensation

The slip compensation function calculates the torque generated by the motor to infer the slip amount. As a result of this calculation, the drop in motor rotation speed can be compensated for to suppress the drop in motor rotation speed. This is useful for improving the speed control accuracy of the motor. To enable the slip compensation function, select “0: V/f control” or “3: V/f control with speed sensor” at Drive Control Selection (F42/A14), then set 1 at Slip compensation Function Selection (H442), and set the conditions for enabling the slip compensation function to Slip Compensation Operating Conditions Selection (H68/A40).

Parameter No.	Function name	Data	Default data	Unit
H442	Slip compensation Function Selection	0: Disable 1: Enable	0	-
H68/A40	1st Slip Compensation Operating Conditions Selection/2nd Slip Compensation Operating Conditions Selection*1	0: Enable during acceleration/deceleration, enable at base frequency or higher 1: Disable during acceleration/deceleration, enable at base frequency or higher 2: Enable during acceleration/deceleration, disable at base frequency or higher 3: Disable during acceleration/deceleration, disable at base frequency or higher	0	-
P09/A23*2	1st Slip Compensation Gain for Driving/2nd Slip Compensation Gain for Driving*1	0.0 to 200.0 %	100.0	%
P10/A24	1st Slip Compensation Response Time/2nd Slip Compensation Response Time*1	0.01 to 10.00 s	0.12	s
P11/A25*2	1st Slip Compensation Gain for Braking/2nd Slip Compensation Gain for Braking*1	0.0 to 200.0 %	100.0	%
P12/A26*2	1st Rated Slip Frequency/2nd Rated Slip Frequency*1	0.00 to 15.00 Hz	Dependent on capacity	Hz

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

*2. When 0.0% or 0.00 Hz is set to one of P09/A23, P11/A25 and P12/A26, slip compensation is disabled.

Details of 1st Slip Compensation Operating Conditions Selection (H68) and 2nd Slip Compensation Operating Conditions Selection (A40) are as shown in the table below.

H68/A40 Data	Motor operation state		Frequency range	
	At acceleration/deceleration	At constant speed	Base frequency or less	Base frequency or more
0	Enable	Enable	Enable	Enable
1	Disable	Enable	Enable	Enable
2	Enable	Enable	Enable	Disable
3	Disable	Enable	Enable	Disable

• For Slip compensation gain for driving (P09/A23)/Slip compensation response time (P10/A24)/Slip compensation gain for braking (P11/A25) slip compensation gain for driving and slip compensation gain for braking, adjust the compensation amount for when slip compensation is performed and the slip amount in the internal calculation. These can be set individually in the driving mode and the

braking mode. The rated slip frequency is archived when set to 100%. When overcompensation (100% or higher) is set in slip compensation, hunting sometimes occurs. So, check this on an actual inverter.
The slip compensation response time determines the response when slip compensation is performed. Basically, there is no need to change the setting.

- Rated slip frequency (P12/A26)
  Set the rated slip frequency of the motor. This is also automatically set by executing auto-tuning.

$$\text{Rated slip frequency (Hz)} = \frac{\text{Synchronous speed - Rated speed}}{\text{Synchronous speed}} \times \text{Base frequency}$$

5-3 Motor Parameter Settings

5-3-1 Induction Motor Basic Settings

When running an induction motor, set the following parameters to match the rated value of the motor used and the design values of the machinery.

Parameter No.	Function name	Data	Default data	Unit
F04 A02	1st Base Frequency 2nd Base Frequency *1	5.0 to 590.0 Hz	50.0	Hz
F05 A03	1st Rated Voltage at Base Frequency 2nd Rated Voltage at Base Frequency *1	80 to 240 V (200-V class) 160 to 500 V (400-V class)	200	V
F03 A01	1st Maximum Output Frequency 2nd Maximum Output Frequency *1	5.0 to 590.0 Hz	60.0	Hz

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

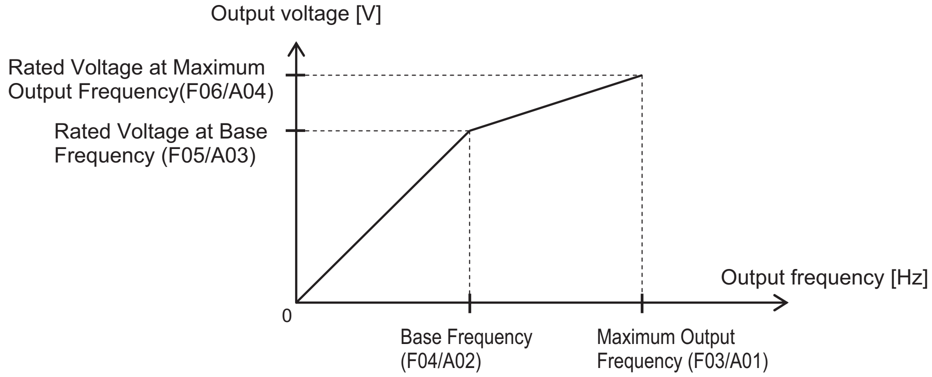
5-3-2 Base Frequency and Maximum Frequency of Motor

To configure the V/f control characteristics output to the motor, set the base frequency and maximum frequency of your motor.
For the base frequency, set the rated frequency of the motor (the frequency listed on the motor rating nameplate).
For the maximum frequency, set the highest frequency required for your application. However, do not exceed the maximum rotation speed of the motor.
Then, set the motor rated voltage to 1st Rated Voltage at Maximum Output Frequency (F06)/2nd Rated Voltage at Maximum Output Frequency (A04).

Parameter No.	Function name	Data	Default data	Unit
F04	1st Base Frequency	5.0 to 590.0Hz	50.0	Hz
A02	2nd Base Frequency*1		50.0	Hz
F03	1st Maximum Output Frequency	5.0 to 590.0Hz	60.0	Hz
A01	2nd Maximum Output Frequency*1		60.0	Hz
F05	1st Rated Voltage at Base Frequency	80 to 240 V (200-V class) 160 to 500 V (400-V class)	Dependent on capacity	V
A03	2nd Rated Voltage at Base Frequency*1		Dependent on capacity	V

Parameter No.	Function name	Data	Default data	Unit
F06	1st Rated Voltage at Maximum Output Frequency	80 to 240 V (200-V class) 160 to 500 V (400-V class)	Dependent on capacity	V
A04	2nd Rated Voltage at Maximum Output Frequency*1		Dependent on capacity	V

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].



Precautions for Correct Use

- For these motors, check the rated motor current and select an appropriate inverter based on the rated current of the inverter.
- Do not set the base frequency to lower than the motor rated frequency. Doing so may cause overload or motor burnout.
- Do not select a motor incoming voltage higher than the motor rated voltage. Doing so may cause an overload or motor burnout.

5-3-3 Motor Electronic Thermal Function

The motor electronic thermal function prevents the motor from overloading and burning. In addition, M1 has a braking resistor electronic thermal function. (Refer to *5-12-2 Braking Resistor Electronic Thermal Function* on page 5-75.)

- The motor electronic thermal function calculates the electronic thermal calculated value for motor protection based on the output current of the inverter. The status of the electronic thermal function can be checked by the monitor of electronic thermal overload protection for motor (monitor mode: 5_62). When 100% is reached in the percentage display, motor overload (alarm OL1 or OL2) is detected.
- The motor electronic thermal function sets Motor Electronic Thermal Level (F11/A07) and Motor Electronic Thermal Characteristic Selection (F10/A06), and Motor Electronic Thermal Time Constant (F12/A08).
- When Motor Electronic Thermal Overload Protection Data Retention (H89) is set to 1, the electronic thermal cumulative value and thermal cumulative value of the overload early warning are saved in the EEPROM when an insufficient voltage state has occurred, and, when the power is next turned ON, EEPROM saved values are used as the defaults for cumulative values.

Parameter No.	Function name	Data	Default data	Unit
F11/A07	1st Motor Electronic Thermal Level/2nd Motor Electronic Thermal Level *1	0.00; 0.01 to 2000 0.00: Disable 0.01 to 2000 A *Setting range is from 1%(HHD) to 135%(ND) of inverter rated current.	22.5	A
F10/A06	1st Motor Electronic Thermal Characteristic Selection/2nd Motor Electronic Thermal Characteristic selection *1	1 to 2 1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor non-ventilated motor or motor with separately powered cooling fan	1	-
F12/A08	1st Motor Electronic Thermal Time Constant/2nd Motor Electronic Thermal Time Constant *1	0.5 to 75.0	5	min
M59	Motor Electronic Thermal Monitor	0.0 to 100.0	0	%
H89	Motor Electronic Thermal Overload Protection Data Retention	0; 1 0: Disable 1: Enable	0	-
Related function		Output terminal functions (OL1, OL2)		

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

Motor Electronic Thermal Level (F11/A07)

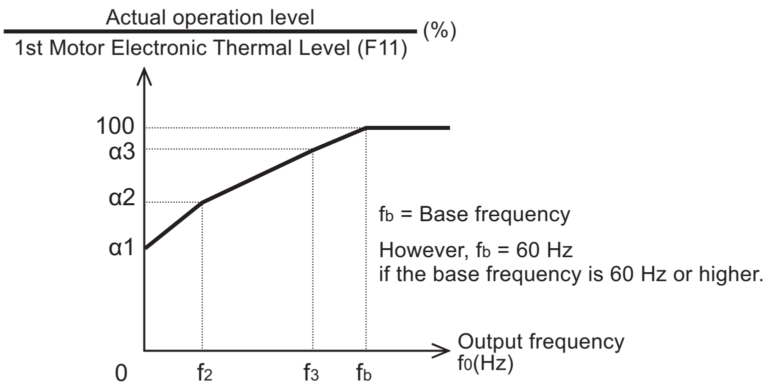
- Set the operation level of the electronic thermal for motor protection. To not use this function, set 0.00.
- Normally, set to the motor continuous allowable current (generally, about 1.0 to 1.1 times the motor rated current) when the motor is run at base frequency.

Motor Electronic Thermal Characteristic Selection (F10/A06)

- Select the characteristics of the motor cooling system.

● When Motor Electronic Thermal Characteristic Selection (F10/A06) = 1: For a general-purpose motor with shaft-driven cooling fan

- The figure below shows the electronic thermal operation characteristics. Characterization factors α1 to α3 and their switching frequencies f2 and f3 differ according to the characteristics of the motor.



- The following shows each factor that is set according to the motor characteristics selected by motor capacity and motor type (induction motor/PM motor).

(Induction motor (IM))

Motor capacity	Thermal time constant t (factory default)	Thermal time constant setting reference current value Imax	Characterization factor switching frequency		Characterization factor		
			f_2	f_3	α1	α2	α3
0.4, 0.75 kw	5 min	Continuous allowable current value × 150%	5 Hz	7 Hz	75%	85%	100%
1.5 to 3.7 kW					85%	85%	100%
5.5 to 11 kW				6 Hz	90%	95%	100%
15 kw				7 Hz	85%	85%	100%
18.5, 22 kW				5 Hz	92%	100 %	100%
30 to 45 kW	10 min		Base frequency × 33%	Base frequency × 83%	54%	85%	95%
55 to 90 kW					51%	95%	95%
110 kw min.					53%	85%	90%

(Synchronous motor (PM))

Motor capacity	Thermal time constant t (factory default)	Thermal time constant setting reference current value Imax	Characterization factor switching frequency		Characterization factor		
			f_2	f_3	α1	α2	α3
0.2 to 22 kW	5 min	Continuous allowable current value × 150%	Base frequency × 33%	Base frequency × 33%	69%	90%	90%
30 to 45 kW	10 min			Base frequency × 83%	54%	85%	95%
55 to 90 kW					51%	95%	95%
110 kw min.					53%	85%	90%

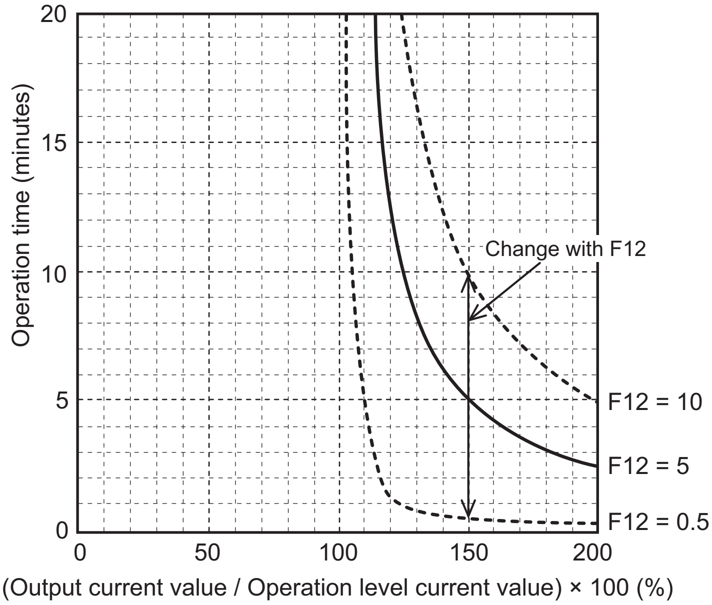
● When Motor Electronic Thermal Characteristic Selection (F10/A06) = 2: For an inverter-driven motor non-ventilated motor or motor with separately powered cooling fan

- The operation level is a constant value without decrease that is set at Motor Electronic Thermal Level (F11/A07) as there is no drop in the cooling effectiveness by output frequency.

Motor Electronic Thermal Time Constant (F12/A08)

- Set the thermal time constant of the motor. Set the electronic thermal operating time for when a current of 150% of the operation level set at Motor Electronic Thermal Level (F11/A07) flows continuously. The thermal time constant of a general motor is 5 minutes for 22kW or less (factory default).

(Example) When the data of F12/A08 is set to 5 (5 minutes)
When a current 150% of the overload detection level set as shown in the figure below flows for 5 minutes, the motor overload (alarms OL1/OL2) protection function operates. Also, for 120%, the motor overload protection function operates after approx. 12.5 minutes.
The time that an alarm actually is generated is shorter than the set data as the time from when the continuous allowable current (100%) is exceeded up to when the 150% level is reached also is taken into consideration.



Motor Electronic Thermal Warning

Use this function to output a warning signal before the motor electronic thermal function executes an overload protection. The electronic thermal warning operates at or above the current value set in the Overload early warning 2 Level (OL2) (E34). Generally, set to around 80% to 90% of the current value of the Motor Electronic Thermal Level (F11/A07). The temperature characteristics of the motor are set in Motor Electronic Thermal Characteristic Selection (F10/A06) or Motor Electronic Thermal Time Constant (F12/A08).

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	7: THM (Electronic thermal warning)	-	-

Parameter No.	Function name	Data	Default data	Unit
E34	Overload early warning 2 Level (OL2)	0.00; 0.01 to 176.0 0.00: Disable 0.01 to 176.0 A *Setting range is from 1%(HHD) to 200%(ND) of inverter rated current.	21	A

5-4 RUN command

5-4-1 RUN Command Selection

Select the input method for the RUN command.

Parameter No.	Function name	Data	Default data	Unit
F02 E102	1st RUN Command Selection 2nd RUN Command Selection *1	0 to 5 0: Operator (Direction of rotation input: terminal block) 1: External signal (FW or RV) 2: Operator (Forward rotation) 3: Operator (Reverse rotation) 4: RS-485 communication 5: Do not use	2	-
Related functions		Input Terminal [DI6] Function Selection (E98), Input Terminal [DI7] Function Selection (E99) Refer to *5-9-1 Input Terminal Functions* on page 5-51. Operation command (S06)*2		

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

*2. When “4: RS-485 communication” is selected at 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102), the FW command is executed by setting bit 0 of Operation command (S06) to ON, and the RV command is executed by setting bit 1 to ON. These parameters are exclusively for reading and writing via the RS-485 interface. These parameters are not displayed on the Operator. To check these parameters, use Sysmac Studio.

The operation method for data selected at 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102) is as follows.

Data	Operation method
0	When the RUN key on the Operator is pressed, forward rotation is performed when the FW terminal turns ON. Reverse rotation is performed when the RV terminal turns ON. When the STOP key is pressed, operation is stopped.
1	Forward rotation is performed when the FW terminal turns ON regardless of the RUN key on the Operator. Reverse rotation is performed when the RV terminal turns ON. Operation stops when both the FW and RV terminals are OFF or both are ON.
2	When the RUN key on the Operator is pressed, forward rotation is performed. When the STOP key is pressed, operation is stopped.
3	When the RUN key on the Operator is pressed, reverse rotation is performed. When the STOP key is pressed, operation is stopped.
4	When bit 00:FW in Operation command (S06) is turned ON via RS-485 communication, forward rotation is performed. When bit 01:RV is turned ON, reverse rotation is performed. When both are OFF or ON, operation is stopped.

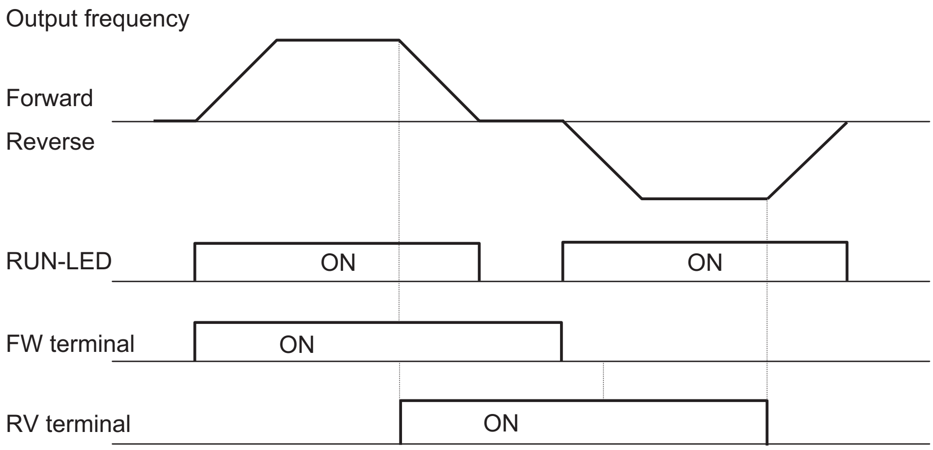
- When “0: Operator (Direction of rotation input: terminal block)” and “1: External signal (Digital input)” are selected at RUN Command Selection (F02/E102), allocate “98: FW (forward rotation)” and “99: RV (reverse rotation)” to each of Input Terminal [DI6] Function Selection (E98) and Input Terminal

[DI7] Function Selection (E99). Operation stops when both the FW and RV terminals are ON or OFF.

- When “1: External signal (Digital input)” is selected at RUN Command Selection (F02/E102), 3-wire input is possible. Refer to *3-wire Input Function (FW, STP, F/R)* on page 5-56.
- The RUN command from the Operator can be forcibly enabled via input terminals. Refer to *7-7-2 Forced Operator Function (OPE)* on page 7-74. The RUN command from an input terminal can also be forcibly enabled via input terminals. Refer to *7-7-3 Forced Terminal Block Function (F-TM)* on page 7-74.
- When the inverter is outputting to the motor, operation is in progress and the RUN-LED lights. Lights during deceleration after RUN command OFF. Goes out while the RUN command is ON at frequency reference 0 Hz as there is no output. When zero speed control is being executed, this lights as the inverter outputs even when the frequency reference is 0 Hz.

● Operation example

- The following shows an example of operation by forward command FW input and reverse command RV input when “1: External signal (Digital input)” is selected at RUN Command Selection (F02/E102).



5-5 Frequency Reference

5-5-1 Frequency Reference Selection

- Select the input method for the frequency reference.

Parameter No.	Function name	Data	Default data	Unit
F01	1st Frequency Reference Selection	0 to 15 0: Operator (and keys) (output frequency not inherited) 1: Analog Valtage Input (Input Terminal[AI1]) 2: Analog Current Input (Input Terminal[AI2](AII)) 3: Analog Valtage Input (Input Terminal[AI1])＋ Analog Current Input (Input-Termina (Input Terminal[AI2](AII)) 5: Analog Valtage Input (Input Terminal[AI2](AIV)) 7: UP/DOWN control 8: Digital Operator (and keys) (balancelessbumpless switching available) 10: Pattern operation 12: Pulse train input 13: Calculation result 14: RS-485 communication 15: Do not use	0	
C30	2nd Frequency Reference Selection*1		2	-
S06	Operation command	0000 to FFFF hex Bit1: REV Bit0: FWD	0	
Related functions		Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) Refer to *5-9-1 Input Terminal Functions* on page 5-51.		

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

The frequency reference method for data selected at 1st Frequency Reference Selection (F01) and 2nd Frequency Reference Selection (C30) is as follows.

Data	Frequency reference method
0	Sets the frequency reference via the Operator. When 1st control is selected, the setting value is reflected in 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99). When 2nd control is selected, the setting value is reflected in 2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (CE109).
1	Sets the frequency reference via the analog voltage input (input terminal [AI1]).
2	Sets the frequency reference via the analog current input (input terminal [AI2](AII)).
3	Sets the value obtained by adding the analog voltage input (input terminal [AI1]) and analog current input (input terminal [AI2](AII)) as the frequency reference.

Data	Frequency reference method
5	Sets the frequency reference via the analog voltage input (input terminal [AI2] (AIV)).
7	Sets the frequency reference via the UP and DOWN terminals.
8	Sets the frequency reference via the Operator. When “8” is set to Frequency Reference Selection (F01/C30), the frequency currently being output is inherited as the frequency reference value.
10	Sets the frequency reference via Pattern Operation / Timed Operation.
12	Sets the frequency reference via pulse train input.
13	The result of calculation of the frequency calculation function is set as the frequency reference.
14	Sets the frequency reference via RS-485 communication.

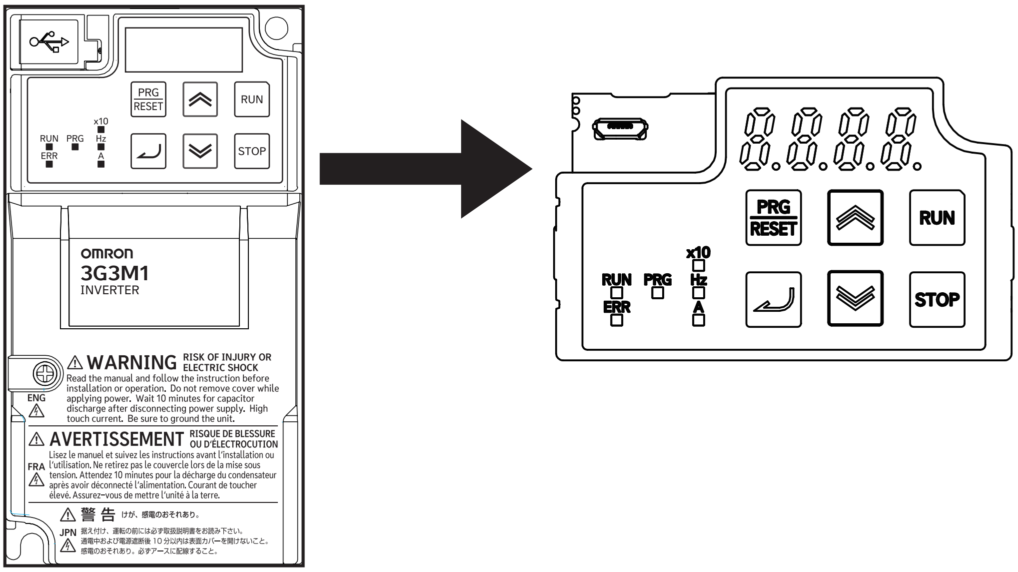
- The forced operation function and forced terminal block function are given priority over the frequency reference selected at Frequency Reference Selection (F01/C30). For details, refer to *7-7-2 Forced Operator Function (OPE)* on page 7-74 and *7-7-3 Forced Terminal Block Function (F-TM)* on page 7-74.

Command on the Operator (Frequency Reference Selection (F01/C30) = “0” “8”)

Sets the frequency reference via the Operator.

Parameter No.	Function name	Data	Default data	Unit
F01	Frequency Reference Selection	0: Operator (and keys) 8: Digital Operator (and keys) (balancelessbumpless switching available)	0	-

- The display when the power is ON can be set at Operator Display when Stopped Selection (E44). (Refer to *7-7-5 Initial Screen Selection* on page 7-75.)
- When the Operator is in the program mode or the alarm mode, the frequency reference cannot be changed by the key or key. When in the program mode or alarm ode, enter the RUN mode. (Refer to *3-1-2 Key Operation Method* on page 3-3.)
- When the key or key is pressed, the set frequency is displayed, and the lowermost digit of the set frequency flashes.
- The set frequency can be changed by pressing the key or key again. The setting value is reflected in 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99), 2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (E109) according to the 1st/2nd control selection.
- When the power is next turned ON again, operation is possible from the frequency reference that was active when the power was last turned OFF. (E64 = 0: Factory default)



- When the power is turned ON, operation starts from the set value that was saved before the power was last turned OFF. The timing that the set value is saved can be selected at Operator Reference Frequency Saving Selection (E64).

Parameter No.	Function name	Data	Default data	Unit
E64	Operator Reference Frequency Saving Selection	0; 1 0: Automatic saving (when main power is turned OFF) 1: Saving by Up/Down key and ↵ key	0	-

- When E64 = 0, the frequency reference that was set when the power was turned OFF is inherited when the power is turned ON again.
- When E64 = 1, the frequency reference that was saved by pressing the ↵ key when the frequency reference was changed is inherited. When the PRG RESET key is pressed without pressing the ↵ key, and approximately four seconds of inactivity pass, the frequency reference is considered as not having been confirmed, and operation starts from the value when the ↵ key was pressed when the power is next turned ON.
- When “8” is set to the data of Operator Reference Frequency Saving Selection (F01), and when a frequency setting is switched to by the Operator from a frequency setting means other than the Operator, the frequency setting before the value was switched is inherited as the default value of the frequency reference according to the Operator that switched the value. Operation is shockless even if the frequency setting is switched by this function.

Command Using Analog Voltage Input or Analog Current Input (Frequency Reference Selection (F01/C30) = “1” “2” “3” “5”)

Set value	Description
1	Sets the frequency reference via the analog voltage input (input terminal [AI1]).
2	Sets the frequency reference via the analog current input (input terminal [AI2](AII)).

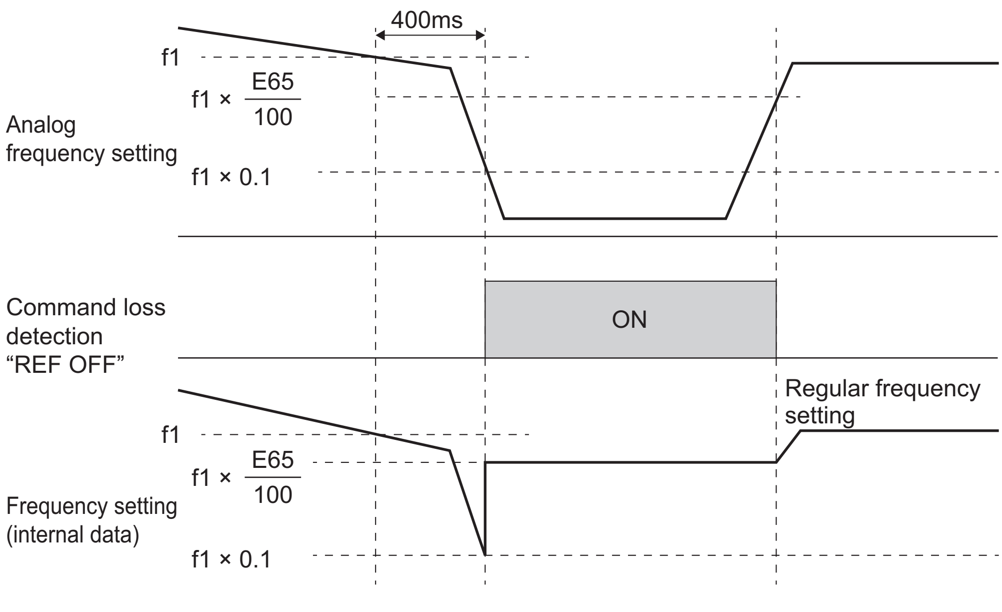
Set value	Description
3	Sets the value obtained by adding the analog voltage input (input terminal [AI1]) and analog current input (input terminal [AI2](AII)) as the frequency reference.
5	Sets the frequency reference via the analog voltage input (input terminal [AI2](AIV)).

- Analog input can adjust the input signal by gain and bias. (Refer to *7-3-2 Analog Input Start/End Function Settings* on page 7-34.)
- Behavior when the analog signal is disconnected can be set at analog reference loss detection.

● Analog Reference Loss Detection

When the analog frequency reference falls to 10% or lower of the frequency reference for 400 ms, the wiring of the analog frequency reference is judged to have become disconnected, operation is continued at the frequency of the ratio set at E65 for the frequency setting value, and the analog input reference loss detection "33: REF OFF (analog input reference loss)" terminal is turned ON. When the frequency setting value returns to the value set at E65 or higher, it is judged that the disconnection has been restored, and operation is performed at the legitimate frequency setting.

Parameter No.	Function name	Data	Default data	Unit
H193	Analog Reference Loss Detection Operation Selection	0: Decelerate to stop 20% to 120% 999% 999: Cancel	0	-



Additional Information

- With the frequency reference via analog input, select only linear acceleration/deceleration.

UP/DOWN Control (Frequency Reference Selection (F01/C30) = "7")

- Refer to *7-9-10 UP/DOWN control (UP, DWN)* on page 7-116.

Pattern Operation / Timed Operation Mode Selection (Frequency Reference Selection (F01/C30) = “10”)

- Refer to *5-5-3 Pattern Operation / Timed Operation Function* on page 5-33.

Command Based on Pulse Train Input (Frequency Reference Selection (F01/C30) = “12”)

- Refer to *7-9-17 Pulse Train Frequency Input* on page 7-140.

Command via Calculation Result of Frequency Calculation Function (Frequency Reference Selection (F01/C30) = “13”)

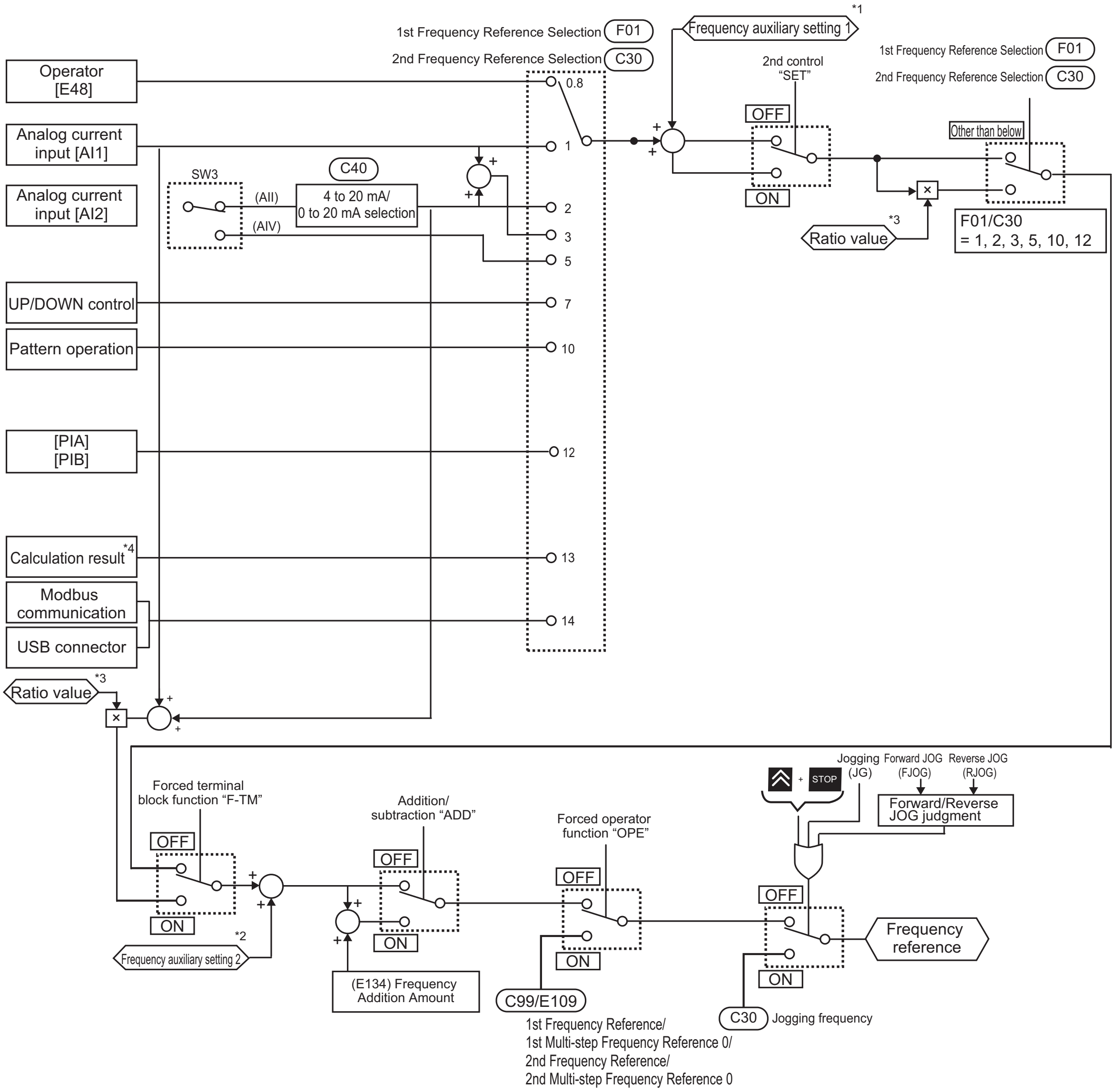
- Refer to *7-9-8 Frequency Calculation Function* on page 7-115.

Command Based on Communication (Frequency Reference Selection (F01/C30) = “14”)

- Refer to *Section 8 Communications Functions* on page 8-1.

Frequency Reference Correlation Chart

Set the frequency reference at 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30).
Alternatively, the frequency reference can be switched via multifunction input. Below shows a chart showing the correlation between priority, related parameters, and related multifunction input terminals when the frequency reference is switched.



The presence/absence of the pulse train command depends on the combination of the following parameter settings.

F01	C30	E131	E132	E119	Pulse train command
Any one is 12		Ignore			Set frequency
Any one is 13		Any one is 5		45	PID feedback
Other than the above				3	Without
Other than the above					Without

*1. Auxiliary frequency setting 1 is set by setting 1 to Extended functions (E61/E62/E63).
*2. Auxiliary frequency setting 2 is set by setting 2 to Extended functions (E61/E62/E63).
*3. Ratio value is set by setting 6 to Extended functions (E61/E62/E63).
*4. For details on the result of logical operation, refer to *7-9-8 Frequency Calculation Function* on page 7-115.

5-5-2 Frequency Limit

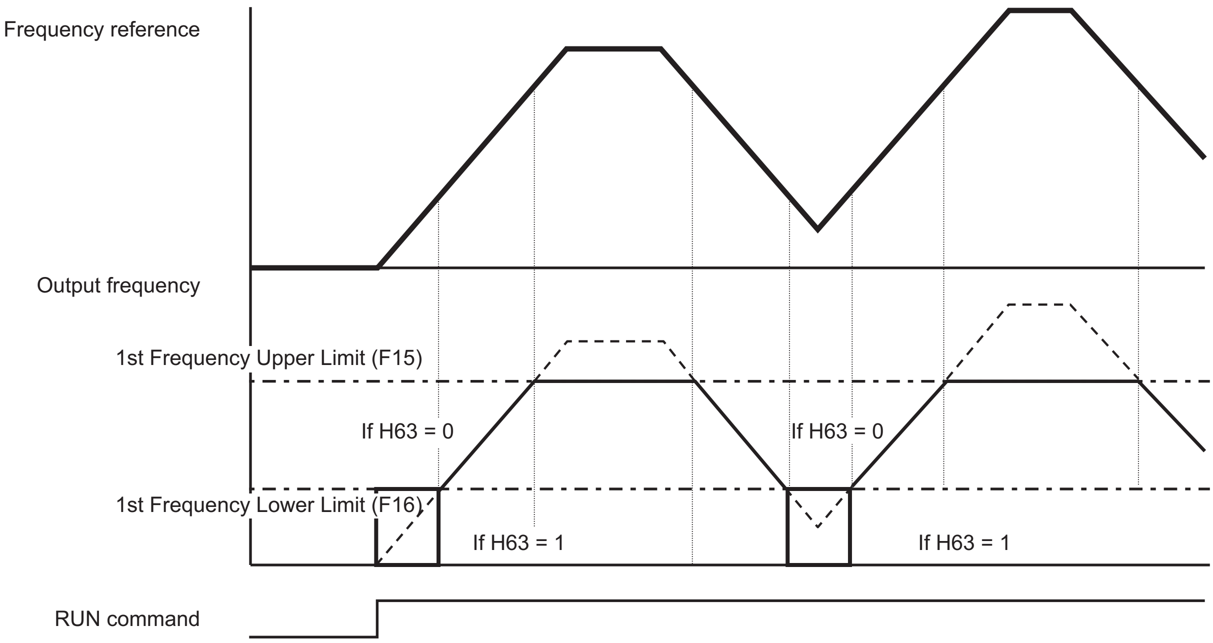
- Use this function to set the upper and lower limits of the output frequency. The set limits will be applied if the input frequency reference is beyond the upper/lower limit(s).
- Be sure to set so that the Frequency Upper Limit (F15/E117) is greater than the Frequency Lower Limit (F16/E118).
- Set the lower limit so that it does not reach or exceed Maximum Output Frequency (F03/A01).
- When 0 Hz is set to the upper limit, operation is limited to 0 Hz and disabled.

- Processing when the set frequency is less than the Frequency Lower Limit (F16/E118) can be selected at Frequency Lower Limit Operation Selection (H63).

Parameter No.	Function name	Data	Default data	Unit
F16/E117	1st Frequency Upper Limit/2nd Frequency Upper Limit*1	0.00 to 590.0	70.0	Hz
F16/E118	1st Frequency Lower Limit/2nd Frequency Lower Limit*1	0.00 to 590.0	0.0	Hz
H63	Frequency Lower Limit Operation Selection	0: Frequency Command is the Frequency Lower Limit. 1: Frequency Command is 0Hz	0	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

- When “0: Frequency Command is the Frequency Lower Limit” is selected at Frequency Lower Limit Operation Selection (H63), the output frequency becomes the frequency set at Frequency Lower Limit (F16/E118) even if the frequency reference is set to less than Frequency Lower Limit (F16/E118). Even if 0 Hz is set to the frequency reference, priority is given to the lower limit. For this reason, turn the RUN command OFF to stop output.



5-5-3 Pattern Operation / Timed Operation Function

- To perform Pattern Operation / Timed Operation, set Frequency Reference Selection (F01/C30) = “10.”
- The pattern operation function operates according to seven preset patterns.
- Operation time, rotation direction, acceleration/deceleration time, and the frequency reference are set to patterns.
- Three pattern operations can be selected: one cycle operation, repetition operation and constant speed operation after 1 cycle operation,
- The status of pattern operation can be output to output terminal [DO1].

- Timed operation is performed when “3: Timed operation” is selected at Pattern Operation / Timed Operation Mode Selection (C21).

Parameter No.	Function name	Data	Default data	Unit
C21	Pattern Operation / Timed Operation Mode Selection	0: 1 cycle operation*1 1: Repetition operation 2: Constant speed operation after 1 cycle operation*2 3: Timed operation	0	-
C22 to C28	Pattern Operation Stage 1 Operation Setting to Pattern Operation Stage 7 Operation Setting	0000 to FFFF hex Bit 15: 0 = Forward 1 = Reverse Bit 14: Fixed to 0 (Not used) Bit 13 to 12: Acceleration/Deceleration time selection 0=1st Acceleration Time 1 (F07)/1st Deceleration Time 1 (F08) 1 = 2nd Acceleration Time 1 (E10)/2nd Deceleration Time 1 (E11) 2 = 1st Acceleration Time 2 (E12)/1st Deceleration Time 2 (E13) 3= 2nd Acceleration Time 2 (E14)/2nd Deceleration Time 2 (E15) Bit 11 to 10: Minimum unit of operation time 0 = X 0.01 1 = X 0.1 2 = X 1 3 = X 10 Bit 9 to 0: Data part of operation time When minimum unit 0 (X 0.01); 000 hex to 3E7 hex (0.00 to 9.99) When minimum unit 1 (X 0.1); 064 hex to 3E7 hex (10.0 to 99.9) Note 1 When minimum unit 2 (X 1); 064 hex to 3E7 hex (100 to 999) Note 1 When minimum unit 3 (X 10); 064 hex to 258 hex (1000 to 6000) Note 2 Note 1) (0000 hex to 0063 hex)(03E8 hex to 03FF hex) cannot be set. Note 2) (0000 hex to 0063 hex)(0259 hex to 03FF hex) cannot be set.	0	-
C05 to C11	Multi-step Frequency Reference 1 to 15	0.00 to 590.00 Hz	0	Hz

Parame-ter No.	Function name	Data	Default data	Unit
E20 E21 E27	Output Terminal [DO1] Function Selection Output Terminal [DO2] Function Selection Output Terminal [ROA, ROB] Function Selection	16: TU (transition to pattern operation stage) 17: TO (pattern operation cycle operation completion) 18: STG1 (pattern operation stage No.1) 19: STG2 (pattern operation stage No.2) 20: STG4 (pattern operation stage No.4)	0	-

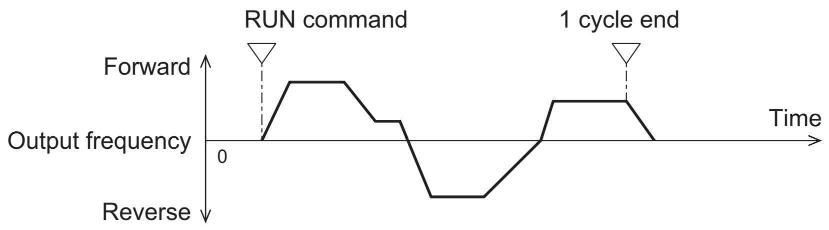
*1. With the deceleration time after end of one cycle, a deceleration stop is performed according to the setting value of 1st Deceleration Time 1 (F08).

*2. With constant speed operation after end of one cycle, constant speed operation is performed according to the last set frequency in pattern operation.

Pattern operation

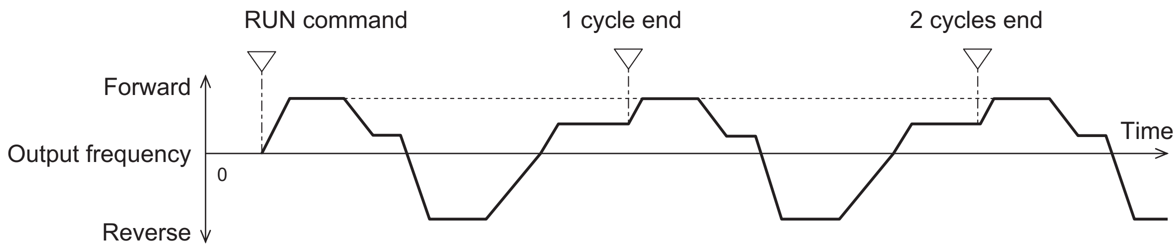
- Operation is as follows when 0 to 2 is selected at Pattern Operation / Timed Operation Mode Selection (C21.)

1. Pattern Operation / Timed Operation Mode Selection (C21) = “0: 1 cycle operation (Pattern operation)”
   A deceleration stop is performed after one cycle operation by the preset pattern.



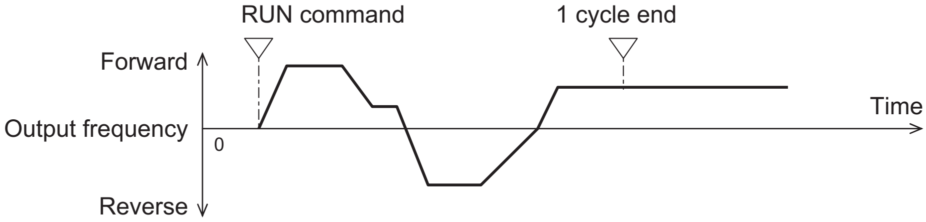
1 cycle operation

2. Pattern Operation / Timed Operation Mode Selection (C21) = “1: Repetition operation (Pattern operation)”
   Operation by the preset pattern is repeated.



Repetition operation

3. Pattern Operation / Timed Operation Mode Selection (C21) = “2: Constant speed operation (Pattern operation) after 1 cycle operation”
   After one cycle operation by the preset pattern, constant speed operation is performed in accordance with the last set frequency of pattern operation.
   To stop constant speed operation, turn the RUN command OFF.



Constant speed operation after 1 cycle operation

Pattern Operation Setting

- To set the patterns in pattern operation, set the operation time, rotation direction and acceleration/deceleration time to Pattern Operation Stage 1 Operation Setting to Pattern Operation Stage 7 Operation Setting (C22 to C28). The following describes the method for setting stages in Operator and in Sysmac Studio.

<Setting stages in Operator>
Set the operation time, rotation direction and acceleration/deceleration time of stages 1 to 7 to Pattern Operation Stage 1 Operation Setting to Pattern Operation Stage 7 Operation Setting (C22 to C28)

For operation on the Digital Operator, press the key three times for the respective parameter and set the three types of data.

If parameter setup is exited by the PRG RESET key before pressing the key three times and setting the three types of data, the data will not be updated.

Setting	Description
First time	The operation time is set in the range 0.0 to 6000 s.
Second time	The operation direction is to FW (forward) or RV (reverse).
Third time	The acceleration/deceleration time is set in the range 1 to 4. 1: Follows F07/F08 2: Follows E10/E11 3: Follows E12/E13 4: Follows E14/E15

<Setting stages in Sysmac Studio>
Set Pattern Operation Stage 1 Operation Setting to Pattern Operation Stage 7 Operation Setting (C22 to C28) in hexadecimal.
Example: In case of (reverse rotation, 2nd deceleration time, 10.0 s)
Rotation direction Reverse: 8000 hex
Acceleration/deceleration time 2nd acceleration/deceleration time: 1000 hex
Operation time 10.0 s = 0.1 × 100: 0400 hex + 0064 hex
Accordingly, the set value becomes 8000 hex + 1000 hex + 0400 hex + 0064 hex = 9464 hex

- Stages set with an operation time of 0.0 are disabled and are ignored.
- Each of Multi-step Frequency Reference 1 to 7 (C05 to C11) is applied to the frequency setting of stages 1 to 7.
- When "18: STG1 (pattern operation stage No.1)" to "20: STG4 (pattern operation stage No.4)" is allocated to output terminals DI1 to DI7, the stage (phase of operation) currently operating by ON/OFF of the output signal can be checked. For details, refer to the operation example figure below.

Operation pattern stage No.	Output terminal signal		
	STG1	STG2	STG4
Stage 1	ON	OFF	OFF
Stage 2	OFF	ON	OFF
Stage 3	ON	ON	OFF
Stage 4	OFF	OFF	ON
Stage 5	ON	OFF	ON
Stage 6	OFF	ON	ON
Stage 7	ON	ON	ON

- The signal can be output at completion of cycle operation when the pattern operation stage is transitioned to by allocating “16: TU (transition to pattern operation stage)” and “17: TO (pattern operation cycle operation completion)” to output terminals DI1 to DI7. For details, refer to the operation example figure below.

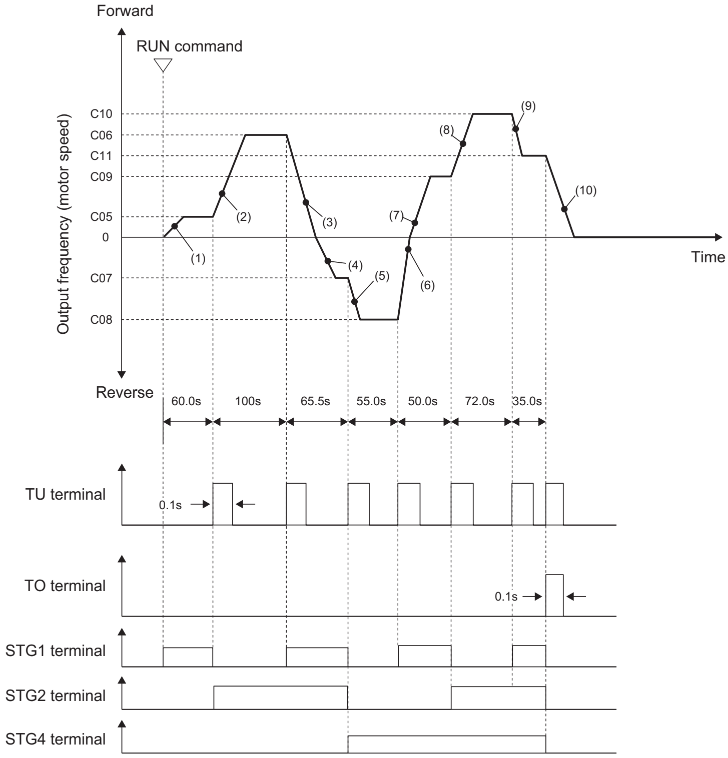
Precautions for Correct Use

When C21=0 is set and pattern operation is started by input via the FW/RV terminals turning ON, the motor stops when the final stage ends even if the FW/RV terminals stay ON.
At this time, when the value of F01/C30 is changed without turning the FW/RV terminals OFF, operation is immediately started according to the set frequency after the value is changed.

● Pattern operation setting examples

C21 (Pattern Operation / Timed Operation Mode Selection)	Stage No.	Operation time	Rotation direction	Acceleration/deceleration time	Operation (reference) frequency
		Set value	Set value	Set value	
0	Stage 1	60.0	F	2	C05 Multi-step Frequency Reference 1
	Stage 2	100	F	1	C06 Multi-step Frequency Reference 2
	Stage 3	65.5	r	4	C07 Multi-step Frequency Reference 3
	Stage 4	55.0	r	3	C08 Multi-step Frequency Reference 4
	Stage 5	50.0	F	2	C09 Multi-step Frequency Reference 5
	Stage 6	72.0	F	4	C10 Multi-step Frequency Reference 6
	Stage 7	35.0	F	2	C11 Multi-step Frequency Reference 7

This is illustrated as follows.



Acceleration times or deceleration times set at (1) to (10)

(1)	Acceleration time: E10
(2)	Acceleration time: F07
(3)	Deceleration time: E15
(4)	Acceleration time: E14
(5)	Acceleration time: E12
(6)	Deceleration time: E11
(7)	Acceleration time: E10
(8)	Acceleration time: E14
(9)	Deceleration time: E11
(10)	Deceleration time: F08

Timed operation

- With the timed operation function, operation is performed for a preset time and is stopped when the timer value reaches 0.
- Operation is performed by timed operation when “3: Timed operation” is selected at Pattern Operation / Timed Operation Mode Selection (C21).
- When operation is stopped during timed operation, timed operation can be stopped.
- The following shows the procedure for setting timed operation.
  1. Set “3: Timed operation” to Pattern Operation / Timed Operation Mode Selection (C21) and “13” to Operator Display Selection during Run (E43).
  2. Set the timer time (time unit: seconds) by the [Up] / [Down] keys while viewing the timer value on the LED monitor.
  3. When the RUN command is input and operation is started, the timer time is counted down. After the timer time elapses, the motor stops. (Timed operation is enabled also when the LED monitor displays a value other than the timer value.)

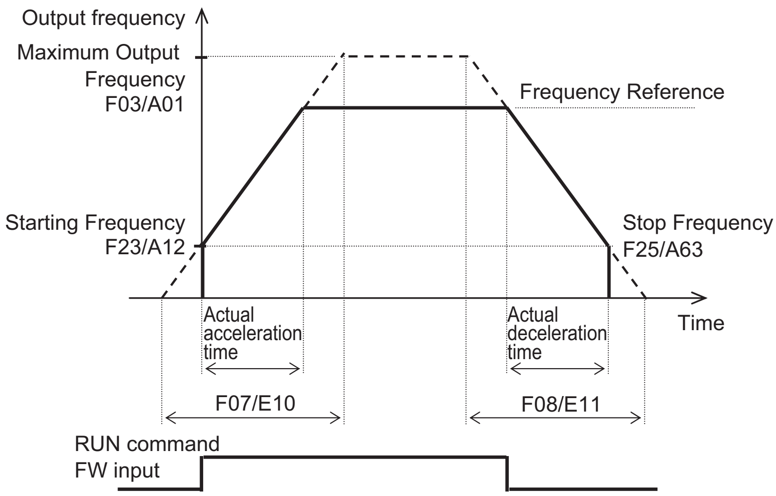
Additional Information

When operation is performed on the FW terminal, End and LED monitor display are displayed alternately when a deceleration stop is made after timed operation. When the FW terminal is set to OFF, the display returns to the LED monitor display.

5-6 Acceleration/deceleration time

5-6-1 Acceleration/Deceleration Time Setting

- Set the motor acceleration/deceleration time.
- The set time here is the acceleration/deceleration time from 0 Hz to the maximum frequency. The actual acceleration/deceleration time varies depending on the frequency reference value.
- This parameter is for setting the time constant of the primary delay filter with respect to the output frequency during acceleration/deceleration when V/f control (F42/A14 = 0 to 3) is selected. Set this parameter when an overshoot or undershoot occurs when the frequency arrives at the target frequency or the rotation of the motor stops and this causes mechanical problems. Setting a large value stabilizes the output frequency but worsens response.



Parameter No.	Function name	Data	Default data	Unit
F07	1st Acceleration Time 1	0.00 to 6000 s	6.00	s
E10	2nd Acceleration Time 1*1			
F08	1st Deceleration Time 1	0.00 to 6000 s	6.00	s
E11	2nd Deceleration Time 1*1			
d86	Acc/Dec Output Frequency Filter	0.000 to 5.000 s	0.000	s
Related functions		F03, A01, E01 to E05, E98, E99		

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

Additional Information

When a short deceleration time is set, the regenerative amount that is fed back at deceleration increases. When the regenerative amount exceeds the allowable capacity of the inverter, either the deceleration time is extended by the setting of Anti-regenerative Control Function Selection (H69), or overvoltage (OU2) is detected. To shorten the deceleration time, use the regenerative braking function. For details on the regenerative braking function, refer to *5-12 Regenerative Braking Function* on page 5-75.

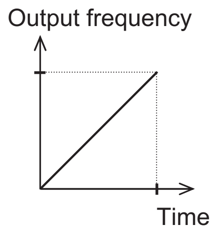
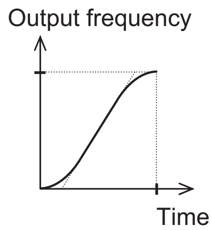
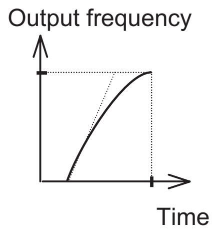
5-6-2 Acceleration/Deceleration Pattern

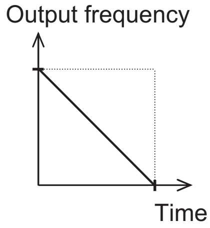
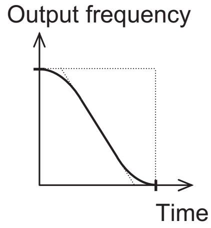
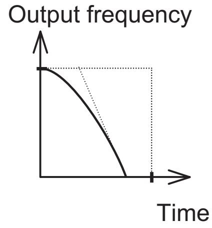
- Use this function to set the acceleration/deceleration pattern.
- Select the acceleration/deceleration pattern at Acceleration/Deceleration Pattern Selection (H07).
- These acceleration/deceleration patterns are enabled also for frequency reference input via analog input terminals.

Parameter No.	Function name	Data	Default data	Unit
H07	Acceleration/Deceleration Pattern Selection	0 to 3 0: Disable (Linear acceleration/deceleration) 1: S-curve acceleration/deceleration (Weak) 2: S-curve acceleration/deceleration (Arbitrary: According to H57 to H60) 3: Curve acceleration/deceleration	0	-
H57	S-curve Acceleration Range Frequency at Starting	0 to 100%	10	%
H58	S-curve Acceleration Range Frequency at End			
H59	S-curve Deceleration Range Frequency at Starting			
H60	S-curve Deceleration Range Frequency at End			
Related function		F03, A01		

Pattern Selection

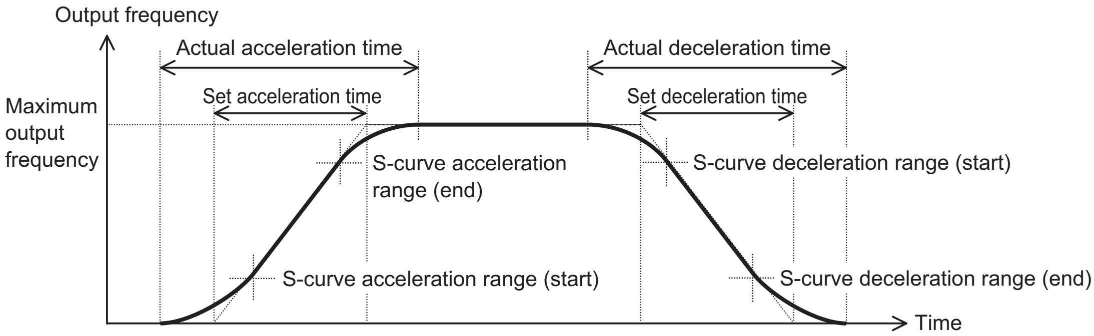
- Set Acceleration/Deceleration Pattern Selection (H07) according to the following table.

H07 (Acceleration/ Deceleration Pattern Selection)	Set value			
	0	1	2	3
	Disable (Linear acceleration/deceleration)	S-curve acceleration/ deceleration	S-curve acceleration/ deceleration (Arbitrary)	Curve acceleration/ deceleration
At acceleration				

H07 (Acceleration/ Deceleration Pattern Selection)	Set value			
	0	**1**	**2**	**3**
	Disable (Linear acceleration/deceleration)	**S-curve acceleration/ deceleration**	**S-curve acceleration/ deceleration (Arbitrary)**	**Curve acceleration/ deceleration**
At deceleration				

S-curve Acceleration/Deceleration Range

- When “2: S-curve acceleration/deceleration (Arbitrary)” is selected at Acceleration/Deceleration Pattern Selection (H07), set S-curve Acceleration Range Frequency at Starting (H57), S-curve Acceleration Range Frequency at End (H58), S-curve Deceleration Range Frequency at Start (H59) and S-curve Deceleration Range Frequency at End (H60). When “1: S-curve acceleration/deceleration” is set at Acceleration/Deceleration Pattern Selection (H07), each are fixed at 5%.
- The larger the values of S-curve Acceleration Range Frequency at Starting (H57), S-curve Acceleration Range Frequency at End (H58), S-curve Deceleration Range Frequency at Start (H59) and S-curve Deceleration Range Frequency at End (H60) are, the gentler acceleration/deceleration is performed. For this reason, the actual acceleration/deceleration time is longer than the set acceleration/ deceleration time.



	S-curve acceleration range (start)	S-curve acceleration range (end)	S-curve deceleration range (start)	S-curve deceleration range (end)
S-curve acceleration/deceleration	5% (fixed)	5% (fixed)	5% (fixed)	5% (fixed)
S-curve acceleration/deceleration (Arbitrary)	0 to 100% S-curve Acceleration Range Frequency at Starting (H57)	0 to 100% S-curve Acceleration Range Frequency at End (H58)	0 to 100% S-curve Deceleration Range Frequency at Starting (H59)	0 to 100% S-curve Deceleration Range Frequency at End (H60)

5-6-3 Acceleration/Deceleration Stop Function

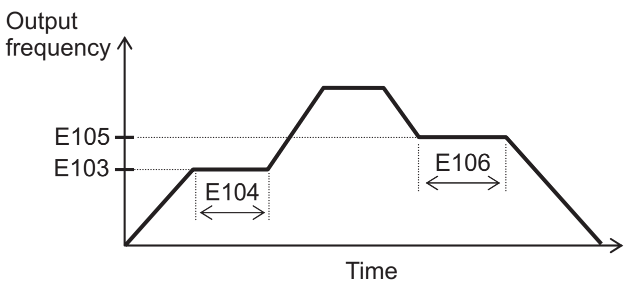
- This function causes the inverter stop accelerating/decelerating temporarily and start running at a constant speed at the frequency output at that time.
- There are two acceleration/deceleration stop methods as follows, which can be used in conjunction with each other.
  - When the output frequency reaches the set frequency, acceleration/deceleration stops for the set stop time.
  - Stop the acceleration/deceleration operation by entering “163: HLD (Acceleration/deceleration stop)” in Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).

Parameter No.	Function name	Data	Default data	Unit
E103	Acceleration Stop Frequency	0.00 to 590.0	0.00	Hz
E104	Acceleration Stop Time	0.0 to 60.0	0.0	s
E105	Deceleration Stop Frequency	0.00 to 590.0	0.00	Hz
E106	Deceleration Stop Time	0.0 to 60.0	0.0	s
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	163: HLD (Acceleration/deceleration stop)	-	-

- If the HLD terminal is ON, acceleration/deceleration operation stops regardless of the stop time. Until the set stop time elapses, acceleration/deceleration stops continuously even if the HLD terminal is turned OFF during the set stop frequency.

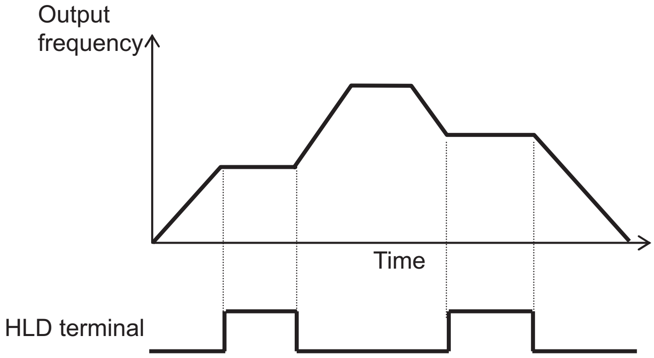
Stopping when the specified frequency/stop time is reached

- Set the frequency at which acceleration operation is stopped to E103, and set the time that acceleration operation is stopped to E104. To not stop acceleration operation, set Acceleration Stop Time (E104) to 0.0.
- Set the frequency at which deceleration operation is stopped to E105, and set the time that deceleration operation is stopped to E106. To not stop deceleration operation, set Deceleration Stop Time (E106) to 0.0.



Stopping via input to a multifunction input terminal

- When the HLD terminal is turned ON during acceleration, acceleration is stopped, and when it is turned OFF, acceleration is resumed.
- When the HLD terminal is turned ON during deceleration, deceleration is stopped, and when it is turned OFF, deceleration is resumed.



5-6-4 2-step Acceleration/Deceleration Function

- Use the 2-step acceleration/deceleration function to control two acceleration/deceleration time.
- The acceleration/deceleration time switching method can be selected from the following four.
  - E125/E126 = 0: Switching by 2CH terminal (Input Terminal Function Selection set to “159: 2CH (2-step acceleration/deceleration)”) (Example 1)
  - E125/E126 = 1: Switching by 2-step acceleration/deceleration (E127 to E130) (switching frequency set at E127 to E130) (Example 2)
  - E125/E126 = 2: Switching at forward/reverse switching (Example 3)
  - E125/E126 = 3: Switching by RT1, RT2 terminals (Example 4)
- To switch via an input terminal, allocate “159: 2CH (2-step acceleration/deceleration),” or “4: RT1 (2-step acceleration/deceleration),” “5: RT2 (Acceleration/deceleration Time Selection 2)” to one of Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
- For acceleration time 2 (E12/E14) and deceleration time 2 (E13/E14), set the time from frequency 0 Hz up to the maximum frequency in the same way as acceleration time 1 (F07/E10) and deceleration time 1 (F08/E11).
- Acceleration/deceleration pattern and acceleration/deceleration operation stop also can be used.

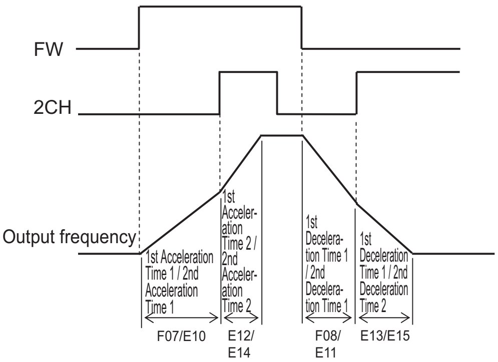
Parameter No.	Function name	Data	Default data	Unit
F07	1st Acceleration Time 1	0.00 to 6000	6.00	s
F08	1st Deceleration Time 1			
F10	2nd Acceleration Time 1*1			
E11	2nd Deceleration Time 1*1			
E12	1st Acceleration Time 2			
E13	1st Deceleration Time 2			
E14	2nd Acceleration Time 2*1			
E15	2nd Deceleration Time 2*1			

Parameter No.	Function name	Data	Default data	Unit
E125	1st 2-step Acceleration/ Deceleration switching Condition Selection	0: Switching by 2CH terminal (159: 2-step acceleration/deceleration) 1: Switching by setting 2: Forward and reverse 3: Switching by RT1, RT2 terminals	0	-
E126	2nd 2-step Acceleration/Deceleration Switching Condition Selection*1			
E127	1st 2-step Acceleration Switching Frequency	0.00 to 590.0	0.00	Hz
E128	2nd 2-step Acceleration Switching Frequency*1			
E129	1st 2-step Deceleration Switching Frequency			
E130	2nd 2-step Deceleration Frequency*1			
d86	Acc/Dec Output Frequency Filter	0.000 to 5.000	0.000	s
Related functions		F07, E10, F08, E11, E01 to E05, E98, E99		

*1. To enable switching to the 1st and 2nd control, allocate "12: SET (2nd control)" to either of input terminal [DI1] to [DI7].

2-step Acceleration/Deceleration Switching Condition Selection (E125/E126 = "0: Switching by 2CH terminal (159: 2-step Acceleration/Deceleration)" (Example 1)

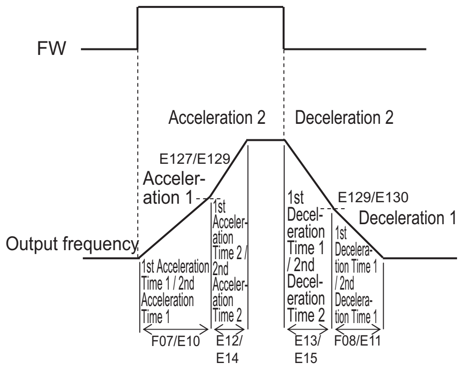
- When 2CH terminal is ON, acceleration/deceleration is performed at acceleration time 2 (E12/E14) or deceleration time 2 (E13/E15). When the terminal is OFF, acceleration/deceleration is performed at acceleration time 1 (F07/E10) or deceleration time 1 (F08/E11).



2-step Acceleration/Deceleration Switching Condition Selection (E125/E126 = "2: Switching only at forward/reverse switching" (Example 2)

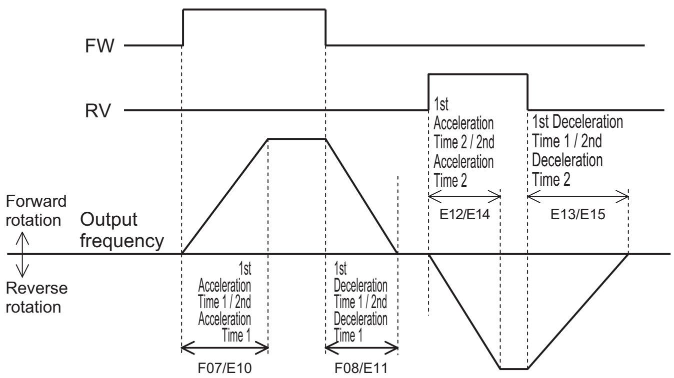
- During forward rotation, acceleration is performed at acceleration time 1 (F07/E10) from output frequency 0 Hz up to 2-step Acceleration Switching Frequency (E127/E129). Acceleration is performed at acceleration time 2 (E12/E14) from 2-step Acceleration Switching Frequency (E127/E129) up to the maximum output frequency.
- During reverse rotation, deceleration is performed at deceleration time 1 (F08/E11) from output frequency 0 Hz up to 2-step Deceleration Switching Frequency (E129/E130). Deceleration is

performed at deceleration time 2 (E13/E15) from 2-step Deceleration Frequency (E129/E130) up to the maximum output frequency.



2-step Acceleration/Deceleration Switching Condition Selection (E125/E126 = “2: Switching at forward/reverse switching” (Example 3)

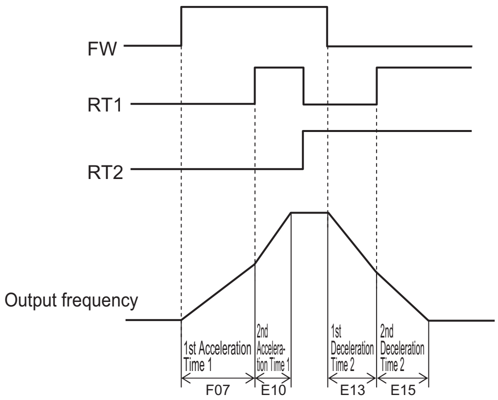
- During forward rotation, acceleration/deceleration is performed at acceleration time 1 (F07/E10) or deceleration time 1 (F08/E11). During reverse rotation, acceleration/deceleration is performed at acceleration time 2 (E12/E14) or deceleration time 2 (E13/E15).



2-step Acceleration/Deceleration Switching Condition Selection (E125/E126 = “3: Switching by RT1 Terminal (4: 2-step Acceleration/Deceleration), RT2 Terminal (5: Acceleration/Deceleration Time Selection 2)” (Example 4)

- With RT1 terminal (4: 2-step Acceleration/Deceleration) and RT2 terminal (5: Acceleration/Deceleration Time Selection 2) combined, select the acceleration/deceleration time during which acceleration/deceleration is performed.

RT2 terminal	RT1 terminal	Selected acceleration/deceleration time
OFF	OFF	1st Acceleration Time 1 (F07), 1st Deceleration Time 1 (F08)
OFF	ON	2nd Acceleration Time 1 (E10), 2nd Deceleration Time 1 (E11)
ON	OFF	1st Acceleration Time 2 (E12), 1st Deceleration Time 2 (E13)
ON	ON	2nd Acceleration Time 2 (E14), 2nd Deceleration Time 2 (E15)


FW
RT1
RT2
Output frequency
1st Acceleration Time 1
2nd Accelera-tion Time 1
1st Deceleration Time 2
2nd Deceleration Time 2
F07
E10
E13
E15

5-7 Stop Operation

The stop operation methods are as follows.

- Stop by RUN command

Trigger	Stop operation	Reference page
STOP key on the Operator	Select stop by deceleration time or free-run stop at Stop Selection (H11). The STOP key priority function can be used.	page 7-79
FW terminal/RV terminal or 3-wire operation stop		page 5-56
Operation stop via Modbus communication		page 8-166
Jogging operation stop		page 5-60

- Stop from external input terminal

Trigger	Stop operation	Reference page
Forced stop (30: STOP) terminal	Deceleration Time for Forced Stop (H56)	page 7-148
External trip (9: EXT) terminal	Free-run stop	page 7-85
Free-run stop (7: FRS) terminal	Free-run stop	page 7-59

- Stop by error occurrence

Trigger	Stop operation	Reference page
Trip by error occurrence	Free-run stop	page 9-4
Overvoltage/overcurrent occurrence	Select trip or restart at Overvoltage/ Overcurrent Restart Function Selection (E139).	page 7-56
Momentary power failure	Select whether to perform a free-run by trip or perform continuous running or a restart at a momentary power failure at Power Interruption Restart Mode Selection (F14).	page 7-47

5-7-1 Stop Selection

- Select whether you want the motor to make a deceleration stop according to the deceleration time setting or a free-run stop, when the stop command is input via the Digital Operator or the control circuit terminal block.
- Stop Selection (E11) is enabled by a stop by the following selected at RUN Command Selection (F02). Priority can be set to the STOP key on the Operator.
- In position control, a deceleration stop is performed regardless of the setting of Stop Selection (H11).
- When STOP Key Priority enable (H96 = 1 or 3) is selected and “1: External signal (digital input)” or “4: RS-485 communication” is selected at RUN Command Selection (F02/E102), when the STOP key is pressed, stop operation in accordance with the setting of Stop Selection (H11) is performed, and the operation error (Er6: sub code 1) is displayed on the LED monitor.

Parameter No.	Function name	Data	Default data	Unit
H11	Stop Selection	0: Normal deceleration 1: Free run stop	0	-
H96	STOP Key Priority/Start Check Function	0: Disable STOP key priority, disable start check function 1: Enable STOP key priority, disable start check function 2: Disable STOP key priority, enable start check function 3: Enable STOP key priority, enable start check function	0	-
Related function		RUN Command Selection (F02/E102) Input Terminal Function Selection (E00 to E05, E98, E99) Deceleration time (F07, E10, F08, E11)		

When Normal Deceleration Stop Is Selected (Stop Selection (H11) = "0")

- Deceleration stop according to the selected deceleration hold time. For details, refer to *5-6-1 Acceleration/Deceleration Time Setting* on page 5-39.

When Free Run Stop Is Selected (Stop Selection (H11) = "1")

- By the free run stop function, power to the motor is cut off to stop the motor.
- To use external braking, select free-run stop. Using external braking midway during a deceleration stop may cause an overload or overcurrent.
- If operation is started again during free run operation, the inverter will restart according to Free Run Stop Restart Operation Selection (H441).

5-8 Reset

5-8-1 Reset Function

- Use the reset function to reset the trip status (output shutoff status caused by occurrence of error) of the inverter.
- The reset function is executed by the PRG RESET key on the Operator, input terminal "8: RS (Reset)" terminal, Operation command (S06 bit 15:RST) via Modbus communication or the Alarm Reset Command (S14).
- When a reset is performed with the RUN command ON, the inverter may abruptly start depending on the setting of the STOP Key Priority/Start Check Function (H96). When performing a reset operation, ensure that the RUN command is OFF. For details, refer to *Start Check Function* on page 7-79.

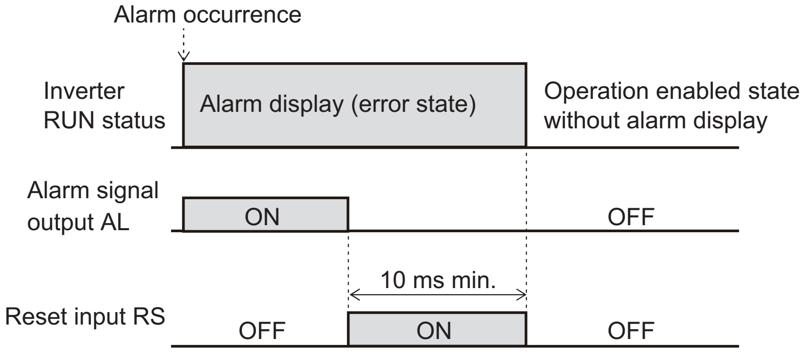
Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	8: RS (Reset)	-	-
S14	Alarm Reset Command	0: Disable 1: Alarm reset	0	-
S06	Operation command	bit 15: RST	0	-
Related function		Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), Output Terminal [ROA, ROB] Function Selection (E27) = "99: AL (Alarm signal)"		

Reset by Operator

Reset alarms and cancel errors by pressing the PRG RESET key on the Operator.

Reset from Terminal

When the state of the RS (reset) terminal is changed from OFF to ON, the alarm is reset and AL (alarm output) output allocated to the multifunction output terminal is set to OFF. When it is next changed from ON to OFF, the alarm display is erased and the error state is cleared. Ensure at least 10 ms as the time for turning the RS (reset) terminal ON. During normal operation, keep the terminal set to OFF.



Reset via Modbus Communication

The alarm can be reset by one of the following operations via Modbus communication.

- Set 1 to Alarm Reset Command (S14). (After a reset, this command automatically returns to 0.)
- The state of bit 15 of Operation command (S06) is changed from 0 to 1, then returns to 0. (It does not automatically return to 0.)

Additional Information

Be sure to confirm that the RUN command is turned OFF before resetting the alarm because the machine may abruptly start depending on the setting of STOP Key Priority/Start Check Function (H96).

5-9 Multi-function Input

5-9-1 Input Terminal Functions

Functions can be operated via input terminals by allocating the functions to input terminals [DI1] to [DI7]. This section describes primary functions. For details on other functions, refer to *7-2 Multifunction Input/Output Functions List* on page 7-22.

- Set selection of functions to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	Refer to the table below or *7-2 Multifunction Input/Output Functions List* on page 7-22.	-	-
H324 to H330	Input Terminal [DI1] Response Time to Input Terminal [DI7] Response Time	1 to 400 (ms)	1	ms

- By setting data in which 1000 is added to the set data, it is possible to switch from an NO contact input to an NC contact input. However, as standard, input is an NC contact, and can be changed to an NO contact by setting data in which 1000 is added. (Refer to *7-2-1 Multifunction Input Selection* on page 7-22.)

Example 1) SET terminal (2nd control)
To use the function for an NO contact, set 12. To use the function for an NC contact, set 1012.

Example 2) STP terminal (3-wire stopping: NC contact)
To use the function for an NC contact, set 6. To use the function for an NO contact, set 1006.

- If the same function is allocated to the multifunction input terminals, and if any one of the multifunction input terminals to which the function is allocated, except for the exceptions below, turns ON, the function is handled as ON. If all terminals to which "98: FW (forward rotation)" and "99: RV (reverse rotation)" is allocated are ON, the function is handled as ON.
- Set the response time for each multifunction input terminal DI1 to DI7 independently. This function is effective for removing noise caused by chattering, etc. Inputs are set when the status matches twice after checking the statues of the input terminals at each individual set response time. For example, when 400 ms is set, up to 800 ms is required until an input is set.

Fig. 1: Example of response time matching twice and recognition of inverter ON

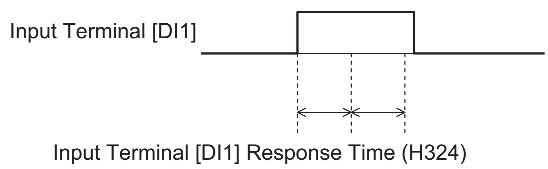
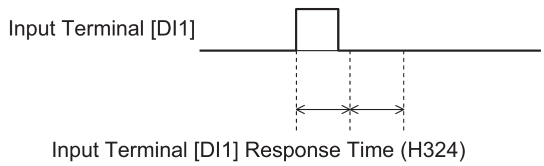


Fig. 2: Example of response time matching less than twice and non-recognition of inverter ON



Parameter No.	Set data	Function name	Reference item	Reference page
E01 to E05, E98, E99	6	SET (2nd control)	2nd control	page 5-55
	98	FW (forward rotation)*1	Forward run command	
	99	RV (reverse rotation)*1	Reverse run command	
	6	STP (3-wire stopping: NC contact)	3-wire input function	page 5-56
	97	F/R (3-wire forward/reverse rotation)		
	0	CF1 (Multi-step speed setting binary 1)	Multi-step speed operation function	page 5-57
	1	CF2 (Multi-step speed setting binary 2)		
	2	CF3 (Multi-step speed setting binary 3)		
	3	CF4 (Multi-step speed setting binary 4)		
	173	SF1 (Multi-step speed setting bit 1)		
	174	SF2 (Multi-step speed setting bit 2)		
	175	SF3 (Multi-step speed setting bit 3)		
	176	SF4 (Multi-step speed setting bit 4)		
	177	SF5 (Multi-step speed setting bit 5)		
	178	SF6 (Multi-step speed setting bit 6)		
	179	SF1 (Multi-step speed setting bit 7)		
	10	JG (Jogging)	Jogging	page 5-60
	159	2CH (2-step acceleration/deceleration)	2-step acceleration/deceleration	page 5-66
	8	RS (Reset)	Reset	page 5-66

*1. "98: FW (forward rotation)" and "99: RV (reverse rotation)" can be allocated to only Input Terminal [DI6] Function Selection (E98) or Input Terminal [DI7] Function Selection (E99). When one function has been allocated to two terminals, the state is considered to be ON by both terminals turning ON.

2nd Control Function (SET)

On the M1 series, two controls are held in two parameters. There are three types of parameters: shared parameters, parameters for 1st control and parameters for 2nd control. Parameters for 1st control and parameters for 2nd control are switched for to use.

- To enable switching to the 1st and 2nd control, allocate "12: SET (2nd control)" to either of input terminal [DI1] to [DI7]. (OFF: 1st control, ON: 2nd control)
- The status of the selected control can be checked via external output terminals by allocating "49: SETM (2nd control under selection)" to Output Terminal [DO1] Function Selection (E20), Output

Terminal [DO2] Function Selection (E21) and Output Terminal [ROA, ROB] Function Selection (E27). When the SET terminal is turned ON, 2nd control is selected, and 2nd control under selection (49: SETM) turns ON.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	12: SET (2nd control selected)	-	-
Related function		Sets “49: SETM (2nd control under selection)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) and Output Terminal [ROA, ROB] Function Selection (E27).		

- 1st control and 2nd control cannot be switched when operation is stopped. During operation, the SET terminal does not operate even if it is turned ON.
  The functions that can be switched by the SET terminal are as shown below.

Parameter No.		Parameter name
1st control	2nd control	
F042	A014	Drive control selection
F037	A013	V/f characteristics selection
F002	E102	RUN command selection
F001	C030	Frequency Reference Selection
C099	E109	Frequency Reference/Multi-step Frequency Reference 0
F003	A001	Maximum output frequency
F004	A002	Base Frequency
F005	A003	Rated Voltage at Base Frequency
F006	A004	Rated Voltage at Maximum Output Frequency
F007	E010	Acceleration time 1
F008	E011	Deceleration time 1
E012	E014	Acceleration time 2
E013	E015	Deceleration time 2
E125	E128	2-step Acceleration/Deceleration Switching Condition Selection
E127	E126	2-step Acceleration Switching Frequency
E129	E130	2-step Deceleration Frequency
F010	A006	Motor Electronic Thermal Characteristic Selection
F011	A007	Motor Electronic Thermal Level
F012	A008	Motor Electronic Thermal Time Constant
F015	E117	Frequency Upper Limit
F016	E118	Frequency Lower Limit
F020	A009	DC Injection Braking Start Frequency
F021	A010	DC Injection Braking Level
F022	A011	DC Injection Braking Time
F023	A012	Starting frequency
F024	A062	Starting Frequency Holding Time
F025	A063	Stop Frequency
F038	A064	Stop Frequency Detection Method Selection
F039	A065	Stop Frequency Holding Time

Parameter No.		Parameter name
1st control	2nd control	
H068	A040	Slip Compensation Operating Conditions Selection
H080	A041	Output current fluctuation damping gain for motor
F043	E146	Overload Protect Function Selection
F044	E147	Overload Protect Level
E037	E056	Overload Early Warning Detection Level
E038	E055	Overload Early Warning Detection Timer
E039	A061	Display Coefficient 1 for Transport Time / Auxiliary Display Coefficient 1 for Speed Monitor
E050	A060	Display coefficient for speed monitor
E112	E113	Torque Boost Function Selection
F009	A005	Manual Torque Boost Voltage
E122	E123	AVR Function Selection
C053	C054	Input Terminal [AI1, AI2] Normal/Inverse Operation for Frequency Command
P001	A015	Number of motor poles
P002	A016	Motor capacity
P003	A017	Motor Rated Current
P004	A018	Auto Tuning　Function Selection
P005	A019	Online Tuning Function Selection
P006	A020	Motor Armature Resistance
P007	A021	Motor Parameter %R1
P008	A022	Motor Parameter %X
P053	A053	Motor %X Correction Factor
P009	A023	Slip Compensation Gain for Driving
P010	A024	Slip Compensation Response Time
P011	A025	Slip Compensation Gain for Braking
P012	A026	Rated Slip Frequency
P013	A027	Iron Loss Factor 1
P016	A030	Magnetic Saturation Factor 1
P017	A031	Magnetic Saturation Factor 2
P018	A032	Magnetic Saturation Factor 3
P019	A033	Magnetic Saturation Factor 4
P020	A034	Magnetic Saturation Factor 5
P055	A055	Torque Current for Vector Control
P056	A056	Induced Voltage Factor for Vector Control

- The following parameters are enabled only when 1st control is selected. When 2nd control is selected, this control operates by setting the following parameters.

Parameter No.	Parameter name
F018	Input Terminal [AI1, AI2] Bias for 1st Frequency Command
C050	Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command
H195	DC Injection Braking Startup Time
H078	1st Motor Maintenance Interval
H079	1st Preset Startup Count for Motor Maintenance
M081	1st Remaining Time before the Next Motor Maintenance
M085	1st Remaining Startup Times before the Next Motor Maintenance

Parameter No.	Parameter name
P030	1st PM Motor Starting Method
P060	1st PM Motor Armature Resistance
P061	1st PM Motor d-axis Inductance
P062	1st PM Motor q-axis Inductance
P063	1st PM Motor Induced Voltage Ke
P064	1st PM Motor Iron Loss
P065	1st PM Motor d-axis Inductance Magnetic Saturation Correction
P074	1st PM Motor Reference Current at Starting
P085	1st PM Motor Flux Limitation Value
P087	1st PM Motor Reference Current for Magnetic Pole Detection
P090	1st PM Motor Overcurrent Protection Level
P095	1st PM Motor Magnetic Pole position Offset
d080	1st PM Motor Magnetic Pole Position Pull-in Frequency

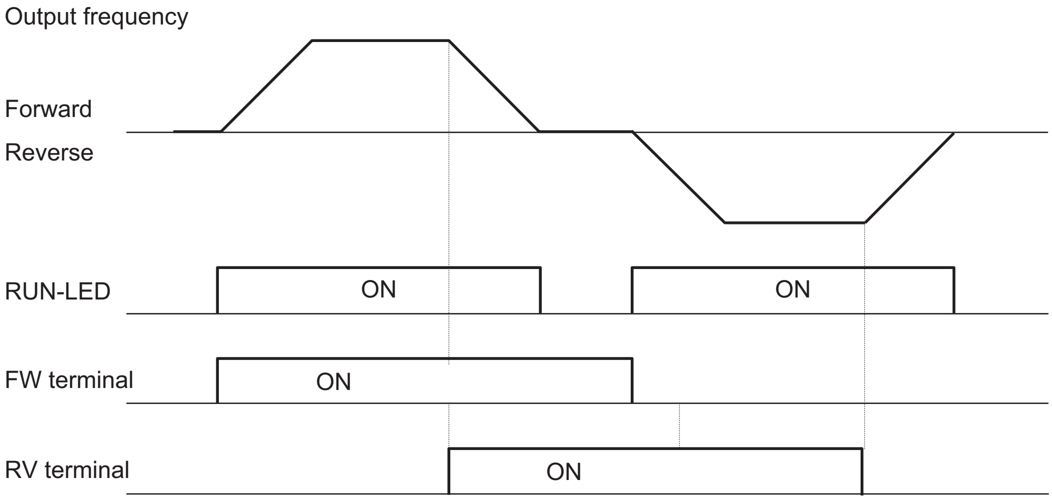
Forward RUN Command (FW) and Reverse RUN Command (RV)

- To input the forward RUN and reverse RUN commands via the control circuit terminals, allocate “98: FW” and “99: RV” to Input Terminal [DI6] Function Selection (E98) and Input Terminal [DI7] Function Selection (E99). FW (forward rotation) and RV (reverse rotation) can be set to only Input Terminal [DI6] Function Selection (E98) and Input Terminal [DI7] Function Selection (E99).
- Set “1: External signal (digital input)” to 1st RUN Command Selection (F02) and 2nd RUN Command Selection (E102).
- If all assigned terminals to which the same RUN command (FW or RV) is assigned to input terminals [DI6] and [DI7] are ON, the function is handled as ON.

Parameter No.	Function name	Data	Default data	Unit
F02/E102	1st RUN Command Selection/2nd RUN Command Selection*1	1: External signal (digital input)	2	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	98: FW (forward rotation) 99: RV (reverse rotation)	-	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

- When both FW and RV turn ON, operation is the same as when they are both OFF.



3-wire Input Function (FW, STP, F/R)

- To select 3-wire input, allocate the three parameters “98: FW (forward rotation),” “6: STP (3-wire stopping)” and “97: F/R (3-wire forward/reverse rotation)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
- Set “1: External signal (digital input)” to 1st RUN Command Selection (F02) and 2nd RUN Command Selection (E102).

Parameter No.	Function name	Data	Default data	Unit
F02/E102	1st RUN Command Selection/2nd RUN Command Selection*1	1: External signal (digital input)	2	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	98: FW (forward rotation)*2 6: STP (3-wire stopping: NC contact) 97: F/R (3-wire forward/reverse rotation)	-	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

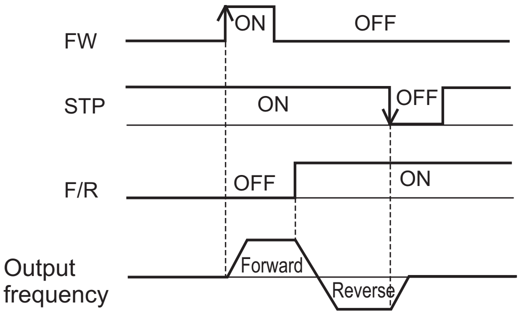
*2. FW (forward rotation) can be allocated to only one of E98 and E99. Also, 3-wire operation cannot be started up by “99: RV (reverse rotation).”

Data	Symbol	Function name	Status	Description
98	FW	Forward rotation (3-wire starting up)	ON	Start via automatic reset contact → 3-wire operation started by rising edge
			OFF	Independent of motor operation
6	STP	3-wire stopping: NC contact	ON	Motor operation enabled
			OFF	Stop via automatic reset contact → 3-wire operation stopped by falling edge
97	F/R	3-wire forward/reverse	ON	Reverse
			OFF	Forward

- To reliably ascertain ON/OFF, continue ON or OFF for the time twice the set value of Input Terminal Response Time (H324 to H330). When Input Terminal Response Time is the default value, continue for 2 ms.

- When the STP terminal signal is disconnected, the input signal turns OFF and the status changes to the stop status. Even if the FW terminal is turned ON in this state, the output frequency is not output.

- The operation timing is as follows.



Multi-step Frequency Reference

- Use this function to switch the frequency reference set to 16 frequencies or frequency reference set to 8 frequencies based on the combination of selected input terminals.

Parameter No.	Function name	Data	Default data	Unit
F01/C30	1st Frequency Reference Selection/2nd Frequency Reference Selection*1	0: Operator (▲ / ▼ keys) (output frequency not inherited) (disabled on EtherCAT type) 1: Analog Valtage Input (Input Terminal[AI1]) 2: Analog Current Input (Input Terminal[AI2](AII)) 3: Analog Valtage Input (Input Terminal[AI1])＋ Analog Current Input (Input-Termina (Input Terminal[AI2](AII)) 5: Analog Valtage Input (Input Terminal[AI2](AIV)) 7: UP/DOWN control 8: Operator (▲ / ▼ keys) (output frequency inherited) 10: Pattern operation 12: Pulse train input 13: Calculation result 14: RS-485 communication	0	-
E107	Multi-step Frequency Selection	0: Binary (16-step selection with 4 terminals) 1: Bit (8-step selection with 7 terminals)	0	-
C99 E109	1st Frequency Reference/1st Multi-step Frequency Reference 0 2nd Frequency Reference/2nd Multi-step Frequency Reference 0*1	0.00 to 590.0	0.00	Hz
C05 to C19	Multi-step Frequency Reference 1 to 15	0.00 to 590.0	0.00	Hz

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	(Binary operation) 0 to 3: CF1 to 4 (Multi-step frequency reference setting binary 1 to 4) (Bit operation) 173 to 179: SF1 to 7 (Multi-step frequency reference setting bits 1 to 7)	-	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

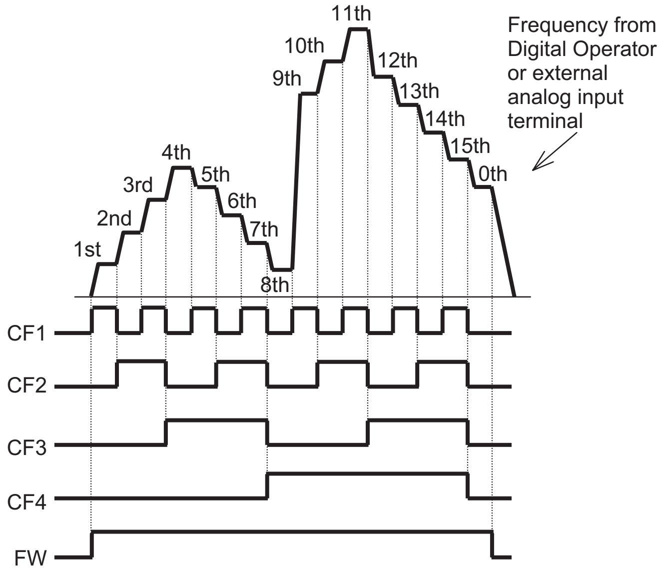
- Select the setting method for 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99) or 2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (E109) at 1st Frequency Reference Selection (F01) and 2nd Frequency Reference Selection (C30).
- For the set frequency, Multi-step Frequency Reference 1 to 15 are common in 1st control and 2nd control.
- Multi-step Frequency Reference 0 can be set to 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99) and 2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (E109) for each of 1st and 2nd control. Multi-step Frequency Reference 1 to 15 (in bit operation, 1 to 7) are common in 1st control and 2nd control.
- To switch between Bit (8-step selection with 7 terminals) and Binary (16-step selection with 4 terminals), select “0: Binary (16-step selection with 4 terminals)” or “1: Bit (8-step selection with 7 terminals)” at Multi-step Frequency Selection (E107).
- To switch the frequency reference, allocate “173 to 179: SF1 to 7 (Multi-step frequency reference setting bits 1 to 7)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) in the case of “binary (16-step selection with 4 terminals).” In the case of “8-step selection with 7 terminals,” select “0 to 3: CF1 to 4 (Multi-step frequency reference setting binary 1 to 4).”
- The rotation direction becomes the direction specified by the RUN command.
- With switching of frequency selection in multi-step function, an unintended frequency reference is sometimes selected depending on the deviation of timing of input terminals [DI1] to [DI7].

● Binary Operation

Setting “0: CF1” to “3: CF4” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) enables selection of multi-step speeds 0 to 15.

- Use the Multi-step Frequency Reference 1 to 15 (C05 to C19) to set the frequency reference for the multi-step speed 1 to 15.
- Multi-step Frequency Reference 0 is selected when CF1 to CF4 are all OFF.
- Multi-step Frequency Reference 0 can be set to 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99) and 2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (E109) for each of 1st and 2nd control.

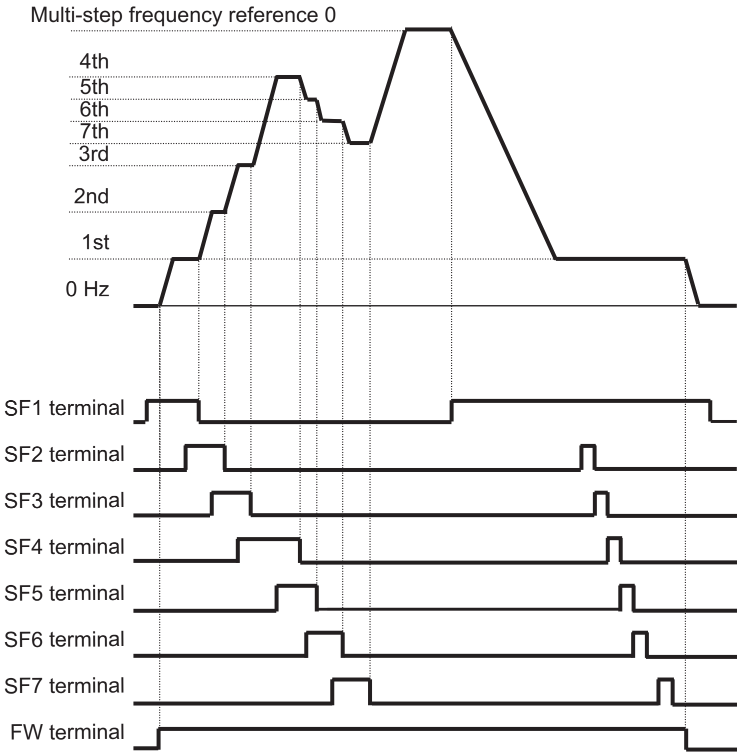
<table>
<tr><th>Multi-step speed</th><th>CF4</th><th>CF3</th><th>CF2</th><th>CF1</th></tr>
<tr><td>0th</td><td rowspan="8">OFF</td><td rowspan="4">OFF</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>1st</td><td>ON</td></tr>
<tr><td>2nd</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>3rd</td><td>ON</td></tr>
<tr><td>4th</td><td rowspan="4">ON</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>5th</td><td>ON</td></tr>
<tr><td>6th</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>7th</td><td>ON</td></tr>
<tr><td>8th</td><td rowspan="8">ON</td><td rowspan="4">OFF</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>9th</td><td>ON</td></tr>
<tr><td>10th</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>11th</td><td>ON</td></tr>
<tr><td>12th</td><td rowspan="4">ON</td><td rowspan="2">OFF</td><td>OFF</td></tr>
<tr><td>13th</td><td>ON</td></tr>
<tr><td>14th</td><td rowspan="2">ON</td><td>OFF</td></tr>
<tr><td>15th</td><td>ON</td></tr>
</table>



● Bit Operation

- Multi-step frequency references 0 to 7 can be selected by input terminals when “173: SF1” to “179: SF7” are set to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
- Set the frequency reference of SF1 to SF7 to Multi-step Frequency Reference 1 to 7 (C05 to C11).
- Multi-step Frequency Reference 0 is selected when SF1 to SF7 are all OFF.
- When multiple terminals are turned ON simultaneously, priority is given to the terminal with the smallest number among SF1 to SF7. (“Disabled” in the following table indicates that speed is selected regardless of the ON/OFF status.)
- Select multi-step frequency reference 0 at 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30). The selected frequency reference is set to 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99) and 2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (E109).

Multi-step speed	SF7	SF6	SF5	SF4	SF3	SF2	SF1
0th	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1st	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	ON
2nd	Disabled	Disabled	Disabled	Disabled	Disabled	ON	OFF
3rd	Disabled	Disabled	Disabled	Disabled	ON	OFF	OFF
4th	Disabled	Disabled	Disabled	ON	OFF	OFF	OFF
5th	Disabled	Disabled	ON	OFF	OFF	OFF	OFF
6th	Disabled	ON	OFF	OFF	OFF	OFF	OFF
7th	ON	OFF	OFF	OFF	OFF	OFF	OFF



- A smaller number is sometimes selected for the frequency reference depending on the timing of switching.

Jogging (JG)

The jogging function operates according to the jogging terminal (10: JG) and RUN command (FW or RV terminal), or forward rotation jogging terminal (94: FJOG) and reverse rotation jogging terminal (95: RJOG). The jogging function can also be enabled from the Operator.

  - Jogging terminal (10: JG) and RUN command (FW or RV terminal)
  - Forward rotation jogging terminal (94: FJOG) and reverse rotation jogging terminal (95: RJOG)
  - Jogging function startup from Operator
  - Jogging execution via communication
- Jogging frequency (C20), acceleration time (H54) and deceleration time (H55) of jogging operation can be set. Select jogging operation at start and stop of jogging at Jogging Operation Selection (E111).
- During position control, jogging operation is disabled.
- Speed control during jogging operation can be adjusted by filter, gain, etc.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	10: JG (Jogging) 94: Forward rotation jogging 95: Reverse rotation jogging	-	-

Parameter No.	Function name	Data	Default data	Unit
E111	Jogging Operation Selection	0: Free run stop on jogging stop, disabled in operation 1: Deceleration stop on jogging stop, disabled in operation 2: DC injection braking on jogging stop*1, disabled in operation 3: Free run stop on jogging stop, enabled in operation 4: Deceleration stop on jogging stop, enabled in operation 5: DC injection braking on jogging stop*1, enabled in operation	4	-
C20	Jogging frequency	0.00 to 590.00	0.00	Hz
H54	Jogging Acceleration Time	0.00 to 6000	6.00	s
H55	Jogging Deceleration Time	0.00 to 6000	6.00	s
d99	Extension Function 1	0000 to FFFF hex Bit 3: Jogging Enable via communications Use of other bits is prohibited	0008 hex	-
d09	Speed Control Jogging Speed Command Filter	0.000 to 5.000	0.02	s
d10	Speed Control Jogging Speed Detection Filter	0.000 to 0.100	0.005	s
d11	Speed Control Jogging P Proportional Gain	0.1 to 200.0	10.0	-
d12	Speed Control Jogging I Integral Time	0.001 to 9.999 999: Disable	0.1	s
H147	Speed Control Jogging Feed Forward Gain	0.00 to 99.99	0.00	s
d13	Speed Control Jogging Output Filter	0.000 to 0.100	0.002	s
Related function		DC Injection Braking Selection (E114)		

*1. When the Jogging Operation Selection (E111) setting is “2: DC injection braking on jogging stop, disabled in operation” or “5: DC injection braking on jogging stop, enabled in operation,” DC Injection Braking Selection (E114) must be set. Refer to *7-5-1 DC Injection Braking (DB)* on page 7-63.

● Switching by JG terminal

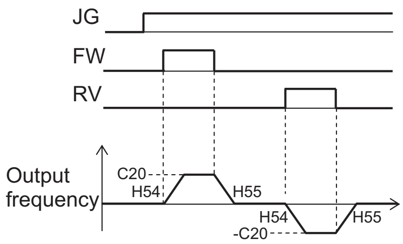
- When “10: JG: (Jogging)” is set to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99), the jogging function can be switched to by the input terminals. Jogging is executed by turning the JG signal ON and then turning the FW and RV signals ON.
- Set the jogging operation stop method and whether to enable or disable the jogging function during operation at Jogging Operation Selection (E111).
- For 100 ms after the RUN command turns ON, jogging operation can be switched to by the JG (Jogging) terminal regardless of the setting of Jogging Operation Selection (E111).
- Set the frequency for jogging operation at Jogging Frequency (C20).
- Set the acceleration time and deceleration time during jogging operation at Jogging Acceleration Time (H54) and Jogging Deceleration Time (H55).

● Jogging function via Operator and RUN command

	Operation	Display on Operator
Step 1	• While the operation mode is set to the RUN mode (refer to *3-1-2 Key Operation Method* on page 3-3), if the STOP key + key on the Operator are pressed simultaneously during a stop, jogging operation is performed.	The jogging frequency is displayed on the LED monitor for approximately one second, and the screen returns to the jog display. 
Step 2	• While the RUN key on the touch panel is held down, jogging operation is performed, and when the RUN key is released, a deceleration stop is performed.	
Step 3	• If the STOP key + key on the Operator are pressed during jogging operation, the jogging operation enabled state is canceled.	

● Disabled in operation (when Jogging Operation Selection (E111) = “0,” “1,” “2”)

- Turn the JG terminal ON and then turn the FW or RV terminal ON.
- During operation (FW terminal is ON, RV terminal is ON), the jogging function is disabled. Note, however, that the function is enabled within 100 ms of starting operation. During operation, the jogging operation is enabled, and jogging operation is started.



- Jogging operation is not performed if the JG signal turns ON after the FW signal turns ON first and 100 ms or more elapses. To perform jogging operation, turn the JG terminal ON and then turn the FW or RV terminal ON.

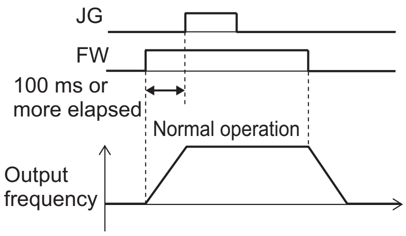


Fig.: Operation of setting when disabled while inverter is running

● Enabled in operation (when Jogging Operation Selection (E111) = “3,” “4,” “5”)

- Jogging is performed even if the FW signal turns ON first.

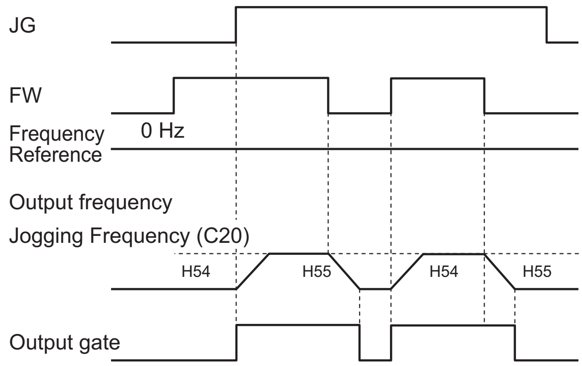


Fig.: Jogging operation switching while inverter is running

However, if the JG signal turns OFF first, the motor comes to a free-run state.

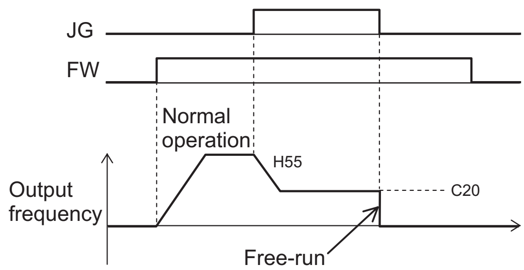


Fig.: Operation when jogging is canceled

If the JG signal is turned ON again with the motor in a free-run state (JG signal OFF and FW signal ON), jogging operation is started again.
If the FW signal is turned OFF with the motor in a free-run state (JG signal OFF and FW signal ON), and the FW signal is turned ON again, normal operation is performed.

● Relationship with DC braking

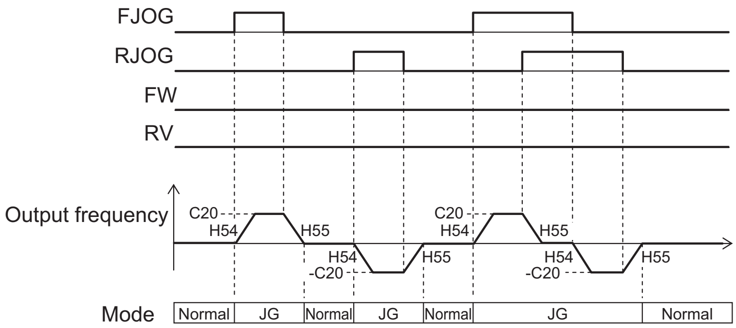
When the jogging function is used to perform inching, the inverter sometimes does not come to an exact stop in applications such as turntables and rotates an extra bit more before it comes to a stop.
In vector control, the braking torque just before the stop can be adjusted so that the inverter comes to an exact stop by adjusting the speed adjuster (ASR). However, in V/f control, sufficient braking torque sometimes cannot be ensured simply by adjusting the torque boost.
In cases like these, jogging operation and the DC braking function are used in combination to adjust inching.
For details on DC braking, refer to *7-5-1 DC Injection Braking (DB)* on page 7-63.
Operation when the RUN command is turned OFF during jog operation with the DB (DC braking) terminal turned ON is as follows.
(Example: When External DC Injection Braking Edge/Level Selection (E115) = “1: Level operation”)

- When E111 = 0, 3, operation immediately becomes free run when the RUN command turns OFF, and immediately DC braking by the DB terminal operates.

- When E111 = 1, 2, 4, 5, DC braking by the DB terminal operates immediately when the RUN command turns OFF.

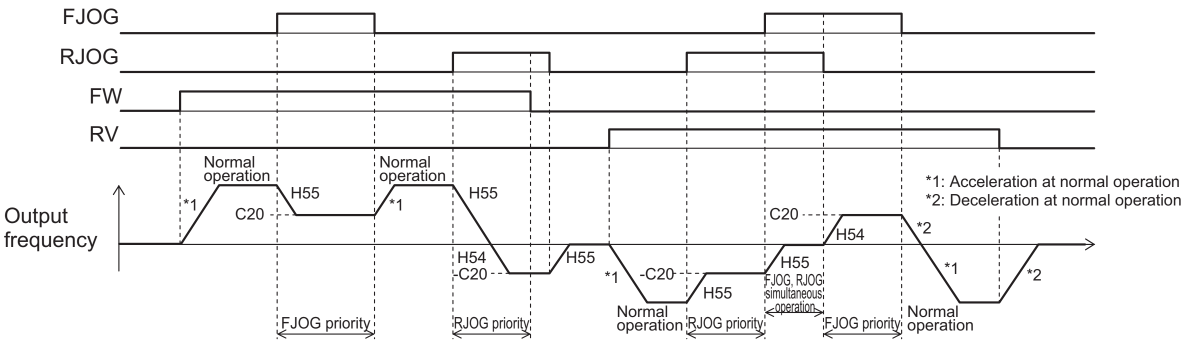
● Forward Rotation Jogging/Reverse Rotation Jogging

- When the FJOG (Forward rotation jogging) terminal or RJOG (Reverse rotation jogging) terminal is turned ON when the RUN command is OFF, forward rotation or reverse rotation jogging operation can be performed. Deceleration stop is performed according to the acceleration/deceleration time regardless of E111.



FJOG, RJOG operation

Fig.: Jogging operation by FJOG and RJOG terminals during an operation stop



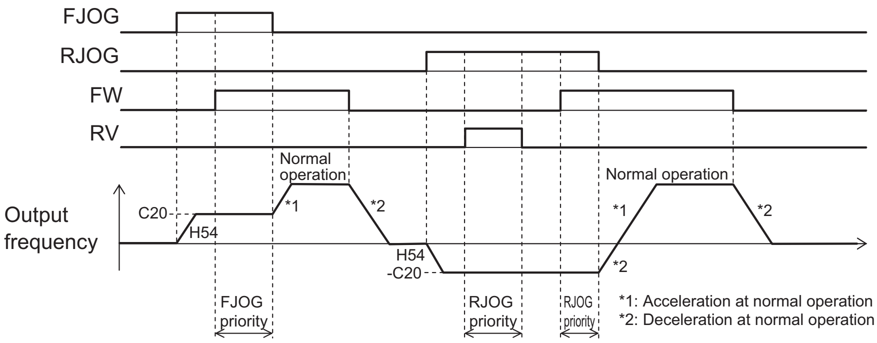
FJOG, RJOG ON while FW, RV are ON

Fig.: Jogging operation by FJOG and RJOG terminals while inverter is running

- When the FJOG (Forward rotation jogging) terminal and RJOG (Reverse rotation jogging) terminal are both ON, operation is the same as when they are both OFF.
- Operation during a stop follows the setting of Jogging Operation Selection (E111), though the enabled/disabled during operation settings are not affected.
- FJOG (Forward rotation jogging) terminal and RJOG (Reverse rotation jogging) terminal are given priority over jogging operation by the FW terminal/RV terminal and the JG terminal.

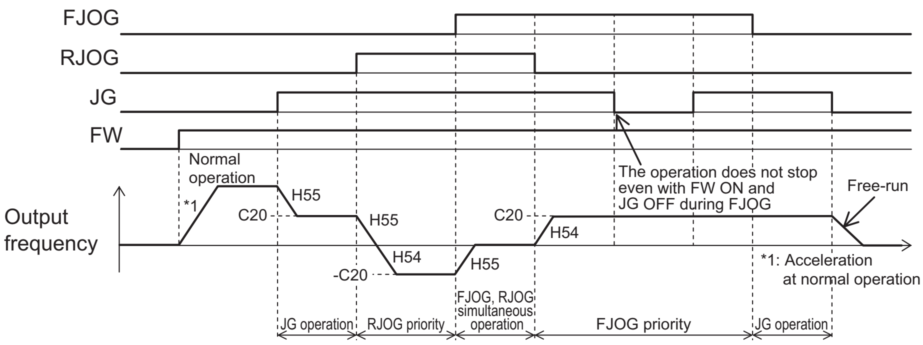
Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	94: FJOG (Forward rotation jogging) 95: RJOG (Reverse rotation jogging)	-	-

- Operation when FW and RV turn ON while FJOG and RJOG are ON is as follows.



FW, RV ON while FJOG, RJOG are ON

- Combinations of the JG terminal and FJOG terminal, RJOG terminal while jogging during operation is enabled act as follows.



Combinations of JG and FJOG, RJOG while jogging during operation is enabled

● Jogging function via communication

- When Extension Function 1 (d99) bit 3 is “0: Jogging Disable via communications,” this function is enabled only when 1st RUN Command Selection (F02) is “1: External signal (digital input).”
- When Extension Function 1 (d99) bit 3 is “1: Jogging Enable via communications,” forward rotation jogging or reverse rotation jogging operations are possible by the command arriving via communication regardless of the value of d99 bit 3. When commands via communication are enabled, input terminal is disabled.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	10: JG (Jogging) 94: FJOG (Forward rotation jogging) 95: RJOG (Reverse rotation jogging)	-	-

Parameter No.	Function name	Data	Default data	Unit
S06	Operation command (Communication Data Terminal [DI])	0000 to FFFF hex bit 15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-

- Allocate this function to “10: JG (Jogging),” “94: FJOG (Forward rotation jogging)” and “95: RJOG (Reverse rotation jogging)” input terminals in Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection, and operate S06 via communication to perform jogging.

● Adjustment of jogging operation

- This function is for adjusting the speed control during jogging operation. As this speed control parameter is used only in jogging operation, jogging operation with a speed response faster than during normal operation can be performed.
- For details on parameters for the speed control jogging operation, refer to the parameters (d01 to d06) for speed control during normal operation that are applicable in *6-5-1 Speed Control Settings* on page 6-26. There are no parameters relating to the notch filter for jogging.

2-step acceleration/deceleration

- For details on the 2-step acceleration/deceleration function, refer to *5-6-4 2-step Acceleration/Deceleration Function* on page 5-43.

Reset

- For details on a reset, refer to *5-8-1 Reset Function* on page 5-49.

5-10 Multi-function output

5-10-1 Output Terminal Functions

- Inverter status can be output from output terminals by allocating functions to output terminals [DO1], [DO2], [ROA/B/C] (Relay output). For details on other functions, refer to *7-2 Multifunction Input/ Output Functions List* on page 7-22.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection Output Terminal [DO2] Function Selection Output Terminal [ROA, ROB] Function Selection	Refer to the table below or *7-2 Multifunction Input/ Output Functions List* on page 7-22.	-	-
H309	Output Terminal [DO1] ON Delay Time	0.0 to 100.0	0.0	s
H311	Output Terminal[DO2] ON Delay Time			
H313	Output Terminal [ROA, ROB] ON Delay Time			
H310	Output Terminal[DO1] OFF Delay Time	0.0 to 100.0	0.0	s
H312	Output Terminal[DO2] OFF Delay Time			
H314	Output Terminal [ROA, ROB] OFF Delay Time			

- Set this at Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) and Output Terminal [ROA, ROB] Function Selection (E27).
- An NO contact output can be changed to an NC contact output by setting data in which 1000 is added to the set data, and, as a result, the operations of set signals are reversed.
- Each multifunction output terminal can be allocated with the ON/OFF delay time independently.
- Multifunction output terminals DO1 and DO2 are open collector outputs, and multifunction output terminals ROA/B/C (Relay output) are relay outputs.
- The following functions have an OFF delay time of 0.1 s even if the OFF delay time is not set. When these functions are allocated to output terminals, the OFF delay becomes the time obtained by adding 0.1 s to Output Terminal [DO1] OFF Delay Time (H310), Output Terminal [DO2] OFF Delay Time (H312) and Output Terminal [ROA, ROB] OFF Delay Time (H314).
  - Thermistor detection (56: MOH) terminal, Inverter output limited (5: IOL) terminal, Electronic thermal warning (7: THM) terminal, Overload prevention control in progress (36: OLP) terminal, Overload early warning 2 (37: OL2) terminal, Overload early warning (38: OL) terminal, Low current signal (41: LOC) terminal, PID deviation excessive (42: OD) terminal, PID wakeup timer stopped (44: PID-STP) terminal, Overtorque (46: OTQ) terminal

Parameter No.	Data	Function name	Reference item	Reference page
Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) Output Terminal [ROA, ROB] Function Selection (E27)	0	RUN (Signal during run)	Signal during run	page 5-68
	1	FA1 (Constant speed arrival signal)	Constant speed arrival signal	page 5-70
	99	AL (Alarm signal)	Alarm signal	page 5-71
	70	ZS (0 Hz detection signal)	0 Hz detection signal	page 5-71
	10	IRDY (Operation ready completion)	Operation ready completion	page 5-68
	52	FWR (Forward run signal)	Forward run signal	page 5-69
	53	RVR (Reverse run signal)	Reverse run signal	page 5-69

Operation Ready Completion Signal (IRDY)

- This signal is output when the inverter becomes ready to operate (ready to accept the RUN command).
- To output this signal, allocate “10: IRDY (Operation ready)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	10: IRDY (Operation ready completion)	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	-

- When this signal is not output, the inverter does not operate even if the RUN command is input.
- If this signal is not output, check if the input power supply voltage (L1/R, L2/S,L3/T) is within the specification range.

Signal during RUN (RUN), Inverter Output Signal (RUN2)

- This signal is output while the inverter is running (RUN command ON).
- The signal during RUN (RUN) and inverter output signal (RUN2) are output also when the inverter is decelerating after the RUN command turns OFF.
- When in a free-run state (output shutoff status), the signal during RUN (RUN) and inverter output signal (RUN2) are not output even if the RUN command is turned ON. (Note that on the Operator, the RUN LED is lit when the RUN command is ON.)
- The signal during RUN (RUN) is not output while DC braking is operating, during tuning of motor parameters while stopped, and during pre-excitation by the EXITE terminal. The inverter output signal (RUN2) is output.
- To output this signal, allocate “00: RUN” and “35: RUN2” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	0: RUN (Signal during RUN) 35: RUN2 (Inverter output in progress)	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	-
Related function				

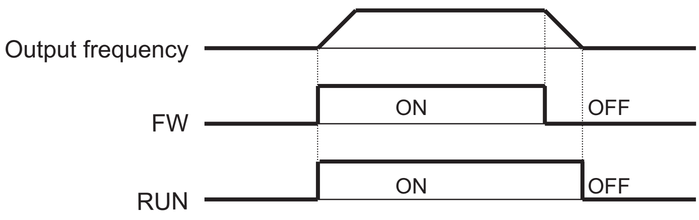


Fig. OFF when at stop frequency and starting frequency or below

Forward Run Signal (FWR)

- This signal is output while the inverter performs forward operation.
- To output this signal, allocate “52: FWR (Forward run signal)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

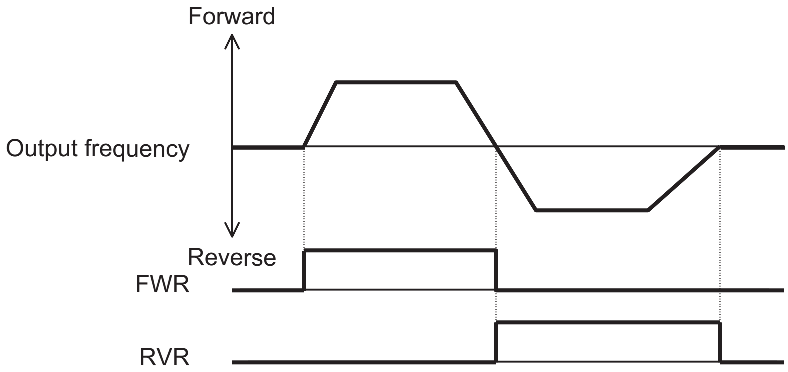
Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	52: FWR (Forward run signal)	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	

- This signal is not output while the inverter performs reverse operation, when it is stopped or during free-run. Note, however, that during control methods with sensor, judgment is performed based on the speed detection value to output the signal even in free-run status.

Reverse Run Signal (RVR)

- This signal is output while the inverter performs reverse operation.
- To output this signal, allocate “53: RVR (Reverse run signal)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	53: RVR (Reverse run signal)	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	



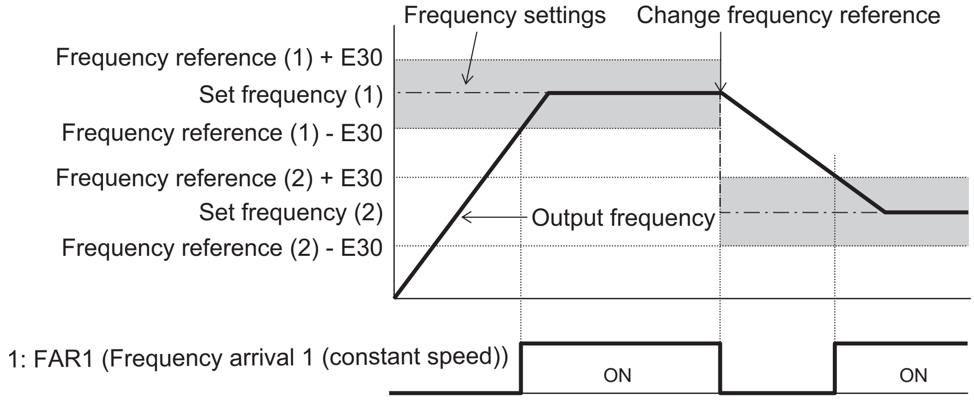
- This signal is not output while the inverter performs forward operation, when it is stopped or during free-run. Note, however, that during control methods with sensor, judgment is performed based on the speed detection value to output the signal even in free-run status.

Frequency Arrival 1 (Constant Speed) (FAR1)

- This signal is output when the output frequency arrives at the frequency reference.
- To output this signal, allocate “1: FAR1 (Frequency arrival 1 (constant speed))” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).
- The detection width of the frequency arrival signal is set at Frequency Arrival Detection Width (FAR1/FAR2/FAR3/FDT3/FDT4) (E30).

Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	1: FAR1 (Frequency arrival 1 (constant speed))	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	-
E30	Frequency Arrival Detection Width (FAR1/FAR2/FAR3/FDT3/FDT4)	0.0 to 10.0 Hz	2.5	Hz
Related function				

- When the output frequency is within the range of ± Frequency Arrival Detection Width (FAR1/FAR2/FAR3/FDT3/FDT4) (E30) centering around the frequency reference, ON is output, and when it is outside the range, this signal turns OFF.
- During free-run or when the set frequency is less than the stop frequency, the RUN command turns OFF, and turns OFF during a deceleration stop.
- The figure below shows an example of changing the frequency reference from frequency reference (1) to frequency reference (2).



Alarm Signal (AL)

- The inverter detects an overcurrent, overvoltage, or some other abnormality, and outputs an alarm signal (AL).
- To output this signal, allocate “99: AL (Alarm signal)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27). The alarm signal is the default data of Output Terminal [ROA, ROB] Function Selection (E27).
- A trip state can be canceled by resetting the inverter, by which the alarm signal is also turned OFF. To reset the inverter, press the PRG RESET key on the Digital Operator or turn the reset terminal ON. (Refer to *5-8-1 Reset Function* on page 5-49.)

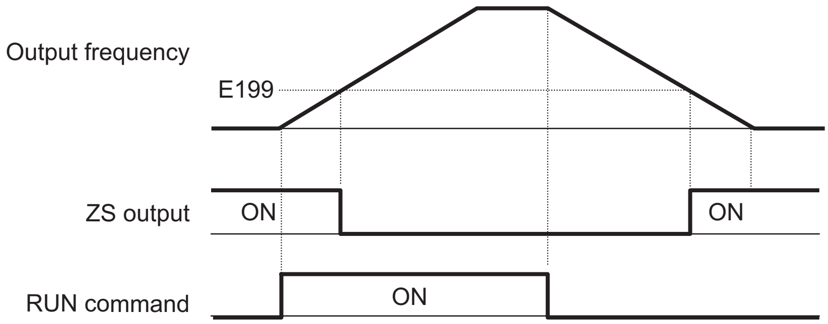
Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	99: AL (Alarm signal)	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	-

0 Hz Detection Signal (ZS)

- This signal is output when the output frequency of the inverter falls below the 0Hz Detection Output Detection Level (ZS) (E199).
- To output this signal, allocate “70: ZS (0 Hz detection signal)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	70: ZS (0 Hz detection signal)	-	-
E27	Output Terminal [ROA, ROB] Function Selection		99	-
E199	0Hz Detection Output Detection Level (ZS)	0.00 to 100.00	0.00	Hz

- This signal is output when the output frequency of the inverter falls below the 0Hz Detection Output Detection Level (ZS) (E199) also when the RUN command is OFF.
  - This signal turns ON if the speed command value (output frequency) or the speed detection value is less than the 0Hz Detection Output Detection Level (E199), and turns OFF if it is at E199 or higher regardless of the alarm status or free-run after the power is turned ON.



5-11 Torque Boost Function

5-11-1 Torque Boost

- The torque boost function is for increasing the output torque if it is not sufficient at lower speeds.
- This inverter provides two torque boost options: Manual torque boost for manual torque adjustment and Automatic torque boost for automatic torque adjustment.
- Automatic torque boost is enabled when “0: IM V/f control,” “1: IM Dynamic torque vector control without speed sensor,” “3: IM V/f control with speed sensor” or “4: IM Dynamic torque vector control with speed sensor” is selected at Drive Control Selection (F42/A14).
- Manual torque boost is enabled when “0: IM V/f control” or “3: IM V/f control with speed sensor” is selected at Drive Control Selection (F42/A14).
- The default is automatic torque boost set to enabled. (1st Torque Boost Function Selection (E112)/2nd Torque Boost Function Selection (E113) = 1)

Parameter No.	Function name	Data	Default data	Unit
F42	1st Drive Control Selection	0: IM V/f control 1: IM Dynamic torque vector control without speed sensor 3: IM V/f control with speed sensor 4: IM Dynamic torque vector control with speed sensor	0	-
A14	2nd Drive Control Selection			
E112	1st Torque Boost Function Selection	0: Manual torque boost 1: Automatic torque boost	1	-
E113	2nd Torque Boost Function Selection			
F09	1st Manual Torque Boost Voltage	0.0% to 20.0% (percentage with respect to 1st Rated Voltage at Base Frequency (F05)/2nd Rated Voltage at Base Frequency (A03))	1.9	%
A05	2nd Manual Torque Boost Voltage			
Related function		Motor Capacity (P02/A16), Base Frequency (F04/A02), Rated Voltage at Base Frequency (F05/A03), Motor Parameters (P01/A15 to P03/A17 and P06/A20 to P20/A34)		

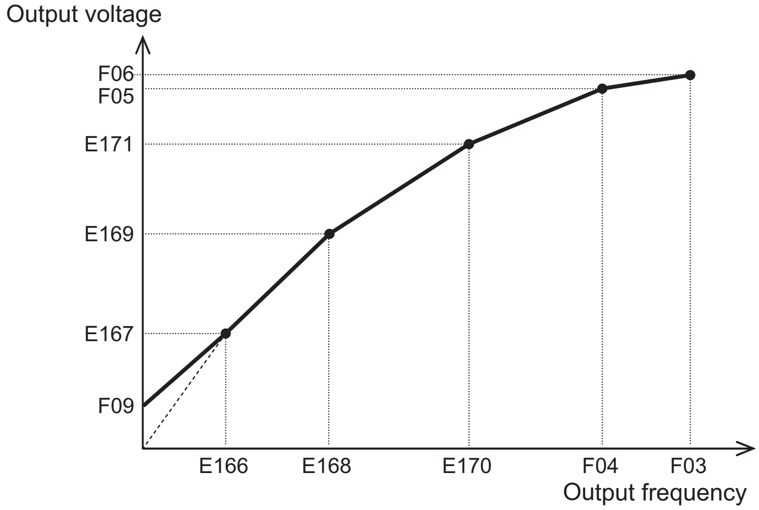
Automatic Torque Boost (E112/E113 = 1)

- With this setting, the inverter increases the output voltage automatically depending on the load condition.
- When automatic torque boost function is enabled, the non-linear V/f function is disabled.
- To use the automatic torque boost function, either set 1st Base Frequency (F04), 1st Rated Voltage at Base Frequency (F05) and motor parameters (P01 to P03 and P06 to P95) to match the motor capacity or motor characteristics, or execute auto-tuning (P04).
- To use automatic torque boost , set “1: Constant torque load” to 1st V/f Characteristics Selection (F37) and 2nd V/f Characteristics Selection (A13). When “0: Variable torque load” is set, manual torque boost is selected regardless of the setting of Torque Boost Function Selection (E112/E113).

- Automatic torque boost controls to match the motor characteristics. Either set Base Frequency (F04/A02), Rated Voltage at Base Frequency (F05/A03) and motor parameters (P01/A15 to P03/A17 and P06/A20 to P20/A34) to match the motor capacity or motor characteristics, or execute auto-tuning.

Manual Torque Boost (E112/E113 = 0)

- With the torque boost by Manual Torque Boost Voltage (F09/A05), a constant voltage is added to the V/f characteristics before output regardless of the load. The optimum voltage suited to the motor and load are manually adjusted by the Manual Torque Boost Voltage (F09/A05) to ensure starting torque. Adjust the voltage to a level at which startup is possible and overexcitation does not occur in a no-load state or light load state.
- When the non-linear V/f function is used in combination with the manual torque boost function, the torque boost is enabled at the lowest non-linear V/f frequency or less.



- When Manual Torque Boost Voltage (F09/A05) is set to 0.0%, manual torque boost is disabled.

5-12 Regenerative Braking Function

5-12-1 Regenerative Braking Function

- During motor deceleration and elevator descent, regenerative energy sometimes is returned to the inverter and an overvoltage is detected due to an excessive regenerative amount.
- The regenerative braking function uses the built-in or an external regenerative braking resistor to decrease the internal Main Circuit DC Voltage of the inverter by converting the regenerated energy from the motor into heat via external braking resistors.
- The 3G3M1 Series has a built-in regenerative braking circuit and a regenerative braking function operates at all times regardless of whether the inverter is running or has stopped.

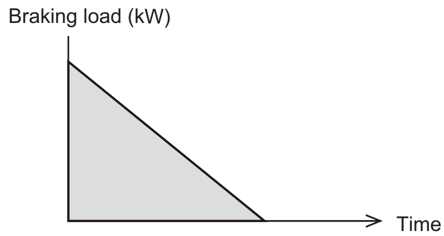
5-12-2 Braking Resistor Electronic Thermal Function

- Either use a braking resistor with thermal contact or use the braking resistor electronic thermal function for overheat protection of the external braking resistor.
- Use the braking resistor electronic thermal function by setting the discharge capacity, allowable average loss and resistance value to each of F50, F51 and F52. These values are determined by inverter model and type of braking resistor.
- To use the regenerative braking function, set Anti-regenerative Control Function Selection (H69) to “0: Disable.”

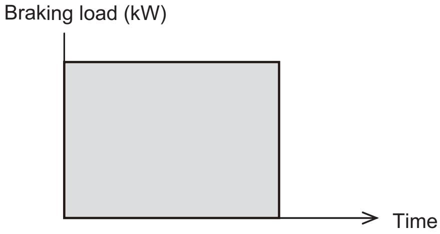
Parameter No.	Function name	Data	Default data	Unit
F50	Electronic Thermal for Braking Resistor Discharging Capacity	1 to 9000 32767: Cancel	32767	kWs
F51	Electronic Thermal for Braking Resistor Allowable Average Loss	0.001 to 99.99	0.001	kW
F52	Braking resistor electronic thermal braking resistance	0.01 to 999	0.01	Ω
W161	Braking resistor thermal calculated value	0.0 to 100.0	0.0	%
Related function		Anti-regenerative Control Function Selection (H69)		

- Set the Electronic Thermal for Braking Resistor Discharging Capacity (F50) and Electronic Thermal for Braking Resistor Allowable Average Loss (F51) by the following formula depending on how the braking load is applied.

● When braking load during deceleration decreases with time

How to apply a braking load	Allowable average loss	Thermal braking resistance value
	Electronic Thermal for Braking Resistor Discharging Capacity (F50) = $\frac{\text{Braking time (s)} \times \text{Motor capacity (kW)}}{2}$	Electronic Thermal for Braking Resistor Allowable Average Loss (F51) = $\frac{\frac{\%ED(\%)}{100} \times \text{Motor capacity (kW)}}{2}$

● When braking load at deceleration is a constant speed

How to apply a braking load	Allowable average loss	Thermal braking resistance value
	Electronic Thermal for Braking Resistor Discharging Capacity (F50) = Braking time (s) × Motor capacity (kW)	Electronic Thermal for Braking Resistor Allowable Average Loss (F51) = $\frac{\%ED(\%)}{100}$ × Motor capacity (kW)

Additional Information

- When a braking resistor capable of outputting a temperature detection signal is applied, set “9: EXT (external trip)” to one of Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E50 to E55, E98, E99), and connect the temperature detection signal of the braking resistor.
- Even if there is actually little temperature rise, the electronic thermal sometimes is activated and the overheating protection dbH alarm is generated depending on the braking resistor specifications. Check the specifications of the braking resistor and set its parameter.

6

Vector Control and Applied Functions

This section describes the vector control and applied functions characteristic of this inverter.

6-1 Details of Motor Control Methods

Select the control method best suited to type of motor to be driven and application. Set the control method to be used in 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14).
Available control methods differ according to the type of motor.
Vector control without speed sensor and vector control with speed sensor can be set only to 1st motor control.

6-1-1 Motor Control Methods

Dynamic Torque Vector Control (Induction Motor)

To make full use of motor torque, torque corresponding to load is calculated, and the voltage/current vector is optimally controlled according to that calculated value. When dynamic torque vector control is selected, automatic torque boost and slip compensation are automatically enabled. This function is useful for enhancing response to load fluctuation or other external disturbances and improving the speed control accuracy of the motor. Note, however, that this control is open loop V/f control and does not control current like in vector control. For this reason, response to sudden load external disturbances may not be possible, though it does have advantages such as a maximum torque larger than that of vector control.

Dynamic Torque Vector Control with Speed Sensor (Induction Motor)

With regard to V/f control with speed sensor, to make full use of motor torque, torque corresponding to load is calculated, and the voltage/current vector is optimally controlled according to that calculated value. This control is useful for enhancing response to load fluctuation or other external disturbances and improving the speed control accuracy of the motor.

Speed Sensorless Vector Control (Induction Motor)

Speed control is performed based on the motor speed inferred from voltage and current, motor current is further divided into excitation current and torque current, and vector control for controlling each of these currents is performed. The required response can be achieved by adjusting the control constants (PI constants) with speed control (PI controller).
With vector control, a certain degree of difference (voltage margin) between the induction voltage of the motor and voltage that can be output from the inverter is required as motor current is controlled. Generally, the voltage of a general-purpose motor is matched to the commercial power supply. However, due to the necessity for this voltage margin, the terminal voltage of the motor must be kept low when performing control. When the terminal voltage of the motor is kept low when performing control, the rated torque of the motor cannot be output even if the rated current of the motor according to specification is applied. To ensure the rated torque, the rated current must be increased (the same applies in vector control with speed sensor).

Vector Control with Speed Sensor (Induction Motor)

Speed control is performed based on the motor rotation position and speed detected according to the feedback signal from the motor's PG, motor current is further divided into excitation current and torque current, and vector control for controlling each of these currents is performed. The required response can be achieved by adjusting the control constants (PI constants) with speed control (PI controller). Compared with speed sensorless vector control, vector control with speed sensor affords speed control with even higher accuracy and faster response.

Sensorless Vector Control (Synchronous Motor)

Speed control is performed based on the motor speed inferred from voltage and current, motor current is further divided into excitation current and torque current, and vector control for controlling each of these currents is performed. The required response can be achieved by adjusting the control constants (PI constants) of speed control (PI controller).

Vector Control with Speed Sensor (Synchronous Motor)

Speed control is performed based on the motor rotation speed and magnetic pole position detected according to the feedback signal from the motor's speed/magnetic pole position sensor, motor current is further divided into excitation current and torque current, and vector control for controlling each of these currents is performed. The required response can be achieved by adjusting the control constants (PI constants) of speed control (PI controller). Compared with sensorless vector control, vector control with sensor affords a wider speed control range and speed control with higher response.

6-1-2 Basic Motor Parameter Settings

Set the basic parameters for motor control and protection.
Setting the correct motor parameters to the inverter is effective in stabilizing motor behavior as appropriate values are obtained for the control result.

- Match the base frequency to the rated frequency stipulated for the motor. Setting the base frequency lower than the rated frequency might result in motor burnout.
- The rated frequency of a general induction motor is designed to be within the range 50 to 60 Hz. When setting the maximum frequency to 60 Hz or higher, check the maximum allowable frequency in the motor specifications. Setting a maximum frequency and rated voltage exceeding the motor specifications might result in motor burnout.

Basic Parameter Settings

Item	Inverter parameter		Setting range	Description	Default value
Capacity	P02/A16	1st Motor Capacity/2nd Motor Capacity	0.01 to 1000 kW	Sets the motor capacity.	Dependent on capacity
Number of poles	P01/A15	1st Motor Pole Number/2nd Motor Pole Number	2 to 128 poles	Sets the number of poles of the motor.	4
Frequency	F04/A02	1st Base Frequency/2nd Base Frequency	5.0 to 590.0 Hz	Sets the base frequency of the motor.	50.0
	F03/A01	1st Maximum Output Frequency/2nd Maximum Output Frequency	5.0 to 590.0 Hz	Sets the maximum frequency of the motor.	60.0
Voltage	F05/A03	1st Rated Voltage at Base Frequency/2nd Rated Voltage at Base Frequency	80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	Sets the base voltage of the motor.	Dependent on capacity
	F06/A04	1st Rated Voltage at Maximum Output Frequency/2nd Rated Voltage at Maximum Output Frequency	80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	Sets the maximum voltage of the motor.	Dependent on capacity
Current	P03/A17	1st Motor Rated Current/2nd Motor Rated Current	0.00 to 500.0 A	Set the rated current of the motor.	Dependent on capacity

Capacity and Number of Poles

Set the capacity and number of poles of the motor.
Note that when the capacity is changed, specific parameters on the inverter are initialized to their factory defaults.
After setting the capacity, either perform auto-tuning or manual input the motor constants that have been prepared.
When the correct motor constants are set, operation is optimized so it becomes stable.
Cleared default values are for auto-tuning, and action may not be as expected if the values deviate from actual motor constants. For this reason, ensure that the motor constants are set correctly.

Base Frequency/Base Voltage

Match 1st Base Frequency (F04)/2nd Base Frequency (A02) and 1st Rated Voltage at Base Frequency (F05)/2nd Rated Voltage at Base Frequency (A03) to the rated frequency and rated voltage of the motor.
The base frequency is found as follows from the rated rotation speed (min-1) of the motor and the number of poles.

- Base frequency (Hz) = Rated rotation speed (min-1) × number of poles/120

Maximum Frequency/Maximum Output Voltage

Set the maximum frequency and maximum output voltage of the motor.

Rated Current

Set the motor rated current matched to the motor specifications. Motor protection sometimes does not function properly if the motor rated current is not set properly.
Also, motor control sometimes becomes unstable if the motor rated current is not set properly.

6-1-3 Motor Parameter Settings

When motor parameters are correctly set matched to the motor control method, control is compensated and motor behavior is stabilized.

Note that when the capacity is changed, specific parameters on the inverter are initialized to their factory defaults.
After setting the capacity, either perform auto-tuning or manual input the motor constants that have been prepared.
For details on auto-tuning, refer to *6-8-1 Motor Off-line Auto-tuning* on page 6-65.

Save the set parameter values as a user preference dataset so that motor constants can be recovered if they are initialized unintentionally.
For details on the user preference dataset, refer to *5-1-2 Data Initialization* on page 5-4.

Set the following constants according to the settings of 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14).

Dynamic Torque Vector Control (With/without Speed Sensor) (Induction Motor)

Parameter No.	Function name	Set data	Default data
F42/A14	1st Drive Control Selection/2nd Drive Control Selection	1: IM Dynamic torque vector control 5: IM Vector control without speed sensor	0
F04/A02	1st Base Frequency/2nd Base Frequency	Motor rated value	50.0 Hz
F05/A03	1st Rated Voltage at Base Frequency/2nd Rated Voltage at Base Frequency		Dependent on capacity
P02/A16	1st Motor Capacity/2nd Motor Capacity		Dependent on capacity
P03/A17	1st Motor Rated Current/2nd Motor Rated Current		Dependent on capacity
P06/A20	1st Motor Armature Resistance/2nd Motor Armature Resistance	When rotation tuning can be performed, this does not need to be set. When rotation tuning is not possible, either set the values given in the test report for the motor, or set the value calculated by the following formula. $\sqrt{(P03)^2-(P55)^2}$	Dependent on capacity
F03/A01	1st Maximum Output Frequency/2nd Maximum Output Frequency	Design specification value	60.0 Hz
F07	1st Acceleration Time 1		6.0 s
F08	1st Deceleration Time 1		6.0 s

Vector Control (With/without Speed Sensor) (Induction Motor)

Parameter No.	Function name	Set data	Default data
F42/A14	1st Drive Control Selection/2nd Drive Control Selection	4: IM Dynamic torque vector control with speed sensor 6: IM Vector control with speed sensor	0

Parameter No.	Function name	Set data	Default data
F04/A02	1st Base Frequency/2nd Base Frequency	Motor rated value	50.0 Hz
F05/A03	1st Rated Voltage at Base Frequency/2nd Rated Voltage at Base Frequency		Dependent on capacity
P01/A15	1st Motor Pole Number/2nd Motor Pole Number		4
P02/A16	1st Motor Capacity/2nd Motor Capacity		Dependent on capacity
P03/A17	1st Motor Rated Current/2nd Motor Rated Current		Dependent on capacity
P06/A20	1st Motor Armature Resistance/2nd Motor Armature Resistance	When rotation tuning can be performed, this does not need to be set. When rotation tuning is not possible, either set the values given in the test report for the motor, or set the value calculated by the following formula. $\sqrt{(P03)^2-(P55)^2}$	Dependent on capacity
F03/A01	1st Maximum Output Frequency/2nd Maximum Output Frequency	Design specification value	60.0 Hz
F07	1st Acceleration Time 1		6.0 s
F08	1st Deceleration Time 1		6.0 s

Vector Control (With/without Speed Sensor) (Synchronous Motor)

Parameter No.	Function name	Set data	Default data
F42	1st Drive Control Selection	15: PM Vector control without speed and pole position sensor 16: PM Vector control with speed and pole position sensor	0
F26	Carrier Frequency	Motor specification	2 kHz
F04	1st Base Frequency	Motor rated value	50.0 Hz
F05	1st Rated Voltage at Base Frequency		Dependent on capacity
P01	1st Motor Pole Number		4
P02	1st Motor Capacity		Dependent on capacity
P03	1st Motor Rated Current		Dependent on capacity

Parameter No.	Function name	Set data	Default data
P30	1st PM Motor Starting Method	0: Pull-in by current 1: For IPM type 1(Interior permanent magnet synchronous motor) 2: For SPM type (Surface permanent magnet synchronous motor) 3: Pull-in by current for IPM type 4: For IPM type 2(Interior permanent magnet synchronous motor)	1
P63	1st PM Motor Induced Voltage Ke	When unknown, perform rotation tuning.	Dependent on capacity
P64	1st PM Motor Iron Loss	When unknown, set 0%.	Dependent on capacity
P90	1st PM Motor Overcurrent Protection Level	When unknown, set 2x the rated current.	Dependent on capacity
F03	1st Maximum Output Frequency	Design specification value	60.0 Hz
F15	1st Frequency Upper Limit		70.0 Hz
F07	1st Acceleration Time 1		6.0 s
F08	1st Deceleration Time 1		6.0 s

When Control with Speed Sensor Is Selected as Control Method

When a control with speed sensor is selected as the control method, the following parameters matched to the encoder specifications are required.

Parameter No.	Function name	Set data	Default data
d14	Input Terminal [PIA][PIB] Pulse Input Format Selection	2: Quadrature A/B signal (B phase lead) 3: Quadrature A/B signal (A phase lead)	2
d15	Input Terminal [PIA][PIB] Encoder Pulse Resolution	Number of pulses of motor encoder to be controlled 0400 (hexadecimal display) / 1024 P/R	0400 (hexadecimal display)
d16	Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator	Set the speed reduction ratio of the motor and encoder. When the encoder is directly coupled to the motor, this does not need to be set. (Default value = 1) Motor speed = Encoder speed × (d17)/(d16)	1
d17	Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator		1

Parameters That Do Not Require Setting

The following table shows parameters whose values are determined by other parameters or parameters that do not need to be changed from their factory default values.

Parameter No.	Function name	Data	Default data	Unit
P13/A27	1st Iron Loss Factor 1/2nd Iron Loss Factor 1	0.00 to 20.00%	Dependent on capacity	%

Parameter No.	Function name	Data	Default data	Unit
P55/A55	1st Motor Torque Current under Vector Control/Torque Current for 2nd Vector Control	0.00 to 2000 A	Dependent on capacity	A
P56/A56	1st Induced Voltage Factor under Vector Control/ Induced Voltage Factor for 2nd Vector Control	50 to 100%	Dependent on capacity	%
P65	1st PM Motor d-axis Inductance Magnetic Saturation Correction	0.0 to 100% (100.0%=No magnetic saturation) 999 (Factory default)	999	%
P74	1st PM Motor Reference Current at Starting	10 to 200% (Based on the rated current of the motor)	80	%
P85	1st PM Motor Flux Limitation Value	50.0 to 150.0% 999 (Factory default)	999	%
P87	1st PM Motor Reference Current for Magnetic Pole Detection	0 to 200% (Based on the rated current of the motor)	0	%

6-2 V/f control with speed feedback

The 3G3M1 Series Inverter can perform V/f control with speed feedback by using the pulse train input function mounted as standard.
This control enables highly accurate and stable speed control based on the feedback of the pulse generator (PG) signal or the phase A/B signals from the encoder.
This section describes the settings and functions of V/f control with speed feedback.

6-2-1 Settings of V/f Control with Speed Feedback

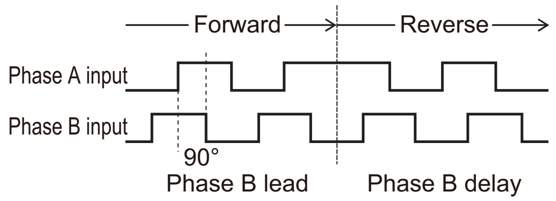
In this control mode, the inverter can perform highly accurate and stable speed control as V/f control, based on the speed feedback data.

- To use this function, set “3: IM V/f control with speed sensor” at 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14).
- Set the type of the pulse train signal to input in Input Terminal [PIA][PIB] Pulse Input Format Selection (d14), and the number of pulses per one rotation of the motor (×1 multiplication) in Input Terminal [PIA][PIB] Encoder Pulse Resolution (d15).
- Set values in Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator (d16) and Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator (d17) according to the speed reduction ratio of the motor and encoder.

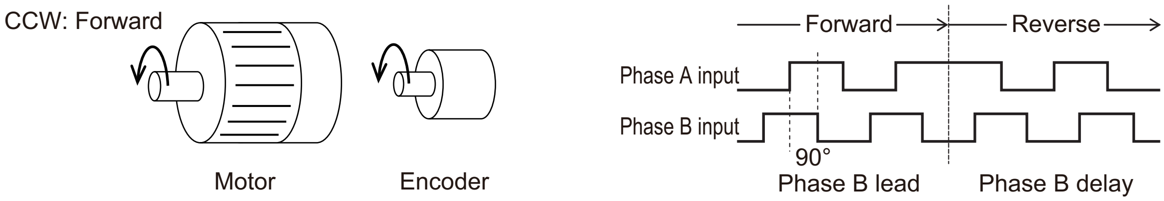
Parameter No.	Function name	Data	Default data	Unit
F42/A14	1st Drive Control Selection/ 2nd Drive Control Selection	3: IM V/f control with speed sensor	0	-
d14	Input Terminal [PIA][PIB] Pulse Input Format Selection	0: Pulse train signing/pulse train input 1: Forward/reverse rotation pulse 2: Quadrature A/B signal (B phase lead) 3: Quadrature A/B signal (A phase lead)	2	-
d15	Input Terminal [PIA][PIB] Encoder Pulse Resolution	20 to 60000	1024	Pulse
d16	Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator	1 to 32767	1	-
d17	Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator	1 to 32767	1	-

● Details of Input Terminal [PIA][PIB] Pulse Input Format Selection (d14)

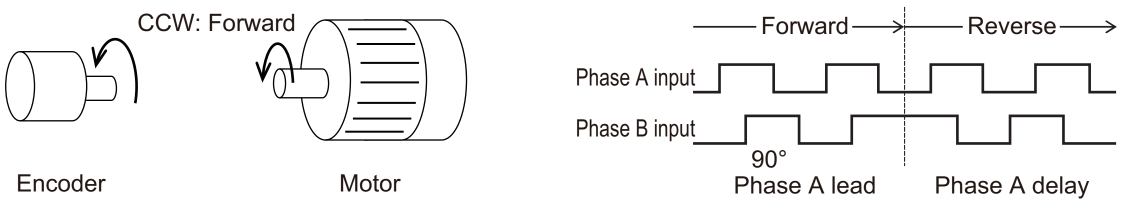
The Input Terminal [PIA][PIB] Pulse Input Format Selection (d14) setting causes the inverter to recognize the feedback rotation direction as shown below.

d14 data	Pulse input method	Remarks
2	Quadrature A/B signal (B phase lead)	
3	Quadrature A/B signal (A phase lead)	When d14 = 2, reverse rotation (A phase lead becomes forward rotation).

The counterclockwise direction (CCW) as viewed from the shaft side is taken as the forward rotation direction of the motors. At this time, if the output pulse of the encoder is B phase lead, set “2: Quadrature A/B signal (B phase lead)” at Input Terminal [PIA][PIB] Pulse Input Format Selection (d14).



If the output pulse of the encoder is A phase lead, set “3: Quadrature A/B signal (A phase lead)” at Input Terminal [PIA][PIB] Pulse Input Format Selection (d14).



Additional Information

In the case of a motor that complies with the IEC Standards, forward rotation causes the motor to rotate clockwise (CW).
Either connect the output pulse of the encoder during forward (CW) rotation so that it becomes B phase lead, or set Input Terminal [PIA][PIB] Pulse Input Format Selection (d14) to match the output pulse of the encoder.

6-2-2 Protective Detection under V/f Control with Speed Feedback

In V/f control with speed feedback, the following protective detection functions can be used.
Use these functions according to your application.

Parameter No.	Function name	Data	Default data	Unit
d21	Speed Agreement / Speed Deviation Error Hysteresis Width	0.0 to 50.0	10.0	%
d22	Speed Agreement / Speed Deviation Error Detection Timer	0.00 to 10.00	0.50	s

Parameter No.	Function name	Data	Default data	Unit
d23	Speed Deviation Error Processing Selection	0: Continue to run 1 1: Stop with alarm 1 2: Stop with alarm 2 3: Continue to run 2 4: Stop with alarm 3 5: Stop with alarm 4	2	-
d32	Speed Limit 1 in Forward	0 to 110	100	%
d33	Speed Limit 2 in Reverse	0 to 110	100	%
d35	Over Speed Detection Level	0 to 120, 999: Depend on d32 and d33	999	%
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	71: DSAG (Speed agreement) 76: DSE (Excessive speed deviation)	-	-

● Overspeed error detection

If the output frequency exceeds the overspeed protection level, the inverter detects the overspeed protection alarm OS and shuts off (trips) inverter output.

- Conditions that cause an overspeed protection alarm

  Over Speed Detection Level (d35) = 999

<Forward rotation side>	Overspeed detection level = 1st Maximum Output Frequency (F03)/2nd Maximum Output Frequency (A01) × Speed Limit 1 in Forward (d32) (%) × 120 (%)
<Reverse rotation side>	Overspeed detection level = 1st Maximum Output Frequency (F03)/2nd Maximum Output Frequency (A01) × Speed Limit 2 in Reverse (d33) (%) × 120 (%)

  Over Speed Detection Level (d35) = Other than 999

  Overspeed detection level = 1st Maximum Output Frequency (F03)/2nd Maximum Output Frequency (A01) × Over Speed Detection Level (d35) (%) × 120v(%)

● Speed mismatch/excessive speed deviation

If the state where the difference between the frequency reference and the actual frequency exceeds the set value of Speed Agreement / Speed Deviation Error Hysteresis Width (d21) continues for Speed Agreement / Speed Deviation Error Detection Timer (d22), this state is judged to be a speed mismatch/excessive speed deviation, post-detection processing is performed according to the setting of Speed Deviation Error Processing Selection (d23).

d23 data	Function	Detection condition	Post-detection processing	Error detection width when speed command > F04
0	Continue to run 1	When the speed command (after software start processing) cannot be followed due to a heavy overload, for example, and the detection speed drops compared with the speed command, a PG error is not judged.	The excessive speed deviation "DSE" signal is output and the inverter continues to operate.	Even at 1st Base Frequency (F04) or higher, constant at "detection width = d21 × maximum frequency."
1	Stop with alarm 1		Inverter free-run at ErE alarm	
2	Stop with alarm 2	There are no exception conditions.		
3	Continue to run 2	When the speed command (after software start processing) cannot be followed due to a heavy overload, for example, and the detection speed drops compared with the speed command, a PG error is not judged.	The excessive speed deviation "DSE" signal is output and the inverter continues to operate.	At 1st Base Frequency (F04) or lower, constant at "detection width = d21 × maximum frequency." At 1st Base Frequency (F04) or higher, "detection width = d21 × speed command × maximum frequency / base frequency."
4	Stop with alarm 3		Inverter free-run at ErE alarm	
5	Stop with alarm 4	There are no exception conditions.		

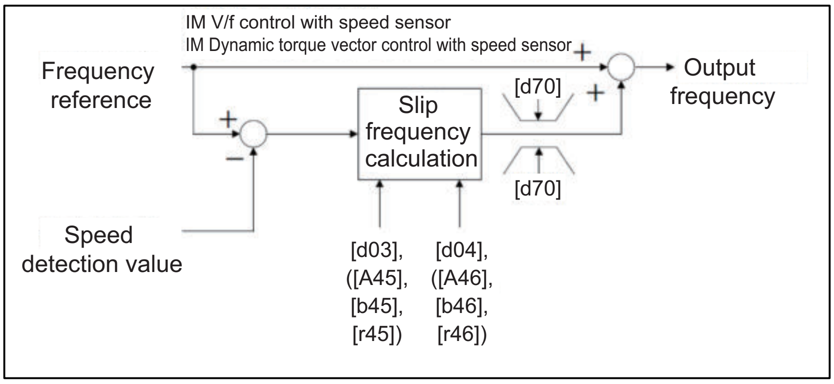
When Continue to run (0 or 3) is set in Speed Deviation Error Processing Selection (d23), inverter output is not shut off (tripped). For this reason, allocate "76: DSE (excessive speed deviation)" to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27), and configure a sequence that, for example, stops control.
To judge that the speed deviation is within the setting range, allocate "71: DSAG (speed agreement)."

6-2-3 Adjustments for V/f Control with Speed Feedback

You can adjust the V/f control with speed feedback function with the gain settings shown below. However, the function cannot be adjusted when using a motor that causes an extremely large slip (10% of the rated rotation speed or higher) or in applications where such a large load that causes the motor to stall (or step out) is applied. If so, set the type and capacity of the motor again.

Parameter No.	Function name	Data	Default data	Unit
d03	Speed Control 1 P Proportional Gain	0.1 to 200.0	10.0	time
d04	Speed Control 1 I Integral Time	0.001 to 9.999 999: Cancel integral term	0.100	s

Parameter No.	Function name	Data	Default data	Unit
d70	Speed Control Slip Frequency Limit	0.00 to 100.00	100.00	%



● **V/f control with speed feedback slip compensation proportional gain**

At first, adjust the proportional gain for speed feedback control.

- Check and gradually increase the set value of PG feedback value (monitor mode: 3_29).
- While checking the PG feedback value (monitor mode: 3_29), increase the value within the range where the motor speed is stable.
- If the motor speed fluctuates or the motor vibrates wildly, decrease the set value until it becomes stable.
- When adjusting the response if the load is actually activated, increase the set value to improve response, or decrease the set value to make it stable.

● **V/f control with speed feedback slip compensation integral time**

Next, adjust the integral time for speed feedback control.

- Check and gradually decrease the set value of PG feedback value (monitor mode: 3_29).
- Decrease the value in the PG feedback value (monitor mode: 3_29) until it matches the reference frequency.
- If the motor speed fluctuates or the motor vibrates wildly, increase the set value until it becomes stable.
- When adjusting the response if the load is actually activated, decrease the set value to improve response, or increase the set value to make it stable.

● **Speed control limiter**

Speed Control Slip Frequency Limit (d70) is the limiter for the slip frequency that is added to the frequency reference. The maximum frequency is taken to be 100%. Ordinarily, leaving this setting at 100% causes no problems.

6-3 Sensorless Vector Control

A characteristic of an induction motor is that its rotation speed drops when output torque increases. When sensorless vector control is selected, the relationship between the output torque and rotation speed of an induction motor can be improved and high torque can be output even at low speeds. Sensorless vector control enables a high starting torque of 200% to be output at 0.5 Hz.
An auto-tuning function (rotation method, stop method) that automatically sets motor constants also is mounted on the inverter.

6-3-1 Sensorless Vector Control Parameter Settings

- Set the 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) to “5: IM Vector control without speed sensor.”
- Set 1st Motor Capacity (P02)/2nd Motor Capacity (A16), 1st Motor Pole Number (P01)/2nd Manual Torque Boost Voltage (A05), 1st Motor Rated Current (P03)/2nd Motor Rated Current (A17) according to the motor in use.
- When rotation tuning is not possible, set 1st Motor Armature Resistance (P06)/2nd Motor Armature Resistance (A20) by the formula below. When rotation tuning is possible, setting is not required.

  $$\sqrt{(P03)^2-(P55)^2}$$

- Set the rated frequency of the motor to 1st Base Frequency (F04)/2nd Base Frequency (A02), and set the motor rated voltage to 1st Rated Voltage at Base Frequency (F05)/2nd Rated Voltage at Base Frequency (A03). If the motor synchronous speed can be confirmed, set the value calculated by the formula below to F04/A02.

  $$\frac{\text{Synchronous speed}}{120} \times \text{Number of poles}$$

- To use this function, set the motor constants of the motor in use according to *6-3-2 Motor Parameter Settings* on page 6-17.
- Motor magnetic flux is controlled according to the instructed torque by setting “1: Enable” in Magnetic Flux Weakening Control Function Selection (d82). When the instructed torque is small, motor magnetic flux is weakened and stability of control is improved with Magnetic Flux Weakening Lower Limit (d83) as the lower limit.
- Set the magnetic flux weakening lower limit value in % units in Magnetic Flux Weakening Lower Limit (d83). If the lower limit value is set to too low, there is the risk of the problems of hunting and speed delay.
  Use the lower limit value at its factory default (40%) as far as feasibly possible.

Parameter No.	Function name	Data	Default data	Unit
F42	1st Drive Control Selection/	0 : IM V/f control 1 : IM Dynamic torque vector control 5 : IM Vector control without speed sensor	0	-
A14	2nd Drive Control Selection*6-3-1 Sensorless Vector Control Parameter Settings* on page 6-16	0: IM V/f control 1: IM Dynamic torque vector control without speed sensor 5: IM Vector control without speed sensor		
P02/A16	1st Motor Capacity/2nd Motor Capacity	0.01 to 1000 kW	Dependent on capacity	kW
P01/A05	1st Motor Pole Number/2nd Manual Torque Boost Voltage	2 to 128 poles	4	Pole
P03/A17	1st Motor Rated Current/2nd Motor Rated Current	0.00 to 500.0 A	21	A
P06/A20	1st Motor Armature Resistance/2nd Motor Armature Resistance	0.00 to 500.0 A	10.55	A
F04/A02	1st Base Frequency/2nd Base Frequency	5.0 to 590.0	50.0	Hz
F05/A03	1st Rated Voltage at Base Frequency/2nd Rated Voltage at Base Frequency	80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	200	V
d82	Magnetic Flux Weakening Control Function Selection	0: Disable 1: Enable	0	-
d83	Magnetic Flux Weakening Lower Limit	10 to 70%	40	%

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

6-3-2 Motor Parameter Settings

- Ordinarily, offline auto-tuning is performed to set motor parameters.
  However, if offline auto-tuning ends in error, for example, when the inverter does not reach 50% of its rated current during auto-tuning, set the motor parameters manually.
- To increase the performance of vector control, set each parameter value again according to the motor in use.
- Obtain the motor’s datasheet from the motor manufacturer and set each motor parameter.
  For the following set values, set the data for one phase in a Y-connection after conversion in 1st Base Frequency (F04)/2nd Base Frequency (A02),

1st Motor Armature Resistance (P06)/2nd Motor Armature Resistance (A20)	:	Set the no-load current of the motor, or set the current value measured when the motor is in isolated no-load operation in 1st Base Frequency (F04)/2nd Base Frequency (A02).

1st Motor Parameter %R1 (P07)/2nd Motor Motor Constant %R1 (A21)	:	Set the wiring resistance value on the primary side of the motor for one phase in a Y-connection as a percentage Ohmic drop. Calculate by the following formula. $\%R1 = \dfrac{R1 + \text{Cable } R1}{V/(\sqrt{3} \times I)} \times 100\ (\%)$ R1: Motor primary resistance (Ω) Cable R1: Resistance value c of output side cable V: Motor rated voltage (V) I: Motor rated current (A)
1st Motor Parameter %X (P08)/2nd Motor Motor Constant %X (A22)	:	Set the leakage inductance for one phase in a Y-connection motor as a percentage reactance drop. Calculate by the following formula. $\%X = \dfrac{X1 + X2 \times XM/(X2+XM) + \text{Cable } X}{V/(\sqrt{3} \times I)} \times 100\ (\%)$ X1: Motor primary leakage reactance (Ω) X2: Motor secondary leakage reactance (primary converted value) XM: Motor excitation reactance (Ω) Cable X: Reactance of output side cable (Ω) V: Motor rated voltage (V) I: Motor rated current (A)
1st Rated Slip Frequency (P12)/2nd Rated Slip Frequency (A26)	:	Set the rated slip frequency in a Y-connection motor as Hz.

- After setting each motor parameter, adjust the parameters according to *6-3-3 Adjustments for Sensorless Vector Control* on page 6-18.
- To increase response, increase the setting of Speed Control 1 P Proportional Gain (d03)/Speed Control 2 P Proportional Gain (A45), and decrease the setting if motor hunting occurs.

Parameter No.	Function name	Data	Default data	Unit
P06/A20	1st Motor Armature Resistance/2nd Motor Armature Resistance	0.00 to 500.0 A	10.55	A
P07/A21	1st Motor Parameter %R1/2nd Motor Motor Constant %R1	0.00 to 50.00 %	3.17	%
P08/A22	1st Motor Parameter %X/2nd Motor Motor Constant %X	0.00 to 50.00 %	11.47	%
P12/A26	1st Rated Slip Frequency/2nd Rated Slip Frequency	0.00 to 15.00 Hz	1.00	Hz

6-3-3 Adjustments for Sensorless Vector Control

- To use sensorless vector control, perform offline auto-tuning.
  If offline auto-tuning cannot be performed, set the parameters of the motor in use according to *6-3-2 Motor Parameter Settings* on page 6-17.

- The inverter may not provide sufficient performance characteristics if the motor is two or more sizes smaller than the maximum applicable motor capacity. This is because the inverter requires a current accuracy of at least 50% of the rated current.
- If sensorless vector control does not provide the intended performance characteristics, adjust the motor parameters depending on the phenomenon, as shown in the following table.

Operation status	Phenomenon	Description of adjustment	Adjustment item
Power running	Actual motor speed is lower than target speed.	Increase the slip compensation gain (drive) or rated slip gradually.	P09/A23 P12/A26
	Actual motor speed is higher than target speed.		
Regeneration	Torque is insufficient at low frequencies (a few Hz).	Increase %R1 and no-load current gradually.	P07/A21 P06/A20
During startup	Shock occurs during startup.	Adjust the speed control P gain.	d03/A45
	Motor rotates momentarily in opposite direction to instructed rotational direction.	Set rotational direction limitation.	H08
At deceleration	Motor is hunting.	Adjust the speed control P gain.	d03/A45
During torque limit	Torque becomes insufficient at low frequencies when torque limit is enabled.	Decrease the torque limit.	F40 F41 E16 E17
Low frequency operation	Rotation is unstable.	Adjust the speed control P gain.	d03/A45

Output Torque Monitor Function

This function monitors the output torque value.

To monitor the output torque value on the Digital Operator, either set Operator Display Selection during Run (E43) to “8: Calculated torque,” or monitor in monitor mode 3_04.

When monitoring by a signal on the control terminal block, refer to *7-3-6 AO Terminal (Analog/Pulse Monitor Outputs)* on page 7-44.

Parameter No.	Function name	Data	Default data	Unit
E43	Operator Display Selection during Run	8: Calculated torque	0	-
F31	Output Terminal [AO] Function Selection	4: Output torque 29: Output torque (Bipolar)	0	-

6-4 PM Motor Mode

The 3G3M1 Series provides the PM motor mode.
Synchronous motors (PM motors) that are more efficient than induction motors (IM motors) can be controlled.
This section describes the PM motor mode.

6-4-1 PM Motor and PM Motor Control

PM Motor

A PM motor (abbreviation for “Permanent Magnet motor”) is a motor that uses permanent magnets for the motor rotor.
Generally, it is also called a synchronous motor. Compared with induction motors that are used conventionally for the inverter, PM motors allow no current flow on the rotor side, which results in highly efficient operation due to reduced loss.
In terms of the internal construction, there are various types of PM motors: IPM motors (interior permanent magnet type), SPM motors (surface permanent magnet type), and so on.
PM motors have the control characteristics as shown below.
When using the PM motor mode of the 3G3M1 Series Inverter, understand the following characteristics before selecting the inverter type and function settings.

- The applied AC power must be synchronized with the rotor permanent magnets.
  Although the motor allows a large current to flow, it cannot output a sufficient torque if the AC power is not synchronized.
- The permanent magnets used for the rotor are subject to demagnetization if a large current flows in the PM motor.
  Once a rotor is demagnetized, the motor cannot output a sufficient torque and must be replaced.

PM Motor Control

PM motor control with speed feedback can be selected on the 3G3M1 Series.
As large startup torque cannot be output, PM motor control without speed feedback is suitable for applications with reduced torque characteristics (which do not require torque at low speeds) such as fans and pumps.
For applications with constant torque characteristics such as general transfer equipment and elevating axes (which require a torque exceeding the rated torque also at low speeds), select PM motor control with speed feedback.
In PM motor control without speed feedback, use control with startup torque at 50% or less of the motor rated torque to keep the PM motor in a synchronized state.
Follow the steps below to use PM motor control.

1. Switch to the PM motor mode (*6-4-2 Switching to PM Motor Mode* on page 6-21)
2. Execute offline auto-tuning for PM motor parameters (*6-8-1 Motor Off-line Auto-tuning* on page 6-65)
3. Set PM motor parameters (*6-3-2 Motor Parameter Settings* on page 6-17)

Refer to this section if offline auto-tuning fails.

4. Adjust the PM motor mode (*6-4-4 Adjustment of PM Motor Mode Settings* on page 6-22)

Parameters with Changed Default Data

Changing the control method switches the default data for the following parameters.

Parameter No.	Function name	F42 set value	
		Changed from 15, 16 to other than 15, 16	Changed from other than 15, 16 to 15, 16
F03	1st Maximum Output Frequency	60	90
F04	1st Base Frequency	50	90
F05	1st Rated Voltage at Base Frequency	200/400	Individual capacity values for PMSM
F06	1st Rated Voltage at Maximum Output Frequency	200/400	Individual capacity values for PMSM
F11	1st Motor Electronic Thermal Level	Individual capacity values for IM	Individual capacity values for PMSM
F12	1st Motor Electronic Thermal Time Constant	5 minutes	Less than 18.5 kW: 2 minutes 18.5 kw or more: 5 minutes
F15	1st Frequency Upper Limit	70	90
F23	1st Starting Frequency	0.5	1
F26	Carrier Frequency	2	4
E50	1st Frequency Conversion Coefficient	30	20
P01	1st Motor Pole Number	4	6
P03	1st Motor Rated Current	Individual capacity values for IM	Individual capacity values for PMSM
d01	Speed Control 1 Speed Command Filter	0.02	0.2
d02	Speed Control 1 Speed Detection Filter	0.005	0.025
d03	Speed Control 1 P Proportional Gain	10	2
d04	Speed Control 1 I Integral Time	0.1	0.6
d06	Speed Control 1 Output Filter	0.002	0

Parameter No.	Function name	F42 set value	
		Changed from 15 to other than 15	Changed from other than 15 to 15
d67	Motor Starting Mode Auto Search in Speed Sensor Vector Control	1	2

6-4-2 Switching to PM Motor Mode

To switch to the PM motor control mode, set “15: PM Vector control without speed and pole position sensor” or “16: PM Vector control with speed and pole position sensor” to 1st Drive Control Selection (F42), and switch to the PM motor mode.

The PM motor can be connected only in drive control selection 1.

Parameter No.	Function name	Data	Default data	Unit
F42	1st Drive Control Selection	15 : PM Vector control without speed and pole position sensor 16 : PM Vector control with speed and pole position sensor	0	-

6-4-3 Offline Auto-tuning for PM Motor Parameters

For details on auto-tuning a PM motor, refer to *6-8-1 Motor Off-line Auto-tuning* on page 6-65.

6-4-4 Adjustment of PM Motor Mode Settings

PM Motor Adjustment Parameters

For the adjustment of PM motor control, this inverter provides parameters for the control method during startup, parameters for stableness and responsiveness, and initial pole position estimation functions. The following table summarizes the parameters.
For details on how to adjust these parameters, refer to the next section onwards.

Parameter No.	Function name	Data	Default data	Unit
F24	1st Starting Frequency 1 Holding Time	0.00 to 10.00	0.00	s
F26	Carrier Frequency	0: 0.75 kHz 1 to 16	2	kHz
d03	Speed Control 1 P Proportional Gain	0.1 to 200.0	10.0	time
d04	Speed Control 1 I Integral Time	0.001 to 9.999 999: Cancel integral term	0.100	s
P30	1st PM Motor Starting Method	0: Pull-in by current 1: For IPM type 1(Interior permanent magnet synchronous motor) 2: For SPM type (Surface permanent magnet synchronous motor) 3: Pull-in by current for IPM type 4: For IPM type 2(Interior permanent magnet synchronous motor)	1	-
P61	1st PM Motor d-axis Inductance	0.00 to 500.00	4.77	mH
P62	1st PM Motor q-axis Inductance	0.00 to 500.00	10.70	mH
P74	1st PM Motor Reference Current at Starting	10 to 200 (Based on the rated current of the motor)	80	%
{P89}	{P89Motor 1 (PM motor control switching level)}	0 to 100	0	%

PM Motor Adjustment

Adjust the PM motor as shown in the table below depending on its operation status and the phenomenon.

<table>
<tr><th>Operation status</th><th>Phenomenon</th><th>Description of adjustment</th><th>Adjustment item</th></tr>
<tr><td rowspan="4">During startup</td><td>Motor rotates in reverse or rotates slightly.</td><td>The motor may rotate slightly in magnetic pole alignment during startup.
Set 1st PM Motor Starting Method P30 to 1 to suppress the rotation amount during startup.
When operation is performed with P30 set to 0 or 3, reverse rotation becomes difficult by lowering P74.</td><td>P30
P74</td></tr>
<tr><td rowspan="2">Motor stalls or causes an overcurrent trip.</td><td>If the motor stalls during startup, a large current may flow, which causes an overcurrent trip.
Increase the PM motor starting current value.
Increasing the PM motor starting current value improves the magnetic pole alignment during startup, which results in an increase in the startup torque.
However, setting this parameter to an excessively large value may cause detection of an overload.
Check the value in the monitor of electronic thermal overload protection for motor (monitor mode: 5_62).</td><td>P74</td></tr>
<tr><td>Increase the PM motor starting time value.
This increases the time during which the starting current flows to improve magnetic pole alignment during startup, which results in an increase in the startup torque.</td><td>F24</td></tr>
<tr><td>Motor starting time is too long.</td><td>Set P30 correctly according to the motor in use.</td><td>P30</td></tr>
<tr><td rowspan="6">Motor rotating</td><td>Rotation is unstable.</td><td>If the motor rotation is unstable during startup, increase the motor starting current.
However, setting this parameter to an excessively large value may cause detection of an overload.
Check the value in the monitor of electronic thermal overload protection for motor (monitor mode: 5_62).</td><td>P74</td></tr>
<tr><td>A shock or overcurrent trip occurs.</td><td>Adjust the speed control gain to a larger value and the integral time to a smaller value.</td><td>d03, d04</td></tr>
<tr><td rowspan="4">Motor is hunting or vibrating.</td><td>Adjust the speed control gain to a smaller value and the integral time to a larger value.</td><td>d03, d04</td></tr>
<tr><td>Increase the carrier frequency if it is low.</td><td>F26</td></tr>
<tr><td rowspan="2">Gradually increase the PM motor d-axis inductance.
Gradually increase the PM motor q-axis inductance.</td><td>P61</td></tr>
<tr><td>P62</td></tr>
</table>

Overcurrent Protection

PM motors must set with an allowable current value for preventing the permanent magnet from becoming demagnetized. If a current exceeding this allowable current value is allowed to pass, the magnetic force of the permanent magnet weakens and the desired motor characteristics can no longer be obtained.
When a current of current value set in 1st PM Motor Overcurrent Protection Level (P90) or higher flows, overcurrent protection alarms OC1, OC2 or OC3 are output to protect the motor.

Parameter No.	Function name	Data	Default data	Unit
P90	1st PM Motor Overcurrent Protection Level	0.00 to 4000 A (0.00: No active)	50.00	A

High-efficiency Control

In the operation of PM motors, motor parameters are used to perform high-efficiency control. Operation of a PM motor with the motor parameters unknown or in a state where rotation tuning cannot be performed is sometimes possible by disabling high-efficiency control.
To disable high-efficiency control, set PM Motor High-efficiency Control Selection (d89) to 0.

Parameter No.	Function name	Data	Default data	Unit
d89	PM Motor High-efficiency Control Selection	0: Disable 1: Enable	1	-

Magnetic Position Detection Completed Signal (PTD)

The ON signal is output when the magnetic pole position is detected at PM motor startup. This parameter is enabled when P30 is set to other than 0.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	89: PTD (magnetic position detection completed signal)	-	-

Synchronous Motor Magnetic Pole Position Pull-in Frequency

When using an encoder having A, B and Z phase outputs in PM Vector control with speed and pole position sensor, pull-in operation at the magnetic pole position is performed at the frequency set at d80 during the period up to detection of the Z phase immediately after power is turned ON as the magnetic pole position is unknown. After detection of the Z phase, the magnetic pole position referenced to the magnetic pole position sensor offset set to P95 is established, and regular operation is switched to. Generally, there is no need for adjustment.

Parameter No.	Function name	Data	Default data	Unit
d80	1st PM Motor Magnetic Pole Position Pull-in Frequency	0.1 to 10.0	1.0	Hz

6-5 Speed Control

The 3G3M1 Series is provided with speed control.
This section describes the speed control settings and functions.

6-5-1 Speed Control Settings

Speed control parameters can be selected from four types by combining speed control signals. Speed control is enabled in vector control with speed sensor, V/f control with speed sensor and vector control without speed sensor (permanent magnet synchronous motor). Speed control parameters can be adjusted to perform optimum speed control.

Parameter No.	Function name	Data	Default data	Unit
d01/A43/b43/r 43	Speed Control 1 Speed Command Filter/Speed Control 2 Speed Command Filter/Speed Control 3 Speed Command Filter/Speed Control 4 Speed Command Filter	0.000 to 5.000	0.02	s
d02/A44/b44/r 44	Speed Control 1 Speed Detection Filter/Speed Control 2 Speed Detection Filter/Speed Control 3 Speed Detection Filter/Speed Control 4 Speed Detection Filter	0.000 to 0.100	0.005	s
d03/A45/b45/r 45	Speed Control 1 P Proportional Gain/Speed Control 2 P Proportional Gain/Speed Control 3 P Proportional Gain/ Speed Control 4 P Proportional Gain	0.1 to 200.0	10	-
d04/A46/b46/r 46	Speed Control 1 I Integral Time/Speed Control 2 I Integral Time/Speed Control 3 I Integral Time/Speed Control 4 I Integral Time	0.001 to 9.999 999: Cancel integral term	0.1	s
d05/A47/b47/r 47	Speed Control 1 FF Gain/ Speed Control 2 FF Gain/ Speed Control 3 FF Gain/ Speed Control 4 FF Gain	0.00 to 99.99	0	s
d06/A48/b48/r 48	Speed Control 1 Output Filter/ Speed Control 2 Output Filter/ Speed Control 3 Output Filter/ Speed Control 4 Output Filter	0.000 to 0.100	0.002	s

Parameter No.	Function name	Data	Default data	Unit
d07/A49/b49/r49	Speed Control 1 Notch Filter Resonance Frequency/Speed Control 2 Notch Filter Resonance Frequency/Speed Control 3 Notch Filter Resonance Frequency/Speed Control 4 Notch Filter Resonance Frequency	1 to 500	200	Hz
d08/A50/b50/r50	Speed Control 1 Notch Filter Attenuation Level/Speed Control 2 Notch Filter Attenuation Level/Speed Control 3 Notch Filter Attenuation Level/Speed Control 4 Notch Filter Attenuation Level	0 to 40	0	dB
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	78: Speed control parameter selection 1 79: Speed control parameter selection 2	-	-

Switching Speed Control Constants

In readiness for cases where speed control constants must be changed according to changes in load or machine conditions, the 3G3M1 has four speed control constants. These can be switched by speed control parameter selection 1 terminal input “MPRM1” and speed control parameter selection 2 “MPRM2.” Speed control constants 1 and 2 can also be switched by the “SET (2nd control)” terminal.

Input signal		Switching speed control constants
MPRM2	MPRM1	
OFF	OFF	Speed control constant 1: d01 to d08
OFF	ON	Speed control constant 2: A43 to A50
ON	OFF	Speed control constant 3: b43 to b50
ON	ON	Speed control constant 4: r43 to r50

Input signal SET	Switching speed control constants
OFF	Speed control constant 1: d01 to d08
ON	Speed control constant 2: A43 to A50

Speed Command Filter (d01/A43/b43/r43)

This parameter is for setting the time constant of the primary lag filter for the speed set value. Adjust this parameter, for example, when overshooting in response to changes in the speed command is large.

Setting a large filter time constant stabilizes the output and reduces overshoot in response to changes in the speed setting though the speed response becomes slower.

Speed Detection Filter (d02/A44/b44/r44)

This parameter is for setting the time constant of the primary lag filter with respect to the speed detection value. This is a filter for feedback. Set it when the mechanical system vibrates.
Adjust this parameter, for example, when ripple (vibration component) is carried on the speed detection signal as a result of the control target (mechanical system) such as belt deflection, and hunting caused by that vibration component prevents gain, etc. of the PI controller from being sufficiently increased (response is slow). Also, set this parameter when there are few pulses from the encoder which results in a speed that causes vibration.
When the filter time constant is increased, the speed detection value is stabilized, and the gain of the PI controller can be increased even if ripple is carried on the speed detection signal. Note, however, that as speed detection itself is delayed, speed response slows down, overshooting increases and sometimes results in hunting.

P (Gain) (d03/A45/b45/r45), I (Integral Time) (d04/A46/b46/r46)

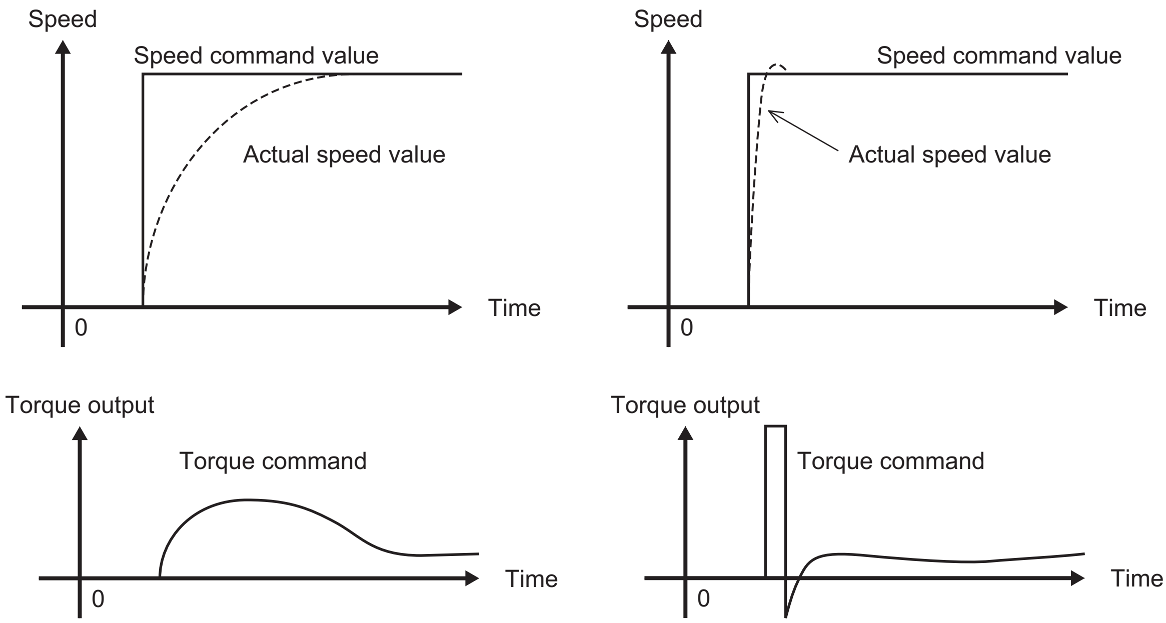
These parameters are for setting the gain and integral time of the speed controller (ASR).
By setting d04 = 999, the integral operation can be disabled.

- P (gain)
  Definition of P gain = 1.0 is a torque command of 100% (100% torque output at each capacity) when the speed deviation (speed command - actual speed) is 100% (equivalent to the maximum speed setting).
  Adjust the P gain according to the moment of inertia of the machine connected to the motor shaft. When the moment of inertia increases, P gain also must be increased to ensure the same response. When P gain is increases, control response becomes faster, however, the motor speed sometimes overshoots and the motor hunts. Also, machine resonance and excessive noise amplitude causes the machine or motor to generate abnormal noise.
  If this happens, the resonance amplitude can be decreased by lowering P gain. However, excessively decreasing P gain causes control response to slow down, low-frequency speed fluctuations to occur, and stabilization of the motor speed to take longer.
- I (integral time)
  When the integral time is set to a small value, response is fast as the correction time for deviation is short. To allow overshooting to enable the target speed to be reached quickly, decrease the set value, and when overshooting cannot be allowed, increase the set value.
  In cases where machine resonance occurs and abnormal machine noise is emitted from the motor and gears, the resonance point can be moved to the low frequency side to suppress resonance in the high frequency region by increasing the integral time.

FF (Gain) (d05/A47/b47/r47)

This parameter performs feedforward control for adding the torque that is determined from the amount of change in the speed command directly to the torque command.
PI control of the speed controller is feedback control whereby corrective action (following the speed command) is performed according to the result (actual speed value) of the control target. Accordingly, with this control, correction also is effective on external disturbances that cannot be measured and causes that cannot be directly measured such as the uncertainty of control target characteristics.

However, changes also in known command amounts are corrected after they appear in deviation (speed command - actual speed value) later on. As the control value (torque command) is required in advance for known causes, faster-response control can be expected by adding that control value directly to the torque command. This parameter is for performing this kind of control. Feedforward control adds the torque that is determined from the amount of change in the speed command directly to the torque command.
This is effective when the load inertia is already known. As shown conceptually in the figure below, the speed of the actual value following the command amount when feedforward control is disabled and when it is enabled is completely different. Note, however, that, in order to obtain maximum effect, the PI constants of feedback control should be adjusted to balance well with this set value.



Although the above effect can be obtained by setting the P gain of the speed controller to a higher value, increasing gain is counterproductive as is it also increases system response and produces machine resonance and vibration sound.

Notch Filter Resonance Frequency (d07/A49/b49/r49) and Notch Filter Attenuation Level (d08/A50/b50/r50)

The speed loop gain at only near a preset resonance point can be lowered to suppress machine resonance. The notch filter can be used only when “vector control with speed sensor” is selected. Setting a higher speed loop gain to increase speed response may result in machine resonance being generated.
To suppress machine resonance, the speed loop gain must be lowered to lower the overall speed response. If the notch filter is used at this time, the speed loop gain at only near the preset resonance point can be lowered, and the speed loop gain at other than the resonance point can be set higher. As a result, the overall speed response can be increased.
When “0” (dB) is set to “attenuation level,” the notch filter is disabled.

Speed Control Speed Loop Switching Time at Parameter Change (d25)

Parameters can be switched even when the inverter is operating. The parameters that can be switched include the P gain and I integral time of the speed control system. When these parameters are switched while the inverter is operating, in some load operating conditions, sudden torque fluctuations may occur and cause mechanical shock which may be problematic.
To alleviate this kind of shock, suppress sudden fluctuations in torque by setting the ramp function in Speed Control Speed Loop Switching Time at Parameter Change (d25) when switching parameters.

Parameter No.	Function name	Data	Default data	Unit
d25	Speed Control Speed Loop Switching Time at Parameter Change	0.000 to 1.000	0.000	s

6-6 Torque Control

The 3G3M1 Series provides the torque control mode.
This section describes the torque control settings and functions.

6-6-1 Torque Control Settings

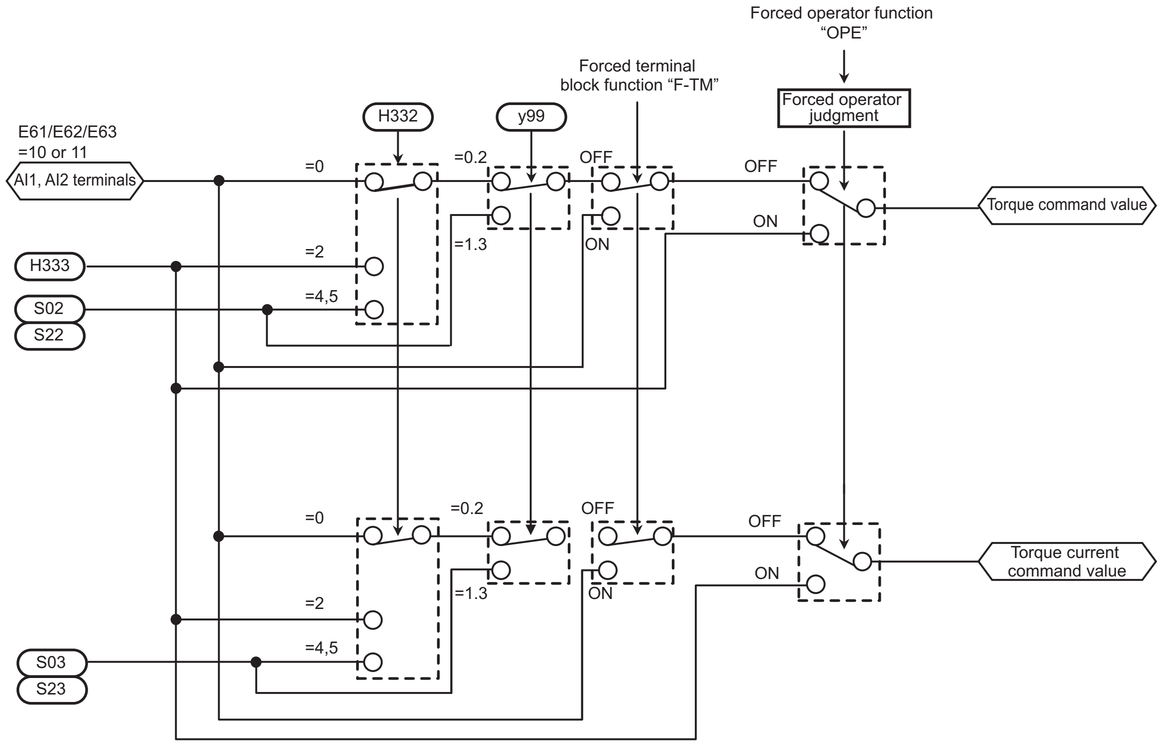
The inverter provides torque control that controls the output torque of the motor.

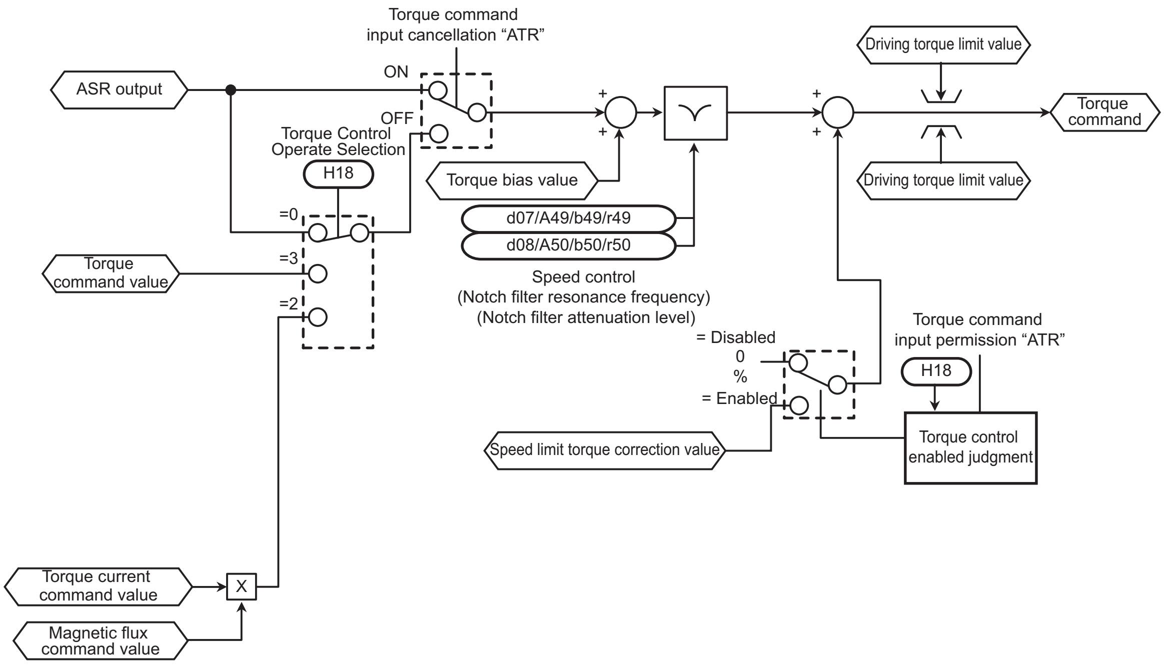
- This function is enabled when “5: IM Vector control without speed sensor,” “6: IM Vector control with speed sensor” and “16: PM Vector control with speed and pole position sensor” are set in 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14).
- Torque control can be switched between enabled and disabled by the setting of parameter H18. Torque control can be switched to speed control by turning “23: ATR (torque control cancel)” allocated to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) to ON with the torque reference enabled.
- Select torque command input in Torque Reference Selection (H332). One of Torque Reference (H333), analog input, and communication can be selected.
  When instructing the torque command by analog input, torque becomes 0% to 200% at 0 to 10 V (4 to 20 mA).
- Because, under torque control, the speed of the inverter is determined by the balance between torque and load, to prevent the inverter from going out of control, set the speed limit/acceleration level as a percentage of the maximum frequency in d32 (for forward rotation) and d33 (for reverse rotation).
- The torque command value of this torque control function takes the motor rated torque to be 100%.
- When “4: B/D (torque polarity detection)” is allocated to a multifunction output terminal, the signal for distinguishing drive torque or braking torque is output. The OFF signal is output when the torque is drive torque, and the ON signal is output when the torque is braking torque.

Parameter No.	Function name	Data	Default data	Unit
H18	Torque Control Operate Selection	0: Disable (Speed control) 2: Torque current command input 3: Torque command input	0	-
H332	Torque Reference Selection	0: Analog input 2: Operator (H333) 4: RS-485 communication 5: Fieldbus (Reserved)	0	-
H333	Torque Reference	0 to 200 %	0	%
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	23: ATR (torque control cancel)	-	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	4: B/D (torque polarity detection)	-	-

Parameter No.	Function name	Data	Default data	Unit
E61	Input Terminal [AI1] Function Selection	10: Torque command 11: Torque current command	-	-
E62	Input Terminal [AI2] Function Selection （AII）			
E63	Input Terminal [AI2] Function Selection （AIV）			
y99	Support Tool Link Function Selection	0: Numerical setting and terminal command (including operation command) by related parameter settings 1: Numerical setting uses communications command (support tools) 2: Terminal setting uses communications command (support tools) 3: Both numerical setting and terminal command use communications command (support tools) Numerical setting means Frequency reference, torque command, or torque bias command.	0.00	%
S02	Torque Reference	-327.68 to 327.67*1	0.00	%
S03	Torque Current Command	-327.68 to 327.67*1	0.00	%
S22	Torque Reference via Communication	-327 to 327*1	0	%
S23	Torque Current Command via Communication	-327 to 327*1	0	%

*1. The upper and lower limits of the torque command via communications are ±200.00%. When the command contains a value exceeding the ±200.00% range, the torque command is limited internally to ±200.00%.





6-6-2 Torque Bias Function Settings

This function is for applying bias to the torque command in torque control.

- This function is enabled when “5: IM Vector control without speed sensor,” “6: IM Vector control with speed sensor” and “16: PM Vector control with speed and pole position sensor” are set in 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14).
- Select the command source of torque bias in Torque Bias Function Selection (H154).
  “0: Torque bias invalid”
  Disables torque bias.

“1: Torque bias (Level 1 to 3)”

Switches the torque bias level according to “TB1” and “TB2” allocated to multifunction input terminals.

Input signal		Torque bias value selection
TB1	TB2	
OFF	OFF	No torque bias
OFF	ON	H155: Torque bias level 1
ON	OFF	H156: Torque bias level 2
ON	ON	H157: Torque bias level 3

“2: Analog torque bias”

Set one of Input Terminal [AI1] Function Selection (E61), Input Terminal [AI2] Function Selection（AII） (E62) or Input Terminal [AI2] Function Selection（AIV） (E63) to “9c torque bias,” and determine the torque bias value by analog current input or analog voltage input.

When “62: H-TB (Torque bias hold)” is allocated to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) and the terminal is turned ON, the torque bias level currently entered to that input is held.

“4: Modbus communication”

Set Torque Bias Value via Communication (S15)/Torque Bias Value (S24) via Modbus communication.

- The torque command value of this torque control function takes the motor rated torque to be 100%.
- Set the polarity of the instructed torque bias value in Torque Bias Polarity Selection (H334).
  “0: Signed”
  The forward torque increases when the torque bias value is positive (+) and the reverse torque increases when the torque bias value is negative (−), independent of the operation direction.
  “1: Depends on the run direction”
  The direction in which torque bias works depends on the RUN command direction.

Forward command	:	Forward torque increases when torque bias value is positive (+). Reverse torque increases when torque bias value is negative (-).
Reverse command	:	Reverse torque increases when torque bias value is positive (+). Forward torque increases when torque bias value is negative (-).

- Set Torque Bias Mechanical Loss Compensation (H158) to compensate for mechanical loss.
- Shock is sometimes large when the torque bias is simply added. Startup with little shock is possible by setting a timer in Torque Bias Startup Timer (H159). Set the timer as the time for adding 100% torque. When 0 is set, all the torque bias value is added instantaneously.
- Torque bias can be gradually excluded in the same way as the startup timer by setting Torque Bias Shutdown Timer (H161). Set the timer as the time for subtracting 100% torque. When 0 is set, all the torque bias value is subtracted.
- The maximum torque bias value can be limited by setting Torque Bias Limit (H162).

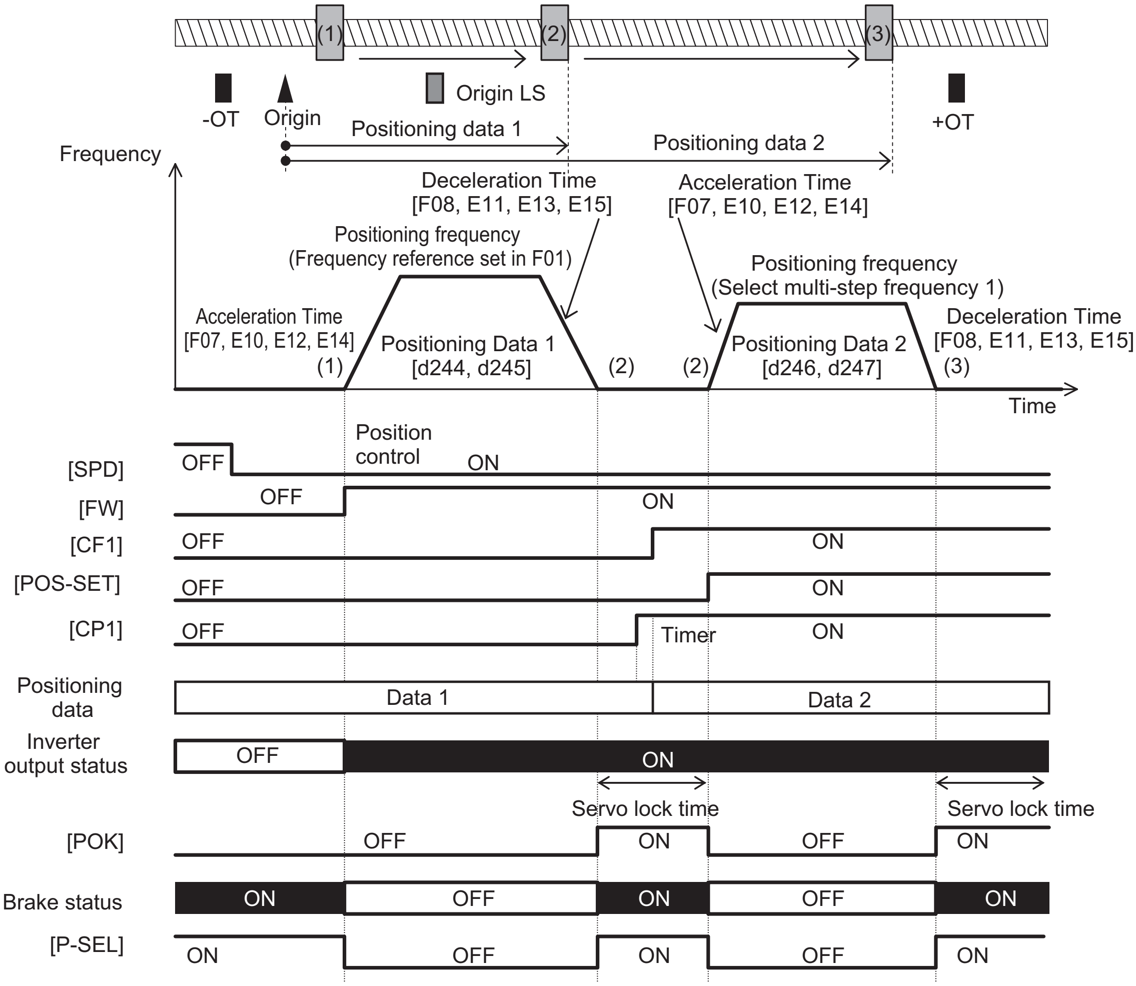
Parameter No.	Function name	Data	Default data	Unit
H154	Torque Bias Function Selection	0: Invalid 1: Operator (H155 to H157) 2: Analog input 4: RS-485 communication 5: Fieldbus (Reserved)	0	-
H155/ H156/ H157	Torque Bias Level 1 Torque Bias Level 2 Torque Bias Level 3	-300 to +300 %	0	%
H158	Torque Bias Mechanical Loss Compensation	0 to 300	0	%
H159	Torque Bias Startup Timer	0.00 to 1.00	0.00	s
H161	Torque Bias Shutdown Timer	0.00 to 1.00	0.00	s
H162	Torque Bias Limit	0 to 300	200	%
H334	Torque Bias Polarity Selection	0: Signed 1: Depends on the run direction	0	-
S15	Torque Bias Value via Communication	-327.68 to 327.67	0.00	%
S24	Torque Bias Value (MX2 compatible)	-327 to +327 (Truncate to S15 set value)	0	%
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	60: TB1 (Torque bias command 1) 61: TB2 (Torque bias command 2) 62: H-TB (Torque bias hold)	-	-

6-7 Position Control

On the 3G3M1 Series, the PG feedback signal can be used to perform position control.
The pulses of the feedback signal are counted internally by the inverter, and operation is performed so that moving amount is to the specified position data.
In vector control with speed sensor or V/f control with speed sensor, the speed and position are calculated based on the feedback signal. In vector control without speed sensor or V/f control without speed sensor, only position is calculated based on the feedback signal. The inverter is also mounted with an orientation function as an applied function for position control.
The position control function can be used in 1st and 2nd control. However, note that only one set of position control related parameters is provided for the position control function.

6-7-1 Basic Operation

Positioning control is enabled by turning digital input “SPD” OFF during a stop. After that, operation is started by input of the RUN command, acceleration is performed up to the set frequency, and a deceleration and stop are performed so that movement is made up to the position data. When movement stops, the servo lock is activated. Eight types of positioning data can be selected by combinations of “CP1,” “CP2” and “CP3.” Movement is resumed by a change made to the position data (target position changed) by “POS-SET” turning ON. When the target position is reached and the servo lock is activated, digital output “POK” turns ON. If “P-SEL” is turned ON when the mechanical brake is applied during a servo lock, the electric angle is fixed so that the mechanical brake can be input.



List of input terminal functions		
Data	**Terminal function**	**Description**
42	ORL: Origin search limit signal	The return-to-origin operation is as follows: After “ORL” is turned ON during return-to-origin operation, movement is made by the homing offset from the initial Z phase of the PG, and movement is stopped.
119	P-SEL: ASR integral term cancellation	When “P-SEL” is turned ON, the integral term of the speed controller is canceled and P operation is performed. When the mechanical brake is applied during position control, the motor cannot rotate even if there exists position error. For this reason, the integral term accumulates which sometimes causes an overload trip to occur. In such a case, use this function.
135	INC/ABS: Increment/absolute position switching	When “INC/ABS” turns ON, the positioning data is taken as the absolute position from the current position. When “INC/ABS” turns OFF, the positioning data is taken as the absolute position from the origin.
136	ORT: Orientation command	Orientation operation is started when “ORT” is turned ON.

List of input terminal functions		
Data	**Terminal function**	**Description**
137	SPD: Speed/position switching	The mode changes to the position control mode when “SPD” is turned OFF. The mode changes to the speed control mode when turned ON. This function can be operated during operation. After positioning by position control, the state changes to a servo lock state (in vector control) or to a DC braking state (in V/f control).
138	ORG: Return-to-origin start up signal	The mode changes to the return-to-origin mode when “ORG” is turned ON.
139	FOT: Forward rotation drive prohibited	The overtravel detection signal in the positive direction is input when “FOT” is turned OFF. Use this for emergency stop and return-to-origin.
140	ROT: Reverse rotation driving prohibited	The overtravel detection signal in the negative direction is input when “ROT” is turned OFF. Use this for emergency stop and return-to-origin.
141	PCLR: Current position clear	The current position is cleared to zero when “PCLR” is turned ON.
142	PSET: Current position preset	When “PSET” is turned ON, the current position is taken as Preset Position (MSB) (d240) and Preset Position (LSB) (d241).
144	POS-SET: Position change command	When “POS-SET” is turned ON, the target position is changed, and movement to the new target position is started.
145 146 147	CP1: Position command selection 1 CP2: Position command selection 2 CP3: Position command selection 3	Select Positioning Data 1 to 8 (d244 to d259) as a combination of these.

List of output terminal functions		
Data	**Terminal function**	**Description**
82	POK: Positioning completed	This turns ON at completion of positioning (position deviation is Positioning Completed Range (d239) or less).
151	OT-OUT: Overtravel detection	This turns ON when the software overtravel was detected or the overtravel detection signal was accepted.
152	STOP-OUT: Forced stop detection	This turns ON when a forced deceleration stop is made by a multifunction input function “STOP” or detection of an overtravel.

6-7-2 Position Control Gain

Position control generates the torque command and speed command to drive the inverter based on the deviation between the current position and command position according to operation patterns that are generated from position data (target position). Basically, position control assumes that speed control has already been adjusted under a real load and that acceleration and deceleration are possible without any problem. Position control gain adjusts the response of position control. To increase response, set larger values in Position Loop Gain 1 (d203) and Position Loop Gain 2 (d204). Setting too large a value causes hunting or overshooting. To switch the gain at low speed and high speed, set the switching frequency in Position Loop Gain Switch Frequency (d205). If the system starts to vibrate when system rigidity is weak and gain is increased, set a large value in Position Control Feed Forward Gain (d201).

Parameter No.	Function name	Data	Default data	Unit
d201	Position Control Feed Forward Gain	0.00: Cancel 0.01 to 1.50	0.00	-
d202	Position Control Feed Forward Filter	0.000 to 5.000	0.500	s
d203	Position Loop Gain 1 (low speed side)	0.1 to 300.0	1.0	-
d204	Position Loop Gain 2 (high speed side)	0.1 to 300.0	1.0	-
d205	Position Loop Gain Switch Frequency	0.0 to 590.0	0.0	Hz

6-7-3 Electronic Gear

With position control, the moving amount is basically managed by the number of pulses of the PG. However, it is more convenient to manage moving amounts referenced to physical numeric values (user values). The conversion ratio of user values to number of PG pulses can be set as an electronic gear.

Parameter No.	Function name	Data	Default data	Unit
d206	Electronic Gear Denominator	1 to 65535	1	-
d207	Electronic Gear Numerator	1 to 65535	1	-

● How to calculate the electronic gear

Electronic gear numerator/electronic gear denominator ratio can be calculated based on the moving amount per user values unit (position resolution) [mm/user preference], moving amount per single rotation of the motor [mm/rev] and number of PG pulses per single rotation of the motor [pulse/rev].

$$\frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}} = \frac{\text{Moving amount per user value [mm/user value]}}{\text{Moving amount per 1 PG pulse [mm/pulse]}}$$

$$= \frac{\text{Moving amount per user value [mm/user value]}}{\dfrac{\text{Moving amount per motor rotation [mm/rev]}}{\text{Number of pulses per motor rotation [pulse/rev]}}}$$

Set the electronic gear reduced so that each of the electronic gear numerator/electronic gear denominator reduced become integers of 65535 or less.

Example) When the moving amount per user values unit is 0.1 [mm/user preference], machine speed at motor speed of 1,800 [r/min] is 150 [m/min] and the number of PG pulses is 1,000 [pulse/rev]

$$\frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}} = \frac{0.1\text{ [mm/user value]}}{\dfrac{150 \times 1000 / 1800\text{ [mm/rev]}}{1000\text{[pulse/rev]}}} = \frac{180}{150} = \frac{12}{10}$$

6-7-4 Acceleration/Deceleration Time Selection

The normal acceleration/deceleration time is selected during position control. Even if the acceleration/deceleration time selection is switched or parameter values are changed during position control operation, the new selection or parameter values are not reflected in operation. These are reflected when the next position control operation is started.
The following table summarizes acceleration/deceleration time selections.

SET terminal	E125 E126	2CH terminal	Output frequency	Forward / reverse	RT2 terminal	RT1 terminal	Acceleration time	Deceleration time
1st control	0: 2CH	OFF	-	-	-	-	F071st Acceleration Time 1	F081st Deceleration Time 1
		ON	-	-	-	-	E121st Acceleration Time 2	E131st Deceleration Time 1
	1: Switch frequency	-	Disable	-	-	-	F071st Acceleration Time 1	F081st Deceleration Time 1
	2: Switching normal/reverse rotation	-	-	Disable	-	-	F071st Acceleration Time 1	F081st Deceleration Time 1
	3: RT1/2	-	-	-	OFF	OFF	F071st Acceleration Time 1	F081st Deceleration Time 1
		-	-	-	OFF	ON	E102nd Acceleration Time 1	E112nd Deceleration Time 1
		-	-	-	ON	OFF	E121st Acceleration Time 2	E131st Deceleration Time 1
		-	-	-	ON	ON	E142nd Acceleration Time 2	E152nd Deceleration Time 2
2nd control	0: 2CH	OFF	-	-	-	-	E102nd Acceleration Time 1	E112nd Deceleration Time 1
		ON	-	-	-	-	E142nd Acceleration Time 2	E152nd Deceleration Time 2
	1: Switch frequency	-	Disable	-	-	-	E102nd Acceleration Time 1	E112nd Deceleration Time 1
	2: Switching normal/reverse rotation	-	-	Disable	-	-	E102nd Acceleration Time 1	E112nd Deceleration Time 1
	3: RT1/2	-	-	-	OFF	OFF	F071st Acceleration Time 1	F081st Deceleration Time 1
		-	-	-	OFF	ON	E102nd Acceleration Time 1	E112nd Deceleration Time 1
		-	-	-	ON	OFF	E121st Acceleration Time 2	E131st Deceleration Time 1
		-	-	-	ON	ON	E142nd Acceleration Time 2	E152nd Deceleration Time 2

Acceleration/deceleration time selection during position control is basically the same as in speed control, with the exception of limits being applied to the following:

- LAC terminal disabled

- The function for switching the acceleration/deceleration time according to the output frequency when “1: Switch frequency” is set to 1st 2-step Acceleration/ Deceleration switching Condition Selection (E125)/2nd 2-step Acceleration/Deceleration Switching Condition Selection (E126) is disabled. Ordinarily, the acceleration/deceleration time is used when the output frequency is the threshold or less.
- The function for switching the acceleration/deceleration time according to the forward rotation/ reverse rotation when “2: Forward/reverse” is set to 1st 2-step Acceleration/ Deceleration switching Condition Selection (E125)/2nd 2-step Acceleration/Deceleration Switching Condition Selection (E126) is disabled. Ordinarily, the acceleration/deceleration time on the forward rotation side is used.

Deceleration Time for Forced Stop (H56) is selected for the acceleration/deceleration time in the following cases:

- When the RUN command (FWD, REV) is shut off and deceleration is performed during position control
- When an emergency stop is performed by detection of an overtravel (OT) or input of the “STOP” signal

6-7-5 Positioning Data

Positioning data for up to eight points can be set in user value units. Positioning data is selected in combinations of position command selection signals “CP1” “CP2” and “CP3” via digital input. To prevent chattering at contacts, selection is switched when a position command selection signal has not changed state until the Position Data Determination Time (d238) elapses. Positioning data can be changed during position control. To reflect a newly changed position, turn the position change command “POS-SET” ON. When positioning data is changed during a stop, operation by position change command “POS-SET” is not required.

“CP3”	“CP2”	“CP1”	Parameter	Data	Range (user value unit)
OFF	OFF	OFF	d244, d245	Positioning data 1	±268435455 (F000 0001 hex to 0FFF FFFF hex)
OFF	OFF	ON	d246, d247	Positioning data 2	±268435455
OFF	ON	OFF	d248, d249	Positioning data 3	±268435455
OFF	ON	ON	d250, d251	Positioning data 4	±268435455
ON	OFF	OFF	d252 d253	Positioning data 5	±268435455
ON	OFF	ON	d254, d255	Positioning data 6	±268435455
ON	ON	OFF	d256, d257	Positioning data 7	±268435455
ON	ON	ON	d258, d259	Positioning data 8	±268435455

Parameter No.	Function name	Data	Default data	Unit
E01 to E05 E98 E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	135 (1135): Increment/absolute position switching "INC/ABS" 144 (1144): Position change command "POS-SET" 145 (1145): Position command selection 1 "CP1" 146 (1146): Position command selection 2 "CP2" 147 (1147): Position command selection 3 "CP3"	-	-
d237	Positioning Data Type	0: Absolute position (ABS) 1: Relative position (INC)	0	-
d238	Position Data Determination Time	0.000 to 0.100 s	0.000	s
d277	Positioning Data Setting Selection via communication	0: Disable Communications Positioning Data (S20, S21) 1: Enable Communications Positioning Data (S20, S21)	0	-
S20	Positioning Data via Communication (MSB)	−268435455 to 268435455 (MSB: -4096 to 4095)	0	-
S21	Positioning Data via Communication (LSB)	(LSB: 0 to 65535)	0	-

● Positioning Data Type (d237)

Handling of the positioning data set to positioning data 1 to 8 can be switched between handling as absolute positions or as moving amounts.
To switch handling when necessary, use increment/absolute position switching "INC/ABS" (data = 135) in the multifunction input terminal function.
When "INC/ABS" is allocated to multifunction input terminals, the d237 setting is disabled.

● Position Data Determination Time (d238)

When position command selection 1 "CP1" to position command selection 3 "CP3" is switched, chattering may cause the selected positioning data to change. In cases like these, set the time up to settling of the positioning data to d238.

● Positioning Data Setting Selection via communication (d277)

Positioning data can also be assigned via communication. To assign positioning data via communication, set 1 to d277. The upper four digits and lower four digits of the positioning data are assigned to Positioning Data via Communication (MSB) (S20) and Positioning Data via Communication (LSB) (S21), respectively.
To reflect positioning data, turn the position change command "POS-SET" ON.
While commands via communication are enabled, Positioning Data 1 (MSB) (d244) and Positioning Data 1 (LSB) (d245) are switched to S20 and S21. These parameters can also be switched to positioning data 2 to 8 by position command selection 1 "CP1" to position command selection 3 "CP1."

6-7-6 Overtravel (OT)

When a movement limit point is passed through, there is the risk of mechanical failure or accident. For this reason, the movement limit point can be detected by the hardware and input digitally as an overtravel (OT) signal. OT detection causes a deceleration stop for the time set in Deceleration Time for Forced Stop (H56) and then servos change to a locked state. When Over Travel Forced Stop Operation Selection (d280) = 1, a deceleration stop is performed and then the Er6 alarm is generated. Plus side overtravel “FOT” and minus side overtravel “ROT” can be allocated independently. The overtravel signal is enabled (NC contact is made) when it is OFF, for safety reasons. When an overtravel is detected, overtravel detection signal “OT-OUT” is output as a digital output.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05 E98 E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	139 (1139): Forward rotation driving prohibited “FOT” 140 (1140): Reverse rotation driving prohibited “ROT”	-	-
d280	Over Travel Forced Stop Operation Selection	0: Servo lock after deceleration stop 1: Er6 fault occurs after deceleration stop	0	-

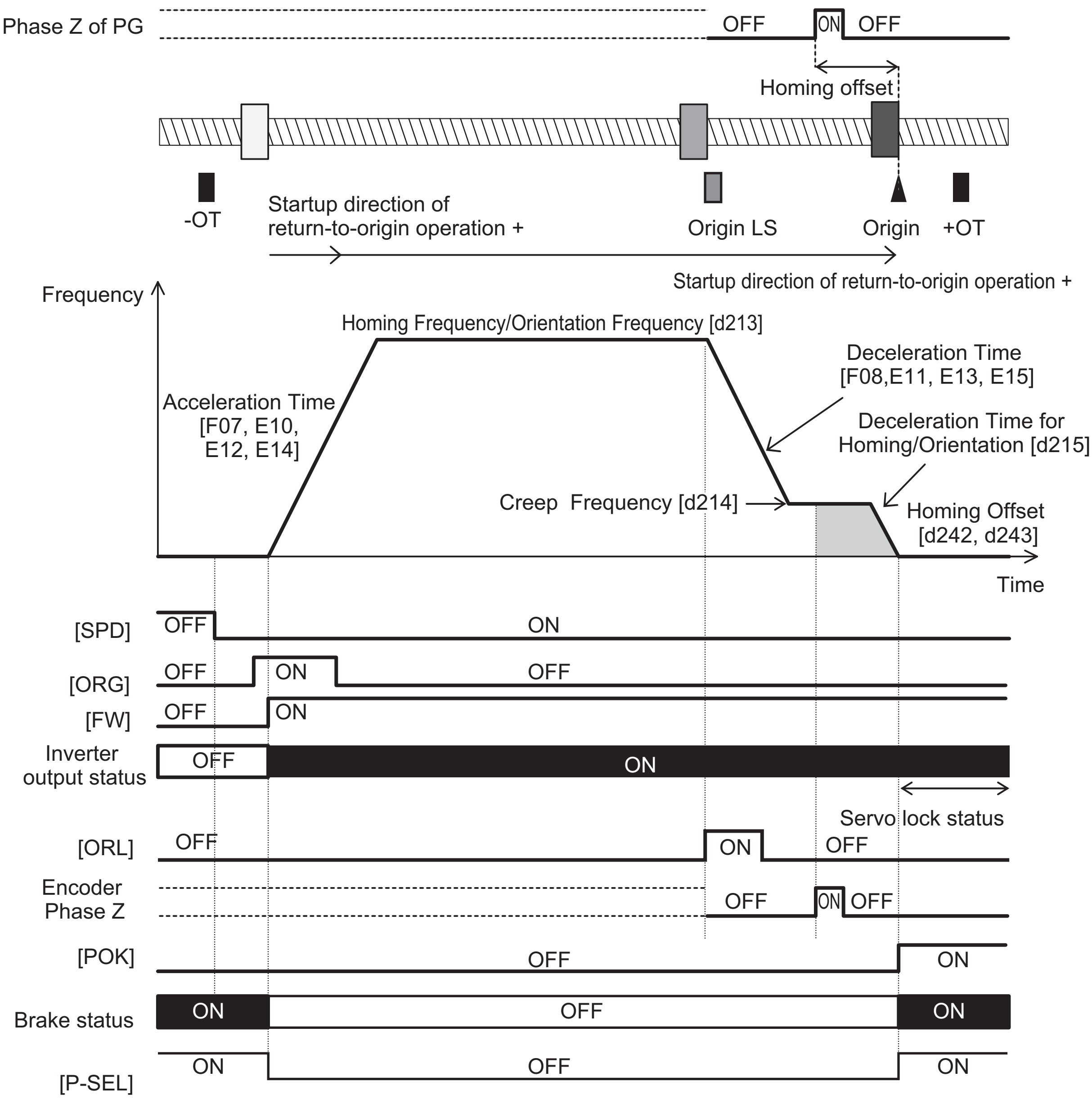
6-7-7 Software OT

With overtravel (OT), the movement limit point is basically detected by the hardware. However, the limit point position can be set by number of pulses as a software OT. The limit point position can be set in two directions independently by + software OT and - software OT. Operation when a software OT is detected can be selected in Overtravel Function Selection (d222). When an OT limit point does not exist, for example, on a rotating body, leave parameter d222 at its default value (= 0).

Parameter No.	Function name	Data	Default data	Unit
d222	Overtravel Function Selection	0: Invalid/Infinite rotation 1: Valid (Positioning at OT position at over traveling), normal PTP 2: Valid (Immediately stopped at over traveling), normal PTP	0	-
d225	Software Overtravel Detection Position in the Positive Direction (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	268435455	-
d226	Software Overtravel Detection Position in the Positive Direction (LSB)			
d227	Software Overtravel Detection Position in the Negative Direction (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	-268435455	-
d228	Software Overtravel Detection Position in the Negative Direction (LSB)			

6-7-8 Basic Return-to-origin Operation

The return-to-origin operation is started when the RUN command is input with multifunction input terminal “SPD” set to OFF and terminal “ORG” set to ON. Specify the operation direction in Homing Operation Selection (d209). The return-to-origin operation is as follows. Acceleration is performed to the frequency set in Homing Frequency/Orientation Frequency (d213), and, after the moving body has turned origin search limit signal “ORL” ON, movement is performed from the initial Z phase signal (reference signal for homing offset) by the amounts set in the homing offsets (Homing Offset (MSB) (d242) and Homing Offset (LSB) (d243)), and movement is stopped. The positioning completed signal “POK” also is output. When overtravel turns ON before the origin limit switch, reverse rotation operation is performed to search for the origin limit switch.



● Homing Operation Selection (d209)

This parameter defines the startup direction of return-to-origin operation, moving direction of return-to-origin operation, operation at detection of an overtravel, and limit switch detection timing.

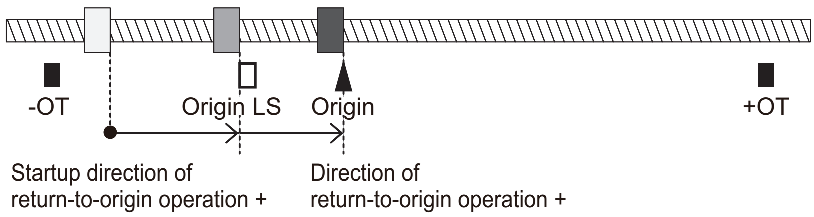
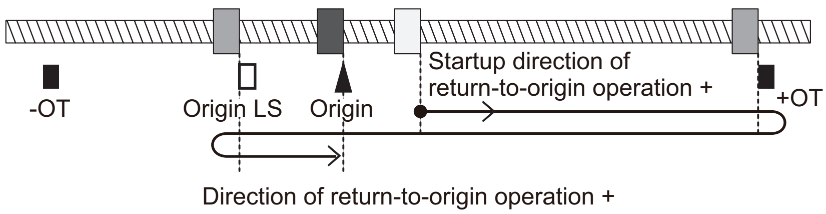
bit 0 : Startup direction of return-to-origin operation 0: Forward rotation direction, 1: Reverse rotation direction
Return-to-origin operation starts in the direction defined by this bit regardless of the direction specified in the RUN command from the inverter.

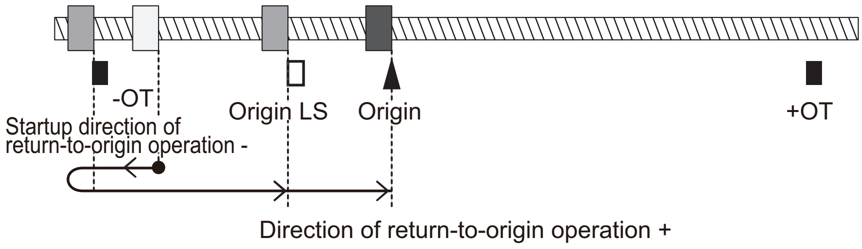
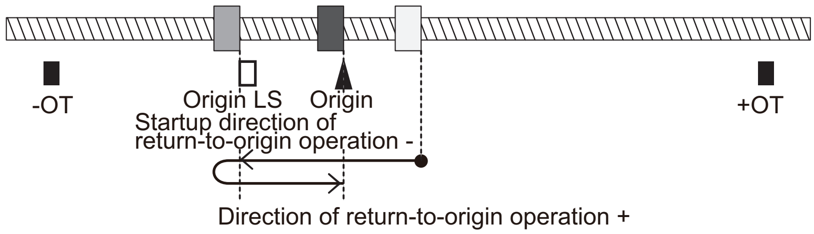
bit 1 : Direction of return-to-origin operation 0: Forward rotation direction, 1: Reverse rotation direction.
This bit defines the direction of movement of the return-to-origin operation. When the reverse of the startup direction is set, ORL (origin search limit signal) is detected, then operation is paused and is reversed.

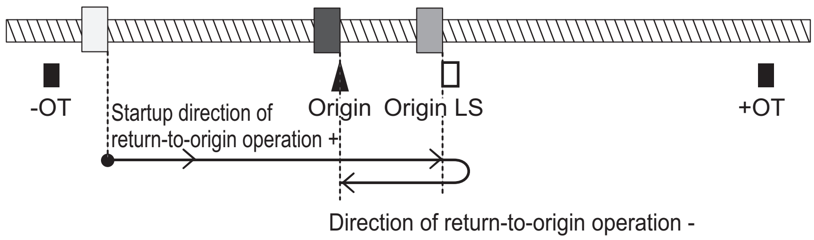
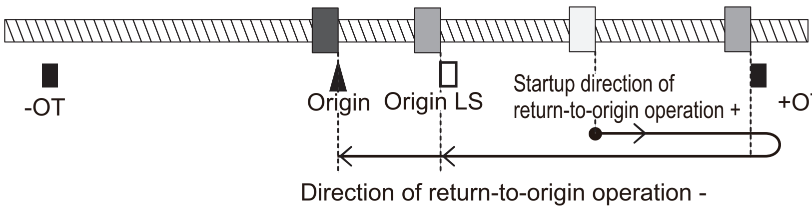
bit 2 : Return-to-origin operation overtravel operation selection 0: Reversal by overtravel detection, 1: Stop by overtravel detection
This bit defines whether to stop or reverse operation when an overtravel is detected before ORL (origin search limit signal) is detected.

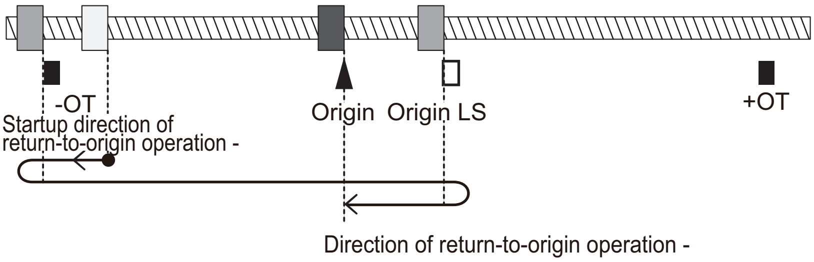
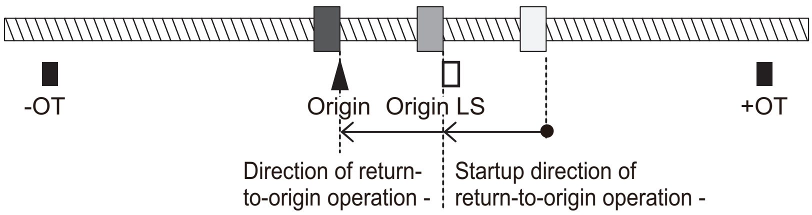
bit 3 : Origin limit switch timing selection 0: ON edge detection, 1: OFF edge detection
This bit defines whether or not to detect the limit switch at its ON edge or OFF edge.

The figure below shows action according to the setting of the d209 parameter. In the figure, it is assumed that bit 2 = 0 and reverse operation is performed at detection of an overtravel.

[d209 bit 1] Direction of return-to-origin operation 0: Forward rotation direction (+)		When origin position > origin limit switch position
Startup direction of return-to-origin operation [d209 bit 0]	**Initial position**	**Return-to-origin pattern diagram**
0: + direction	- side from origin limit switch	
	+ side from origin limit switch	

<table>
<tr><th colspan="3">[d209 bit 1] Direction of return-to-origin operation 0: Forward rotation direction (+)</th><th>When origin position > origin limit switch position</th></tr>
<tr><th>Startup direction of return-to-origin operation [d209 bit 0]</th><th>Initial position</th><th colspan="2">Return-to-origin pattern diagram</th></tr>
<tr><td rowspan="2">1: - direction</td><td>- side from origin limit switch</td><td colspan="2"></td></tr>
<tr><td>+ side from origin limit switch</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="3">[d209 bit 1] Direction of return-to-origin operation 1: Reverse rotation direction (+)</th><th>When origin position < origin limit switch position</th></tr>
<tr><th>Startup direction of return-to-origin operation [d209 bit 0]</th><th>Initial position</th><th colspan="2">Return-to-origin pattern diagram</th></tr>
<tr><td rowspan="2">0: + direction</td><td>- side from origin limit switch</td><td colspan="2"></td></tr>
<tr><td>+ side from origin limit switch</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="2">[d209 bit 1] Direction of return-to-origin operation 1: Reverse rotation direction (+)</th><th>When origin position < origin limit switch position</th></tr>
<tr><th>Startup direction of return-to-origin operation [d209 bit 0]</th><th>Initial position</th><th>Return-to-origin pattern diagram</th></tr>
<tr><td rowspan="2">1: - direction</td><td>- side from origin limit switch</td><td>
</td></tr>
<tr><td>+ side from origin limit switch</td><td>
</td></tr>
</table>

● Homing Reference Signal Selection (d211), Reference Signal for Homing Offset (d212)

The reference signal for homing is to switch from the homing frequency to the homing creep frequency. The reference signal for homing starts incrementing of the homing offset. Ordinarily, the signal of the origin limit switch is taken as the reference signal for homing and the Z phase signal is taken as the reference signal for homing offset (factory default). When return-to-origin is configured using other signals, select the reference signal for homing and reference signal for homing offset according to the table below. When Reference Signal for Homing Offset (d212) is set to other than “0: Z pulse of position encoder”, the reference signal for homing is not included in the configuration, and so the Homing Reference Signal Selection (d211) setting is disabled.

Parameter No.	Function name	Data	Default data	Unit
d211	Homing Reference Signal Selection	0: Z phase 1: Origin limit input (ORL) 2: Overtravel input in the positive direction (FOT) 3: Overtravel input in the negative direction (ROT)	1	-
d212	Reference Signal for Homing Offset	0: Z phase 1: Origin limit input (ORL) 2: Overtravel input in the positive direction (FOT) 3: Overtravel input in the negative direction (ROT) 4: Stopper (Hit and stop)	0	-
d214	Creep Frequency	0.1 to 590.0 Hz	0.5	Hz

d211: Reference signal for homing	d212: Reference signal for homing offset	Frequency at start of homing offset	Operation
0: Z phase	0: Z phase (factory default)	Creep frequency	Homing offset is started at the first detection of the Z phase after startup at the creep frequency
1: Origin limit switch (factory default)		Homing frequency to homing creep frequency	
2: Overtravel switch in the positive direction		Homing frequency to homing creep frequency	Deceleration to creep frequency at reverse operation by detection of overtravel
3: Overtravel switch in the negative direction			
Disable	1: Origin limit switch	Homing frequency	
	2: Overtravel switch in the positive direction	Homing frequency to homing creep frequency	Deceleration to creep frequency at reverse operation by detection of overtravel
	3: Overtravel switch in the negative direction		
	4: Stopper	Homing frequency to homing creep frequency	Operation is instantaneously reversed after judgment of collision with the stopper by generation of the torque limit, and homing offset is performed at the creep frequency

6-7-9 Clearing of Position

The current position is cleared to zero by digital input “PCLR” turning ON. The current position can be cleared to zero in either position control and speed control. Either of the ON edge and ON level can be selected as the timing to clear the current position.
When “PCLR” is turned ON during position control operation, the current position is cleared to zero and movement to the target position is performed. When “PCLR” is turned ON after position control stop, the current position is cleared to zero, however, movement to the target position is not started. To perform movement, either turn the RUN command OFF then back ON again, or turn “POS-SET” ON.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05 E98 E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	141 (1141): Current position clear “PCLR”	-	-
d221	Current Position Clear Signal Operation Selection	0: Clear at edge detection 1: Clear at level detection	0	-

6-7-10 Position Preset

The current position can be overwritten by the setting of Preset Position (MSB) (d240) and Preset Position (LSB) (d241) at the ON edge of digital input “PSET.” The current position can be preset in either position control and speed control.
When “PSET” is turned ON during position control operation, the current position is overwritten by the preset position and movement to the target position is performed. When “PSET” is turned ON after position control stop, the current position is overwritten, however, movement to the target position is not started. To perform movement, either turn the RUN command OFF then back ON again, or turn “POS-SET” ON.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05 E98 E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	142 (1142): Current position preset “PSET”	-	-
d240	Preset Position (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d241	Preset Position (LSB)			

● Position control by pulse train input

Position control can be performed with pulse train input used as the pulse position command.
When digital input “SPD” is turned OFF with “12: Pulse train input” set to 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30), position control is made to operate by taking the pulses according to the pulse train input as the position command pulse.
For details on the pulse train input method, refer to *7-9-17 Pulse Train Frequency Input* on page 7-140.

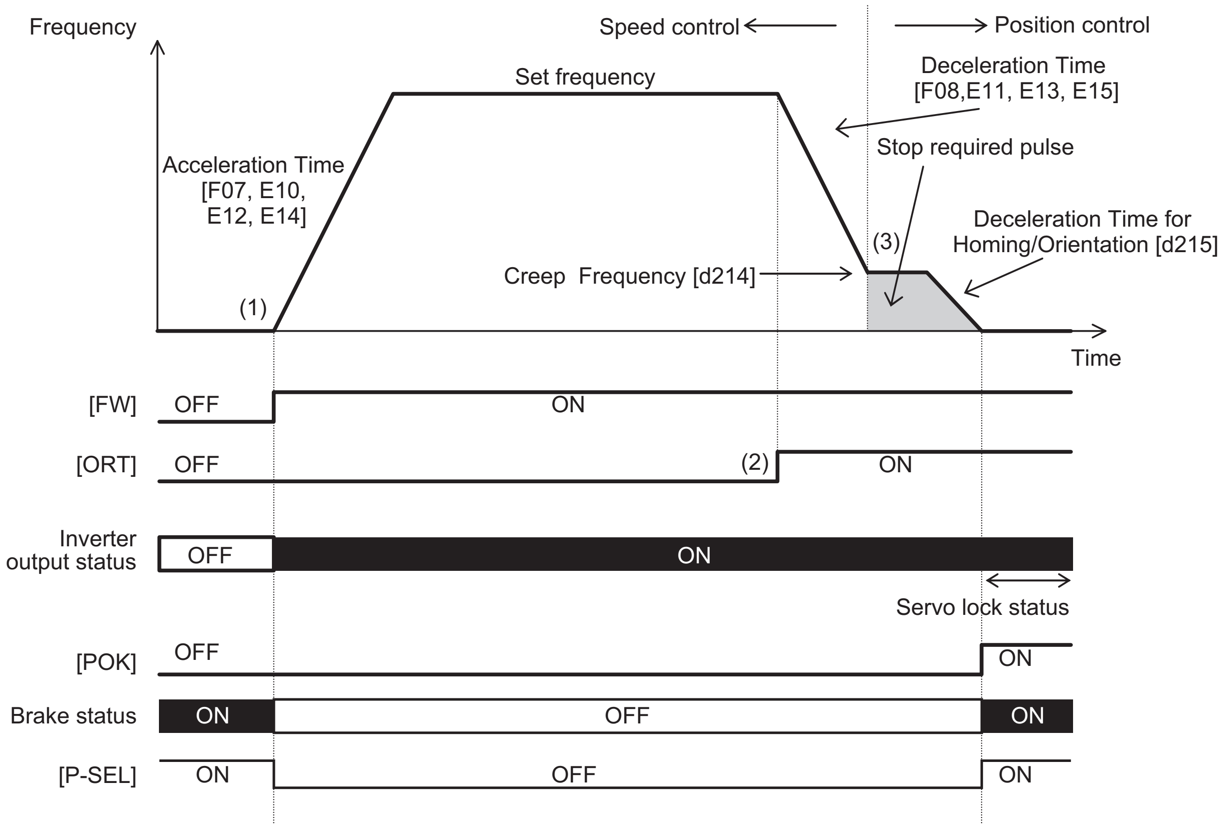
6-7-11 Orientation

The orientation function can be used as an applied function for position control. In speed control, orientation can be performed during operation or while operation is stopped.

● Orientation during speed control

With speed control, a motor in rotation can be stopped at a desired mechanical position. When digital input “ORT” is turned ON (②) during operation in speed control, deceleration is performed up to the frequency set in Homing Frequency/Orientation Frequency (d213) for the currently selected deceleration time, control transitions to the position control mode (③), the rotation amount that allows a deceleration stop at the setting in Deceleration Time for Homing/Orientation (d215) up to the position of the currently selected positioning data is calculated from the current position, and the motor rotates for that calculated rotation amount and stops.
The positioning data can be selected from Positioning Data 1 to 8 (d244 to d259) by digital input position command selection signals “CP1,” “CP2” and “CP3”. When assigning positioning data as factory default absolute positions (ABS), the absolute positions are referenced to the Z phase of the encoder. To assign positioning data as absolute positions referenced not to the Z phase of the encoder but to the machine origin position, Positioning Data 1 to 8 (d244 to d259) can be handled as it is as the positioning data of the machine origin reference by setting the position offset of the

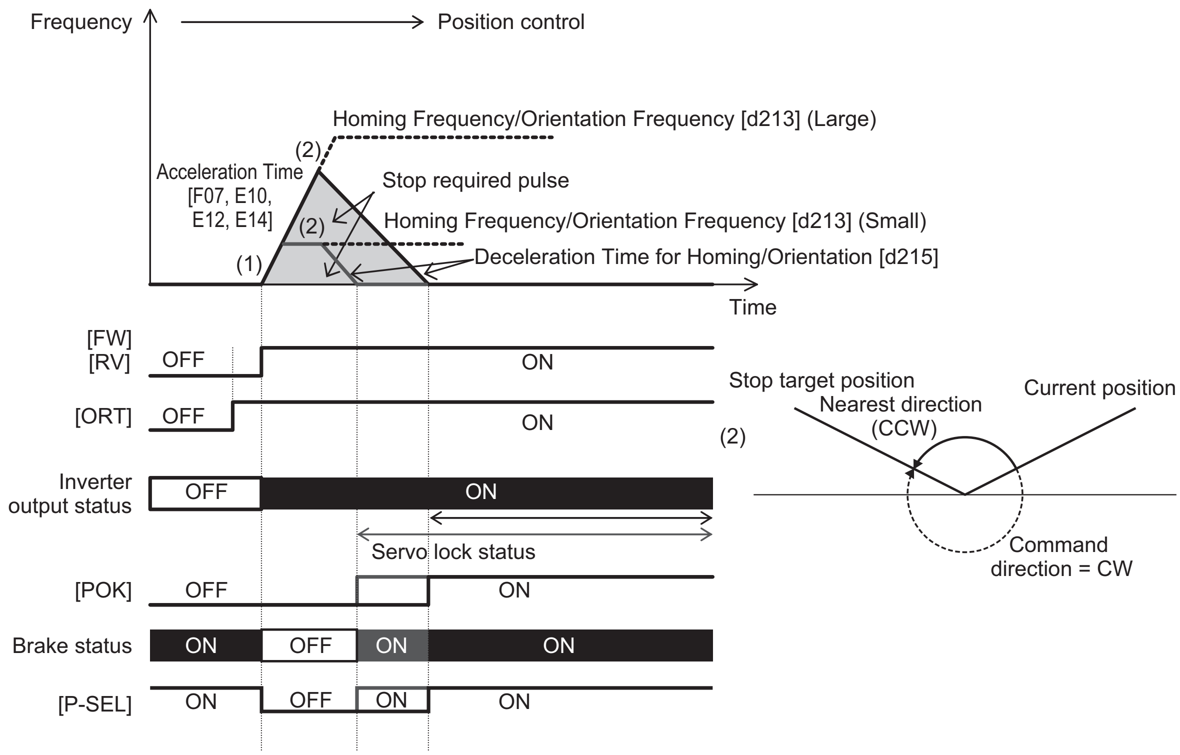
"encoder Z phase - machine origin position" to Homing Offset (MSB) (d242) and Homing Offset (LSB) (d243).



● Orientation from a stopped state

When the control mode is vector control with speed sensor, servo lock operation is performed when positioning by orientation is completed, and digital output "POK" is output if positional deviation is within Positioning Completed Range (d239). When the positioning position is changed from this state and orientation is performed again with "POS-SET" set to ON, control changes to position control and positioning is performed within one rotation. At this time, either of "Nearest direction" operation which performs positioning by the shortest distance or "Command direction" operation which follows the direction instructed in the RUN command can be selected at Orientation Selection (d208) regardless of the operation direction. In V/f control with speed sensor, the control mode changes to DC braking and the inverter maintains output. In orientation from a stopped state, rotation is never performed beyond one rotation even if a value exceeding one rotation is programmed in the positioning data.

If the RUN command turns ON after the orientation command "ORT" is turned ON during an inverter output stop, orientation operation is performed immediately without operating up to the set frequency by speed control. Note, however, that when operation is performed after the orientation command "ORT" is turned ON from a stopped state immediately after the power is turned ON, operation by speed control is always performed for one rotation or more to detect the Z phase and the orientation operation is performed.



When using the orientation function, vector control with speed sensor, by which speed feedback control is performed by a machine shaft encoder, can be selected as the control mode when the motor to machine shaft transmission gear ratio (speed reduction ratio) is (as a guideline) approx. 5x. In the case of vector control with speed sensor, servo lock operation is performed after a positioning stop, and, if external force is applied after the stop, resistance torque is generated in an attempt to hold the stop position.

On the other hand, when the machine shaft to motor shaft transmission gear ratio (speed reduction ratio) is large, it will be difficult to detect the motor speed at low-speed rotation, and machine performance sometimes can no longer be sufficiently demonstrated unless an encoder with a large number of pulses is used. On machines to which an encoder with a large number of pulses cannot be attached or that have a large transmission gear ratio, use V/f control with speed sensor and not vector control with speed sensor that performs speed feedback control from a machine shaft encoder. Servo lock operation is not possible in V/f control with speed sensor. When an external force is applied after a stop, use a mechanical brake. Also, in V/f control with speed sensor, torque boost sometimes must be adjusted or automatic torque boost sometimes must be set to generate torque at ultra low speeds immediately before a stop.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	78(1078): Speed control parameter selection 1 “MPRM1” 79(1079): Speed control parameter selection 2 “MPRM2” 135(1135): Increment/absolute position switching “INC/ABS” 136(1136): Orientation command “ORT” 137(1137): Speed/position switching “SPD” 141(1141): Current position clear “PCLR” 142(1142): Current position preset “PSET” 143(1143): Teaching command “TEACH” 144(1144): Position change command “POS-SET” 145(1145): Position command selection 1 “CP1” 146(1146): Position command selection 2 “CP2” 147(1147): Position command selection 3 “CP3”	-	-
E20 to E21, E27	Output Terminal [DO1] Function Selection to Output Terminal [DO2] Function Selection(E21), Output Terminal [ROA, ROB] Function Selection	82(1082): Positioning completed “POK”	-	-
d03, A45, b45, r45	Speed Control 1 P Proportional Gain, Speed Control 2 P Proportional Gain, Speed Control 3 P Proportional Gain, Speed Control 4 P Proportional Gain	0.1 to 200.0	10.00	time
d04	Speed Control 1 I Integral Time	0.001 to 9.999 s 999: Cancel integral term	0.100	s
A46	Speed Control 2 I Integral Time	0.001 to 9.999 s 999: Cancel integral term		
b46	Speed Control 3 I Integral Time	0.001 to 9.999 s 999: Disable		
r46	Speed Control 4 I Integral Time	0.001 to 9.999 s 999: Disable		
d201	Position Control Feed Forward Gain	0.00: Disable feed-forward 0.01 to 1.50	0.00	-
d202	Position Control Feed Forward Filter	0.000 to 5.000 s	0.500	s
d203	Position Loop Gain 1	0.1 to 300.0	1.0	time

Parameter No.	Function name	Data	Default data	Unit
d204	Position Loop Gain 2	0.1 to 300.0	1.0	time
d205	Position Loop Gain Switch Frequency	0.0 to 590.0 Hz	0.0	Hz
d206	Electronic Gear Denominator	1 to 65535	1	-
d207	Electronic Gear Numerator	1 to 65535	1	-
d208	Orientation Selection	0: Nearest direction (Valid for reverse rotation) 1: Command direction (Direction of operation command source)	1	-
d209	Homing Operation Selection	Bit 7: Z phase correction 0: Disable 1: Enable Bit 4 to 6: Reserved Bit 3: Detection timing of homing limit switch 0: By rising edge 1: By falling edge Bit 2: OT detected operation selection 0: Return at FOT/ROT detection 1: Stop at OT detection (Cancel homing) Bit 1: Homing Start direction 0: Forward direction 1: Reverse direction Bit 0: Homing shaft direction 0: Forward direction 1: Reverse direction	0	-
d213	Homing Frequency/Orientation Frequency	0.1 to 590.0 Hz	5.0	Hz
d215	Deceleration Time for Homing/Orientation	0.00 to 6000 s	6.00	s
d221	Current Position Clear Signal Operation Selection	0: Edge 1: Level	0	-
d237	Positioning Data Type	0: Absolute position (ABS) 1: Relative position (INC)	0	-
d238	Position Data Determination Time	0.000 to 0.100 s	0.000	s
d239	Positioning Completed Range	0 to 9999	1	-
d240	Preset Position (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d241	Preset Position (LSB)			
d242	Homing Offset (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d243	Homing Offset (LSB)			

Parameter No.	Function name	Data	Default data	Unit
d244	Positioning Data 1 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d245	Positioning Data 1 (LSB)			
d246	Positioning Data 2 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d247	Positioning Data 2 (LSB)			
d248	Positioning Data 3 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d249	Positioning Data 3 (LSB)			
d250	Positioning Data 4 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d251	Positioning Data 4 (LSB)			
d252	Positioning Data 5 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d253	Positioning Data 5 (LSB)			
d254	Positioning Data 6 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d255	Positioning Data 6 (LSB)			
d256	Positioning Data 7 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d257	Positioning Data 7 (LSB)			
d258	Positioning Data 8 (MSB)	−268435455 to 268435455 (MSB: -4,096 to 4,095, LSB: 0 to 65,535)	0	-
d259	Positioning Data 8 (LSB)			
d277	Positioning Data Setting Selection via communication	0: Disable Communications Positioning Data (S20, S21) 1: Enable Communications Positioning Data (S20, S21)	0	-

● Position Loop Gain 1 (low speed side) (d203), Position Loop Gain 2 (high speed side) (d204)

● Position Loop Gain Switch Frequency (d205)

● Speed control P (gain) (d03,A45,b45,r45)

● Speed control I (integral time) (d04,A46,b46,r46)

In orientation operation, the response of position control can be switched during deceleration and during a stop.
The larger the set value, the more improved response becomes, the shorter the settling time becomes and the more holding performance can be improved during a servo lock stop. However, setting too large a value causes hunting. Adjust this parameter so that hunting does not occur. Also, when increasing the gain of the position controller, also adjust the speed adjuster (ASR). To switch speed control P (gain) and speed control I (integral time), use parameter selection 1 and 2 “MPRM1” and “MPRM2.”

● Electronic Gear Denominator (d206), Electronic Gear Numerator (d207)

Positioning data in orientation can be handled as an angle, number of pulses or other user value.

Example) When the PG of number of pulses 1024 [pulse/rev] is used and the moving amount per user value is 1 [pulse/user value] for the equivalent number of pulses 4x the PG pulses

$$\frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}} = \frac{\text{Moving amount per user value}}{\text{Moving amount per 1 PG pulse}} = \frac{\frac{1}{4 \times 1024}\ \text{[rev/user value]}}{\frac{1}{1024}\ \text{[rev/pulse]}} = \frac{1}{4}\ \text{[pulse/user value]}$$

Example) When the moving amount per user value is 0.01 [°/user value], the moving amount per single motor rotation is 360.00 [°/rev], and the number of PG pulses per single motor rotation is 4096 (1024 × 4x) [pulse/rev]

$$\frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}} = \frac{\text{Moving amount per user value}}{\text{Moving amount per 1 PG pulse}} = \frac{0.01\ \text{[°/user value]}}{\frac{360.00\ \text{[°/rev]}}{4096\text{[pulse/rev]}}} = \frac{4096}{36000}\ \text{[pulse/user value]}$$

● Orientation Selection (d208)

When Orientation Selection (d208) is set to “0: Nearest direction (Valid for reverse rotation),” the moving amount to the positioning data instructed from the current position rotates in the smaller direction (nearest direction) regardless of the direction instructed in the RUN command. Note, however, that when operation has not been performed even once after the power is turned ON, operation starts in the direction instructed in the RUN command and orientation is performed as the near direction is unknown. Then, positioning is performed by the nearest direction. When Orientation Selection (d208) is set to “1: Command direction (Direction of operation command),” operation starts in the direction instructed in the RUN command at all times and orientation is performed.

● Homing Operation Selection (d209)

In a pulse encoder, variance sometimes occurs between the output timing of the A, B phase pulses and Z phase pulse. If a position error of one pulse occurs on the machine side when positioning is performed to the same position during forward rotation and reverse rotation, set 1 to “bit 7: Z phase correction” in Homing Operation Selection (d209). Occurrence of position error caused by the rotational direction can be suppressed by enabling this correction.

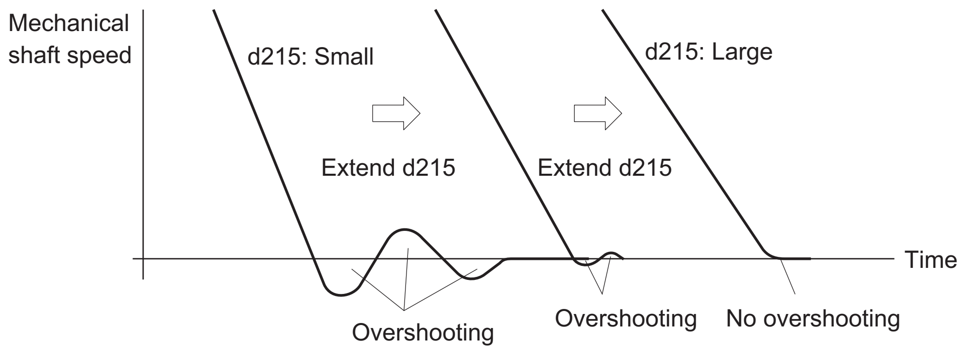
● Homing Frequency/Orientation Frequency (d213)

This is the frequency when speed control is switched to position control by the orientation command “ORT” during speed control. If the preset frequency is high, the time up to completion of positioning increases, and when torque limit deceleration is performed, the position deviation over (oF) alarm sometimes occurs. To perform torque limit deceleration, set the frequency when switching from speed control to position control to as low a frequency as possible.

In V/f control with speed sensor, when the preset frequency is low, it becomes difficult to position to the instructed positioning position unless torque boost is adjusted or automatic torque boost is used. Adjust all of Deceleration Time for Homing/Orientation(d215), Position Loop Gain 1 (low speed side) (d203) and Position Loop Gain 2 (high speed side) (d204) so that the desired settling time is reached in keeping with the control method.

- **Deceleration Time for Homing/Orientation (d215)**

Set the deceleration time from Homing Frequency/Orientation Frequency (d213). This deceleration time can be adjusted to adjust the set time when overtravel or overshooting occurs on the instructed position.

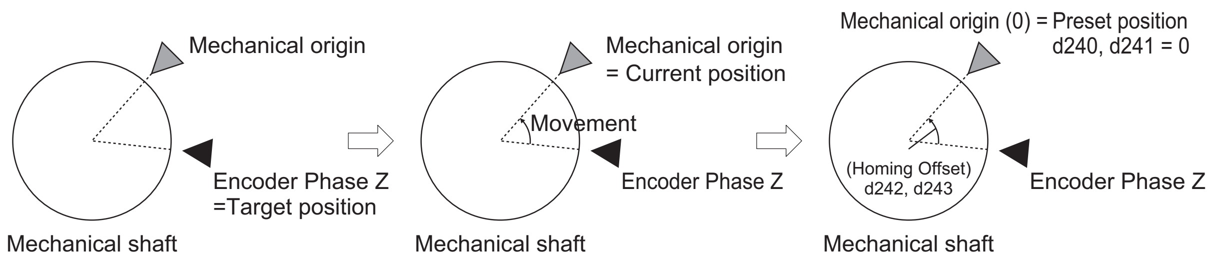


- **Preset Position (MSB) (d240), Preset Position (LSB) (d241)**

The current reference position and current feedback position can be set to any position referenced to the machine origin. In orientation, ordinarily, the position offset between the machine origin and the Z phase of the encoder is handled as the homing offset. For this reason, set Preset Position (MSB) (d240) and Preset Position (LSB) (d241) as “0.”

- **Homing Offset (MSB) (d242) and Homing Offset (LSB) (d243)**

The homing offset in orientation is equivalent to the position offset between the machine origin and the Z phase of the encoder. Adjust the homing offset by the following procedure.



1) When the orientation command is turned ON with the target position set as 0, perform positioning with the Z phase position of the encoder as the origin.
2) Then, operate the motor, and move the machine shaft to the machine origin position and stop movement there. Set the Current Feedback Position Monitor (MSB) (d298) and Current Feedback Position Monitor (LSB) (d299) at this time to Homing Offset (MSB) (d242) and Homing Offset (LSB) (d243). Then, when the current position preset “PSET” is turned ON with Preset Position (MSB) (d240) and Preset Position (LSB) (d241) set to “0,” “0” is set to Current Feedback Position Monitor (MSB) (d298) and Current Feedback Position Monitor (LSB) (d299).
3) For confirmation, perform orientation again. Perform orientation with the current position as “0” (origin), and check that orientation to the machine origin position is possible.

- **Positioning Data 1 to 8 (d244 to d259) and Position Data Determination Time (d238)**

This parameter is for setting the positioning position referenced to the machine origin in orientation. Up to eight points can be set, and multipoint positioning can be performed continuously by using position command selection 1 to 3 “CP1 to CP3.” To prevent malfunction caused by chattering when the position command selection signal is used to switch positioning data, set a time for

chattering to settle or longer in Position Data Determination Time (d238). To enable changes to the positioning data with the RUN command ON, be sure to turn the position change command "POS-SET" ON. As changes to the positioning data while the RUN command is OFF are reset when operation is started, operation by position change command "POS-SET" is not required.
Orientation operation differs from position control in that, even when a value greater than one rotation is set to positioning data, the value is automatically corrected to a position within one rotation when the operation is actually performed.
To assign positioning data as an incremental amount of movement relative to the current position, set movement in Positioning Data Type (d237). To switch handling when necessary, use increment/absolute position switching "INC/ABS" (data = 135) in the multifunction input terminal function. When this function is allocated, the d237 setting is disabled.

- **Positioning Data Setting Selection via communication (d277)**

In orientation, to use Positioning Data via Communication (MSB) (S20) and Positioning Data via Communication (LSB) (S21) via communication to perform positioning, set "1" to Positioning Data Setting Selection via communication (d277) to enable positioning commands via communication, just as in position control.

6-7-12 Functions That Are Disabled in Position Control

When speed/position switching is set to "SPD" OFF and the RUN command is ON, the following functions are disabled.
Jogging operation, PID control, starting frequency hold, stop frequency hold, DC braking, Zero Speed Control, restart after momentary power failure, retry, offline tuning, anti-regenerative control, overload prevention, Stop Selection (H11), pickup, torque control, 1st/2nd control.

6-7-13 Position Monitor

Use this function to monitor the feedback current position and instructed current position on the Digital Operator. The feedback current position is the value obtained by totaling the number of feedback pulses and converting them to user values. The instructed current position is not the target position but the momentary instructed position based on the position instruction pattern, and is the same as the feedback current position during a stop.

Parameter No.	Function name	Data	Default data	Unit
d296	Current Reference Position Monitor (MSB)	−268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	-	-
d297	Current Reference Position Monitor (LSB)		-	
d298	Current Feedback Position Monitor (MSB)	−268435455 to 268435455 (MSB: -4096 to 4095, LSB: 0 to 65535)	-	-
d299	Current Feedback Position Monitor (LSB)		-	

6-7-14 Restarting Positioning

If the motor moves out of the Restarting Positioning Range Setting (d278) while operation is still ON after positioning is performed by position control, the inverter automatically starts repositioning the motor again. When the motor is in the Positioning Completed Range (d239) even if outside of the position restarting range, the motor does not operate.
When the motor current position moves out of the range ±d278 from the target value, it moves to the target position.
The restarting positioning function is useful in V/f control. In vector control, servo lock operation is performed after completion of position control operation, so processing to stop at the target position functions at all times.
When the current position is overwritten during a stop, the restarting positioning function is disabled.

Parameter No.	Function name	Data	Default data	Unit
d239	Positioning Completed Range	0 to 9999	1	-
d278	Restarting Positioning Range Setting	0: Invalid 1 to 9999	9999	-

6-7-15 Brake Control during Position Control

The output state of the brake signal during a position control stop can be set at bit 6 of Brake Control Operation Selection (J96).

At Brake Release

In V/f control, with the RUN command ON, when the output current is at the current set in Brake Control Brake-release Current (J68) or higher, the frequency reference is at the frequency set in Brake Control Brake-release Frequency (J69) or higher, and the time set in J70 elapses, “BRK” is turned ON regardless of the setting of J96 bit 6.

In vector control, when J96 bit 6 = 0, the RUN command is ON, the output current is at the current set in Brake Control Brake-release Current (J68) or higher, the torque command is at the torque set in Brake control Brake-release Torque (J95) or higher, and the time set in J70 elapses, “BRK” is turned ON.

In vector control, if the output current is at the current set in Brake Control Brake-release Current (J68) or higher, the torque command is at the torque set in Brake control Brake-release Torque (J95) or higher, and the time set in Brake Control Brake-release Timer (J70) elapses when J96 bit 6 = 1 and the servo lock state is entered by the servo lock terminal turning ON, the brake release signal “BRK” is turned ON even if the RUN command is OFF.

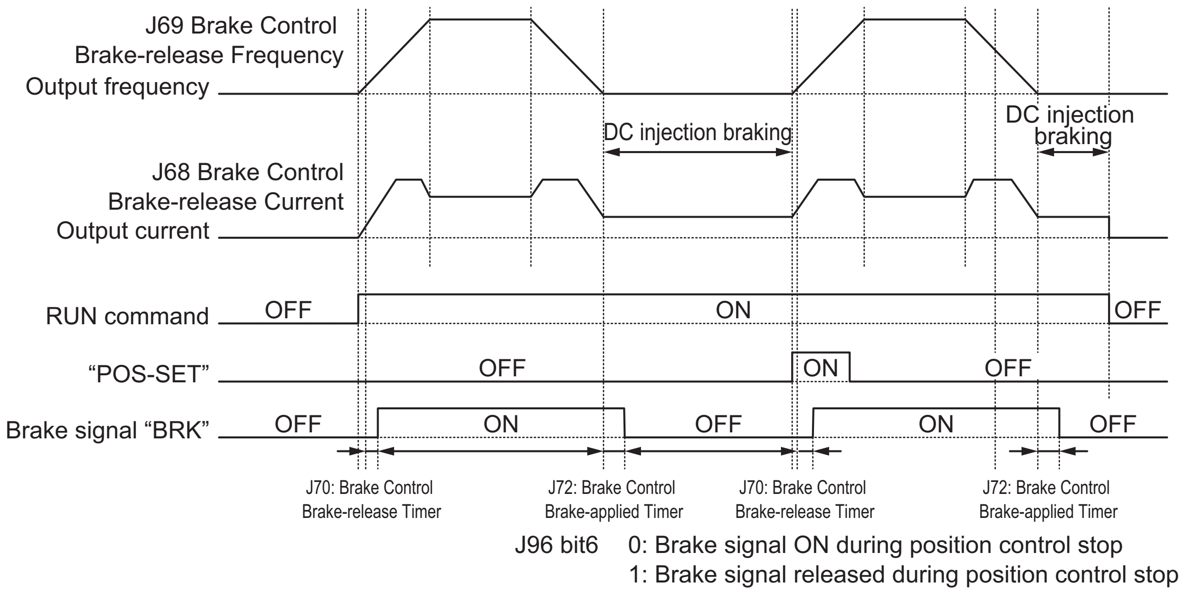
At Application of Brake

When a stop is made at the target position with J96 bit 6 = 0, the brake release signal “BRK” is turned ON when the time set at Brake Control Brake-applied Timer (J72) elapses even if the RUN command is ON.

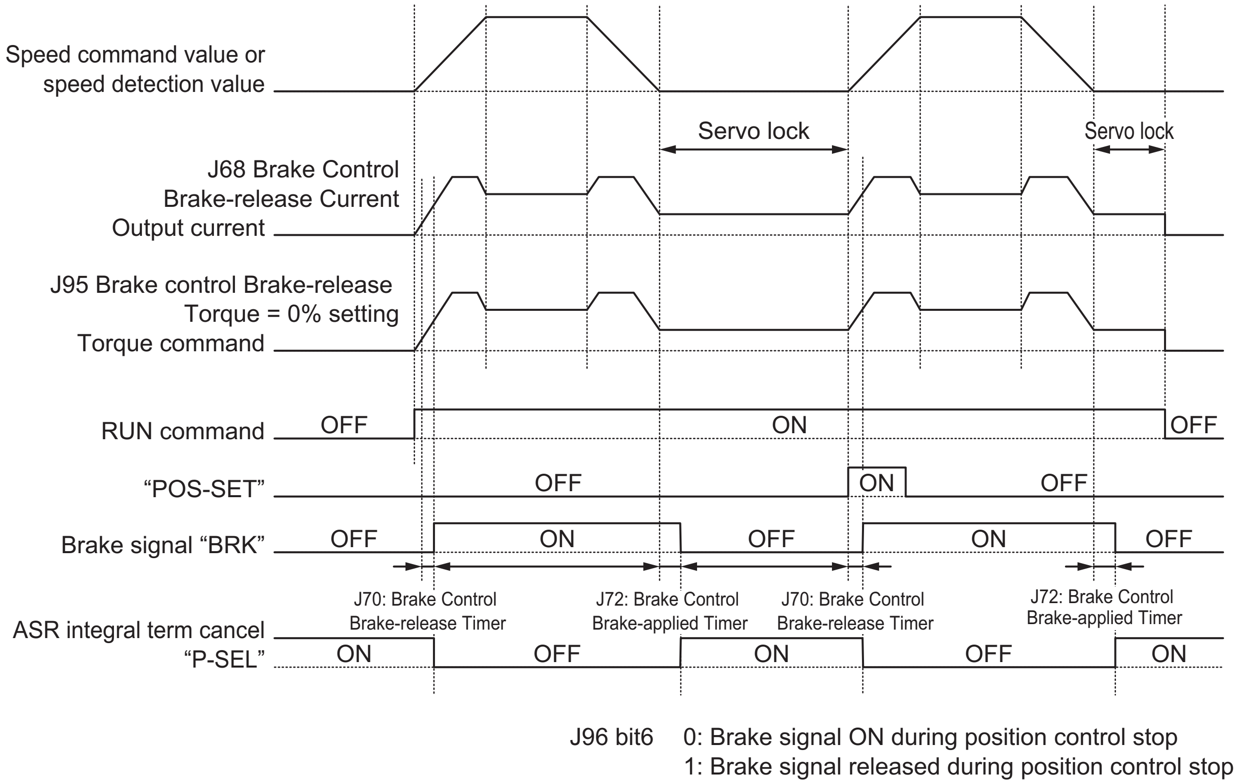
When a stop is made at the target position with J96 bit 6 = 1, the brake release signal “BRK” is not turned ON even if the time set at Brake Control Brake-applied Timer (J72) elapses if the RUN command is ON.

When the brake is applied during position control, the motor cannot rotate even if there exists position error. For this reason, the integral term accumulates which sometimes causes an overload trip to occur. When ASR integral term cancel “P-SEL” allocated to a multifunction input terminal is turned ON, the integral term of the speed controller is canceled and P operation is performed.

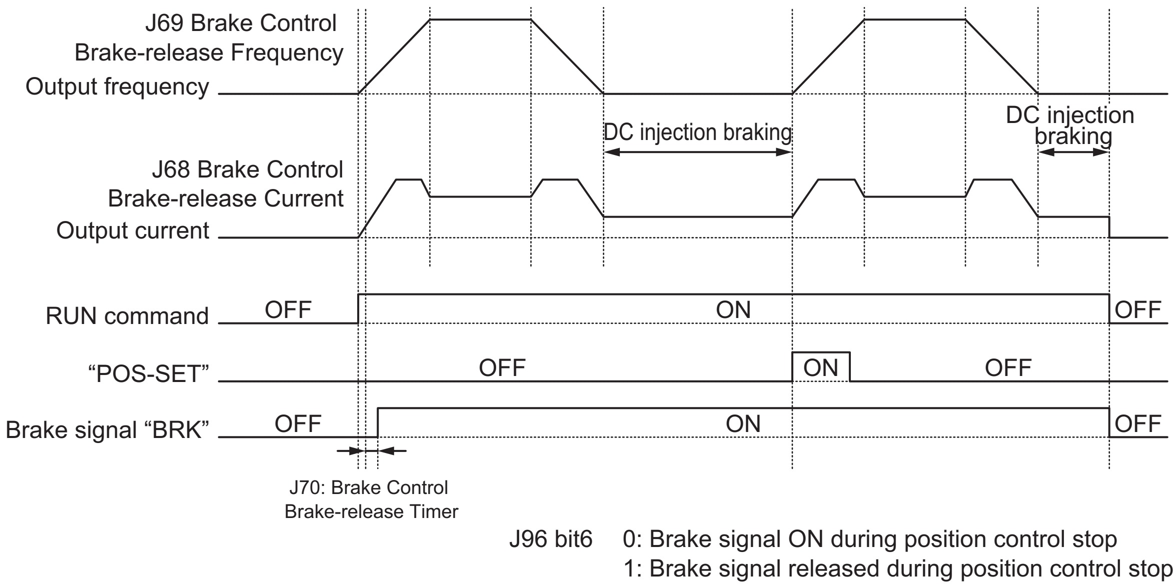
Parameter No.	Function name	Data
J96	Brake Control Operation Selection	bit 6 = 0: Position control stopped, brake signal OFF (brake applied) bit 6 = 1: Position control stopped, brake signal ON (brake released)
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	119: P-SEL (ASR integral term cancellation)



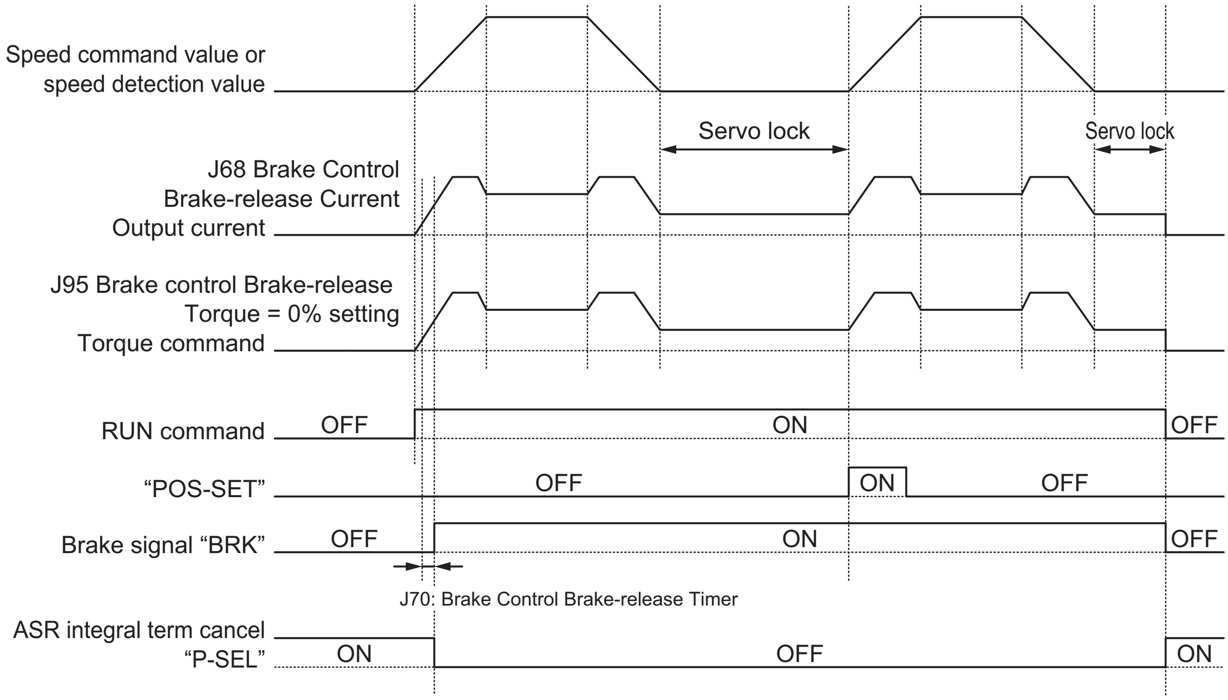
V/f control J96 bit 6 = 0 Operation time chart



Vector control J96 bit 6 = 0 Operation time chart



V/f control J96 bit 6 = 0 Operation time chart



J96 bit6 0: Brake signal ON during position control stop
1: Brake signal released during position control stop

Vector control J96 bit 6 = 0 Operation time chart

6-7-16 Position Store Selection at Power OFF

When d220 is set to "1: Store at low voltage status," the data of the current feedback position (d298, d299) is stored to EEPROM when an insufficient voltage state occurs, and is restored at the next power ON. When "0: Invalid" is set, the data is cleared to zero at the next power ON.
Even if store to EEPROM is enabled when an insufficient voltage state occurs, when the motor rotates with the power supply shut off, the rotation amount cannot be detected and this causes position error.
When this function is used, use of the mechanical brake is recommended.

Parameter No.	Function name	Data	Default data	Unit
d220	Position Feedback Store Selection at Power Off	0: Disable 1: Store at low voltage detected	0	-

6-7-17 Excessive Positional Deviation

Excessive positional deviation is judged when the deviation between the current reference position and current feedback position exceeds the detection level of excessive positioning deviation (d223, d224).
When excessive positional deviation occurs, the excessive positional deviation alarm (d0) is immediately output and the motor runs freely.
In position control, the current reference position is overwritten with the current feedback position when inverter output turns OFF, and the positional deviation of APR is cleared. For this reason, the excessive positional deviation alarm (d0) can be reset when the alarm stops and inverter output turns OFF.

Positional deviation is closely related to positioning frequency and position command gain. When a certain frequency reference is output at a certain position reference gain, a constant positional deviation is always required. Due to this fact, positional deviation can be improved by either increasing the detection level of excessive positioning deviation (d223, d224) or by increasing the position control gain (d203 and d204) when the excessive positional deviation alarm (d0) occurs.

Parameter No.	Function name	Data	Default data	Unit
d223	Detection Level of Excessive Positioning Deviation (MSB)	0: Disable (MSB: 0, LSB: 0) 1 to 268435455 (MSB: 0 to 4,095, LSB: 0 to 65,535)	0	-
d224	Detection Level of Excessive Positioning Deviation (LSB)		0	-

6-7-18 Touch Probe (Latch) Function

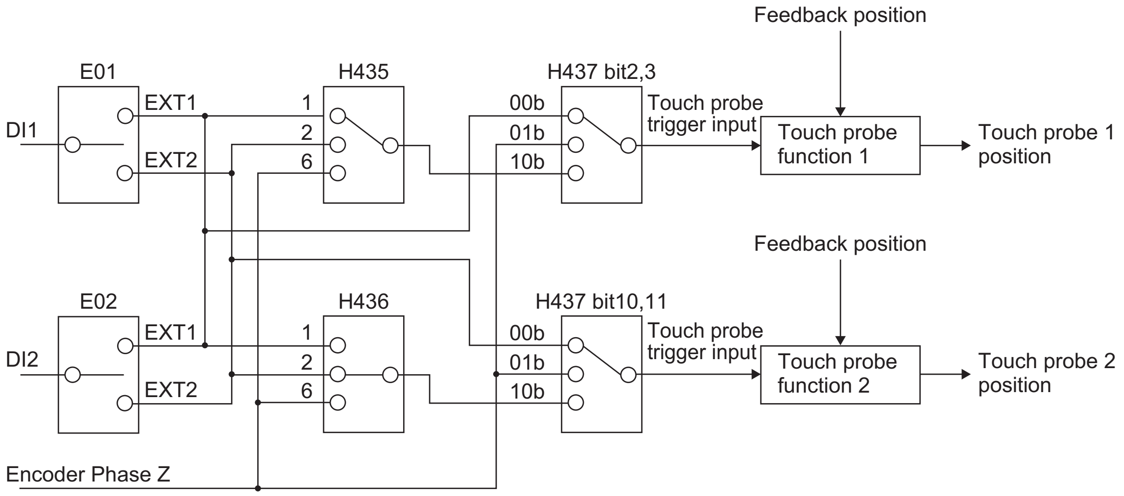
This is a function that latches the feedback position and the time stamp, when the external latch input signal or the encoder Z-phase is started.
This function is disabled if neither of “187: EXT1 (External latch input 1)” and “188: EXT2 (External latch input 2)” is allocated to Input Terminal [DI1] Function Selection (E01) and Input Terminal [DI2] Function Selection (E02), and if the selection trigger is not encoder Z-phase.
This function is also disabled when bit 0 (Latch function 1) and bit 8 (Latch function 2) of Touch Probe Function (H437) are 0.

Parameter No.	Function name	Data	Default data	Unit
H435	Touch Probe 1 Source	1: External Latch Input 1 (EXT1) 2: External Latch Input 2 (EXT2) 6: Encoder Phase Z	1	-
H436	Touch Probe 2 Source	1: External Latch Input 1 (EXT1) 2: External Latch Input 2 (EXT2) 6: Encoder Phase Z	1	-
H437	Touch Probe Function	0000 to FFFF hex	0	-
W148	Touch Probe 1 Positive Edge (MSB)	-4096 to 4095	0	-
W149	Touch Probe 1 Positive Edge (LSB)	0 to 65535	0	-
W150	Touch Probe 2 Positive Edge (MSB)	-4096 to 4095	0	-
W151	Touch Probe 2 Positive Edge (LSB)	0 to 65535	0	-
W152	Touch Probe Status	0000 to FFFF hex	0	-
E01,E02	Input Terminal [DI1] Function Selection, Input Terminal [DI2] Function Selection	187: EXT1 (External latch input 1)*1 188: EXT2 (External latch input 2)*1	-	-

*1. External latch cannot be allocated to other than multifunction input DI1 and DI2.

Setting the Trigger Signal

The trigger of the touch probe function can be selected as shown in the figure below.



Explanation of Bits of Touch Probe Function (H437)

Each bit of the touch probe function is as shown below.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	EPs	TriSel		Cont	Ena	0	0	0	EPs	TriSel		Cont	Ena
Touch probe function 2								Touch probe function 1							

Ena: Touch probe function disabled (0) or enabled (1)

Cont: Touch probe operation Trigger First Event Mode(0) / Continuous Mode(1)

TriSel: Touch probe trigger input switching

bit 3(11)	bit 2(10)	Select trigger input
0	0	EXT1
0	1	Z-phase
1	0	According to the touch probe trigger selection H435 and H436
1	1	The trigger signal input is considered to be "0."

Eps: Latch operation enabled (1) or disabled (0) during Active edge

Explanation of Bits of Touch Probe Status (W152)

Each bit of the touch probe status is as shown below.

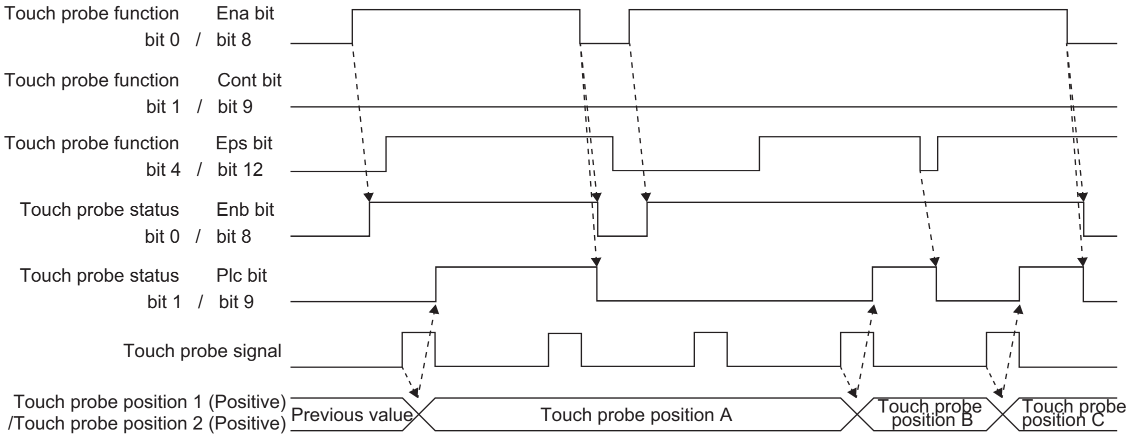
b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	0	PLc	Enb	0	0	0	0	0	0	PLc	Enb
Touch probe function 2								Touch probe function 1							

Enb: Touch probe function disabled (0) or enabled (1)

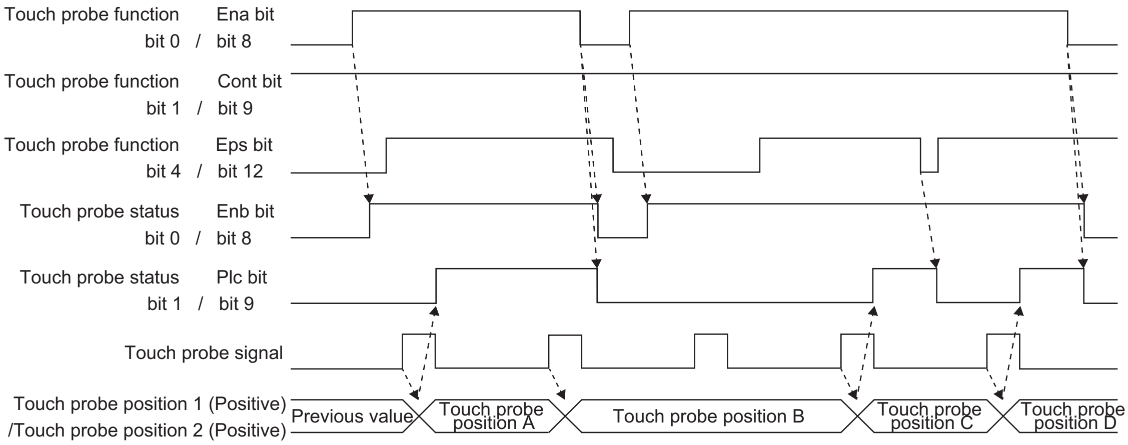
PLc: With (0) or without (1) Latch positive data

Operation Sequence

- **For Cont = 0: Trigger First Event Mode (First Trigger)**



- **For Cont = 1: Continuous Mode (Continuous)**



6-8 Motor tuning

6-8-1 Motor Off-line Auto-tuning

To perform auto-tuning of the motor, perform the settings according to the control method in *6-1-3 Motor Parameter Settings* on page 6-6, and then perform according to the following procedure.

Offline Auto-tuning of Induction Motor (IM Motor)

Offline auto-tuning consists of the following five steps:

- Presetting of parameters
- Selection of motor rotation during auto-tuning
- Execution of auto-tuning
- Processing after auto-tuning
- Corrective action in case of an error

1 Presetting of parameters

1) Set one of “0: IM V/f control,” “1: IM Dynamic torque vector control,” “3: IM V/f control with speed sensor,” “4: IM Dynamic torque vector control with speed sensor,” “5: IM Vector control without speed sensor” or “6: IM Vector control with speed sensor” to 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14).
2) Referring to *6-1-3 Motor Parameter Settings* on page 6-6, set parameters matched to the control method.

2 Selection of tuning method

Check the machine status, and select either “2: Tune the motor parameters while rotating” or “1: Tune the motor parameters while stopped” in 1st Auto Tuning Function Selection (P04)/2nd Auto-tuning Selection Function Selection (A18). When the wiring length has changed after rotation tuning is performed, tuning can be performed by “5: Tune the motor %R1 and %X while stopped.”

P04/A18 data		Data to be tuned	Tuning	Supplementary explanation
1	Tune the motor parameters while stopped	Primary resistance %R1 (P07/A21) Leakage reactance %X (P08/A22) Rated slip (P12/A26) %X correction factor (P53/A53)	Tuning is performed in a stop state.	When the motor cannot be rotated.

P04/A18 data		Data to be tuned	Tuning	Supplementary explanation
2	Tune the motor parameters while rotating	No-load current (P06/A20) Primary resistance %R1 (P07/A21) Leakage reactance %X (P08/A22) Rated slip (P12/A26) Magnetic saturation factor 1 to 5 (P16/A20) %X correction factor (P53/A53)	Tuning is performed in the following order. • %R1, %X in motor stopped state • No-load current and magnetic saturation factor in motor rotating state (50% of base frequency) • Rated slip in motor stopped state again	When the motor can be rotated safely.
5	Tune the motor %R1 and %X while stopped	Primary resistance %R1 (P07/A21) Leakage reactance %X (P08/A22) %X correction factor (P53/A53)	Tuning is performed in a stop state.	When the motor cannot be rotated. (Applied only when rotation tuning has been performed and the wiring length has been changed)

The tuning result is automatically written to the relevant parameter.

3 Preparing the mechanical system

As preparation for performing rotation tuning, remove machine couplings, and disable safety interlocks.

4 Execution of auto-tuning

1) Set one of 1, 2 or 5 to parameter P04, and press the key. 1, 2 and 5 blink slowly.

Parameter No.	Function name	Data	Default data	Unit
P04	1st Auto Tuning Function Selection	1: Tune the motor parameters while stopped 2: Tune the motor parameters while rotating 5: Tune the motor %R1 and %X while stopped	0	-

2) Input the RUN command. In the factory default state, forward rotation is performed when the RUN key is pressed in an enabled state. To perform reverse rotation or when the RUN command is input via the FW or RV terminals, change the setting of F02.
3) When the RUN command is input, 1, 2 and 5 light and tuning is started with operation stopped. The time required for auto-tuning is approx. 5 to 40 seconds.
4) After (3) above is completed when P04 = 2, acceleration is performed up to 50% of the rated speed and rotation tuning is started. When rotation tuning is completed, a deceleration stop is performed. The time required for this operation is 10 seconds excluding the acceleration/deceleration time.
5) When the RUN command via the FW and RV terminals is selected according to the F02 = 1 setting, tuning is completed when End is displayed. Turn the RUN command OFF. When

the RUN command was input via the touch panel or via communication, the RUN command is shut off automatically as soon as tuning is completed.

6) When tuning is completed, the following parameter No. is displayed.

5 Corrective action in case of an error

As unwanted tuning might cause hunting or other malfunctions or worsen operational accuracy, the inverter generates Er7 and discards tuning values when an abnormality is found in the tuning result.

When tuning ends in an error (Er7), check the following.

- Is inverter output wiring open?
- Has the mechanical brake operated?
- Has the free-run command "FRS" turned ON?
- Are parameter settings correct?

For details on the tuning error (Er7), refer to *Tuning Error* on page 6-69.

Offline Auto-tuning of Synchronous Motor (PM Motor)

Offline auto-tuning consists of the following five steps:

- Presetting of parameters
- Selection of tuning method
- Preparing the mechanical system
- Execution of auto-tuning
- Corrective action in case of an error

1 Presetting of parameters

1) Set “15: PM Vector control without speed and pole position sensor” or “16: PM Vector control with speed and pole position sensor” to 1st Drive Control Selection (F42).
2) By referring *6-1-3 Motor Parameter Settings* on page 6-6, set parameters matched to the control method.

2 Selection of tuning method

Check the machine status, and select either “2: Tune the motor parameters while rotating” or “1: Tune the motor parameters while stopped” in 1st Auto Tuning Function Selection (P04).

When performing only offset adjustment of the magnetic pole position sensor, select “4: Tune the PM motor magnetic pole position offset while rotating.” After tuning is finished, adjust the acceleration time and deceleration time, and conformity between the rotational direction of the motor and rotational direction of the machine.

P04 data		Data to be tuned	Tuning	Supplementary explanation
1	Tune the motor parameters while stopped	1st PM Motor Armature Resistance (P60) 1st PM Motor d-axis Inductance (P61) 1st PM Motor q-axis Inductance (P62)	Tuning is performed in a stop state.	When the motor cannot be rotated. For example, when the load cannot be removed. P30 = 1 or 2

P04 data		Data to be tuned	Tuning	Supplementary explanation
2	Tune the motor parameters while rotating	1st PM Motor Armature Resistance (P60) 1st PM Motor d-axis Inductance (P61) 1st PM Motor q-axis Inductance (P62) 1st PM Motor Induced Voltage Ke (P63)	The armature resistance, d-axis inductance and q-axis inductance are tuned in a motor stop state. After this, rotation is performed up to 50% of the rated frequency to tune the induced voltage.	When the motor can be rotated safely.
		1st PM Motor Magnetic Pole position Offset (P95)	The magnetic pole position sensor offset is tuned in a motor rotating state (speed according to d80)	This is implemented only on the case of PM Vector control with speed and pole position sensor (F42 = 16) using an A, B phase + U, V, W phase magnetic pole position detection type (d14 = 4) encoder.
4	Tune the PM motor magnetic pole position offset while rotating	1st PM Motor Magnetic Pole position Offset (P95)	The magnetic pole position sensor offset is tuned in a motor rotating state (speed according to d80)	This is performed when performing tuning of only the magnetic pole position sensor. Select PM Vector control with speed and pole position sensor (F42 = 16)

The tuning result is automatically written to the relevant parameter.

3 Preparing the mechanical system

As preparation for performing rotation tuning, remove machine couplings, and disable safety interlocks.

4 Execution of auto-tuning

1) Set one of 1, 2 or 4 to parameter P04, and press the ↵ key. 1, 2 and 4 blink slowly.

Parameter No.	Function name	Data	Default data	Unit
P04	1st Auto Tuning Function Selection	1: Tune the motor parameters while stopped 2: Tune the motor parameters while rotating 4: Tune the PM motor magnetic pole position offset while rotating	0	-

2) Input the RUN command. In the factory default state, forward rotation is performed when the RUN key is pressed in an enabled state. To perform reverse rotation or when the RUN command is input via the FW or RV terminals, change the setting of F02.
3) When the RUN command is input, 1, 2 and 4 light and tuning is started with operation stopped. The time required for auto-tuning is approx. 5 to 40 seconds.
4) After (3) above is completed when P04 = 2, acceleration is performed up to 50% of the rated speed and rotation tuning is started. When rotation tuning is completed, a deceleration stop is performed. The time required for this operation is 10 seconds excluding the acceleration/deceleration time.
5) When the RUN command via the FW and RV terminals is selected according to the F02 = 1 setting, tuning is completed when End is displayed. Turn the RUN command OFF. When the RUN command was input via the touch panel or via communication, the RUN command is shut off automatically as soon as tuning is completed.
6) When tuning is completed, the following parameter No. is displayed.

5 Corrective action in case of an error

As unwanted tuning might cause hunting or other malfunctions or worsen operational accuracy, the inverter generates Er7 and discards tuning values when an abnormality is found in the tuning result.

When tuning ends in an error (Er7), check the following.

- Is inverter output wiring open?
- Has the mechanical brake operated?
- Has the free-run command "FRS" turned ON?
- Are parameter settings correct?

For details on the tuning error (Er7), refer to *Tuning Error* on page 6-69.

Tuning Error

The following table summarizes the causes of tuning errors.

Sub codes can be displayed in the alarm information display (monitor mode 6_21). To display a sub code, press the Enter key when an alarm is displayed and select 6_21. Individual alarms are displayed in addition to the following alarms when regular alarm detection is activated.

Cause of tuning error	Er7 Error sub code	Cause and countermeasure
Sequence abnormality	7 8 9	When RUN command OFF, forced stop “STOP” and free-run stop “FRS,” etc. are input during tuning →Do not turn the RUN command OFF during tuning.
Overcurrent abnormality	6 10	When an abnormally large current flows during tuning →Check the state of the mechanical brake. Also, check if the motor can be mechanically rotated.

Cause of tuning error	Er7 Error sub code	Cause and countermeasure
Tuning result abnormality	1 2 3 4	When unbalance between phases or an output phase loss is detected, or when an open output, etc. causes the tuning result to be an abnormally large or small value →Check the wiring.
Tuning frequency abnormality (Only when P04 = 2)	13	When various limit operations occur during tuning, or when a limit is applied at the maximum output frequency or frequency limiter (upper limit) →Change so that the limit value becomes 50% or higher of the base frequency.
Error occurrence	15	When an insufficient voltage state has occurred or an alarm has occurred →For details on countermeasures for individual alarms, refer to *9-1 Alarm Display and Remedies* on page 9-2.
Acceleration time exceeded (Only when P04 = 2)	18	When 3x the set value of acceleration time in F07 is exceeded for the output frequency to reach 50% of the base frequency →Increase the value of F07.
Control method error	21	Although the motor is rotated for magnetic pole position tuning when P30 = 0 or 3, when P04 = 1: Tune the motor parameters while stopped is performed at this setting When P04 = 5: Tune the motor %R1 and %X while stopped is performed when F42 = 15 is set →Set to the correct combination.
Parameter Setting error	5003	When the rated impedance or rated inductance is outside the effective range →Check setting of F04, F05 and P03
Inability to calculate magnetic pole position	5005	When P30 = 1 or 3 is set: When the salient pole ratio of the motor inductance is small When P30 = 2 is set: When there is no magnetic saturation characteristic of the motor →When P30 = 1, change P87 to a small value. Note, however, that in the case of motors that are difficult to magnetically saturate, tuning is sometimes impossible. →When P30 = 2 or 3, set P30 = 0, and adjust while increasing F24 in stages in increments between about 0.5 to 5.0 s until rotation tuning no longer fails.
Insufficient magnetic saturation	5056	When the magnetic saturation characteristic of the motor is small and the magnetic pole position cannot be distinguished →Increase the value of P87 in stages taking about 120% as the upper limit. When there is no apparent effect, set P30 = 0 or 3, and set to about F24 = 0.5 to 5.0 s.
Excessive magnetic saturation	5057	When the magnetic saturation characteristic of the motor is large, and a large current flows for distinguishing the magnetic pole position, which is dangerous →Set P87 to a small value.

Cause of tuning error	Er7 Error sub code	Cause and countermeasure
Tuning result abnormality	5059 ~ 5065	When unbalance between phases or a phase loss is detected, or when an open output or short-circuit causes the tuning result to be abnormally small or large →Check that there is no error occurring in the wiring between the inverter and motor. →When there is an electromagnetic contactor (MC) between the inverter and motor, check to see if the contact is open.

6-8-2 Online Tuning

When dynamic torque vector control or slip compensation control is adopted and operation is performed for a long time, motor constants change according to the rise in motor temperature. When motor constants change, the speed compensation amount of the motor changes, and this sometimes results in the motor speed deviating from the initial motor rotation speed. By enabling online tuning, the motor constants corresponding to the change in motor temperature are identified and fluctuation in motor speed is reduced.

Online tuning can be used in either of the following cases after having performed rotation tuning by auto-tuning.

- When 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) is set to “1: IM Dynamic torque vector control”
- When 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) is set to “0: IM V/f control,” and Slip compensation Function Selection (H442) is set to “1: Valid” and 1st Torque Boost Function Selection (E112)/2nd Torque Boost Function Selection (E113) is set to “1: Automatic torque boost”

Parameter No.	Function name	Data	Default data	Unit
P05/A19	1st Online Tuning Function Selection/2nd Online tuning Function Selection	0: Disable 1: Enable	0	-

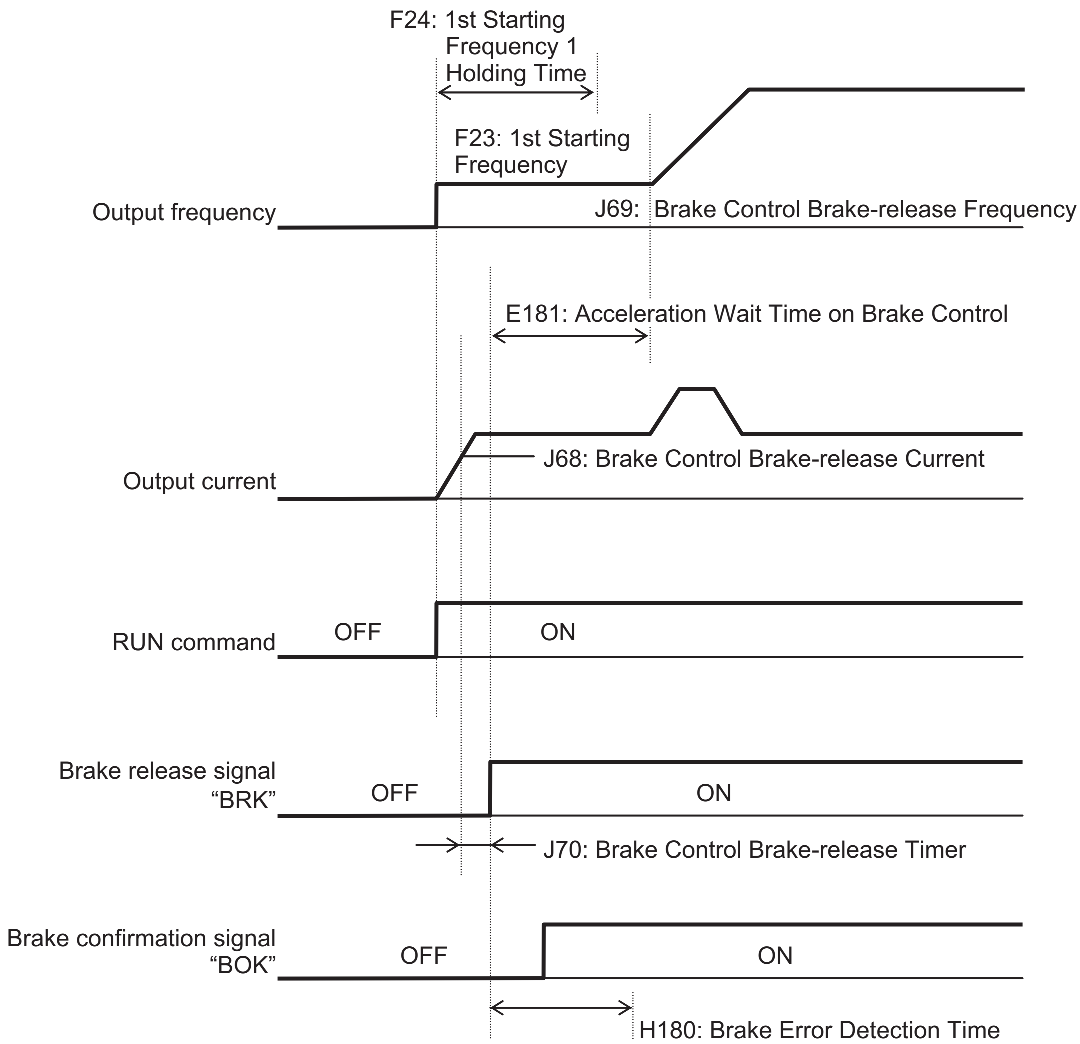
6-9 Brake Control Function

The 3G3M1 Series Inverter has a built-in brake control function for an elevating system, for example. Use this function to control the external brake used in an elevating system, for example, from the inverter.

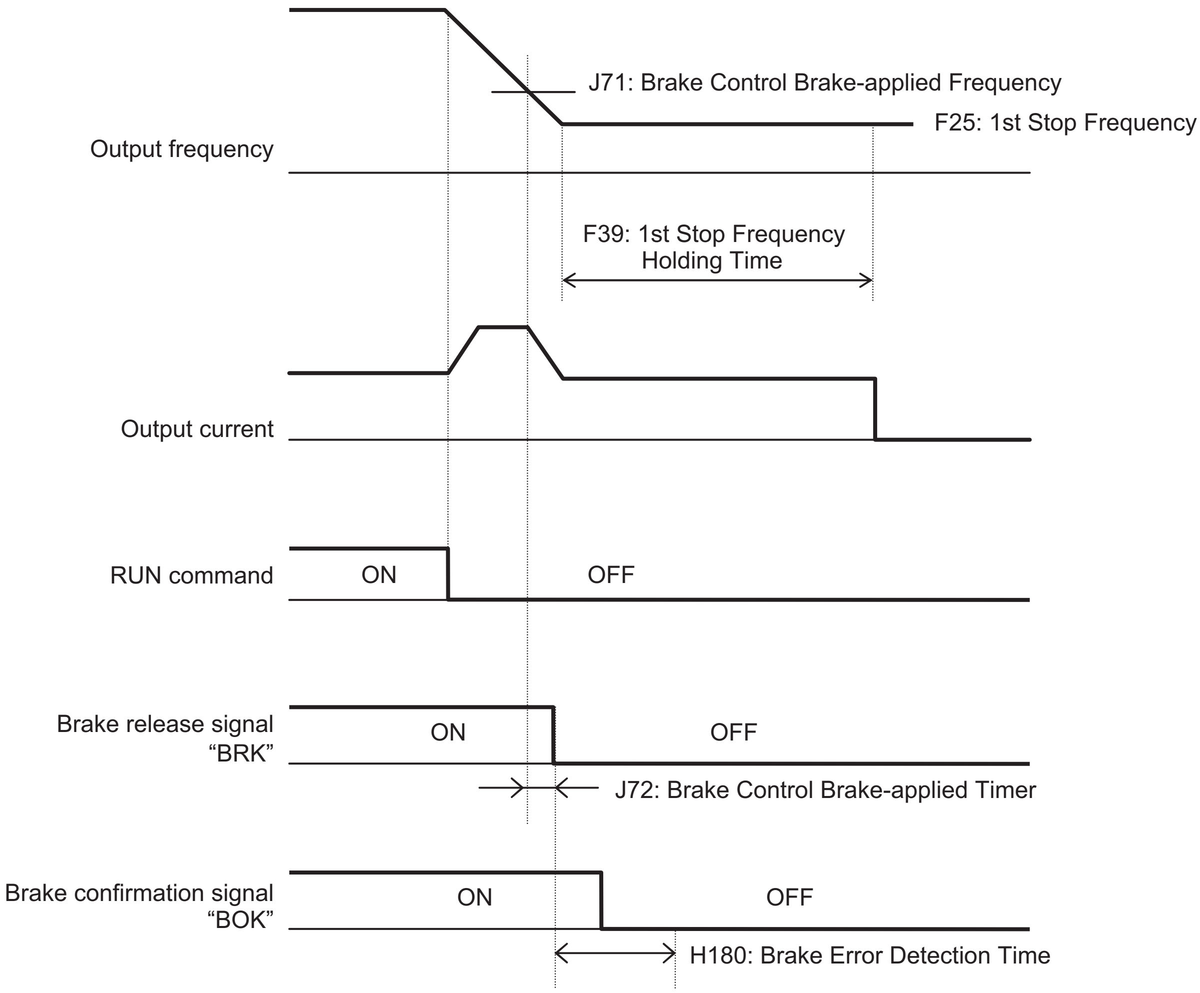
The brake control function can be used independently of the 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) setting.

6-9-1 Operation Sequence of Brake Control Function

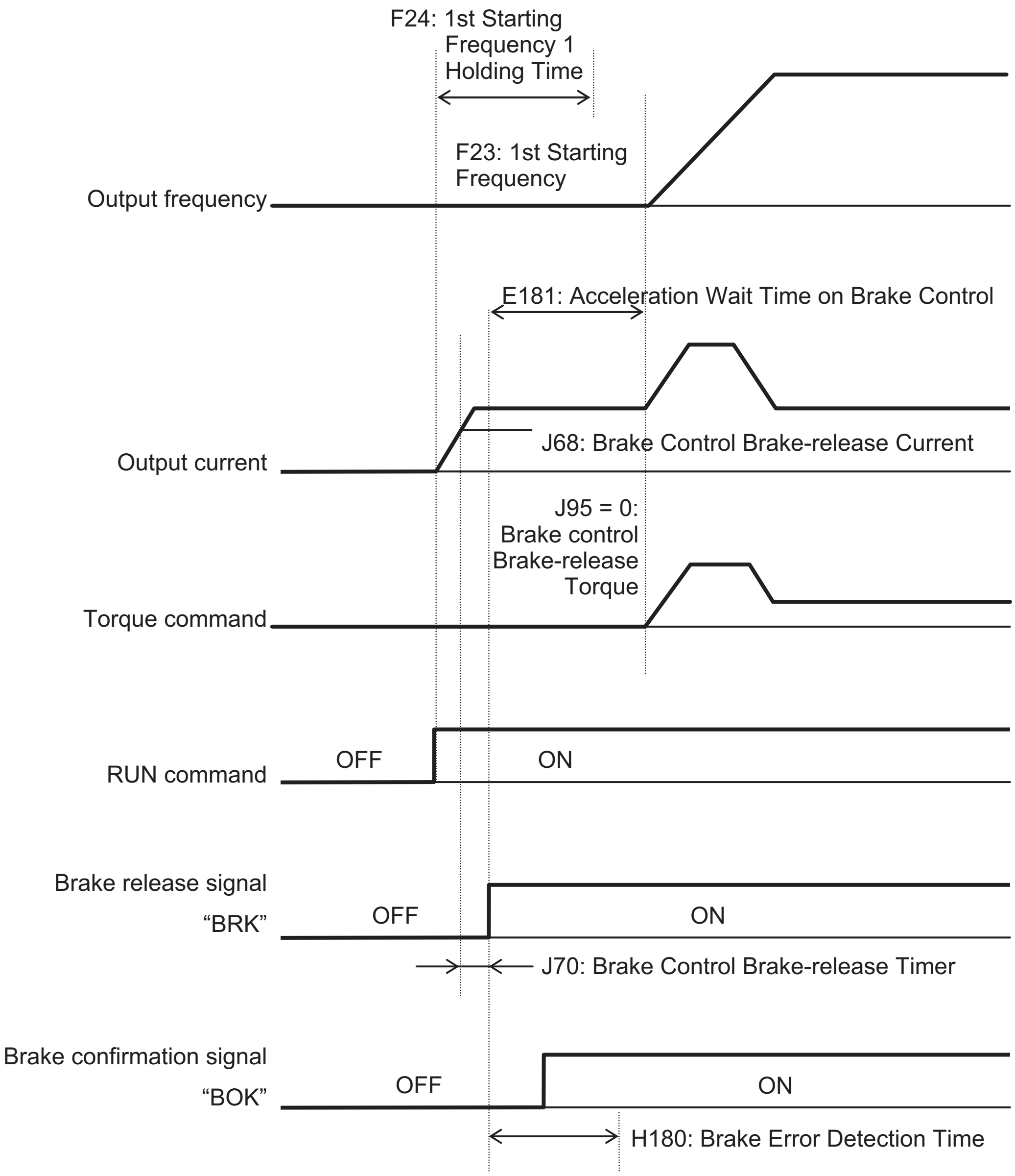
The description of operation sequence of brake control function is shown below.



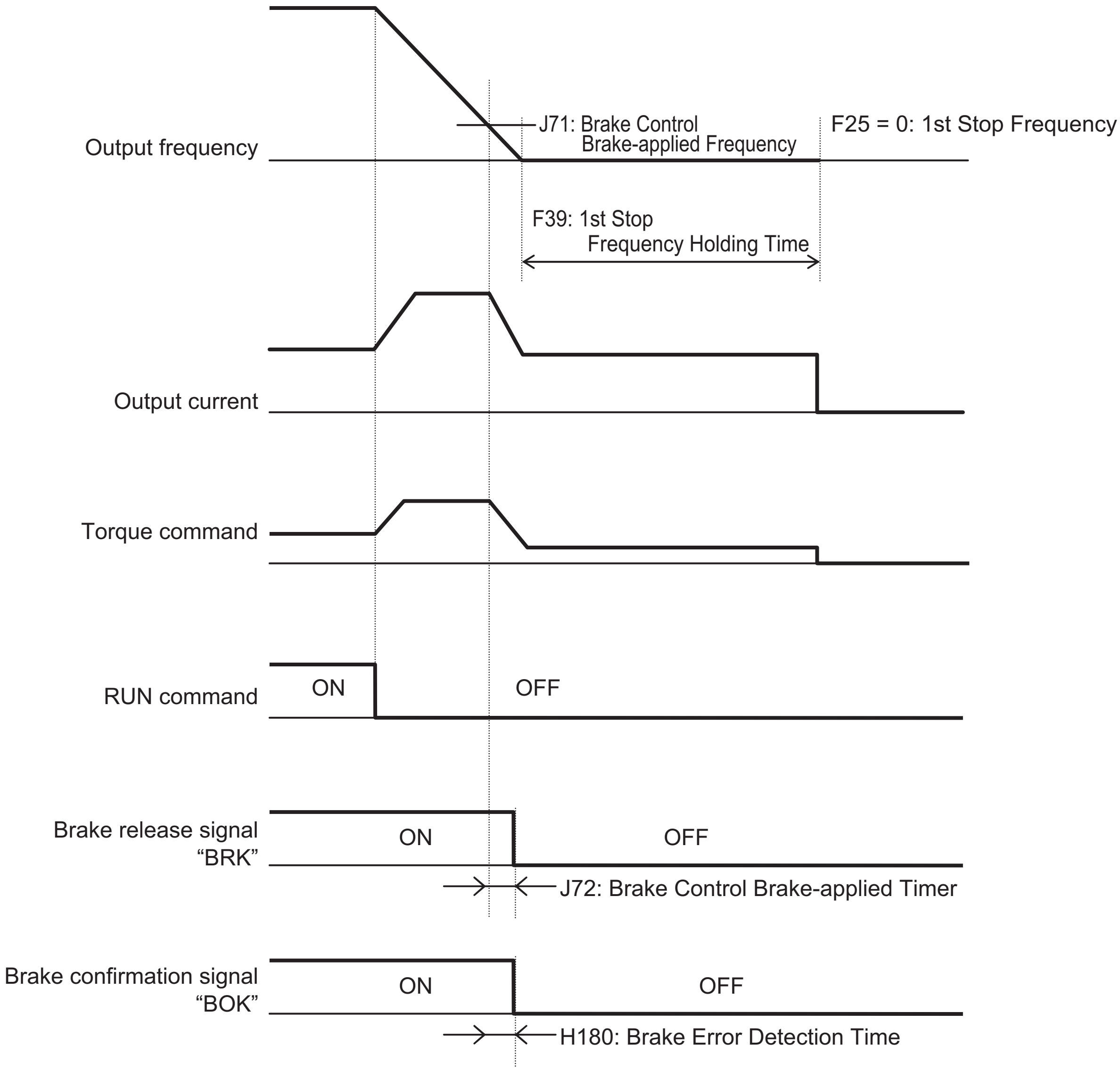
V/f control Operation time chart at startup



V/f control Operation time chart at stop



Vector control Operation time chart at startup



Vector control Operation time chart at stop

Note The above sequence chart shows an example where one of Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) is set to "65: BOK (brake confirmation signal)."

● At acceleration

1. When the RUN command is input, the inverter starts output.
2. When both the output current and output frequency (in V/f control) and the output current and torque command (in vector control) reach the brake signal release level (J68, J69, J95), the inverter waits for the time set at Brake Control Brake-release Timer (J70) and then outputs the brake release signal (E20, E21, E27 = 57: BRK).
3. After the brake release signal is output, the inverter waits for input of the brake confirmation signal (E01 to E05, E98, E99 = 65: BOK) for the time set at Brake Error Detection Time (H180). If the brake confirmation signal is not input within the time set at H180, the inverter sets the output terminal and outputs the brake error signal (E20, E21, E27 = 182: BER) and detects the brake error (Er6).

4. After the brake release signal is input (brake is released), the inverter waits for the time set at Acceleration Wait Time on Brake Control (E181), and performs acceleration again up to the set frequency.

● At deceleration

1. When the RUN command turns OFF, the inverter decelerates to the Brake Control Brake-applied Frequency (J71), waits for the time set at Brake Control Brake-applied Timer (J72), and turns OFF the brake release signal (E20, E21, E27 = 57: BRK).
2. After the brake release signal is turned OFF, the inverter waits for the brake confirmation signal (E01 to E05, E98, E99 = 65: BOK) for the time set at Brake Error Detection Time (H180) to turn OFF.
   If the brake confirmation signal does not turn OFF within the time set at H180, the inverter outputs the brake error signal (E20, E21, E27 = 182: BER) and detects the brake error (Er6).
3. After the brake confirmation signal turns OFF (after applying the brake), when the inverter arrives at the stop frequency, it waits for the time set at 1st Stop Frequency Holding Time (F39) and decelerates again to an output frequency of 0 Hz.

6-9-2 Brake Control Function Settings

To enable the brake control function, allocate “57: BRK (brake release)” to the multifunction output terminal.
The brake control function can be used independently of the 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) setting.
In the 3G3M1 Series, you can combine this function with the position control.
For details on how to combine this function with position control, refer to *6-7-15 Brake Control during Position Control* on page 6-58.

- Allocate the following output to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

  Brake control output : “57: BRK (brake release)”
  Brake error output : “182: BER (brake error)”
- As required, allocate “65: BOK (brake confirmation)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) to use this function.
- According to your system, set the parameters used for the operation sequence.
- To generate high torque at startup, it is recommended to use the torque bias function. For details on the torque bias function, refer to *6-6-2 Torque Bias Function Settings* on page 6-33.
- Set a frequency higher than Brake Control Brake-release Frequency (J69). If the set frequency is equal to or lower than the J69 value, the inverter will detect an overload because the brake cannot be released.

Parameter No.	Function name	Data	Default data	Unit
J70	Brake Control Brake-release Timer	0.000 to 5.000	1.000	s
E181	Acceleration Wait Time on Brake Control	0.00 to 5.00	0.00	s
F39	1st Stop Frequency Holding Time	0.00 to 10.00	0.00	s

Parameter No.	Function name	Data	Default data	Unit
H180	Brake Error Detection Time	0.00 to 10.00	1.00	s
J69	Brake Control Brake-release Frequency[*1]	0.0 to 25.0	1.0	Hz
J68	Brake Control Brake-release Current[*2]	0.00 to 300.00 Set the motor rated torque as 100%.	100.00	%
J71	Brake Control Brake-applied Frequency[*1]	0.0 to 25.0	1.0	Hz
J72	Brake Control Brake-applied Timer	0.000 to 5.000	1.000	Hz
J95	Brake control Brake-release Torque	0.00 to 300.00 Set the motor rated torque as 100%.	100.00	%
J96	Brake Control Operation Selection	0 to 31 (Decimal) (Enabled only in vector control with speed sensor)	0	-
	bit 0: Target operation speed	0: Speed detection value	0	-
		1: Speed command value		
		Selection of speed information used for braking judgment		
	bit 4: Braking condition selection	0: RUN command OFF disabled	0	-
		1: RUN command OFF enabled		
	bit 6: Operation selection during position control stop	0: BRK OFF	0	-
		1: BRK ON		
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	65: BOK (brake confirmation)	-	-
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	57: BRK (brake release)	-	-
E27	Output Terminal [ROA, ROB] Function Selection	182: BER (brake error)		

*1. Set this to a value larger than 1st Starting Frequency (F23).
*2. Note that, if the set value is too low, the inverter may not output a sufficient torque when the brake is released.

6-10 Application Control

In winding systems such as wire drawing machines and spinning machines, the outer diameter of the wind-up roll increases due to the amount of material being wound onto the roll and the actual wind-up speed increases when winding is continued at a constant shaft speed. To maintain the wind-up speed at the outer periphery at a constant speed, a speed sensor is used to detect the wind-up speed, and the speed of the motor shaft is controlled so that the wind-up speed is kept constant.

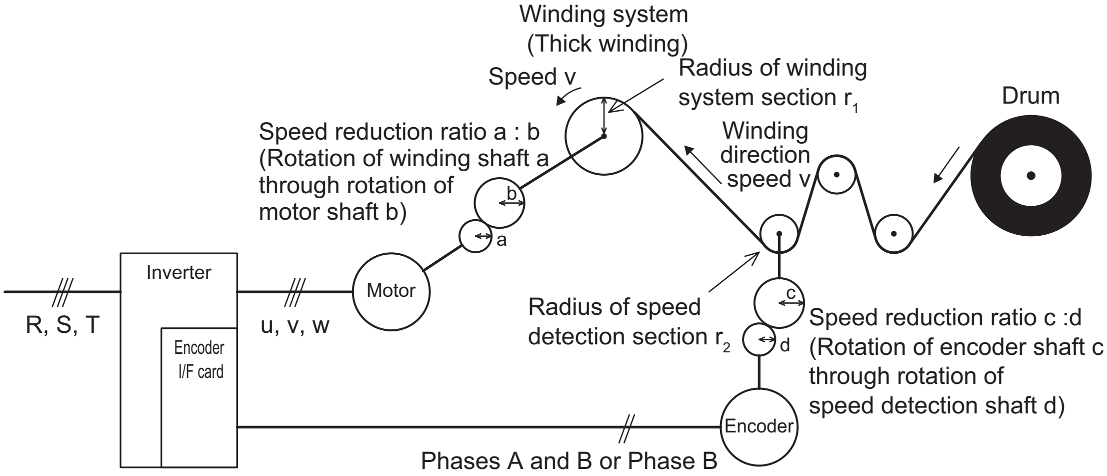
6-10-1 Application Control Settings

Set enable/disable status for line speed control and synchronized run operation (simultaneous start synchronization/standby synchronization).

Parameter No.	Function name	Data	Default data	Unit
d41	Special Control Selection	1: Line speed control with speed sensor	0	-
d15	Input Terminal [PIA][PIB] Encoder Pulse Resolution	20 to 60000	1024	Pulse
d16	Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator	1 to 32767	1	-
d17	Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator	1 to 32767	1	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	70: Line speed control cancellation 71: Line speed control frequency memory	-	-

Machine Configuration and Settings

The following parameters must be set when the mechanical system of a winder is configured as shown in the figure below.



- Speed reduction ratio of motor shaft to winding shaft: a:b
- Speed reduction ratio of speed detection shaft to encoder shaft: c:d
- Radius of winding system section before winding: r1 [m]
- Radius of speed detection section: r2 [m]

Parameter No.	Function name	Description
d15	Input Terminal [PIA][PIB] Encoder Pulse Resolution	Set the number of encoder pulses in hexadecimal [P/R]
d16	Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator	Speed reduction ratio of overall mechanical system $\frac{K_2}{K_1} = \frac{r_2}{r_1} \times \frac{b}{a} \times \frac{d}{c}$ = d17/d16 Set denominator coefficient (K1 = r1 × a × c) of d16 = speed reduction ratio Set numerator coefficient (K2 = r2 × b × d) of d17 = speed reduction ratio
d17	Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator	

Canceling Line Speed Control

Line speed control can be canceled by the “Hz/LSC” signal. When line speed control is canceled, frequency compensation by PI arithmetic calculation is set to zero. As a result, thick winding compensation is no longer carried out and winding speed increases. Use this feature to temporarily stop control, for example, to correct thread breakage.

Hz/LSC	Function
OFF	Line speed control enabled (According to d41)
ON	Line speed control canceled (V/f control, thick winding compensation OFF)

Line Speed Control Frequency Memory

The frequency reference that was executed can be saved to memory. By doing so, startup is performed from the saved frequency at a restart so that the peripheral speed is kept constant.

LSC-HLD	Function
OFF	Disabled (save operation not performed)
ON	Enabled (frequency reference after thick winding compensation is saved)

Digital Setting

Set as follows to set the peripheral speed (feed speed) digitally in m/min.

Parameter No.	Function name	Description
E48	Operator Display Speed Monitor Item Selection	5: Feed speed
E50	1st Frequency Conversion Coefficient	$K_S = \dfrac{240\pi \times a \times r_1}{p \times b}$ K_S : 1st Frequency Conversion Coefficient (E50) p : Number of motor poles a, b : Motor shaft - Winding shaft speed reduction ratio (Rotation of winding shaft a occurs when the motor shaft b rotates) r1 : Radius of winding system (Initial value before winding) (m)

Analog Setting

To set the peripheral speed (feed speed) by analog input, set analog input (0% to 100%) by the following formula.

$$\text{Analog input (\%)} = \frac{p \times b \times 100}{240\pi \times r1 \times a \times fmax} \times V$$

V: Peripheral speed (line speed) (m/min), fmax: 1st Maximum Output Frequency (F03)

Adjustment

Just like regular speed control, the speed command filter, speed detection filter, P gain, integral time, and other parameters of the speed control system that controls peripheral speed to a constant speed must adjusted.

Parameter No.	Function name	Description
d01	Speed Control 1 Speed Command Filter	Increase the filter constant when overshooting in response to changes in the speed command is large.
d02	Speed Control 1 Speed Detection Filter	Set a large filter constant to increase gain when the speed detection signal contains ripple and the gain of speed control cannot be raised.
d03	Speed Control 1 P Proportional Gain	When running a motor at a speed in which hunting occurs, lower the gain. When response is slow, increase the gain.
d04	Speed Control 1 I Integral Time	When response is slow, shorten the integral time.

6-11 Torque Limit Function

6-11-1 Torque Limit Function Settings

The torque limit function is for limiting the output torque of the motor.

- With the torque limit function, the following torque limit values are applied according to torque limit switching 1 and 2, analog voltage/current input and operation state allocated to 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14), Torque Limit Operation Selection (H75) and multifunction input.

Control Method	Torque Limit Operation Selection H75	Multi-function Input TRQ1	Multi-function Input TRQ2	Analog input	Operation state	Torque limit value to be applied
V/f control	-	OFF	-	Available*1	Power running*2	Analog input
					Regeneration*2	
				Not available	Power running	F40
					Regeneration	F41
		ON		-	Power running	E16
					Regeneration	E17
Vector control	0: Four quadrants independent	-	-	Available	1st quadrant	Analog input
				Not available		F40
				-	2nd quadrant	F41
					3rd quadrant	E16
					4th quadrant	E17
	1: Four quadrants identical	OFF	OFF	Available	-	Analog input
				Not available		F40
		ON	OFF	-		F41
		OFF	ON			E16
		ON	ON			E17

*1. To enable analog input, set “7: Analog torque limiter” to one of Input Terminal [AI1] Function Selection (E61), Input Terminal [AI2] Function Selection（AII） (E62) or Input Terminal [AI2] Function Selection（AIV） (E63).

*2. Power running indicates the 1st and 3rd quadrants, and regeneration indicates the 2nd and 4th quadrants.

- Setting “184: TL (torque limit enabled)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) enables the torque limit function only when the TL is input.

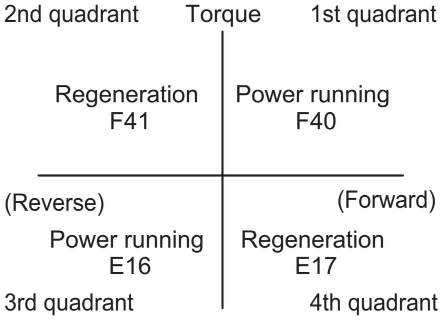
When this terminal is reset, the torque limit setting is disabled and the inverter uses the maximum value (300%) as the torque limit value.
When the torque limit enabled (TL) function is not allocated to a multifunction input terminal, the torque limit function is enabled at all times.

- The torque limit function regards the motor rated torque as 100%.
- When “132: TRQ (Torque limited)” is set to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27), the torque limit function can be checked to see if it is activated by the status of the torque limited signal.
- To enable the torque limit value by analog input or current input, set “7: Analog torque limiter” to one of Input Terminal [AI1] Function Selection (E61), Input Terminal [AI2] Function Selection（AII）(E62) or Input Terminal [AI2] Function Selection（AIV） (E63). Analog inputs 0 to 10 V or 4 to 20 mA (0 to 20 mA) are equivalent to torque limit values 0% to 300%. The torque limit value set by analog input is enabled in all operation modes.

<table>
<tr><th>Parameter No.</th><th>Function name</th><th>Data</th><th>Default data</th><th>Unit</th></tr>
<tr><td>F40</td><td>Torque Limit 1 (power running)</td><td>0 to 300 (In four quadrants, forward driving)</td><td rowspan="4">300</td><td rowspan="4">%</td></tr>
<tr><td>F41</td><td>Torque Limit 2 (regeneration)</td><td>0 to 300 (In four quadrants, reverse regeneration)</td></tr>
<tr><td>E16</td><td>Torque Limit 3 (power running)</td><td>0 to 300 (In four quadrants, reverse driving)</td></tr>
<tr><td>E17</td><td>Torque Limit 4 (regeneration)</td><td>0 to 300 (In four quadrants, forward regeneration)</td></tr>
<tr><td>E01 to E05, E98, E99</td><td>Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection</td><td>14: TRQ1 (Torque limit switching 1)
184: TL (Torque control enabled)
185: TRQ2 (Torque limit switching 2)</td><td>-</td><td>-</td></tr>
<tr><td>E20, E21</td><td>Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection</td><td rowspan="2">132: TRQ (Torque limited)</td><td rowspan="2">-</td><td rowspan="2">-</td></tr>
<tr><td>E27</td><td>Output Terminal [ROA, ROB] Function Selection</td></tr>
<tr><td>E61
E62
E63</td><td>Input Terminal [AI1] Function Selection
Input Terminal [AI2] Function Selection（AII）
Input Terminal [AI2] Function Selection（AIV）</td><td>7: Analog torque limiter</td><td>-</td><td>-</td></tr>
<tr><td>H74</td><td>Torque Limit Function Selection</td><td>0: Torque limit
1: Torque current limit</td><td>1</td><td>-</td></tr>
<tr><td rowspan="2">H75</td><td rowspan="2">Torque Limit Operation Selection</td><td>0: Four quadrants independent</td><td rowspan="2">0</td><td rowspan="2">-</td></tr>
<tr><td>1: Four quadrants identical</td></tr>
<tr><td>H76</td><td>Frequency Rising Limit for Torque Limit</td><td>0.0 to 590.0</td><td>5.0</td><td>Hz</td></tr>
</table>

● Details of Four Quadrant Independent (H75 = 0)

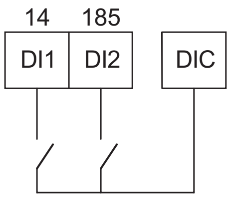
The torque limit when “0: Four quadrant independent” is selected at Torque Limit Operation Selection (H75) (F40, F41, E16 and E17) is as shown in the figure below.



● Details of Four Quadrant Identical (H75 = 1)

When “1: Four quadrants identical” is selected at Torque Limit Operation Selection (H75), the torque limit value (F40, F41, E16 and E17) that is switched by torque limit switching 1 and 2 allocated to multifunction input terminals is set as shown in the figure below.

Example) When torque limit switching 1 (14: TRQ1) is allocated to multifunction input terminal DI1 and torque limit switching 2 (185: TRQ2) is allocated to multifunction input terminal DI2



14: TRQ1	185: TRQ2	
OFF	OFF	→ F40
ON	OFF	→ F41
OFF	ON	→ E16
ON	ON	→ E17

● Details of Torque Limiter (H74 = 0)

This parameter limits the torque to a fixed value.

● Details of Frequency Rising Limit for Torque Limit (H76)

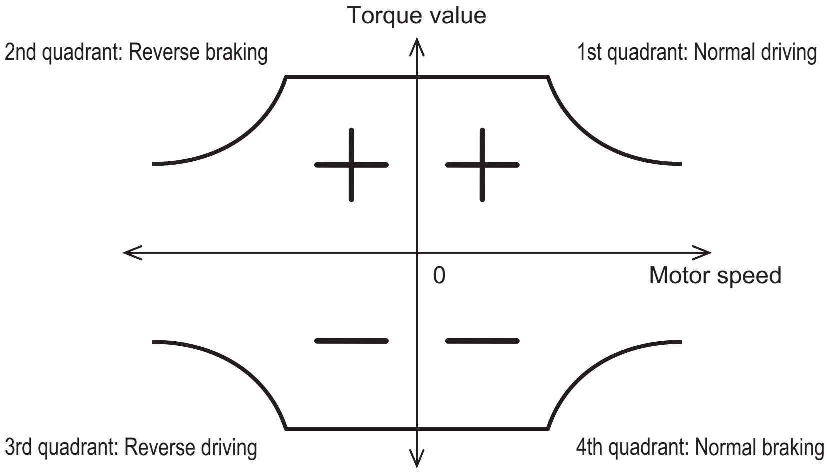
When a load is applied on the regeneration side, the actual speed of the motor is pulled to the load side to become faster than the output frequency of the inverter. When this state continues, the voltage at both ends of the main circuit capacity rises, and an overvoltage is detected and results in the inverter tripping. To avoid a trip, the overvoltage is averted by increasing the output frequency to more than the actual frequency reference. However, at this time, this torque limiter functions to apply a limit to how far the frequency rises.

6-11-2 Torque Monitor

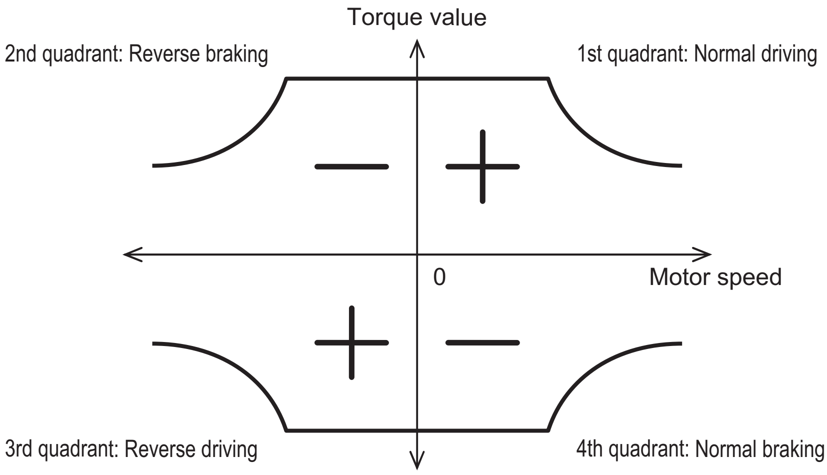
In the torque calculation value of V/f control and the torque command value in vector control, the torque polarity is generally + for drive and - for braking. When the rotational direction changes from forward rotation to reverse rotation in elevator loads or similar applications, the polarity also is reversed as torque changes from drive to braking.
When Sysmac Studio is connected to trace torque data, continuous data can no longer be acquired as the polity of the torque command value also changes interlocked with the speed polarity. The continuity of torque data can be ensured as forward drive and reverse braking is handled as + polarity and

forward braking and reverse drive is handled as - polarity by setting 0 to Torque Command Monitor Polarity Selection (E49).

Parameter No.	Function name	Data	Default data	Unit
E49	Torque Command Monitor Polarity Selection	0: Torque polarity 1: Plus for driving Minus for braking	1	-



E49 = 0 (Torque polarity)



E49 = 1 (+ driving, - braking)

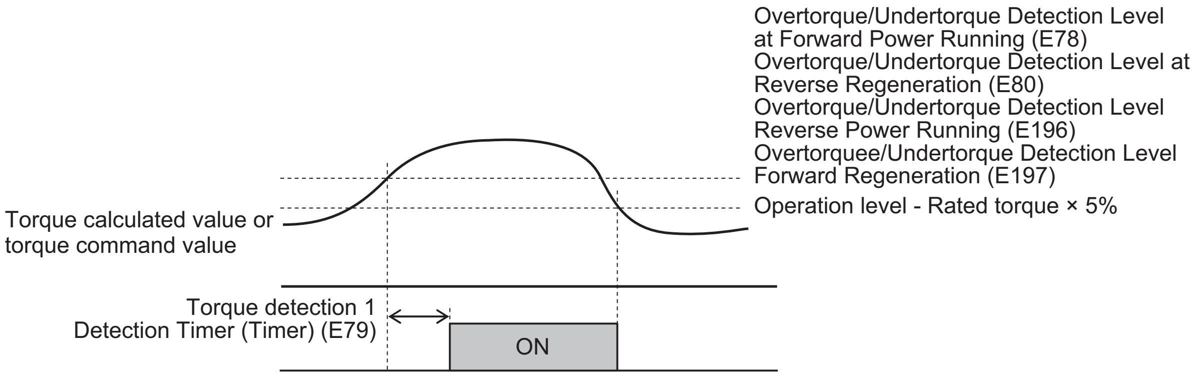
6-12 Overtorque/Undertorque Function

6-12-1 Overtorque/Undertorque Function Settings

Use this function to detect that the estimated motor output torque value exceeded the set level and output the overtorque signal.

- To enable detection of the overtorque state, allocated “46: OTQ (Over/under torque signal) (NO contact)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27). Detection of the undertorque state also can be enabled by allocating “1046: OTQ (Over/under torque signal) (NC contact).”
- The overtorque/undertorque ON signal is output when the torque value calculated by the inverter or the torque command value is at the set level of torque detection (operation level) or higher, and continues for the set time of torque command detection (timer time) or longer. The overtorque/undertorque signal is turned OFF when the torque calculation value becomes “operation level - 5% of the motor rated torque or lower.”
- The operation level can be set separately to each of the four quadrants, and the state at acceleration/deceleration and constant speed also can be selected.
- For calculating the overtorque and undertorque levels in this function, the motor rated torque is taken to be 100%.
- Use this function to detect the brake release signal of an elevator, or if the load applied to the load machine is abnormally high.

Parameter No.	Function name	Data	Default data	Unit
E20, E21	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection	46: OTQ (Overtorque) 1046: OTQ (Undertorque)	-	-
E27	Output Terminal [ROA, ROB] Function Selection			
E78	Overtorque/Undertorque Detection Level at Forward Power Running	0 to 300	100	%
E80	Overtorque/Undertorque Detection Level at Reverse Regeneration	0 to 300	100	%
E196	Overtorque/Undertorque Detection Level Reverse Power Running	0 to 300	100	%
E197	Overtorquee/Undertorque Detection Level Forward Regeneration	0 to 300	100	%
E79	Torque detection 1 Detection Timer	0.01 to 600.00	10.00	s
E198	Overtorque/Undertorque Detection Condition Selection	0: Output during acceleration/deceleration and constant-speed operation 1: Output only during constant-speed operation	1	s


Overtorque/Undertorque Detection Level at Forward Power Running (E78)
Overtorque/Undertorque Detection Level at Reverse Regeneration (E80)
Overtorque/Undertorque Detection Level Reverse Power Running (E196)
Overtorquee/Undertorque Detection Level Forward Regeneration (E197)
Operation level - Rated torque × 5%
Torque calculated value or torque command value
Torque detection 1
Detection Timer (Timer) (E79)
ON

7

Other Functions

This section describes the details of functions not described in Section 5 or Section 6.

7-1 Monitor Mode

This section describes the output frequency, fault monitor during trip, and other monitor functions of the inverter.

7-1-1 Operation Monitor

Item No.	Parameter No.	Item	Range	Display item
3_00	W03	Output Frequency Monitor before Slip Compensation	0.00 to 99.99 to 590.0 [Hz]	Output frequency 1 (before slip compensation) is displayed in increments of 0.01 Hz. However, a frequency of 100 Hz or higher is displayed in increments of 0.1 Hz and a frequency of 1,000 Hz or higher is displayed in increments of 1 Hz.
3_01	W115	Output Frequency After Slip Compensation	0.00 to 99.99 to 590.0 [Hz]	Output frequency 2 (after slip compensation) is displayed in increments of 0.01 Hz.
3_02	W05	Output Current Monitor	0.00 to 99.99 to 655.3 [A]	Output current effective value is displayed in increments of 0.01 A. A current value of 100 A or higher is displayed in increments of 0.1 A.
3_03	W06	Output Voltage Monitor	0.0 to 999.0 [V]	The output voltage command value is displayed in increments of 0.1 V. However, the display value changes in increments of 1.0 V.
3_04	W07	Output Torque Monitor	-400 to 400 [%]	The torque calculated value, torque command value and torque current command value are displayed in increments of 1%. • Rated motor torque ratio of torque calculated value in the case of V/f control and dynamic torque vector control • Speed control mode of vector control: Rated motor torque ratio of speed control output (after torque bias) • When the torque command is used in the torque control mode of vector control: Rated motor torque ratio of torque command value • When the torque current command is used in the torque control mode of vector control: Rated motor current ratio of torque current command value
3_05	W02	Frequency Reference Monitor	0.00 to 590.0 [Hz]	However, a set frequency of 0.01 Hz or 100 Hz or higher is displayed in increments of 0.1 Hz.

Item No.	Parameter No.	Item	Range	Display item
3_06	-	Operation direction		The output operation direction is displayed. "F: Forward" or "r: Reverse" is displayed, and "----" is displayed when stopped. The rotation direction is determined according to the polarity of the output frequency. During vector control, it is determined according to the detection speed. *Generally, as seen from the axial direction, the forward rotation of the motor is in the counterclockwise direction.
3_07	W01	Running Status 1 Monitor	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.
3_08	W110	Motor Speed	0.00 to 9999 [r/min] 1000 to 9999 [10r/min]	The rotation speed is displayed as "output frequency (Hz) × 120/Number of motor poles." If the monitor value is 10000 or above, the x10 LED lights up and the value of "monitor value/10" is displayed. • V/f, torque vector: Value converted from the frequency before slip compensation based on the number of poles • V/f with speed sensor, vector with speed sensor: Motor rotation speed detection value • Vector without speed sensor: Motor rotation speed estimated value
3_09	W111	Load Shaft Speed	0.00 to 9999 [r/min] 1000 to 9999 [10r/min]	The load speed is displayed as "output frequency (Hz) × E50 (1st Frequency Conversion Coefficient)/E39 (Display Coefficient 1 for Transport Time / Auxiliary Display Coefficient 1 for Speed Monitor)." If the monitor value is 10000 or above, the x10 LED lights up and the value of "monitor value/10" is displayed.
3_10	W11	PID Process Command	-999 to 9990	The PID process command is displayed by converting to the control-target physical quantity (such as the temperature, pressure, etc.) using the parameter J106 and the J107 data (PID display maximum value, display minimum value). Display value = (PID process command (%)/100) × (Display maximum value - Display minimum value) + Display minimum value If PID control is disabled, "-----" is displayed.

Item No.		Parame-ter No.	Item	Range	Display item
3_11		W12	PID Feedback Value Monitor	-999 to 9990	The PID feedback value is displayed by converting to the control-target physical quantity (such as the temperature, pressure, etc.) using the parameter J106 and the J107 data (PID display maximum value, display minimum value). Display value = (PID feedback value (%)/100) × (Display maximum value - Display minimum value) + Display minimum value If PID control is disabled, "-----" is displayed.
3_12		W13	Analog Torque Limit Value Monitor	-300 to 300 [%]	The torque limit set value of the rated motor torque ratio is displayed in increments of 1%.
3_13		{W14}	{W14Level of torque value B}		
3_14		W15	Ratio value Monitor	0.00 to 200.0 [%]	A ratio set value of 1.00 time is displayed as 100%. If the ratio set value is not selected, "-----" is displayed.
3_15		W10	Feed Speed	0.00 to 9999 [m/min] 1000 to 9999 [10 m/min]	The feed speed is displayed as "output frequency (Hz) × E50 (1st Frequency Conversion Coefficient) / E39 (Display Coefficient 1 for Transport Time / Auxiliary Display Coefficient 1 for Speed Monitor)." If the display value is 10000 or above, the x10 LED lights up and the value of "display value/10" is displayed.
When position control is enabled (When DI terminal SPD is allocated)	3_17	W144, W145	Target Position Monitor (MSB), Target Position Monitor (LSB)	F000 0000 hex to 0FFF FFFF hex (Hexadecimal) (Equivalent to -268435456 to 268435455) The upper two bytes and lower two bytes are displayed alternately.	The target position user value (hexadecimal) is displayed alternately in upper bytes/lower bytes.
	3_18	W142, W143	Feedback Current Position Monitor (MSB), Feedback Current Position Monitor (LSB)		The current position is displayed. The display format is the same as above.
	3_19	W146, W147	Position Deviation Monitor (MSB), Position Deviation Monitor (LSB)		The position deviation is displayed. The display format is the same as above.
	3_20	W152	Touch Probe Status	0000 hex to FFFF hex (Hexadecimal)	bit 0: Touch probe 1 Enb bit 1: Touch probe 1 PLc bit 8: Touch probe 2 Enb bit 9: Touch probe 2 PLc Other than the above: Reserved

Item No.		Parameter No.	Item	Range	Display item
When position control is disabled (When DI terminal SPD is not allocated)	3_17	{W59}, {W60}	{W59Master follower control - target position (Upper column)}, {W60Master follower control - target position (Lower column)}	-999 9999 to 999 9999 Sign + Upper three digits and lower four digits are displayed alternately. In the case of a negative value, the dot of the lowermost digit (rightmost digit) of the lower four-digit display lights up.	The target position (decimal) is displayed alternately in upper bytes/lower bytes. The pulse before quad edge evaluation is displayed.
	3_18	{W57}, {W58}	{W57Master follower control - current position (Upper column)}, {W58Master follower control - current position (Lower column)}		The current position is displayed. The display format is the same as above.
	3_19	{W61}, {W62}	{W61Master follower control - position error (Upper column)}, {W62Master follower control - position error (Lower column)}		The position deviation is displayed. The display format is the same as above.
	3_20	{W63}	{W63Master follower control status}	0 to 26	The control status number of the master follower control is displayed. 0: Master follower control stop status 20: Master follower control priority waiting status 21: Master follower control command waiting status 22: Z phase detection waiting status 23: Reference Z phase detection status 24: Follower Z phase detection status 25: Master follower under control status 26: Master follower control completion status
3_21		W32	PID Output Monitor	-150 to -99.9 to -9.99 to 99.99 to 150.0[%]	The PID output value is displayed in increments of 0.01%. (The maximum frequency is 100%.) If PID control is disabled, "-----" is displayed.
3_22		W26	Magnetic Flux Command Value	0 to 999 [%]	The magnetic flux command value is displayed in increments of 1%.
3_23		M74	Running Status 2 Monitor	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.

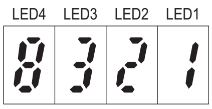
Item No.	Parame-ter No.	Item	Range	Display item
3_25	{W66}	{W66Difference pulse of master follower con-trol}	-999 to -99.9 to 99.99 to 999.9 [deg]	The master follower control position error (in angles) is displayed.
3_29	W116	PG Feedback Value	0.00 to 590.0 [Hz]	The value obtained by converting the PG feedback value to frequency is displayed in Hz.
3_32	W118	Torque Bias Monitor	-999 to 999	The selected torque bias command value is displayed. (Displayed in % with respect to the rated motor torque)
3_50	W153	Pulse Input Rate for A/B Phase of Refer-ence Side	-327 to -99.9 to -9.99 to 99.99 to 327.6 [p/s]	The pulse rate entered in the AB phase of the PG used as the command (reference) side is displayed. (in increments of 0.01 [kp/s])
3_51	W154	Pulse Input Rate for Z Phase of Refer-ence Side	0 to 9999 [p/s] 1000 to 1600 [10p/s]	The pulse rate entered in the Z phase of the PG used as the command (reference) side is displayed. If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.
3_52	W155	Pulse Input Rate for A/B Phase of Feed-back Side	-327 to -99.9 to -9.99 to 99.99 to 327.6 [kp/s]	The pulse rate entered in the AB phase of the PG used as the return (follower) side is dis-played. (in increments of 0.01 [kp/s])
3_53	W156	Pulse Input Rate for Z Phase of Feed-back Side	0 to 9999 [p/s] 1000 to 1600 [10p/s]	The pulse rate entered in the Z phase of the PG used as the return (follower) side is dis-played. If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.

Operation Status Monitor [3_07]

The operation status displays the status allocated to each bit by a four-digit hexadecimal.
The allocation for 0 to 15 bits of the operation status is described in the table below.

Bit	Symbol	Description
15	BUSY	1, when parameter data is being written
14	WR	Fixed to 0
13		Fixed to 0
12	RL	1, when communication is enabled (the condition when the RUN command is issued from com-munication, or when the set frequency is referenced)
11	ALM	1, when an alarm occurs
10	DEC	1, during deceleration
9	ACC	1, during acceleration
8	IL	1, during current limitation
7	VL	1, during voltage limitation
6	TL	1, during torque limitation
5	NUV	1, when Main Circuit DC Voltage > Undervoltage level

Bit	Symbol	Description
4	BRK	1, during braking
3	INT	1, when the inverter output is intercepted
2	EXT	1, during direct current DC braking
1	REV	1, during reverse operation
0	FWD	1, during forward operation

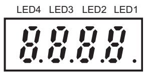
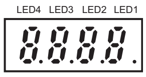
Display example of operation status																	
LED No.		LED4				LED3				LED2				LED1			
Bit		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Display example	Binary	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1
	Hexadecimal LED Monitor																

Operation Status 2 Monitor [3_23]

The operation status 2 displays the status allocated to each bit by a four-digit hexadecimal.
The allocation for 0 to 15 bits of the operation status is described in the table below.
The display of operation status 2 is the same as that of “3_07: Operation status” monitor.

Bit	Symbol	Description
15	-	Synchronous motor drive
14	-	Not used
13	-	
12	-	
11	-	
10	-	
9	-	
8	-	
7	-	1, during speed limitation (torque control)
6	-	Not used
5	-	Motor selection 00: Motor 1 01: Motor 2
4	-	
3	-	Control Method 0000: V/f control (no slip compensation) 0001: Dynamic torque vector control 0010: V/f control (with slip compensation) 0011: V/f control with speed sensor 0100: Dynamic torque vector control with speed sensor 0101: Vector control without speed sensor 0110: Vector control with speed sensor 1011: Torque control (vector control with speed sensor)
2	-	
1	-	
0	-	

7-1-2 I/O check

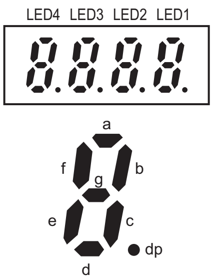
Item No.	Parameter No.	Item	Range	Display contents (The value range depends on the model)
4_00	W40, W41	Input Terminal Monitor, Output Signal Monitor		The ON/OFF status of the multifunction input/output terminal is displayed.
4_01	W42, W43	Communications Input Signal Monitor, Communications Control Output Signal Monitor		The ON/OFF status of the digital input/ output terminal instructed via communication based on RS-485 is displayed.
4_02	W44	Input Terminal [AI1] Input Voltage	0.0 to 12.0 [V]	The input voltage of the terminal [AI1] is displayed in increments of 0.1 V.
4_03	W45	Input Terminal [AI2]AII Input Current (AII)	0.0 to 30.0 [mA]	The input current of the terminal [AI2] (AII) is displayed in increments of 0.1 mA. *Since this item is shared with other terminal functions, “0.0” is displayed when it is disabled due to switching by the hardware SW.
4_04	W46	Output Terminal [AO]AOV Output Voltage	0.0 to 12.0 [V]	The output voltage of terminal [AO] (AOV) is displayed in increments of 0.1 V.
4_06	W48	Output Terminal [AO]PO Output Frequency	0 to 9999 [p/s] 1000 to 3200 [10p/s]	The number of output pulses per unit time of terminal [AO] (PO) is displayed in (p/s). If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.
4_07	W49	Input Terminal [AI2] Input Voltage (AIV)	0.0 to 12.0 [V]	The input voltage of terminal [AI2] (AIV) is displayed in increments of 0.1 V. *Since this item is shared with other terminal functions, “0.0” is displayed when it is disabled due to switching by the hardware SW.
4_08	W50	Output Terminal [AO]AOI Output Current	0.0 to 30.0 [mA]	The output current of terminal [AO] (AOI) is displayed in increments of 0.1 mA. *Since this item is shared with other terminal functions, “999” is displayed when it is disabled due to switching by the hardware SW.
4_15	W53	Pulse Input (A/B Phase of Ch1 Side)	-327 to -99.9 to -9.99 to 99.99 to 327.6 [kp/s]	The pulse rate entered in the AB phase (PRA, PRB terminals) of the Ch1-side PG is displayed. (in increments of 0.01 [kp/s]) Displayed without quad edge evaluation regardless of the pulse format.
4_16	W54	Pulse Input (Z Phase of Ch1 Side)	0 to 9999 [p/s] 1000 to 1600 [10p/s]	The pulse rate entered in the Z phase (PRZ terminal) of the Ch1-side PG is displayed. If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.

Item No.	Parameter No.	Item	Range	Display contents (The value range depends on the model)
4_17	W55	Reserved	-327 to -99.9 to -9.99 to 99.99 to 327.6 [kp/s]	The pulse rate entered in the terminal blocks [PIA] [PIB], or the AB phase (PIA, PIB terminals) of the Ch2-side PG is displayed. (in increments of 0.01 [kp/s]) Displayed without quad edge evaluation regardless of the pulse format.
4_18	W56	Reserved	0 to 9999 [p/s] 1000 to 1600 [10p/s]	The pulse rate entered in the terminal block [PIZ], or the Z phase (PIZ terminal) of the Ch2-side PG is displayed. If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.
-	-	Reserved	-	-
4_36	X97	Input Input Terminal [PTC] Input Voltage	-12.0 to 12.0 [V]	The input voltage of the terminal [PTC] is displayed in increments of 0.1 V. *Since this item is shared with other terminal functions, “999” is displayed when it is disabled due to switching by the hardware SW.

Control Circuit Terminal (Input/Output) Monitor [4_00]

This function displays the ON/OFF status of the input/output signal of the digital input/output terminal. The monitor displays the input/output status of the terminals depending on whether each segment of the LED is ON or OFF.

The allocation of each segment and the input/output signal is described in the table below.



Segment	LED4	LED3	LED2	LED1
a	ROA/B/C	DO1	-	DI6
b	-	DO2*2	-	DI7
c	-	-	-	DI1
d	-	-	EN1	DI2
e	-	-	EN2	DI3
f	-	-	(RST)*1	DI4
g	-	-	(XR)*1	DI5
dp	-	-	(XF)*1	-

*1. (XF), (XR) and (RST) are for communication. They are used only in the communications control signal monitor.

*2. Even if the hardware switch SW8 is set at the SRCF side, DO2 displays the signal information of the multi-function output function allocated at the parameter E21.

Communications Control Signal (Input/Output) Monitor [4_01]

The ON/OFF status of the digital input/output terminal instructed via communication based on RS-485 is displayed.

The display on the monitor is the same as “4_00: Control Circuit Terminal (Input/Output)” monitor, but (XF), (XR) and (RST) are added as input. However, the input/output display of the communications control signal is Active ON (a signal that does not perform logical inversion).

7-1-3 Maintenance Information

Item No.	Parameter No.	Item	Range	Display contents
5_00	W70	Total Power ON Time Monitor	0 to 655350 hours	The cumulative operation time (the time when the main power supply is ON) of the inverter is displayed. Measurement range: 0 to 655,350 hours Display: The cumulative operation time is displayed alternately in the upper digits and lower digits. Example 0 <=> 535h (535 hours) 655 <=> 350h (655,350 hours) When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit. When 655,350 hours is reached, it is considered as the upper limit.
5_01	{W71}	{W71DC link bus voltage}	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed. Although the display is in increments of 0.1 V, the data changes in increments of 1 V.
5_02	W72	Internal Air Highest Temperature	20 to 125 [°C]	The maximum value of the internal air temperature for each hour is displayed in increments of 1 degree. Display unit: °C (for 20°C and below, 20°C is displayed.) Since there is no internal air temperature sensor in 15 kW and lower models, “-----” is displayed.
5_03	W73	Heat Sink Maximum Temperature	20 to 125 [°C]	The maximum value of the cooling fin temperature for each hour is displayed. Display unit: °C (for 20°C and below, 20°C is displayed.)
5_04	W74	Maximum Effective Current Value	0.00 to 99.99 [A] 100.0 to 999.9 [A]	The maximum effective current value for each hour is displayed. Display unit: Displayed in increments of 0.01 A for 100 A or below, and in increments of 0.1 A for above 100 A
5_05	W75	Main Circuit Capacitor's Capacitor Monitor	0.0 to 100.0 [%]	The factory default value of the current main circuit capacitor's capacitor is displayed as 100.0%.

Item No.	Parameter No.	Item	Range	Display contents
5_06	W67	Cumulative Run Time of Capacitors on Printed Circuit Boards	0 to 9999 [x10h]	The time obtained by multiplying the coefficient based on the ambient temperature conditions with the cumulative time during which voltage is applied to the electrolytic capacitors on printed circuit boards is displayed as the cumulative operation time. Measurement range: 0 to 99,990 hours Display: 0 to 9999 x10 LED lit (Cumulative run time of capacitors on printed circuit boards = Display × 10 hours) If 99,990 hours is exceeded, the accumulation operation stops, and the display remains as 9999.
5_07	W68	Cumulative Run Time of Cooling Fan	0 to 9999 [x10h]	The cumulative time when the cooling fan was operating is displayed. Counting is not performed when the cooling fan ON-OFF control (parameter H06) is enabled, and the cooling fan has stopped. Measurement range: 0 to 99,990 hours Display: 0 to 9999 x10 LED lit If 99,990 hours is exceeded, the accumulation operation stops, and the display remains as 9999.
5_08	W78	Number of Startups	0 to 9999 1000 to 6553 [x10 LED]	The number of operations of the 1st motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed. If the number of operations becomes 10,000 or more, the x10 LED lights up and the value of “Number of operations/10” is displayed. If 65,530 operations is exceeded, the value returns to 0 and the calculation continues.
5_09	W81	Integrated Power Monitor	0.000 to 9999 [100 kWh]	The integrating electric power consumption is displayed. 0.1 kWh to 999,900 kWh is displayed for 0.001 to 9999, with 1 = 100 kWh. The value returns to 0 at 1,000,000 kWh. The integrating electric power consumption and the integrating electric power data can be reset by setting parameter E51 to “0.000.” If 999,900 kWh is exceeded, the value returns to 0.

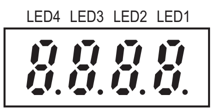
Item No.	Parameter No.	Item	Range	Display contents
5_10	W82	Data Used Integrating Electric Power	0.001 to 9999	The integrating electric power consumption (1.000 = 100 kWh) × parameter E51 data is displayed as the integrating electric power data. The parameter E51 setting range is 0.000 to 9999. Display unit: None If the value is 9999 or above, the accumulation operation cannot be performed and the display remains as 9999. The decimal point position moves depending on the size of the integrating electric power data, and the display resolution changes. The integrating electric power data can be reset by setting parameter E51 to “0.000.”
5_11	W83	Number of Operator Comm Errors	0 to 9999 [errors]	The number of errors after turning ON the power is accumulated and displayed. If the number of errors exceeds 9,999, the value returns to 0.
5_12	W84	Contents of Operator Comm error	0 to 127	The latest errors that occur in the Digital Operator are displayed in a decimal code.
5_13	{W95}	{W95Reserved}	-	-
5_14	W87	Inverter ROM Version 1 Main	x.xx.xx	x.xx (upper three digits) and xx (lower two digits) are displayed alternately.
5_15	W88	Inverter ROM Version 2 Sub	x.xx.xx	x.xx (upper three digits) and xx (lower two digits) are displayed alternately.
5_16	W89	ROM Version Operator	-	-
5_17	W85	Number of RS-485 Errors	0 to 9999	If the cumulative value of the number of errors after turning ON the power reaches 9999, the value returns to 0.
5_18	W94	Contents of RS-485 Error	0 to 127	The error code of the final communication error that has occurred in the SP-SN terminal is displayed in hexadecimal.
5_19	{W90}	{W90Reserved}	-	-
5_23	Z40	1st Cumulative Run Time	0 to 9999 [x10h]	The cumulative time of the 1st motor run time is displayed. Measurement range: 0 to 99,990 hours (Cumulative operation time of motor = Display × 10 hours) If 99,990 hours is exceeded, the value returns to 0 and the calculation continues.

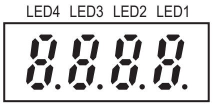
Item No.	Parameter No.	Item	Range	Display contents
5_24	M61	Inverter Internal Air Temperature Monitor (Real-time value)	20.0 to 125.0 [°C]	The current internal temperature of the inverter is displayed. Although the display is in increments of 0.1°C, the data changes in increments of 1°C. Display unit: °C Since there is no internal air temperature sensor in 15-kW and lower models, “-----” is displayed.
5_25	M62	Fin Temperature Monitor (Real-time value)	20.0 to 125.0 [°C]	The current temperature of the cooling fin inside the inverter is displayed. Although the display is in increments of 0.1°C, the data changes in increments of 1°C. Display unit: °C
5_26	M76	Service Life of Main Circuit Capacitor Elapsed Time	0 to 6553 [10h]	The time during which voltage is applied to the electrolytic capacitor of the main circuit is displayed as the cumulative elapsed time. The capacity of the electrolytic capacitor of the main circuit is measured when the main power supply is OFF, and the elapsed time is corrected. x10_LED always ON The upper limit is reached at 9999
5_27	M77	Service Life of Main Circuit Capacitor Remaining Time	0 to 6553 [10h]	The time remaining until the service life of the electrolytic capacitor of the main circuit is displayed. x10_LED always ON
5_28	Z41	2nd Cumulative Run Time of motor	0 to 9999 [x10h]	The cumulative time of the 2nd motor run time is displayed.
5_31	M81	1st Remaining Time before the Next Motor Maintenance	0 to 9999 [x10h]	The time until the next maintenance is displayed. The value obtained by subtracting the cumulative operation time of motor from 1st Motor Maintenance Interval (H78) is displayed. (This function is available only for the 1st motor) Display: 0 to 99990
5_32	Z44	2nd Number of Startups	0 to 9999 1000 to 6553 [x10 LED]	The number of operations of the 2nd motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed. If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.

Item No.	Parameter No.	Item	Range	Display contents
5_35	M85	1st Remaining Start-up Times before the Next Motor Maintenance	0 to 9999 1000 to 6553 [x10 LED]	The number of startups until the next maintenance is displayed. The value obtained by subtracting the number of startups from 1st Preset Startup Count for Motor Maintenance (H79) is displayed. (This function is available only for the 1st motor) If the monitor value is 10000 or above, the x10 LED lights up and the value of “monitor value/10” is displayed.
5_36	M86	Latest Light Alarm Factor		The contents of the recently occurred light alarm are displayed by a code.
5_37	M87	Light Alarm Factor Last		The contents of the light alarm that occurred the last to third last time are displayed by a code.
5_38	M88	Light Alarm Factor 2nd Last		
5_39	M89	Light Alarm Factor 3rd Last		
5_40	{W96}	{W96Reserved}		-
5_54	W161	Braking Resistor Thermal Monitor	0.0 to 100.0%	The percentage of the electronic thermal calculated value for motor protection at the current moment is displayed. If the percentage reaches 100.0%, the dBH alarm occurs.
5_62	M59	Motor Electronic Thermal Monitor	0.0 to 100.0%	The percentage of the electronic thermal calculated value for motor protection at the current moment is displayed. If the percentage reaches 100.0%, the OL1 or OL2 (depending on whether the 1st control or 2nd control is selected) alarm occurs.
5_63	W179	Total RUN Time Monitor	0 to 655350 hours	The cumulative time of the inverter RUN state is displayed. Measurement range: 0 to 655,350 hours Display: The cumulative operation time is displayed alternately in the upper digits and lower digits. Example 0 <=> 535h (535 hours) 655 <=> 350h (655,350 hours) When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit. When 655,350 hours is reached, it is considered as the upper limit.

7-1-4 Alarm information

Item No.	Parameter No.	Item	Range	Description
1 Latest alarm				
6_00	X20	Latest Alarm Info. Output Frequency	0.00 to 99.99 to 590.0 [Hz]	The output frequency before slip compensation is displayed.

Item No.	Parameter No.	Item	Range	Description
6_01	X21	Latest Alarm Info. Output Current	0.00 to 99.99 to 655.3 [A]	The output current is displayed. Display unit: A (Ampere)
6_02	X22	Latest Alarm Info. Output Voltage	0 to 999 [V]	The output voltage is displayed. Display unit: V (Volt)
6_03	X23	Latest Alarm Info. Torque Monitor	-400 to 400 [%]	The torque calculated value is displayed.
6_04	X24	Latest Alarm Info. Frequency Command	0.00 to 99.99 to 590.0 [Hz]	The set frequency is displayed.
6_05	X25	Latest Alarm Info. Running Status 1		The output operation direction is displayed.
6_06	X25	Latest Alarm Info. Running Status 1	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal. The monitor contents are the same as the operation status (3_07).
6_07	X26	Latest Alarm Info. Cumulative Ope. time	0 to 655,350 hours	The number of operations of the motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed.
6_08	X27	Latest Alarm Info. Number of Startups	0 to 9999 1000 to 6553 [x10 LED]	The Main Circuit DC Voltage of the inverter is displayed.
6_09	X28	Latest Alarm Info. Main Circuit DC Voltage	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed.
6_10	X29	Latest Alarm Info. Internal Air Temperature	20 to 125 [°C]	The internal air temperature during the occurrence of an alarm is recorded and displayed. Display unit: °C
6_11	X30	Latest Alarm Info. Heat Sink Temperature	20 to 125 [°C]	The heat sink temperature during the occurrence of an alarm is recorded and displayed. Display unit: °C
6_12	X31, X32	Latest Alarm Info. Input Terminal, Latest Alarm Info. Output Terminal (Display depending on whether each segment of the LED is ON or OFF.)		Same as the expression of the final command value, I/O check
6_13	X31	Latest Alarm Info. Input Terminal (Hexadecimal display)	0000 hex to FFFF hex	Same as the expression of the final command value, I/O check
6_14	X32	Latest Alarm Info. Output Terminal (Hexadecimal display)	0000 hex to FFFF hex	Same as the expression of the final command value, I/O check
6_15	X00	Latest Alarm History/ Number of Consecutive Same Alarms	-	-

Item No.	Parameter No.	Item	Range	Description
6_16	X01	Latest Multiple Alarm1	Alarm code display	Simultaneously occurring alarm code (1st) ("---" is displayed if no alarm occurs simultaneously)
6_17	X02	Latest Multiple Alarm2	Alarm code display	Simultaneously occurring alarm code (2nd) ("---" is displayed if no alarm occurs simultaneously)
6_18	X33, X34	Latest Alarm Info. Input Terminal via Communication, Latest Alarm Info. Output Terminal via Communication (Display depending on whether each segment of the LED is ON or OFF.)		
6_19	X33	Latest Alarm Info. Input Terminal via Communication (Hexadecimal display)	0000 hex to FFFF hex	The final command value of the communication input signal when an alarm occurs is displayed by a four-digit hexadecimal.
6_20	X34	Latest Alarm Info. Output Terminal via Communication (Hexadecimal display)	0000 hex to FFFF hex	The final command value of the communication output signal when an alarm occurs is displayed by a four-digit hexadecimal.
6_21	X03	Latest Alarm Sub Code 1	0 to 9999	An auxiliary code for the alarm factors is displayed.
6_22	X36	Latest Alarm Info. Running Status 2	0000 hex to FFFF hex	Operation status 2 is displayed by a four-digit hexadecimal. The monitor contents are the same as the operation status 2 (3_23).
6_23	X37	Latest Alarm Info. Speed Detection	B1E0(-fmax) to 4E20(fmax)	The speed detection value is displayed. The speed detection value [p.u] with ±Maximum Frequency = ±20000d expressed in hexadecimal is displayed in increments of ±0.01 Hz.
6_24	X38	Latest Alarm Info. Running Status 3	0000 hex to FFFF hex	Operation status 3 is displayed by a four-digit hexadecimal.
6_25	X04	Latest Multiple Alarm Sub Code 2	0 to 9999	An auxiliary code for multiple alarm factors is displayed.
6_30	X108	Latest Alarm Info. Cumulative Running Time	0 to 655,350 hours	The cumulative time of the inverter RUN state is displayed. The cumulative operation time is displayed alternately in the upper digits and lower digits. When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit.

Item No.	Parameter No.	Item	Range	Description
6_31	X49	Fault Counter	0 to 9999 1000 to 6553 [x10 LED]	The number of times the inverter trips is displayed. The number of times is saved in the EE-PROM when the power is turned OFF. Counting is performed from 0 to 65535, and when the upper limit is reached, it is considered as the limit. The value returns to 0 when the error history is cleared.
2 The last alarm				
6_00	X60	Last Info. Alarm Info. Output Frequency	0.00 to 99.99 to 590.0 [Hz]	The output frequency before slip compensation is displayed.
6_01	X61	Last Alarm Info. Output Current	0.00 to 99.99 to 655.3 [A]	The output current is displayed. Display unit: A (Ampere)
6_06	X65	Last Alarm Info. Running Status	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.
6_07	X66	Last Alarm Info. Cumulative Ope. Time	0 to 655,350 hours	The number of operations of the motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed.
6_09	X68	Last Alarm Info. Main Circuit DC Voltage	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed.
6_30	X118	Last Alarm Info. Cumulative Running Time	0 to 655,350 hours	The cumulative time of the inverter RUN state is displayed. The cumulative operation time is displayed alternately in the upper digits and lower digits. When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit.
3 Second last alarm				
6_00	Z00	Second Last Alarm Info. Output Frequency	0.00 to 99.99 to 590.0 [Hz]	The output frequency before slip compensation is displayed.
6_01	Z01	Second Last Alarm Info. Output Current	0.00 to 99.99 to 655.3 [A]	The output current is displayed. Display unit: A (Ampere)
6_06	Z05	Second Last Alarm Info. Running Status	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.
6_07	Z06	Second Last Alarm Info. Cumulative Ope. Time	0 to 655,350 hours	The number of operations of the motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed.
6_09	Z08	Second Last Alarm Info. Main Circuit DC Voltage	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed.

Item No.	Parameter No.	Item	Range	Description
6_30	X128	Second last Alarm Info. Cumulative Running Time	0 to 655,350 hours	The cumulative time of the inverter RUN state is displayed. The cumulative operation time is displayed alternately in the upper digits and lower digits. When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit.
4 Third last alarm				
6_00	Z50	Third Last Alarm Info. Output Frequency	0.00 to 99.99 to 590.0 [Hz]	The output frequency before slip compensation is displayed.
6_01	Z51	Third Last Alarm Info. Output Current	0.00 to 99.99 to 655.3 [A]	The output current is displayed. Display unit: A (Ampere)
6_06	Z55	Third Last Alarm Info. Running Status	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.
6_07	Z56	Third Last Alarm Info. Cumulative Ope. Time	0 to 655,350 hours	The number of operations of the motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed.
6_09	Z58	Third Last Alarm Info. Main Circuit DC Voltage	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed.
6_30	X138	Third last Alarm Info. Cumulative Running Time	0 to 655,350 hours	The cumulative time of the inverter RUN state is displayed. The cumulative operation time is displayed alternately in the upper digits and lower digits. When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit.
5 Fourth last alarm				
6_00	X141	Fourth last Alarm Info. Output Frequency	0.00 to 99.99 to 590.0 [Hz]	The output frequency before slip compensation is displayed.
6_01	X142	Fourth last Alarm Info. Output Current	0.00 to 99.99 to 655.3 [A]	The output current is displayed. Display unit: A (Ampere)
6_06	X149	Fourth Last Alarm Info. Running Status	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.
6_07	X143	Fourth Last Alarm Info. Cumulative Ope. time	0 to 655,350 hours	The number of operations of the motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed.
6_09	X144	Fourth Last Alarm Info. Main Circuit DC Voltage	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed.

Item No.	Parameter No.	Item	Range	Description
6_30	X148	Fourth Last Alarm Info. Cumulative Running Time	0 to 655,350 hours	The cumulative time of the inverter RUN state is displayed. The cumulative operation time is displayed alternately in the upper digits and lower digits. When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit.
6 Fifth last alarm				
6_00	X151	Fifth Last Alarm Info. Output Frequency	0.00 to 99.99 to 590.0 [Hz]	The output frequency before slip compensation is displayed.
6_01	X152	Fifth Last Alarm Info. Output Current	0.00 to 99.99 to 655.3 [A]	The output current is displayed. Display unit: A (Ampere)
6_06	X159	Fifth Last Alarm Info. Running Status	0000 hex to FFFF hex	The operation status is displayed by a four-digit hexadecimal.
6_07	X153	Fifth Last Alarm Info. Cumulative Ope. Time	0 to 655,350 hours	The number of operations of the motor (number of times the RUN command for the inverter is turned ON) is calculated and displayed.
6_09	X154	Fifth last Alarm Info. Main Circuit DC Voltage	0.0 to 999.0 [V]	The Main Circuit DC Voltage of the inverter is displayed.
6_30	X158	Fifth last Alarm Info. Cumulative Running time	0 to 655,350 hours	The cumulative time of the inverter RUN state is displayed. The cumulative operation time is displayed alternately in the upper digits and lower digits. When the lower three digits are displayed, an h (hours) is displayed in the lowermost digit.

Operation Status 3 Monitor [6_24]

The operation status 3 displays the status allocated to each bit by a four-digit hexadecimal.
The allocation for 0 to 15 bits of the operation status is described in the table below.
The display of operation status 3 is the same as that of “3_07: Operation status” monitor.

Bit	Symbol	Description
15	-	Fixed to 0
14	ID2	1, at current detection 2
13	IDL	1, at low current detection
12	ID	1, at current detection
11	OLP	1, during overload prevention control
10	LIFE	1, at lifetime alarm
9	OH	1, at heat sink overheat early warning
8	TRY	1, during retry
7	FAN	1, during fan operation
6	KP	1, during touch panel operation
5	OL	1, at motor overload early warning

Bit	Symbol	Description
4	IPF	1, during restart after instantaneous power failure
3	SWM2	1, during 2nd motor selection
2	RDY	1, at operation ready
1	FDT	1, at frequency detection
0	FAR	1, at frequency arrival

7-2 Multifunction Input/Output Functions List

This section describes the input/output signals of the inverter.

7-2-1 Multifunction Input Selection

By allocating the following functions to the Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99), the set function can be operated. However, “98: FW (forward rotation)” and “99: RV (reverse rotation)” can be allocated to only Input Terminal [DI6] Function Selection (E98) or Input Terminal [DI7] Function Selection (E99).

By setting data in which 1000 is added to the set data of the following functions that are to be used, it is possible to switch the multifunction input terminals DI1 to DI7 from an NO contact input to an NC contact input. However, as a standard, “9: EXT (external trip),” “30: STOP (forced stop)” and “38: ROK (operation permission signal)” are set to an NC contact, and change to an NO contact by setting data in which 1000 is added.

If the same function is allocated to the multifunction input terminals, and if any one of the multifunction input terminals to which the function is allocated, except for the exceptions below, turns ON, the function is handled as ON.
Exception 1: If all terminals to which “98: FW (forward rotation)” and “99: RV (reverse rotation)” is allocated are ON, the function is handled as ON.
Exception 2: If all terminals to which “9: EXT (external trip),” “30: STOP (forced stop)” or “38: ROK (operation permission signal),” which are set to an NC contact as a standard, is allocated are ON, the function is handled as ON.

The terminal block can be changed between ON/OFF with the communications function. During the time the communications function is enabled, the state changed by the communications function is prioritized for some functions.

E: The terminal block cannot be used when the communications function is enabled
O: When the communications function is enabled, the function is ON if either one of the terminals is ON
A: When the communications function is enabled, the function is ON if both of the terminals are ON
-: Changes cannot be made by the communications function

Each of the multifunction input terminals DI1 to DI7 can be turned ON and OFF by bit 2 to bit 6, bit 13 and bit 14 of Input Terminal Monitor (S06) via Modbus communication.

Parameter No.	Function name	Data	Default data	Unit
S06	Input Terminal Monitor	Bit2: DI1 Bit3: DI2 Bit4: DI3 Bit5: DI4 Bit6: DI5 Bit13: DI6 Bit14: DI7	0	-

Parameter No.	Data	Description		Com-mu-nica-tions func-tion	Reference item	Page
E01 to E05, E98, E99	0	CF1:	Multi-step speed setting binary 1	E	Multi-step speed operation function	page 5-57
	1	CF2:	Multi-step speed setting binary 2	E		
	2	CF3:	Multi-step speed setting binary 3	E		
	3	CF4:	Multi-step speed setting binary 4	E		
	4	RT1:	Acceleration/deceleration selection (2-step)	E	2-step acceleration/deceleration function 2-step acceleration/deceleration	page 5-43 page 5-66
	5	RT2:	Acceleration/deceleration selection (4-step)	E		
	6	STP:	3-wire stopping	-	3-wire input function	page 5-56
	7	FRS:	Free-run stop	O	Free-run stop	page 7-59
	8	RS:	Reset	O	Reset Reset (RS)	page 5-49 page 5-66
	9	EXT:	External trip	-	External trip	page 7-85
	10	JG:	Jogging	O	Jogging	page 5-60
	12	SET:	2nd control	O	2nd control function	page 5-52
	13	DB:	Braking with external direct current	E	Direct current braking	page 7-63
	14	TRQ1:	Torque limit switching 1	E	Torque limit function	page 6-81

Parameter No.	Data	Description		Communications function	Reference item	Page
E01 to E05, E98, E99	15	CS:	Commercial switching	E	Commercial switching	page 7-136
	16	SW60:	Commercial switching (60 Hz)	E		
	17	UP:	Acceleration through remote operation	-	Remote operation function	page 7-116
	18	DWN:	Deceleration through remote operation	-		
	19	SFT:	Soft lock	O	Soft lock	page 7-73
	20	PID:	PID disabled	E	PID function	page 7-118
	21	IVS:	Normal/inverse operation switching	E		
	22	IL:	Interlock	-		page 7-152
	23	ATR:	Torque command input permission	E	Torque control	page 6-31
	25	U-DI:	Universal DI	-		page 7-47
	26	STM:	Startup characteristics selection	O	Restart after Momentary Power Failure	page 7-49
	30	STOP:	Forced stop	A		page 7-148
	32	EXITE:	Pre-excitation	E	Pre-excitation	page 7-146
	33	PIDC:	Resetting of PID integration	E	PID function	page 7-118
	34	PID-HLD:	PID integration hold	E		
	35	OPE:	Forced operation function	-	Forced operation function	page 7-74
	38	ROK:	Permission of RUN Command	E	Permission of RUN Command	page 7-114
	42	ORL:	Origin search limit signal	O		page 6-36
	44	Do not set.		O		-
	46	OLS:	Overload stop enabled	E		page 7-148
	47	LOCK:	Servo lock	E	Servo lock	page 7-144
	58	UDC:	Clearing of remote operation data	O	Remote operation function	page 7-116
	59	BATRY:	Battery operation selection	E		page 7-151
	60	TB1:	Torque bias 1	E	Torque bias function	page 6-33
	61	TB2:	Torque bias 2	E		
	62	H-TB:	Torque bias hold	E		

Parameter No.	Data	Description		Com-mu-nica-tions func-tion	Reference item	Page
E01 to E05, E98, E99	65	BOK:	Brake check	-	Brake control function	page 6-72
	70	Hz/LSC:	Line speed control cancellation	E	Line speed control cancellation	page 6-79
	71	LSC-HLD:	Line speed control frequency memory	E	Line speed control frequency memory	page 6-79
	72	CRUN-M1:	Input during commercial operation (Motor 1)	O	Commercial switching	page 7-136
	73	CRUN-M2:	Input during commercial operation (Motor 2)	O		
	76	DROOP:	Droop selection	E		page 7-145
	78	MPRM1:	Speed control constant selection 1	E		page 6-26
	79	MPRM2:	Speed control constant selection 2	E		
	80	Do not set.		E	-	-
	81	Do not set.		E	-	-
	82	AR-CCL:	Anti-regenerative control cancellation	E		page 7-84
	84	LAC:	Cancellation of LAD	E	Acceleration/deceleration time setting	page 5-39
	85	AHD:	Retention of analog command	O	Retention of analog command function	page 7-43
	94	FJOG:	Forward rotation jogging	E		page 5-60
	95	RJOG:	Reverse rotation jogging	E		
	97	F/R:	3-wire forward/reverse	O	3-wire input function	page 5-56
	98	FW:	Forward rotation*1	E	RUN command selection Forward RUN command (FW) and reverse RUN command (RV) P	page 5-25 page 5-55
	99	RV:	Reverse rotation*1	E		
	100	no:	Without allocation	E	-	-
	119	P-SEL:	ASR integral term cancellation	O		page 6-36
	121	Do not set.		O	-	-
	122	Do not set.		O	-	-
	123	Do not set.		O	-	-

Parameter No.	Data	Description		Communications function	Reference item	Page
E01 to E05, E98, E99	124	Do not set.		O	-	-
	125	Do not set.		O	-	-
	126	Do not set.		O	-	-
	127	Do not set.		O	-	-
	134	Do not set.		O	-	-
	135	INC/ABS:	Movement amount/position switching	E		page 6-41
	136	ORT:	Orientation command	E		page 6-49
	137	SPD:	Speed/position switching	E		page 6-36
	138	ORG:	Return-to-origin startup signal	E		
	139	FOT:	Prohibition of forward rotation driving	-		page 6-43
	140	ROT:	Prohibition of reverse rotation driving	-		
	141	PCLR:	Clearing of current position	O	Clearing of position	page 6-48
	142	PSET:	Current position preset	O	Position preset	page 6-49
	144	POS-SET:	Position change command	E	Positioning data	page 6-41
	145	CP1:	Position command selection 1	E		
	146	CP2:	Position command selection 2	E		
	147	CP3:	Position command selection 3	E		
	159	2CH:	2-step acceleration/deceleration	E	2-step acceleration/deceleration function 2-step acceleration/deceleration	page 5-43 page 5-66
	160	485:	Start inverter communication	E	EzCOM	page 8-27
	161	ADD:	Set frequency E134 addition	E	Frequency addition function	page 7-116
	162	F-TM:	Forced terminal block	-	Forced terminal block function	page 7-74
	163	HLD:	Stop acceleration/deceleration	E	Acceleration/deceleration stop function	page 5-42
	164	KHC:	Clearing of integrated power	O		page 7-108
	171	PID-SS1:	PID multi-step command 1	E	PID function	page 7-118
	172	PID-SS2:	PID multi-step command 2	E		

Parameter No.	Data	Description		Communications function	Reference item	Page
E01 to E05, E98, E99	173	SF1:	Multi-step speed setting bit 1	E	Multi-step speed operation function	page 5-57
	174	SF2:	Multi-step speed setting bit 2	E		
	175	SF3:	Multi-step speed setting bit 3	E		
	176	SF4:	Multi-step speed setting bit 4	E		
	177	SF5:	Multi-step speed setting bit 5	E		
	178	SF6:	Multi-step speed setting bit 6	E	Multi-step speed operation function	page 5-57
	179	SF7:	Multi-step speed setting bit 7	E		
	184	TL:	Torque control enabled	E	Torque limit function	page 6-81
	185	TRQ2:	Torque limit switching 2	E		
	186	USP:	Power recovery restart prevention function	-	Power recovery restart prevention function	page 7-58
	187	EXT1:	External latch input 1*2	-		page 6-62
	188	EXT2:	External latch input 2*2	-		

*1. Forward rotation and reverse rotation can be allocated only to the DI6 and DI7 terminals.

*2. External latch input 1 and external latch input 2 can be allocated only to DI1 and DI2.

7-2-2 Multifunction Output Selection

The following functions can be allocated to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27).

The multifunction output terminals DO1 and DO2 are open collector outputs, and the multifunction relay output terminals ROA/B/C are relay outputs.

By setting data in which 1000 is added to the set data of the following functions that are to be used, it is possible to switch the multifunction output terminals DO1, DO2 and ROA/B/C from an NO contact input to an NC contact input.

Parameter No.	Data	Description		Reference item	Page
E20, E21, E27	0	RUN:	Signal during run	Signal during run	page 5-68
	1	FAR1:	Frequency arrival signal 1 (constant speed)	Constant speed arrival signal	page 5-70
	2	FDT1:	Over set frequency arrival signal 1	Frequency arrival signal	page 7-87
	3	UV:	Signal during undervoltage		page 7-50
	4	B/D:	Torque polarity detection		page 6-31
	5	IOL:	Inverter output limited		page 7-102
	6	IPF:	During instantaneous power failure restoration operation		page 7-50
	7	THM:	Electronic thermal warning	Electronic thermal warning	page 5-23
	8	REF:	RUN command source	RUN command status signal	page 7-102
	10	IRDY:	Operation ready completion	Operation ready completion signal	page 5-68
	15	AX:	AX terminal function (for inverter input-side electromagnetic contactor)		page 7-103
	16	TU:	Transition to pattern operation stage		page 5-33
	17	TO:	Pattern operation cycle operation completion		
	18	STG1:	Pattern operation stage No. 1		
	19	STG2:	Pattern operation stage No. 2		
	20	STG4:	Pattern operation stage No. 4		

Parameter No.	Data	Description		Reference item	Page
E20, E21, E27	21	FAR2:	Frequency arrival signal 2	Frequency arrival signal	page 7-87
	22	IOL2:	Inverter output limited (with delay)		page 7-102
	25	FAN:	Cooling fan ON/OFF control	Cooling FAN control method selection	page 7-96
	26	TRY:	During retry		page 7-56
	27	Reserved			page 7-152
	28	OHF:	Cooling fin overheat warning	Cooling fin overheat warning	page 7-99
	29	SY:	Synchronous completion signal		-
	30	LIFE:	Life warning	Life warning (LIFE)	page 7-97
	31	FDT2:	Over set frequency arrival signal 2		page 7-87
	33	REF OFF:	Reference loss detection		page 5-29
	35	RUN2:	Inverter output in progress	Signal during run	page 5-68
	36	OLP:	Overload prevention control in progress	Overload Limit/Overload Warning	page 7-81
	37	OL2:	Overload warning 2		
	38	OL:	Overload warning		
	41	LOC:	Low current signal	Low current signal	page 7-99
	42	OD:	Excessive PID deviation	PID function	page 7-118
	43	PID-CTL:	PID control in progress		
	44	PID-STP:	PID wakeup timer stopped		
	46	OTQ:	Overtorque/undertorque signal	Overtorque/undertorque	page 6-85
	48	SWM1:	Motor 1 switching		page 7-102
	49	SETM:	Motor 2 selection	2nd control under selection signal	
	52	FWR:	Forward run signal	Forward run signal	page 5-69
	53	RVR:	Reverse run signal	Reverse run signal	page 5-69
	54	RMT:	During remote mode		page 7-74
	56	MOH:	Thermistor detection		page 7-86
	57	BRK:	Brake release	Brake control function	page 6-72
	59	AIIDc:	Analog AI2 (AII) disconnection detection		page 7-100

Parameter No.	Data	Description		Reference item	Page
E20, E21, E27	70	ZS:	0 Hz detection signal	0 Hz detection function	page 5-71
	71	DSAG:	Speed agreement		page 6-12
	72	FAR3:	Frequency arrival signal 3	Frequency arrival signal	page 7-87
	76	DSE:	Excessive speed deviation		page 6-12
	77	U-EDC:	Low-to-moderate voltage detection		page 7-103
	79	IPF2:	During instantaneous power failure deceleration		page 7-54
	82	POK:	Positioning completed		page 6-36
	84	MNT:	Maintenance timer		page 7-91
	87	FAR1FDT1:	Frequency match detection	Frequency arrival signal	page 7-87
	89	PTD:	(Function unclear)		-
	90	Do not set.			-
	91	Do not set.			-
	92	Do not set.			-
	93	Do not set.			-
	95	Do not set.			-
	98	L-ALM:	Light alarm		page 7-104
	99	AL:	Alarm signal		page 5-71
	101	DECF:	EN terminal detection circuit error		page 7-69
	102	EDM:	Safety device monitor	Safety function (Set by the EDM selector switch)	
	105	DBAL:	Braking transistor error		page 7-96
	111	Do not set.		-	-

Parameter No.	Data	Description		Reference item	Page
E20, E21, E27	112	Do not set.		-	-
	113	Do not set.		-	-
	114	Do not set.		-	-
	115	Do not set.		-	-
	116	Do not set.		-	-
	117	Do not set.		-	-
	118	Do not set.		-	-
	119	Do not set.		-	-
	120	Do not set.		-	-
	132	TRQ:	Torque limiting	Torque limit function	page 6-81
	151	OT-OUT:	Over-travel detection	Over-travel	page 6-43
	152	STOP-OUT:	Forced stop detection		page 7-148
	182	BER:	Brake abnormality	Brake control function	page 6-72
	183	FDT3:	Set-frequency-only arrival signal	Frequency arrival signal	page 7-87
	185	FDT4:	Set-frequency-only arrival signal 2		
	186	FBV:	PID feedback comparison signal	PID function	page 7-118
	187	FR:	Starting contact signal	Starting contact signal	page 7-98
	188	FREF:	Frequency reference operator	Frequency reference selection status signal	page 7-101
	206	LOG1:	Logical operation result 1	Logical operation function	page 7-92
	207	LOG2:	Logical operation output 2		
	208	LOG3:	Logical operation output 3		
	209	NDc:	Communications disconnection detection	Communications disconnection detection signal	page 7-98
	236	ONT:	Power ON time over	RUN time/Power ON time over	page 7-90
	237	RNT:	RUN time over		
	238	AI1Dc:	Analog AI1 disconnection detection		page 7-100
	239	AIVDc:	Analog AI2 (AIV) disconnection detection		
	240	WAC:	Capacitor life warning signal	Capacitor life warning signal	page 7-94
	241	WAF:	Cooling fan life warning signal	Cooling fan life warning signal	page 7-96

7-3 Analog I/O Settings

This section describes the analog I/O signal settings for this inverter.

7-3-1 Analog Input (Function Selection)

This inverter has two types of analog external input terminals.

Frequency reference (analog voltage input) AI1 to AIC terminals	:	0 to ±10 V
Frequency reference (analog current/voltage input) AI2 to AIC terminals	:	4 to 20 mA (AII), 0 to 20 mA (AII), 0 to 10 V (AIV)

AII and AIV switch when SW3 on the printed circuit board is switched.

For details on the settings of analog input start and end, refer to *7-3-2 Analog Input Start/End Function Settings* on page 7-34.

In M1, one function is allocated to one analog input. One input cannot be used simultaneously for another function.
For a command system function, the command source must be set to analog input in the corresponding parameter.
If the same function is allocated to multiple analog inputs, the [AI1] terminal is prioritized over the [AI2] terminal.

The functions related to analog input are described below. Configure each function according to your application.

Parameter No.	Function name	Data	Default data	Unit
F01/C30	1st Frequency Reference Selection/2nd Frequency Reference Selection	1: Voltage input to terminal [AI1] (0 to ±10 VDC) 2: Current input to terminal [AI2] (AII function) (0(4) to 20 mA DC) 3. Sum of voltage and current inputs to terminals [AI1] and [AI2] (AII function) 5: Voltage input to terminal [AI2] (AIV function) (0 to 10 VDC)		-

Parameter No.	Function name	Data	Default data	Unit
E61 E62 E63	Input Terminal [AI1] Function Selection/ Input Terminal [AI2] Function Selection（AII）/ Input Terminal [AI2] Function Selection（AIV）	0: None 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID process command 1 *1 5: PID feedback value 6: Ratio setting 7: Analog torque limiter 9: Torque bias*1 10: Torque command value*1 11: Torque current command value*1 17: Speed limit value for forward rotation 18: Speed limit value for reverse rotation 20: Analog signal input monitor 21: PID feed forward		-
C40	Input Terminal [AI2] Operation Selection (AII) *2	0: 4 to 20 mA Unipolar 1: 0 to 20 mA Unipolar 10: 4 to 20 mA Bipolar 11: 0 to 20 mA Bipolar	0	-

*1. PID process command 1, torque bias, torque command value, and torque current command value are command system functions.

*2. Depending on unipolar or bipolar, a bias value below 0 switches between enabled and disabled for Terminal [AI2] (AII function) (Range / polarity selection).
For details, refer to *7-3-2 Analog Input Start/End Function Settings* on page 7-34.

E61, E62, E63 data	Function	Description
0	None	-
1	Auxiliary frequency setting 1	An auxiliary frequency input added to 1st Frequency Reference Selection (F01). Not added to other than frequency setting 1 (such as frequency setting 2, multistep frequency, etc.). 100%/Full scale
2	Auxiliary frequency setting 2	An auxiliary frequency input added to all frequency settings. Added to frequency setting 1, frequency setting 2, multistep frequency, etc. 100%/Full scale
3	PID process command 1	Enter the command source for the temperature, pressure, etc. in PID control. It is also necessary to set PID Control PID Command Selection (J02). 100%/Full scale
5	PID feedback value	Enter the feedback for the temperature, pressure, etc. in PID control. It is also necessary to set PID Control Feedback Selection (E119). 100%/Full scale

E61, E62, E63 data	Function	Description
6	Ratio setting	The ratio setting is used for the constant line speed control by diameter calculation of the winding machine and the ratio operation of multiple units, and is therefore calculated as percentage in the last frequency reference. 100%/Full scale
7	Analog torque limiter	Used when the analog input is used as the torque limiter (F40). 200%/Full scale
9	Torque bias	The analog input is used as the torque bias value. It is also necessary to set Torque Bias Function Selection (H154). 200%/Full scale
10	Torque command	During torque control, the analog input is used as the torque command. It is also necessary to set Torque Control Operate Selection (H18).
11	Torque current command	During torque control, the analog input is used as the torque current command. It is also necessary to set Torque Control Operate Selection (H18).
17	Speed limit for forward rotation	During torque control, the motor speed control value can be set by the [AI] terminal and the [AI2] terminal (AII/AIV function). To limit the motor speed to the maximum frequency (F02, A01), set the analog input (maximum input) to the maximum value. When using this function, the concomitant use of Over Speed Detection Level (d35) is recommended. Note: Parameters C31 to C45 are applicable to these analog inputs.
18	Speed limit for reverse rotation	
20	Analog signal input monitor	The status of peripheral equipment can be monitored via communications by connecting analog signals from sensors, such as a temperature sensor of air conditioning facilities, to the inverter. The display coefficient can also be used to convert and display analog signals as temperature, pressure and other physical quantities. 100%/Full scale
21	PID feed forward	Enter the feedforward such as the temperature, pressure, etc. in PID control. It is also necessary to set PID Control PID Feedforward Selection for Process Control (E121). 100%/Full scale

7-3-2 Analog Input Start/End Function Settings

Use these functions to configure the relationship between the analog inputs (AI1/AI2) and the frequency reference.

- Set the minimum value of analog input in the bias base points (C50/C56/C62/C68).
- In the biases (F18/C55/C61/C67), set the output frequency of the analog input set in the bias base points.
- Set the maximum value of analog input in the gain base points (C34/C39/C44).
- In the gains (C32/C37/C42), set the output frequency of the analog input set in the gain base points.
- If the biases (F18/C55/C61/C67) and bias base points (C50/C56/C62/C68) are set to 0.0%, and the gains (C32/C37/C42) and gain base points (C34/C39/C44) are set to 100.00%, the setting of the start and end frequencies is disabled, and the analog input operates between 0 Hz and the maximum frequency.
- In the offsets (C31, C36, C41), set an offset with respect to the analog input voltage/current. It is also possible to correct the signals from external equipment.
- In Input Terminal [AI1] Polarity Selection (C35), set the input range of the analog input voltage of terminal AI1.
- In Terminal [AI2] (AII function) (Range / polarity selection), set the input range of the analog input current of terminal AI2.
- In Input Terminal [AI2] Polarity Selection (AIV) (C45), set the input range of the analog input voltage of terminal AI2.
- The output frequency of analog input is affected by the frequency limit. If 0 V (4 mA) is entered in analog input, the frequency set in the lower limit is output. For details on the frequency limit, refer to *5-5-2 Frequency Limit* on page 5-32.
- In the case of the initial data, operation is performed as described below.

Frequency reference (analog voltage input) AI1 to AIC terminals	:	0 to 10 V (0 Hz to maximum frequency)
Frequency reference (analog current input) AI2 to AIC terminals (AII function)	:	4 to 20 mA (0 Hz to maximum frequency)
Frequency reference (analog voltage input) AI2 to AIC terminals (AIV function)	:	0 to 10 V (0 Hz to maximum frequency)

- If a value between 0 and 5 V is input, the initial data is set in the bias base points, biases and gains, and 50% is set in the gain base points.
- If a value between 0 and 20 mA is input, the initial data is set in the bias base points, biases, gain base points and gains, and C40 is set to “1: 0 to 20 mA Unipolar.”

Parameters corresponding to each analog input are as follows.

1st Frequency Reference Selection (F01) adjustment parameters

F01 data	Input terminal	Input range	Bias		Gain		Polarity selection	Filter	Offset
			Bias	Base point	Gain	Base point			
1	AI1	0 to 10 VDC (-10 to 10 VDC)	F18	C50	C32	C34	C35	C33	C31
2	AI2(AII)	4 to 20 mA DC (0 to 20 mA DC)	F18	C50	C37	C39	C40	C38	C36
3	AI1+AI2(AII)	0 to 10 VDC (-10 to 10 VDC)	F18	C50	C32	C34	C35	C33	C31
		4 to 20 mA DC (0 to 20 mA DC)	F18	C50	C37	C39	C40	C38	C36

F01 data	Input terminal	Input range	Bias		Gain		Polarity selection	Filter	Offset
			Bias	Base point	Gain	Base point			
5	AI2(AIV)	0 to 10 VDC	F18	C50	C42	C44	C45	C43	C41

2nd Frequency Reference Selection (C30) adjustment parameters

C30 data	Input terminal	Input range	Bias		Gain		Polarity selection	Filter	Offset
			Bias	Base point	Gain	Base point			
1	AI1	0 to 10 VDC (-10 to 10 VDC)	C55	C56	C32	C34	C35	C33	C31
2	AI2(AII)	4 to 20mA (0 to 20 mA DC)	C61	C62	C37	C39	C40	C38	C36
3	AI1 + AI2(AII)	0 to 10 VDC (-10 to 10 VDC)	C55	C56	C32	C34	C35	C33	C31
		4 to 20 mA DC (0 to 20 mA DC)	C61	C62	C37	C39	C40	C38	C36
5	AI2(AIV)	0 to 10 VDC	C67	C68	C42	C44	C45	C43	C41

When “3: Analog voltage input (terminal AI1) + analog current input (terminal AI2(AII))” is set to the frequency setting, bias and gain are reflected individually on each of AI1 and AI2(AII), and are added by the resultant frequency reference value.

Parameter No.	Function name	Data	Default data	Unit
F18	Input Terminal [AI1, AI2] Bias for 1st Frequency Command	-100.00 to 100.00	0.00	%
C55	Input Terminal [AI1] Bias (Command)			
C61	Input Terminal [AI2] Bias (AII Command)			
C67	Input Terminal [AI2] Bias (AIV Command)			
C50	Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command	0.00 to 100.00	0.00	%
C56	Input Terminal [AI1] Bias (Analog Input)			
C62	Input Terminal [AI2] Bias (AII Analog Input)			
C68	Input Terminal [AI2] Bias (AIV Analog Input)			
C32	Input Terminal [AI1] Gain（Command）	0.00 to 400.00	100.00	%
C37	Input Terminal [AI2] Gain （AII Command）			
C42	Input Terminal [AI2] Gain (AIV Command)			

Parameter No.	Function name	Data	Default data	Unit
C34	Input Terminal [AI1] Gain (Analog Input)	0.00 to 100.00	100.00	%
C39	Input Terminal [AI2] Gain (AII Analog Input)			
C44	Input Terminal [AI2] Gain (AIV Analog Input)			
C31	Input Terminal [AI1] Offset	-5.0 to 5.0	0.0	%
C36	Input Terminal [AI2] Offset (AII)			
C41	Input Terminal [AI2] Offset (AIV)			
C35	Input Terminal [AI1] Polarity Selection	0: Bipolar (-10 to 10 V) 1: Unipolar (0 to 10 V)*1	1	-
C40	Input Terminal [AI2] Operation Selection (AII)	0: 4 to 20 mA Unipolar *3 1: 0 to 20 mA Unipolar *3 10: 4 to 20 mA Bipolar *2 11: 0 to 20 mA Bipolar *2	0	-
C45	Input Terminal [AI2] Polarity Selection (AIV)	0: Bipolar *2 1: Unipolar *3	1	-
F15	1st Frequency Upper Limit	0.0 to 590.0	70	Hz
E117	2nd Frequency Upper Limit	0.0 to 590.0	70	Hz
F16	1st Frequency Lower Limit	0.0 to 590.0	0	Hz
E118	2nd Frequency Lower Limit	0.0 to 590.0	0	Hz
H63	Frequency Lower Limit Operation Selection	0: Limited at lower limit and operation continued (default) 1: Deceleration stop at lower limit or below	0	-

*1. If unipolar is selected for Terminal [AI1] (Polarity selection), the negative voltage is considered to be 0 V.

*2. If bipolar is selected for Terminal [AI2] (All function) (Range / polarity selection), Terminal l [AI2] (AIV function) (Polarity selection), a bias value below 0 is considered as enabled.

*3. If unipolar is selected for Terminal [AI2] (All function) (Range / polarity selection), Terminal [AI2] (AIV function) (Polarity selection), a bias value below 0 is considered as disabled, and 0 is set as the limit.

Offsets (C31, C36, C41)

Set an offset with respect to the analog input voltage/current. It is also possible to correct the offset of signals from external equipment.

Filter (C33, C38, C43)

Set the filter time constant with respect to the analog input voltage/current. As response slows down when a large time constant is set, take the response speed of the machinery into consideration when determining the time constant. When noise causes the input voltage to fluctuate, increase the time constant.

Polarity Selection (C35, C40, C45)

Set the input range of analog input voltage/current.

C35 data	Terminal input specifications
0	-10 to 10 V
1	0 to 10 V (A negative voltage is considered as 0 V.)

C40 data	Terminal input range	Handling when the bias value is set as a negative value
0	4 to 20 mA (Default value)	0 is set as the limit for a value below 0.
1	0 to 20mA	
10	4 to 20mA	A value below 0 is enabled as a negative value.
11	0 to 20mA	

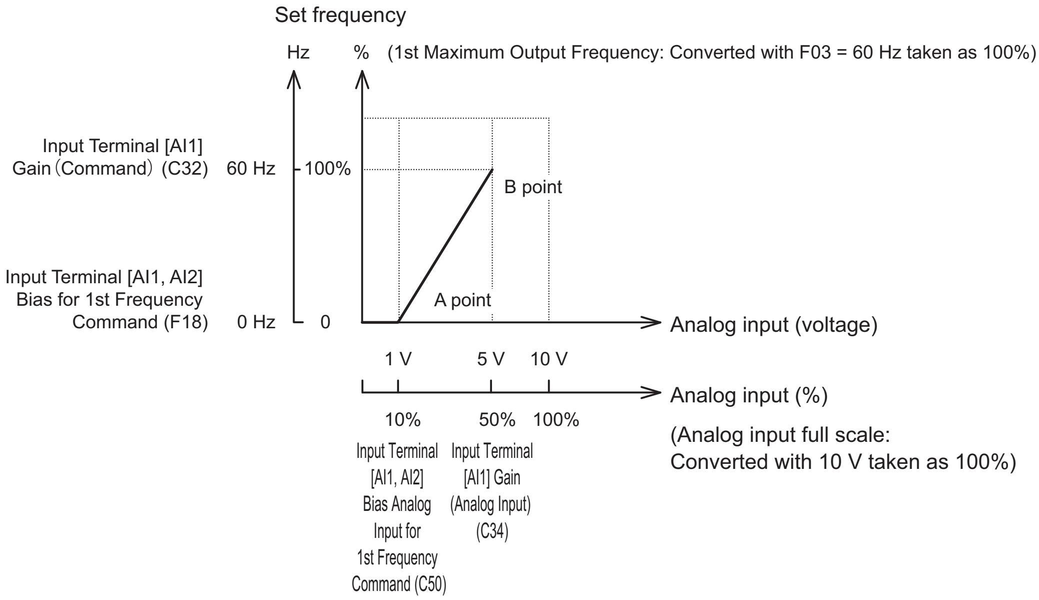
C45 data	Terminal input specifications
0	-10 to 10 V When the bias value is set as a negative value, a value below 0 is enabled as a negative value.
1	0 to 10 V When the bias value is set as a negative value, 0 is set as the limit for a value below 0.

Gain/Bias

When setting bias and gain data, take the maximum frequency to be 100% for both data. When setting the bias base point and gain base point data, take full scale of analog input (10 V or 20 mA) to be 100%.

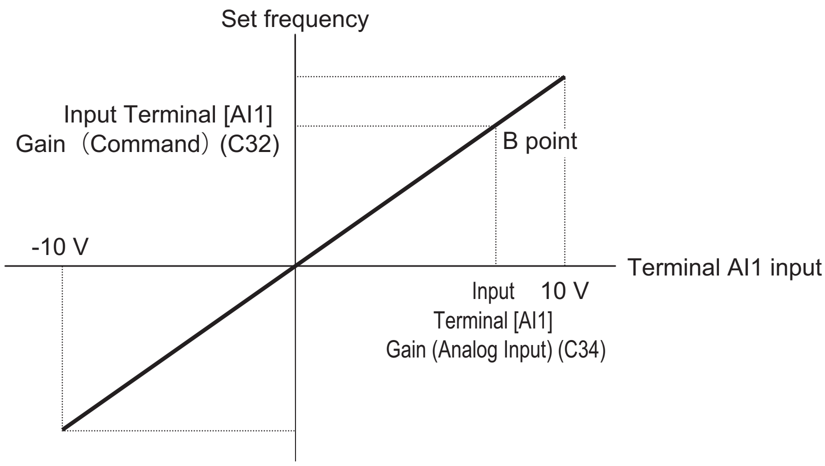
Even if an analog input is unipolar, the frequency setting can be set as bipolar by setting bias as a negative value. By setting C40 to 10 or 11 at terminal AI2(AII) and setting C45 to 1 at terminal AI2(AIV), the frequency setting can be set as negative polarity by analog inputs of 0 points or less and forward/reverse operation can be possible by only analog commands.

Example) When setting the set frequency 0 to 60 Hz by analog input AI1 1 to 5 V (1st Maximum Output Frequency F03 = 60 Hz)



(A point)
To take the set frequency to be 0 Hz when the analog input is 1 V, set Input Terminal [AI1, AI2] Bias for 1st Frequency Command (F18) to 0%. At this time, as 1 V becomes the bias base point and 1 V is equivalent to 10% of full scale 10 V of terminal AI1, set Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command (C50) to 10%.
(B point)
To take the set frequency to be the maximum frequency when the analog input is 5 V, set Input Terminal [AI1] Gain（Command） (C32) to 100%. At this time, as 5 V becomes the gain base point and 5 V is equivalent to 50% of full scale 10 V of terminal AI1, set Input Terminal [AI1] Gain (Analog Input) (C34) to 50%.

Terminal AI1 can be used with bipolar inputs (-10 V to 10 V) by setting function code C35 to “0.”
When Input Terminal [AI1, AI2] Bias for 1st Frequency Command (F18) and Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command (C50) are both set to “0,” the command becomes symmetrically inverted as shown in the figure below.

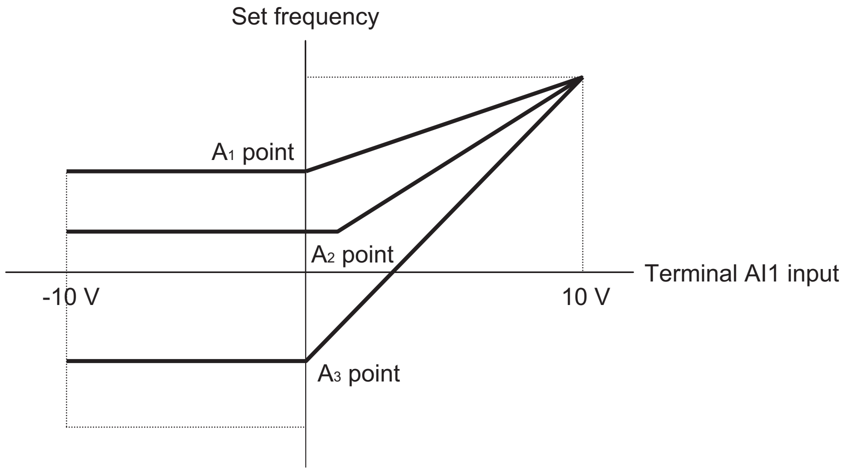


When Input Terminal [AI1, AI2] Bias for 1st Frequency Command (F18) and Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command (C50) are set to an arbitrary value (e.g. points A1, A2, A3), each of the values are limited by bias values as shown in the figure below.

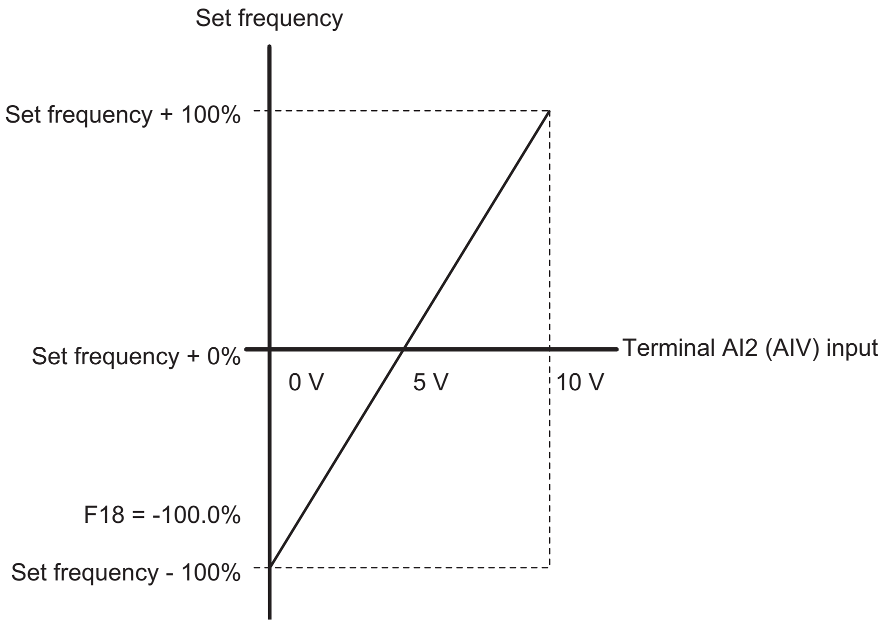
7-3 Analog I/O Settings

7

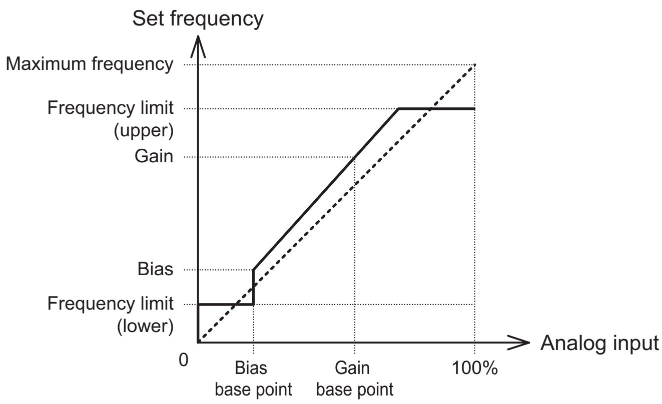
7-3-2 Analog Input Start/End Function Settings



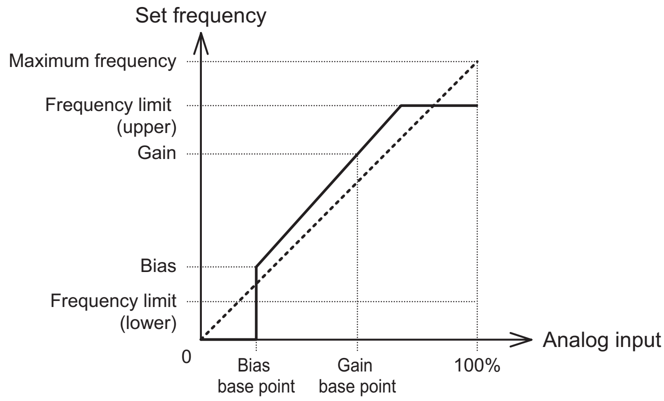
Data can be input as negative polarity by analog inputs of 0 points or less by setting C40 = 10, 11 at terminal AI2(AII), C45 = 0 at terminal AI2(AIV), and the bias value to a negative value.



The following shows an example of operation using Frequency Lower Limit Operation Selection (H63).
(Example 1) When H63 = 0

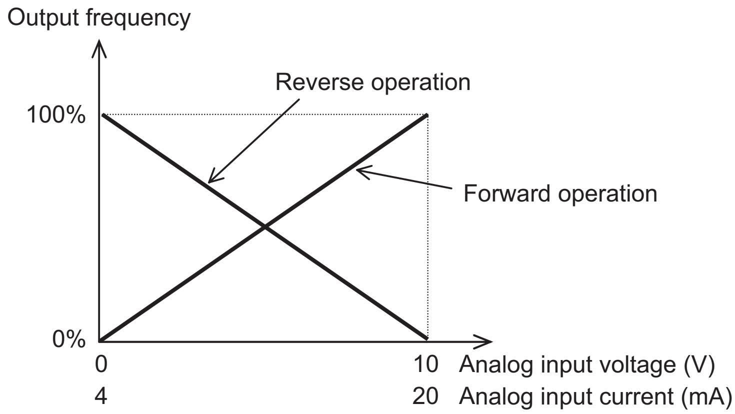


(Example 2) When H63 = 1



7-3-3 Selection of Forward/Reverse Operation

The frequency setting or output signal (frequency setting) of PID control is switched between forward operation and reverse operation.



Parameter No.	Function name	Data	Default data	Unit
C53	Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command	0: Normal 1: Inverse	0	-
C54	Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command	0: Normal 1: Inverse	0	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	21: IVS (Normal/Inverse switching)	-	-

When Operation Is Performed According to the Analog Frequency Reference from outside of the Inverter

Switching of Normal/Inverse is performed by the combination of Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command (C53)/Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command (C54) and the Normal/Inverse switching “IVS” signal. Operation is as shown in the following table.

C53/C54 data	Input signal “IVS”	Operation
0: Normal	OFF	Normal operation
0: Normal	ON	Reverse operation
1: Inverse	OFF	Reverse operation
1: Inverse	ON	Normal operation

Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command (C53)/Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command (C54) are enabled when analog input is selected as the frequency reference at 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30).
In UP/DOWN control, normal/inverse operation cannot be selected.

When Performing Process Control According to the PID Control Function Built Into the Inverter

In modes in which process control is performed by the PID control function built into the inverter, PID control enable (operation according to PID controller) and PID control disable (operation according to the manual frequency setting) can be switched according to the PID cancel “Hz/PID” signal. Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command (C53)/Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command (C54), PID Control Function Selection (J01) can be combined with the Normal/Inverse switching “IVS” signal on each operation, and determination of normal operation/reverse operation is performed as follows.

PID Control Function Selection (J01)	Input signal “IVS”	Operation
1: Process (normal operation)	OFF	Normal operation
	ON	Reverse operation
2: Process (inverse operation)	OFF	Reverse operation
	ON	Normal operation

Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command (C53)/Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command (C54)	Input signal “IVS”	Operation
0: Normal	-	Normal operation
1: Inverse	-	Reverse operation

When process control is performed by the PID control function built into the inverter, the Normal/ Inverse switching “IVS” signal is used for switching normal/reverse operation of the output (frequency setting) of the PID controller, and is not related to normal/reverse operation switching in the manual frequency setting.

7-3-4 Analog Input Filter

The analog input filter is effective in removing noise from the analog input circuit.
Use it to set an input filter for voltage or current input when using an external analog signal to input the frequency reference.

Increasing the set value results in a slow response. This is the filter time constant for a sett value of 0.00 to 5.00 (s).

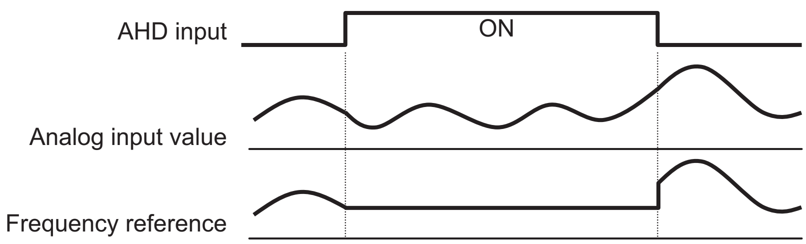
Parameter No.	Function name	Data	Default data	Unit
C33	Input Terminal [AI1] Filter	0.00 to 5.00	0.05	s
C38	Input Terminal [AI2] Filter (AII)			
C43	Input Terminal [AI2] Filter (AIV)			

7-3-5 Analog Command Hold Function (AHD)

Use this function to hold the frequency reference, PID command, etc. instructed by analog input.
Set “85: AHD (Analog command hold)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
While the AHD terminal is ON, the capture result of the analog input to terminals AI1, AI2 (AII) and AI2 (AIV) is held.
Since the three above-described analog input values are held, this function can be used regardless of the usage purpose of the analog inputs.

If the power is turned ON, or if the reset terminal is turned from ON to OFF with the AHD terminal ON, the last held data is made available.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	85: AHD (Analog command hold)	-	-
Related function		H402		



- If you switch from the 1st control to the 2nd control with the AHD terminal ON, the held analog input value will remain as the frequency reference. To switch the control function, turn OFF the AHD terminal and have the inverter hold the signal again.

7-3-6 AO Terminal (Analog/Pulse Monitor Outputs)

The AO terminal performs analog DC power, current and pulse output.
The voltage (AOV)/current (AOI)/pulse (PO) outputs are exclusive, and switching of each output is performed by the hardware switch SW5.
The output frequency and output current can be monitored by the AO terminal of the control circuit terminal block.

AO Terminal (Mode Selection)

Select the output form of the AO terminal. Also change the hardware switch SW5.
For details on the hardware switch, refer to *2-2-2 Terminal Blocks* on page 2-6.

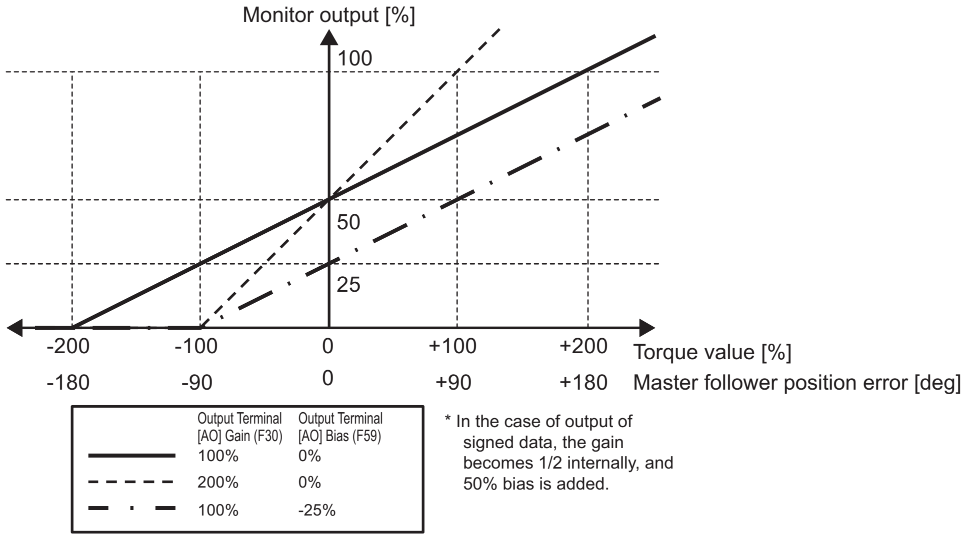
Parameter No.	Function name	Data	SW5	Default data	Unit
F29	Output Terminal [AO] Mode Selection	0: Output in voltage (0 to 10 VDC)	AOV	0	-
		1: Output in current (4 to 20 mA DC)	AOI		
		2: Output in current (0 to 20 mA DC)			
		3: Pulse output	PO		

AO Terminal (Function Selection)

From the following contents, select the signals to be output.

Parameter No.	Function name	Data	Description	Full scale value
F31	Output Terminal [AO] Function Selection	0	Output frequency 1 (before slip compensation)	Maximum output frequency [Hz]
		1	Output frequency 1 (after slip compensation)	Maximum output frequency [Hz]
		2	Output current	Inverter rated output current × 200%
		3	Output voltage	For 200-V class series: 250 V For 400-V class series: 500 V
		4	Output torque	Rated motor torque × 200%
		5	Load rate	Rated motor load × 2
		6	Input power	Standard applicable electric motor output × 200%
		7	PID feedback value	Feedback value 100%
		8	Actual speed /estimated speed	Maximum output frequency [Hz]
		9	Main Circuit DC Voltage	For 200-V class series: 500 V For 400-V class series: 1,000 V
		10	Universal AO	20,000
		13	Motor output	Rated motor output × 200%
		14	Calibration (+)	Always full scale
		15	PID command (SV)	PID process command 100%
		16	PID output (MV)	Maximum output frequency [Hz]
		17	Position error in master-follower operation (Bipolar)*1	Monitor amount 0% to 50% to 100% Position error: -180 to 0 to 180 deg
		18	Heat sink temperature	200°C
		21	PG feedback value	Maximum output frequency [Hz]
		27	Thermal load rate	OL1/OL2 trip level
		28	LAD-FQ (LAD frequency)	Maximum output frequency [Hz]
		29	Output torque (Bipolar)*1	Monitor amount 0% to 50% to 100% Rated motor torque × -200% to 0% to 200%
		111 to 124	Reserved	

*1. The output specifications of (signed) data are as described below.



Gain/Bias Setting

In the voltage (AOV)/current (AOI) outputs, gain and bias can be applied to monitor data selected for output.
Adjust the gain and bias of AO output in accordance with the meter connected to the AO terminal.
When a reset input has been input, the bias setting is disabled, and 0 V is output.

Parameter No.	Function name	Data	Default data	Unit
F30	Output Terminal [AO] Gain	0 to 300%	100.	%
F59	Output Terminal [AO] Bias	-100.0% to 100%	0.0	%

(Example) If a value between 0 and 5 V is output, set the initial data in F59 and 50% in F30.

Filter Setting

In the voltage (AOV)/current (AOI)/pulse (PO) outputs, a filter can be applied to monitor data selected for output.
Increasing the set value results in a slow response. This is the filter time constant for a sett value of 0.00 to 5.00 (s).

Parameter No.	Function name	Data	Default data	Unit
F58	Output Terminal [AO] Filter	0.00 to 5.00 s	0.00	s

Pulse Rate Setting

In the pulse (PO) output, set the number of pulses when the set monitor output becomes 100% in accordance with the specifications of the counter to be connected, etc.

Parameter No.	Function name	Data	Default data	Unit
F33	Output Terminal [AO] Pulse Rate (PO)	25 to 32000	1440	p/s

7-4 Restart Functions

This section describes the restart-related functions and their operations.

7-4-1 Restart Settings

- Whether or not to perform a frequency matching start during restart is determined based on the setting of Starting Mode Auto Search Function Selection (H09). If frequency matching start is not to be performed, the inverter restarts from the starting frequency as in normal operation.
- If “0: Disable” is set in Starting Mode Auto Search Function Selection (H09), then Power Interruption Restart Wait Time (H13) is ignored, and restart is performed from 0 Hz.
- If “2: Enable (At restart after momentary power failure and at normal start)” is selected for Starting Mode Auto Search Function Selection (H09), frequency matching restart is performed even when the power is turned ON again.
- H09 is a parameter that is used in V/f control (including dynamic torque vector control).
  d67 is used during sensorless vector control.
- When vector control with speed sensor is used, restart is performed from the speed detected by the speed sensor regardless of H09.
- When using V/f control with speed sensor (including dynamic torque vector control with speed sensor), H09 is followed.

Parameter No.	Function name	Data	Default data	Unit
H09	Starting Mode Auto Search Function Selection	0: Disable 1: Enable only at restart after momentary power failure 2: Enable at normal start and restart after momentary power failure	0	-
d67	Motor Starting Mode Auto Search in Speed Sensor Vector Control	0: Disable 1: Enable (Only at restart after momentary power failure) 2: Enable (At normal start and restart after momentary power failure)	1	-

- The details of Starting Frequency Selection at Frequency Pull-in Restart (E152) are as follows.

Set value	Description	Description
0	Frequency at which the power failure occurred	Pull-in from frequency when inverters output was shut off
1	Maximum frequency	Pull-in from maximum frequency
2	Reference frequency	Pull-in from currently selected frequency reference
3	Starting frequency	Restart from starting frequency

7-4-2 Restart after Momentary Power Failure

This function is used to set operation selection during restart after a momentary power failure.

Parameter No.	Function name	Data	Default data	Unit
F14	Power Interruption Restart Mode Selection	0: Trip immediately 1: Trip after a recovery from power failure 2: Trip after decelerate-to-stop 3: Continue to run 4: Restart at the frequency selected by E152 6: Decelerate-to-stop (no tripping)	1	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	26: STM (startup characteristics selection)	-	-
H09	Starting Mode Auto Search Function Selection	0: Disable 1: Enable only at restart after momentary power failure 2: Enable at normal start and restart after momentary power failure	0	-
d67	Motor Starting Mode Auto Search in Speed Sensor Vector Control	0: Disable 1: Enable (Only at restart after momentary power failure) 2: Enable (At normal start and restart after momentary power failure)		
H69	Anti-regenerative Control Function Selection	0: Disable 2: Torque limit control with forced stop after three times deceleration time has passed 3: Main Circuit DC Voltage control with forced stop after three times deceleration time has passed 4: Torque limit control without forced stop 5: Main Circuit DC Voltage control without force-to-stop	0	-
H13	Power Interruption Restart Wait Time	0.1 to 100.0 s	0.5	s
H14	Deceleration Setting During Current Limit for Restart Mode after Power Interruption	0.00: Selected deceleration time 0.01 to 100.00 Hz/s 999: According to current limiter	999	Hz/s
H15	Continuous Running Voltage Level	200 to 300 V (200 V class series) 400 to 600 V (400 V class series)	235	V
H16	Allowable Time for Power Interruption Restart	0.0 to 30.0 s 999: Auto judgment	999	s
H49	Auto Search Delay Time 1 for Starting Characteristic	0.0 to 10.0 s	0.0	s
H46	Auto Search Delay Time 2 for Starting Mode	0.1 to 100.0 s	1.0	s
H92	Continuous Running at the Momentary Power Failure P Proportional Gain	0.000 to 10.000 999: Auto	999	time

Parameter No.	Function name	Data	Default data	Unit
H93	Continuous Running at the Momentary Power Failure Integral Time	0.010 to 10.000 s 999: Auto	999	s
E152	Starting Frequency Selection at Frequency Pull-in Restart	0: Frequency at which the power failure occurred 1: Maximum output frequency 2: Reference frequency 3: Starting frequency	3	-

Restart Mode after Momentary Power Failure (Mode Selection)

The operation of restart after momentary power failure differs depending on 1st Drive Control Selection (F42).

● For V/f control (F42=0, 1), speed sensorless vector control (F42=5) and speed sensorless vector control (permanent magnet synchronous motor) (F42=15)

<table>
<tr><th rowspan="2">F14 data</th><th colspan="2">Operation details</th></tr>
<tr><th>Without auto search</th><th>With auto search*1</th></tr>
<tr><td>0: Trip immediately</td><td colspan="2">If a momentary power failure occurs while the inverter is operating and an undervoltage is detected in the Main Circuit DC Voltage of the inverter, the undervoltage alarm LU is output at that time, the inverter output is cut off and the motor enters the free-run state.</td></tr>
<tr><td>1: Trip after a recovery from power failure</td><td colspan="2">If a momentary power failure occurs while the inverter is operating and an undervoltage is detected in the Main Circuit DC Voltage of the inverter, the inverter output is cut off at that time and the motor enters the free-run state, but no undervoltage alarm is generated. During power restoration from a momentary power failure, an undervoltage alarm LU is output.</td></tr>
<tr><td>2: Trip after decelerate-to-stop</td><td colspan="2">If a momentary power failure occurs while the inverter is operating and the Main Circuit DC Voltage of the inverter falls below the continuous running level, the deceleration stop control is started. During deceleration stop control, the kinetic energy of the moment of inertia of the load is regenerated due to deceleration, and the deceleration operation continues. After the deceleration stop, the LU alarm is output.</td></tr>
<tr><td rowspan="2">3: Continue to run</td><td colspan="2">If a momentary power failure occurs while the inverter is operating and the Main Circuit DC Voltage of the inverter falls below the continuous running level, the operation continuation control is started. During continuous running control, the kinetic energy of the moment of inertia of the load is regenerated due to deceleration, and the operation continues and power restoration is awaited. If the energy to be regenerated is low and an undervoltage is detected, the inverter output is cut off, and the motor falls in a free-run state.</td></tr>
<tr><td>If the RUN command is input during power restoration, restart is performed from the pull-in frequency. Select the pull-in frequency in E152.*2</td><td>If the RUN command is input during power restoration, auto search is performed, the motor speed is estimated, and restart is performed from the frequency.</td></tr>
</table>

<table>
<tr><th rowspan="2">F14 data</th><th colspan="2">Operation details</th></tr>
<tr><th>Without auto search</th><th>With auto search*1</th></tr>
<tr><td rowspan="2">4: Restart based on pull-in frequency</td><td colspan="2">If a momentary power failure occurs while the inverter is operating and an undervoltage is detected in the Main Circuit DC Voltage of the inverter, the inverter output is cut off and the motor enters the free-run state.</td></tr>
<tr><td>If the RUN command is input during power restoration, restart is performed from the pull-in frequency. Select the pull-in frequency in E152.*2</td><td>If the RUN command is input during power restoration, auto search is performed, the motor speed is estimated, and restart is performed from the frequency.</td></tr>
<tr><td>6: Decelerate-to-stop (no tripping)</td><td colspan="2">If a momentary power failure occurs while the inverter is operating and the Main Circuit DC Voltage of the inverter falls below the continuous running level, the deceleration stop control is started. During deceleration stop control, the kinetic energy of the moment of inertia of the load is regenerated due to deceleration, and the deceleration operation continues. An alarm does not occur after a deceleration stop.
If the RUN command turns OFF in the deceleration stop state, the deceleration stop state is canceled, and the operation can be performed when the RUN command turns ON the next time.</td></tr>
</table>

*1. With auto search is selected when startup characteristics selection “STM” is ON, or H09(d67) = 1 or 2.

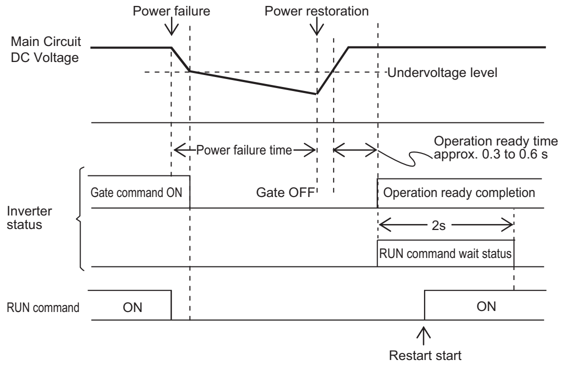
*2. When using sensorless vector control, do not use starting from the pull-in frequency. If you select starting from pull-in frequency, normal start may not be performed, or the device may be damaged.

● For V/f control with speed sensor (F42=3), dynamic torque vector control with speed sensor (F42=4) and vector control with speed sensor (F42=6, 16)

The operation conforms to the operation of “With auto search” in the table above, but instead of estimating the motor speed by the auto search operation, restart is performed from the motor speed detected by the speed sensor.

Restart Mode after Momentary Power Failure (Basic Operation: Without Auto Search Setting)

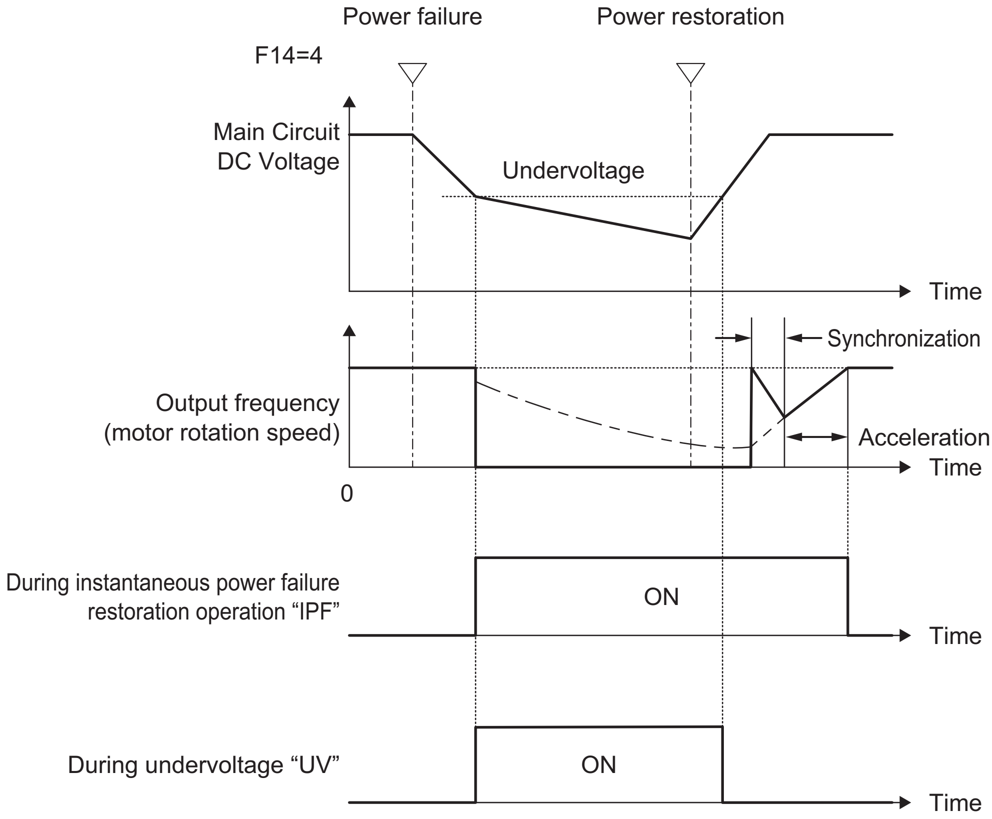
When the inverter detects that the Main Circuit DC Voltage has dropped below the undervoltage level during operation, it judges a momentary power failure.
After the restoration of power, the inverter is set to the operation ready completion state once the initial charging time has elapsed.
During a momentary power failure, the power of the external circuit (such as a relay circuit) controlling the inverter also declines and the RUN command may also turn OFF. Therefore, when the operation ready state is complete, the inverter waits for two seconds for the RUN command to be input. If the input of the RUN command is confirmed within two seconds, the inverter starts restarting according to F14 (Power Interruption Restart Mode Selection). If the RUN command is not input, the restart mode after momentary power failure is canceled, and startup is performed from the normal starting frequency.



- During power restoration, the inverter waits for two seconds for the RUN command to be input, but if the time period set in Allowable Time for Power Interruption Restart (H16) elapses after power restoration is judged, the two-second long RUN command input waiting state is canceled, and normal startup is performed.
- If the free-run command “FRS” is input during a power failure, Free Run Stop Restart Operation Selection (H441) is set, and when the RUN command is input, startup is performed from the normal starting frequency.
- As a measure against difficulty in bringing down the Main Circuit DC Voltage during momentary power failure, if “22: IL (Interlock)” is allocated to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99), the momentary power failure can be detected accurately.

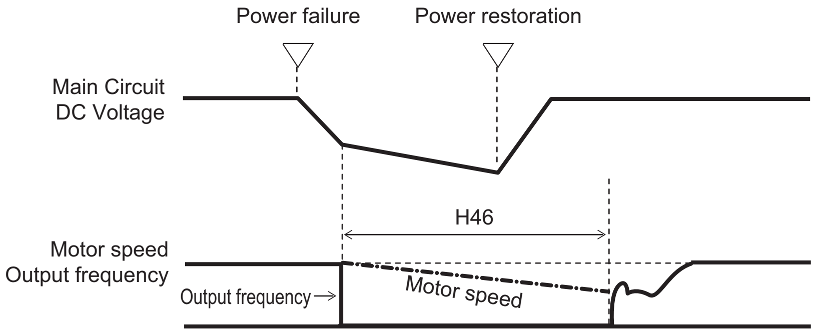
Input signal IL	Meaning
OFF	Momentary power failure not occurred
ON	Momentary power failure occurred (Restart after momentary power failure enabled)

When the motor speed drops during momentary power failure and startup is performed from the frequency prior to the momentary power failure after the power is restored, the current limitation function is activated, and the output frequency of the inverter declines automatically. When the output frequency and the motor rotation speed are synchronous, acceleration is performed up to the original output frequency.
However, the momentary overcurrent limitation must be enabled (H12 = 1) for the synchronous pull-in of the motor.



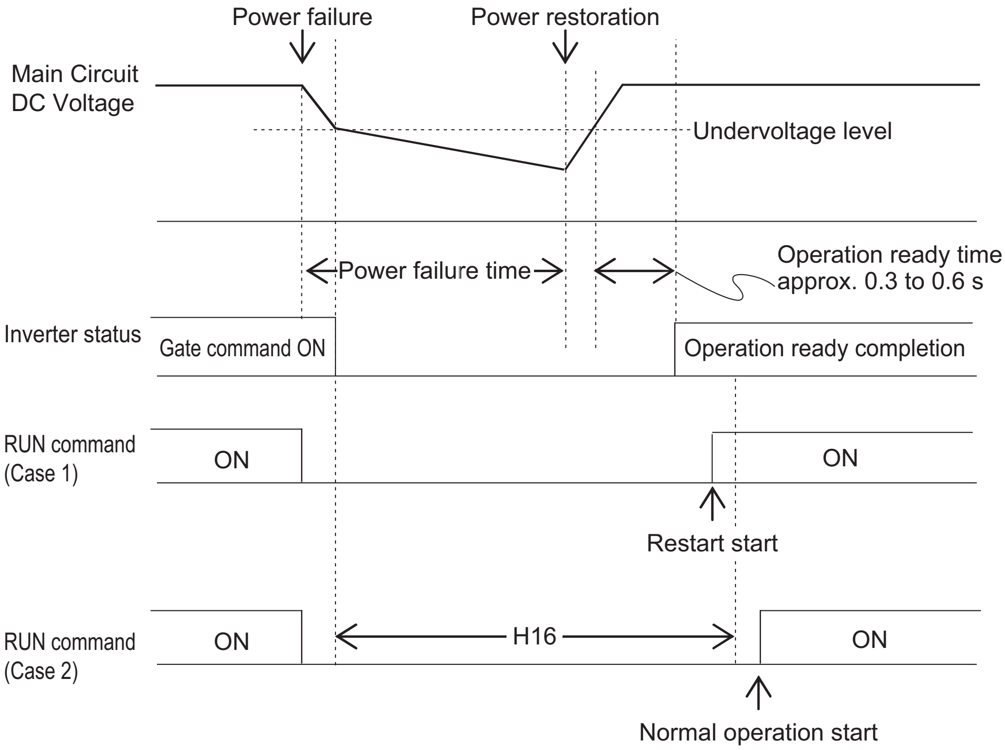
Restart Mode after Momentary Power Failure (Basic Operation: With Auto Search Setting)

The auto search operation does not operate normally if residual voltage is remaining in the motor. Therefore, it is necessary to secure time for the residual voltage to dissipate.
The required time for restart after momentary power failure is secured by the parameter H46 (Auto Search Delay Time 2 for Starting Mode).



Allowable Time for Power Interruption Restart (H16)

Set the maximum time from when a momentary power failure (undervoltage level) occurs until a restart is performed (setting range: 0.0 to 30.0 s). If the setting range is exceeded, the restart after momentary power failure is not performed, and operation is performed by turning ON the power again.

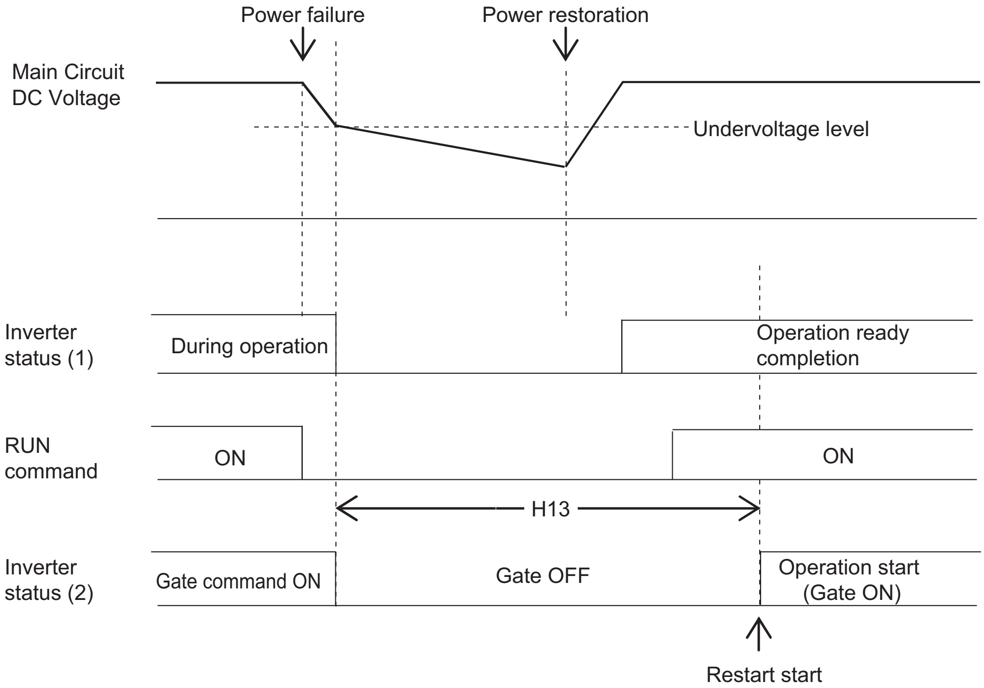


If Allowable Time for Power Interruption Restart (H16) is set to "999," restart after momentary power failure is performed until the Main Circuit DC Voltage drops down to the allowable voltage for restart after momentary power failure, and once it becomes equal to or below the allowable voltage for restart after momentary power failure, it is judged that the power supply is cut off, the restart after momentary power failure is not performed, and the operation is performed by turning the power ON again.

Power supply system	Allowable voltage for restart after momentary power failure
200 V	50 V
400 V	100 V

Power Interruption Restart Wait Time (H13)

Set the time from after the occurrence of momentary power failure until the inverter restarts (H46 (Auto Search Delay Time 2 for Starting Mode) is used during auto search setting). If the inverter is started in a state when the residual voltage of the motor is high, the inrush current may increase, there may be a temporary regeneration, and an overvoltage alarm may occur. For safety, adjust H13 so that restart is performed after the residual voltage becomes low to an extent.



Deceleration Setting During Current Limit for Restart Mode after Power Interruption (H14)

During restart after a momentary power failure, if the output frequency of the inverter and the rotation speed of the motor are not in sync, an overcurrent flows and current limitation is activated. If a current limitation is detected, the output frequency is automatically lowered to be in sync with the motor rotation speed. In H14, set the gradient (frequency fall rate (Hz/s)) for lowering the output frequency.

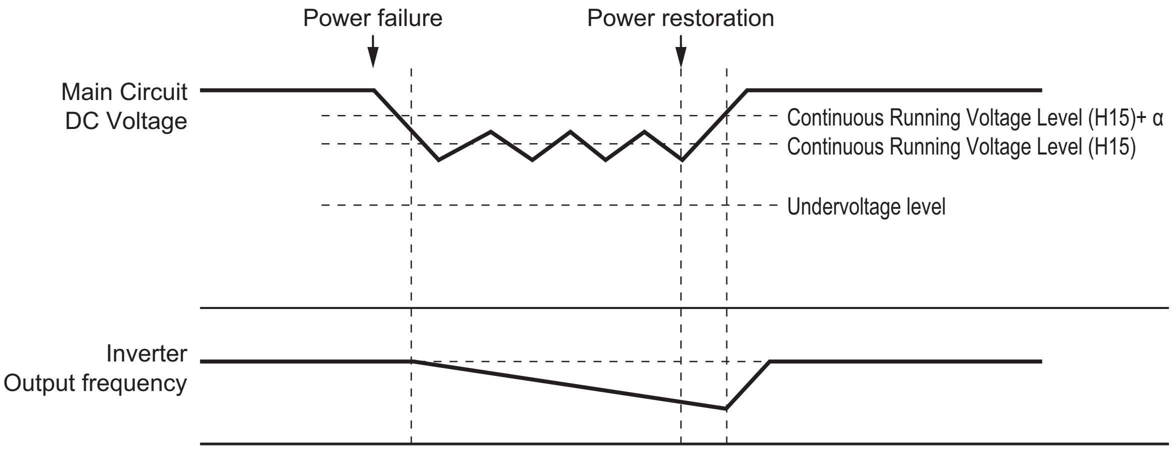
H14 data	Output frequency lowering operation
0.00	Falls at the selected deceleration time.
0.01 to 100.00 (Hz/s)	Falls at the fall rate set in H14.
999	Falls in accordance with the PI controller of the current limitation process (the PI constant is a fixed value inside the inverter).

Continuous Running Voltage Level (H15)

- Deceleration stop during momentary power failure
  If “Trip after decelerate-to-stop (F14 = 2)” or “Decelerate-to-stop(w/o trip) (F14 = 6)” is selected in the restart mode after momentary power failure (mode selection), then at the moment a momentary power failure occurs while the inverter is operating and the Main Circuit DC Voltage of the inverter falls below the continuous running level, the deceleration stop control is started.
  Adjust the Main Circuit DC Voltage level at which to start the deceleration stop control in H15. During deceleration stop control, deceleration is performed while controlling the Main Circuit DC Voltage at a constant level with a PI controller. The P (Proportional) and I (Integral) of the PI controller are adjusted by H92 and H93, respectively.

- Continuous running

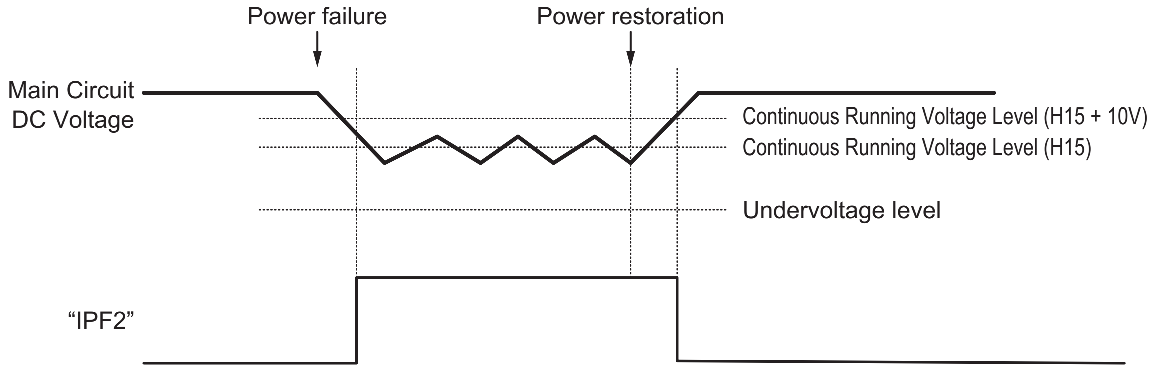
If “Continue to run (F14 = 3)” is selected in the restart mode after momentary power failure (mode selection), then at the moment a momentary power failure occurs while the inverter is operating and the Main Circuit DC Voltage of the inverter falls below the continuous running level, the operation continuation control is started.
Adjust the continuous running level at which to start the continuous running control in H15. During continuous running control, the operation is continued while controlling the Main Circuit DC Voltage at a constant level with a PI controller.



Power supply system	α	
	22 kW max.	30 kw min.
200 V	5 V	10 V
400 V	10 V	20 V

- Allocating during momentary power failure deceleration “IPF2”
  This parameter turns ON when F14 is 2 or 3, and the Main Circuit DC Voltage falls below H15 “Continuous running level” and the continuous running state is established. This parameter turns OFF when power restores and the Main Circuit DC Voltage becomes “the voltage set in H15 +10 V or higher.”
  This parameter turns ON even when F14 is 4 or 5 and the Main Circuit DC Voltage falls below the undervoltage level. This parameter turns OFF when the DC link bus voltage reaches “the undervoltage level +10 V or higher.”

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	79: IPF2 (During momentary power failure deceleration)	-	-

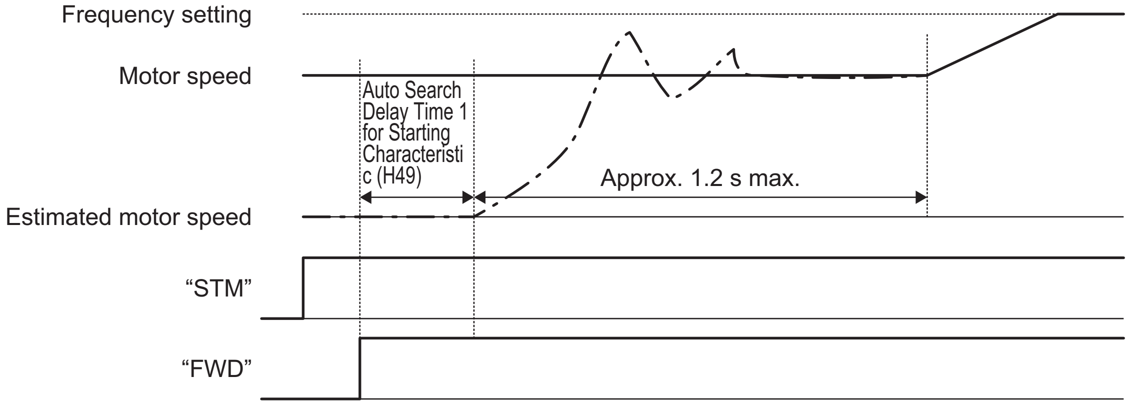


Startup Characteristics Selection STM

Allocate "26: STM (startup characteristics selection)" to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
This function is used to select whether or not to perform the auto search operation (auto search without stopping the motor during idling) when the inverter is started by turning the STM terminal ON or OFF.

Startup characteristics selection STM	Operation
OFF	Auto search disabled
ON	Auto search enabled

By a startup with auto search enabled, the speed at startup will be searched (for a maximum of approx. 1.2 seconds) as an auto search without stopping the motor during idling is performed. After a speed search, acceleration is performed up to the set frequency in accordance with the set acceleration time.



At a startup as a result of the RUN command turning ON, the auto search is started after a delay by the time set at Auto Search Delay Time 1 for Starting Characteristic (H49). When control of a motor is alternately switched between two inverters, and the motor is started by an auto search after a free run during switching, the RUN command does not need to be issued in a timely manner by setting H49.

7-4-3 Trip Retry Operation

This function is used to set the operation selection to trip retry.

Parameter No.	Function name	Data	Default data	Unit
E139	Overvoltage/Overcurrent Restart Function Selection	0: Trip immediately 4: Restart at the frequency selected by E152	0	-
H04	Retry Count at Trip	0: Disable 1 to 20: Number of retries	0	time
H05	Retry Standby Time at Trip	0.5 to 20.0	5.0	s
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	26: TRY (Retry in progress)	-	-

Trip Retry (Mode Selection)

The trip retry operation differs depending on 1st Drive Control Selection (F42).

● For V/f control (F42=0, 1), speed sensorless vector control (F42=5) and speed sensorless vector control (permanent magnet synchronous motor) (F42=15)

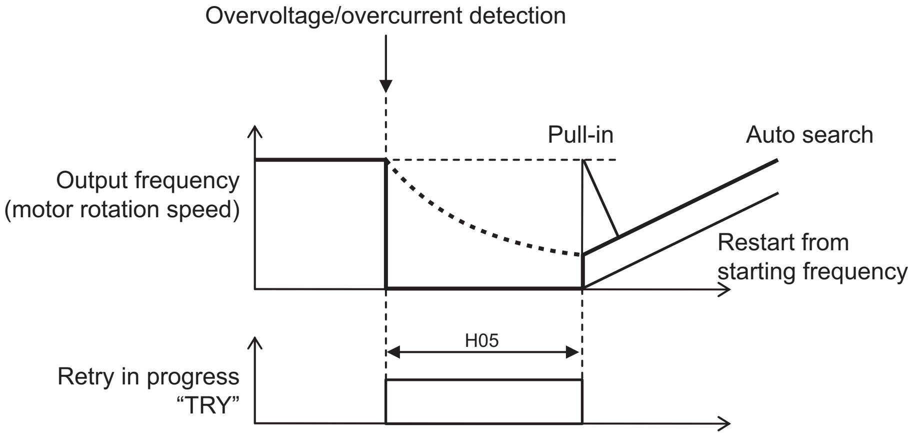
E139 data	Operation details	
	Without auto search	With auto search*1
0: Trip immediately	An alarm is output when an overvoltage or overcurrent is detected, the inverter output is cut off, and the motor falls in a free-run state.	
4: Restart at the frequency selected by E152	If an overvoltage or overcurrent is detected, the inverter output is cut off, and the motor falls in a free-run state.	
	During recovery from overvoltage or overcurrent, restart is performed from the pull-in frequency. Select the pull-in frequency in E152.*2	During recovery from overvoltage or overcurrent, auto search is performed, the motor speed is estimated, and restart is performed from the frequency.

*1. With auto search is selected when startup characteristics selection “STM” is ON, or H09(d67) = 2.
*2. When using sensorless vector control, do not use starting from the pull-in frequency. If you select starting from pull-in frequency, normal start may not be performed, or the device may be damaged.

● For V/f control with speed sensor (F42=3), dynamic torque vector control with speed sensor (F42=4) and vector control with speed sensor (F42=6, 16)

The operation conforms to the operation of “With auto search” in the table above, but instead of estimating the motor speed by the auto search operation, restart is performed from the motor speed detected by the speed sensor.

Use the retry function to recover from overvoltage or overcurrent.
(H04: Retry Count at Trip, H05: Retry Standby Time at Trip)
As for the starting method, the settings in E139 is applied.



7-4-4 Power Recovery Restart Prevention Function (USP)

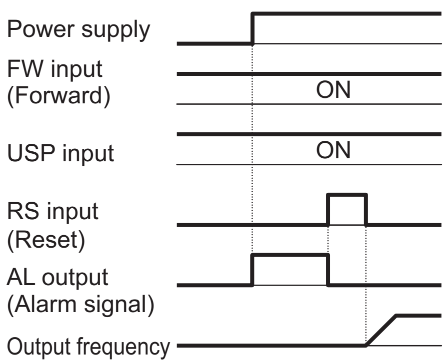
Use this function to have the inverter trip with the alarm code Er6 displayed, if the power supply is turned ON with the RUN command ON in the inverter.

If a trip is reset with the RUN command input ON, the inverter starts running immediately after the trip is reset. (Example 1)
If the RUN command turns ON after the power supply is turned ON, the inverter operates normally. (Example 2)
Allocate "186: USP (Power recovery restart prevention function)" to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
Power recovery restart prevention based on USP input is enabled only for a RUN command from the terminal block.

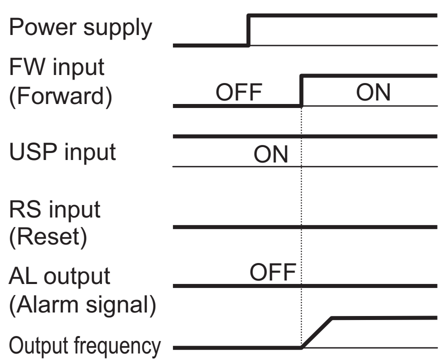
Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	186: USP (Power recovery restart prevention function)	-	-

The operation of the power recovery restart prevention function is shown below.

(Example 1) Power ON with RUN command ON (Reset with Reset (RS))



(Example 2) RUN command after power ON (Normal operation)



Using the Power Recovery Restart Prevention Function and the Start Check Function in Combination

When the inverter is started with the power recovery restart prevention function in an enabled state (USP (power recovery restart prevention function) terminal ON) and the start check function in an enabled state (H96 = 2, 3), and the RUN command ON, both the power recovery restart prevention function and the start check function are applicable, and the Er6 sub code 5 is generated by the start check function. At this time, the alarm cannot be canceled even if the reset operation is performed with the RUN command ON, and the alarm can also not be canceled with the RUN command OFF.
For details on the start check function, refer to *7-7-10 STOP Key Priority/Start Check Function* on page 7-79.

7-4-5 Free-run Stop Selection

- Free-run stop is a method of shutting off inverter output to stop motor rotation.
  Executing the free-run stop function causes the motor to fall a free-run state, in which it decelerates due to the load and friction forces exerted on the motor or machine and comes to a stop.
- In Free Run Stop Restart Operation Selection (H441), set how to restart the motor that is rotating by inertia after execution of the free-run stop.
- The Free Run Stop Restart Operation Selection (H441) setting is enabled for the following cases.
  [When “1: Coast to a stop” is selected in Stop Selection (H11)]
  Restarting the motor in a free-run stop state when “1: Coast to a stop” is set in Stop Selection (H11) causes the motor to restart according to the Free Run Stop Restart Operation Selection (H441) setting.
  [When free-run stop (FRS) function is used via a multifunction input terminal]
  Setting “7: FRS” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) and turning ON the corresponding input terminal causes the motor to fall to a free-run stop state (with the inverter output shut off). Then, when FRS terminal input is cleared to OFF, the motor restarts according to the Free Run Stop Restart Operation Selection (H441) setting. However, the motor does not restart when the 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102) is set to “0, 2, 3: Operator.”
- Set Free Run Stop Restart Operation Selection (H441) as follows.
  [1: Frequency matching restart]
  Frequency matching restart causes the inverter to restart by recognizing the frequency from the voltage between the motor terminals during free-run stop and adjusting to it. If the voltage between the motor terminals is not sufficient, the inverter restarts from 1st Starting Frequency (F23)/2nd Starting Frequency (A12). Use this setting if the inverter is in a free-run stop for several seconds.
  [2: Frequency pull-in restart]
  Frequency pull-in restart causes the inverter to restart by outputting the Starting Frequency Selection at Frequency Pull-in Restart (E152) to the motor in a free-run stop state and a deceleration is performed according to the current limit. When there is no longer a current limit, acceleration is performed again. This enables a smooth restart independent of the voltage between motor terminals. Use this setting when the inverter is in free-run state for a long time due to a large load inertia.
  Note that by a restart from the starting frequency (E152=3), the inverter operates suddenly while the motor is operating by inertia. Use this setting if the motor stops soon due to the load after a free-run stop.

- When 1st Starting Frequency (F23)/2nd Starting Frequency (A12) is set, a restart is performed from 0 Hz if a frequency of this set frequency or less is detected at a frequency matching restart.
- Immediately after a free-run stop, a large residual voltage remains between motor terminals. If the inverter restarts the output in this state, an overcurrent may be detected. To avoid this, set Power Interruption Restart Wait Time (H13) to a long time.
- While in a free-run stop state, the motor is not subject to external influence because inverter output is shut off.
  Even if the motor is stopped by external brake or the effect of other equipment, the inverter can still be used without detecting overcurrent.
  However, if the motor in a free-run state is rotated externally, the regenerated energy may be fed back to the inverter and an overvoltage may be detected. In this case, use the regenerative braking function.
- In control with speed sensor (F42=3, 4, 6 ,16), recovery from a free-run stop starts from the detection frequency regardless of the setting of Free Run Stop Restart Operation Selection (H441).
  In sensorless vector control (permanent magnet type synchronous electric motor) (F42=15), recovery from a free-run stop starts from the frequency found by inferring the speed based on pick-up.
  In sensorless vector control (induction motor) (F42=5), a normal restart is sometimes not possible if the motor rotation speed differs considerably with the restart frequency when a frequency pull-in restart is selected.

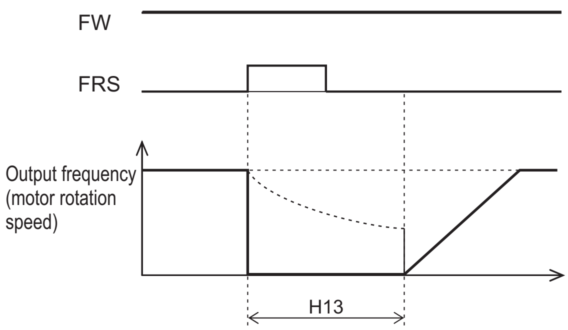
Parameter No.	Function name	Data	Default data	Unit
H441	Free Run Stop Restart Operation Selection	1: Starting with matching frequency 2: Starting with active matching frequency	2	-
H13	Power Interruption Restart Wait Time	0.1 to 100.0 s	Dependent on capacity	s
H46	Auto Search Delay Time 2 for Starting Mode			
F23/A12	1st Starting Frequency/2nd Starting Frequency	0.0 to 60.0 Hz	0.5	Hz
H14	Deceleration Setting During Current Limit for Restart Mode after Power Interruption	0.00: Selected deceleration time 0.01 to 100.00 Hz/s 999 (According to current limiter)	999	Hz/s
E152	Starting Frequency Selection at Frequency Pull-in Restart	0: Frequency at which the power failure occurred 1: Maximum output frequency 2: Reference frequency 3: Starting frequency	3	-
H440	Free Run Stop Restart Allowable Time	0.0 to 30.0 s	30.0	s
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	7: FRS (Free-run stop) 26: STM startup characteristics selection	-	-

- The details of Starting Frequency Selection at Frequency Pull-in Restart (E152) are as follows.

Set value	Description	Description
0	Frequency at which the power failure occurred	Pull-in from frequency when inverter output was shut off
1	Maximum output frequency	Pull-in from maximum frequency
2	Reference frequency	Pull-in from currently selected frequency reference
3	Starting frequency	Restart from starting frequency

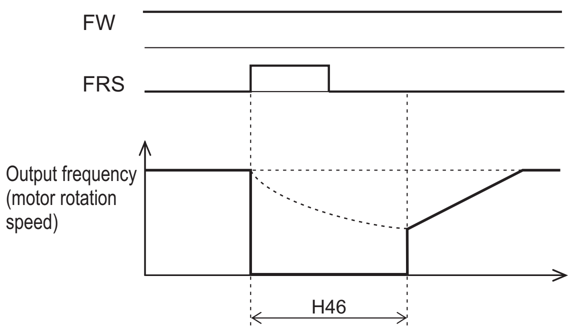
- The examples below assume that the FRS terminal is used.
  When the motor is stopped in a free-run state by the STOP command, restarting of the inverter occurs at the same timing as when the FRS terminal turns OFF.

(Example 1) 0 Hz restart (H441=2 and E152=3)



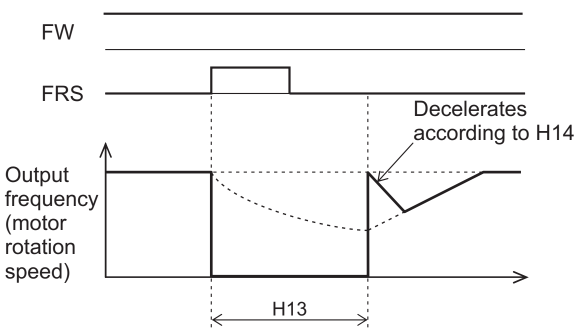
- A restart is performed from the starting frequency after H13 has elapsed since motor output shutoff.

(Example 2) Frequency matching restart (H441=1)



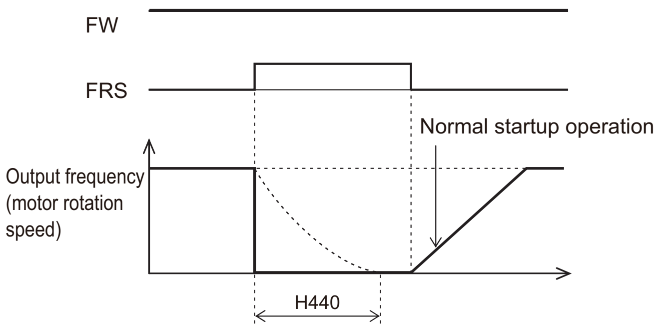
- A frequency matching restart is performed after H46 has elapsed since motor output shutoff.
- When the anticipated speed value exceeds the maximum frequency or the upper limit frequency, picking-up is disabled, and the start is performed from whichever of the maximum frequency or upper limit frequency is the smaller.

(Example 3) Frequency pull-in restart (H441=2)



- Output is started from the pull-in frequency set to E152 after H13 has elapsed since motor output shutoff.
- A deceleration is performed according to the value of H14 by current limit.
- When there is no longer a current limit, acceleration is performed again to return to the original frequency.

- The status changes from a motor shutoff (free-run status) to the free-run status for the duration Free Run Stop Restart Allowable Time (H440). When the status is restored from motor shutoff (free-run status) after H440 has elapsed, a normal start operation is performed.


FW
FRS
Normal startup operation
Output frequency
(motor rotation
speed)
H440

7-5 DC Injection Braking Function

This section describes the DC injection braking function.

7-5-1 DC Injection Braking (DB)

Use this function to have the motor apply DC injection braking according to the load.
For an induction motor, this function allows braking with no feedback of regenerated energy to the inverter.
However, for a PM motor, consider to take measures against overvoltage because even the DC injection braking function allows regenerated energy to be fed back to the inverter.
DC injection braking can be controlled with one of the following three methods:

- Setting “13: DB (External DC injection braking)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) and turning ON/OFF the terminal to which the external DC injection braking function is allocated.
- Setting DC Injection Braking Selection (E114) to “1” and controlling the motor by parameter settings.
- Setting DC Injection Braking Selection (E114) to “2” and controlling the motor only by comparison via the frequency set in the DC Injection Braking Frequency parameter.

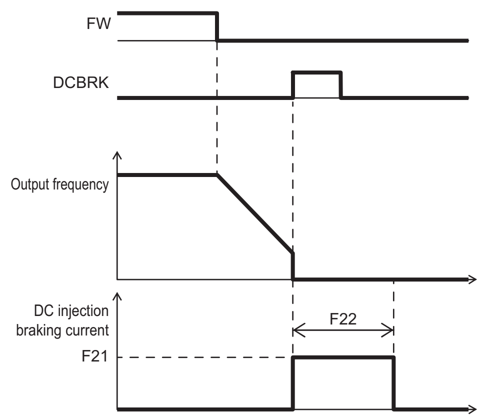
Note, however that the use of DC injection braking may not cause the motor to stop due to the moment of inertia of the motor load.
DC injection braking is disabled when the servo lock is enabled.

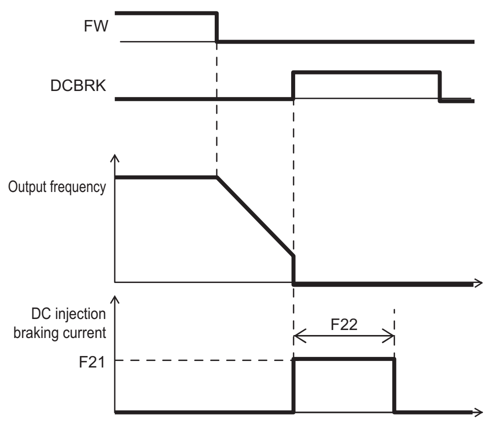
Parameter No.	Function name	Data	Default data	Unit
E114	DC Injection Braking Selection	0: Disable 1: Enable 2: Enable (Operates only via set frequency)	0	-
F20/A09	1st DC Injection Braking Start Frequency/2nd DC Injection Braking Start Frequency	0.0 to 60.0	0.0	Hz
H95	DC Injection Braking Start Characteristic Selection	0: Slow response 1: Quick response	1	-
F21/A10	1st DC Injection Braking Level/2nd DC Injection Braking Level	0 to 100% (HHD mode) 0 to 80% (HND mode)	0	%
F22/A11	1st DC Injection Braking Time/2nd DC Injection Braking Time	0.00: (Disable) 0.01 to 30.00	0.00	s
E115	External DC Injection Braking Edge/Level Selection	0: Edge operation 1: Level operation	1	-
H195	DC Injection Braking Startup Time	0.00: (Disable) 0.01 to 30.00	0.00	s
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	13: DB (External DC injection braking)	-	-

Controlling DC Injection Braking via ON/OFF Status of External DC Injection Braking Terminal

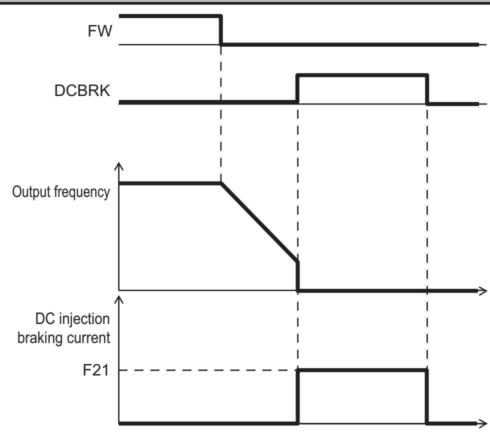
DC injection braking based on terminal input is activated when DC Injection Braking Selection (E114) = 0, 1. Allocate “13: DB (External DC injection braking)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99). DC injection braking based on terminal input is disabled when E114 = 2.
DC injection braking based on terminal is given priority over DC injection braking selection by E114 = 1.
When “0: Edge operation” is selected for External DC Injection Braking Edge/Level Selection (E115), DC injection braking operates only for the time period set in 1st DC Injection Braking Time (F22)/2nd DC Injection Braking Time (A11).
When the RUN command is ON, DC injection braking based on terminal input is not performed as the operation priority.
In the edge operation, the judgment to start DC injection braking is made only at the point of time of DB rising edge. The DB turns ON while the RUN command is ON, thereafter, even if the RUN command turns OFF, the DC injection braking does not operate.

E115 = 0: Edge operation





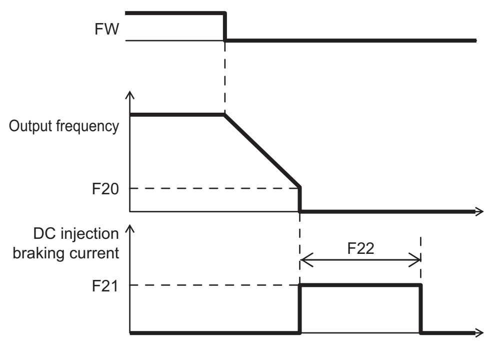
E115 = 1: Level operation



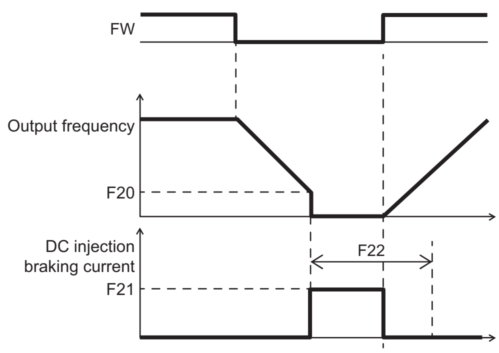
When the RUN command is ON (FWD = ON), DC injection braking is disabled, and normal operation is performed.

Controlling DC Injection Braking via Parameter Settings (E114 = 01)

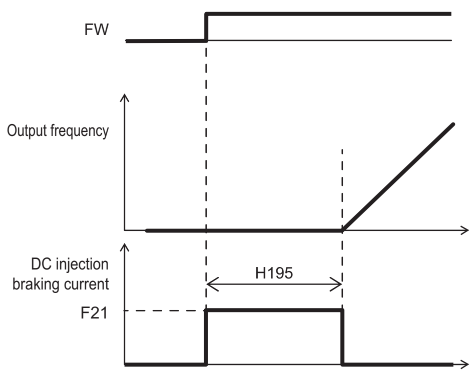
During a deceleration stop, DC injection braking is started from the time the output frequency reaches the DC injection braking start frequency (F20), and is performed only for the period of DC braking time (F22).
However, if the stop frequency (F25) is higher than the DC braking frequency (F20)}, DC injection braking is started from the time the output frequency reaches the stop frequency (F25), and is performed only for the period of DC braking time (F22).



If the RUN command is turned ON during DC braking, DC braking is canceled and operation is started.

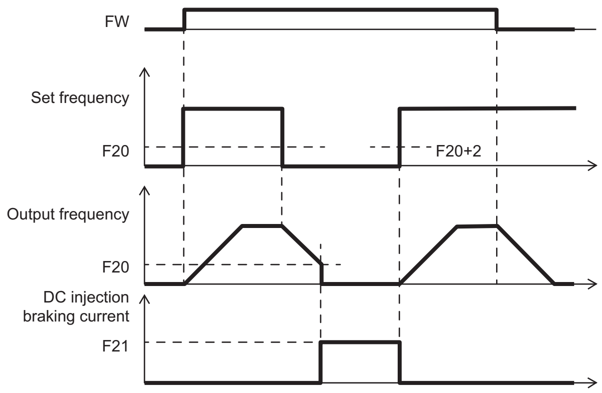


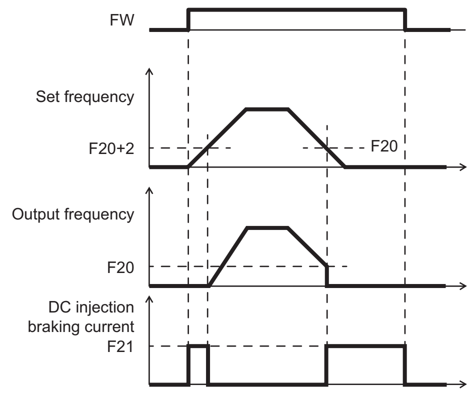
During startup, DC injection braking is performed only for the time period specified in H195 with the RUN command ON, and thereafter, the output of the output frequency is started.



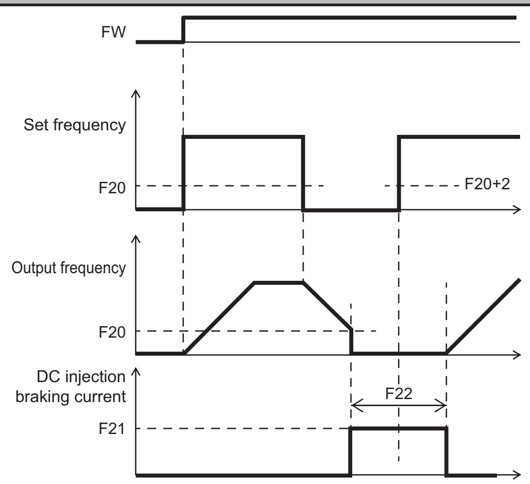
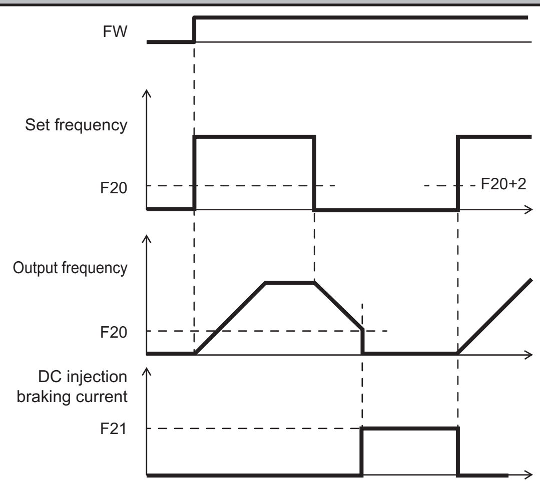
Controlling DC Injection Braking Only via Set Frequency (E114 = 02)

Use this method to control DC injection braking only by changing the set frequency.
DC injection braking based on terminal input is disabled when E114 = 2. The DC injection braking during startup as set in H195 is also disabled.
If both the set frequency and the output frequency are equal to or lower than that set in F20, the inverter starts DC injection braking.
If F20 < F25, and both the set frequency and the output frequency are equal to or lower than that set in F25, the inverter starts DC injection braking.
If, during DC injection braking, the set frequency becomes higher than F20 + 2 Hz, or the maximum value set in F23,F25, the inverter cancels DC injection and returns to normal operation. DC injection braking is also canceled when the RUN command is OFF.
If the set frequency starts from 0 Hz via analog input etc., the inverter starts the operation with DC injection braking.





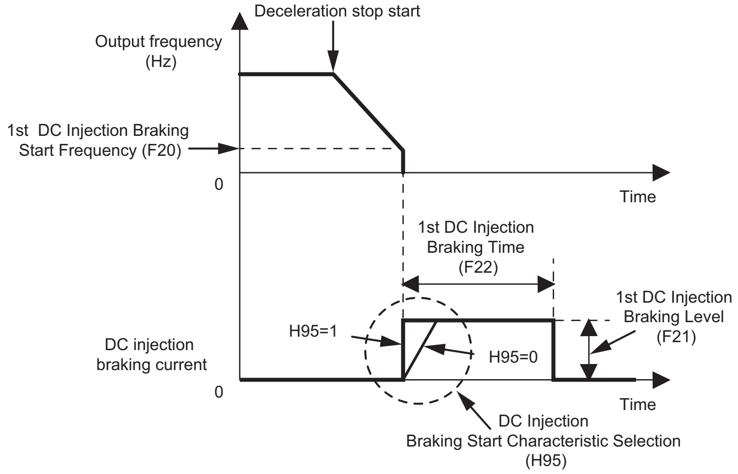
The timing at which the inverter cancels DC injection braking depends on the value set in DC injection braking method selection.

<table>
<tr><th>E115 = 0: Edge operation</th><th>E115 = 1: Level operation</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

DC Injection Braking Start Characteristic Selection (H95)

You can select the rise characteristics for DC braking.

H95 data	Characteristics	Precautions
0	Slow response. Smoothens the rise of current, and prevents the reverse phenomenon when DC braking is started.	The braking torque may become insufficient when DC braking is started.
1	Quick response. Makes the rise of current faster, and also fastens the rise in braking torque.	Reverse operation may be performed depending on the inertia of the mechanical system and the condition of coupling.



7-6 Safety Function

7-6-1 Overview of Safety Function

The safety function is designed so that the safety stop function of category 0 (uncontrolled stop) specified in IEC 60204-1 is used to meet the safety standards of PL-e under ISO 13849-1.
The safety input function allows the inverter output when current flows in both the terminals SF1 and SF2. When the safety input function is activated, in compliance with the above standards, the output transistor operation of the inverter is stopped safely (by shutting off its output). As a result, the motor stops with free run.

- It takes 50 ms or shorter from when the safety input is input till when the inverter shuts off the output.
- The emergency disconnect (_EN) is displayed.

Safety Functions

Function	Standard
STO (Safe Torque Off)	EN/IEC 61800-5-2
Stop Category 0	EN/IEC 60204-1

Response Time

Response time		Remarks
STO response time	50 ms or less	Time from when the SF1/SF2 signal state changes to STO up to when power to the motor is cut off
EDM response time	50 ms	Time from when the SF1/SF2 signal state changes to STO up to when the EDM signal state changes to ON

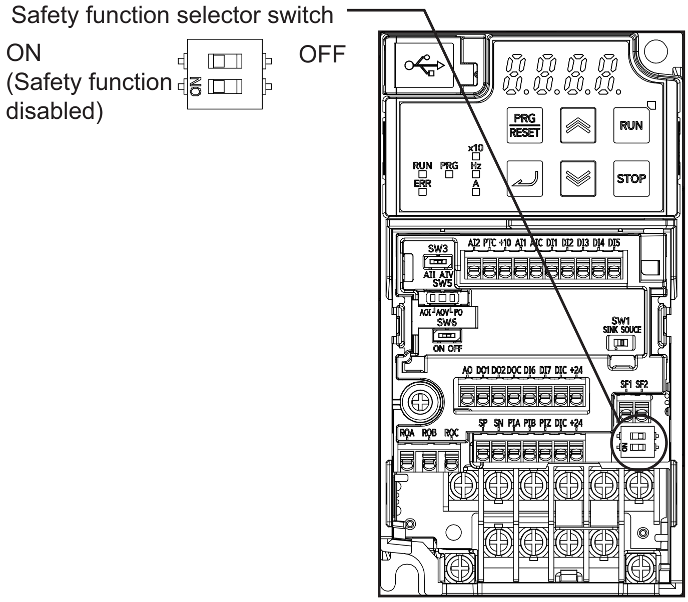
Safety Related Parameters

Parameter	Value	Standard
PL	e	EN/ISO 13849-1 EN/IEC 60204-1
Cat	3	
MTTFd	>62 years	
DCavg	Medium	

Parameter	Value	Standard
SIL	3	EN/IEC 61508-1 to -7 EN/IEC 61800-5-2 EN/IEC 62061
HFT	1	
SFF	>90%	
PFH	3.00×10^{-9}	
PFD	2.00×10^{-5}	
Mission time	20 years	

7-6-2 Safety Function Settings

Turn OFF the safety function selector switch SW9 when the inverter power supply is turned OFF.
Set SW9 to enabled (OFF) or disabled (ON) so that both sides are at the same position at all times.



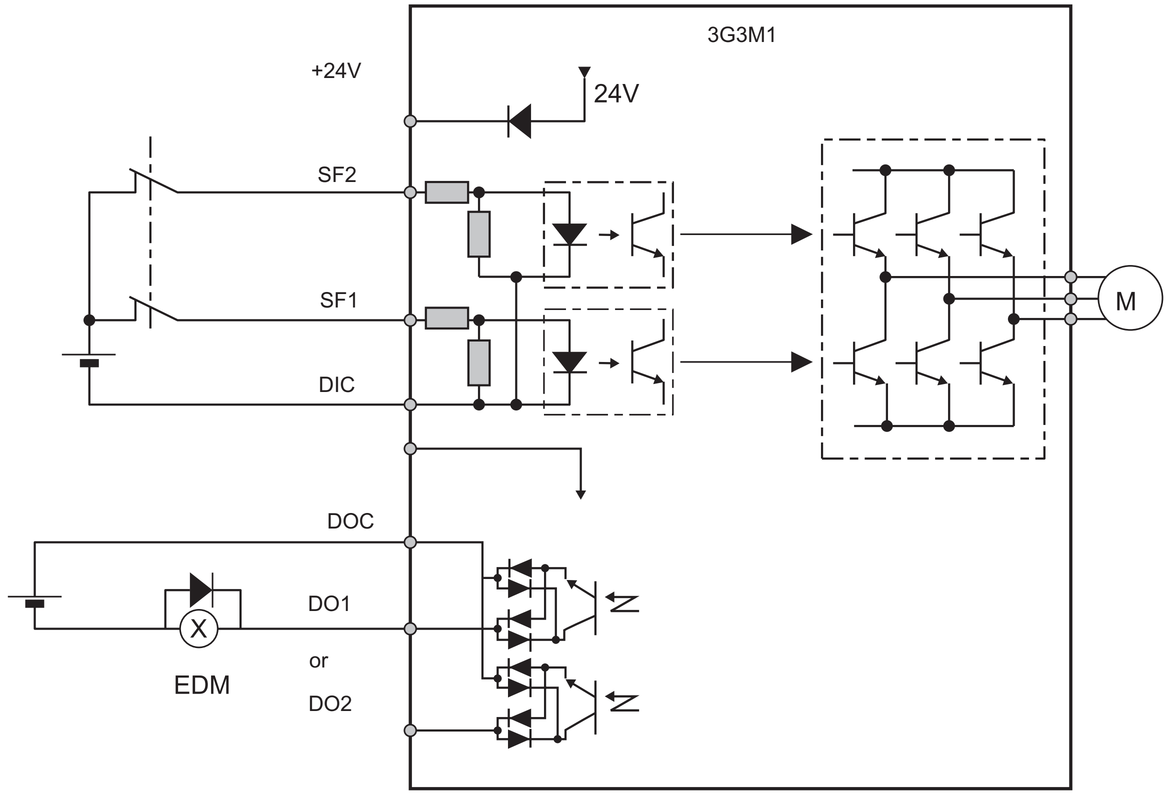
7-6-3 Wiring Safety Function for Use

Perform wiring with reference to the wiring example to meet the applicable safety standards. Be sure to use both SF1 and SF2 inputs and configure a system that turns OFF both of the SF1 and SF2 input signals when the safety function is activated.
If the inverter detects that either the SF1 or SF2 input is OFF, the safety function is activated and the inverter shuts off the output.

Parameter No.	Function name	Data	Default data	Unit
E20	Output Terminal [DO1] Function Selection	101: DECF (EN circuit failure detected) 102: EDM (Safety monitor)	-	-

Wiring Example

Wiring example when EDM is enabled (for compliance with ISO13849-1 PL-e)



When connecting to multiple inverters or safety devices, be sure to use the equipment within its guaranteed operating range, according to the above figure.

System Configuration Example

An example of the safety-compliant peripheral equipment recommendable for system configuration is shown below.

Model	Applicable standard for system configuration	Certification authority
G9SP	EN ISO13849-1 PL-e Cat4 (IEC61508 SIL3)	TÜV Rheinland

Periodic Inspection

The redundancy circuit is configured so that when the safety function is activated, the inverter shuts off its output if current no longer flows to either the SF1 or SF2 terminal. Therefore, the inverter must be periodically inspected to ensure that there is no defect in the F1 and SF2 wirings so that redundancy to ensure reliable operation is not lost. Be sure to perform periodical inspection at least once in three months.

For the wiring inspection on the terminals SF1, SF2 and EDM, refer to the table below.

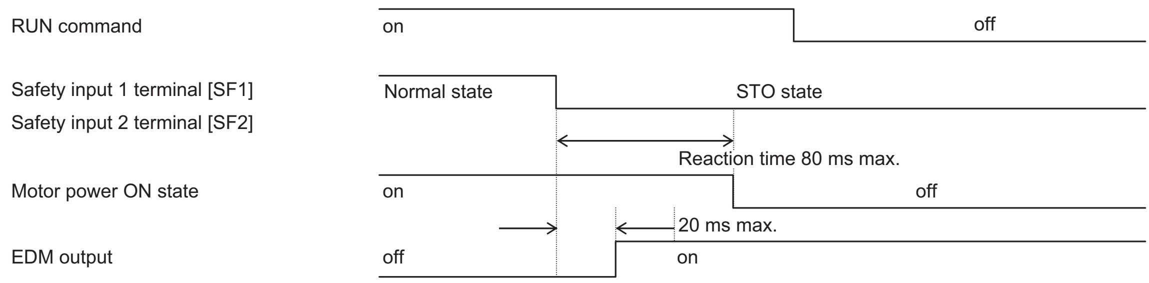
Signal		Status 1	Status 2	Status 3	Status 4
Input	SF1	OFF	ON	OFF	ON
	SF2	OFF	OFF	ON	ON
Internal status	Alarm detection	None	None	None	None

Signal		Status 1	Status 2	Status 3	Status 4
Output	EDM	ON	OFF	OFF	OFF
	Output to motor	Shut off	Shut off	Shut off	Output enabled
Alarm		None	EcF	EcF	None

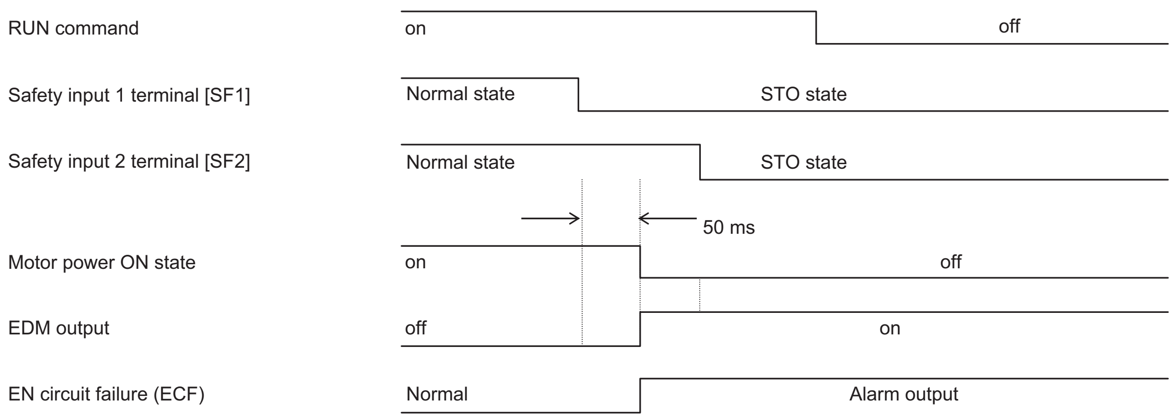
Precautions

● Timing of transition to safety status

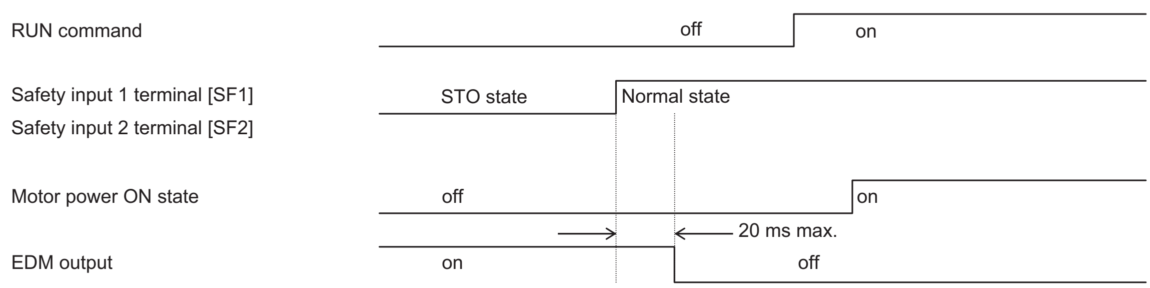
When either of safety inputs 1 or 2 turns OFF, control transitions to the STO state.



The following shows the timing chart for generation of the EN circuit failure (ECF) caused by terminal [SF1] or [SF2] input mismatch.



Timing of return from safety status



- To ensure that the safety function works normally, evaluate the entire safety system on every possible risk factor.

- The safety function is not intended to shut off the input or to isolate the output electrically. Be sure to shut off the input power supply to the inverter before attempting installation or maintenance.
- For the safety function, always use a cable length of 20 m or shorter.
- To restart the inverter after the safety function is activated, follow the steps below.
  Be sure to turn OFF the RUN command before you reset the safety equipment. Resetting the host safety equipment with the RUN command ON may cause the inverter to restart suddenly.
  1. Turn OFF the RUN command.
  2. Release the emergency stop switch.
  3. Reset the host safety equipment.
  4. After resetting the safety equipment, make sure that the SF1 and SF2 input signals of the inverter are ON.
  5. Turn ON the RUN command to restart the inverter.
- It takes 50 ms or shorter from when the safety input is input till when the inverter shuts off the output.
- Install the inverter in a control panel with an enclosure rating of IP54 or higher.
- If minute pulses are to be input to terminals [SF1] and [SF2] based on the diagnosis of the safety PLC, ensure that the pulse width is less than 1 ms.
- The logical mismatch between the terminals [SF1] and [SF2] based on the signal delay must be within 50 ms. If it exceeds 50 ms, an EcF alarm is output.

7-7 Digital Operator and Operation Functions

This section describes the Digital Operator and other operation functions.

7-7-1 Soft Lock Function (SFT)

Use this function to protect various parameter settings against changes. This helps prevent data rewriting due to erroneous operation.

Allocate “19: SFT (soft lock)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).

Operation is performed as described below depending on the combination of Operator Protection Function Selection (F00) and SFT.

F00 data	Changes to parameter		Setting of various command values based on the Digital Operator operation
	Changes from the Digital Operator	Changes based on communication	
0	Possible	Possible	Possible
1	Not possible*1	Possible	Possible
2	Possible	Possible	Not possible
3	Not possible*1	Possible	Not possible

*1. While parameters cannot be changed from the Digital Operator, parameter F00 can be changed.

Combination of digital input SFT (soft lock) and Operator Protection Function Selection F00

Input signal SFT	Changes to parameter	
	Changes from the Digital Operator	Changes based on communication
OFF	Not possible	Possible
ON	According to F00	

SFT is a parameter change permission signal, and is not a function for protecting the frequency setting or PID command by key operation.

Parameter No.	Function name	Data	Default data	Unit
F00	Operator Protection Function Selection	0: Disable parameter protection, enable ∧ / ∨ keys 1: Enable parameter protection, enable ∧ / ∨ keys 2: Disable parameter protection, disable ∧ / ∨ keys 3: Enable parameter protection, disable ∧ / ∨ keys	0	-

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	19: SFT (soft lock)	-	-

7-7-2 Forced Operator Function (OPE)

If other than the Digital Operator is selected for 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) and 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102), use this function to forcibly enable the operations from the Digital Operator by turning the multifunction input terminal ON/OFF.

When “35: OPE (Forced operation function)” is allocated to the multifunction input terminal and turn the OPE terminal ON, it results in forcible frequency reference and RUN command from the Digital Operator. At this time, if F02 is 0, 2, 3, the operation direction follows F02. In other cases, the operation direction is forward. If canceled, the settings of F01/C30 and F02/E102 are followed.

If “54: RMT (Under remote mode)” is allocated to the output terminal, the signal turns OFF while the forced operation function is activated.
If input is performed simultaneously with the forced terminal block (162: F-TM), the forced operation function is given priority. Moreover, the forced operation function is given priority in the case of frequency reference than the multi-step speed reference.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	35: OPE (Forced operation function)	-	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	54: RMT (Under remote mode)	-	-
Related function		F01, C30, F02, E102		

7-7-3 Forced Terminal Block Function (F-TM)

If other than the control circuit terminal block is selected for 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) and 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102), use this function to forcibly enable the operations from the control circuit terminal block by turning the multifunction input terminal ON/OFF.

If “162: F-TM (Forced terminal block)” is selected for Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99), the operation is performed from the frequency reference source and run command source selected by 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) and 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102) if the F-TM terminal has been canceled, and the operation is performed

forcibly by the frequency reference and the RUN command from the control circuit terminal block if there is an input.
If switching is performed during operation, the RUN command is canceled and the inverter output stops. If operation is to be performed again, cancel the RUN command from each command destination to prevent any harm, and then input the RUN command again.

If input is performed simultaneously with the forced operation function (35: OPE), the forced operation function is given priority.
The frequency reference for the forced terminal block function is the frequency reference based on the analog input terminals [AI1] + [AI2] (AII).
The RUN command for the forced terminal block function is the FW terminal and the RV terminal allocated to multifunction input. If FW and RV are not allocated to the multifunction input terminal, it becomes impossible to perform operation.
The forced terminal block function is given priority in the case of frequency reference than the multi-step speed reference.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	162: F-TM (Forced terminal block)	-	-
Related function		F01, C30, F02, E102		

7-7-4 Operation at External Operator Disconnection

When the inverter detects a disconnection with the Digital Operator (the communication with the Digital Operator is paused for more than one second), the inverter operation becomes “Trip + Free run stop.”
Er2 occurs as the alarm during tripping.
The Digital Operator disconnection operation is enabled only if all of the following conditions are satisfied.

- The RUN command is the Digital Operator (F02 = 0, 2, 3)
- The inverter is running

7-7-5 Initial Screen Selection

LED Monitor (Item Selection)

This function makes it possible to select the monitor information of the operation status displayed on the Digital Operator LED.
For details, refer to the operation mode in *3-1-2 Key Operation Method* on page 3-3.

LED Monitor (Display when Stopped)

This function is used to select the monitor information that is displayed on the Digital Operator when the inverter is stopped. The set frequency is displayed in the case of E44 = 0 and the output frequency is displayed in the case of E44 = 1. The display format is that selected in speed monitor E48.

Parameter No.	Function name	Data	Default data	Unit
E44	Operator Display when Stopped Selection	0: Specified value 1: Output value	0	-

E48 data	Monitor selection	E44 = 0: Specified value	E44 = 1: Output value
0	Output frequency 1 (before slip compensation)	Set frequency	Output frequency 1 (before slip compensation)
1	Output frequency 2 (after slip compensation)	Set frequency	Output frequency 2 (after slip compensation)
2	Set frequency	Set frequency	Set frequency
3	Motor rotation speed	Motor speed set value	Rotation speed
4	Load shaft speed	Load shaft speed set value	Load shaft speed
5	Line speed	Line speed set value	Line speed
6	Transport time for specified length	Transport time set value for specified length	Transport time for specified length
7	Speed (%)	Speed set value	Speed

7-7-6 Password Function

This is a function for completely or partially obscuring the parameters set in the inverter.

Parameter No.	Function name	Data	Default data	Unit
H199	User Password 1 Setting	0: Disable 1: Protected	0	-
H197	User password 1 Mode selection	0: Display all, but prevent changes 1: Display and allow changes in quick-setup only 2: Do not use	0	-
H198	User Password 1 Setting/Verification	0000 to FFFF Hex	0	-
H99	Password 2 Setting/Verification	0000 to FFFF Hex	0	-

Password Protection

The set values of all parameters except a few can be protected by two types of passwords as rewriting prohibited. While password 1 enables the selection of the protection operation, password 2 is only for prohibiting the display and change of the set values of parameters.

In User password 1 Mode selection (H197), select the target parameter to be protected, and in User Password 1 Setting/Verification (H198), set the password (four digit in hexadecimal). Next, when 1 is set in User Password 1 Setting (H199), the parameter is protected by password 1 (protection against rewriting).

With password 2, the set value of all parameters can be protected against reading and rewriting regardless of the selection in User password 1 Mode selection (H197). (As an exception, some parameters are not protected.)
By setting a password in Password 2 Setting/Verification (H99) and setting 1 in User Password 1 Setting (H199), the parameter is protected by password 2 (protection against reading or writing).

As for parameters for which reading or writing is prohibited, it is not possible to write set values to the inverter by an external equipment using the Digital Operator or serial communication, and also to read the set values.

If a parameter is protected by password 1 and the same value as the password set in User Password 1 Setting/Verification (H198) is entered in H198, the password 1 protected state is temporarily canceled, and the set value of the parameter can be rewritten.
If password 2 is also set simultaneously, password 2 must be canceled beforehand in H99.

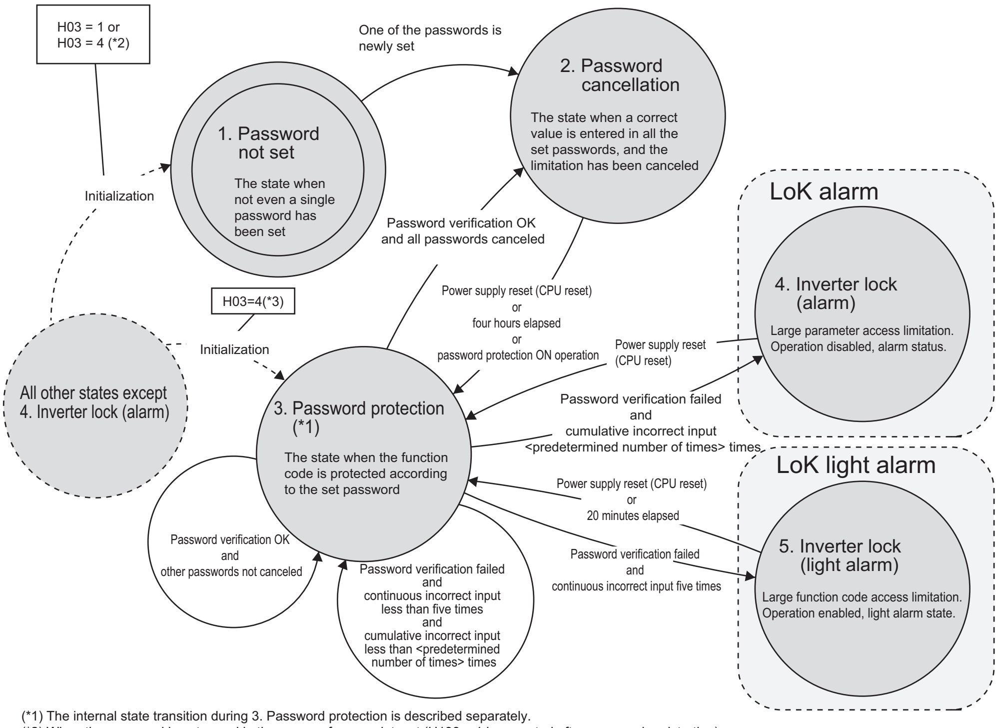
During the password 1 protected state or the password 2 protected state, if you enter the wrong value for the password in H198 or H99 when trying to temporarily cancel the protected state, you will not be able to temporarily cancel the protected state.
If an incorrect password is entered five times continuously in either H198 or H99, a light alarm LoK occurs.
When the LoK light alarm occurs, it is not possible to make an input in H198/H99. (The inverter can be operated)

Enabling/Disabling Conditions

The password is enabled when a value other than 0 is set in User Password 1 Setting/Verification (H198) and Password 2 Setting/Verification (H99).
From the viewpoint of ensuring security, to make sure that only the person who sets the password can change or delete it, a password cannot be disabled (password deletion) once it has been enabled.
Moreover, a password cannot be changed.
However, the password is deleted by initializing the inverter itself, and password protection is disabled.

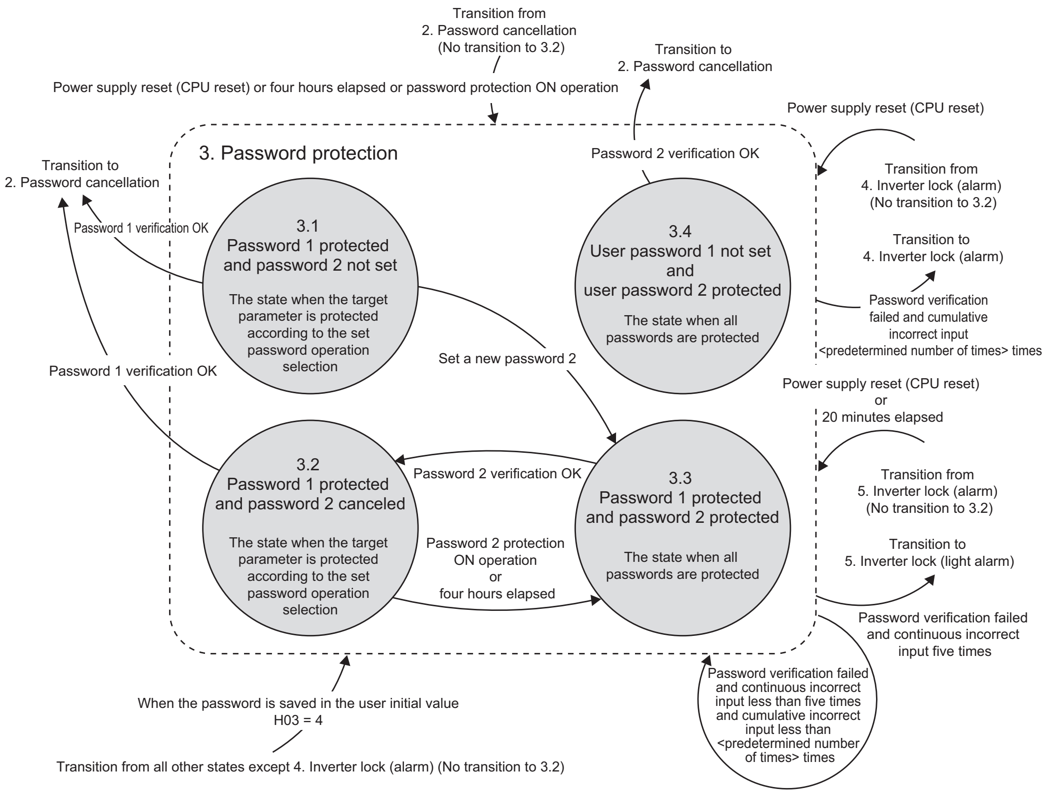
State Transition

The state transition based on password protection is as shown below.



(*1) The internal state transition during 3. Password protection is described separately.
(*2) When the password is not saved in the user preference dataset (H193 = 1 is executed after password registration).
(*3) When the password is saved in the user preference dataset (H193 = 1 is executed after password registration).

The internal state transition of the password protected state is as shown below.



7-7-7 Initial Screen Automatic Return

If the Digital Operator is not operated for five minutes, the display automatically changes to the initial screen.

7-7-8 User Parameter Setting Function

If the ↵ key is pressed and held during the display of a parameter, the parameter is registered in "user preferences," and to indicate that the parameter has been registered, the decimal LED of the uppermost digit lights up. If the same operation is performed one more time, the parameter is removed from "user preferences," and the decimal LED of the uppermost digit turns OFF.
If menu number 0 "User preferences: 0.Fnc" is selected in the program mode, the parameters registered in user preferences are displayed. There is no limit to the number of parameters that can be registered.

7-7-9 User Parameter Automatic Setting Function

If menu number 2 "Data check: 2.rEP" is selected in the program mode, the parameters that have changed from the default value are displayed. There is no limit to the number of parameters that can be displayed.

Since the display returns to the factory default state due to initialization of the entire data (H03 = 1), parameters may no longer be displayed in menu number 2 "Data check: 2.rEP," but can be displayed when parameters are changed again.

7-7-10 STOP Key Priority/Start Check Function

Combinations of the STOP key priority and start check functions can be selected.

H96 data	STOP key priority function	Start check function
0	Disable	Disable
1	Enable	Disable
2	Disable	Enable
3	Enable	Enable

STOP Key Priority Function

This function is for forcibly making a deceleration stop when the STOP key on the touch panel is pressed with RUN command applied on the terminal block or via communication. After the deceleration stop is made, "Er6" is displayed on the LED monitor.

Start Check Function

The start check function allows presence of the RUN command to be checked for safety sake in the following instances.

- When the power is turned ON
- When the PRG RESET key is pressed to clear an alarm or when a digital input alarm (error) reset "RS" is input
- When the means for setting the RUN command is switched

When a RUN command is already input at the following timing, the inverter is not operated and the Run operation error Er6 sub codes 2 to 6 are generated.
RUN command ON also includes the following instances where operation is not actually performed.

- FRS terminal (7: Free run stop) ON and RUN command ON
- ROK terminal (38: Permission of Run command) OFF and RUN command ON
- STO terminal status (EN terminal OFF) and RUN command ON
- FW terminal (98: Forward Run/Stop) ON and RV terminal (99: Reverse Run/Stop) ON

The sub codes of Run operation error Er6 that occurs by this function are as follows.

Sub code	Description
1	STOP key priority/forced stop (STOP terminal)
2	Start check function
3	Start check function (when operation is permitted)
4	Start check function (at a reset power ON)
5	Start check function (at power restoration when power is turned ON)
6	Start check function (Operator connect)
30	Prevention of power restoration restarting (USP terminal)

7-8 Functions Related to Protection, Warning and Various Output Signals

This section describes the protection functions such as warning signals.

7-8-1 Overload Limit/Overload Warning

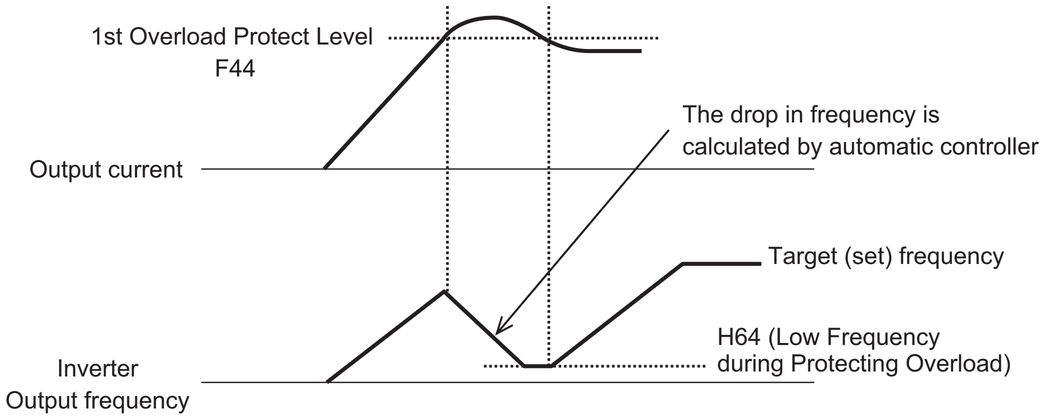
Overload Limit

If the output current of the inverter becomes equal to or above the operation level, the output frequency is operated to prevent the engine from stalling, and the output current is restricted by a limitation value based on the inverter rated current.
The current limitation function is enabled only in V/f control.
This function selects the operation in 1st Overload Protect Function Selection (F43)/2nd Overload Protect Function Selection (E146).
In 1st Overload Protect Level (F44)/2nd Overload Protect Level (E147), set an operation level with the inverter rated output current value as 100%.

If this function is operated while the inverter is accelerating, the acceleration time becomes longer than the set time.
The lower limit value of the frequency when the current limitation is operated can be set in Low Frequency during Protecting Overload (H64), but generally, there is no need to change the settings. Besides current limitation, H64 is also applicable to torque limitation and overload prevention control.

<table>
<tr><th>Parameter No.</th><th>Function name</th><th>Data</th><th>Default data</th><th>Unit</th></tr>
<tr><td>F43/E146</td><td>1st Overload Protect Function Selection/2nd Overload Protect Function Selection</td><td>0: Disable
1: Enable at constant speed
2: Enable during ACC/constant speed operation</td><td>2</td><td>-</td></tr>
<tr><td>F44</td><td>1st Overload Protect Level</td><td>20 to 200%
100% = Rated output current of inverter (Default: 180% for HHD mode and 130% for ND mode)</td><td rowspan="2">180</td><td rowspan="2">%</td></tr>
<tr><td>E147</td><td>2nd Overload Protect Level</td><td>20 to 200 %
The data is interpreted as the rated output current of the inverter for 100%.</td></tr>
<tr><td>H64</td><td>Low Frequency during Protecting Overload</td><td>0.0: Depends on Frequency Lower Limit(F16)
0.1 to 590.0 Hz</td><td>1.6</td><td>Hz</td></tr>
</table>

● **Example case where overload limit function is activated during acceleration (F43/E146 = 2)**



Overload Prevention Control

Set the rate of decline of the output frequency of overload prevention control. This function causes the inverter output frequency to drop before the cooling fin of the inverter overheats or an overload trip occurs (alarm 0H1 or 0LU), and thus prevents tripping. This function is applicable in equipment such as pumps where the load reduces with a drop in the output frequency, but it is necessary to continue with the operation even when the output frequency drops.
Allocating “36: OLP (Overload prevention control in progress)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27) activates overload prevention control and indicates that the output frequency changes, the signal “OLP” that turns ON during the overload prevention control is output.

Parameter No.	Function name	Data	Default data	Unit
H70	Overload Prevention Control	0.00: Depend on selected deceleration time 0.01 to 100.00 Hz/s 999: Cancel	999	Hz/s
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	36: OLP (Overload prevention control in progress)	-	-

Overload Warning

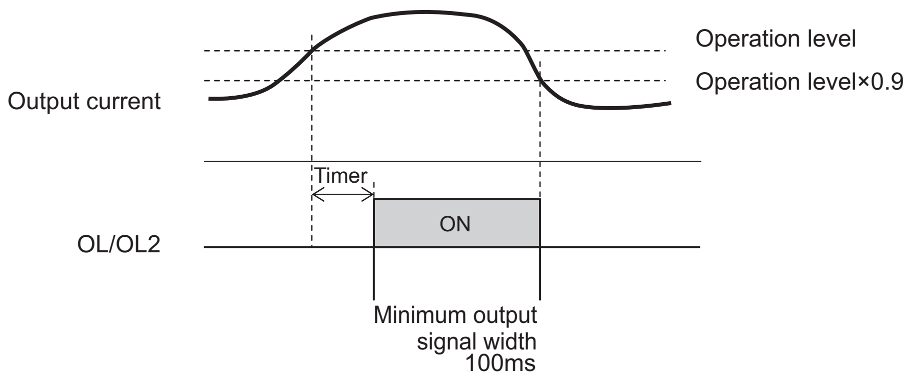
The overload warning function causes the inverter to output an overload warning if the load is too large, before it detects an overload trip.
This is useful to prevent mechanical damage to transfer machines, etc. due to overweighed loading, or stoppage of transfer lines due to an overload, through the use of the overload protection function of the inverter.

Allocate “38: OL (Overload warning)” or “37: OL2 (Overload warning 2)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27). (Two types of overload warning signals can be output.)
If using “38: OL (Overload warning),” use E37 and E38 when the 1st control is selected, and E55 and E56 when the 2nd control is selected for both the 1st and 2nd controls. If using “37: OL2 (Overload warning 2),” use E34 and E35.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	37: OL2 (Overload warning 2) 38: OL (Overload warning)	-	-
E34	Overload early warning 2 Level (OL2)	0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated inverter current.	21.00	A
E35	Overload early warning 2 Detection Timer (OL2)	0.01 to 600.00 s	10.00	s
E37	1st Overload Early Warning Detection Level	0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated inverter current.	21.00	A
E38	1st Overload Early Warning Detection Timer / Low Current detection level (OL, LOC)	0.01 to 600.00 s	10.00	s
E55	2nd Overload Warning Detection Level*1	0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated inverter current.	21.00	A
E56	2nd Overload Early Warning Detection Timer*1	0.00 to 600.00 s	10.00	s
E185	Overload Warning Detection Condition Selection (OL1, OL2)	0: Output during acceleration/ deceleration and constant-speed operation 1: Output only during constant-speed operation	1	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

Overload warning has a hysteresis characteristic of operation level ×10%. The minimum output signal width of the signal is 100 ms.



7-8-2 Overvoltage Suppression Function during Deceleration

- Use this function to avert overvoltage tripping caused by the regenerative energy from the motor during deceleration.
- The action of this function can be selected at Anti-regenerative Control Function Selection (H69). In the 3G3M1 Series, the default data is set to "0: Disable."
- The output frequency is controlled so that the braking torque is almost 0 (zero) when "2: Torque limit control with force-to-stop(Cancel limit control after three times of deceleration time has passed)" or "4: Torque limit control without force-to-stop" is selected at Anti-regenerative Control Function Selection (H69). (Enabled at acceleration, constant speed and deceleration)
- The output frequency is controlled so that the Main Circuit DC Voltage is lowered when it exceeds the limit level when "3: Main Circuit DC Voltage control with forced stop after three times deceleration time has passed" or "5: Main Circuit DC Voltage control without force-to-stop" is selected at Anti-regenerative Control Function Selection (H69). (Enabled at acceleration)
- The operation level can be adjusted when performing torque limit anti-regenerative control with H69 set to 2 or 4. Generally, there is no need for adjustment.
- This function is temporarily disabled when "82: AR-CCL" is set at multifunction input terminals and the AR-CCL terminal is turned ON.

Parameter No.	Function name	Data	Default data	Unit
H69	Anti-regenerative Control Function Selection	0: Disable 2: Torque limit control with forced stop after three times deceleration time has passed 3: Main Circuit DC Voltage control with forced stop after three times deceleration time has passed 4: Torque limit control without forced stop 5: Torque limit control without forced stop	0	-
H114	Anti-regenerative Control Level	0.0 to 50.0 999: Standard control level	999	%
H76	Frequency Rising Limit for Torque Limit	0.0 to 590.0 Hz	5.0	Hz
Related functions		E01 to E05, E98, E99		

- With the torque limit method, torque is limited by increasing the output frequency. Set the maximum increase amount of the output frequency to Frequency Rising Limit for Torque Limit (H76). The output frequency is limited by “set frequency + H76.” When the output frequency is limited, an overvoltage trip sometimes is generated as anti-regenerative control is limited. Anti-regenerative capability can be improved by setting a larger Frequency Rising Limit for Torque Limit (H76).
- When a forced stop at elapse of three times of the deceleration time has been set, anti-regenerative control is suspended and the motor is stopped when a time three times of the currently selected deceleration time elapses after the RUN command is turned OFF. Use this function when the load state causes the output frequency to rise by anti-regenerative control and the motor does not stop.

Precautions for Correct Use

- Anti-regenerative control sometimes increases the deceleration time.
- When the braking unit is connected, do not use anti-regenerative control. Anti-regenerative control sometimes acts simultaneously with operation of the braking unit and the deceleration time is not as set.
- When the deceleration time is too short, the Main Circuit DC Voltage of the inverter sometimes rises quickly and anti-regenerative control cannot keep up. In instances like this, set a longer deceleration time.

7-8-3 Instantaneous Overcurrent Limitation

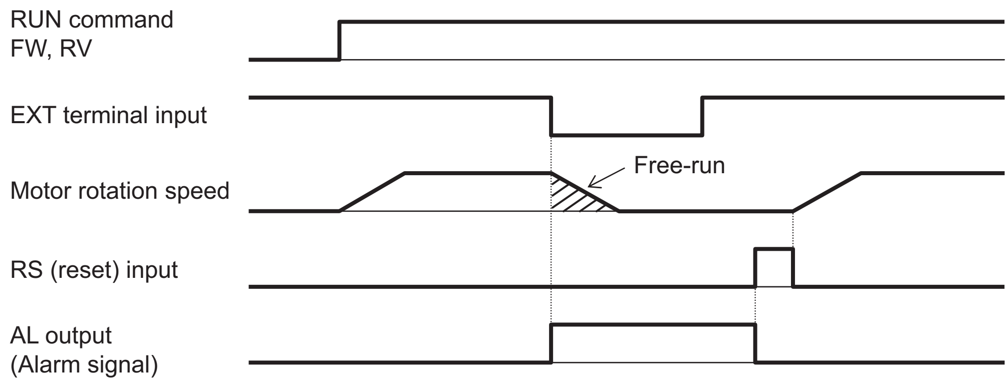
- This function is used to select whether to perform the current limitation process (a process where the inverter output is momentarily turned OFF to suppress an increase in the current, and the output frequency is operated) or overcurrent tripping when the output current of the inverter becomes equal to or above the instantaneous overcurrent limitation level.
- If the torque generated by the motor is temporarily reduced due to the current limitation process, and a failure occurs for the use of the equipment or machinery, it is necessary to perform overcurrent tripping and use a mechanical brake.
- The current limitation caused by 1st Overload Protect Function Selection (F43), 1st Overload Protect Level (F44) is a limitation based on software, because of which there may be an operation lag. If fast-responding current limitation is required, Instantaneous Overcurrent Limiting Function Selection (H12) can also be enabled together for a fast-responding current limitation.

Parameter No.	Function name	Data	Default data	Unit
H12	Instantaneous Overcurrent Limiting Function Selection	0: Disable 1: Enable	1	-

7-8-4 External Trip (EXT)

Use this signal to have the inverter trip via an error signal generated by a peripheral system. To do so, allocate “9: EXT (external trip)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
When the EXT terminal turns ON, the inverter trips with the alarm code 0H2 displayed and shuts off its output.
Once the inverter trips with the alarm code 0H2 displayed, the trip status will not be reset even if the error signal from external equipment is reset (the EXT terminal is turned ON).
In this case, perform the reset operation or cycle the power supply to reset the trip.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	9: EXT (external trip)	-	-



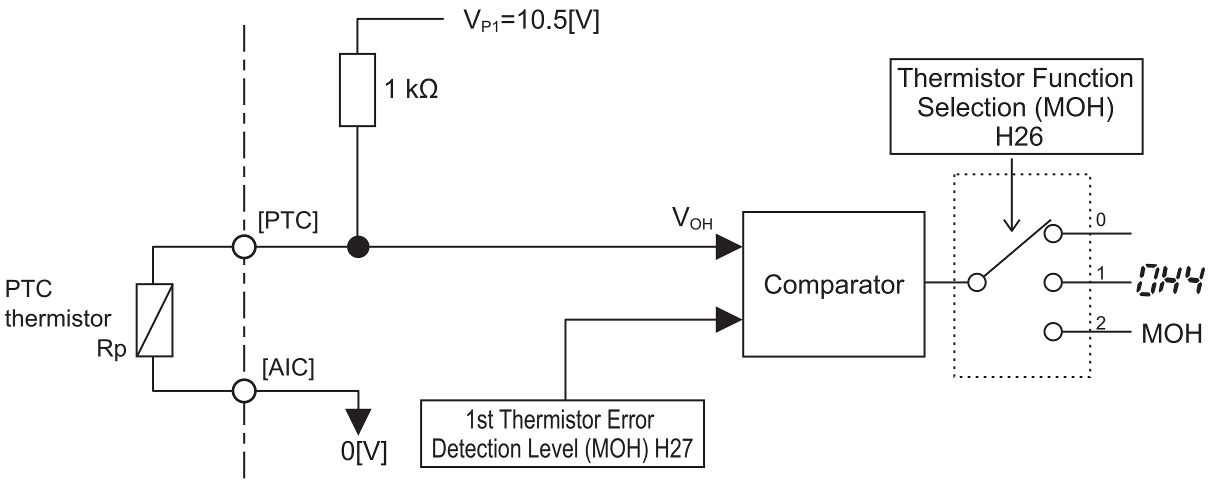
7-8-5 Thermistor Trip Function

You can provide thermal protection for external equipment such as a motor by connecting a thermistor installed on it to the inverter and enabling this function.

Connect a PTC thermistor between the terminal PTC and the terminal AIC. If, as a result of the resistance value of the connected PTC thermistor, the internal power supply is divided, and the voltage between the terminal PTC and the terminal AIC exceeds 1st Thermistor Error Detection Level (MOH) (H27), operation set in Thermistor Function Selection (MOH) (H26) is performed. If the resistance value of a PTC thermistor at the protection temperature is considered as Rp, the operation level V_{OH} is calculated by the formula below.

$$V_{OH} = \frac{R_p}{1000 + R_p} \times 10.5(V)$$

See below for the block part of the operation.



Parameter No.	Function name	Data	Default data	Unit
H26	Thermistor Function Selection (MOH)	0: Disable 1: The inverter immediately trips with OH4 displayed 2: The inverter issues output signal “MOH” and continues to run	0	-
H27	1st Thermistor Error Detection Level (MOH)	0.00 to 5.00	1.60	V
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	56: MOH (Thermistor detection)	-	-

7-8-6 Frequency Arrival Signal (FA1 to 5, FAR2, FAR3, FARFDT)

The inverter outputs the frequency arrival signal when the output frequency reaches the set level.

Allocate “1: FA1 (Constant speed arrival signal),” “2: FA2 (Over set frequency arrival),” “21: FAR2 (Speed arrival 2),” “31: FA4 (Over set frequency arrival 2),” “72: FAR3 (Frequency (speed) arrival 3),” “87: FARFDT (Frequency arrival detection),” “183: FA3 (Set-frequency only signal),” or “185: FA5 (Set-frequency only signal 2)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).

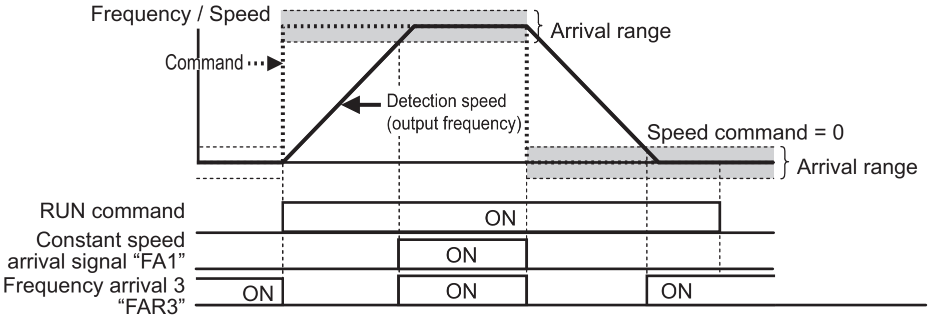
Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	1: FAR1 (Frequency arrival signal 1 (constant speed)) 2: FDT1 (Over set frequency arrival signal 1) 21: FAR2 (Frequency arrival signal 2) 31: FDT2 (Over set frequency arrival signal 2) 72: FAR3 (Frequency arrival signal 3) 87: FAR1FDT1 (Frequency match detection) 183: FDT3 (Set-frequency-only arrival signal) 185: FDT4 (Set-frequency-only arrival signal 2)	-	
E29	Frequency Arrival 2 ON Timer (FAR2)	0.01 to 10.00	0.10	s
E30	Frequency Arrival Detection Width (FAR1/FAR2/FAR3/FDT3/FDT4)	0.0 to 10.0	2.5	Hz
E31	Frequency Detection Level1 (FDT1/FDT3)	0.0 to 590.0	60.0	Hz
E32	Frequency Detection Hysteresis Width (FDT1/FDT2)	0.0 to 590.0	1.0	Hz

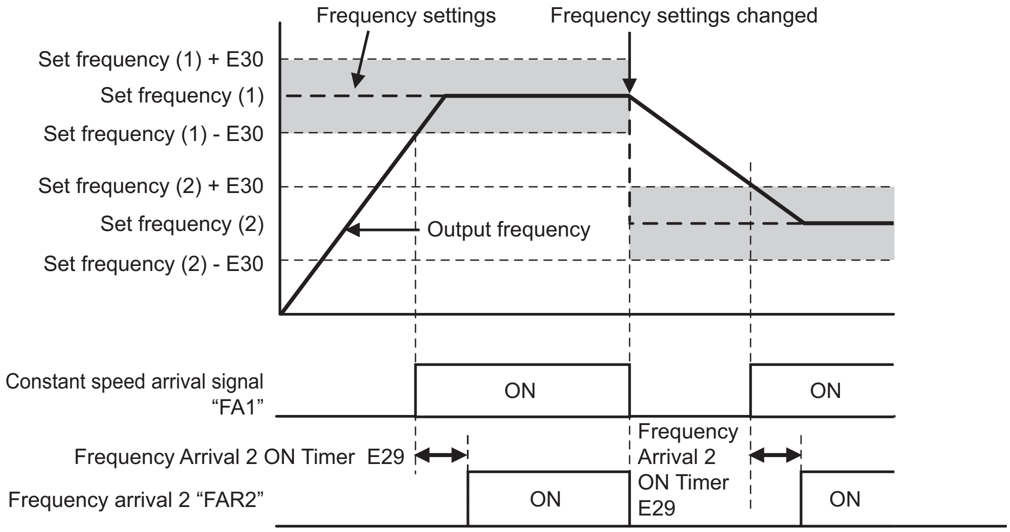
Parameter No.	Function name	Data	Default data	Unit
E36	Frequency Detection Level 2 (FDT2/FDT4)	0.0 to 590.0	60.0	Hz

Frequency (Speed) Arrival Signal (E20, E21, E27 = 1: FA1, 21: FAR2, 72: FAR3)

The signal is turned ON/OFF under the following conditions.

Output signal	E20, E21, E27 allocated data	Operation condition 1	Operation condition 2
FA1	1	An ON signal is output when the difference between the output frequency (speed detection value) and the set frequency (speed command) is within the frequency arrival range.	The signal is always OFF when the RUN command is OFF or the speed command is 0.
FAR3	72		An ON signal is output when the output frequency is within 0 ± frequency arrival detection range while the speed command is considered to be 0 with the RUN command is OFF.
FAR2	21	An ON signal is output when the difference between the output frequency command value (before torque limitation, current limitation) and the set frequency (speed command) is within the frequency arrival range.	The signal is always OFF when the RUN command is OFF or the speed command is 0. A delay can be set by E29.

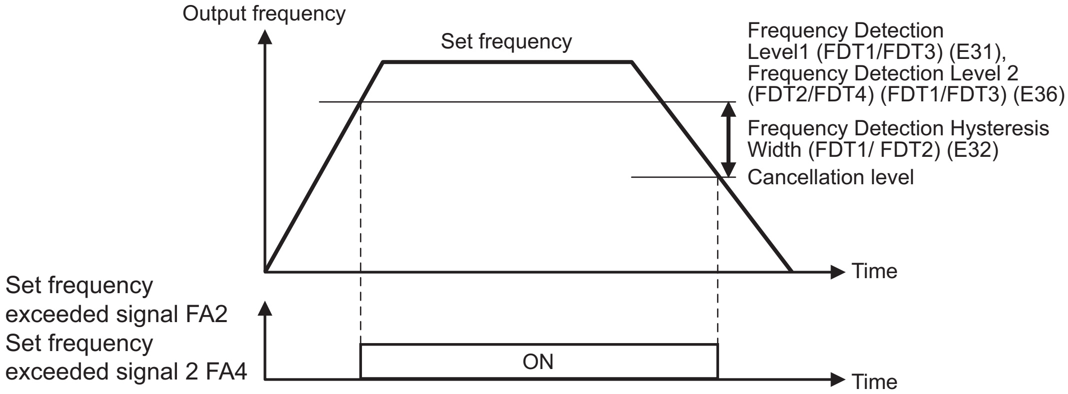




Set Frequency Exceeded Signal (E20, E21, E27 = 2: FA2, 31: FA4)

An ON signal is output when the output frequency becomes equal to or higher than the operation level (E31/E36) set in the frequency detection, and the signal is turned OFF when the frequency falls below Frequency Detection Hysteresis Width (FDT1/ FDT2) (E32).

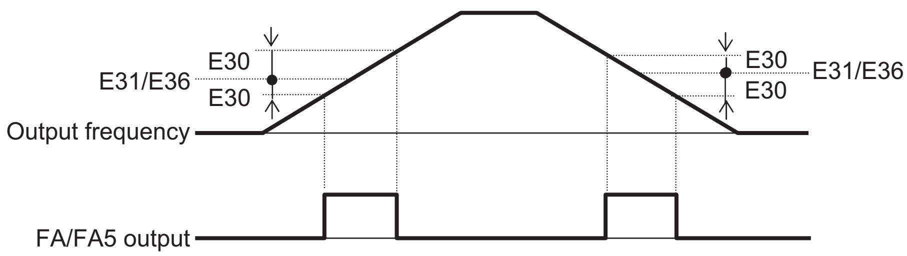
Name	Output signal	E20, E21, E27 allocated data	Operation level Range: 0.0 to 500.0 Hz	Hysteresis width Range: 0.0 to 500.0 Hz
Set frequency exceeded signal	FA2	2	E31	E32
Set frequency exceeded signal 2	FA4	31	E36	E32



Set-frequency Only Signal (E20, E21, E27 = 183: FA3, 185: FA5)

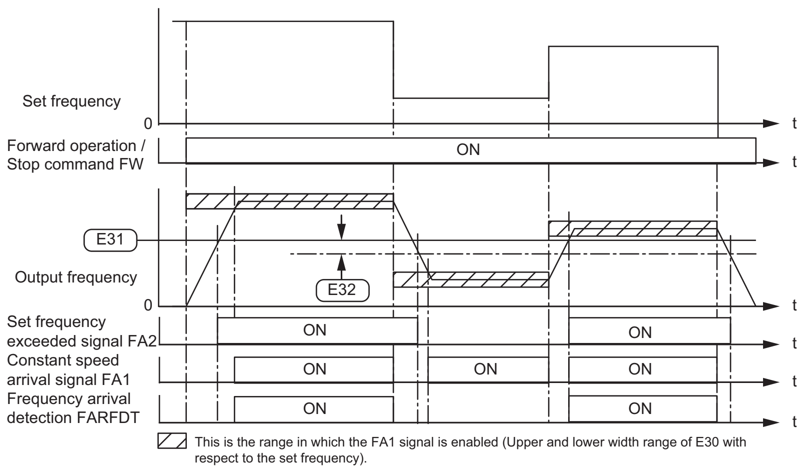
An ON signal is output when the output frequency is within the range of the operation level (E31/E36) set in the frequency detection, and the signal is turned OFF when the frequency is out of range.

Name	Output signal	E20, E21, E27 allocated data	Operation level	Frequency arrival detection width
			Range: 0.0 to 500.0 Hz	Range: 0.0 to 10.0 Hz
Set-frequency only signal	FA3	183	E31	E30
Set-frequency only signal 2	FA5	185	E36	E30



Frequency Arrival Detection (E20, E21, E27 = 87: FARFDT)

This is an AND composite signal of FA1 and FA2, which turns ON when both the conditions are established.



7-8-7 RUN Time/Power ON Time Over (RNT/ONT)

If the total RUN time or power ON time of the inverter exceeds the time set in RUN Time Over (RNT)/ Power ON Time Over (ONT) Detection Level (E154), the inverter will output the RUN Time/Power ON Time Over (RNT/ONT) signal.

Parameter No.	Function name	Data	Default data	Unit
E154	RUN Time Over (RNT)/ Power ON Time Over (ONT) Detection Level	0: Function disabled 1 to 9999 [x10h] (10 to 99.990 hours)	0	10 hex
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection (E27)	237: RNT (RUN time elapsed) 236: ONT (Power ON time over)	-	-

RUN Time Over (E20, E21, E27 = 237: RNT)

Allocate “237: RNT (RUN time elapsed)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27). Set RUN Time Over (RNT)/Power ON Time Over (ONT) Detection Level (E154).

Power ON Time Over (E20, E21, E27 = 236: ONT)

Allocate “236: ONT (Power ON time over)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27). Set RUN Time Over (RNT)/Power ON Time Over (ONT) Detection Level (E154).

7-8-8 Maintenance monitor

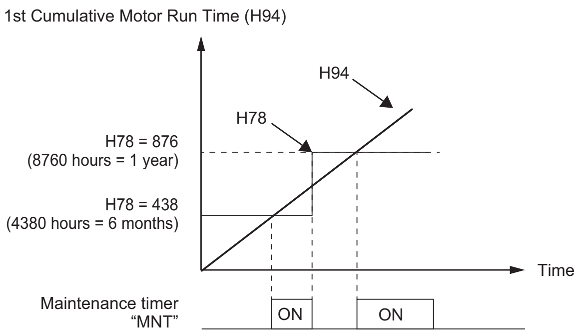
The maintenance timer (MNT) signal is output when the cumulative operation time for motor 1 exceeds the preset time, or when the number of startups for motor 1 exceeds the preset number of times.

Parameter No.	Function name	Data	Default data	Unit
H78	1st Motor Maintenance Interval	0: Disable 1 to 9999: Maintenance interval (in 10 hours)	8760	Time
H94/A51	1st Cumulative Motor Run Time/2nd Cumulative Motor Run Time	0 to 9999 (Counted automatically as the operation time elapses)	0	Time
H79	1st Preset Startup Count for Motor Maintenance	0: Disable 1 to 65535: Preset startup count for maintenance	0	Times
H44/A52	1st Startup Count for Motor/2nd Startup Counter for Motor	0 to 65535 (Counted automatically during startup)	0	Times
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	84: MNT (Maintenance timer)	-	-

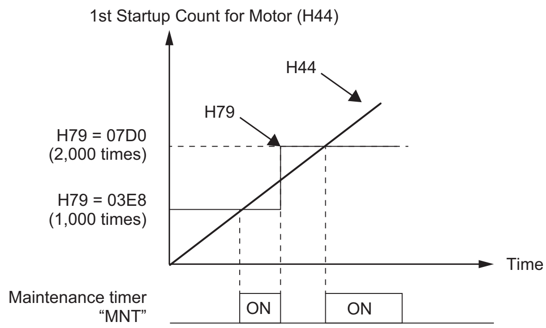
Maintenance Timer (E20, E21, E27 = 84: MNT)

Allocate “84: MNT (Maintenance timer)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).
The signal is output when 1st Startup Count for Motor (H44) reaches the value set in 1st Preset Start-up Count for Motor Maintenance (H79), or 1st Cumulative Motor Run Time (H94) reaches the value set in 1st Motor Maintenance Interval (H78).
This function is exclusively for the 1st control. The maintenance timer signal is not output even if 2nd Cumulative Motor Run Time (A51)/2nd Startup Counter for Motor (A52) exceeds the set time period or set number of times.

<For half-yearly maintenance>



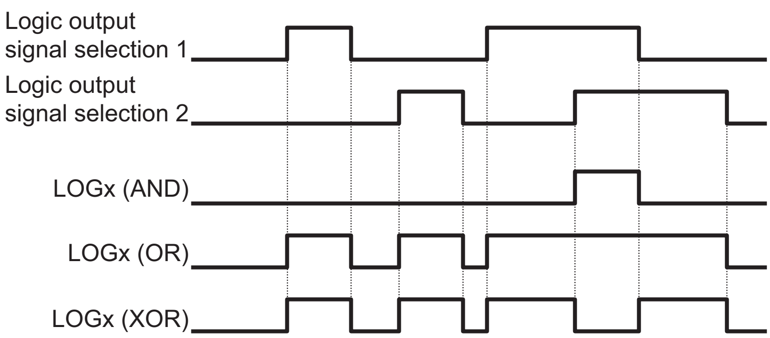
<For maintenance performed every 1,000 times>



When the maintenance time is reached, or when the set number of startups for maintenance is reached, again set a numeric value in H78 or H79, and press the Enter key to reset the output signal, and restart the measurement of the time period or the number of startups.

7-8-9 Logic Operation Output Signal (LOG1 to LOG3)

Use these signals to have the inverter internally perform logical operations with output signals. Set “206: LOG1 (Logic operation output 1),” “207: LOG2 (Logic operation output 2),” or “208: LOG3 (Logic operation output 3)” in Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27). The logic output signal selection parameters cannot be set to “27: OPO (Option)” or “206 to 208: LOG1 to LOG3 (Logical operation output 1 to 3)”.
Three operators, AND, OR and XOR, are available.

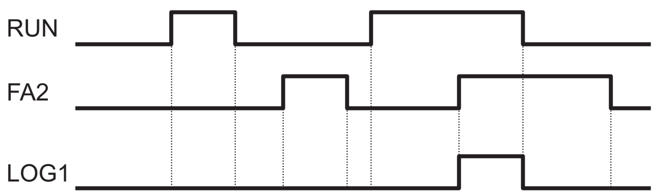


Each logic operation output signal requires different parameter settings.
Set the necessary parameters according to the table below.

Selected signal	Logic output signal selection 1	Logic output signal selection 2	Operator selection
206: Logic operation output 1 (LOG1)	H315	H316	H317
207: Logic operation output 2 (LOG2)	H318	H319	H320
208: Logic operation output 3 (LOG3)	H321	H322	H323

(Example) To output the result of the AND operation between RUN (0: Signal during RUN) and FA2 (2: Set frequency exceeded signal) to the multifunction output terminal DO2 as a logic operation output 1 (LOG1) terminal.

Output Terminal [DO2] Function Selection (E21) : 206 (LOG1)
Logical Expression 1 Operation Target 1 (H315) : 0 (RUN)
Logical Expression 1 Operation Target 2 (H316) : 2 (FA2)
Logical Expression 1 Logical Operator (H317) : 0 (AND)



Parameter No.	Function name	Data	Default data	Unit
H315 H318 H321	Logical Expression 1 Operation Target 1 Logical Expression 2 Operation Target 1 Logical Expression 3 Operation Target 1	0 to 241: Same as the options for E20 (Except 206 to 208: LOG1 to LOG3, 27: OPO)	0	-
H316 H319 H322	Logical Expression 1 Operation Target 2 Logical Expression 2 Operation Target 2 Logical Expression 3 Operation Target 2		0	-
H317 H320 H323	Logical Expression 1 Logical Operator Logical Expression 2 Logical Operator Logical Expression 3 Logical Operator	0: AND 1: OR 2: XOR	0	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	206: LOG1 (Logic operation output 1) 207: LOG2 (Logic operation output 2) 208: LOG3 (Logic operation output 3)	-	-

7-8-10 Capacitor Life Warning Signal (WAC)

Use this signal to determine the life expectancy of the capacitor on the printed circuit board based on the inverter's internal temperature, conduction time, and the capacity of the capacitor.
By turning H98 bit 4 ON, the service life of the capacitor is judged to have reached its end when any one of the following conditions is satisfied, and WAC (Capacitor life warning signal) is turned ON.

- The capacity of the capacitor becomes 85% or below the factory default value.
- The conduction time exceeds 61,000 hours (7 years) in all models of the HND mode "A2022/037, A4022/040, AB002-022" and ND mode.
- The conduction time exceeds 87,000 hours (10 years) in models other than the above.

The capacity of the capacitor can be monitored by "Main circuit capacitor's capacity monitor (Monitor mode: 5_05)," and the conduction time by "Service life of DC link bus capacitor (Elapsed time) (Monitor mode: 5_26)."
This function is set based on *A-2 Smoothing Capacitor Life Curve* on page A-6.
The time until the service life of the main circuit capacitor is reached (in 10 hours) is displayed in Service Life of Main Circuit Capacitor Remaining Time (H77).

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	240: WAC (Capacitor life warning signal)	-	-

Method for Comparing the Main Circuit Capacitor's Capacity and the Default Value during Shipment from Factory

When bit 3 = 0 in H98, follow the measurement procedure below to measure the capacitance of the main circuit capacitor when the power supply is cut off, and compare the value with the default value at the time of shipment from the factory. The measurement result is displayed as a percentage (%) with respect to the default value at the time of shipment from the factory.

Capacity measurement procedure

1. To compare with the default value measured at the time of shipment from the factory, return the state of the actual product to the state during shipment from the factory.
   - If another inverter is connected to the main circuit terminals P(+) and N(-) via a DC bus line, disconnect it. A DC reactor (option), even if connected, need not be removed.
   - Remove the wires of the control power auxiliary inputs (R0, T0).
   - Turn OFF all digital inputs (DI1 to DI7) of the control circuit terminals.
   - Make the setting to ensure that the transistor output (DO1, DO2) and relay output (ROA/B/C) do not turn ON.
   - Stop the RS-485 communications of the inverter.
     If the setting is made to perform logical inversion of the transistor output and relay output, the output turns ON even when the inverter is not running. In such a case, change the setting.
   - Ensure an ambient temperature of 25°C±10°C.

2. Turn ON the main power supply.
3. Make sure the cooling fan is operating and the inverter is in a stopped state.
4. Cut off the main power supply.
5. The measurement of the capacity of the main circuit capacitor starts automatically. Make sure the display on the LED monitor is "____."
   If "____" is not displayed on the LED monitor, the measurement is not started. Check the conditions in (1).
6. Once the display on the LED monitor is cleared, again turn ON the main power supply.
7. Move to menu number 5 "Maintenance Information" in the program mode, and check the percentage (%) of capacitance of the main circuit capacitor.

Method of Measuring the Capacity of the Main Circuit Capacitor when Power Supply is Cut Off during Normal Operation

The capacity of the main circuit capacitor in the normal operation state is measured automatically when the power supply is cut off, if bit 3 = 1 in H98. To perform this measurement, it is necessary to measure the reference capacitor capacity according to the measurement procedure below.

Parameter No.	Function name	Description
H42	Main Circuit Capacitor Service Life Coefficient (Measurement Value)	• Measurement value when the capacity of the main circuit capacitor is measured • Start the default value measurement mode during normal operation (0000) • Measurement failure (0001)
H47	Main Circuit Capacitor Service Life Coefficient (Initial Value)	• Default value of the main circuit capacitor • Start the default value measurement mode during normal operation (0000) • Measurement failure (0001)

When a part is replaced, it is necessary to clear or replace the data in H42 and H47.

Reference capacity measurement procedure

1. Change Protection/Maintenance Function Mode Selection (H98) to user measured value reference (bit 3 = 1).
2. Stop the inverter.
3. Set the inverter to a state when the power supply is cut off during normal operation.
4. Set Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42) and Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47) to 0000, respectively.
5. Cut off the power supply to the inverter (the operation described below is executed automatically when the power is cut off).
   Measure the discharge time of the main circuit capacitor and save it to Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47).
   The measurement conditions for main circuit capacitor are detected automatically, and the conditions are saved.
   The LED during measurement displays "____."

6. Turn ON the inverter power supply again.
   Make sure Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42) and Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47) are correct.
   Move to menu number 5 “Maintenance Information” in the program mode, and make sure the percentage (%) of capacitance of the main circuit capacitor is 100%.
   If measurement fails, 0001 is set respectively in Main Circuit Capacitor Service Life Coefficient (Measurement Value) (H42) and Main Circuit Capacitor Service Life Coefficient (Initial Value) (H47). Remove the cause of the failure and perform measurement again.

If the conditions described above are satisfied when the power supply is cut off the next time, the discharge time of the main circuit capacitor is measured automatically. Periodically move to menu number 5 “Maintenance Information” in the program mode, and check the percentage (%) of capacitance of the main circuit capacitor.

Braking Transistor Error (DBAL)

When bit 6 = 1 in H98, an error in the built-in braking transistor is detected, the inverter is topped, and the alarm dba is displayed.
When bit 6 = 0 in H98, the braking transistor is not used and an alarm does not occur.

Bit	Function	Data	Default data
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	105: DBAL (Braking transistor error)	-

7-8-11 Cooling FAN Control Method Selection

This signal is used to monitor the internal temperature of the cooling fan when the inverter has stopped so as to increase the life and reduce the noise from the cooling fan, and stops the cooling fan when the temperature falls below a fixed value.
In Cooling Fan Function Selection (H06), you can select whether to operate the cooling fan at all times or perform ON/OFF control.

If “25: FAN (Cooling fan ON/OFF control)” is allocated to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27), it is possible to output an ON signal when the cooling fan ON/OFF control is enabled (H06 = 1) and during the cooling fan operation, and output an OFF signal when the cooling fan has stopped. Based on this signal, the cooling system of the peripheral equipment can be linked and ON/OFF control can be performed.

Parameter No.	Function name	Data	Default data	Unit
H06	Cooling Fan Function Selection	0: Disable (Alway Fan ON) 1: Enable (ON/OFF control effective)	0	-

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	25: FAN (Cooling fan ON/OFF control)	-	-

7-8-12 Cooling Fan Life Warning Signal (WAF)

The number of hours of operation of the cooling fan is counted. The cooling fan is judged to have reached the end of its life when it exceeds 87,000 hours (10 years) of operation, and WAF (Cooling fan life warning signal) is turned ON. Allocate “241: WAF (Cooling fan life warning signal)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).

The operation time of the cooling fan can be monitored by “Cooling fan cumulative run time monitor (Monitor mode: 5_07).”
The operation time can be cleared in Cumulative Run Time of Cooling Fan (H43), but this may cause the cooling fan life warning signal to operate abnormally. Therefore, do not clear the cumulative operation time other than when the cooling fan is replaced.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	241: WAF (Cooling fan life warning signal)	-	-
H43	Cumulative Run Time of Cooling Fan	0 to 9999 (in 10 hours)	0	10 hex

7-8-13 Life Warning (LIFE)

In addition to the main circuit capacitor and the cooling fan, if any of the capacitors on the printed circuit board exceeds the life judgment standard, the LIFE (Life warning) signal is turned ON. Allocate “30: LIFE (Life warning)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).

The capacitors on the printed circuit board are judged to have reached the end of life when the operation time exceeds 87,600 hours (10 years).
The operation time can be cleared in Cumulative Run Time of Capacitors on Printed Circuit Boards (H48), but because of this, life warning may not operate normally. Therefore, do not clear the cumulative operation time other than when a capacitor is replaced.

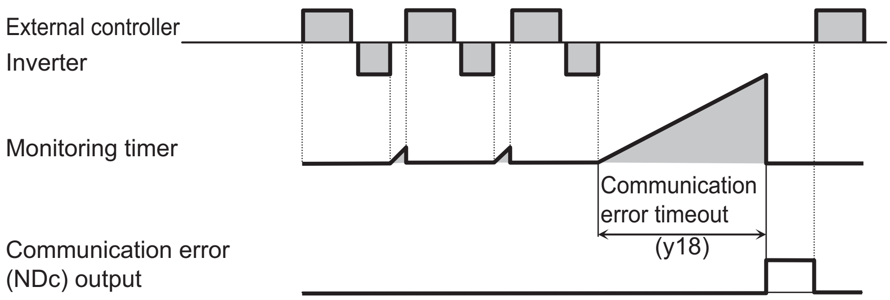
Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	30: LIFE (Life warning)	-	-
H48	Cumulative Run Time of Capacitors on Printed Circuit Boards	0 to 9999 (in 10 hours)	0	10 hex

7-8-14 Communications Disconnection Detection Signal (NDc)

This signal is enabled only when Modbus communication is selected for RS-485 communications.
If a reception timeout error occurs, this signal will be output until the next data is received.
Set the time until the reception timeout in RS-485 Communication Timeout Time (y18).
The disconnection detection timer starts under the following AND conditions.

- The communication protocol setting is Modbus-RTU.
- Either operation or frequency is authorized in communications.
- A RUN command is present.
- The setting of the disconnection detection time is enabled.

For details, refer to *Section 8 Communications Functions* on page 8-1.



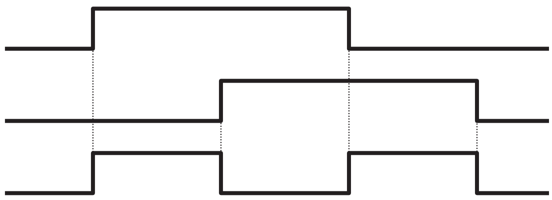
Parameter No.	Function name	Data	Default data	Unit
y18	RS-485 Communication Timeout Time	0: Not check of the time-out (OFF) 1 to 60	0	s
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	209: NDc (Communications disconnection detection)	-	-

7-8-15 Starting Contact Signal (FR)

The starting contact signal will be output while the inverter is ready to accept the RUN command.
The signal is output regardless of the setting of 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102).

The inverter will stop if the FW and RV signals are input simultaneously.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	187: FR (Starting contact signal)	-	-



7-8-16 Cooling Fin Overheat Warning (OHF)

This function monitors the temperature of the cooling fin located inside the inverter and turns the cooling fin overheat warning signal ON/OFF according to the conditions below.

- When the cooling fin overheat warning signal is OFF
  The cooling fin overheat warning signal turns ON when the cooling fin temperature is overheat trip temperature - 5°C or above.

- When the cooling fin overheat warning signal is ON
  The cooling fin overheat warning signal turns OFF when the cooling fin temperature is overheat trip temperature - 8°C or below.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	28: OHF (Cooling fin overheat warning)	-	-

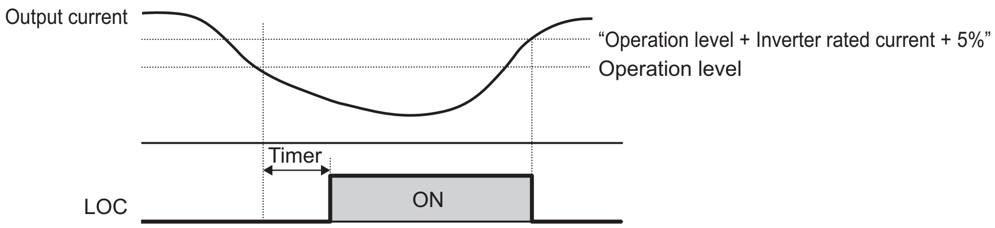
7-8-17 Low Current Signal (LOC)

This signal is output when the output current falls to or below 1st Overload Early Warning Detection Level (E37).
In Low Current Detection Condition Selection (LOC) (E184), select whether to have the inverter output this signal constantly during run or only during constant speed operation.

Parameter No.	Function name	Data	Default data	Unit
E37	1st Overload Early Warning Detection Level	0.00 ; 0.01 to 176.0 0.00 : Disable 0.01 to 176.0 A * Setting range from 1%(HHD) to 200%(ND) of the rated inverter current.	21.00	A

Parameter No.	Function name	Data	Default data	Unit
E38	1st Overload Early Warning Detection Timer / Low Current detection level (OL, LOC)	0.01 to 600.00 s	10.00	s
E184	Low Current Detection Condition Selection (LOC)	0: Output during acceleration/deceleration and constant-speed operation 1: Output only during constant-speed operation	1	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	41: LOC (Low current signal)	-	-

*1. If analog input (F01/C30 = 1, 2, 3, 5) is selected for 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30), the signal may not be judged as a constant speed depending on the sampling condition. In this case, set E184 = 0 (Output during acceleration/deceleration and constant-speed operation), or increase the value set in the Input Terminal [AI1] Filter (C33).



7-8-18 Window Comparator/Disconnection Detection (AI1Dc/AIIDc/AIVDc)

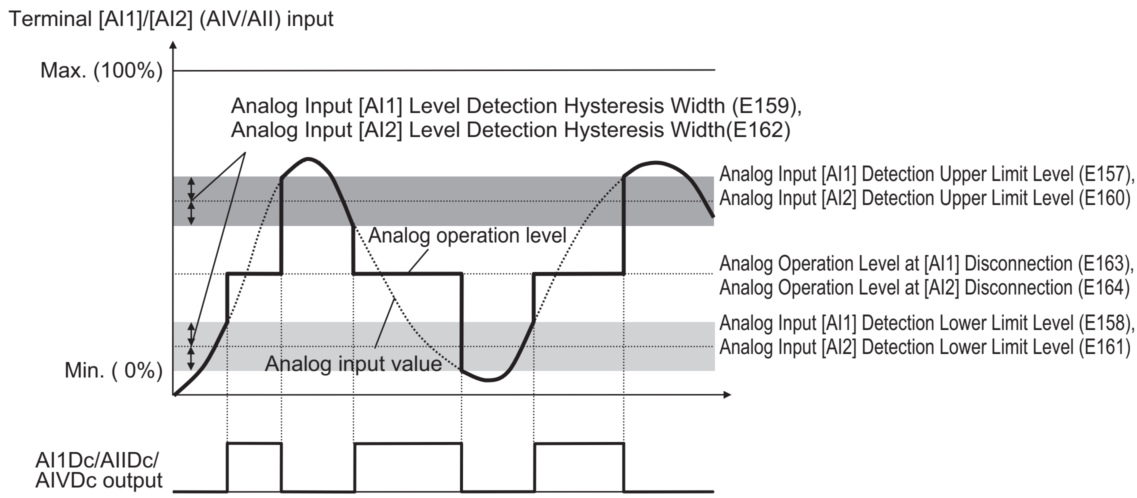
The window comparator signal is output when the input value of the analog input terminals [AI1], [AI2] (AII) and [AI2] (AIV) is between the upper and lower limit level of the window comparator. It is useful for monitoring the analog input at a level to detect disconnection or other faults.

The hysteresis width can be set for the upper and lower limit level settings for the window comparator function.
In addition to the hysteresis width, the upper and lower limit levels can be set individually for each of the terminals [AI1] and [AI2] (AII/AIV).
The analog operation level during AI1Dc/AIIDc/AIVDc output can be set to a fixed value. To do so, set a value in Analog Operation Level at [AI1] Disconnection (E163)/Analog Operation Level at [AI2] Disconnection (E164). When set to 999, the analog input value will be used as is.

Parameter No.	Function name	Data range	Default data	Unit
E157	Analog Input [AI1] Detection Upper Limit Level	0 to 100%	-	%
E160	Analog Input [AI2] Detection Upper Limit Level			

Parameter No.	Function name	Data range	Default data	Unit
E158	Analog Input [AI1] Detection Lower Limit Level	0 to 100%	-	%
E161	Analog Input [AI2] Detection Lower Limit Level			
E159	Analog Input [AI1] Level Detection Hysteresis Width	0 to 100%	-	%
E162	Analog Input [AI2] Level Detection Hysteresis Width			
E163	Analog Operation Level at [AI1] Disconnection	-100 to 100, 999: Inactive	999	-
E164	Analog Operation Level at [AI2] Disconnection	0 to 100 999: Inactive		
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	238: AI1Dc (Analog AI1 disconnection detection / Window comparator) 59: AIIDc (Analog AI2 (AII) disconnection detection / Window comparator) 239: AIVDc (Analog AI2 (AIV) disconnection detection / Window comparator)	-	-

Note Set the upper and lower limit level settings for the window comparator function as a percentage [%] of the input voltage (10 V) or current (20 mA) rather than making the start and end settings for each analog input.



7-8-19 Frequency Reference Selection Status Signal (FREF)

This signal is output when the frequency reference is input via the Digital Operator (F01/C30 = 0, 8), or when the forced operator function (35: OPE) is allocated.

The signal is OFF when the frequency reference is input via other than the Digital Operator.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	188: FREF (Frequency reference operator)	-	-

7-8-20 RUN Command Status Signal (REF)

This signal is output when the RUN command is input via the Digital Operator (F02/E102=0, 2, 3), or when the forced operator function (35: OPE) is allocated.
The signal is OFF when the RUN command is input via other than the Digital Operator.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	8: REF (RUN command operator)	-	-

7-8-21 2nd Control Selection Signal (SETM)

This signal is output when the SET terminal of multifunction input terminal is ON and the 2nd control (2nd motor) has been selected. If the SET terminal is OFF and the 1st control (1st motor) has been selected, the SWM1 signal is output.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	48: SWM1 (1st control under selection) 49: SETM (2nd control under selection)	-	-

7-8-22 Inverter Output Limited (IOL)

This signal is output when the inverter is performing the limitation operations described below. (Minimum output signal width 100 ms)
The signal is output when the limitation operation in “22: IOL2 (Inverter output limited (with delay))” continues for 20 ms or longer.

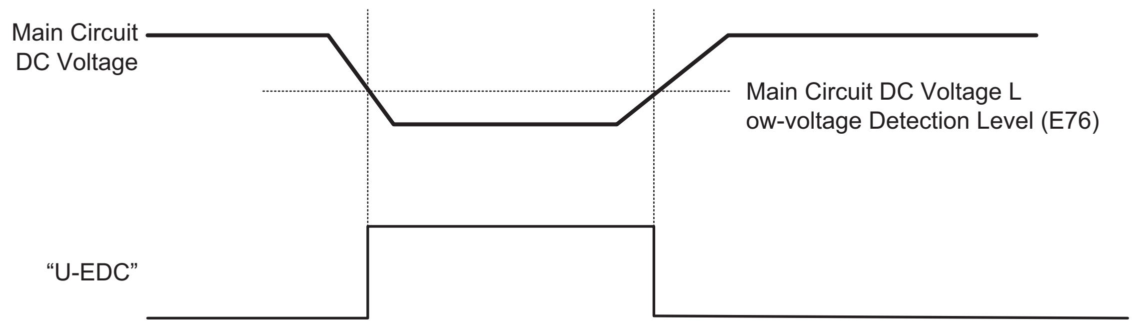
- Torque limitation operation (F40, F41, E16, E17, internal maximum value)
- Current limitation operation by software (F43, F44)
- Current limitation operation by hardware (H12 = 1)
- Anti-regenerative control (H69)
- Overload stop function (J65)

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	5: IOL (Inverter output limited) 22: IOL2 (Inverter output limited (with delay))	-	-

7-8-23 Low-To-Moderate Voltage Detection (U-EDC)

This signal turns ON when the Main Circuit DC Voltage becomes equal to or below Main Circuit DC Voltage low-voltage detection level (E76), and turns OFF when it becomes above the Main Circuit DC Voltage low-voltage detection level (E76).

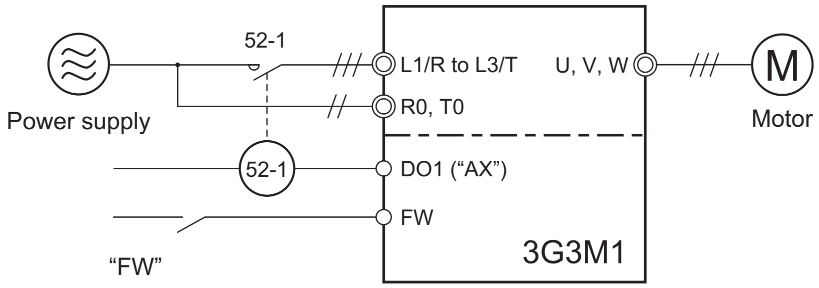
Parameter No.	Function name	Data	Default data	Unit
E76	Main Circuit DC Voltage Low-voltage Detection Level	200 to 400 V (200 V series) 400 to 800 V (200 V series)	235	V
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	77: U-EDC (Low-to-moderate voltage detection)	-	-

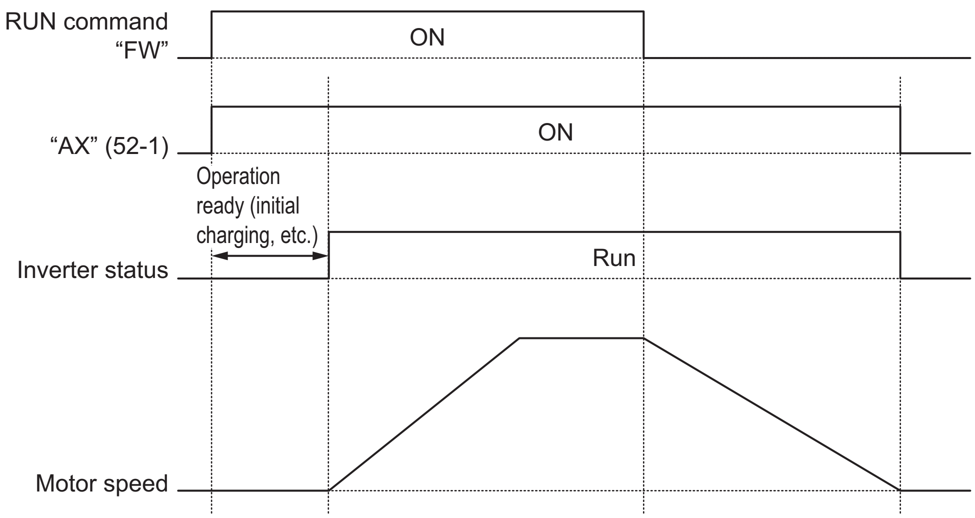


7-8-24 AX Terminal Function (AX)

This function is used to control the electromagnetic contactor at the inverter input side in association with the RUN command. It turns ON when the RUN command is input. When the stop command is input, this function turns OFF after the inverter undergoes a deceleration stop. This function turns OFF momentarily when the free run command is input and an alarm is generated.
“AX” can be selected at a capacity of 18.5 kW or more of auxiliary power supply.

Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	15: AX terminal function (for inverter input-side electromagnetic contactor)	-	-





7-8-25 Light Alarm Selection

When various error states are detected, this function displays a light alarm (see the codes in the table below) on the LED monitor for light errors, and enables continuation of operation without tripping the inverter. The contents of the light alarm can be selected in Light Alarm Selection 1 (H81)/Light Alarm Selection 2 (H82).

Parameter No.	Function name	Data	Default data	Unit
H81	Light Alarm Selection 1	0 to FFFF	0	-
H82	Light Alarm Selection 2	0 to FFFF	0	-

The causes of the alarm to be selected are as shown below.

Code	Name	Overview
OH1	Cooling fin overheating	The cooling fin temperature has risen to the trip level.
OH2	External trip	An error has occurred in a peripheral equipment, and the external trip “EXT” signal has turned ON.
OH3	Inverter internal overheating	The internal temperature of the inverter has risen abnormally.
OH6	Inrush current prevention resistor overheat	The temperature of the inrush current prevention resistor has risen abnormally due to frequently turning the power supply ON/OFF.
dbH	Braking resistor overheating	The estimated temperature of the braking resistor coil has risen above the permissible temperature.
OL1 to OL2	Motor 1, 2 overload	The motor temperature is calculated from the output current of the inverter, and the motor temperature has reached the trip level.
Er4	Option communications error	Communications error between the inverter and option
Er5	Option error	An error judged in an option
ErP	RS-485 communications error	An error in RS-485 communications
ErE	Speed mismatch (Excessive speed deviation)	The deviation in the speed adjuster (deviation between the speed command and speed estimated value/detected speed) continued for more than the set time (d22) outside the set range (d21).
Ero	Positioning error	During synchronous control, the position deviation exceeded the specified value.
CoF	Current input disconnection detection	The current input terminal [AI2 (AII)] signal is disconnected.
OL	Motor overload early warning	Early warning before the occurrence of motor overload alarm.
OH	Cooling fin overheating early warning	Early warning before the occurrence of cooling fin overheat tripping.
LiF	Life warning	Any one of the main circuit capacitor used in the inverter, the capacitors on the printed circuit board, and the cooling fan has reached the end of its life.
rEF	Reference loss	The analog frequency reference is disconnected.
Pid	PID warning output	Warning related to PID control (Absolute value warning/Deviation warning).
UTL	Low torque detection	The output torque continued to be below the low torque detection level for more than the time set in the timer.
PTC	Thermistor detection (PTC)	Temperature detection by the PTC thermistor of the motor.
rTE	Inverter life (Cumulative operation time of motor)	The cumulative operation time of motor has reached the set maintenance time.

Code	Name	Overview
CnT	Inverter life (Number of startups)	The number of startups has reached the set number of maintenance.

● Method of selecting light alarm causes

The causes of the light alarm that can be selected are allocated to 0 to 15 bits as shown below, and are set and displayed in hexadecimals.
By setting the bit corresponding to the cause to be selected to 1, the concerned cause can be treated as a light alarm.

Light Alarm Selection 1 (H81)

Bit	Symbol	Description	Bit	Symbol	Description
15	OH6	Inrush current prevention resistor overheat	7	-	-
14	-	-	6	OL2	Motor 2 overload
13	ErP	RS-485 communications error	5	OL1	Motor 1 overload
12	-	-	4	dbH	Braking resistor overheating
11	Er5	Option error	3	-	-
10	Er4	Option communications error	2	OH3	Inverter internal overheating
9	-	-	1	OH2	External trip
8	-	-	0	OH1	Cooling fin overheating

Light Alarm Selection 2 (H82)

Bit	Symbol	Description	Bit	Symbol	Description
15	-	-	7	LiF	Life warning
14	-	-	6	OH	Cooling fin overheating early warning
13	CnT	Inverter life (Number of startups)	5	OL	Motor overload early warning
12	rTE	Inverter life (Cumulative run time)	4	-	-
11	PTC	Thermistor detection (PTC)	3	CoF	Current input disconnection detection
10	UTL	Low torque detection	2	Ero	Positioning error
9	Pid	PID warning output	1	-	-
8	rEF	Reference loss	0	ErE	Speed mismatch (Excessive speed deviation)

(Example) When “RS-485 communications error,” “Option communications error,” “Motor 1 overload” or “Cooling fin overheating” is selected in H81.

LED No.		LED4				LED3				LED2				LED1			
Bit		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Symbol		OH6	-	ErP	-	Er5	Er4	-	-	-	OL2	OL1	dbH	-	OH3	OH2	OH1
Display example	Binary	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1
	Hexadecimal	2				4				2				1			
	Hexadecimal LED monitor	LED4 LED3 LED2 LED1 2 4 2 1															

The input of light alarm selection must be made by converting a binary 4 bits unit to hexadecimal. The conversion table is shown below.

Binary				Hexadecimal	Binary				Hexadecimal
0	0	0	0	0	1	0	0	0	8
0	0	0	1	1	1	0	0	1	9
0	0	1	0	2	1	0	1	0	A
0	0	1	1	3	1	0	1	1	b
0	1	0	0	4	1	1	0	0	C
0	1	0	1	5	1	1	0	1	d
0	1	1	0	6	1	1	1	0	E
0	1	1	1	7	1	1	1	1	F

● Light Alarm L-ALM Signal

If “98: L-ALM (Light alarm)” is allocated to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27), the light alarm “L-ALM” signal is output when the cause of a light alarm occurs.

7-8-26 Input Phase Loss Protection / Output Phase Loss Protection

By setting Input Phase Loss Protection Function Selection (H411) and Output Phase Loss Protection Function Selection (H412), it is possible to set whether to continue with the operation or trip the inverter when an input loss or output loss is detected.

Parameter No.	Function name	Data	Default data	Unit
H411	Input Phase Loss Protection Function Selection	0: Disable (Continue to run) 1: Enable (Trip)	1	-
H412	Output Phase Loss Protection Function Selection	0: Disable (Continue to run) 1: Enable (Trip)	0	-

- Input phase loss protection
  If excessive stress is generated on the main circuit devices as a result of the loss of the three-phase power supply input to the inverter or the unbalance between phases, it is detected and the input loss protection function (alarm Lin) is activated.
  If the load to be connected is light and a DC reactor has been connected, the stress on the main circuit devices is low. Therefore, even if there is an input loss or an unbalance between phases, the loss may not be detected.

- Output phase loss protection
  If an output loss is detected during the inverter operation, the output loss protection function (alarm OPL) is activated.
  In a configuration where an electromagnetic contactor is connected at the output side, if the electromagnetic contactor turns OFF during operation, the current of all phases becomes zero. In such a case, the output loss protection function is not activated.

7-8-27 Clearing of Integrated Power (KHC)

When this terminal command is turned ON, the integrated power is cleared to zero. While this command is ON, the integrated power is cleared continuously. To resume integrating operation, turn this command OFF.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	164: KHC (Integrated power clear)	-	-

7-9 Other Operation Functions

This section describes the parameters associated with other operation functions.

7-9-1 Carrier Frequency

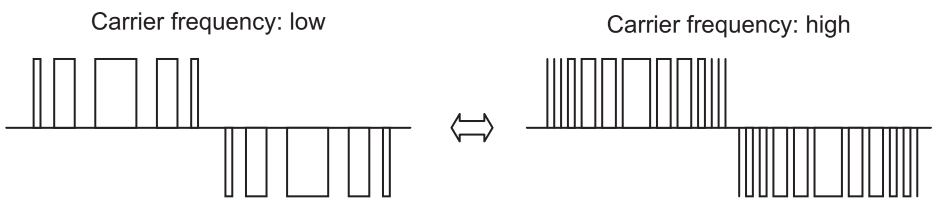
Use this function to change the carrier frequency output from the inverter in a PWM waveform.
Set a higher carrier frequency value to reduce the metallic noise from the motor. If the inverter generates a large sound due to resonance with the mechanical system or motor, you can effectively avoid the resonance by setting the carrier frequency out of the resonance frequency range.
However, this results in an increase in electrical noise or leakage current from the inverter.
Motor Sound Tone (F27) is enabled if the setting of Carrier Frequency (F26) is 7 kHz or below.
By adjusting the level to be set, it may be possible to reduce the high-pitched operation sound (metal sound) generated by the motor.

Parameter No.	Function name	Data	Default data	Unit
F26	Carrier Frequency	0: 0.75 kHz 1: 1 kHz 2: 2 kHz 3: 3 kHz 4: 4 kHz 5: 5 kHz 6: 6 kHz 7: 7 kHz 8: 8 kHz 9: 9 kHz 10: 10 kHz 11: 11 kHz 12: 12 kHz 13: 13 kHz 14: 14 kHz 15: 15 kHz 16: 16 kHz	2	-
F27	Motor Sound Tone	0: Inactive 1: Level 1 2: Level 2 3: Level 3	0	
Related function		E165		

- Derating of the output current may be required depending on the installation environment or the setting of Carrier Frequency (F26). For derating in each inverter model, refer to *A-1 Derating Table* on page A-2.
  Set the output current value to be derated as electronic thermal level.
  This setting, however, is unnecessary if the electronic thermal level is already set to the derating value or lower.
  For details on the electronic thermal function, refer to *5-3-3 Motor Electronic Thermal Function* on page 5-20.

- Note that adjusting the carrier frequency exceeding the allowable derating level for the output current may cause damage or shortened life expectancy of the inverter.
- If the level of Motor Sound Tone (F27) is increased too much, the output current may become disordered, and the machine vibrations or noise may increase. Moreover, depending on the motor, the effect may be less.
- The table below shows the carrier frequency setting and its influence.

Carrier frequency	Low	High
Motor noise	Large	Small
Noise/leakage current	Small	Large
Torque	Slightly large	Minute
Motor temperature (Harmonic component)	High (More)	Low (Less)
Output current waveform	Poor	Good
Noise generated	Less	More
Inverter loss	Small	Large



7-9-2 Automatic Carrier Frequency Reduction

Use this function to reduce the carrier frequency automatically as the output current and the cooling fin temperature increase.
This function is enabled if “1” is set to Carrier Frequency Automatic Reduction Function Selection (E165).

Parameter No.	Function name	Data	Default data	Unit
E165	Carrier Frequency Automatic Reduction Function Selection	0: Disable 1: Enable	1	-
Related function		F26		

- In order to avoid overheating or overload trip, the carrier frequency may fluctuate in the range of carrier frequency set value (F26) (Upper limit) to 2 kHz (Lower limit).

7-9-3 Starting Frequency and Stop Frequency

Set the frequency for starting inverter output when the RUN signal is turned ON, and the frequency for stopping the inverter output when the RUN signal is turned OFF.
The starting frequency and stop frequency are enabled only during speed control, and the operation is different during V/f control and vector control with speed sensor.

Starting Frequency

- During V/f control (F42 = 0, 3)

When the inverter is started, the output frequency starts from the starting frequency. Set the starting frequency to enable securing sufficient starting torque. In general, set the rated slip frequency of the motor.
In order to compensate the delay time during establishment of motor flux, the starting frequency (holding time) can also be set.

- During vector control (F42 = 1, 4, 5, 6, 15, 16)
  When the inverter is started, the speed starts from zero, and acceleration is performed up to the starting frequency in accordance with the acceleration time. After performing starting frequency (hold), acceleration is again performed to the speed instructed in accordance with the acceleration time.

Parameter No.	Function name	Data	Default data	Unit
F23	1st Starting Frequency	0.0 to 60.0	0.5	Hz
F24	1st Starting Frequency 1 Holding Time	0.00 to 10.00	0.00	s
A12	2nd Starting Frequency	0.0 to 60.0	0.5	Hz
A62	2nd Starting Frequency Hold-ing Time	0.00 to 10.00	0.00	s

Stop Frequency

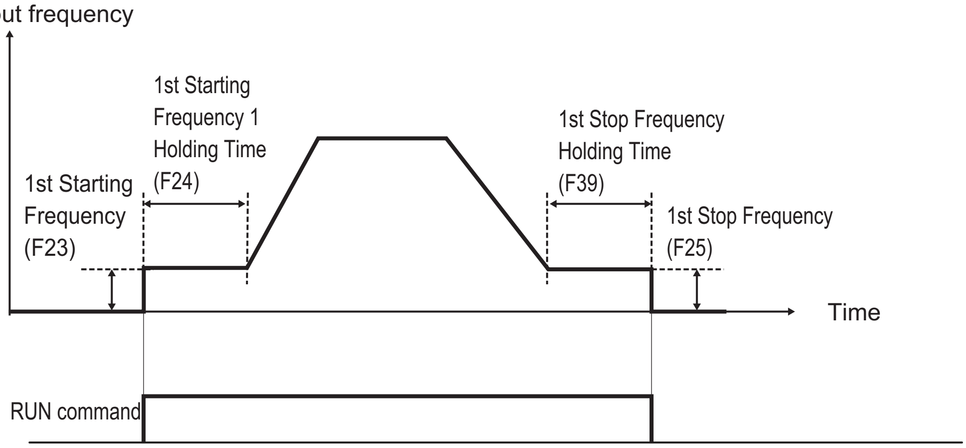
- During V/f control (F42 = 0, 3)
  When the inverter is stopped, the inverter output is cut off at the time the output frequency reaches the stop frequency. It is also possible to set the stop frequency (holding time) in order to stabilize the motor speed when the inverter has stopped.
- During vector control (F42 = 1, 4, 5, 6, 15, 16)
  When the inverter is stopped, the inverter output is cut off at the time the speed command value or the detection value (can be selected at F38/A64 only during vector control with speed sensor) reaches the stop frequency.

Parameter No.	Function name	Data	Default data	Unit
F25	1st Stop Frequency	0.0 to 60.0 Hz	0.2	Hz
F38	1st Stop Frequency Detection Method Selection	0: Detected/Estimated speed 1: Reference speed	0	-
F39	1st Stop Frequency Holding Time	0.00 to 10.00 s	0.00	s
A63	2nd Stop Frequency	0.0 to 60.0 Hz 999: According to F025	999	Hz
A64	2nd Stop Frequency Detection Method Selection	0: Detected speed 1: Reference speed 100: According to F38	100	-
A65	2nd Stop Frequency Holding Time	0.00 to 10.00 s	0.00	s

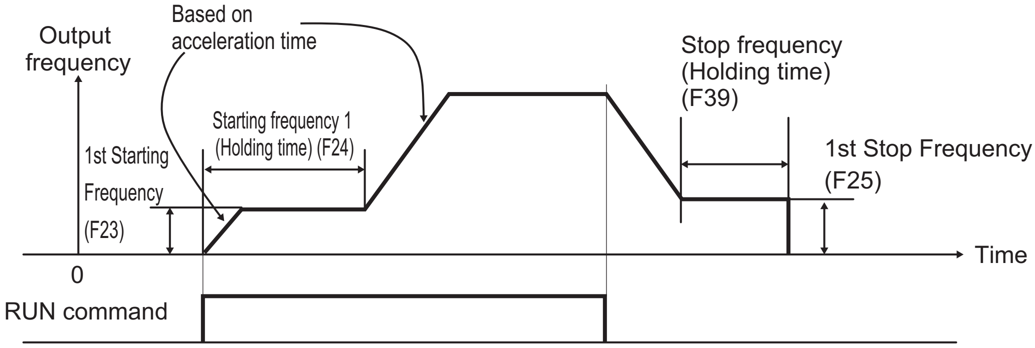
About the stop frequency (detection mode)

Generally, the stop frequency is determined based on the speed detection value, but in the case of a load exceeding the capacity of the inverter, such as when an excessive external load is applied, the motor cannot be stopped, and the speed detection value may not reach up to the stop frequency or an equivalent value. In such a case, the inverter cannot be stopped. If the setting is made to perform the judgment based on the speed command value, the command value is reached even if the detection value is not reached, and therefore, the inverter is properly stopped. If a situation such as the above is assumed, select the speed command value to ensure safety.

- **During V/f control (F42 = 0, 3)**



- **During vector control (F42 = 1, 4, 5, 6, 15, 16)**



7-9-4 Zero Speed Control

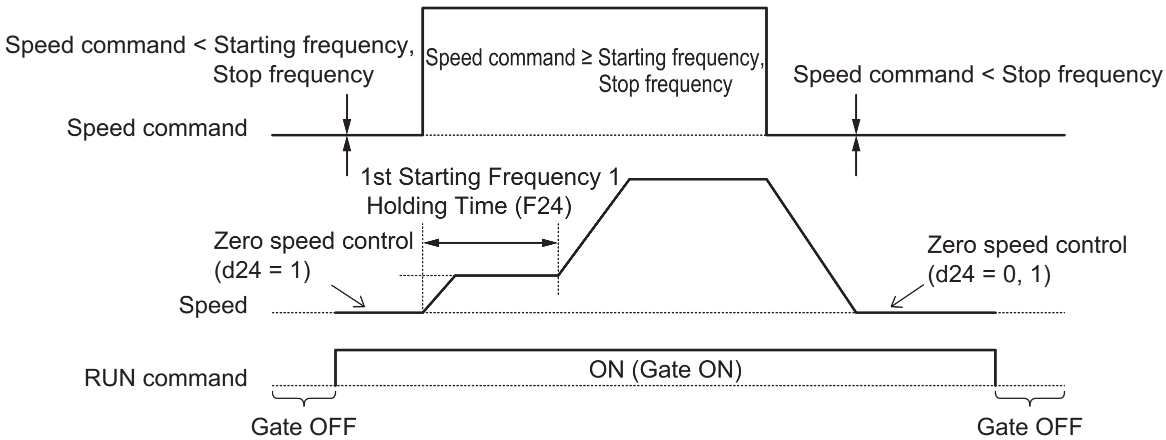
To perform zero speed control, zero speed control operation at startup and a stop must be set to Zero Speed Control (d24) and then the speed command (frequency reference) must be set to less than the starting frequency and less than the stop frequency. Note, however, that when the starting frequency and stop frequency are 0.0 Hz, zero speed control is possible with the speed command set to 0.00 Hz.

Parameter No.	Function name	Data	Default data	Unit
d24	Zero Speed Control	0: Disable at startup 1: Enable at startup 2: Not permit	0	-

d24 data	Zero speed control at startup	Zero speed control at stop	Description of operation
0	Not possible	Possible	The speed command is set to the starting frequency and less than the stop frequency, and zero speed control is not performed even if the RUN command is turned ON. The speed command is set to the starting frequency or higher, and zero speed control is enabled after the inverter is started once.
1	Possible	Possible	The speed command is set to the starting frequency and less than the stop frequency, and zero speed control is performed when the RUN command is turned ON.
2	Not possible	Not possible	Zero speed control is not performed at both startup and stop regardless of the speed command.

The following shows the conditions for enabling and disabling zero speed control at startup and stop.

	Speed command	RUN command	Operation		
			d24=0	d24=1	d24=2
At start	Starting frequency/less than stop frequency	OFF	Stop (gate OFF)		
		ON	Stop (gate OFF)	Zero speed control	Stop (gate OFF)
At stop	Less than stop frequency	ON	Zero speed control	Zero speed control	Stop (gate OFF)
		OFF	Stop (gate OFF)		



7-9-5 Frequency Jump Function

Use this function to avoid the resonant point of the load machine during operation.

If the jump frequency is set to avoid steady operation within the jump frequency range, the setting of the frequency reference within the jump frequency range operates as described below.

- When the set frequency is increased and the set frequency enters the jump frequency band, the internal set frequency is kept constant at the lower limit of the jump frequency band. If the set frequency exceeds the upper limit of the jump frequency band, the internal set frequency reaches the value of the set frequency. When the set frequency is reduced, the opposite relationship to that during increase is realized. Refer to the figure below on the left.

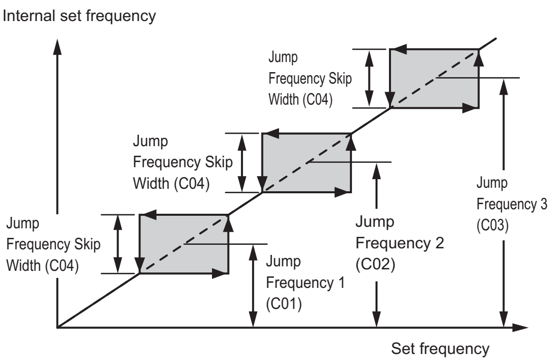
- If two or more jump frequency ranges overlap each other, the minimum and maximum frequencies among those respectively become the lower limit and upper limit frequencies of the actual jump frequency range. Refer to the figure below on the right.

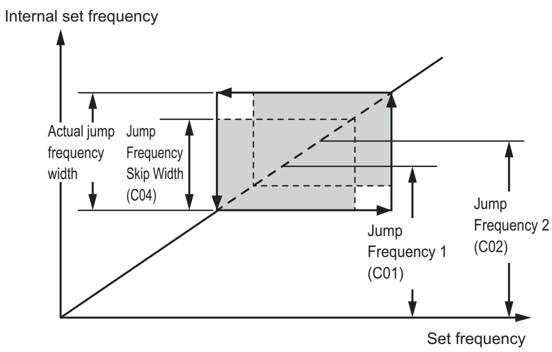
During acceleration and deceleration, the output frequency changes continuously in accordance with the acceleration and deceleration time.

Although the jump frequency can be set at three locations, the jump frequency width is common at the three locations.

Parameter No.	Function name	Data	Default data	Unit
C01/C02/C03	Jump Frequency 1/ Jump Frequency 2/ Jump Frequency 3	0.0 to 590.0 Set the center of the frequency to be jumped.*1	0.0	Hz
C04	Jump Frequency Skip Width	0.0 to 30.0 Set 1/2 of the frequency width to be jumped.	3.0	Hz

*1. This function is disabled when 0 Hz is set.





7-9-6 RUN Direction Limit Selection

Use this function to limit the RUN direction of the motor.

It can be activated either via the control circuit terminal block or the Digital Operator.

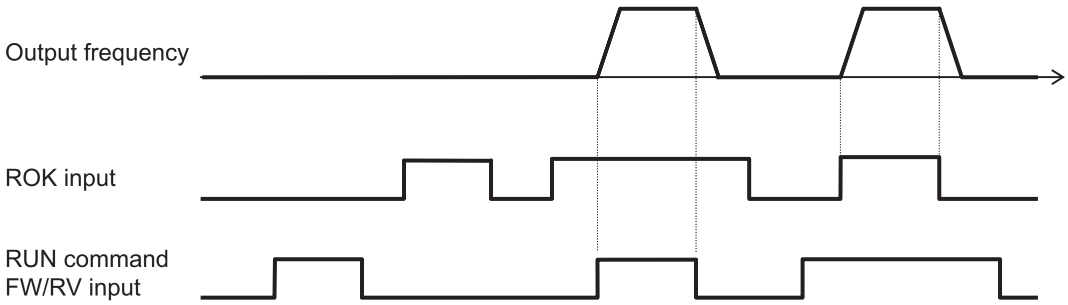
Parameter No.	Function name	Data	Default data	Unit
H08	Reverse Rotation Prevention Function	0: Disable 1: Enable (Reverse rotation inhibited) 2: Enable (Forward rotation inhibited)	0	-

7-9-7 Permission of RUN Command

Use this function to have the inverter accept the RUN command only while the permission of RUN command is ON.

When using this function, allocate “38: ROK (Operation permission signal)” to any of the multifunction input terminals.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	38: ROK (Operation permission signal)	-	-



7-9-8 Frequency Calculation Function

The calculation results from two frequency reference channels can be used as the value of frequency reference. When using as the frequency reference, set 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) as “13: Calculation result.”

Parameter No.	Function name	Data	Default data	Unit
F01/C30	1st Frequency Reference Selection/2nd Frequency Reference Selection	13: Calculation result	0	-
E131	Frequency Calculation Operation Target 1	0: ∧ or ∨ keys on Operator 1: Voltage input to terminal [AI1] (0 to 10 VDC) 2: Current input to terminal [AI2](AII) (4(0) to 20 mA DC) 3: Voltage input to terminal [AI2](AIV) (0 to 10 VDC) 5: Pulse train input 6: RS-485 (terminal block) 7: Reserved	1	-
E132	Frequency Calculation Operation Target 2		2	
E133	Frequency Calculation Operator Selection	0: Addition (E131 + E132) 1: Subtraction (E131 - E132) 2: Multiplication (E131 × E132)	0	-

Note 1. The frequency set for UP/DOWN control cannot be used for operation frequency input setting.
Note 2. The same setting can be made in E131/E132.
Note 3. If the calculation results exceed 1st Maximum Output Frequency (F03)/2nd Maximum Output Frequency (A01), the limit is set at the maximum frequency. Similarly, if the calculation results are below 0.0 Hz, the limit is set at 0.0 Hz.
Note 4. The frequencies set for communication (S01, S05, S19) are shared with the RS-485, and therefore, if E131 = 6 and E132 = 7 (or the opposite combination), the same set frequency value is referenced.

7-9-9 Frequency Addition Function

Use this function to add or subtract the value set in Frequency Addition Amount (E134) to or from the selected frequency reference.
When using this function, allocate “161: ADD (Addition of set frequency E134)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
If “161: ADD” is not allocated to the multifunction input terminal, or if the ADD terminal is ON, add or subtract E134. If the ADD terminal is turned OFF, the addition or subtraction of Frequency Addition Amount (E134) is canceled, and the inverter returns to the status of the selected frequency reference.

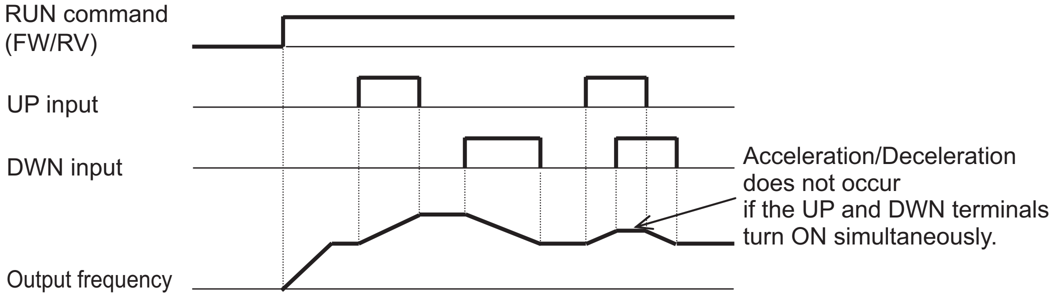
Parameter No.	Function name	Data	Default data	Unit
E134	Frequency Addition Amount	0.00 to 590.0	0.00	Hz
E135	Frequency Addition Sign Selection	0: Frequency command + E134 1: Frequency command - E134	0	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	161: ADD (Addition of set frequency E134)	-	-

Note 1. If the sign of the frequency reference changes (from (-) to (+), or from (+) to (-)) as a result of the calculation, the rotation direction is reversed.
Note 2. When the PID function is used, this function is enabled even for the PID target value.
(Note that E134 can be set as a percentage of the maximum frequency in increments of 0.01% At this time, if a value larger than 100.0 is set, the limit is set at 100.0.)

7-9-10 UP/DOWN control (UP, DWN)

Use this function to change the inverter output frequency via the multifunction input terminals UP and DWN.
If 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) is set to “7: UP/DOWN control,” the set frequency is based on “17: UP (Acceleration through remote operation)” and “18: DWN (Deceleration through remote operation)” that are allocated to input terminals [DI1] to [DI7] function selection (E01 to E05, E98, E99).

Parameter No.	Function name	Data	Default data	Unit
F01/C30	1st Frequency Reference Selection/2nd Frequency Reference Selection	7: UP/DWN control	0	
H61	UP/DOWN Control Initial Value Selection	0: Default value is 0.00 Hz 1: Default value is the frequency set based on the UP/DWN command immediately before the RUN command turns OFF	1	-
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	17: UP (Acceleration through remote operation) 18: DWN (Deceleration through remote operation) 58: UDC (Clearing of remote operation data)	-	-



- The remote operation function is enabled only when 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) is set to “7: Terminal command UP / DWN control.”
- Acceleration/deceleration when the UP and DWN terminals are ON operates in accordance with the acceleration/deceleration time (F07/E10, F08/E11, etc.) selected at that time.
- “58: UDC (Clearing of remote operation data)” can be allocated to the input terminal, and the frequency reference adjusted by UP and DWN can be cleared.
- At UP/DOWN Control Initial Value Selection (H61), set the initial value of the frequency set at the time of starting the remote operation.
  When the operation is resumed (including when the power is turned ON) with H61 as “0,” the initial value of the frequency set based on the UP/DOWN control is cleared as “0.”
  With H61 as “1,” the output frequency set by the UP/DOWN control is maintained internally, and when the operation is resumed (including when the power is turned ON), the control is started from the previous operation frequency.

7-9-11 AVR (Automatic Voltage Regulator) Function

This is a function for automatically correcting the output voltage to the motor even if the inverter incoming voltage fluctuates.
This function is used to avoid a drop in the output torque of the motor or the overexcitation state.
Note, however, that the inverter cannot output voltage exceeding the incoming voltage to the inverter.

AVR (Automatic Voltage Regulator) Function Setting

The AVR (automatic voltage regulator) function is set to enabled or disabled by 1st AVR Function Selection (E122)/2nd AVR Function Selection (E123).

- The voltage output in the motor is based on the voltage selected in 1st Rated Voltage at Base Frequency (F05)/2nd Rated Voltage at Base Frequency (A03) as the base.
  Note, however, that the inverter cannot output voltage exceeding the incoming voltage to the inverter.

Parameter No.	Function name	Data	Default data	Unit
E122/E123	1st AVR Function Selection/2nd AVR Function Selection	0: Disable 1: Enable	1	-
F05/A03	1st Rated Voltage at Base Frequency/2nd Rated Voltage at Base Frequency	80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	200	V

7-9-12 Overexcitation Control during Deceleration

This function decreases the regenerative energy to be fed back to the inverter by forcing the motor during deceleration to be in an overexcited state.
It enables you to shorten the deceleration time without use of optional braking resistors.
If, in spite of using this function, the operation cannot be performed at the target deceleration time, or if an overcurrent occurs, use the optional braking resistors.
Avoid frequent acceleration and deceleration as it may cause the motor to burn.
This function is enabled in V/f control, V/f control with speed sensor, and vector control with speed sensor. If Anti-regenerative Control Function Selection (H69) in the torque limit method is set to “2: Torque limit control with force-to-stop(Cancel limit control after three times of deceleration time has passed)” or “4: Torque limit control without force-to-stop,” this function is disabled.

- When using this function, set Over-Excitation Control Selection during Deceleration Function Selection (H71) to “1: Enable.”
- Set 1st AVR Function Selection (E122)/2nd AVR Function Selection (E123) to “1: Enable.”
- By setting Magnetic Flux Level during Deceleration (d90) to higher than 100%, the overexcitation state of the motor is adjusted.
  Set this as a percentage of the 1st Rated Voltage at Base Frequency (F05)/2nd Rated Voltage at Base Frequency (A03) value.

Parameter No.	Function name	Data	Default data	Unit
H71	Over-Excitation Control Selection during Deceleration Function Selection	0: Disable 1: Enable	0	-
F05/A03	1st Rated Voltage at Base Frequency/2nd Rated Voltage at Base Frequency	80 to 240 V: AVR operation (200 V class series) 160 to 500 V: AVR operation (400 V class series)	200	V
d90	Magnetic Flux Level during Deceleration	100 to 300 %	120	%
Related function		H69		

Adjusting overexcitation control during deceleration

Set H71 to “1: Enable,” and gradually keep increasing the sett data of d90 so as to approach the desired deceleration time. If, in spite of using this function, the operation cannot be performed at the target deceleration time, or if an overcurrent occurs, use the optional braking resistors.

7-9-13 PID Function

PID control detects the status (control amount) of the object to be controlled by a sensor, etc., and compares it with the target value (such as the temperature command). If there is a deviation during this time, operation is performed to set the deviation to zero. It is a closed loop control method that matches the control amount (feedback value) with the target value.
It is possible to perform process controls such as the flow rate control, pressure control, temperature control, etc., and speed controls such as the dancer control.
If PID control is enabled (J01 = 1 to 5), the frequency setting block switches to PID control block.

Parameter No.	Function name	Data	Default data	Unit
E119	PID Control Feedback Selection	0: Analog input terminals (AI1, AI2 (AII function), AI2 (AIV function)) 2: Modbus communication 3: Pulse train frequency	0	-
E120	PID Control PID Output Variable Range for Process Control	0.0: Function disabled 0.1 to 100.0 Variable range based on target value	0	-
E121	PID Control PID Feedforward Selection for Process Control	0: Invalid 1: Analog input terminal AI1,AI2(AII),AI2(AIV)	0	-
C59	Input Terminal [AI1] Analog Input Adjustment Maximum Scale	-999.00 to 0.00 to 9990.00	100	-
C60	Input Terminal [AI1] Analog Input Adjustment Minimum Scale	-999.00 to 0.00 to 9990.00	0	-
C65	Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AII)	-999.00 to 0.00 to 9990.00	100	-
C66	Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AII)	-999.00 to 0.00 to 9990.00	0	-
C71	Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AIV)	-999.00 to 0.00 to 9990.00	100	-
C72	Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AIV)	-999.00 to 0.00 to 9990.00	0	-
J01	PID Control Function Selection	0: Disable 1: Process (normal operation) 2: Process (inverse operation) 3: Speed control (Dancer) 4: Process (normal operation, opposite operation available) 5: Process (inverse operation, opposite operation available)	0	-
J02	PID Control PID Command Selection	0: or keys on Operator 1: PID process command 1 (Analog input terminals AI1, AI2(AII), AI2(AIV)) 3: Terminal command UP / DWN control 4: Communication	0	-
J03	PID Control P Proportional Gain	0.000 to 30.000	0.1	time
J04	PID Control I Integral Time	0.0 to 3600.0	0	s
J05	PID Control D Differential Time	0.00 to 600.00	0	s
J06	PID Control Feedback Filter	0.0 to 900.0	0.5	s
J10	PID Control Anti-reset Windup Width	0 to 200	200	%

Parameter No.	Function name	Data	Default data	Unit
J11	PID Control Select Warning Output Selection	0: Warning caused by process command value 1: Warning caused by process command value with hold 2: Warning caused by process command value with latch 3: Warning caused by process command value with hold and latch 4: Warning caused by PID error value 5: Warning caused by PID error value with hold 6: Warning caused by PID error value with latch 7: Warning caused by PID error value with hold and latch	0	-
J12	PID Control Upper Limit of Warning (AH)	-100 to 100	100	%
J13	PID Control Lower Limit of Warning (AL)	-100 to 100	0	%
J15	PID Control Sleep Frequency for Process Control	0.0 (Disable) 1.0 to 590.0	0	Hz
J16	PID Control Sleep Timer for Process Control	0 to 60	30	s
J17	PID Control Restart Frequency after Stopping for Process Control	0.0 to 590.0	0	Hz
J18	PID Control PID Output Upper Limit	-150 to 150 999: Depends on setting of F15	999	%
J19	PID Control PID Output Lower Limit	-150 to 150 999: Depends on setting of F16	999	%
J23	PID Control Restart Feedback Deviation after Stopping for Process Control	0.0 to 100.0	0	%
J24	PID Control Restart Delay Time after Stopping for Process Control	0 to 3600	0	s
J57	PID Control Operator PID Reference Position for Dancer	-100 to 0 to 100	0	%
J58	PID Control PID Reference Position Detection Width for Dancer	0: Disable switching PID constant 1 to 100	0	%
J59	PID Control P Gain 2	0.000 to 30.000	0.1	time
J60	PID Control I Integral Time 2	0.0 to 3600.0	0	s
J61	PID Control D Differential Time 2	0.00 to 600.00	0	s

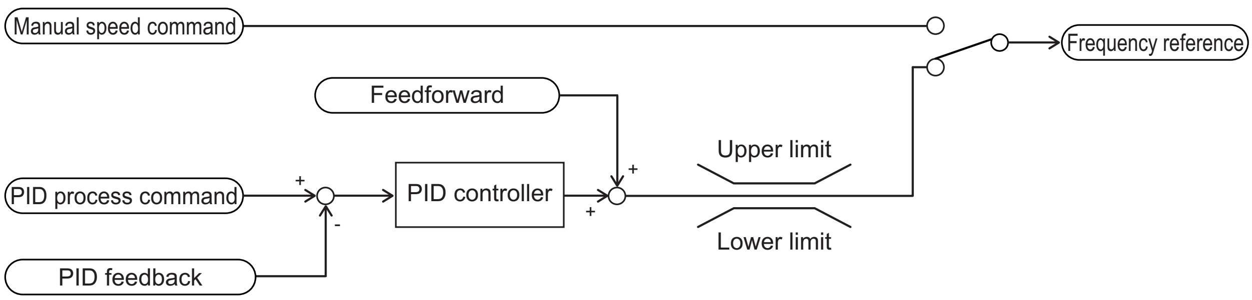
Parameter No.	Function name	Data	Default data	Unit
J62	PID Control Block Selection	0 to 3 bit 0: Select polarity compensation for PID output/error 0 = Plus (Addition) 1 = Minus (Subtraction) bit 1: Select compensation factor for PID output 0 = Ratio (relative to the main setting) 1 = Speed command (relative to maximum frequency)	0	-
J106	PID Control Maximum Scale	-999.00 to 0.00 to 9990.00	100	-
J107	PID Control Minimum Scale	-999.00 to 0.00 to 9990.00	0	-
J136	PID Control Multistep PID Command 1	-999.00 to 0.00 to 9990.00	0	-
J137	PID Control Multistep PID Command 2	-999.00 to 0.00 to 9990.00	0	-
J138	PID Control Multistep PID Command 3	-999.00 to 0.00 to 9990.00	0	-
H438	Feedback Value Comparison Signal Off Level	0.0 to 100.0 FBV signal output judgment level	100	%
H439	Feedback Value Comparison Signal On Level	0.0 to 100.0 FBV signal output judgment level	0	%
S13*1	PID Control PID Command via Communication	-32768 to 32767 (-20000 = -100%; +20000 = +100%)	0	-
S30*1	PID Control Feedback Value via Communication	-32768 to 32767 (-20000 = -100%; +20000 = +100%)	0	-
M73*1	PID Output Monitor	-32768 to 32767 (-20000 = -100%; +20000 = +100%)	0	-
M115*1	PID Output Non Filter	-150.0 to 150.0	0	%
W11	PID Process Command	-999.00 to 0.00 to 9990.00	0	-
W12	PID Feedback Value Monitor	-999.00 to 0.00 to 9990.00	0	-
W29*1	Frequency and PID Command Source Monitor	0 to 25, 39: Command source No. other than PID control 30: PID control Touch panel process 31: PID control Analog process 33: PID control UP/DOWN process 34: PID control Communication process 36: PID control Multi-step terminal process	0	-
W32	PID Output Monitor	-150.0 to 150.0	0	%
W131*1	PIC Control PID Deviation	-999.00 to 0.00 to 9990.00	0	-
W132*1	PIC Control PID Deviation	-32768 to 32767 (-20000 = -100%; +20000 = +100%)	0	-

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	20: Hz/PID (PID control cancellation) 21: IVS (Normal/Inverse switching) 33: PID-RST (PID integral/differential reset) 34: PID-HLD (PID integration hold) 171: PID-SS1 (PID control multi-step command 1) 172: PID-SS2 (PID control multi-step command 2)	-	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	42: PID-ALM (PID alarm output) 43: PID-CTL (PID control in progress) 44: PID-STP (PID wakeup timer stopped) 186: FBV (PID feedback comparison signal)	-	-
E61, E62, E63	Input Terminal [AI1] Function Selection/Input Terminal [AI2] Function Selection（AII）/ Input Terminal [AI2] Function Selection（AIV）	21 : PID feed forward	-	-

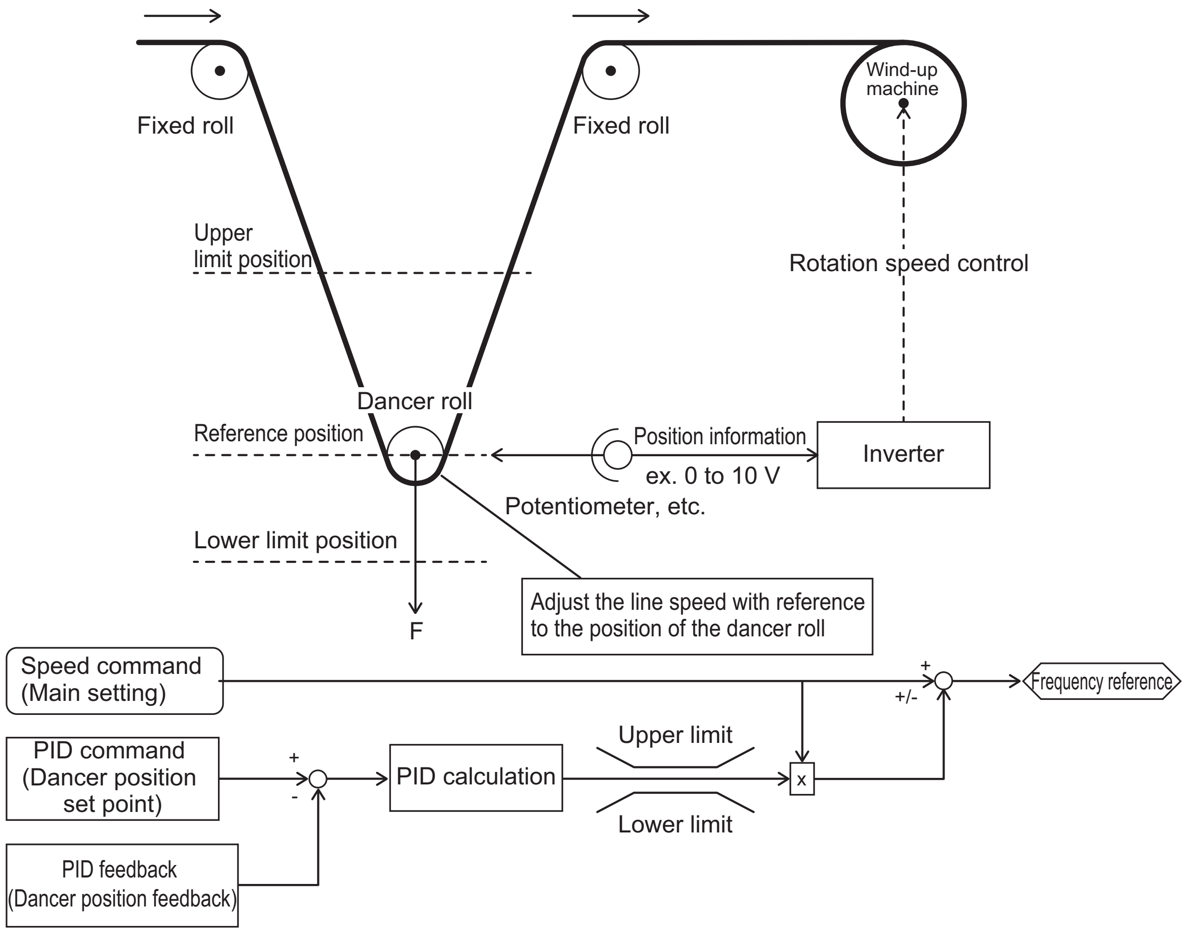
*1. This function can be referenced only from the communications function or Sysmac Studio.

Basic Structure of PID Control

<Schematic block diagram of PID process control>



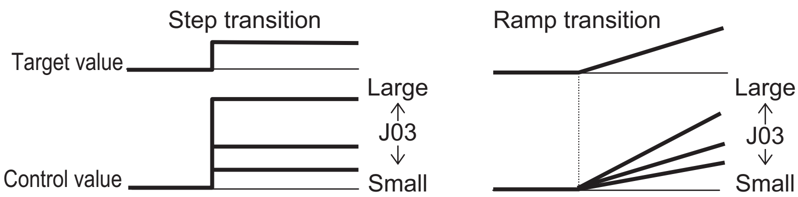
<Schematic block diagram of PID dancer control>



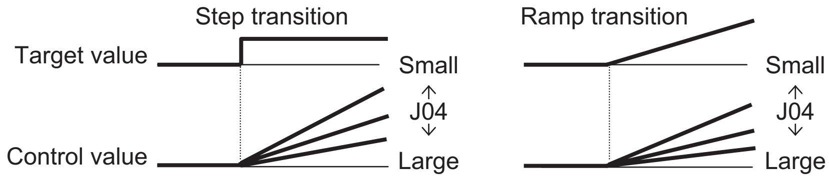
Since normal operation or reverse operation can be selected for the output of PID process control, the fluctuations in the motor rotation speed with respect to the deviation (difference between the command value and feedback value) can be set. Switching of normal operation and reverse operation by an external signal (21:IVS (Normal/Inverse switching)) is also possible.

PID Operation

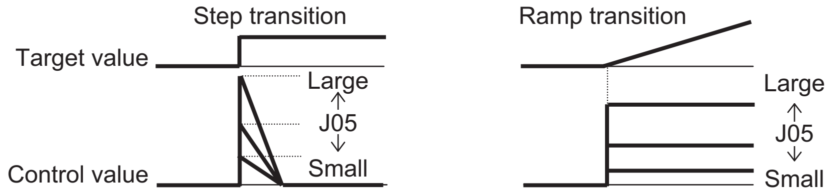
1. P Operation
   In this operation, the operation amount is proportional to the deviation (difference between the target value and the current value).



2. I Operation
   In this operation, the operation amount is proportional to the time integral value of the deviation. The P operation is less effective as the current value approaches the target value due to smaller deviation, taking a long time to reach the target value. The I operation compensates this disadvantage.



3. D Operation
   In this operation, the operation amount is proportional to the percentage of change in the deviation. Because using only the PI operation is time-consuming, the D operation is used to effectively compensate for the disadvantage in responsiveness.



Feedback Input Setting

- E119 = 0: Analog input terminal
  If 0: Analog input terminal ([AI1], [AI2] AII function, [AI2] AIV function) is selected for PID Control Feedback Selection (E119), allocate “5: PID feedback value” to the terminal used in feedback input by any one of E61, E62 and E63. The analog input value is internally controlled as 0% to 100%. For details on analog input, refer to *7-3-1 Analog Input (Function Selection)* on page 7-32.

  When analog input is applied to PID feedback, the following gains, biases, filters and offsets are applicable.

Input terminal	Input range	Bias		Gain		Polarity selection (Range selection)	Filter	Offset
		Bias	Base point	Gain	Base point			
AI1	0 to 10 V, -10 to 10 V	C55	C56	C32	C34	C35	C33	C31
AI2 (AII function)	4 to 20 mA, 0 to 20 mA	C61	C62	C37	C39	C40	C38	C36
AI2 (AIV function)	0 to +10 V	C67	C68	C42	C44	C45	C43	C41

- E119 = 2: Modbus communication
  If “2: Modbus communication” is set in PID Control Feedback Selection (E119), set a value in communication parameter (S30) under the assumption of 20000d = 100%.

- E119 = 3: Pulse train frequency
  When “03: Pulse train frequency” is set to PID Control Feedback Selection (E119), the inverter captures a value converted into a percentage with the maximum frequency as 100% where the Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator (d16) and Input Terminal [PIA][PIB] Pulse

Scaling Factor Numerator (d17) are multiplied with the frequency value [kP/s] of the captured pulse train input.

$$f^* \text{ [Hz]} = \text{Np [kp/S]} \times \frac{\text{Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator (d17)}}{\text{Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator (d16)}}$$

$$\text{PV [\%]} = f^* \text{ [Hz]} \times \frac{100}{\text{Maximum frequency [Hz]}}$$

PV [%]: PID feedback input

f* [Hz]: Frequency set value

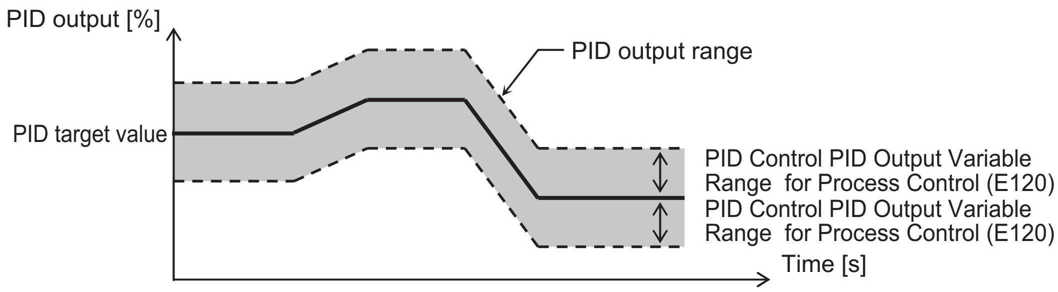
Np [kp/s]: Entered input pulse frequency

Feedforward Selection

Feedforward is applied during PID process control. Select feedforward by PID Control PID Feedforward Selection for Process Control (E121). If 1: Analog input terminal is selected, allocate “21: PID feedforward value” to the terminal used in the feedforward signal by any one of E61, E62 and E63. If not allocated, feedforward control is not performed.
Feedforward is disabled during dancer control.

PID Variable Range

In the case of PID process control, the PID output is restricted to a variable range with reference to the target value.
When using this function, set PID Control PID Output Variable Range for Process Control (E120).
Then, the output frequency will be limited to within a range of Target value ± (E120) with the maximum frequency as 100%.
If E120 is 0.0, the function is disabled. The function is also disabled when “4: Process (normal operation, opposite operation available)” or “5: Process (inverse operation, opposite operation available)” is set in PID Control Function Selection (J01).



PID Reverse Output

If the PID calculation results are negative during regular PID control (J01 = 1, 2), the frequency reference to the inverter is limited at 0 Hz. If PID Control Function Selection (J01) is set to “4: Process (normal operation, opposite operation available)” or “5: Process (inverse operation, opposite operation

available),” an inverse output can be performed for the inverter if the PID calculation results are negative.
If J01 = 4, 5 is set, PID Control PID Output Variable Range for Process Control (E120) is disabled.

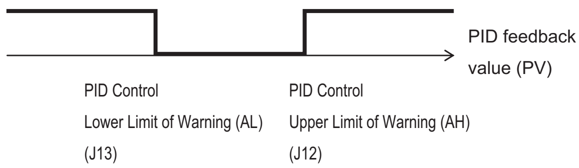
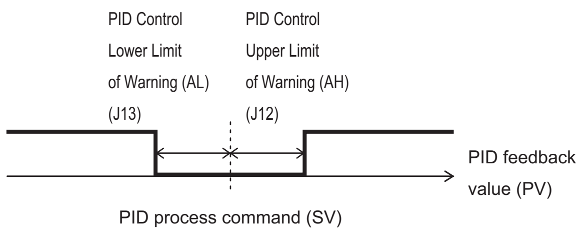
PID Gain Adjustment

If the PID function does not provide a stable response, adjust each gain as described below depending on the state.

State	Adjustment method
Changes in target value are not reflected quickly on feedback value.	Increase PID P Gain J03
Changes are reflected quickly on feedback value, but not stable.	Decrease PID P Gain J03
Target and feedback values do not match quickly.	Decrease I Gain J04
Feedback value fluctuates unstably.	Increase PID I Gain J04
Increasing PID P Gain does not improve response speed.	Increase PID D Gain J05
Increasing PID P Gain results in fluctuating and unstable feedback value.	Decrease PID D Gain J05

PID Deviation Excessive (OD)

An absolute value warning or a deviation warning can be output in PID control. As a warning output, allocate “42: OD (PID deviation excessive)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).
In PID Control Select Warning Output Selection (J11), set the warning type, and in PID Control Upper Limit of Warning (AH) (J12) and PID Control Lower Limit of Warning (AL) (J13), set the upper limit value and lower limit value of the warning, respectively.

J11	Type	Description
0	Warning caused by process command value	“OD” is ON when PV < AL or AH < PV 
1	Warning caused by process command value with hold	Same as above (hold)
2	Warning caused by process command value with latch	Same as above (with latch)
3	Warning caused by process command value with hold and latch	Same as above (with hold and latch)
4	Warning caused by PID error value	“OD” is ON when PV < SV-AL, SV+AH < PV 
5	Warning caused by PID error value with hold	Same as above (hold)

J11	Type	Description
6	Warning caused by PID error value with latch	Same as above (with latch)
7	Warning caused by PID error value with hold and latch	Same as above (with hold and latch)

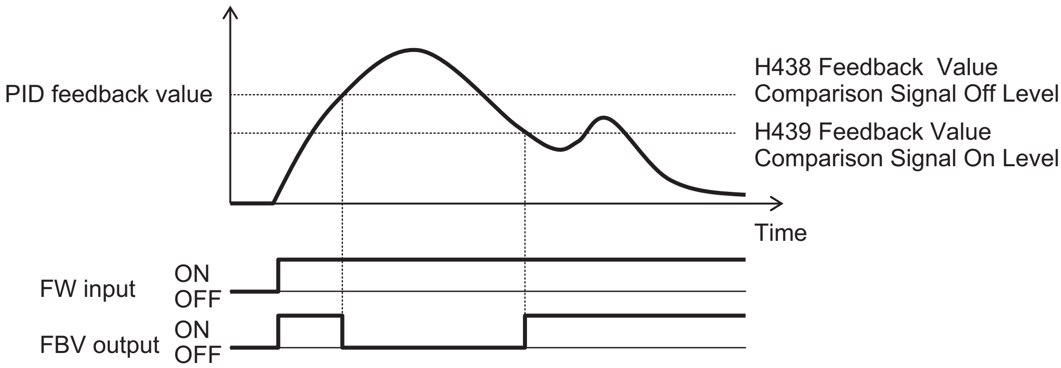
Hold function : When the power is turned ON, the warning output turns OFF even within the warning range. The warning output is enabled when it goes outside the warning range and then again enters the warning range.

Touch probe function : Once the warning output turns ON after entering the warning range, the warning output does not turn OFF even if it goes outside the range. To release the touch probe, either press the PRG RESET key on the Digital Operator, or turn ON the RS allocated to the multifunction input terminal.

Feedback Comparison Signal

If PID feedback is outside the setting range, the signal is output to the multifunction output terminal. Allocate “186: FBV (PID feedback comparison signal)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).

Set Feedback Value Comparison Signal Off Level (H438)/Feedback Value Comparison Signal On Level (H439) in units of percentage with 1st Maximum Output Frequency (F03)/2nd Maximum Output Frequency (A01) as 100%.



PID Feedback Value Monitor (Monitor Mode: 3_11)

The PID feedback value is displayed by converting to the control-target physical quantity (such as the temperature, pressure, etc.) using the data of PID Control Maximum Scale (J106) and PID Control Minimum Scale (J107).

Display value = (PID feedback value (%)/100) × (Maximum scale - Minimum scale) + Minimum scale

If PID control is disabled, “-----” is displayed.

PID Integral Reset (PIDC)

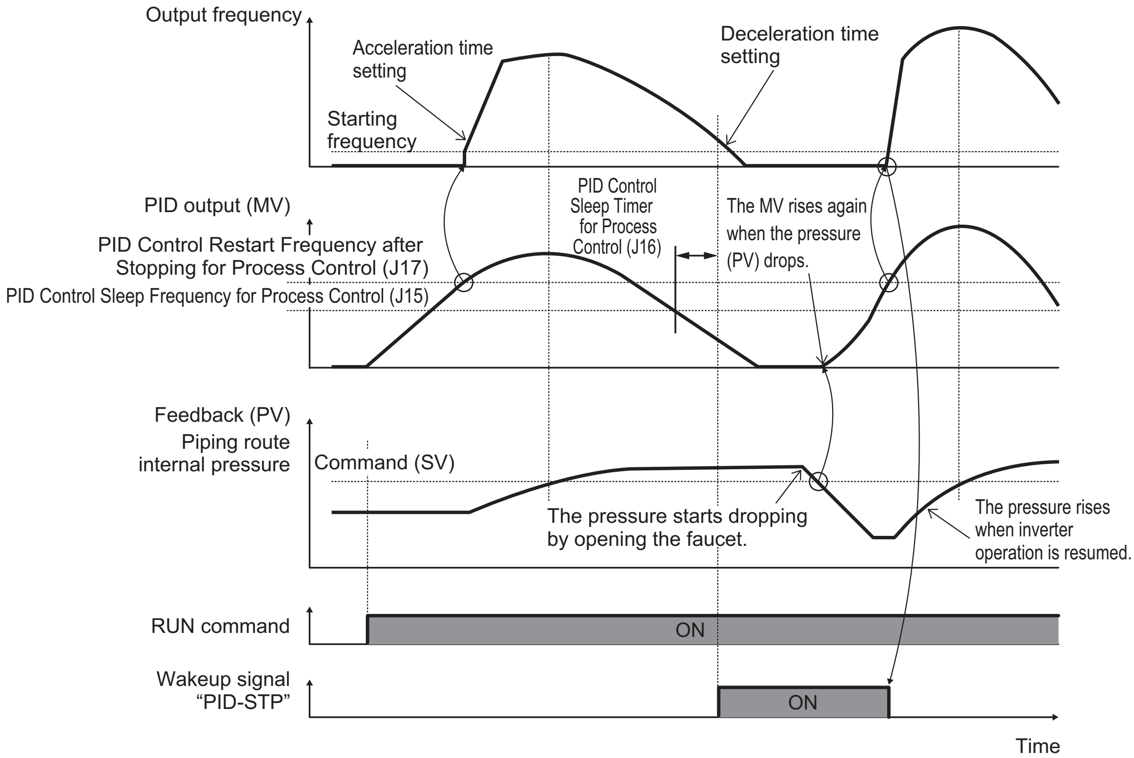
Use this function to clear the integral value of PID operation.

Allocate “33: PIDC (PID integral reset)” to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21), or Output Terminal [ROA, ROB] Function Selection (E27).
The values are cleared each time the PIDC terminal is turned ON.
Never turn ON the PIDC terminal during the PID operation as overcurrent tripping may occur. Be sure to deactivate the PID operation before turning ON the PIDC terminal.

PID Sleep Function

In parameters J15 to J17, J23, J24, a sleep function for stopping the inverter when the discharge pressure rises and the discharge volume reduces during pump control is set. When the discharge pressure rises, the frequency set value of the output of PID controller drops, and the sleep timer J16 elapses at the sleep frequency J15 or below, the inverter decelerates and stops. However, PID control itself continues. When the discharge pressure falls, the frequency set value of the output of PID controller rises, and the wakeup frequency J17 is exceeded, the inverter resumes operation. The restart conditions can be adjusted by J23 and J24 based on the time and pressure variation.

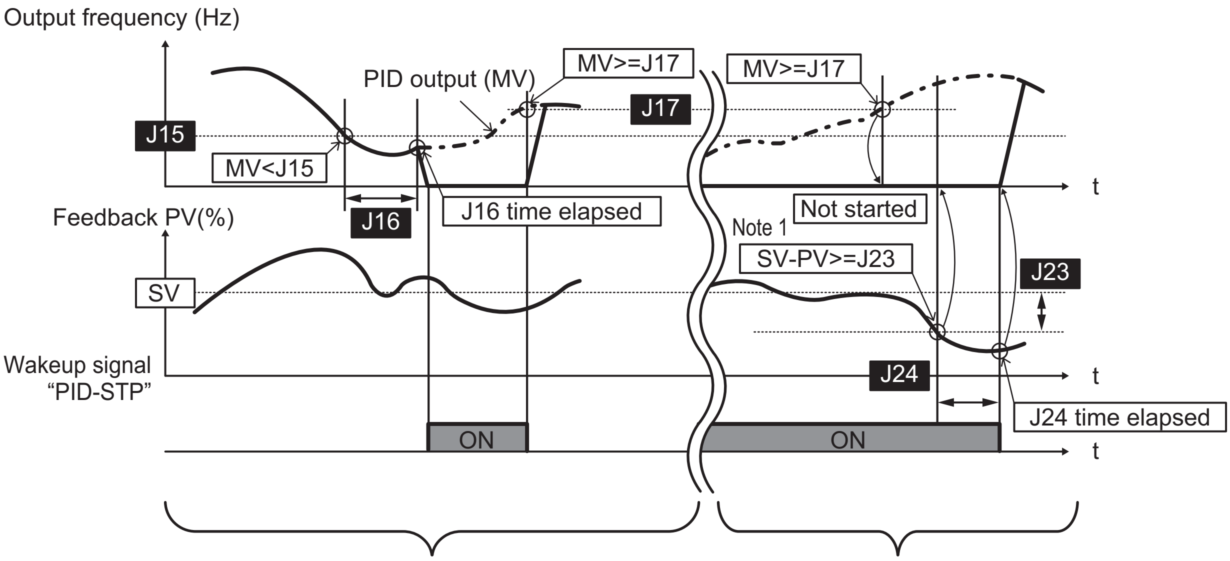
- PID Control Sleep Frequency for Process Control (J15)
  The sleep frequency is set.
- PID Control Sleep Timer for Process Control (J16)
  The time from when the PID output falls below the value set in J15 until the inverter starts deceleration stop is set.
- PID Control Restart Frequency after Stopping for Process Control (J17)
  The wakeup frequency is set. Set the wakeup frequency larger than the sleep frequency J15. If the wakeup frequency is set smaller than the sleep frequency, the sleep frequency is ignored, and the sleep function operates when the PID output falls below the wakeup frequency set value.
- Allocating PID wakeup “PID-STP” (Parameter E20 to E21, E27 data = 44)
  PID wakeup “PID-STP” outputs an ON signal when the inverter stops by the sleep function during PID control. If a signal output indicating that the inverter is in a stopped state is required, it is necessary to allocate “PID-STP.”



- PID Control Restart Feedback Deviation after Stopping for Process Control (J23)
- PID Control Restart Delay Time after Stopping for Process Control (J24)

The inverter restarts when both of the following conditions are satisfied.

1. The discharge pressure falls, the frequency reference value of the PID controller output rises, the wakeup frequency J17 is exceeded, and the wakeup timer (J24) elapses.
2. The difference between SV (command value) and PV (feedback value) becomes more than the wakeup level of PID error (J23), and the wakeup timer (J24) elapses.



Note 1

Normal operation: SV - PV ≥ J23

Reverse operation: SV - PV ≤ J23

PID Command

This command is used to select the means for setting the command values of PID control.

J02	Function
0	PID command by Operator PID command by the / keys on Operator
1	PID command 1 (Analog input: Terminals [AI1], [AI2] (AII function), [AI2] (AIV function)) Setting based on the voltage value (0 to ±10 VDC, PID 100% command/±10 VDC) input to the terminal [AI1]. Setting based on the current value (4 to 20 mA DC, PID 100% command/20 mA DC) input to the terminal [AI2] (AII function). Setting based on the voltage value (0 to 10 VDC, PID 100% command/10 VDC) input to the terminal [AI2] (AIV function).
3	PID command by the UP/DOWN commands With the UP command “UP” and the DOWN command “DOWN,” the PID control commands 0 to 100% can be set to a value obtained by conversion to a physical quantity by PID Control Maximum Scale (J106) and PID Control Minimum Scale (J107).
4	Command by communication Communication parameter (S13): Transmission data 20000d/100% PID command

- PID command by Operator (J02 = 0 (Factory default state))
  With the / keys on the Operator, the PID control commands 0 to 100% (±100% during dancer control) can be set to a value obtained by conversion to an easy-to-identify display such as physical quantity by PID Control Maximum Scale (J106)/PID Control Minimum Scale (J107).
- PID command 1 by analog input (J02 = 1)
  The PID command value can be set arbitrarily by multiplying the gain with the PID command value based on analog input (the voltage value input to the terminal [AI1] and terminal [AI2] (AIV function), and the current value input to the terminal [AI2] (AII function)), and then adding the bias. Polarity selection, filtering and offset adjustment are also possible. In addition to setting of J02, PID command 1 must be selected for each analog setting (parameters E61, E62 and E63) as well.
- PID command by UP/DOWN control (J02 = 3)
  If UP/DOWN control is selected as the PID control command, and either “UP” or “DWN” is turned ON, the command value of PID control fluctuates in the range of maximum scale to minimum scale accordingly. It enables a command according to the application.

To make the setting of the PID command by UP/DOWN control, it is necessary to allocate “17: UP (Acceleration through remote operation)” or “18: DWN (Deceleration through remote operation)” to the multifunction input terminal.

UP	DWN	Operation
OFF	OFF	The current command values of PID control are retained.
ON	OFF	The command values of PID control increase according to the change rate from 0.1%/0.1 s to 1%/0.1 s.
OFF	ON	The command values of PID control decrease according to the change rate from 0.1%/0.1 s to 1%/0.1 s.
ON	ON	The current command values of PID control are retained.

In the inverter, the PID control values set by the UP/DOWN control are maintained internally, and when the operation is resumed (including when the power is turned ON), the control is started from the previous PID command value.

When analog input is applied to the PID command value, the following gains, biases, filters and offsets are applicable.

Input terminal	Input range	Bias		Gain		Polarity selection (Range selection)	Filter	Offset
		Bias	Base point	Gain	Base point			
AI1	0 to 10 V -10 to 10 V	C55	C56	C32	C34	C35	C33	C31
AI2 (AII function)	4 to 20 mA, 0 to 20 mA	C61	C62	C37	C39	C40	C38	C36
AI2 (AIV function)	0 to +10 V	C67	C68	C42	C44	C45	C43	C41

The following processing is performed during polarity selection C35, C45 and range selection C40.
C35: Set the input range of the AI1 terminal.

C35	Terminal input specifications
0	-10 to 10 V
1	0 to 10 V (A negative voltage is considered as 0 V.)

C40: Set the input range of the AI2 (AII function) terminal.

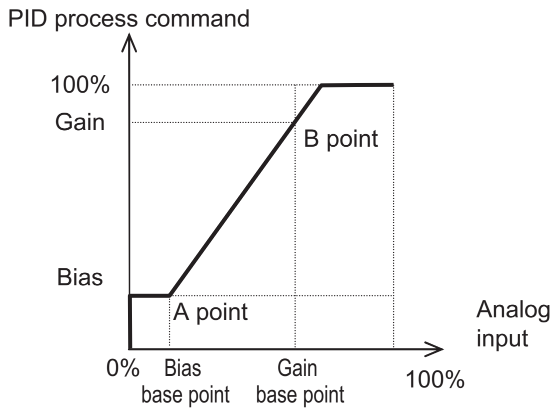
C40	Terminal input specifications	Handling when the bias value is set as a negative value
0	4 to 20 mA	0 is set as the limit for a value below 0.
1	0 to 20 mA	
10	4 to 20 mA	A value below 0 is enabled as a negative value.
11	0 to 20 mA	

C35: Set the input range of the AI2 (AIV function) terminal.

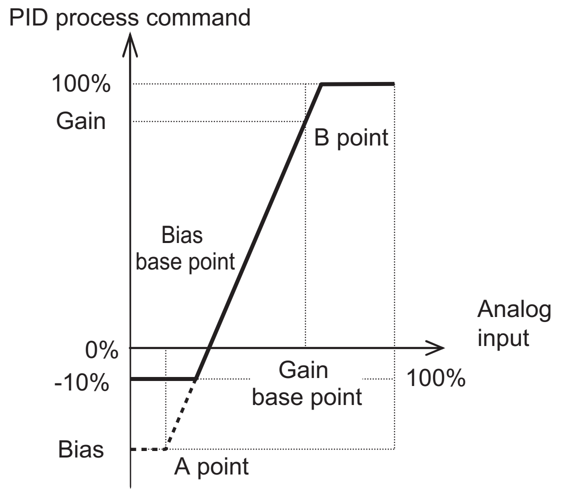
C35	Terminal input specifications	Handling when the bias value is set as a negative value
0	0 to +10 V	A value below 0 is enabled as a negative value.
1	0 to +10 V	0 is set as the limit for a value below 0.

An example of PID process control is shown below.

Used for unipolar

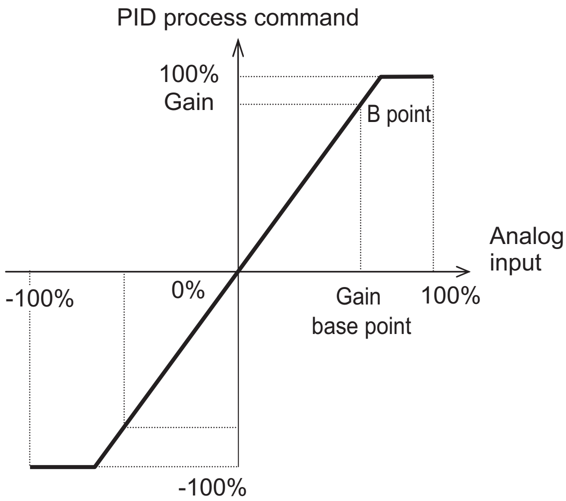


Used for bipolar

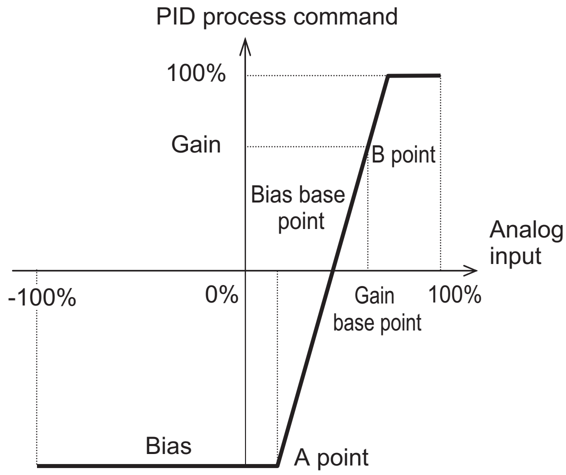


An example of dancer control is shown below.

Bias = 0%, Bias base point = 0%



Bias ≠ 0%, Bias base point ≠ 0%



- PID command by communication (J02 = 4)
  Communication parameter (S13): Transmission data 20000d/100% PID command.

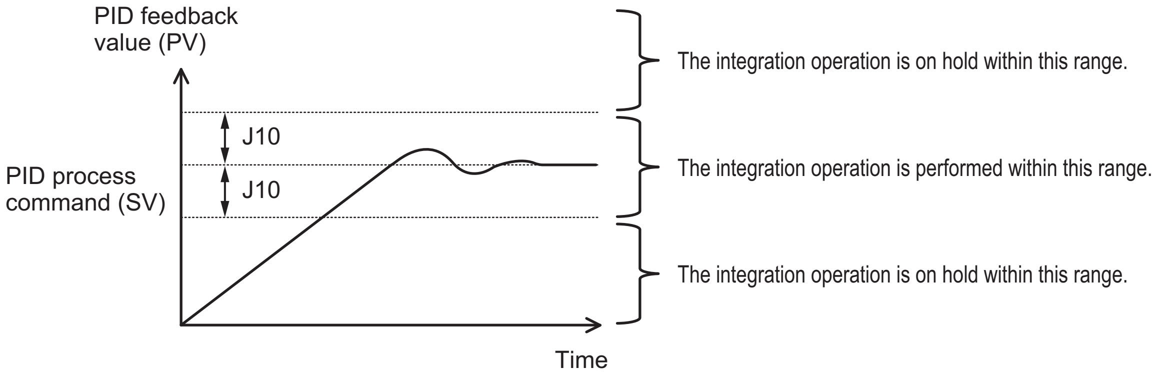
PID Multi-step Command

- PID Control Multistep PID Command 1 to 3 (J136, J137 and J138)
  The PID command value can be applied by the multi-step command of digital input. Allocate “171: PID-SS1” and “172: PID-SS2” to the multifunction input terminal.

PID-SS2	PID-SS1	PID multi-step command
OFF	OFF	Not selected
OFF	ON	J136: PID Control Multistep PID Command 1 Change range: -999.0 to 0.00 to 9990
ON	OFF	J137: PID Control Multistep PID Command 2 Change range: -999.0 to 0.00 to 9990
ON	ON	J138: PID Control Multistep PID Command 3 Change range: -999.0 to 0.00 to 9990

Anti-reset Windup

- PID Control Anti-reset Windup Width (J10)
  Restrains overshooting during control by a PID controller. If the difference between the command and the feedback value is outside the range of the set value, the integrator holds the value and the integration operation is not performed.
- Data setting range: 0 to 200 (%)



PID Output Limiter

It is possible to set a limiter for the upper limit and lower limit in the PID output exclusively for PID control. The limiter is disabled when PID cancellation “Hz/PID” is entered and operation is performed at the normal frequency setting.

- PID Control PID Output Upper Limit (J18)
  The upper limit value for the limiter of PID controller output is set in percentage. If the set value is specified as 999, the settings of 1st Frequency Upper Limit (F15) are followed.
- PID Control PID Output Lower Limit (J19)
  The lower limit value for the limiter of PID controller output is set in percentage. If the set value is specified as 999, the settings of 1st Frequency Lower Limit (F16) are followed.

Setting Dancer Control

- PID Control Operator PID Reference Position for Dancer (J57)
  The reference position during dancer control is set in the range of -100% to 100%. If J02 =0 (Operator) is set, this parameter is enabled as the dancer reference position.

  The PID command can also be applied by the / keys on Operator. In such a case too, the value of J57 changes along with this parameter.

- PID control (Dancer control gain switching) (J58 to J61)
  When the position of the dancer roll (feedback) enters the “Dancer position set point ± Detection width of dancer position error” (J58), the PID constant of the PID controller is switched from J03, J04 and J05 to J59, J60 and J61. It is possible to increase the gain and thus improve the responsiveness, and increase the accuracy.

  PID Control PID Reference Position Detection Width for Dancer (J58)

Set in the range of 1% to 100%. If set to 0, switching of the PID constant is not performed.

PID Control P Gain 2 (J59)

PID Control I Integral Time 2 (J60)

PID Control D Differential Time 2 (J61)

Same as PID Control P Proportional Gain (J03), PID Control I Integral Time (J04) and PID Control D Differential Time (J05).

- PID Control Block Selection (J62)

  It is possible to select whether to add or subtract the output of the PID controller of dancer control to or from the main settings. It is also possible to select whether to perform control of the main settings by the output of the PID controller based on the ratio, or to perform correction based on the absolute value (Hz).

J62 data			Block selection	
Decimal	**bit 1**	**bit 0**	**Control amount**	**Operation on the main settings**
0	0	0	Ratio control	Addition
1	0	1	Ratio control	Subtraction
2	1	0	Absolute value control	Addition
3	1	1	Absolute value control	Subtraction

Terminal Input Function

- PID control cancellation “Hz/PID”

  When “Hz/PID” is ON, switching occurs from PID control to manual frequency setting.

Input signal Hz/PID	Function selected
OFF	PID control enabled
ON	PID control disabled (manual frequency setting)

“Hz/PID” OFF -> ON operation

If, during PID operation, “Hz/PID” is switched from OFF to ON and set to the PID canceled state, and F01/C30 is set to 0: or keys on Operator, 7: Terminal command UP / DWN control, 8: or keys on Operator (balanceless-bumpless switching available), the output frequency is inherited (balanceless-bumpless). If PID control is set to “Opposite operation available” (J01 = 4, 5), and PID output is “During reverse rotation,” the output frequency of PID control is not inherited and becomes 0 Hz.

“Hz/PID” ON -> OFF operation

When PID operation is restored by switching “Hz/PID” from ON to OFF during normal operation, and PID process control (J01 = 1, 2, 4, 5) is enabled, the output frequency during switching is inherited in the MV (balanceless-bumpless), and shifted to PID control. When inverse operation is being performed due to a negative setting of the frequency reference during PID cancellation, and the PID control is set to “Opposite operation not available” (J01 = 1, 2), the absolute value of the output frequency is inherited in the MV, and switching occurs from reverse output to normal output.

- Normal/inverse operation switching “IVS”

  In modes in which process control is performed by the PID control function built into the inverter, PID control enable (operation based on PID controller) and PID control disable (operation based on the manual frequency setting) can be switched according to the PID cancel “Hz/PID” signal. Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command (C53) and PID Control

Function Selection (J01) can be combined with the Normal/Inverse switching “IVS” signal on each operation, and determination of normal operation/reverse operation is performed as follows.

When PID control is enabled: Normal/reverse operation of PID controller output (frequency setting)

PID Control Function Selection (J01)	Input signal IVS	Operation
1: Process (normal operation)	OFF	Normal operation
	ON	Reverse operation
2: Process (inverse operation)	OFF	Reverse operation
	ON	Normal operation

When PID control is disabled: Normal/reverse operation of manual frequency setting

Input Terminal [AI1, AI2] Normal/ Inverse Operation for 1st Frequency Command (C53)	Input signal IVS	Operation
0: Normal	-	Normal operation
1: Inverse	-	Reverse operation

- PID differential/integral reset “PID-RST”
  When “PID-RST” is turned ON, the derivative terms and integration terms of the PID controller are reset.
- PID integration hold “PID-HLD”
  When “PID-HLD” is turned ON, the integration terms of the PID controller are held.

Terminal Output Function

- PID control in progress “PID-CTL”
  When PID control is enabled and the RUN command is ON, the ON signal is output.

PID Feedback Disconnection Detection

If “0: Analog input terminals (AI1, AI2 (AII function), AI2 (AIV function))” is selected for PID Control Feedback Selection (E119), and “5: PID feedback value” is selected for Input Terminal [AI2] Function Selection（AII） (E62), disconnection is detected and processed as an alarm (cof alarm). In Current Input Wire Break Detection (H91), set whether disconnection detection is enabled or disabled, and also set the time for judging a disconnection (a disconnection is judged when the current input of terminal [AI2] is below 2 mA).
If other than “0: 4 to 20 mA Unipolar” is set in Input Terminal [AI2] Operation Selection (AII) (C40), this function does not operate.

Parameter No.	Function name	Data	Default data	Unit
H91	Current Input Wire Break Detection	0.0: Disable alarm detection 0.1 to 60.0 s: Issue alarm after set time	0.0	s

7-9-14 Automatic Energy-saving Operation Function

This function automatically adjusts the inverter output power during constant speed operation to the minimum level. It is suitable for load with reduced torque characteristics, such as fans and pumps.
To perform energy-saving operation using this function, set Energy-saving Operation Function Selection (E124) to “1: Energy-saving operation.”
When the automatic energy-saving operation is enabled, it is possible to select Enable during running at constant speed, and Enable during running at constant speed and acceleration/deceleration with Auto Energy Saving Operation Condition Selection(H67).

Because this function controls the output power to the minimum necessary level, the motor may stall if the rapid load fluctuation, such as impact load, occurs, which may result in an overcurrent trip.
When the frequency reference is analog input, increase the sett value of Input Terminal [AI1] Filter (C33)/Input Terminal [AI2] Filter (AII) (C38)/Input Terminal [AI2] Filter (AIV) (C43) according to the analog input terminal used.

Parameter No.	Function name	Data	Default data	Unit
E124	Energy-saving Operation Function Selection	0: Normal operation 1: Energy-saving operation	0	-
H67	Auto Energy Saving Operation Condition Selection	0: Enable only at constant speed 1: Enable in all modes	0	-

7-9-15 Commercial Switching (CS)

When switching between commercial operation/inverter operation is performed in an external sequence, input the CS allocated to multifunction input in accordance with the operation chart below.
Then, the inverter can be started from the commercial power supply frequency regardless of the set frequency of the inverter, and the motor during the commercial operation can be smoothly switched to inverter operation.
This function is enabled in V/f control and V/f control with speed sensor.
15: CS is a function that is used when the power supply frequency is 50 Hz. When the power supply frequency is 60 Hz, use 16: SW60.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	15: CS (Commercial switching) 16: SW60 (Commercial switching (60 Hz))	-	-
H13	Power Interruption Restart Wait Time	0.1 to 100.0	0.5	s

Switching from Inverter Operation to Commercial Power Supply Operation

Follow the sequence diagram given below to switch among the terminals MC1 to MC3, FW, and CS.
When the CS terminal turns ON, the inverter shuts off its output and the motor falls in a free-run state.

Switching from Commercial Power Supply Operation to Inverter Operation

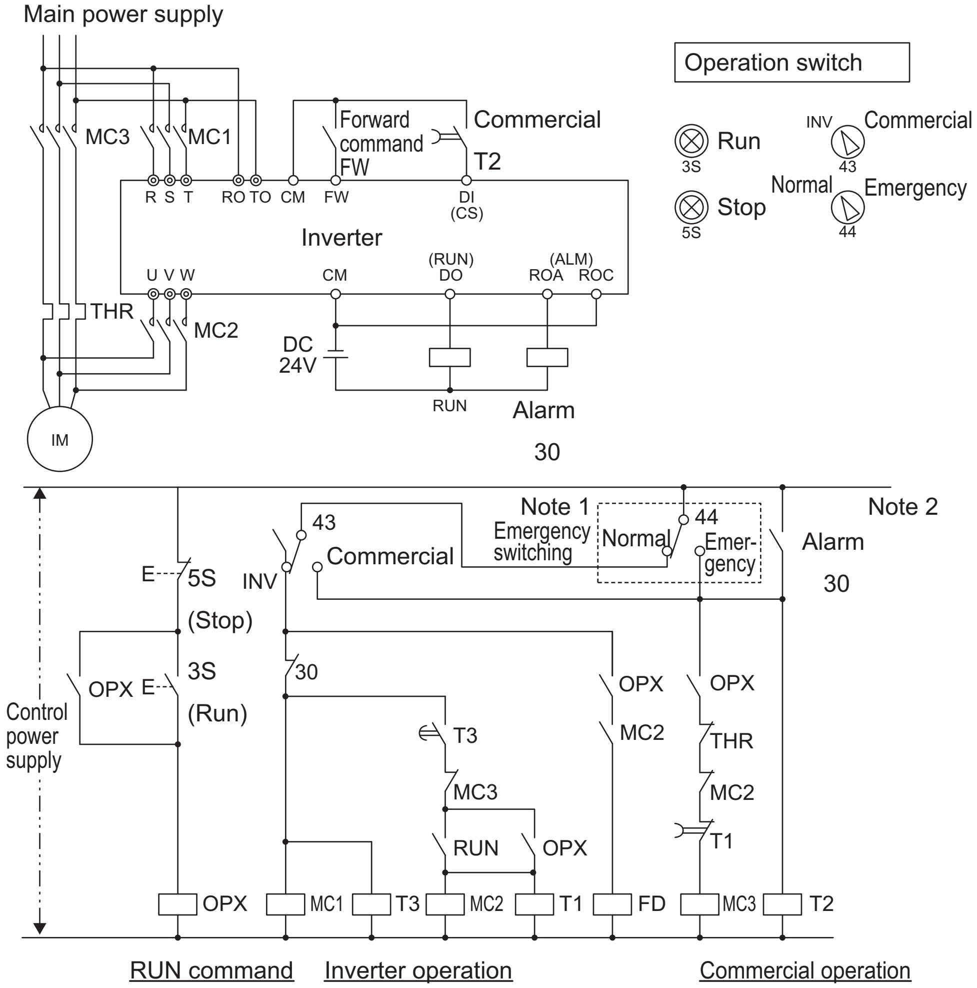
When the commercial switching signal “CS” or “SW60” is turned OFF, the operation switches to inverter operation, and following the elapse of the restart timer after momentary power failure (H13), the 50 Hz output starts when the signal during commercial 50 Hz selection turns OFF, and the 60 Hz output starts when the signal during commercial 60 Hz selection turns OFF. (Start of pull-in operation)
If the output frequency is deviating from the motor rotation speed, perform adjustment of the output frequency during the pull-in operation based on the fall rate of restart after momentary power failure (H14). After the completion of the pull-in operation, acceleration/deceleration is performed to the set frequency of the inverter based on the set acceleration/deceleration time.

Input during Commercial Operation (CRUN-M1, CRUN-M2)

If operation is not performed by the inverter during the commercial switching operation, it is possible to integrate 1st Cumulative Motor Run Time (H94)/2nd Cumulative Motor Run Time (A51) by incorporating the auxiliary contact points of the electromagnetic contactor for commercial switching to CRUN-M1 and CRUN-M2 allocated to multifunction input as a digital signal.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	72: CRUN-M1 (Input during commercial operation (Motor 1)) 73: CRUN-M2 (Input during commercial operation (Motor 2))	-	-

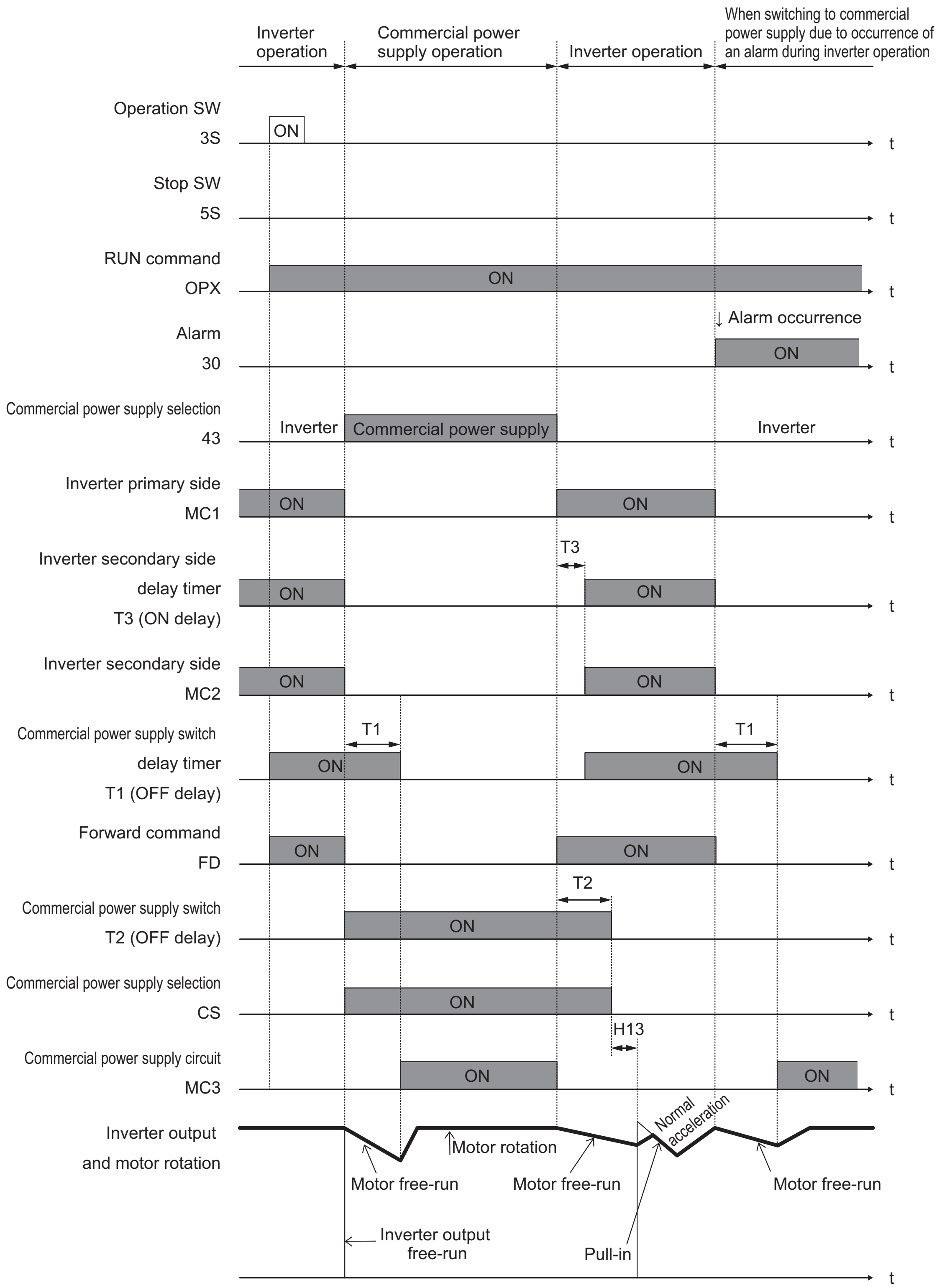
● Connection diagram for commercial switching operation



Note 1. Emergency switching
Manual switching performed when the sequence for switching to commercial power supply is not performed normally due to a major breakdown of the inverter.

Note 2. When an alarm is issued in the inverter, switching to commercial power supply occurs automatically.

● Timing diagram for commercial switching



7-9-16 Stabilization Parameter

When the motor is driven, the output current of the inverter may fluctuate (current fluctuation) due to the motor characteristics or the backlash at the load machine side. This parameter changes the data when the control function for suppressing such current fluctuation is to be adjusted.

Parameter No.	Function name	Data	Default data	Unit
H80/A41	1st Output Current Fluctuation Damping Gain/2nd Output Current Fluctuation Damping Gain	0.00 to 1.00	0.20	-

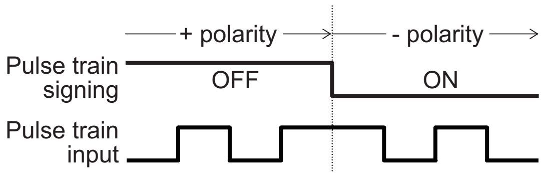
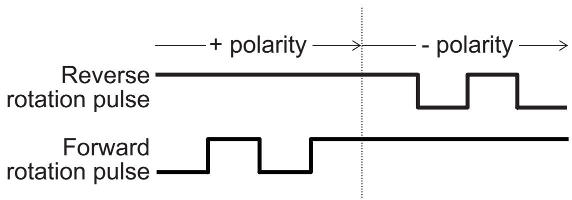
7-9-17 Pulse Train Frequency Input

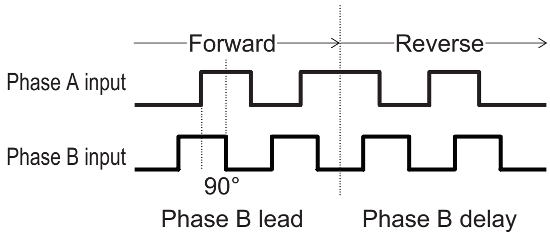
When 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) = “12: Pulse train input,” or F01/C30 is “13: Calculation result,” and Frequency Calculation Operation Target 1 (E131)/Frequency Calculation Operation Target 2 (E132) = “7: Pulse train frequency,” or PID Control Feedback Selection (E119) = “3: Pulse train frequency” the frequency setting can be made based on pulse train input.

Parameter No.	Function name	Data	Default data	Unit
F01/C30	1st Frequency Reference Selection/2nd Frequency Reference Selection	12: Pulse train input 13: Calculation result	0	-
F15/E117	1st Frequency Upper Limit/2nd Frequency Upper Limit	0.00 to 590.00	70.00	Hz
F16/E118	1st Frequency Lower Limit/2nd Frequency Lower Limit	0.00 to 590.00	0.00	Hz
E119	PID Control Feedback Selection	3: Pulse train frequency	0	-
d14	Input Terminal [PIA][PIB] Pulse Input Format Selection	0: Pulse train signing/pulse train input 1: Forward and reverse pulse 2: Quadrature A/B signal (B phase lead) 3: Quadrature A/B signal (A phase lead)	2	-
d16	Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator	1 to 32767	1	-
d17	Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator	1 to 32767	1	-
d18	Input Terminal [PIA][PIB] Pulse Train Filter Time Constant	0.000 to 5.000	0.005	s
E131/E132	Frequency Calculation Operation Target 1/Frequency Calculation Operation Target 2	5: Pulse train input	1/2	-
E134	Frequency Addition Amount	0.00 to 590.00	0.00	Hz
E135	Frequency Addition Sign Selection	0: Frequency command + E134 1: Frequency command - E134	0	-

Parameter No.	Function name	Data	Default data	Unit
W53	Pulse Input (A/B Phase of Ch1 Side)	-327.68 to 327.67	-	kp/s
W54	Pulse Input (Z Phase of Ch1 Side)	0 to 16000	-	p/s
W55	Reserved	-327.68 to 327.67	-	kp/s
W56	Reserved	0 to 16000	-	p/s
W139	Pulse Train Frequency Monitor	-163.84 to 163.83	-	%

- Pulse train input method (d14)
  By entering a serial pulse in the terminals [PIA] [PIB] of the inverter control circuit, it is possible to make a frequency setting proportional to the frequency of the pulse. The pulse train input method is specified by d14. Input can be made in four types, namely the Pulse train signing/pulse train input, Forward and reverse pulse, and Quadrature A/B signal (A phase lead, B phase lead).

d14 data	Pulse input method	Target terminal	Remarks
0	Pulse train signing	PIA (terminal block)	A speed command corresponding to the frequency of pulse train input is applied. Moreover, the polarity of the speed command can be set by the pulse train signing. 
	Pulse train input	PIB (terminal block)	
1	Forward rotation pulse	PIA (terminal block)	A speed command corresponding to the frequency of pulse train input is applied. If the input pulse is a forward rotation pulse, it results in straight polarity, and if the input pulse is a reverse rotation pulse, it results in reverse polarity. 
	Reverse rotation pulse	PIB (terminal block)	

<table>
<tr><th>d14 data</th><th>Pulse input method</th><th>Target terminal</th><th>Remarks</th></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Quadrature A/B signal (B phase lead)</td><td>PIA (terminal block)</td><td rowspan="2">A speed command with polarity is applied based on the phase difference and frequency, by two types of pulse signals having a 90° phase difference (B phase lead).

</td></tr>
<tr><td>PIB (terminal block)</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Quadrature A/B signal (A phase lead)</td><td>PIA (terminal block)</td><td rowspan="2">The polarity is reversed (A phase lead becomes forward rotation) when d14 = 2.
If the A-phase and B-phase are wired in the reverse order, the polarity can be corrected by setting data 3 in this code.</td></tr>
<tr><td>PIB (terminal block)</td></tr>
</table>

- Encoder pulse resolution
  Set the number of encoder pulses of pulse train input.
- Pulse scaling factor 1 (d16), Pulse scaling factor 2 (d17)
  Set the relationship between the input pulse frequency and the frequency set value with d16 (Pulse scaling factor 1) and d17 (Pulse scaling factor 2). If the set frequency is to be specified in f[Hz] when the frequency of pulse train input is Np [kp/s],

  set d16 = Np, d17 = f*.

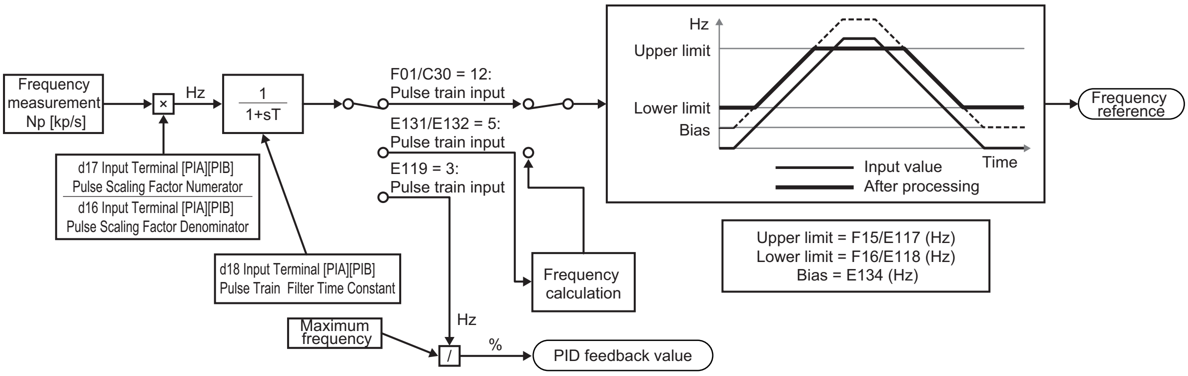
  The relational expression is as described below.

$$f^* \text{ [Hz]} = Np \text{ [kp/S]} \times \frac{\text{Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator (d17)}}{\text{Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator (d16)}}$$

  f* [Hz]: Frequency set value

  Np [kp/s]: Entered input pulse frequency

- Filter time constant (d18)
  Set the filter time constant with respect to the pulse train input.
- Pulse train frequency bias value
  The bias value for the pulse train frequency can be specified by frequency addition based on Frequency Addition Amount (E134) and Frequency Addition Sign Selection (E135). Frequency addition can be switched by "ADD" that is allocated to the multifunction input terminal, but, if ADD is not allocated to the multifunction input terminal, it is handled as always ON, and addition can be performed only by setting.
- Pulse train frequency upper limit/lower limit
  After performing the bias processing for the frequency setting of pulse train, perform the upper and lower limit processing.
  The upper and lower limits are not applicable to the PID feedback value. As for the calculation function selection value, set the upper and lower limit for the final frequency after the calculation.



- PID feedback based on pulse train input (E119 = 3)
  Perform the same processing as the frequency setting process for the pulse train, and convert to the feedback value with the maximum frequency with respect to the frequency reference value of the result as 100%.
  When (1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) = 12: Pulse train input), or (F01/C30 = 13: Calculation result, and Frequency Calculation Operation Target 1 (E131)/Frequency Calculation Operation Target 2 (E132) = 7: Pulse train frequency) are set simultaneously, the pulse train input is used in both the set frequency and the PID feedback.
- Operation frequency input setting based on pulse train input (E131/E132 = 5)
  Perform the same processing as the frequency setting process for the pulse train, and set the frequency reference value of the result as the selection value of the operation frequency.
- Terminals for which pulse train input is enabled
  When the pulse train input is used as the frequency setting, it is necessary to set pulse train input (12) in the setting of F01/C30.
  The terminals for which pulse train input is enabled are as shown in the table below.

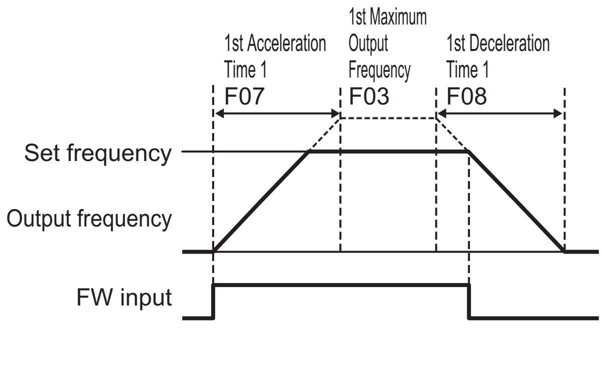
Terminals for which pulse train input is enabled	Maximum frequency	Voltage
PIA, PIB (standard terminal blocks)	0 to 32 Hz complementary	5 to 24 VDC

7-9-18 LAD Cancel Function

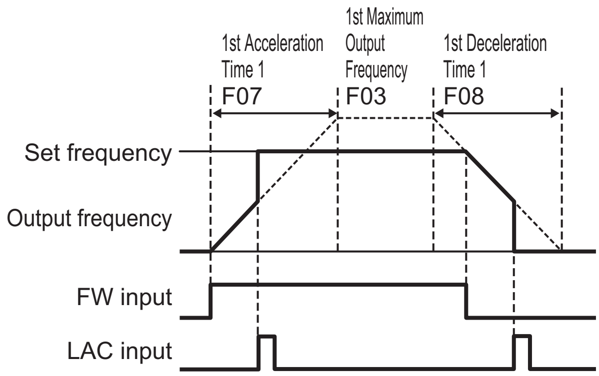
LAD functions to calculate the transient frequency reference value to enable the motor to reach the reference frequency in the set acceleration/deceleration time. The LAD cancel function disables this frequency acceleration/deceleration function (LAD).
When “84: LAC (LAD Cancel)” is allocated to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) and the LAC terminal is turned ON, the frequency acceleration/deceleration function (LAD) is disabled and the frequency reference is output momentarily.
For details on the acceleration/deceleration time, refer to *5-6-1 Acceleration/Deceleration Time Setting* on page 5-39.
This function is also applicable to the acceleration/deceleration during the jogging operation and the deceleration during forced stop.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	84: LAC (LAD Cancel)	-	-

Parameter No.	Function name	Data	Default data	Unit
Related function		F07, F08, E10 to E15		



Normal acceleration/ deceleration



LAD cancel

7-9-19 Servo Lock

The servo lock function is used to control the position of the motor, and continue to retain the position even when an external force is applied. It is enabled only during vector control with speed sensor. The servo lock function is enabled by allocating “47: LOCK (Servo lock command)” to the multifunction input terminal and then turning it ON.
The servo lock operates at a low speed, and therefore, if it is used by applying an external force over a long period of time, overheat protection may be activated.

The servo lock startup conditions are as described below.

	Servo lock startup conditions (servo lock control is started when the conditions below are established)	
	1st Stop Frequency Detection Method Selection (F38) = 0 (Stop judgment based on speed detection value)	1st Stop Frequency Detection Method Selection (F38) = 1 (Stop judgment based on speed command value)
1	RUN command is OFF, or set frequency < stop frequency (F25)	
2	Servo lock command “LOCK” is ON	
3	Speed detection value is equal to or less than the stop frequency (F25)	Speed command value is equal to or less than the stop frequency (F25)

When the servo lock is complete, and has been retained within the range set in Servo Lock Completion Range (J99) for the time period set in Servo Lock Completion Timer (J98), the positioning completion signal “POK” is output as the positioning completion signal.

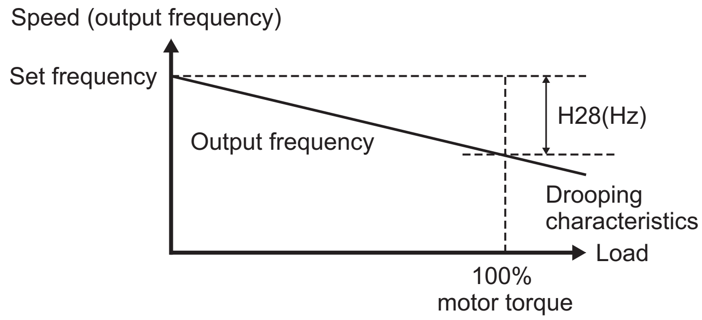
Set the gain for the position control of the servo lock by Servo Lock Gain (J97). The behavior of stopping the inverter during a servo lock, and the axial holding force can be adjusted.
When setting smaller value to J97, the response is delayed, but the behavior becomes smoother and the axial holding force is reduced. When setting larger value, the response becomes faster, but hunting increases and the axial holding force also increases.

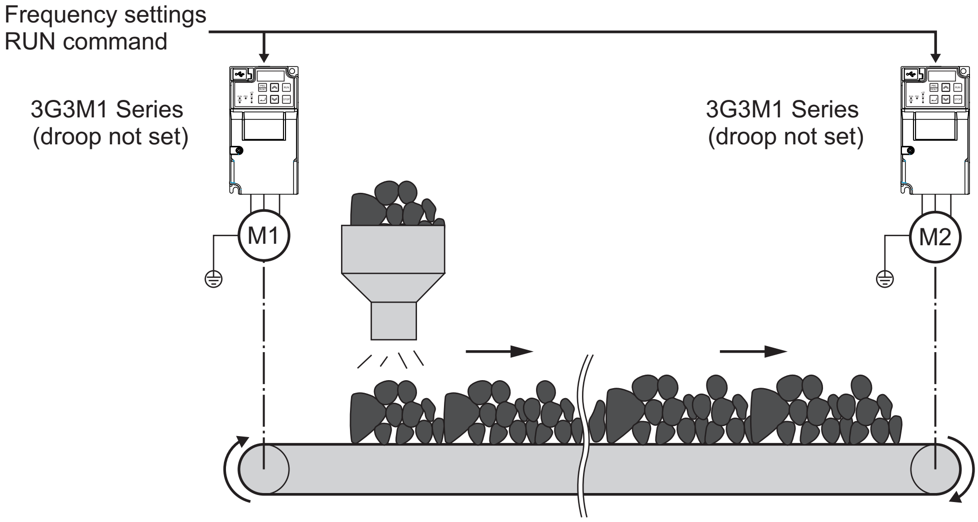
Parameter No.	Function name	Data	Default data	Unit
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection(E21), Output Terminal [ROA, ROB] Function Selection	82: POK (Positioning completed)	-	-
J97	Servo Lock Gain	0.000 to 9.999	0.010	time
J98	Servo Lock Completion Timer	0.000 to 1.000	0.1	s
J99	Servo Lock Completion Range	0 to 9999	10	Pulse

7-9-20 Droop Control

If a single mechanical system is driven by multiple motors, and there is a speed difference in each of the motors, a load unbalance occurs. Droop control is a function for ensuring load balance by providing drooping characteristics to the motor speed in response to an increase in load.
The set value of Droop Control (H28) is around the rated slip frequency of the applicable motor.
If “76: DROOP (Droop selection)” is selected for Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99), the droop control is enabled by turning ON the DROOP terminal.

Parameter No.	Function name	Data	Default data	Unit
H28	Droop Control	-60.0 to 0.0	0	Hz
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	76: DROOP (Droop selection)	-	-

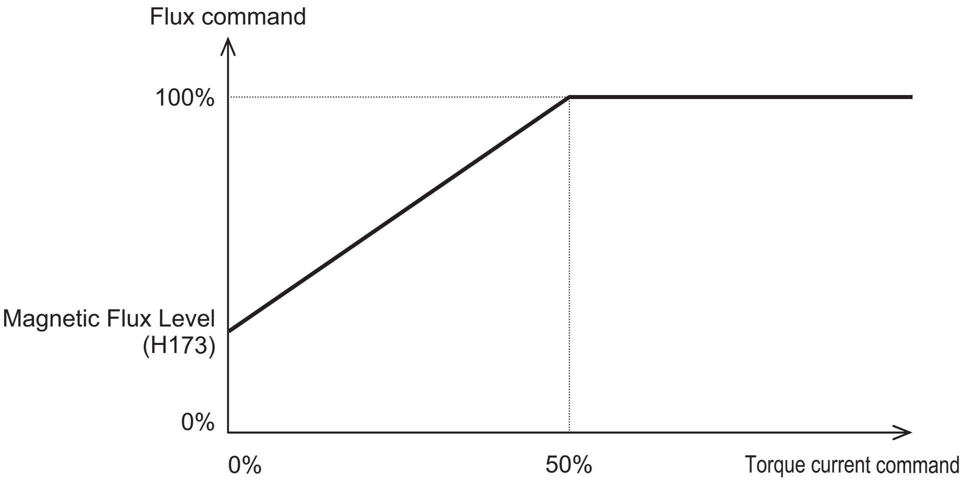




7-9-21 Magnetic Flux Level at Light Load

By setting Magnetic Flux Level at Light Load (H173), the magnetic flux of the motor during a light load can be reduced, and thus, the motor noise can be reduced. This function can be used only during vector control with speed sensor. The motor magnetic flux command is controlled in proportion, when the torque current command value is below 50%. Magnetic Flux Level at Light Load (H173) specifies the minimum value of the magnetic flux command. Refer to the figure below.

Parameter No.	Function name	Data	Default data	Unit
H173	Magnetic Flux Level at Light Load	10 to 100	100	%

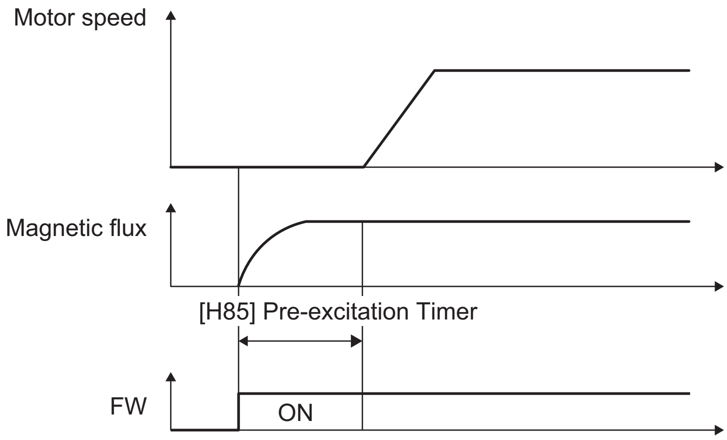


7-9-22 Pre-excitation

The motor generates torque through magnetic flux and torque current. Since the establishment of magnetic flux has a lag element, sufficient torque is not generated at the moment of starting.
Pre-excitation is a function for establishing the magnetic flux before startup to ensure sufficient torque even during the moment of starting.

There are two methods for issuing pre-excitation commands: one is to execute for the period of Pre-excitation Timer (H85) after the RUN command is turned ON, and the other is to turn ON the EXITE (pre-excitation command) terminal and apply pre-excitation until the RUN command is input.
Pre-excitation Level (H84) is a function for forcing pre-excitation. Generally, there is no need to change the settings.
When the pre-excitation (Timer) elapses, it is judged that magnetic flux has been established, and acceleration is started. Secure sufficient time for establishment of magnetic flux with Pre-excitation Timer (H85).
The appropriate value of the pre-excitation (Timer) is different for each capacity. As a standard, consider it equivalent to the default value of the Power Interruption Restart Wait Time (H13).

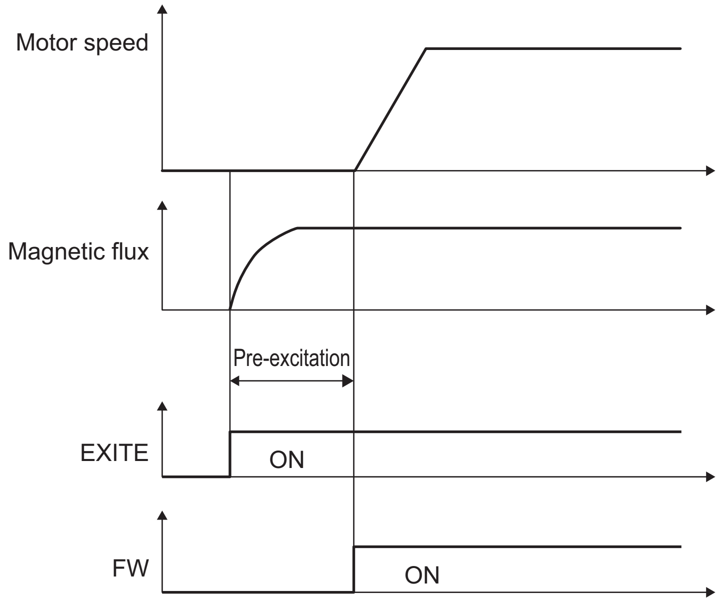
Parameter No.	Function name	Data	Default data	Unit
H84	Pre-excitation Level	100 to 400	100	%
H85	Pre-excitation Timer	0.00: Disable 0.01 to 30.00	0.00	s



Method of Controlling by Turning the Pre-excitation Command Terminal ON/OFF

Allocate “32: Pre-excitation (EXITE)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99). Pre-excitation starts operating when the EXITE terminal is turned ON.
Even if the Pre-excitation Timer (H85) is set to 0.00: Disable, pre-excitation can be instructed by the EXITE signal.
Input the RUN command after the lag time for establishing the confirmation time has elapsed. When the RUN command is input, the pre-excitation operation ends, and acceleration starts.
Manage the confirmation establishment time by an external sequence.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	32: Pre-excitation (EXITE)	-	-



7-9-23 Forced Stop

When using this function, allocate “30: STOP (forced stop)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
The forced stop function is used to perform a deceleration stop by Deceleration Time for Forced Stop (H56) when the STOP terminal is turned OFF. After the deceleration stop, alarm Er6 is displayed and the status changes to alarm status.
If “152: STOP-OUT (Forced stop detection)” is allocated to the multifunction output terminal, the signal turns ON when a forced stop is detected.

Parameter No.	Function name	Data	Default data	Unit
H56	Deceleration Time for Forced Stop	0.00 to 6000	6.00	s
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	30: STOP (forced stop)	-	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	152: STOP-OUT (Forced stop detection)	-	-

7-9-24 Overload Stop Function

This function is used to detect the load condition, and if the state exceeding the set detection level (J64) continues as long as the timer setting (J67), stop operation is performed by the selected operation (J65). It is used to protect the inverter when a system-unacceptable load is applied, or to lock the

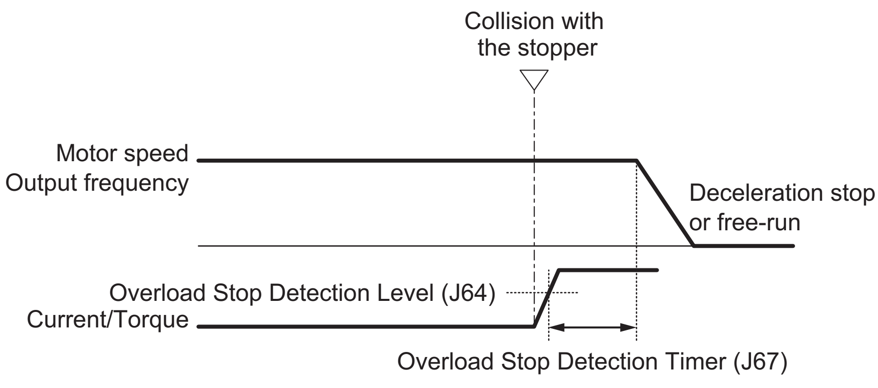
motor shaft by mechanically colliding with the stopper. This function is disabled while the 2nd control is selected.
When “0: Torque” is selected for Overload Stop Item Selection (J63), perform auto-tuning to increase the accuracy of the torque calculated value.
When “1: Current” is selected, a no-load current flows even when there is no load. Therefore, set the value appropriately in consideration of the no-load current.

Parameter No.	Function name	Data	Default data	Unit
J63	Overload Stop Item Selection	0: Torque 1: Current	0	-
J64	Overload Stop Detection Level	20 to 200%	100	%
J65	Overload Stop Mode Selection	0: Disable 1: Deceleration stop 2: Free run stop 3: Mechanical stop	0	-
J66	Overload Stop Operation Mode	0: During constant speed running and deceleration 1: During constant speed running 2: Anytime	0	-
J67	Overload Stop Detection Timer	0.00 to 600.00	0	s
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	46: OLS (Overload stop enabled command)	-	-

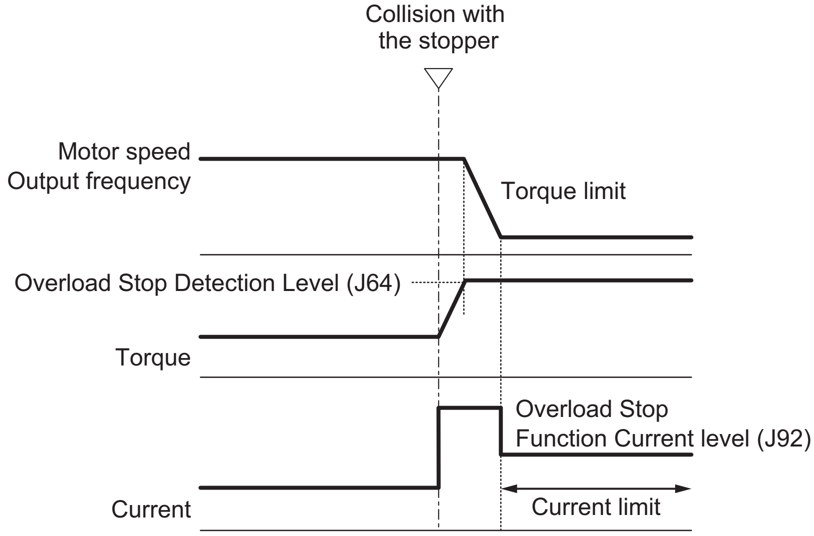
Overload Stop Mode Selection (J65)

If the load set in Overload Stop Detection Level (J64) is exceeded, the operation selected in Overload Stop Mode Selection (J65) is followed.
To disable the overload stop function, set (J65 = 0: Disable).

● For operation selection (J65 = 1, 2)



● **For operation selection (J65 = 3)**



Torque Limitation P (Gain), Torque Limitation I (Integral Time) and Current Limitation Level

When “3: Hit mechanical stop” function is selected for Overload Stop Mode Selection (J65), the parameters described below can be set.

● **Overload Stop Function P gain (J90)**

If the response of the torque limitation operation is slow, increase the gain, and if hunting occurs, decrease the gain.

● **Overload Stop Function Integral time (J91)**

If the response of the torque limitation operation is slow, decrease the integral time, and if hunting occurs, increase the integral time.

● **Overload Stop Function Current level (J92)**

This function is used to correct the current command during current limitation. When the set value is increased, the retention torque increases, but an inverter overload alarm (OLU) or a motor overload alarm (OL1) may occur, and vibrations may occur in the mechanical system.

Parameter No.	Function name	Data	Default data	Unit
J90	Overload Stop Function P gain	0.000 to 2.000 999: Default value (= 0.050)	999	time
J91	Overload Stop Function Integral time	0.001 to 9.999 999: Default value (= 0.025)	999	s
J92	Overload Stop Function Current level	50.0 to 150.0	100	%

Overload Stop Enabled OLS

Allocate “46: OLS (Overload stop enabled command)” to Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).

Overload stop can be selected as enabled/disabled by turning the OLS terminal ON or OFF.
Note that if overload stop is disabled by turning OFF the OLS terminal in a state when the inverter has stopped due to overload stop, the inverter will restart.

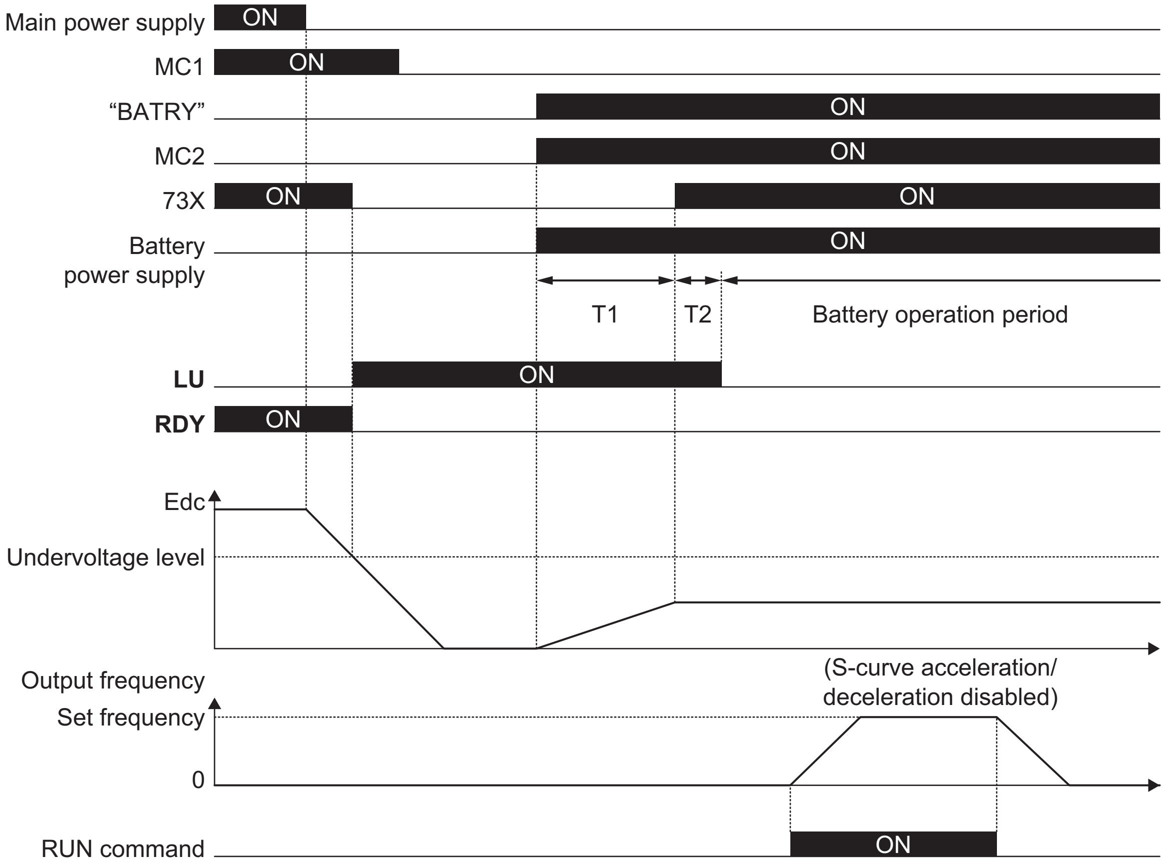
Overload stop enabled OLS	Operation
OFF	Overload stop disabled
ON	Overload stop enabled

7-9-25 Battery Operation Enable Command (BATRY)

When this terminal command is turned ON, undervoltage protection is disabled, and the motor can be operated even in an undervoltage state. In an event that an elevator fails to stop at a normal position due to power failure, this command is expected to operate the elevator to the normal position with a low-voltage and small-capacity emergency power supply.
When “BATRY” is allocated to the multifunction input terminal, the momentary power failure operation is not performed regardless of the setting of F14, and the inverter trips during a power failure.
When “BATRY” is ON, the input phase loss protection is disabled regardless of the setting of parameter H411.
During battery operation, it is assumed that the main power is supplied from the battery, and the control power is supplied from the UPS to perform the operation. Battery operation can be performed in 18.5 kW or higher models.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	59: Battery operation selection	-	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	10: IRDY (Operation ready completion)	-	-

- About the battery operation (when “BATRY” = ON)
  1. The undervoltage protection function (LU) is disabled.
  2. Even under the undervoltage condition, the inverter can operate the motor.
  3. The operation ready completion “IRDY” signal is forcibly turned OFF.
  4. The inrush current prevention resistor short circuit is shorted after a delay time T1 since the “BATRY” terminal is turned ON. (73X = ON). In addition, the battery operation starts after the delay time T2 (0.1 s maximum).



Power supply condition	T1
The time from when the supply of control power turns ON from an OFF state and the power supply switches to the battery until the inrush current prevention resistor short circuit 73X turns ON	100 ms
The time from when a momentary power failure occurs while the control power is ON and the power supply switches to the battery until the inrush current prevention resistor short circuit 73X turns ON	205 ms

5. The S-curve acceleration/deceleration is disabled.
6. The speed at which operation can be performed during the battery operation is calculated based on the formula below.

$$\text{Frequency reference during battery operation} \leq \frac{\text{Battery voltage - 5 [V]}}{\sqrt{2} \times \text{1st Rated Voltage at Base Frequency (F05)}} \times \text{1st Base Frequency (F04)} \times k$$

Here, the battery voltage is 24 VDC or higher (200-V class) and 48 VDC or higher (400-V class)

1st Base Frequency: F04

1st Rated Voltage
at Base Frequency: F05 (Motor rated voltage (V))

k: Safety factor (Less than 1. Approx. 0.8)

7-9-26 Universal Terminal

The digital signal of the peripheral equipment of the inverter can be connected to the input/output terminal of the inverter, and monitored via RS-485 communication.

Universal DI

When “25: U-DI (Universal DI)” is allocated to the multifunction input terminal, this function has absolutely no effect on the operation even when turned ON/OFF, and is simply used to monitor the condition of the terminal block.

Option

When “27: OPO (Option)” is allocated to the multifunction output terminal, ON/OFF is output from the OPO terminal when data is written to the parameter S07 from communication.

Universal AO

When “10: Universal AO” is allocated to the analog output terminal AO, output is performed from the analog terminal when data is written to the parameter S12 from communication.
Full scale is assumed for a numeric value of 20000.

Parameter No.	Function name	Data	Default data	Unit
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	25:U-DI (Universal DI)	-	-
E20, E21, E27	Output Terminal [DO1] Function Selection, Output Terminal [DO2] Function Selection, Output Terminal [ROA, ROB] Function Selection	27: OPO (Option)	-	-
F31	Output Terminal [AO] Function Selection	10: Universal AO	-	-
M13*1	Operation Command at Final	0000 hex to FFFF hex (Hexadecimal) bit 0: FWD bit 1: REV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	0	-

Parameter No.	Function name	Data	Default data	Unit
S07*1	Communication Data Terminal [DO]	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	0	-
S12*1	Communication Data Terminal [AO]	-32768 to 32767 +20000 or -20000 = ±full scale	0	-

*1. This function can be referenced only from the communications function or Sysmac Studio.

7-9-27 Protection/Maintenance Mode Selection Function

Main circuit capacitor life judgment selection, main circuit capacitor life judgment, inrush current prevention resistor overheat detection protection, and braking transistor error detection operations can be selected and set as combined operations.

Parameter No.	Function name	Data	Default data	Unit
H98	Protection/Maintenance Function Mode Selection	Bit7: Reserved Bit6: Braking transistor error detection 0: Disable 1: Enable Bit5: Detect charge register overheat 0: Enable 1: Disable Bit4: Judge main circuit capacitor life 0: Disable 1: Enable Bit3: Main circuit capacitor life judgment selection 0: Factory default standard 1: User measurement value standard Bit0 to 2: Reserved	80	-

Set function settings as binary values to their respective bits, and set the resulting data as decimal data to H98. The following shows the settings of each bit and each function.

Bit	Function	Data = 0	Data = 1	Default value
bit 0 to 2	Reserved	-	-	-
bit 3	Main circuit capacitor life judgment standards selection	Default value	User setting	0: Default value
bit 4	Judge the life of main circuit capacitor	Disable	Enable	1: Enable
bit 5	Charge resistor overheat detection protection	Enable	Disable	0: Enable
bit 6	Braking transistor error detection	Continuous running	Alarm processing	1: Alarm processing
bit 7	Reserved	-	-	-

Below are the details of each function.

Selection of Main Circuit Capacitor Life Judgment Standards (Bit 3)

Either of the factory default standards or user setting standards can be selected as the criteria level for judging the life of the main circuit capacitor.
When user setting standards are selected, the reference level must be measured and set beforehand.
For details, refer to *7-8-10 Capacitor Life Warning Signal (WAC)* on page 7-94.

Judge the Life of Main Circuit Capacitor (Bit 4)

To judge the life of the main circuit capacitor, measure the discharge time when the power supply is shut off. The discharge time is determined by the capacity of the main circuit capacitor and the inverter's internal load. Accordingly, accurate measurement is not possible when the inverter's internal load conditions fluctuate considerably. Life is also sometimes judged erroneously in some conditions. To prevent erroneous judgment of the life of the main circuit capacitor, life judgment based on the discharge time of the main circuit capacitor can be disabled (life judgment based on incrementation of the time that voltage is applied to the main circuit capacitor continues to stay active).

In the following states, the load varies considerably. For this reason, during run operation, either disable life judgment and then enable life judgment after aligning conditions at periodic inspection, or measure by a method matched to actual usage conditions.

- When the control power supply auxiliary input is used
- When the option card (reserved) is used

Charge Resistor Overheat Detection Protection (0h6: Inrush Current Prevention Resistor Overheat) (Bit 5)

On 0.1 to 15 kW inverters, when overheating of the inrush current prevention resistor inside the inverter is detected when the main circuit power is turned ON and started, the overheat protection function (alarm 0h6) is activated. When startup is slow due to the main circuit power being a variable power supply device, the overheat protection function is sometimes activated. In this case, protection can be disabled.

Braking Transistor Error Detection (dba) (Bit 6)

An error in the built-in braking transistor is detected, the inverter is topped, and the alarm dba is displayed. To disable alarm generation without using the braking transistor, set this bit to “0.”

8

Communications Functions

This section describes the general-purpose serial communications functions (Modbus communication).

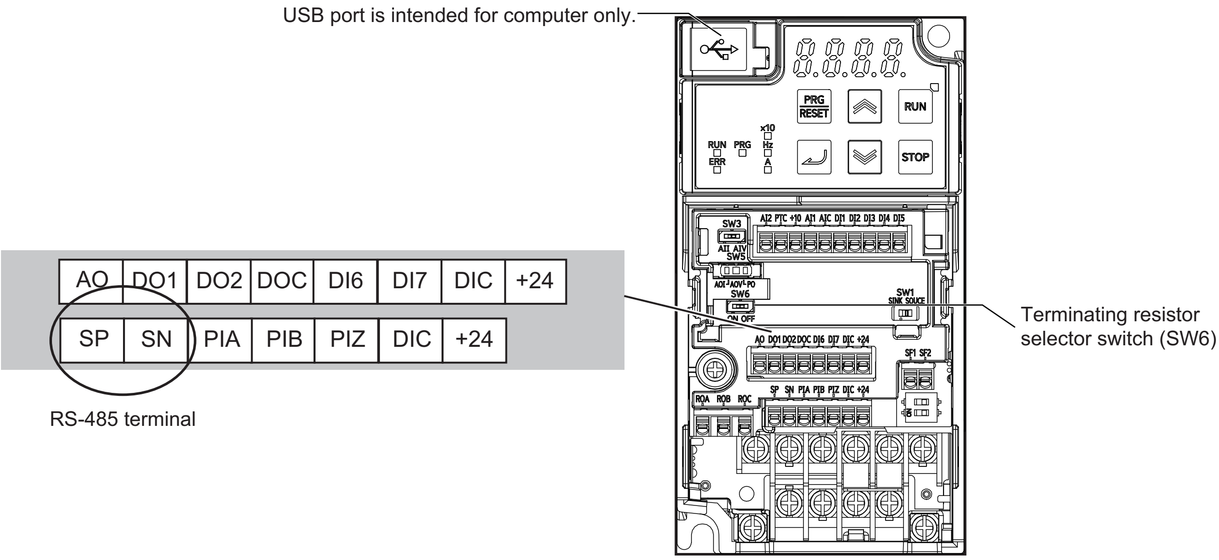
8-1 Communications Specifications

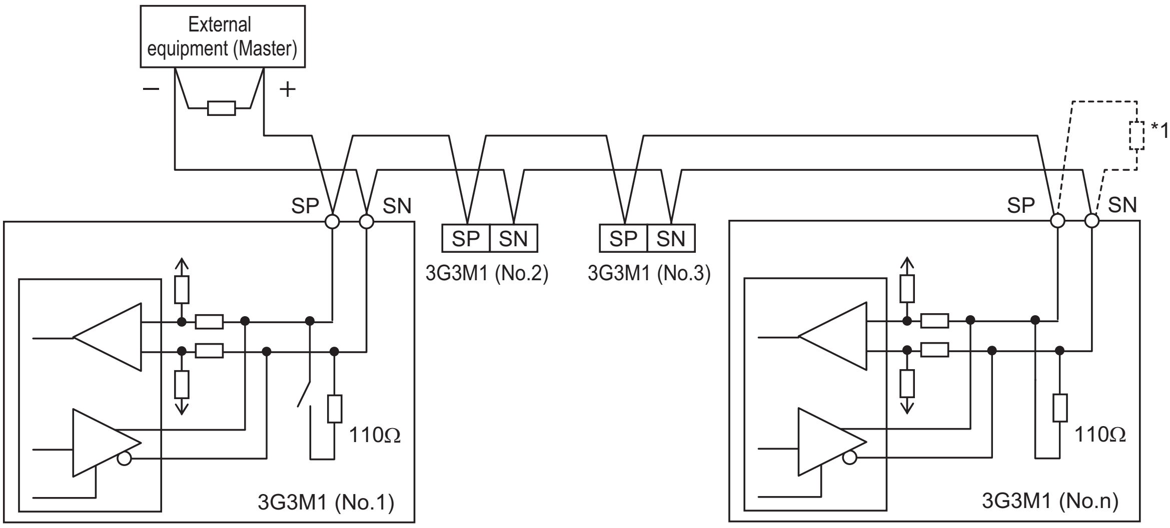
The 3G3M1 Series Inverter has the RS-485-compliant Modbus communication function as standard, which enables communications with external network controllers. The basic specifications of this communications function are provided in the table below.

Item	Description	Remarks
Protocol	Modbus communication (Slave)	
Transmission speed	2,400, 4,800, 9,600, 19.2 k, 38.4 k, 57.6 k, 76.8 k, 115.2 kbps	Selectable via parameter
Synchronous system	Start-stop synchronous system	
Transmission code	Binary	
Transmission mode	LSB first (Transmission starts with Least Significant Bit)	
Compatible interface	RS-485	
Data bit length	8 bits	
Parity	No/Even/Odd	Selectable via parameter
Stop bit length	1 or 2 bits	Selectable via parameter
Startup method	One-side start by host command	-
Wait time	Silent interval 0.00 to 1.00 [s]	Selectable via parameter
Connection form	1: N (N = 247 max.) (32 units max. connectable without repeaters)	Selectable via parameter
Error check	Overrun/Framing/CRC-16/Horizontal parity	
Communications cable length	500 m	

8-2 RS-485 Terminal Arrangement and Connection

The communications terminals are arranged as follows.





*1. If the communications are unstable, install a terminating resistor appropriate to the impedance of the cable to each cable end. The resistance of the terminating resistor built into this inverter is 110 Ω.

8-3 Modbus Communication Parameters

Set the following parameters according to the communications specifications.

- To control the frequency reference or RUN command via Modbus communication, set the 1st Frequency Reference Selection (F01) or 2nd Frequency Reference Selection (C30) to “14: RS-485 communication,” and the 1st RUN Command Selection (F02) or 2nd RUN Command Selection (E102) to “4: RS-485 communication”.
- According to the communications specifications of the host, set the RS-485 Communication Baud Rate (y14), RS-485 Communication Parity Bit Selection (y16), RS-485 Communication Timeout Time (y18), and RS-485 Communication Response Interval Time (y19).
- In the RS-485 Communication Station No. Selection (y11), set the slave address of the inverter.
- If the communications with the host are interrupted for a period longer than the RS-485 Communication Timeout Time (y18), the inverter will detect an communications error. In the Operation Selection on Communication Error (y12), set how the inverter should operate if it detects a communications error.
  When this parameter is set to 0, 1, 2, or 11 and tripped, you must reset the trip in order to resume the inverter control.

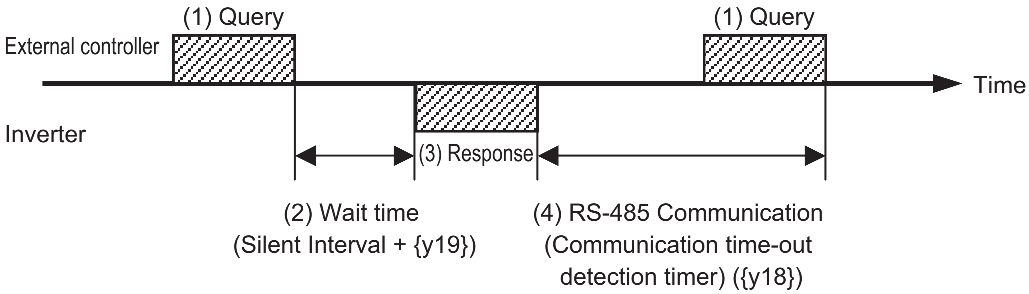
y12	Action at communications error
0: Immediately trip	Detects a Modbus communication error (ErP) and shuts off the output.
1: Trip after running for the period specified by timer	At communications error, this operates the inverter for the period specified by timer (y13), then displays a Modbus communication error (ErP) and stops operation.
2: Retry communications for the period specified by timer, and trip if communications are not restored. Continue running if communications are restored.	At communications error, retries communications for the period specified by timer (y13), and continues operation if communications are restored. If communications are not restored, this displays a Modbus communication error (ErP) and stops operation.
3: Continue to run	Ignores the communications error, and continues to run according to the current reference/command.
11: Trip after deceleration stop	Makes a deceleration stop and detects a Modbus communication error (ErP).
13: Free-run stop	Shuts off the output, but does not trip.
14: Deceleration stop	Makes a deceleration stop, but does not trip.

Parameter No.	Function name	Data	Default data	Unit
F01/C30	1st Frequency Reference Selection/2nd Frequency Reference Selection	14: RS-485 communication	0	-
F02/E102	1st RUN Command Selection/2nd RUN Command Selection	4: RS-485 communication	2	-

Parameter No.	Function name	Data	Default data	Unit
y14	RS-485 Communication Baud Rate	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps 6: 76800 bps 7: 115200 bps	2	-
y11	RS-485 Communication Station No. Selection	1 to 255	1	-
y16	RS-485 Communication Parity Bit Selection	0: None (Stop bit: 2 bits) 1: Even number parity (Stop bit: 1 bits) 2: Odd number parity (Stop bit: 1 bits) 3: None (Stop bit: 1 bits)	3	-
y12	Operation Selection on Communication Error	0: Immediately trip with alarm ErP 1: Trip with alarm ErP after running for the period specified by timer y003 2: Retry during the period specified by timer y003. If the retry fails trip with alarm ErP. If it succeeds continue to run. 3: Continue to run 11: Trip with alarm ErP after deceleration stop 13: Free run stop 14: Deceleration stop	0	-
y18	RS-485 Communication Timeout Time	0: Not check of the time-out (OFF) 1 to 60 s	0.0	s
y19	RS-485 Communication Response Interval Time	0.00 to 1.00 s	0.01	s
y13	RS-485 Error Detection Timer	0.0 to 60.0 s	2.0	s
y97	Communication Data Storage Selection	0: Store into nonvolatile memory (Rewritable times are limited) 1: Write into temporary memory (Rewritable times are unlimited) 2: Save all data from temporary memory to nonvolatile memory (After all data is saved, return to Data 1)	1	-

8-4 Modbus Communication Protocol

The inverter communicates with external controllers as follows.



1. Frame (Query) that is sent from the external control device to the inverter
2. After receiving a query frame, the inverter waits the total time of the silent Interval and the RS-485 Communication Response Interval Time (y19), before returning a response.
   Silent interval
   The wait time that is specified on Modbus communication. Its data length is 3.5 characters (3.5 bytes).
   It depends on the Modbus communication speed setting.

   (Example) For 9,600 bps communications
   One character: 10 bits (1 start bit + 8 data bits + 1 stop bit)
   Time required per character: 1/9,600 (bps) × 10 (bit length) × 1,000 = 1.04 ms
   Time required for 3.5 characters: 1.04 ms × 3.5 = 3.64 ms
   However, according to the Modbus specifications, this time is fixed to 1.75 ms for communications speeds exceeding 19.2 kbps.
3. Frame (Response) that is sent from the inverter back to the external controller.
4. After sending a response, the inverter monitors the time until it completes receiving the query frame from the external control device. The inverter judges it as a communications error if it receives no response within the RS-485 Communication Timeout Time (y18).
   Then, the inverter operates according to the Operation Selection on Communication Error (y12), while waiting for the reception of the first data again.
   The monitoring of the Communication Error Timeout Time starts from the first sending/receiving operation is established after the power supply is cycled or after the inverter is reset.
   The inverter does not recognize as a communications error timeout if the sending/receiving operation is not established at all.

8-4-1 Message Configuration

The command message sent from the master to a slave (or slaves) is called a “query” and the response message returned from the slave(s) is called a “response.” The transmission format of a query/response is as follows.

Query	Response
Slave address	Confirmation slave address
Function code	Confirmation function code

Query	Response
Query data	Response data
Error check (CRC-16)	Error check (CRC-16)

Slave Address

A slave address is a serial number from 1 to 247 set in advance for each inverter (slave). (Only the inverter that matches the slave address specified in the query will capture that query.)

● Simultaneous broadcast to up to five groups

Set the slave address to 0 to perform broadcasting (simultaneous broadcast).
In a broadcast, all slaves receive data, but they return no response to it.
Moreover, during a broadcast, this inverter cannot perform data read or loop-back operation.
Although the Modbus specifications define the slave addresses between 1 to 247, using the slave addresses 250 to 254 on the master side enables you to perform simultaneous broadcasting by group. (In this case, the slaves return no response.)
Please note that this function is enabled for write commands (function code: 05 hex, 06 hex, 0F hex, and 10 hex) only.

Slave address	Recipient
250 (FAh)	Simultaneous broadcast to slave addresses 01 to 09
251 (FBh)	Simultaneous broadcast to slave addresses 10 to 19
252 (FCh)	Simultaneous broadcast to slave addresses 20 to 29
253 (FDh)	Simultaneous broadcast to slave addresses 30 to 39
254 (FEh)	Simultaneous broadcast to slave addresses 40 to 247

Function Code

A function code specifies the function to be performed by the target inverter(s).
The supported function codes are as shown in the table below.

● Function code

Function code	Function	Maximum number of data bytes per message	Maximum number of data per message
01 hex	Read Coil Status	10	80 coils (in bits)
03 hex	Read from Holding Register	200	100 registers (in bytes)
05 hex	Write to Coil	2	1 coil (in bits)
06 hex	Write to Holding Register	2	1 register (in bytes)
08 hex	Loop-back Test	-	-
0F hex	Write to Multiple Coils	2	16 coils (in bits)
10 hex	Write to Multiple Holding Registers	200	100 registers (in bytes)
17 hex	Read/Write from/to Multiple Holding Registers	32 each for read/write operation	16 registers each for read/write operation (in bytes)

Data

A message sends data related to the function code.
The data transmission format differs depending on the function code.
Among the data used in Modbus communication, the 3G3M1 Series supports the following data types.

Data name	Description
Coil	Binary data (1 bit) that supports read/write operation
Holding register	16-bit data that supports read/write operation

Error Check

In Modbus communication, CRC (Cyclic Redundancy Check) is used for error checking.
The CRC code is 16-bit data generated for any data block with a data length in 8-bit units.
For CRC code generation, the following generator polynomial is used: CRC-16 ($X^{16} + X^{15} + X^2 + 1$).

8-4-2 Required Communications Time

The time that the inverter takes to send a response after receiving a query is the sum of the silent interval (3.5 characters) and the y19 (Communication Wait Time) set value.
After receiving a response from an inverter, be sure to include an interval equivalent to the silent interval (3.5 characters) or more before sending the next query to the inverter.

(Example)	For 9,600 bps communications One character: 10 bits (1 start bit + 8 data bits + 1 stop bit) Time required per character: 1/9,600 (bps) × 10 (bit length) × 1,000 = 1.04 ms Time required for 3.5 characters: 1.04 ms × 3.5 = 3.64 ms However, according to the Modbus specifications, this time is fixed to 1.75 ms for communications speeds exceeding 19.2 kbps.

8-4-3 Normal Response

If the function code included in a query is for the Loop-back Test (08 hex), Write to Coil (05 hex, 0F hex), or Write to Holding Register(s) (06 hex,10 hex) function, the inverter returns a response with the same content as that of the query.
If the function code included in a query is for the Read Coil Status (01 hex) or Read from Holding Register (03 hex) function, the inverter returns a response that includes data with the same slave address and function code.
Refer to the later section, *8-5 Explanation of Each Function Code* on page 8-11.

8-4-4 Abnormal Response

If an error (except for a communications error) is found in the query content, the inverter will return an exception response without performing any operation. Refer to the later section, *8-5-9 Exception Response* on page 8-20.

● Response

Slave address

Function code
Exception code
Error check (CRC-16)

If an error (except for a communications error) is found in the query content, the inverter will return an exception response without performing any operation.
For the cause of an error, check the function code for the response. The function code for an exception response is the sum of the function code for the query and 80 hex (where the MSB is 1).
For the cause of an error, check the exception code.

● Exception code

Code	Description
01 hex	An unsupported function is specified.
02 hex	The specified address does not exist.
03 hex	Data to write is out of the allowable range for writing.
07 hex	• The inverter does not allow this function. • During operation, function attempts to write while write disallowed or a function that cannot be written during operation. • Function attempts to write to a write prohibited parameter during undervoltage. (Other than all S group parameters, E52, H99, H198, H199)

8-4-5 No Response

The inverter will ignore the query and return no response if:

- It receives a broadcast (query with the address set to 0).
- It detects a communications error in receiving a query.
- The slave address specified in a query differs from the inverter's slave address setting.
- The length of the time interval set for the inverter to receive the next data of the message after receiving a message is less than 3.5 characters.
- The data length of a query is inappropriate.
- The length of the reception interval in a frame exceeds 1.5 characters.
- The error check code specified in a query does not match (CRC error).
- It receives a simultaneous broadcast by group (query with the address set to 250 to 254).
- It detects a parity error.

- Provide a timer on the master side for monitoring the response and set it to resend the same query if no response is received within the set time.

8-5 Explanation of Each Function Code

8-5-1 Read Coil Status [01 hex]

Reads the coil status (ON/OFF).

Example) Reading Data from Multifunction Input Terminals DI1 to DI7 of Inverter with Slave Address 1

The status of each multifunction input terminal is as follows.

Item	Data						
Coil No.	0003 hex	0004 hex	0005 hex	0006 hex	0007 hex	000E hex	000F hex
Multifunction input terminal	DI1	DI2	DI3	DI4	DI5	DI6	DI7
Coil status	ON	OFF	ON	OFF	OFF	OFF	ON

Coil numbers 0008 to 000D hex are a reserved area.

● **Query**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	01	
3	Coil start address (MSB)*2	00	(Coil address) = (Coil number) − 1
4	Coil start address (LSB)*2	02	
5	Number of coils (MSB)	00	
6	Number of coils (LSB)	0C	
7	CRC-16 (MSB)	9D	
8	CRC-16 (LSB)	CF	

*1. Broadcasting cannot be performed.

*2. Note that the coil start address is 0002 hex, which is 1 less than the coil number 0003 hex: Coil start address = Coil number - 1.

● **Response**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	01	
3	Number of data bytes	02	
4	Coil data 1*2	08	Input terminal D7, D6 / Input terminal D5 to D1 ← 805 hex = 1000 0000 0101 Reserved
5	Coil data 2*2	05	
6	CRC-16 (MSB)	7E	

No.	Field name	Example (hex)	Remarks
7	CRC-16 (LSB)	3F	

*1. Broadcasting cannot be performed.
*2. Data as much as the number of data bytes will be transferred. The MSB (the first received data) has the smallest coil address.

The data received in a response shows the status for coils 0003 to 000F hex. Therefore, the received data “805 hex=1000 0000 0101” can be read, with the status for coil 0003 hex as the LSB, as described in “Response” on the previous page.
The received data is always transferred in 1-byte (8 bits) format. Bits that lack data are transferred as 0.
If the Read Coil Status function is not executed normally, refer to *8-5-9 Exception Response* on page 8-20.

(Example) When the status of 16 coils starting from coil number 0001 hex is read, the order of data is as shown below. Data 1 is the initial byte data to be sent.

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Data 1	0008 hex	0007 hex	0006 hex	0005 hex	0004 hex	0003 hex	0002 hex	0001 hex
Data 2	0010 hex	000F hex	000E hex	000D hex	000C hex	000B hex	000A hex	0009 hex

8-5-2 Read from Holding Register [03 hex]

Reads the contents of only the specified number of consecutive holding registers from the specified holding register address.

Example) Reading Latest Trip Data (0012 hex to 001B hex) from Inverter with Slave Address 1

● Query

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	03	
3	Register start address (MSB)*2	00	(Register address) = (Register number) − 1
4	Register start address (LSB)*2	11	
5	Number of holding registers (MSB)	00	10 registers
6	Number of holding registers (LSB)	0A	
7	CRC-16 (MSB)	C4	
8	CRC-16 (LSB)	08	

*1. Broadcasting cannot be performed.
*2. Note that the holding register start address is 0011 hex, which is 1 less than the register number 0012 hex: Register address = Register number - 1.

● **Response**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	03	
3	Number of data bytes*2	14	
4	Register data 1 (MSB)	00	0001 hex → 01 dec → OC1 Overcurrent protection (during acceleration)
5	Register data 1 (LSB)	01	
6	Register data 2 (MSB)	02	201 hex → 1000000001 bin → FW: During forward operation, ACC: During acceleration
7	Register data 2 (LSB)	01	
8	Register data 3 (MSB)	00	4D2 hex → 1234 dec → 12.34 [Hz] (Frequency)
9	Register data 3 (LSB)	00	
10	Register data 4 (MSB)	04	
11	Register data 4 (LSB)	D2	
12	Register data 5 (MSB)	01	012C hex → 300 dec → 3.00 [A] (Current)
13	Register data 5 (LSB)	2C	
14	Register data 6 (MSB)	0B	0B18 hex → 2840 dec → 284.0 [V] (DC voltage)
15	Register data 6 (LSB)	18	
16	Register data 7 (MSB)	00	A hex → 10 dec → 10 [hex] (Cumulative running time)
17	Register data 7 (LSB)	00	
18	Register data 8 (MSB)	00	
19	Register data 8 (LSB)	0A	
20	Register data 9 (MSB)	00	A hex → 10 dec → 10 [hex] (Cumulative operation time)
21	Register data 9 (LSB)	00	
22	Register data 10 (MSB)	00	
23	Register data 10 (LSB)	0A	
24	CRC-16 (MSB)	F9	
25	CRC-16 (LSB)	14	

*1. Broadcasting cannot be performed.

*2. Data as much as the number of data bytes will be transferred. In this example, the inverter sends back data from 10 holding registers, which is 20 (14 hex) bytes.

8-5-3 Write to Coil [05 hex]

Writes to a single coil. The coil status changes as shown in the table below.

Data	Coil status	
	OFF to ON	ON to OFF
Written data (MSB)	FF hex	00 hex
Written data (LSB)	00 hex	00 hex

Example) Issuing Forward Run Command to Inverter with Slave Address 1

You need to set the Run command selection to communications (F02/E102=4).

The coil number for the forward run command is 0001.

● **Query**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	05	(Coil address) = (Coil number) − 1
3	Coil address (MSB)*2	00	
4	Coil address (LSB)*2	00	
5	Written data (MSB)	FF	OFF to ON: FF00 hex
6	Written data (LSB)	00	
7	CRC-16 (MSB)	8C	
8	CRC-16 (LSB)	3A	

*1. For a broadcast, no response will be sent back.

*2. Note that the coil address is 0000, which is 1 less than the coil number 0001: Coil address = Coil number - 1.

● **Response**

No.	Field name	Example (hex)
1	Slave address*1	01
2	Function code	05
3	Coil address (MSB)*2	00
4	Coil address (LSB)*2	00
5	Written data (MSB)	FF
6	Written data (LSB)	00
7	CRC-16 (MSB)	8C
8	CRC-16 (LSB)	3A

*1. For a broadcast, no response will be sent back.

*2. Note that the coil address is 0000, which is 1 less than the coil number 0001: Coil address = Coil number - 1.

If the Write to Coil function is not executed normally, refer to *8-5-9 Exception Response* on page 8-20.

8-5-4 Write to Holding Register [06 hex]

Writes data to the specified holding register.

Example) Writing 50.00 Hz to Inverter with Slave Address 1 as Output Frequency Setting Value (C99)

Because the holding registers for the Output Frequency Setting/Monitor (C99) have a data resolution of 0.01 Hz, to set 50.00 Hz, set the written data to 5000 (1388 hex).

● **Query**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	06	

No.	Field name	Example (hex)	Remarks
3	Register address (MSB)*2	12	(Register address) = (Register number) − 1
4	Register address (LSB)*2	16	
5	Written data (MSB)	13	1388 hex → 5000 dec → 50.00 Hz
6	Written data (LSB)	88	
7	CRC-16 (MSB)	60	
8	CRC-16 (LSB)	20	

*1. For a broadcast, no response will be sent back.

*2. Note that the holding register start address for C99(LOW) is 1216 hex, which is 1 less than the register number 1217 hex: Register address = Register number - 1.

- **Response**

No.	Field name	Example (hex)
1	Slave address*1	01
2	Function code	06
3	Register address (MSB)*2	12
4	Register address (LSB)*2	16
5	Written data (MSB)	13
6	Written data (LSB)	88
7	CRC-16 (MSB)	60
8	CRC-16 (LSB)	20

*1. For a broadcast, no response will be sent back.

*2. Note that the holding register start address for C99(LOW) is 1216 hex, which is 1 less than the register number 1217 hex: Register address = Register number - 1.

If the Write to Holding Register function is not executed normally, refer to *8-5-9 Exception Response* on page 8-20.

8-5-5 Loop-back Test [08 hex]

Checks the communications between the master and the slave. Any value can be used for test data.

Example) Perform a Loop-back Test on Inverter with Slave Address 1

- **Query**

No.	Field name	Example (hex)
1	Slave address*1	01
2	Function code	08
3	Test sub code (MSB)	00
4	Test sub code (LSB)	00
5	Data (MSB)	Any
6	Data (LSB)	Any
7	CRC-16 (MSB)	CRC

No.	Field name	Example (hex)
8	CRC-16 (LSB)	CRC

*1. Broadcasting cannot be performed.

● Response

No.	Field name	Example (hex)
1	Slave address*1	01
2	Function code	08
3	Test sub code (MSB)	00
4	Test sub code (LSB)	00
5	Data (MSB)	Any
6	Data (LSB)	Any
7	CRC-16 (MSB)	CRC
8	CRC-16 (LSB)	CRC

*1. Broadcasting cannot be performed.

The test sub code supports the Echo Query Data command (00 hex, 00 hex) only. Other commands are not supported.

8-5-6 Write to Multiple Coils [0F hex]

Rewrites the ON/OFF status to consecutive multiple coils.

Example) Changing Status of Multifunction Input Terminals DI1 to DI7 of Inverter with Slave Address 1

Change the ON/OFF status of the multifunction input terminal DI1 to DI7 as shown in the following table.

Item	Data						
Coil No.	0003 hex	0004 hex	0005 hex	0006 hex	0007 hex	000E hex	000F hex
Multifunction input terminal	DI1	DI2	DI3	DI4	DI5	DI6	DI7
Coil status	ON	ON	ON	OFF	ON	OFF	OFF

Coil numbers 0008 to 000D hex are a reserved area.

● Query

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	0F	
3	Coil start address (MSB)*2	00	(Coil address) = (Coil number) − 1
4	Coil start address (LSB)*2	02	
5	Number of coils (MSB)	00	
6	Number of coils (LSB)	0C	
7	Number of bytes	02	

No.	Field name	Example (hex)	Remarks
8	Changed data (MSB)*3	17	Input terminal D7, D6 Input terminal D5 to D1 ← 17 hex = 0000 0001 0111 Reserved
9	Changed data (LSB)*3	00	
10	CRC-16 (MSB)	EB	
11	CRC-16 (LSB)	A2	

*1. During a broadcast, no response will be sent back.
*2. Note that the coil start address is 0002 hex, which is 1 less than the coil number 0003 hex: Coil start address = Coil number - 1.
*3. Since written data occupies both MSB and LSB as a set, make the data have an even number of bytes by adding one byte of padding data, even if you actually need to change an odd number of bytes.

● Response

No.	Field name	Example (hex)
1	Slave address*1	01
2	Function code	0F
3	Coil start address (MSB)*2	00
4	Coil start address (LSB)*2	02
5	Number of coils (MSB)	00
6	Number of coils (LSB)	0C
7	CRC-16 (MSB)	F4
8	CRC-16 (LSB)	0E

*1. During a broadcast, no response will be sent back.
*2. Note that the coil start address is 0002 hex, which is 1 less than the coil number 0003 hex: Coil start address = Coil number - 1.

You can enable terminal commands using communications by enabling “4. RS-485 communication” in 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102). If enabling terminal commands using RS-485 communications, refer to *7-2-1 Multifunction Input Selection* on page 7-22 for the enable/disable relationship with the terminal block.
Multifunction input is monitored using a control circuit terminal for terminal block input (I/O) (monitor mode 4_00), and communications control signal for communications input (I/O) (monitor mode 4_01).

If the Write to Multiple Coils function is not executed normally, refer to *8-5-9 Exception Response* on page 8-20.

(Example) When the status of coils from coil number 0001 to 000D hex is written, the order of data is as shown below. Data 1 is the initial byte data to send.

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Data 1	0008 hex	0007 hex	0006 hex	0005 hex	0004 hex	0003 hex	0002 hex	0001 hex
Data 2	-	-	-	000D hex	000C hex	000B hex	000A hex	0009 hex

8-5-7 Write to Multiple Holding Registers [10 hex]

Writes data to consecutive multiple holding registers.

Example) Writing 10 Seconds to Inverter with Slave Address 1 as 1st Acceleration Time 1 (F07) Value

Because the holding registers 1103 to 1104 hex for the 1st Acceleration Time 1 (F07) has a data resolution of 0.01 s, to set 10 seconds, set the written data to 1000 (0000 03E8 hex).

● Query

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	10	
3	Register start address (MSB)*2	11	(Register address) = (Register number) − 1
4	Register start address (LSB)*2	02	
5	Number of registers (MSB)	00	
6	Number of registers (LSB)	02	
7	Number of bytes*3	04	
8	Written data 1 (MSB)	00	0000 03E8 hex → 1000 dec → 10.00 s
9	Written data 1 (LSB)	00	
10	Written data 2 (MSB)	03	
11	Written data 2 (LSB)	E8	
12	CRC-16 (MSB)	B2	
13	CRC-16 (LSB)	98	

*1. During a broadcast, no response will be sent back.

*2. Note that the holding register start address is 1102 hex, which is 1 less than the register number 1103 hex: Register starting address = Register number - 1.

*3. This is not the number of holding registers, but the number of bytes to be changed actually.

● Response

No.	Field name	Example (hex)
1	Slave address*1	01
2	Function code	10
3	Register start address (MSB)*2	11
4	Register start address (LSB)*2	02
5	Number of registers (MSB)	00
6	Number of registers (LSB)	02
7	CRC-16 (MSB)	E5
8	CRC-16 (LSB)	34

*1. During a broadcast, no response will be sent back.

*2. Note that the holding register start address is 1102 hex, which is 1 less than the register number 1103 hex: Register starting address = Register number - 1.

If the Write to Multiple Holding Registers function is not executed normally, refer to *8-5-9 Exception Response* on page 8-20.

8-5-8 Read/Write from/to Multiple Holding Registers [17 hex]

Reads data from and writes data to consecutive multiple holding registers in a continuous manner.

Example) Writing 50.00 Hz to Output Frequency Setting/Monitor (C99) and Reading from Output Frequency Monitor before Slip Compensation (W03) Value from Inverter with Slave Address 1

Because the holding registers 1216 to 1217 hex for the Output Frequency Setting/Monitor (C99) have a data resolution of 0.01 Hz, to set 50.00 Hz, set the written data to 5000 (0000 1388 hex).
Similarly, the holding registers for the Output Frequency Monitor before Slip Compensation (W03) are 5245 to 5246 hex.

● **Query**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	17	
3	Read register start address (MSB)*2	52	(Register address) = (Register number) − 1
4	Read register start address (LSB)*2	44	
5	Number of read registers (MSB)	00	
6	Number of read registers (LSB)	02	
7	Write register start address (MSB)*2	12	(Register address) = (Register number) − 1
8	Write register start address (LSB)*2	15	
9	Number of write registers (MSB)	00	
10	Number of write registers (LSB)	02	
11	Number of written data bytes n	04	
12	Written data 1 (MSB)	00	0000 1388 hex → 5000 dec → 50.00 Hz
13	Written data 1 (LSB)	00	
14	Written data 2 (MSB)	13	
15	Written data 2 (LSB)	88	
16	CRC-16 (MSB)	E8	
17	CRC-16 (LSB)	67	

*1. Broadcasting cannot be performed.
*2. Note that the holding register start address is 1 less than the register number: Register address = Register number - 1.

● **Response**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	01	
2	Function code	17	
3	Number of read data bytes n	04	
4	Read data 1 (MSB)	00	0000 1388 hex → 5000 dec → 50.00 Hz
5	Read data 1 (LSB)	00	
6	Read data 2 (MSB)	13	
7	Read data 2 (LSB)	88	
8	CRC-16 (MSB)	F4	

No.	Field name	Example (hex)	Remarks
9	CRC-16 (LSB)	71	

*1. Broadcasting cannot be performed.

If the Read/Write from/to Multiple Holding Registers function is not executed normally, refer to *8-5-9 Exception Response* on page 8-20.

8-5-9 Exception Response

In a query, the master requests a response, except for broadcast or simultaneous broadcast by group. Although the inverter normally returns a response to the query, it returns an exception response if the query has an error.

An exception response has the field configuration shown in the table below.

Field configuration
Slave address
Function code
Exception code
Error check

The details of the field configuration are as shown below. An exception response has a function code, which is the sum of the function code value of the query and 80 hex. An exception code shows the cause of the exception response.

Function code	
Query	Exception response
01 hex	81 hex
03 hex	83 hex
05 hex	85 hex
06 hex	86 hex
0F hex	8F hex
10 hex	90 hex
17 hex	97 hex

The MSB is 1.

Exception code	Description
01 hex	An unsupported function is specified.
02 hex	The specified address does not exist.
03 hex	Data to write is out of the allowable range for writing.
07 hex	• The inverter does not allow this function. • During operation, function attempts to write while write disallowed or a parameter that cannot be written during operation. • Function attempts to write to a write prohibited parameter during undervoltage. (Other than all S group parameters, E52, H99, H198, H199)

8-6 Saving a Change to Holding Register (Enter Command)

The Write to Holding Register (06 hex) or Write to Consecutive Holding Registers (10 hex or 17 hex) function is used to enable new register data. However, the new data is not stored in the EEPROM memory of the inverter and is restored to the previous value when the inverter power supply is shut off. To store a change to holding registers in the inverter's EEPROM memory, issue the Enter command according to the following procedure. In addition, after changing a control parameter, you need to re-calculate the motor parameters. In this case, also use the Enter command to execute recalculation.

8-6-1 How to Issue Enter Command

Use the Write to Holding Register (06 hex) command to write data to the holding register for the Enter command (0900 hex). Below are the values to be written to the holding register (0900 hex).

Set value	Description
0000	Disable
0001	Set values are stored in the EEPROM memory. This register automatically returns to 0.

Example) Issuing Enter Command (Storing Set Value) for Inverter with Slave Address 8

- **Query**

No.	Field name	Example (hex)	Remarks
1	Slave address*1	08	
2	Function code	06	
3	Register address (MSB)*2	08	(Register address) = (Register number) − 1
4	Register address (LSB)*2	FF	
5	Written data (MSB)	00	
6	Written data (LSB)	01	
7	CRC-16 (MSB)	7A	
8	CRC-16 (LSB)	C3	

*1. For a broadcast, no response will be sent back.

*2. Note that the register address is 08FF hex, which is 1 less than the register number 0900 hex.

- **Response**

No.	Field name	Example (hex)
1	Slave address	08
2	Function code	06
3	Register address (MSB)*Response* on page 8-21	08
4	Register address (LSB)*Response* on page 8-21	FF
5	Written data (MSB)	00
6	Written data (LSB)	01

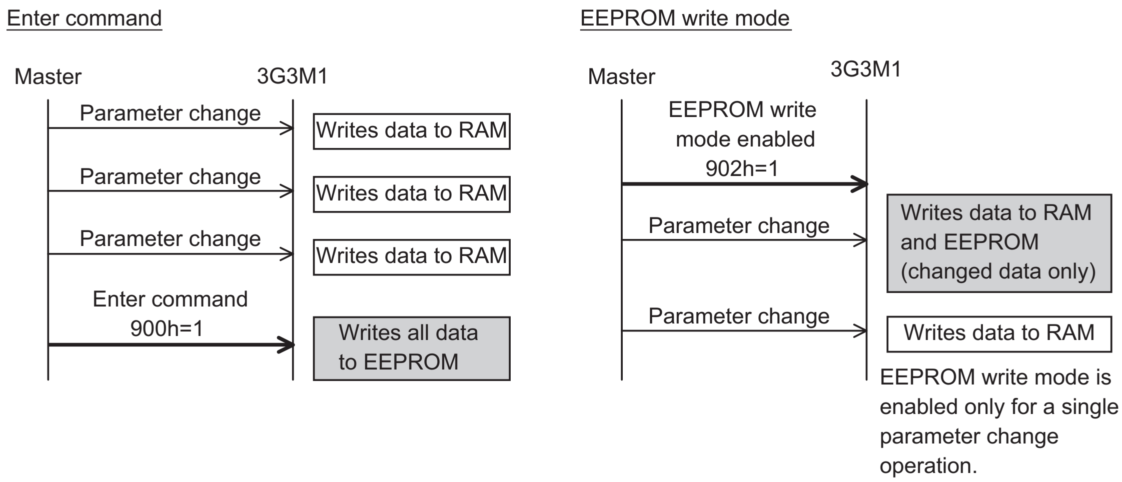
No.	Field name	Example (hex)
7	CRC-16 (MSB)	7A
8	CRC-16 (LSB)	C3

*1. Note that the register address is 08FF hex, which is 1 less than the register number 0900 hex.

8-6-2 EEPROM Write Mode

- To set the EEPROM write mode, use the Write to Holding Register (06 hex) command etc. to write 1 to the holding register for the EEPROM write mode (0902 hex).
- In the EEPROM write mode, the data changed by the Write to Holding Register (06 hex) command is written to both the RAM (volatile memory for operation) and the EEPROM (non-volatile memory for storage). Then, the EEPROM write mode is canceled.
- The EEPROM write mode is canceled also if a command other than the Write to Holding Register (06 hex) command is received in the EEPROM write mode.
- If a continuous write command is received from Write to Multiple Holding Registers (10 hex) or Read/Write from/to Multiple Holding Registers (17 hex) in the EEPROM write mode, data writing will be accepted, but not written to EEPROM.
- When Sysmac Studio is connected online while in the EEPROM write mode, the EEPROM write mode is canceled.
- If “0: Save to non-volatile memory” is set in Communication Data Storage Selection (y97), this will always operate corresponding to EEPROM write mode regardless of this register.
- To change parameter y97, the “STOP key + / keys” must be pressed simultaneously.

● Difference between enter command and EEPROM write mode

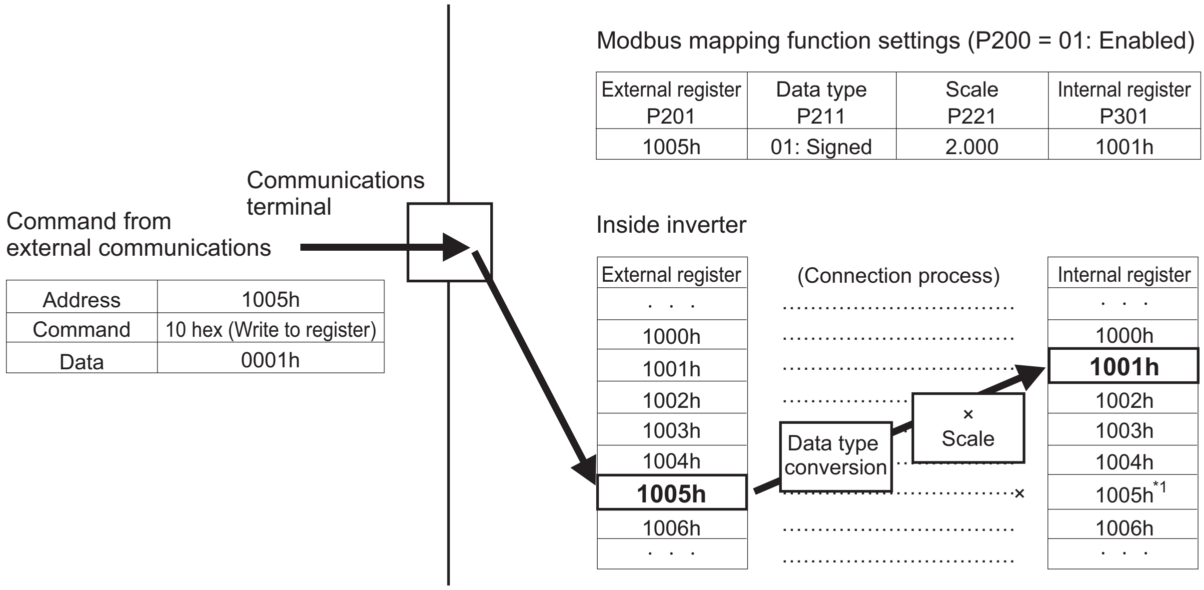


8-7 Modbus Mapping Function

This Modbus mapping function can change up to 10 register addresses.
For example, when designing replacements, you can match the inverter-side register addresses without changing the communications program.
It is also possible to set the data type, scale, and endian (byte order) of communication data according to your application.

8-7-1 Operation of Modbus Mapping Function

The Modbus mapping function can set up to 10 register addresses.
This function processes the command, which is sent to the external register address specified from the external communications, for data in the address set in the internal register.
Even if the data are different between the external and internal registers, it is possible to adjust this using data types and scaling settings.



Modbus mapping function settings (P200 = 01: Enabled)

External register P201	Data type P211	Scale P221	Internal register P301
1005h	01: Signed	2.000	1001h

Address	1005h
Command	10 hex (Write to register)
Data	0001h

*1. The internal register (Modbus register inside the inverter) that overlaps with the external register setting is disabled.
To use that internal register, set an external register not to overlap or set a different Modbus mapping function to access from a different register address.

8-7-2 Modbus Mapping Function Settings

To use the Modbus mapping function, set the Modbus Mapping Function Selection (H355) to “01: Modbus mapping function enabled” and set each parameter.

- Each number of 1 to 10 in Modbus Mapping External Register, Modbus Mapping External Register Type, Modbus Mapping Scaling, and Modbus Mapping Internal Register corresponds to one set of Modbus mapping function settings, respectively.
- In the Modbus Mapping 1 External Register to Modbus Mapping 10 External Register (H356 to H365), set the register address to receive commands from external communications.
- In the Modbus Mapping 1 External Register Sign to Modbus Mapping 10 External Register Sign (H366 to H375), set the data type used for the external register on the external communications

side. When this is set to “0: Unsigned,” the input value is limited to -32768 to 32767, and when set to “1: Signed,” the input value is limited to 0 to 65535.

- In the Modbus Mapping 1 Scaling to Modbus Mapping 10 Scaling (H376 to H385), set the scale factor for receiving data from external communications and capturing it into the inverter. Conversely, each of these settings provides a subtraction factor when internal data is output to external communications.
- In the Modbus Mapping 1 Internal Register to Modbus Mapping 10 Internal Register (H386 to H395), set the Modbus register address inside the inverter to process commands from external communications.
  For the Modbus register addresses of the inverter, refer to *8-9 Modbus Communication Data Lists* on page 8-34.
- The Modbus mapping function is intended for 16-bit single-word and double-word data. It does not support coils. For double-word data writing, refer to *8-7-3 Writing to Double-word Data* on page 8-25.
- After setting or changing the Modbus mapping function, be sure to cycle the inverter power supply. Until the power supply is cycled, the inverter does not apply the changes to the Modbus mapping function settings.
- If the Modbus communication function is executed with any erroneous Modbus mapping function setting, the inverter will return an exception response to the command. In this case, check the exception code for the exception response.
  For details on exception codes, refer to *8-7-4 Troubleshooting for Modbus Mapping Function* on page 8-25.

Parameter No.	Function name	Data	Default data	Unit
H355	Modbus Mapping Function Selection	0: Standard 1: Free mapping	0	-
H356 to H365	Modbus Mapping 1 External Register to Modbus Mapping 10 External Register	0000 to FFFF Hex	0000 hex	-
H366 to H375	Modbus Mapping 1 External Register Sign to Modbus Mapping 10 External Register Sign	0: Unsigned 1: Signed	0	-
H376 to H385	Modbus Mapping 1 Scaling to Modbus Mapping 10 Scaling	0.001 to 65.53*1	1.000	-
H386 to H395	Modbus Mapping 1 Internal Register to Modbus Mapping 10 Internal Register	0000 to FFFF Hex	0000 hex	-
H396	Modbus Mapping Endian Selection	0: Big endian 1: Little endian 2: Special endian	0	-

*1. H376 to H385 can only be displayed and set by the Digital Operator to within a range of 0.001 to 65.53. 0.001 to 65.535 can only be set when using communications.

8-7-3 Writing to Double-word Data

The Modbus mapping function also supports double-word data. When writing to double-word data, access the high word and the low word simultaneously. Accessing these separately will result in the following.

- Access to only the high word: An abnormal response, returning an exception code 02 hex (invalid address).
- Access to only the low word: Writing data to the low word only. High word data will not be changed.

8-7-4 Troubleshooting for Modbus Mapping Function

If there is any setting error for the Modbus mapping function, the inverter will display an exception response during Modbus communication.
In this case, check the exception code for the exception response.
Below are exception codes associated with exception response and the Modbus mapping function setting errors.
For details on other exception codes, refer to *8-5-9 Exception Response* on page 8-20.

● Exception response for erroneous setting

The function code for an exception response is the sum of the executed function code and 80 hex.
Check the error condition with the exception code.

● Response

Slave address
Function code
Exception code
Error check (CRC-16)

Exception code	Error condition	Countermeasure
31 hex	• The Modbus mapping external register is set to other than 0000 and the Modbus mapping internal register address is not changed from 0000.	• Set the Modbus mapping external register.
	• The Modbus mapping internal register setting parameter does not exist.	• Set the Modbus mapping internal register correctly.
	• The Modbus mapping external register overlaps.	• Set the Modbus mapping external register so that it does not overlap.

8-7-5 Endian Function

In communications, endian refers to the byte order in single-word communications data to be sent/received.
Generally, big endian (where the MSB-side byte is stored first) and little endian (where the LSB-side byte is stored first) are used.
Special endian is a kind of big endian where the word order of double-word data is reversed. For the 3G3M1 Series Inverter, Modbus communication is configured in big endian.
The endian function can set endian only for data sent/received in communications (without changing the address).

In the Modbus Mapping Endian Selection (H396), set the endian you want to use.
The Modbus Mapping Endian Selection H396 setting is enabled independent of the Modbus Mapping Function Selection (H355) setting.

Parameter No.	Function name	Data	Default data	Unit
H396	Modbus Mapping Endian Selection	0: Big endian 1: Little endian 2: Special endian	0	-

● Byte order of single-word data

• Relationship between single-word data bits and bytes

Bit	8 to 15	7 to 0
Byte	MSB byte	LSB byte

• Order of data during Modbus communication

Send/Receive byte order	Big endian	Little endian	Special endian
1	MSB byte	LSB byte	MSB byte
2	LSB byte	MSB byte	LSB byte

● Byte order of double-word data

• Relationship between double-word data bits and bytes

Bit	24 to 31	16 to 23	8 to 15	7 to 0
Byte	MSB byte	Data 1	Data 2	LSB byte

• Order of data during Modbus communication

Send/Receive byte order	Big endian	Little endian	Special endian
1	MSB byte	LSB byte	Data 2
2	Data 1	Data 2	LSB byte
3	Data 2	Data 1	MSB byte
4	LSB byte	MSB byte	Data 1

● Executable function codes

This function is enabled only for the function codes listed below.
Other function codes will be processed in big endian.

Function code	
03 hex	Read from multiple holding registers
06 hex	Write to a holding register
10 hex	Write to multiple holding registers
17 hex	Read/Write from/to multiple holding registers

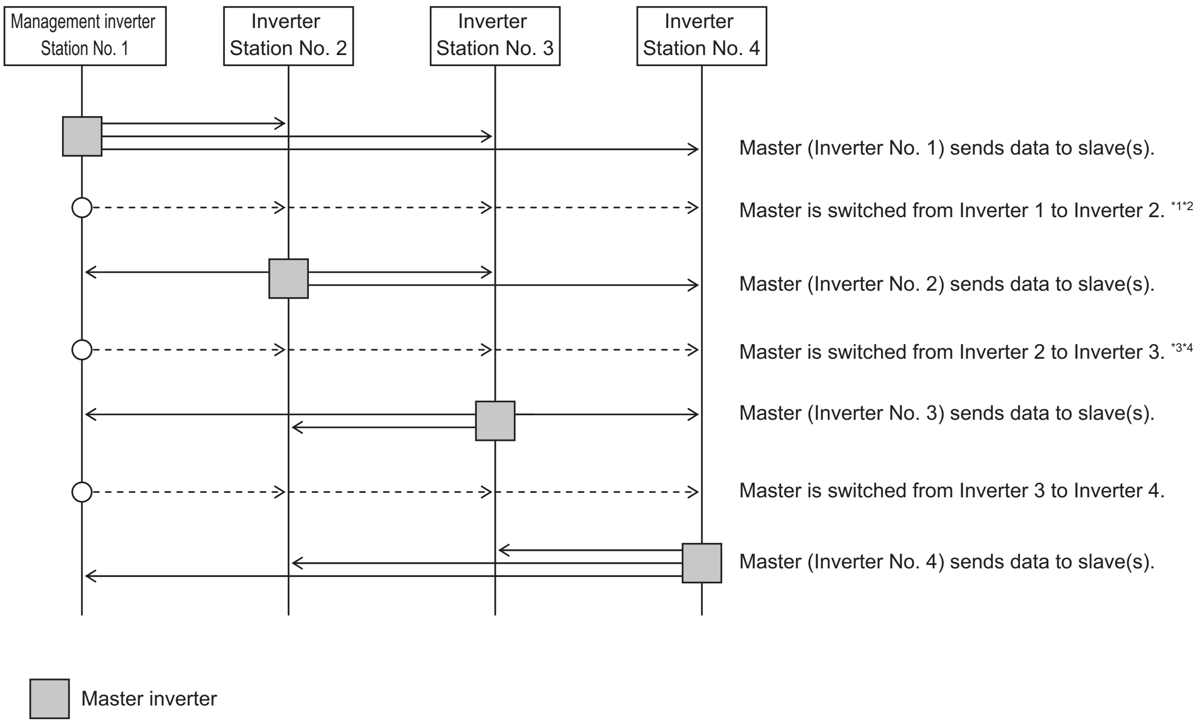
8-8 Co-inverter Communication

In addition to the standard Modbus communication (slave), the 3G3M1 Series Inverter provides the co-inverter communication function, which enables more than one 3G3M1 Series Inverter to communicate mutually without master equipment such as a computer or PLC.
In co-inverter communication, the inverters are assigned as "management inverter," "master inverter," and "slave inverter." The master inverter is specified by the management inverter according to the user settings. The others are slave inverters. The management inverter is always fixed, but the master inverter is switched sequentially. Therefore, the management inverter may serve as the master or a slave inverter. Other conditions are as follows.

- One management inverter is required within a network.
- Up to eight inverters can serve as the master inverter.
- Up to 247 inverters can be connected within the entire network (32 inverters without repeaters in compliance with the RS-485 specifications).

In co-inverter communication, be sure to assign the station No. 1, which serves as the management inverter.

The master inverter can write data to the holding registers on any slave inverter. At this time, up to five different station numbers and holding registers can be specified at once. On completion of each data transmission session between the master and a slave (or slaves), the master inverter is switched to the next in a sequential manner. In this way, data transmission is repeated according to the settings for each master inverter.



*1. Switching of the master inverter is performed automatically by the management inverter.
*2. The management inverter sends the master switching command from Inverter No. 01 to 02 after data is sent from Inverter 01 (master) to a slave (or slaves), with a wait time of "silent interval + Communication Wait Time (y19)."

*3. After receiving data from the master inverter, the management inverter sends the next master switching command with a wait time of “silent interval + Communication Wait Time (y19).” If the management inverter cannot receive the data sent from the master inverter within the Communication Error Timeout Time (y18), a communication timeout occurs and the management inverter follows the operation set in the Operation Selection on Communication Error (y12).
*4. Be sure to enable the Communication Error Timeout Time setting (y18 = 0.01 to 99.99) on the management inverter. When this setting is disabled (y18 = 0), the co-inverter communication will stop if the management inverter cannot receive data from the master inverter. In this case, cycle the power supply for the management inverter, or reset the management inverter (by turning ON/OFF the terminal RS).

8-8-1 Co-inverter Communication Parameters

The parameters required to establish co-inverter communication are shown in the table below.

Parameter No.	Function name	Data	Default data	Unit	Setting target*1
y11*2	RS-485 Communication Station No. Selection	1 to 255*3 (250 to 255: Simultaneous broadcasting by group)	1	-	ALL*4
y12*5	Operation Selection on Communication Error	0: Immediately trip with alarm ErP 1: Trip with alarm ErP after running for the period specified by timer y003 2: Retry during the period specified by timer y003. If the retry fails trip with alarm ErP. If it succeeds continue to run. 3: Continue to run 11: Trip with alarm ErP after deceleration stop 13: Free run stop 14: Deceleration stop	0	-	ALL
y13	RS-485 Error Detection Timer	0.0 to 60.0 s	2.0	s	ALL
y14	RS-485 Communication Baud Rate	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps 6: 76800 bps 7: 115200 bps	2	-	ALL
y16	RS-485 Communication Parity Bit Selection	0: None (Stop bit: 2 bits) 1: Even number parity (Stop bit: 1 bits) 2: Odd number parity (Stop bit: 1 bits) 3: None (Stop bit: 1 bits)	3	-	ALL
y18	RS-485 Communication Timeout Time	0: Not check of the time-out (OFF) 1 to 60 s	0.0	s	ALL

Parameter No.	Function name	Data	Default data	Unit	Setting target*1
y19	RS-485 Communication Response Interval Time	0.00 to 1.00 s	0.01	s	ALL
H303*2	Co-Inverter Communication Function Selection	0: Disable 1: Enable 2: Enable (administrator)	0	-	- B*6 A
H304*2	Co-inverter Communication Starting Station Number (Administrator)	1 to 8 Need to be set in administrator(H303=2)*7	1	-	A
H305*2	Co-inverter Communication Ending Station Number (Administrator)	1 to 8 Need to be set in administrator(H303=2)*7	1	-	A
H306*2	Co-inverter Communication Start Selection (Administrator)	0: Start via RS-485 terminal*8 1: Always ON*9 Need to be set in administrator(H303=2)	0	-	A
H339	Number of Sent Data of All Stations in Co-inverter Communication	1 to 5	5	-	M
H340	Recipient Station Number of All Stations in Co-inverter Communication 1	1 to 247*10	1	-	M
H341	Recipient Register of All Stations in Co-inverter Communication 1	0000 to FFFF Hex	0000	-	M
H342	Sender Register of All Stations in Co-inverter Communication 1	0000 to FFFF Hex	0000	-	M
H343	Recipient Station Number of All Stations in Co-inverter Communication 2	1 to 247*10	2	-	M
H344	Recipient Register of All Stations in Co-inverter Communication 2	0000 to FFFF Hex	0000	-	M
H345	Sender Register of All Stations in Co-inverter Communication 2	0000 to FFFF Hex	0000	-	M
H346	Recipient Station Number of All Stations in Co-inverter Communication 3	1 to 247*10	3	-	M

Parameter No.	Function name	Data	Default data	Unit	Setting target*1
H347	Recipient Register of All Stations in Co-inverter Communication 3	0000 to FFFF Hex	0000	-	M
H348	Sender Register of All Stations in Co-inverter Communication 3	0000 to FFFF Hex	0000	-	M
H349	Recipient Station Number of All Stations in Co-inverter Communication 4	1 to 247*10	4	-	M
H350	Recipient Register of All Stations in Co-inverter Communication 4	0000 to FFFF Hex	0000	-	M
H351	Sender Register of All Stations in Co-inverter Communication 4	0000 to FFFF Hex	0000	-	M
H352	Recipient Station Number of All Stations in Co-inverter Communication 5	1 to 247*10	5	-	M
H353	Recipient Register of All Stations in Co-inverter Communication 5	0000 to FFFF Hex	0000	-	M
H354	Sender Register of All Stations in Co-inverter Communication 5	0000 to FFFF Hex	0000	-	M
E01 to E05, E98, E99	Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection	160: 485 (Start co-inverter communication)*8	-	-	A

*1. Below are the details of the setting target.
ALL: Setting required for all connected inverters
A: Setting required only for management inverter (Station No. 1)
B: Setting required for inverters other than management inverter (Station No. 1)
M: Setting required only for inverters set in H304 to H305 (= Inverters assigned with master role)

*2. After changing any of the y11 and H303 to H306 data on the management inverter, be sure to cycle the power supply to apply the changes. For inverters other than the management inverter, these changes will be applied immediately. However, for inverters other than the management inverter, if y11 is changed to Station No. 1 (Management Inverter), be sure to cycle the power supply to apply the changes. (Station Nos. 2 to 247 will apply changes immediately.)

*3. To switch the master inverter among more than one inverter, be sure to set sequential station numbers. If the set station numbers include any skipped number, communications cannot be established.

*4. For the management inverter, set the station number to 1 (y11 = 1).

*5. When the Operation Selection on Communication Error (y12) is set to other than “3: Continue to run” on the management inverter, the co-inverter communication session will stop if a communications timeout error occurs on the management inverter. In this case, cycle the power supply of the management inverter.

*6. When Co-Inverter Communication Function Selection (H303) is set to “1: Co-inverter communication” or “2: Co-inverter communication (Management Inverter),” co-inverter communication will be possible.

*7. Set these parameters so that H304 is equal to or less than H305.

*8. When the Co-inverter Communication Start Selection (H306) is set to “0: Start via 485 terminal,” set one of the Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99) to “160: 485 (Start co-inverter communication).”

*9. When the Co-inverter Communication Start Selection (Administrator) (H306) is set to “1: Constant communication,” the management inverter starts sending data as soon as the power supply is turned on. At this time, if the next master inverter is delayed in the startup and cannot receive the master switching command, the master inverter cannot send the data, which results in a communications timeout error on the management inverter. When you set H306 to 1, check that the startup of other inverters is completed and power on the management inverter finally.

*10. Although, in master-to-slave communications, you set recipient slave's station number, actually, data is sent to all stations via broadcast communications (Station No. 0). Slaves that are not specified as the recipient on the master side discard the received data.

8-8-2 Co-inverter Communication Settings

- On each inverter, set the station number (y11) so that they do not overlap among the inverters. Do not forget to set the station No. 1, which serves as the management inverter.
- On the management inverter, set the Co-Inverter Communication Function Selection (H303) to “2: Active EzCOM (administrator).” For other inverters, set the Co-Inverter Communication Function Selection (H303) to “1: Active EzCOM” or “2: Active EzCOM (administrator).”
- Set a station number 1 to 8 on inverters that serve as the master inverter. To switch the master inverter among more than one inverter, the station numbering must be sequential. On the management inverter, set the smallest master station number in the Co-inverter Communication Starting Station Number (Administrator) (H304) and the largest master station number in the Co-inverter Communication Ending Station Number (Administrator) (H305).
- In the Co-inverter Communication Start Selection (H306), set how to start inverter communications. When “0: Input terminal[DI1] to [DI8] Co-inverter communication start (485)” is selected for Co-inverter Communication Start Selection (Administrator) (H306), allocate “160: 485 (Start co-inverter communication)” to one of the Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).
- In H339 to H354, set the following parameters, which are required when the master inverter writes data: the number of sent data, recipient station number, recipient register address, and sender register address.

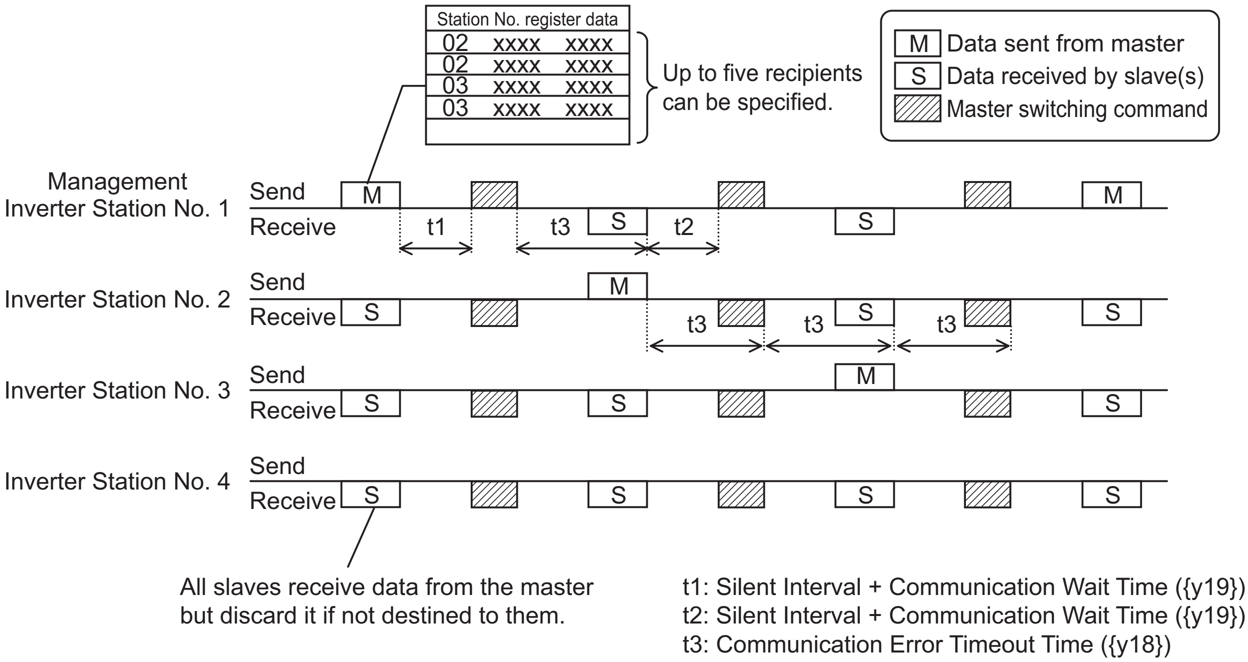
Co-inverter Communication Operation

1. **The master inverter sends data to one or more slave inverters according to the settings for that master inverter.**
   (This data is also sent to the management inverter that does not serve as the master inverter.)
2. **The management inverter sends the master switching command and the master inverter is switched accordingly.**
3. **The next master inverter sends data to one or more slave inverters in the same manner as explained in step (1).**
   (This data is also sent to the management inverter that does not serve as the master inverter.)
4. **Steps (2) and (3) are followed repeatedly.**

Note Because this inverter is designed to establish co-inverter communication as broadcast communications (Station No. 0), communications data is sent to all stations. Therefore, slaves that are not specified as the recipient on the master side receive the data once, but discard internally the data not addressed to them.

Example of Co-inverter Communication Sequence

The sequence diagram below shows co-inverter communication among four inverters with station numbers from 1 to 4, where Stations No. 1 to 3 are set as the master inverter.



- Be sure to set the RS-485 Communication Timeout Time (y18) to other than 0.00 (one second or longer is recommended) on the management inverter. When this parameter is set to 0.00, the inverter's communications function will stop if no data is received from the master inverter. If it stops working, cycle the power supply of the management inverter.
- The communications error timeout timer starts when the inverter starts waiting for data reception and times out when it cannot complete data reception within the set time. If a timeout occurs, the inverter performs the operation set in the Operation Selection on Communication Error (y12). (t3 in above diagram)
- When the management inverter is the master, the master switching command will be sent with a wait time of silent interval + RS-485 Communication Response Interval Time (y19) after the master inverter sends data. (t1 in above diagram)
- When an inverter other than the management inverter is the master, the master switching command will be sent with a wait time of silent interval + RS-485 Communication Response Interval Time (y19) after receipt of data sent from the master inverter. (t2 in above diagram)
- When the Co-inverter Communication Start Selection is set to “1: Constant communication,” the management inverter starts sending data as soon as the power supply is turned on. Therefore, if the power-on timing of any other inverter is delayed, the communications cannot be established normally, which results in a communications timeout error on the management inverter. When set to constant communication, check that the startup of other inverters is completed and power on the management inverter finally.

- Do not set 08FF hex (EEPROM Write) or 0901 hex (EEPROM Write Mode Selection) in the recipient registers. Doing so causes the co-inverter communication session to stop in the EEPROM write process.
- After changing any of the H303 to H306 data, be sure to cycle the power supply to apply the changes.

8-9 Modbus Communication Data Lists

R/W in the list shows whether data can be read from, or written to, the coil or holding register.
(R: Read only, R/W: Read and write enabled)

8-9-1 Coil Number List

Coil No.	Modbus coil spec. No.	Item	R/W	Description
0001 hex	0000 hex	FW (Forward run)	R/W	1: ON 0: OFF
0002 hex	0001 hex	RV (Reverse run)	R/W	1: ON 0: OFF
0003 hex	0002 hex	DI1 (Multifunction input 1)*1	R/W	1: ON 0: OFF
0004 hex	0003 hex	DI2 (Multifunction input 2)*1	R/W	1: ON 0: OFF
0005 hex	0004 hex	DI3 (Multifunction input 3)*1	R/W	1: ON 0: OFF
0006 hex	0005 hex	DI4 (Multifunction input 4)*1	R/W	1: ON 0: OFF
0007 hex	0006 hex	DI5 (Multifunction input 5)*1	R/W	1: ON 0: OFF
0008 hex to 000D hex	-	Reserved	-	-
000E hex	000D hex	DI6 (Multifunction input 6)*1	R/W	1: ON 0: OFF
000F hex	000E hex	DI7 (Multifunction input 7)*1	R/W	1: ON 0: OFF
0010 hex	000F hex	RS (Reset)	R/W	1: ON 0: OFF
0011 hex	0010 hex	FWR (During forward rotation)	R	1: ON 0: OFF
0012 hex	0011 hex	RVR (During reverse rotation)	R	1: ON 0: OFF
0013 hex	0012 hex	EXT (During DC braking or during pre-exciting)	R	1: ON 0: OFF
0014 hex	0013 hex	INT (Inverter shut down)	R	1: ON 0: OFF
0015 hex	0014 hex	BRK (During braking)	R	1: ON 0: OFF
0016 hex	0015 hex	NUV (DC link circuit voltage established)	R	1: ON 0: OFF
0017 hex	0016 hex	TL (Torque limiting)	R	1: ON 0: OFF
0018 hex	0017 hex	VL (During voltage limiting)	R	1: ON 0: OFF
0019 hex	0018 hex	IL (During current limiting)	R	1: ON 0: OFF

Coil No.	Modbus coil spec. No.	Item	R/W	Description
001A hex	0019 hex	ACC (During acceleration)	R	1: ON 0: OFF
001B hex	001A hex	DEC (During deceleration)	R	1: ON 0: OFF
001C hex	001B hex	ALM (Alarm relay)	R	1: ON 0: OFF
001D hex	001C hex	RL (Communications effective)	R	1: ON 0: OFF
001E hex to 001F hex	-	Reserved	-	-
0020 hex	001F hex	BUSY (During function code data writing)	R	1: ON 0: OFF
0021 hex	0020 hex	FA1 (Constant speed arrival)	R	1: ON 0: OFF
0022 hex	0021 hex	FA2 (Over set frequency arrival)	R	1: ON 0: OFF
0023 hex	0022 hex	IRDY (Operation ready)	R	1: ON 0: OFF
0024 hex	0023 hex	SETM (2nd motor selection)	R	1: ON 0: OFF
0025 hex	0024 hex	IPF (During restart after instantaneous power failure)	R	1: ON 0: OFF
0026 hex	0025 hex	THM (Thermal warning)	R	1: ON 0: OFF
0027 hex	0026 hex	REF (Run command source)	R	1: ON 0: OFF
0028 hex	0027 hex	FAN (Fan operation signal)	R	1: ON 0: OFF
0029 hex	0028 hex	TRY (During retry)	R	1: ON 0: OFF
002A hex	0029 hex	OHF (Fin overheat warning)	R	1: ON 0: OFF
002B hex	002A hex	LIFE (Life warning)	R	1: ON 0: OFF
002C hex	002B hex	OLP (During active drive)	R	1: ON 0: OFF
002D hex	002C hex	OL2 (Overload warning 2)	R	1: ON 0: OFF
002E hex	002D hex	LOC (Low current signal)	R	1: ON 0: OFF
002F hex	002E hex	OL (Overload warning)	R	1: ON 0: OFF
0030 hex	-	Reserved	-	-
0031 hex	0030 hex	FW (Forward run)	R	1: ON 0: OFF
0032 hex	0031 hex	RV (Reverse run)	R	1: ON 0: OFF
0033 hex	0032 hex	DI1 (Multifunction input 1)	R	1: ON 0: OFF

Coil No.	Modbus coil spec. No.	Item	R/W	Description
0034 hex	0033 hex	DI2 (Multifunction input 2)	R	1: ON 0: OFF
0035 hex	0034 hex	DI3 (Multifunction input 3)	R	1: ON 0: OFF
0036 hex	0035 hex	DI4 (Multifunction input 4)	R	1: ON 0: OFF
0037 hex	0036 hex	DI5 (Multifunction input 5)	R	1: ON 0: OFF
0038 hex to 003B hex	-	Reserved	-	-
003C hex	003B hex	EN (Safety)	R	1: ON 0: OFF
003D hex	-	Reserved	-	-
003E hex	003D hex	DI6 (Multifunction input 6)	R	1: ON 0: OFF
003F hex	003E hex	DI7 (Multifunction input 7)	R	1: ON 0: OFF
0040 hex	003F hex	RS (Reset)	R	1: ON 0: OFF
0041 hex	0040 hex	DO1 (Multifunction output terminal 1)	R	1: ON 0: OFF
0042 hex	0041 hex	DO2 (Multifunction output terminal 2)	R	1: ON 0: OFF
0043 hex to 0048 hex	-	Reserved	-	-
0049 hex	0048 hex	RO (Multifunction relay output)	R	1: ON 0: OFF
004A hex to 0050 hex	-	Reserved	-	-

*1. You can turn ON/OFF terminal input using Modbus communications by setting “4. RS-485 communication” in 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102). For details on the relationship between terminal block input and ON status, refer to *7-2-1 Multifunction Input Selection* on page 7-22.

8-9-2 Register List

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
0012 hex	0011 hex	Latest Alarm Contents	M16	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 1 (0x01): OC1: Overcurrent protection (during acceleration) 2 (0x02): OC2: Overcurrent protection (during deceleration) 3 (0x03): OC3: Overcurrent protection (during constant speed operation) 6 (0x06): OU1: Overvoltage protection (during acceleration) 7 (0x07): OU2: Overvoltage protection (during deceleration) 8 (0x08): OU3: Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4: Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Reserved 35 (0x23): Reserved 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out	1

Register No.	Modbus register spec. No.	Function name	Param- eter No.	R/W	Monitor or setting data	Data reso- lution
0012 hex	0011 hex	Latest Alarm Contents	M16	R	46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE: Following error (ex- cessive speed deviation) 50 (0x32): ErC: Magnetic pole posi- tion detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP: RS-485 communica- tions error (Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback dis- connection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL: Customize logic fail- ure 68 (0x44): ErU: Support tool commu- nication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err: Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
0013 hex	0012 hex	Latest Alarm Info. Running Status 1	X25	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
0014 hex	0013 hex	Latest Alarm Info. Output Frequency	X20	R	0.00 to 655.35	0.01
0015 hex	0014 hex					
0016 hex	0015 hex	Latest Alarm Info. Output Current	X21	R	0.00 to 9999 A	0.01
0017 hex	0016 hex	Latest Alarm Info. Main Circuit DC Voltage	X28	R	0.0 to 1000.0 V	0.1
0018 hex	0017 hex	Latest Alarm Info. Cumulative Running Time	X108	R	0 to 65535	1
0019 hex	0018 hex					
001A hex	0019 hex	Latest Alarm Info. Cumulative Ope. time	X26	R	0 to 65535	1
001B hex	001A hex					

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
001C hex	001B hex	Last Alarm Con-tents	M17	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 1 (0x01): OC1: Overcurrent protection (during acceleration) 2 (0x02): OC2: Overcurrent protection (during deceleration) 3 (0x03): OC3: Overcurrent protection (during constant speed operation) 6 (0x06): OU1: Overvoltage protection (during acceleration) 7 (0x07): OU2: Overvoltage protection (during deceleration) 8 (0x08): OU3: Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4: Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Reserved 35 (0x23): Reserved 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
001C hex	001B hex	Last Alarm Con-tents	M17	R	46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE: Following error (excessive speed devia-tion) 50 (0x32): ErC: Magnetic pole posi-tion detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP: RS-485 communica-tions error (Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback dis-connection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL: Customize logic fail-ure 68 (0x44): ErU: Support tool commu-nication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err: Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
001D hex	001C hex	Last Alarm Info. Running Status	X65	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
001E hex	001D hex	Last Info. Alarm Info. Output Frequency	X60	R	0.00 to 655.35	0.01
001F hex	001E hex					
0020 hex	001F hex	Last Alarm Info. Output Current	X61	R	0.00 to 9999 A	0.01
0021 hex	0020 hex	Last Alarm Info. Main Circuit DC Voltage	X68	R	0.0 to 1000.0 V	0.1
0022 hex	0021 hex	Last Alarm Info. Cumulative Running Time	X118	R	0 to 65535	1
0023 hex	0022 hex					
0024 hex	0023 hex	Last Alarm Info. Cumulative Ope. Time	X66	R	0 to 65535	1
0025 hex	0024 hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
0026 hex	0025 hex	Second Last Alarm Contents	M18	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 1 (0x01): OC1: Overcurrent protection (during acceleration) 2 (0x02): OC2: Overcurrent protection (during deceleration) 3 (0x03): OC3: Overcurrent protection (during constant speed operation) 6 (0x06): OU1: Overvoltage protection (during acceleration) 7 (0x07): OU2: Overvoltage protection (during deceleration) 8 (0x08): OU3: Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4: Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Reserved	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
0026 hex	0025 hex	Second Last Alarm Contents	M18	R	35 (0x23): Reserved 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE: Following error (excessive speed deviation) 50 (0x32): ErC: Magnetic pole position detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP: RS-485 communications error (Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback disconnection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL: Customize logic failure 68 (0x44): ErU: Support tool communication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err: Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
0027 hex	0026 hex	Second Last Alarm Info. Running Status	Z05	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
0028 hex	0027 hex	Second Last Alarm Info. Output Frequency	Z00	R	0.00 to 655.35	0.01
0029 hex	0028 hex					
002A hex	0029 hex	Second Last Alarm Info. Output Current	Z01	R	0.00 to 9999 A	0.01
002B hex	002A hex	Second Last Alarm Info. Main Circuit DC Voltage	Z08	R	0.0 to 1000.0 V	0.1
002C hex	002B hex	Second last Alarm Info. Cumulative Running Time	X128	R	0 to 65535	1
002D hex	002C hex					
002E hex	002D hex	Second Last Alarm Info. Cumulative Ope. Time	Z06	R	0 to 65535	1
002F hex	002E hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
0030 hex	002F hex	Third Last Alarm Contents	M19	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 1 (0x01): OC1: Overcurrent protection (during acceleration) 2 (0x02): OC2: Overcurrent protection (during deceleration) 3 (0x03): OC3: Overcurrent protection (during constant speed operation) 6 (0x06): OU1: Overvoltage protection (during acceleration) 7 (0x07): OU2: Overvoltage protection (during deceleration) 8 (0x08): OU3: Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4: Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
0030 hex	002F hex	Third Last Alarm Contents	M19	R	34 (0x22): Reserved 35 (0x23): Reserved 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE: Following error (excessive speed devia-tion) 50 (0x32): ErC: Magnetic pole posi-tion detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP: RS-485 communica-tions error (Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback dis-connection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL: Customize logic fail-ure 68 (0x44): ErU: Support tool commu-nication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err: Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
0031 hex	0030 hex	Third Last Alarm Info. Running Status	Z55	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
0032 hex	0031 hex	Third Last Alarm Info. Output Frequency	Z50	R	0.00 to 655.35	0.01
0033 hex	0032 hex					
0034 hex	0033 hex	Third Last Alarm Info. Output Current	Z51	R	0.00 to 9999 A	0.01
0035 hex	0034 hex	Third Last Alarm Info. Main Circuit DC Voltage	Z58	R	0.0 to 1000.0 V	0.1
0036 hex	0035 hex	Third last Alarm Info. Cumulative Running Time	X138	R	0 to 65535	1
0037 hex	0036 hex					
0038 hex	0037 hex	Third Last Alarm Info. Cumulative Ope. Time	Z56	R	0 to 65535	1
0039 hex	0038 hex					

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
003A hex	0039 hex	Fourth Last Alarm Contents	M96	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 1 (0x01): OC1: Overcurrent protection (during acceleration) 2 (0x02): OC2: Overcurrent protection (during deceleration) 3 (0x03): OC3: Overcurrent protection (during constant speed operation) 6 (0x06): OU1: Overvoltage protection (during acceleration) 7 (0x07): OU2: Overvoltage protection (during deceleration) 8 (0x08): OU3: Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4: Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Reserved 35 (0x23): Reserved	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
003A hex	0039 hex	Fourth Last Alarm Contents	M96	R	36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE: Following error (excessive speed deviation) 50 (0x32): ErC: Magnetic pole position detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP: RS-485 communications error (Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback disconnection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL: Customize logic failure 68 (0x44): ErU: Support tool communication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err: Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
003B hex	003A hex	Fourth Last Alarm Info. Running Status	X149	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
003C hex	003B hex	Fourth last Alarm Info. Output Frequency	X141	R	0.00 to 655.35	0.01
003D hex	003C hex					
003E hex	003D hex	Fourth last Alarm Info. Output Current	X142	R	0.00 to 655.35	0.01
003F hex	003E hex	Fourth Last Alarm Info. Main Circuit DC Voltage	X144	R	0.0 to 1000.0 V	0.1
0040 hex	003F hex	Fourth Last Alarm Info. Cumulative Running Time	X148	R	0 to 65535	1
0041 hex	0040 hex					
0042 hex	0041 hex	Fourth Last Alarm Info. Cumulative Ope. time	X143	R	0 to 65535	1
0043 hex	0042 hex					

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
0044 hex	0043 hex	Fifth Last Alarm Contents	M97	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 1 (0x01): OC1: Overcurrent protection (during acceleration) 2 (0x02): OC2: Overcurrent protection (during deceleration) 3 (0x03): OC3: Overcurrent protection (during constant speed operation) 6 (0x06): OU1: Overvoltage protection (during acceleration) 7 (0x07): OU2: Overvoltage protection (during deceleration) 8 (0x08): OU3: Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4: Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Reserved 35 (0x23): Reserved 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
0044 hex	0043 hex	Fifth Last Alarm Contents	M97	R	42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE: Following error (excessive speed deviation) 50 (0x32): ErC: Magnetic pole position detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP: RS-485 communications error (Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback disconnection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL: Customize logic failure 68 (0x44): ErU: Support tool communication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err: Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
0045 hex	0044 hex	Fifth Last Alarm Info. Running Status	X159	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
0046 hex 0047 hex	0045 hex 0046 hex	Fifth Last Alarm Info. Output Frequency	X151	R	0.00 to 655.35	0.01
0048 hex	0047 hex	Fifth Last Alarm Info. Output Current	X152	R	0.00 to 655.35	0.01
0049 hex	0048 hex	Fifth last Alarm Info. Main Circuit DC Voltage	X154	R	0.0 to 1000.0 V	0.1
004A hex 004B hex	0049 hex 004A hex	Fifth last Alarm Info. Cumulative Running time	X158	R	0 to 65535	1
004C hex 004D hex	004B hex 004C hex	Fifth Last Alarm Info. Cumulative Ope. Time	X153	R	0 to 65535	1
0900 hex	08FF hex	EEPROM write	-	W	0: No operation 1: Stores the set values to EEPROM	-
0902 hex	0901 hex	EEPROM write mode	-	W	0: RAM mode 1: EEPROM mode	-

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
1003 hex	1002 hex	Output Current Monitor	W05	R	0.00 to 9999 A	0.01
1004 hex	1003 hex	Running Status 1 Monitor	W01	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
1005 hex	1004 hex	PID Feedback Value Monitor	W12	R	-999.00 to 0.00 to 9990.00	0.01
1006 hex	1005 hex					
1007 hex	1006 hex	Input Terminal Monitor	W40	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DI6 bit 1: DI7 bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN1 bit 12: EN2 bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
1008 hex	1007 hex	Output Signal Monitor	W41	R	0000 hex to FFFF hex (Hexadecimal)	1
100D hex	100C hex	Torque Com-mand at Final	M84	R	-327 to 327	1
100E hex	100D hex	Torque Bias Monitor	W118	R	-999 to 999	1
1010 hex	100F hex	Output Torque Monitor	W07	R	-999 to 999	1
1011 hex	1010 hex	Output Voltage Monitor	W06	R	0.0 to 1000.0	0.1
1012 hex	1011 hex	Input Power Monitor	W135	R	0.0 to 6553.5 kW	0.1
1013 hex	1012 hex	Data Used Inte-grating Electric Power	W82	R	0.0 to 9999	0.1
1014 hex	1013 hex					
1015 hex	1014 hex	Total RUN Time Monitor	W179	R	0 to 100,000 h	1
1016 hex	1015 hex					
1017 hex	1016 hex	Cumulative Run Time of Electro-lytic Capacitors on PC Board	W76	R	0 to 65535 (Displayed in increments of one hour)	1
1018 hex	1017 hex					
1019 hex	1018 hex	Fin Temperature Monitor	M62	R	-3276.8 to 3276.7	0.1
1036 hex	1035 hex	Current Refer-ence Position Monitor (MSB)	d296	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1037 hex	1036 hex	Current Refer-ence Position Monitor (LSB)	d297	R	(LSB: 0 to 65535)	1
1038 hex	1037 hex	Current Feed-back Position Monitor (MSB)	d298	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1039 hex	1038 hex	Current Feed-back Position Monitor (LSB)	d299	R	(LSB: 0 to 65535)	1
1059 hex	1058 hex	Frequency and PID Command Source Monitor	W29	R	0 to 36	1
105A hex	1059 hex	RUN Command Source Monitor	W28	R	0 to 22	1
108E hex	108D hex	Input Terminal [AI1] Input Volt-age (AIV)	W136	R	-1024 to 1023 (1023 = equivalent to 10.9 V)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
108F hex	108E hex	Input Terminal [AI2] Input Current (AII)	W137	R	0 to 1023 (1023 = equivalent to 23.3 mA)	1
1091 hex	1090 hex	Pulse Train Frequency Monitor	W139	R	-100.00 to 100.00%	0.01
10AE hex	10AD hex	PIC Control PID Deviation	W131	R	-999.00 to 0.00 to 9990.00	0.01
10AF hex	10AE hex					
10B2 hex	10B1 hex	PID Output Monitor	W32	R	-150.00 to 150.00	0.01
10B3 hex	10B2 hex					
1103 hex	1102 hex	1st Acceleration Time 1	F07	R/W	0.00 to 6000.00 s	0.01
1104 hex	1103 hex					
1105 hex	1104 hex	1st Deceleration Time 1	F08	R/W	0.00 to 6000.00 s	0.01
1106 hex	1105 hex					
1202 hex	1201 hex	1st RUN Command Selection	F02	R/W	0 to 5 0: Operator (Rotation direction input: Terminal block) 1: Terminal command (digital input) 2: Operator (Forward direction) 3: Operator (Reverse direction) 4: RS-485 communication 5: Fieldbus	1
1216 hex	1215 hex	1st Frequency Reference/1st Multi-step Frequency Reference 0	C99	R/W	0.0 to 590.00 Hz	0.01
1217 hex	1216 hex					
1218 hex	1217 hex	Multi-step Frequency Reference 1	C05	R/W	0.00 to 590.00 Hz	0.01
1219 hex	1218 hex					
121A hex	1219 hex	Multi-step Frequency Reference 2	C06	R/W	0.00 to 590.00 Hz	0.01
121B hex	121A hex					
121C hex	121B hex	Multi-step Frequency Reference 3	C07	R/W	0.00 to 590.00 Hz	0.01
121D hex	121C hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
121E hex	121D hex	Multi-step Frequency Reference 4	C08	R/W	0.00 to 590.00 Hz	0.01
121F hex	121E hex					
1220 hex	121F hex	Multi-step Frequency Reference 5	C09	R/W	0.00 to 590.00 Hz	0.01
1221 hex	1220 hex					
1222 hex	1221 hex	Multi-step Frequency Reference 6	C10	R/W	0.00 to 590.00 Hz	0.01
1223 hex	1222 hex					
1224 hex	1223 hex	Multi-step Frequency Reference 7	C11	R/W	0.00 to 590.00 Hz	0.01
1225 hex	1224 hex					
1226 hex	1225 hex	Multi-step Frequency Reference 8	C12	R/W	0.00 to 590.00 Hz	0.01
1227 hex	1226 hex					
1228 hex	1227 hex	Multi-step Frequency Reference 9	C13	R/W	0.00 to 590.00 Hz	0.01
1229 hex	1228 hex					
122A hex	1229 hex	Multi-step Frequency Reference 10	C14	R/W	0.00 to 590.00 Hz	0.01
122B hex	122A hex					
122C hex	122B hex	Multi-step Frequency Reference 11	C15	R/W	0.00 to 590.00 Hz	0.01
122D hex	122C hex					
122E hex	122D hex	Multi-step Frequency Reference 12	C16	R/W	0.00 to 590.00 Hz	0.01
122F hex	122E hex					
1230 hex	122F hex	Multi-step Frequency Reference 13	C17	R/W	0.00 to 590.00 Hz	0.01
1231 hex	1230 hex					
1232 hex	1231 hex	Multi-step Frequency Reference 14	C18	R/W	0.00 to 590.00 Hz	0.01
1233 hex	1232 hex					
1234 hex	1233 hex	Multi-step Frequency Reference 15	C19	R/W	0.00 to 590.00 Hz	0.01
1235 hex	1234 hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
1238 hex	1237 hex	Jogging Frequency	C20	R/W	0.00 to 590.00 Hz	0.01
1239 hex	1238 hex					
124F hex	124E hex	1st Frequency Upper Limit	F15	R/W	0.00 to 590.00 Hz *Internal values are increments of 0.1.	0.01
1250 hex	124F hex					
1251 hex	1250 hex	1st Frequency Lower Limit	F16	R/W	0.00 to 590.00 Hz *Internal values are increments of 0.1.	0.01
1252 hex	1251 hex					
1274 hex	1273 hex	1st Acceleration Time 2	E12	R/W	0.00 to 6000.00 s	0.01
1275 hex	1274 hex					
1276 hex	1275 hex	1st Deceleration Time 1	E13	R/W	0.00 to 6000.00 s	0.01
1277 hex	1276 hex					
132B hex	132A hex	Torque Limit 1	F40	R/W	0 to 300%	1
132C hex	132B hex	Torque Limit 2	F41	R/W	0 to 300%	1
132D hex	132C hex	Torque Limit 3	E16	R/W	0 to 300%	1
132E hex	132D hex	Torque Limit 4	E17	R/W	0 to 300%	1
1622 hex	1621 hex	Torque Reference via Communication	S22	R/W	-327 to 327%	1
1625 hex	1624 hex	Torque Bias Value	S24	R/W	-327 to 327%	1
163E hex	163D hex	Positioning Data 1 (MSB)	d244	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
163F hex	163E hex	Positioning Data 1 (LSB)	d245	R/W	(LSB: 0 to 65535)	1
1640 hex	163F hex	Positioning Data 2 (MSB)	d246	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1641 hex	1640 hex	Positioning Data 2 (LSB)	d247	R/W	(LSB: 0 to 65535)	1
1642 hex	1641 hex	Positioning Data 3 (MSB)	d248	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1643 hex	1642 hex	Positioning Data 3 (LSB)	d249	R/W	(LSB: 0 to 65535)	1
1644 hex	1643 hex	Positioning Data 4 (MSB)	d250	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1

Register No.	Modbus register spec. No.	Function name	Param- eter No.	R/W	Monitor or setting data	Data reso- lution
1645 hex	1644 hex	Positioning Data 4 (LSB)	d251	R/W	(LSB: 0 to 65535)	1
1646 hex	1645 hex	Positioning Data 5 (MSB)	d252	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1647 hex	1646 hex	Positioning Data 5 (LSB)	d253	R/W	(LSB: 0 to 65535)	1
1648 hex	1647 hex	Positioning Data 6 (MSB)	d254	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1649 hex	1648 hex	Positioning Data 6 (LSB)	d255	R/W	(LSB: 0 to 65535)	1
164A hex	1649 hex	Positioning Data 7 (MSB)	d256	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
164B hex	164A hex	Positioning Data 7 (LSB)	d257	R/W	(LSB: 0 to 65535)	1
164C hex	164B hex	Positioning Data 8 (MSB)	d258	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
164D hex	164C hex	Positioning Data 8 (LSB)	d259	R/W	(LSB: 0 to 65535)	1
1660 hex	165F hex	Preset Position (MSB)	d240	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
1661 hex	1660 hex	Preset Position (LSB)	d241	R/W	(LSB: 0 to 65535)	1
2103 hex	2102 hex	2nd Acceleration Time 1	E10	R/W	0.00 to 6000.00 s	0.01
2104 hex	2103 hex					
2105 hex	2104 hex	2nd Deceleration Time 1	E11	R/W	0.00 to 6000.00 s	0.01
2106 hex	2105 hex					
2216 hex	2215 hex	2nd Frequency Reference/2nd Multi-step Fre- quency Refer- ence 0	E109	R/W	0.0 to 590.00 Hz	0.01
2217 hex	2216 hex					
224F hex	224E hex	2nd Frequency Upper Limit	E117	R/W	0.00 to 590.00 Hz *Internal values are increments of 0.1.	0.01
2250 hex	224F hex					
2251 hex	2250 hex	2nd Frequency Lower Limit	E118	R/W	0.00 to 590.00 Hz *Internal values are increments of 0.1.	0.01
2252 hex	2251 hex					
226F hex	226E hex	2nd Acceleration Time 2	E14	R/W	0.00 to 6000.00 s	0.01
2270 hex	226F hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
2271 hex	2270 hex	2nd Deceleration Time 2	E15	R/W	0.00 to 6000.00 s	0.01
2272 hex	2271 hex					
3001 hex	3000 hex	Operator Protection Function Selection	F00	R/W	0 to 3 0: Disable both data protection and digital reference protection 1: Enable data protection and disable digital reference protection 2: Disable data protection and enable digital reference protection 3: Enable both data protection and digital reference protection	1
3002 hex	3001 hex	1st Frequency Reference Selection	F01	R/W	0 to 15 0: or keys on Operator 1: Voltage input to terminal [AI1] (0 to 10 VDC) 2: Current input to terminal [AI2](AII) (4(0) to 20 mA DC) 3: Sum of voltage and current inputs to terminals [AI1] and [AI2](AII) 5: Voltage input to terminal [AI2](AIV) (0 to 10 VDC) 7: Terminal command UP / DWN control 8: or keys on Operator (balanceless-bumpless switching available) 10: Pattern operation 12: Pulse train input 13: Calculation result 14: RS-485 communication 15: Fieldbus	1
3004 hex	3003 hex	1st Maximum Output Frequency	F03	R/W	5.0 to 590.0 Hz	0.1
3005 hex	3004 hex	1st Base Frequency	F04	R/W	5.0 to 590.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3006 hex	3005 hex	1st Rated Voltage at Base Frequency	F05	R/W	80 to 240 V (for 200 V class series); 160 to 500 V (for 400 V class series) 80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
3007 hex	3006 hex	1st Rated Voltage at Maximum Output Frequency	F06	R/W	80 to 240 V (for 200 V class series); 160 to 500 V (for 400 V class series) 80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
300C hex	300B hex	1st Manual Torque Boost Voltage	F09	R/W	0.0 to 20.0% F05: Percentage with respect to Rated Voltage at Base Frequency 1	0.1
300D hex	300C hex	1st Motor Electronic Thermal Characteristic Selection	F10	R/W	1 to 2 1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven motor non-ventilated motor or motor with separately powered cooling fan	1
300E hex	300D hex	1st Motor Electronic Thermal Level	F11	R/W	0.00; 0.01 to 2000 A 0.00: Disable 0.01 to 2000 A *Setting range is from 1%(HD) to 135% (ND) of inverter rated current.	0.01
300F hex	300E hex	1st Motor Electronic Thermal Time Constant	F12	R/W	0.5 to 75.0 min	0.1
3011 hex	3010 hex	Power Interruption Restart Mode Selection	F14	R/W	0 to 6 0: Trip immediately 1: Trip after a recovery from power failure 2: Trip after decelerate-to-stop 3: Continue to run 4: Restart at the frequency selected by E152 6: Decelerate-to-stop	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3017 hex	3016 hex	Input Terminal [AI1, AI2] Bias for 1st Frequency Command	F18	R/W	-100.00 to 100.00%	0.01
3019 hex	3018 hex	1st DC Injection Braking Start Frequency	F20	R/W	0.0 to 60.0 Hz	0.1
301A hex	3019 hex	1st DC Injection Braking Level	F21	R/W	0 to 100% 0 to 100% (HHD mode) 0 to 80% (HND mode) Inverter rated current	1
301B hex	301A hex	1st DC Injection Braking Time	F22	R/W	0.00; 0.01 to 30.00 s 0.00: Disable 0.01 to 30.00 s	0.01
301C hex	301B hex	1st Starting Fre-quency	F23	R/W	0.0 to 60.0 Hz	0.1
301D hex	301C hex	1st Starting Fre-quency 1 Holding Time	F24	R/W	0.00 to 10.00 s	0.01
301E hex	301D hex	1st Stop Fre-quency	F25	R/W	0.0 to 60.0 Hz	0.1
301F hex	301E hex	Carrier Frequen-cy	F26	R/W	0 to 16 0: 0.75 kHz 1: 1 kHz 2: 2 kHz 3: 3 kHz 4: 4 kHz 5: 5 kHz 6: 6 kHz 7: 7 kHz 8: 8 kHz 9: 9 kHz 10: 10 kHz 11: 11 kHz 12: 12 kHz 13: 13 kHz 14: 14 kHz 15: 15 kHz 16: 16 kHz	1
3020 hex	301F hex	Motor Sound Tone	F27	R/W	0 to 3 0: Level 0 (Inactive) 1: Level 1 2: Level 2 3: Level 3	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3022 hex	3021 hex	Output Terminal [AO] Mode Selection	F29	R/W	0 to 3 0: Output in voltage (0 to 10 VDC) 1: Output in current (4 to 20 mADC) 2: Output in current (0 to 20 mADC) 3: Pulse output	1
3023 hex	3022 hex	Output Terminal [AO] Gain	F30	R/W	0 to 200%	1
3024 hex	3023 hex	Output Terminal [AO] Function Selection	F31	R/W	0 to 124 0: Output frequency 1 (before slip compensation) 1: Output frequency 2 (after slip compensation) 2: Output current 3: Output voltage 4: Output torque 5: Load factor 6: Input power 7: PID feedback amount (PV) 8: Actual speed/estimated speed 9: Main Circuit DC Voltage 10: Universal AO 13: Motor output 14: Calibration (+) 15: PID command (SV) 16: PID output (MV) 17: Position error in master-follower operation (Bipolar) 18: Heat sink temperature 21: PG feedback value 27: Thermal load rate 28: LAD-FQ (LAD frequency) 29: Output torque (Bipolar) 111: DriveProgramming output signal 1 to 124: DriveProgramming output signal 14	1
3026 hex	3025 hex	Output Terminal [AO] Pulse Rate (PO)	F33	R/W	25 to 32000 p/s Pulse rate at 100% output	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
302A hex	3029 hex	1st V/f Characteristics Selection	F37	R/W	0 to 1 0: Variable torque load 1: Constant torque load	1
302B hex	302A hex	1st Stop Frequency Detection Method Selection	F38	R/W	0 to 1 0: Detected/Estimated speed 1: Reference speed	1
302C hex	302B hex	1st Stop Frequency Holding Time	F39	R/W	0.00 to 10.00 s	0.01
302F hex	302E hex	1st Drive Control Selection	F42	R/W	0 to 16 0: V/f control 1: Dynamic torque vector control 3: V/f control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor 15: PM Vector control without speed and pole position sensor 16: PM Vector control with speed and pole position sensor	1
3030 hex	302F hex	1st Overload Protect Function Selection	F43	R/W	0 to 2 0: Disable (Current limiter does not work.) 1: Enable at constant speed (Disable during ACC/DEC) 2: Enable during ACC/constant speed operation (Disable during DEC)	1
3031 hex	3030 hex	1st Overload Protect Level	F44	R/W	20 to 200% The data is interpreted as the rated output current of the inverter for 100%. (Default value for HHD mode is 180%, and for ND mode 130%)	1
3037 hex	3036 hex	Electronic Thermal for Braking Resistor Discharging Capacity	F50	R/W	0: 1 to 9000 kWs; OFF (32767) 0: If internal type braking resistor 1 to 9000 kWs: OFF (32767): Disable	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3038 hex	3037 hex	Electronic Thermal for Braking Resistor Allowable Average Loss	F51	R/W	0.001 to 99.99 kW	0.001
3039 hex	3038 hex	Braking Resistor Resistance	F52	R/W	0.01 to 999 Ω	0.01
303F hex	303E hex	Output Terminal [AO] Filter	F58	R/W	0.00 to 5.00 s	0.01
3040 hex	303F hex	Output Terminal [AO] Bias	F59	R/W	-100.0 to 100.0%	0.1
3055 hex	3054 hex	Load Mode Selection	F80	R/W	0 to 4 0: HHD mode 1: HND mode 3: HD mode (only for 400 V) 4: ND mode (only for 400 V)	1
30C2 hex	30C1 hex	Input Terminal [DI1] Function Selection	E01	R/W	Separate	1
30C3 hex	30C2 hex	Input Terminal [DI2] Function Selection	E02	R/W	Separate	1
30C4 hex	30C3 hex	Input Terminal [DI3] Function Selection	E03	R/W	Separate	1
30C5 hex	30C4 hex	Input Terminal [DI4] Function Selection	E04	R/W	Separate	1
30C6 hex	30C5 hex	Input Terminal [DI5] Function Selection	E05	R/W	Separate	1
30DB hex	30DA hex	Output Terminal [DO1] Function Selection	E20	R/W	Separate	1
30DC hex	30DB hex	Output Terminal [DO2] Function Selection	E21	R/W	Separate	1
30E2 hex	30E1 hex	Output Terminal [ROA, ROB] Function Selection	E27	R/W	Separate	1
30E4 hex	30E3 hex	Frequency Arrival 2 ON Timer	E29	R/W	0.01 to 10.00 s	0.01
30E5 hex	30E4 hex	Frequency Arrival Detection Width (FAR1/FAR2/FAR3/FDT3/FDT4)	E30	R/W	0.0 to 10.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
30E6 hex	30E5 hex	Frequency Detection Level1 (FDT1/FDT3)	E31	R/W	0.0 to 590.0 Hz	0.1
30E7 hex	30E6 hex					
30E8 hex	30E7 hex	Frequency Detection Hysteresis Width (FDT1/FDT2)	E32	R/W	0.0 to 590.0 Hz	0.1
30E9 hex	30E8 hex					
30EB hex	30EA hex	Overload early warning 2 Level (OL2)	E34	R/W	0.00; 0.01 to 3000 A 0.00: Disable 0.01 to 3000 A *Setting range is from 1%(HD) to 200% (ND) of inverter rated current.	0.01
30EC hex	30EB hex	Overload early warning 2 Detection Timer (OL2)	E35	R/W	0.01 to 600.00 s	0.01
30ED hex	30EC hex	Frequency Detection Level 2 (FDT2/FDT4)	E36	R/W	0.0 to 590.0 Hz	0.1
30EE hex	30ED hex					
30EF hex	30EE hex	1st Overload Early Warning Detection Level	E37	R/W	0.00; 0.01 to 3000 A 0.00: Disable 0.01 to 3000 A *Setting range is from 1%(HD) to 200% (ND) of inverter rated current.	0.01
30F0 hex	30EF hex	1st Overload Early Warning Detection Timer / Low Current detection level (OL, LOC)	E38	R/W	0.01 to 600.00 s	0.01
30F1 hex	30F0 hex	Display Coefficient 1 for Transport Time / Auxiliary Display Coefficient 1 for Speed Monitor	E39	R/W	0.000 to 9999	0.001
30F4 hex	30F3 hex	Operator Display Filter	E42	R/W	0.0 to 5.0 s	0.1
30F5 hex	30F4 hex	Operator Display Selection during Run	E43	R/W	Separate	1
30F6 hex	30F5 hex	Operator Display when Stopped Selection	E44	R/W	0 to 1 0: Specified value 1: Output value	1
30FA hex	30F9 hex	Operator Display Speed Monitor Item Selection	E48	R/W	Separate	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
30FB hex	30FA hex	Torque Command Monitor Polarity Selection	E49	R/W	0 to 1 0: Torque polarity 1: Plus for driving, minus for braking	1
30FC hex	30FB hex	1st Frequency Conversion Coefficient	E50	R/W	0.01 to 600.00	0.01
30FD hex	30FC hex	Display Coefficient for Integrated Power	E51	R/W	0.000; 0.001 to 9999 0.000: Cancel/reset 0.001 to 9999	0.001
30FE hex	30FD hex	Operator Display Selection	E52	R/W	0 to 2 0: Parameter data settings mode (Menus #0 and #1, #7) 1: Parameter data check mode (Menus #2 and #7) 2: Full-menu mode	1
3102 hex	3101 hex	2nd Overload Warning Detection Level	E55	R/W	0.00; 0.01 to 3000 A 0.00: Disable 0.01 to 3000 A	0.01
3103 hex	3102 hex	2nd Overload Early Warning Detection Timer	E56	R/W	0.01 to 600.00 s	0.01
3108 hex	3107 hex	Input Terminal [AI1] Function Selection	E61	R/W	0 to 21 0: None 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID process command 1 5: PID feedback value 6: Ratio setting 7: Analog torque limiter 9: Torque bias 10: Torque command 11: Torque current command 17: Speed limit for forward rotation 18: Speed limit for reverse rotation 20: Analog signal input monitor 21: PID feed forward	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3109 hex	3108 hex	Input Terminal [AI2] Function Selection（AII）	E62	R/W	0 to 21 0: None 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID process command 1 5: PID feedback value 6: Ratio setting 7: Analog torque limiter 9: Torque bias 10: Torque command 11: Torque current command 17: Speed limit for forward ro-tation 18: Speed limit for reverse ro-tation 20: Analog signal input moni-tor 21: PID feed forward	1
310A hex	3109 hex	Input Terminal [AI2] Function Selection（AIV）	E63	R/W	0 to 21 0: None 1: Auxiliary frequency setting 1 2: Auxiliary frequency setting 2 3: PID process command 1 5: PID feedback value 6: Ratio setting 7: Analog torque limiter 9: Torque bias 10: Torque command 11: Torque current command 17: Speed limit for forward ro-tation 18: Speed limit for reverse ro-tation 20: Analog signal input moni-tor 21: PID feed forward	1
310B hex	310A hex	Operator Refer-ence Frequency Saving Selection	E64	R/W	0 to 1 0: Automatic saving (when main power is turned OFF) 1: Saving by pressing F/D key or SET key	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
310C hex	310B hex	Reference Loss Detection Opera-tion Selection	E65	R/W	0; 20 to 120%; 999 0: Decelerate to stop 20 to 120% 999: Disable	1
3117 hex	3116 hex	Main Circuit DC Voltage Low-volt-age Detection Level	E76	R/W	200 to 400 V; 400 to 800 V 200 to 400 V (200 V series) 400 to 800 V (400 V series)	1
3119 hex	3118 hex	Overtorque/ Undertorque De-tection Level at Forward Power Running	E78	R/W	0 to 200%	1
311A hex	3119 hex	Torque detection 1 Detection Tim-er	E79	R/W	0.01 to 600.00 s	0.01
311B hex	311A hex	Overtorque/ Undertorque De-tection Level at Reverse Regen-eration	E80	R/W	0 to 200%	1
312D hex	312C hex	Input Terminal [DI6] Function Selection	E98	R/W	Separate	1
312E hex	312D hex	Input Terminal [DI7] Function Selection	E99	R/W	Separate	1
3183 hex	3182 hex	2nd RUN Com-mand Selection	E102	R/W	0 to 5 0: Operator (Rotation direction input: Terminal block) 1: Terminal command (digital input) 2: Operator (Forward direc-tion) 3: Operator (Reverse direc-tion) 4: RS-485 communication 5: Fieldbus	1
3184 hex	3183 hex	Acceleration Stop Frequency	E103	R/W	0.00 to 590.00 Hz	0.01
3185 hex	3184 hex					
3186 hex	3185 hex	Acceleration Stop Time	E104	R/W	0.0 to 60.0 s	0.1
3187 hex	3186 hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3188 hex	3187 hex	Deceleration Stop Frequency	E105	R/W	0.00 to 590.00 Hz	0.01
3189 hex	3188 hex					
318A hex	3189 hex	Deceleration Stop Time	E106	R/W	0.0 to 60.0 s	0.1
318B hex	318A hex					
318C hex	318B hex	Multi-step Frequency Selection	E107	R/W	0 to 1 0: Binary (CF1 to CF4) 1: Bit (SF1 to SF7)	1
3192 hex	3191 hex	Jogging Operation Selection	E111	R/W	0 to 5 0: Free running on jogging stop/Disabled in operation 1: Deceleration stop on jogging stop/Disabled in operation 2: DC injection braking on jogging stop/Disabled in operation 3: Free running on jogging stop/Enabled in operation 4: Deceleration stop on jogging stop/Enabled in operation 5: DC injection braking on jogging stop/Enabled in operation	1
3193 hex	3192 hex	1st Torque Boost Function Selection	E112	R/W	0 to 1 0: Manual torque boost 1: Automatic torque boost	1
3194 hex	3193 hex	2nd Torque Boost Function Selection	E113	R/W	0 to 1 0: Manual torque boost 1: Automatic torque boost	1
3195 hex	3194 hex	DC Injection Braking Selection	E114	R/W	0 to 2 0: Disable 1: Enable 2: Enable (Set-frequency only operation)	1
3196 hex	3195 hex	External DC Injection Braking Edge/Level Selection	E115	R/W	0 to 1 0: Edge operation 1: Level operation	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
319C hex	319B hex	PID Control Feedback Selec-tion	E119	R/W	0 to 3 0: Analog input 2: Command via communi-cations link 3: Pulse train input	1
319D hex	319C hex	PID Control PID Output Variable Range for Proc-ess Control	E120	R/W	0.0: Function disable 0.1 to 100.0 Variable range based on target value	0.1
319E hex	319D hex	PID Control PID Feedforward Se-lection for Proc-ess Control	E121	R/W	0: Disable 1: Analog input (AI1, AI2)	1
319F hex	319E hex	1st AVR Function Selection	E122	R/W	0 to 1 0: Disable 1: Enable	1
31A0 hex	319F hex	2nd AVR Func-tion Selection	E123	R/W	0 to 1 0: Disable 1: Enable	1
31A1 hex	31A0 hex	Energy-saving Operation Func-tion Selection	E124	R/W	0 to 1 0: Normal operation 1: Energy-saving operation	1
31A2 hex	31A1 hex	1st 2-step Accel-eration/ Deceler-ation switching Condition Selec-tion	E125	R/W	0 to 3 0: Switching by 2CH termi-nal 1: Switching by 2-step Ac-celeration/Deceleration 2: Forward and reverse 3: Switching by RT1, RT2 terminals	1
31A3 hex	31A2 hex	2nd 2-step Accel-eration/Decelera-tion Switching Condition Selec-tion	E126	R/W	0 to 3 0: Switching by 2CH termi-nal 1: Switching by 2-step Ac-celeration/Deceleration 2: Forward and reverse 3: Switching by RT1, RT2 terminals	1
31A4 hex	31A3 hex	1st 2-step Accel-eration Switching Frequency	E127	R/W	0.00 to 590.00 Hz	0.01
31A5 hex	31A4 hex					
31A6 hex	31A5 hex	2nd 2-step Accel-eration Switching Frequency	E128	R/W	0.00 to 590.00 Hz	0.01
31A7 hex	31A6 hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
31A8 hex	31A7 hex	1st 2-step Deceleration Switching Frequency	E129	R/W	0.00 to 590.00 Hz	0.01
31A9 hex	31A8 hex					
31AA hex	31A9 hex	2nd 2-step Deceleration Frequency	E130	R/W	0.00 to 590.00 Hz	0.01
31AB hex	31AA hex					
31AC hex	31AB hex	Frequency Calculation Operation Target 1	E131	R/W	0 to 7 0: or keys on Operator 1: Voltage input to terminal [AI1] (0 to 10 VDC) 2: Current input to terminal [AI2](AII) (4(0) to 20 mA DC) 3: Voltage input to terminal [AI2](AIV) (0 to 10 VDC) 5: Pulse train input 6: RS-485 communication 7: Fieldbus	1
31AD hex	31AC hex	Frequency Calculation Operation Target 2	E132	R/W	0 to 7 0: or keys on Operator 1: Voltage input to terminal [AI1] (0 to 10 VDC) 2: Current input to terminal [AI2](AII) (4(0) to 20 mA DC) 3: Voltage input to terminal [AI2](AIV) (0 to 10 VDC) 5: Pulse train input 6: RS-485 communication 7: Fieldbus	1
31AE hex	31AD hex	Frequency Calculation Operator Selection	E133	R/W	0 to 2 0: Addition (E131 + E132) 1: Subtraction (E131 - E132) 2: Multiplication (E131 × E132)	1
31AF hex	31AE hex	Frequency Addition Amount	E134	R/W	0.00 to 590.00 Hz	0.01
31B0 hex	31AF hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
31B1 hex	31B0 hex	Frequency Addition Sign Selection	E135	R/W	0 to 1 0: Frequency command + (E134) 1: Frequency command - (E134)	1
31B6 hex	31B5 hex	Overvoltage/ Overcurrent Restart Function Selection	E139	R/W	0 to 4 0: Trip immediately 4: Restart at the frequency selected by E152	1
31BD hex	31BC hex	2nd Overload Protect Function Selection	E146	R/W	0 to 2 0: Disable (Current limiter does not work.) 1: Enable at constant speed (Disable during ACC/ DEC) 2: Enable during ACC/ constant speed operation (Disable during DEC)	1
31BE hex	31BD hex	2nd Overload Protect Level	E147	R/W	20 to 200% The data is interpreted as the rated output current of the inverter for 100%. (Default value for HHD mode is 180%, and for ND mode 130%)	1
31C3 hex	31C2 hex	Starting Frequency Selection at Frequency Pull-in Restart	E152	R/W	0 to 3 0: Frequency at which the power failure occurred 1: Maximum output frequency 2: Reference frequency 3: Starting frequency	0
31C5 hex	31C4 hex	RUN Time Over (RNT)/Power ON Time Over (ONT) Detection Level	E154	R/W	0 to 9999	1
31C6 hex	31C5 hex					
31C9 hex	31C8 hex	Analog Input [AI1] Detection Upper Limit Level	E157	R/W	0 to 100%	1
31CA hex	31C9 hex	Analog Input [AI1] Detection Lower Limit Level	E158	R/W	0 to 100%	1
31CB hex	31CA hex	Analog Input [AI1] Level Detection Hysteresis Width	E159	R/W	0 to 10%	1
31CC hex	31CB hex	Analog Input [AI2] Detection Upper Limit Level	E160	R/W	0 to 100%	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
31CD hex	31CC hex	Analog Input [AI2] Detection Lower Limit Level	E161	R/W	0 to 100%	1
31CE hex	31CD hex	Analog Input [AI2] Level Detection Hysteresis Width	E162	R/W	0 to 10%	1
31CF hex	31CE hex	Analog Operation Level at [AI1] Disconnection	E163	R/W	-100 to 100; 999 (Inactive)	1
31D0 hex	31CF hex	Analog Operation Level at [AI2] Disconnection	E164	R/W	0 to 100; 999 (Inactive)	1
31D1 hex	31D0 hex	Carrier Frequency Automatic Reduction Function Selection	E165	R/W	0 to 1 0: Disable 1: Enable	1
31D2 hex	31D1 hex	Non-linear V/f Frequency 1	E166	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1
31D3 hex	31D2 hex	Non-linear V/f Voltage 1	E167	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31D4 hex	31D3 hex	Non-linear V/f Frequency 2	E168	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1
31D5 hex	31D4 hex	Non-linear V/f Voltage 2	E169	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31D6 hex	31D5 hex	Non-linear V/f Frequency 3	E170	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Param- eter No.	R/W	Monitor or setting data	Data reso- lution
31D7 hex	31D6 hex	Non-linear V/f Voltage 3	E171	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31D8 hex	31D7 hex	Non-linear V/f Frequency 4	E172	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1
31D9 hex	31D8 hex	Non-linear V/f Voltage 4	E173	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31DA hex	31D9 hex	Non-linear V/f Frequency 5	E174	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1
31DB hex	31DA hex	Non-linear V/f Voltage 5	E175	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31DC hex	31DB hex	Non-linear V/f Frequency 6	E176	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1
31DD hex	31DC hex	Non-linear V/f Voltage 6	E177	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31DE hex	31DD hex	Non-linear V/f Frequency 7	E178	R/W	0.0; 0.1 to 590.0 Hz 0.0: Disable 0.1 to 590.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
31DF hex	31DE hex	Non-linear V/f Voltage 7	E179	R/W	0 to 240 V (for 200 V class series); 0 to 500 V (for 400 V class series) 0 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 0 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
31E1 hex	31E0 hex	Acceleration Wait Time on Brake Control	E181	R/W	0.000 to 5.000 s	0.001
31E4 hex	31E3 hex	Low Current Detection Condition Selection (LOC)	E184	R/W	0 to 1 0: Output during acceleration/deceleration and constant-speed operation 1: Output only during constant-speed operation	1
31E5 hex	31E4 hex	Overload Warning Detection Condition Selection (OL1, OL2)	E185	R/W	0 to 1 0: Output during acceleration/deceleration and constant-speed operation 1: Output only during constant-speed operation	1
31F4 hex	31F3 hex	Overtorque/ Undertorque Detection Level Reverse Power Running	E196	R/W	0 to 200%	1
31F5 hex	31F4 hex	Overtorquee/ Undertorque Detection Level Forward Regeneration	E197	R/W	0 to 200%	1
31F6 hex	31F5 hex	Overtorque/ Undertorque Detection Condition Selection	E198	R/W	0 to 1 0: Output during acceleration/deceleration and constant-speed operation 1: Output only during constant-speed operation	1
31F7 hex	31F6 hex	0Hz Detection Output Detection Level (ZS)	E199	R/W	0.00 to 100.00	0.01
3242 hex	3241 hex	Jump Frequency 1	C01	R/W	0.0 to 590.0 Hz	0.1
3243 hex	3242 hex					

8-9 Modbus Communication Data Lists

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8-9-2 Register List

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3244 hex	3243 hex	Jump Frequency 2	C02	R/W	0.0 to 590.0 Hz	0.1
3245 hex	3244 hex					
3246 hex	3245 hex	Jump Frequency 3	C03	R/W	0.0 to 590.0 Hz	0.1
3247 hex	3246 hex					
3248 hex	3247 hex	Jump Frequency Skip Width	C04	R/W	0.0 to 30.0 Hz	0.1
3269 hex	3268 hex	Pattern Operation / Timed Operation Mode Selection	C21	R/W	0 to 3 0: 1 cycle operation 1: Repetition operation 2: Constant speed operation after 1 cycle operation 3: Timed operation	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
326A hex 326B hex 326C hex 326D hex 326E hex 326F hex 3270 hex	3269 hex 326A hex 326B hex 326C hex 326D hex 326E hex 326F hex	Pattern Operation Stage 1 Operation Setting Pattern Operation Stage 2 Operation Setting Pattern Operation Stage 3 Operation Setting Pattern Operation Stage 4 Operation Setting Pattern Operation Stage 5 Operation Setting Pattern Operation Stage 6 Operation Setting Pattern Operation Stage 7 Operation Setting	C22 C23 C24 C25 C26 C27 C28	R/W	0000 hex to FFFF hex: Set in hexadecimal. 15 bit: 0 = Forward; 1 = Reverse 14 bit: Fixed to 0 (Not used) 13 bit to 12 bit: 0 = Acceleration/Deceleration time 1 1 = Acceleration/Deceleration time 2 2 = Acceleration/Deceleration time 3 3 = Acceleration/Deceleration time 4 11 bit to 10 bit: Exponent part 0 = 0.01 1 = 0.1 2 = 1 3 = 10 9 bit to 0 bit: Data part Case of Exponent part 0 = 0.01; 0000 hex to 03E7 hex (0.00 to 9.99) Case of Exponent part 1 = 0.1; 0064 hex to 03E7 hex (10.0 to 99.9) #1 Case of Exponent part 2 = 1; 0064 hex to 03E7 hex (100 to 999) #1 Case of Exponent part 3 = 10; 0064 hex to 0258 hex (1000 to 6000) #2 #1 (0000 hex to 0063 hex) or (03E8 hex to 03FF hex) cannot be set. #2 (0000 hex to 0063 hex) or (0259 hex to 03FF hex) cannot be set. Example: Case of (Reverse; Acceleration/Deceleration time 2; 10.0 s) Reverse: 8000 hex Acceleration/Deceleration time 2: 1000 hex 10.0 s = 0.1×100: 0400 hex + 0064 hex Therefore, the setting value becomes 9464 hex = 8000 hex + 1000 hex + 0400 hex + 0064 hex	0.01

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3272 hex	3271 hex	2nd Frequency Reference Selec-tion	C30	R/W	0 to 15 0: [up] or [down] keys on Opera-tor 1: Voltage input to terminal [AI1] (0 to 10 VDC) 2: Current input to terminal [AI2](AII) (4(0) to 20 mA DC)	1
3272 hex	3271 hex	2nd Frequency Reference Selec-tion	C30	R/W	3: Sum of voltage and cur-rent inputs to terminals [AI1] and [AI2](AII) 5: Voltage input to terminal [AI2](AIV) (0 to 10 VDC) 7: Terminal command UP / DWN control 8: [up] or [down] keys on Opera-tor (balanceless-bumpless switching available) 10: Pattern operation 12: Pulse train input 13: Calculation result 14: RS-485 communication 15: Fieldbus	1
3273 hex	3272 hex	Input Terminal [AI1] Offset	C31	R/W	-5.0 to 5.0%	0.1
3274 hex	3273 hex	Input Terminal [AI1] Gain （Command）	C32	R/W	0.00 to 400.00%	0.01
3275 hex	3274 hex	Input Terminal [AI1] Filter	C33	R/W	0.00 to 5.00 s	0.01
3276 hex	3275 hex	Input Terminal [AI1] Gain (Ana-log Input)	C34	R/W	0.00 to 100.00%	0.01
3277 hex	3276 hex	Input Terminal [AI1] Polarity Se-lection	C35	R/W	0 to 1 0: Bipolar 1: Unipolar	1
3278 hex	3277 hex	Input Terminal [AI2] Offset （AII）	C36	R/W	-5.0 to 5.0%	0.1
3279 hex	3278 hex	Input Terminal [AI2] Gain （AII Command）	C37	R/W	0.00 to 400.00%	0.01
327A hex	3279 hex	Input Terminal [AI2] Filter (AII)	C38	R/W	0.00 to 5.00 s	0.01

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
327B hex	327A hex	Input Terminal [AI2] Gain (AII Analog Input)	C39	R/W	0.00 to 100.00%	0.01
327C hex	327B hex	Input Terminal [AI2] Operation Selection (AII)	C40	R/W	0 to 11 0: 4 to 20 mA Unipolar 1: 0 to 20 mA Unipolar 10: 4 to 20 mA Bipolar 11: 0 to 20 mA Bipolar	1
327D hex	327C hex	Input Terminal [AI2] Offset （AIV）	C41	R/W	-5.0 to 5.0%	0.1
327E hex	327D hex	Input Terminal [AI2] Gain (AIV Command)	C42	R/W	0.00 to 400.00%	0.01
327F hex	327E hex	Input Terminal [AI2] Filter (AIV)	C43	R/W	0.00 to 5.00 s	0.01
3280 hex	327F hex	Input Terminal [AI2] Gain (AIV Analog Input)	C44	R/W	0.00 to 100.00%	0.01
3281 hex	3280 hex	Input Terminal [AI2] Polarity Selection (AIV)	C45	R/W	0 to 1 0: Bipolar 1: Unipolar	1
3286 hex	3285 hex	Input Terminal [AI1, AI2] Bias Analog Input for 1st Frequency Command	C50	R/W	0.00 to 100.00%	0.01
3289 hex	3288 hex	Input Terminal [AI1, AI2] Normal/Inverse Operation for 1st Frequency Command	C53	R/W	0 to 1 0: Normal 1: Inverse	1
328A hex	3289 hex	Input Terminal [AI1, AI2] Normal/Inverse Operation for 2nd Frequency Command	C54	R/W	0 to 1 0: Normal 1: Inverse	1
328B hex	328A hex	Input Terminal [AI1] Bias (Command)	C55	R/W	-200.00 to 200.00%	0.01
328C hex	328B hex	Input Terminal [AI1] Bias (Analog Input)	C56	R/W	0.00 to 100.00%	0.01

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
328F hex	328E hex	Input Terminal [AI1] Analog Input Adjustment Maximum Scale	C59	R/W	-999.00 to 0.00 to 9990.00 Values of the analog input monitor (terminal [AI1]) can be converted into easily recognizable physical quantities for display. This can also be used for PID feedback and PID process command.	0.01
3290 hex	328F hex	Input Terminal [AI1] Analog Input Adjustment Minimum Scale	C60	R/W	-999.00 to 0.00 to 9990.00 Values of the analog input monitor (terminal [AI1]) can be converted into easily recognizable physical quantities for display. This can also be used for PID feedback and PID process command.	0.01
3291 hex	3290 hex	Input Terminal [AI2] Bias (AII Command)	C61	R/W	-200.00 to 200.00%	0.01
3292 hex	3291 hex	Input Terminal [AI2] Bias (AII Analog Input)	C62	R/W	0.00 to 100.00%	0.01
3295 hex	3294 hex	Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AII)	C65	R/W	-999.00 to 0.00 to 9990.00 Values of the analog input monitor (terminals [AI2] (AII)) can be converted into easily recognizable physical quantities for display. This can also be used for PID feedback and PID process command.	0.01
3296 hex	3295 hex	Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AII)	C66	R/W	-999.00 to 0.00 to 9990.00 Values of the analog input monitor (terminals [AI2] (AII)) can be converted into easily recognizable physical quantities for display. This can also be used for PID feedback and PID process command.	0.01
3297 hex	3296 hex	Input Terminal [AI2] Bias (AIV Command)	C67	R/W	-200.00 to 200.00%	0.01
3298 hex	3297 hex	Input Terminal [AI2] Bias (AIV Analog Input)	C68	R/W	0.00 to 100.00%	0.01
329B hex	329A hex	Input Terminal [AI2] Analog Input Adjustment Maximum Scale (AIV)	C71	R/W	-999.00 to 0.00 to 9990.00 Values of the analog input monitor (terminals [AI2] (AIV)) can be converted into easily recognizable physical quantities for display. This can also be used for PID feedback and PID process command.	0.01

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
329C hex	329B hex	Input Terminal [AI2] Analog Input Adjustment Minimum Scale (AIV)	C72	R/W	-999.00 to 0.00 to 9990.00 Values of the analog input monitor (terminals [AI2] (AIV)) can be converted into easily recognizable physical quantities for display. This can also be used for PID feedback and PID process command.	0.01
32AD hex	32AC hex	Set-point Factor Numerator via Communication	C89	R/W	-32768 to 32767	1
32AE hex	32AD hex	Set-point Factor Denominator via Communication	C90	R/W	-32768 to 32767	1
3302 hex	3301 hex	1st Motor Pole Number	P01	R/W	2 to 128 poles	2
3303 hex	3302 hex	1st Motor Capacity	P02	R/W	0.01 to 1000 kW	0.01
3304 hex	3303 hex	1st Motor Rated Current	P03	R/W	0.00 to 2000 A	0.01
3305 hex	3304 hex	1st Auto Tuning Function Selection	P04	R/W	0 to 5 0: Disable 1 Tune the motor parameters while stopped 2: Tune the motor parameters while rotating 4: Tune the PM motor magnetic pole position offset while rotating 5: Tune the motor %R1 and %X while stopped	1
3306 hex	3305 hex	1st Online Tuning Function Selection	P05	R/W	0 to 1 0: Invalid 1: Valid	1
3307 hex	3306 hex	1st Motor Armature Resistance	P06	R/W	0.00 to 2000 A	0.01
3308 hex	3307 hex	1st Motor Parameter %R1	P07	R/W	0.00 to 50.00%	0.01
3309 hex	3308 hex	1st Motor Parameter %X	P08	R/W	0.00 to 50.00%	0.01
330A hex	3309 hex	1st Slip Compensation Gain for Driving	P09	R/W	0.0 to 200.0%	0.1
330B hex	330A hex	1st Slip Compensation Response Time	P10	R/W	0.01 to 10.00 s	0.01
330C hex	330B hex	1st Slip Compensation Gain for Braking	P11	R/W	0.0 to 200.0%	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
330D hex	330C hex	1st Rated Slip Frequency	P12	R/W	0.00 to 15.00 Hz	0.01
330E hex	330D hex	1st Iron Loss Factor 1	P13	R/W	0.00 to 20.00%	0.01
3311 hex	3310 hex	1st Magnetic Saturation Factor 1	P16	R/W	0.0 to 300.0%	0.1
3312 hex	3311 hex	1st Magnetic Saturation Factor 2	P17	R/W	0.0 to 300.0%	0.1
3313 hex	3312 hex	1st Magnetic Saturation Factor 3	P18	R/W	0.0 to 300.0%	0.1
3314 hex	3313 hex	1st Magnetic Saturation Factor 4	P19	R/W	0.0 to 300.0%	0.1
3315 hex	3314 hex	1st Magnetic Saturation Factor 5	P20	R/W	0.0 to 300.0%	0.1
331F hex	331E hex	1st PM Motor Starting Method	P30	R/W	0 to 4 0: Pull-in by current 1: For IPM type 1 (Interior permanent magnet synchronous motor) 2: For SPM type (Surface permanent magnet synchronous motor) 3: Pull-in by current for IPM type 4: For IPM type 2 (Interior permanent magnet synchronous motor)	1
3336 hex	3335 hex	1st Motor %X Correction Factor	P53	R/W	0 to 200%	1
3338 hex	3337 hex	1st Motor Torque Current under Vector Control	P55	R/W	0.00 to 2000 A	0.01
3339 hex	3338 hex	1st Induced Voltage Factor under Vector Control	P56	R/W	50 to 100%	1
333D hex	333C hex	1st PM Motor Armature Resistance	P60	R/W	0.000 to 50.00 Ω	0.001
333E hex	333D hex	1st PM Motor d-axis Inductance	P61	R/W	0.00 to 500.0 mH	0.01
333F hex	333E hex	1st PM Motor q-axis Inductance	P62	R/W	0.00 to 500.0 mH	0.01
3340 hex	333F hex	1st PM Motor Induced Voltage Ke	P63	R/W	0 to 240V: 0 to 500 V 0 to 240 V (for 200 V class series) 0 to 500 V (for 400 V class series) (Voltage at rated speed)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3341 hex	3340 hex	1st PM Motor Iron Loss	P64	R/W	0.0 to 20.0% (Based on the capacity of the motor) (Iron loss at rated speed)	0.1
3342 hex	3341 hex	1st PM Motor d-axis Inductance Magnetic Saturation Correction	P65	R/W	0.0 to 100.0% (100.0%=No magnetic saturation); 999 (Factory default)	0.1
334B hex	334A hex	1st PM Motor Reference Current at Starting	P74	R/W	10 to 200% (Based on the rated current of the motor)	1
3356 hex	3355 hex	1st PM Motor Flux Limitation Value	P85	R/W	50.0 to 150.0; 999 (Factory default)	0.1
3358 hex	3357 hex	1st PM Motor Reference Current for Magnetic Pole Detection	P87	R/W	0 to 200% (Based on the rated current of the motor)	1
335B hex	335A hex	1st PM Motor Overcurrent Protection Level	P90	R/W	0.00 to 4000 A (0.00: no active)	0.01
3360 hex	335F hex	1st PM Motor Magnetic Pole position Offset	P95	R/W	0.0 to 359.9 deg; 999 (Offset not adjusted)	0.1
33C4 hex	33C3 hex	Data Initialization	H03	R/W	0 to 8 0: Disable 1: Initialize all parameters 2: Initialize motor 1 parameters 3: Initialize motor 2 parameters 4: Restore user defined data 5: Initialize all parameters (except I/O and communications) 6: Reserved 7: Clear alarm history 8: Clear selection of favorite function code	1
33C5 hex	33C4 hex	Retry Count at Trip	H04	R/W	0; 1 to 20 0: Disable 1 to 20: Number of retries	1
33C6 hex	33C5 hex	Retry Standby Time at Trip	H05	R/W	0.5 to 20.0 s	0.1
33C7 hex	33C6 hex	Cooling Fan Function Selection	H06	R/W	0 to 1 0: Disable (Always Fan ON) 1: Enable (ON/OFF control effective)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
33C8 hex	33C7 hex	Acceleration/ Deceleration Pattern Selection	H07	R/W	0 to 3 0: Disable (Linear acceleration/deceleration) 1: S-curve acceleration/ deceleration (Weak) 2: S-curve acceleration/ deceleration (Arbitrary: According to H57 to H60) 3: Curve acceleration/ deceleration	1
33C9 hex	33C8 hex	Reverse Rotation Prevention Function	H08	R/W	0 to 2 0: Disable 1: Enable (Reverse rotation inhibited) 2: Enable (Forward rotation inhibited)	1
33CA hex	33C9 hex	Starting Mode Auto Search Function Selection	H09	R/W	0 to 2 0: Disable 1: Enable (Only at restart after momentary power failure) 2: Enable (At restart after momentary power failure and at normal start)	1
33CC hex	33CB hex	Stop Selection	H11	R/W	0 to 1 0: Normal deceleration 1: Coast to a stop	1
33CD hex	33CC hex	Instantaneous Overcurrent Limiting Function Selection	H12	R/W	0 to 1 0: Disable 1: Enable	1
33CE hex	33CD hex	Power Interruption Restart Wait Time	H13	R/W	0.1 to 100.0 s	0.1
33CF hex	33CE hex	Deceleration Setting During Current Limit for Restart Mode after Power Interruption	H14	R/W	0.00; 0.01 to 100.00 Hz/s; 999 0.00: Selected deceleration time 0.01 to 100.00 Hz/s 999: According to current limiter	0.01
33D0 hex	33CF hex	Continuous Running Voltage Level	H15	R/W	200 to 300 V (for 200 V class series); 400 to 600 V (for 400 V class series) 200 to 300 V: (200 V class series) 400 to 600 V: (400 V class series)	1
33D1 hex	33D0 hex	Allowable Time for Power Interruption Restart	H16	R/W	0.0 to 30.0 s; 999 0.0 to 30.0 s 999: Depend on inverter judgment	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
33D3 hex	33D2 hex	Torque Control Operate Selec-tion	H18	R/W	0 to 3 0: Invalid (Speed control) 2: Valid (Torque current com-mand) 3: Valid (Torque command)	1
33DB hex	33DA hex	Thermistor Func-tion Selection (MOH)	H26	R/W	0 to 3 0: Disable 1: PTC (The inverter imme-diately trips with OH4 dis-played) 2: PTC (The inverter issues output signal THM and continues to run)	1
33DC hex	33DB hex	1st Thermistor Error Detection Level (MOH)	H27	R/W	0.00 to 5.00 V	0.01
33DD hex	33DC hex	Droop Control	H28	R/W	-60.0 to 0.0 Hz	0.1
33EB hex	33EA hex	Main Circuit Ca-pacitor Service Life Coefficient (Measurement Value)	H42	R	0; 1; 2 to 65535 0: Initial value measurement 1: Measurement failure 2 to 65535: Measurement value Indication for replacement of DC link bus capacitor	1
33EC hex	33EB hex	Cumulative Run Time of Cooling Fan	H43	R	0 to 9999 (in 10 hours) Indication for replacement of cooling fan (In units of 10hours)	1
33ED hex	33EC hex	1st Startup Count for Motor	H44	R	0 to 65535 Indication of cumulative startup times	1
33EE hex	33ED hex	Mock Alarm	H45	R/W	0 to 1 0: Disable 1: Enable (Once a mock alarm occurs the data au-tomatically returns to 0)	1
33EF hex	33EE hex	Auto Search De-lay Time 2 for Starting Mode	H46	R/W	0.1 to 100.0 s	0.1
33F0 hex	33EF hex	Main Circuit Ca-pacitor Service Life Coefficient (Initial Value)	H47	R	0; 1; 2 to 65535 0: Initial value measurement 1: Measurement failure 2 to 65535: Measurement value Indication for replacement of DC link bus capacitor	1
33F1 hex	33F0 hex	Cumulative Run Time of Capaci-tors on Printed Circuit Boards	H48	R	0 to 9999 (in 10 hours) Indication for replacement of capacitors (The cumulative run time can be modified or reset in units of 10 hours.)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
33F2 hex	33F1 hex	Auto Search Delay Time 1 for Starting Characteristic	H49	R/W	0.0 to 10.0 s	0.1
33F7 hex	33F6 hex	Jogging Acceleration Time	H54	R/W	0.00 to 6000 s	0.01
33F8 hex	33F7 hex					
33F9 hex	33F8 hex	Jogging Deceleration Time	H55	R/W	0.00 to 6000 s	0.01
33FA hex	33F9 hex					
33FB hex	33FA hex	Deceleration Time for Forced Stop	H56	R/W	0.00 to 6000 s	0.01
33FC hex	33FB hex					
33FD hex	33FC hex	S-curve Acceleration Range Frequency at Starting	H57	R/W	0 to 100%	1
33FE hex	33FD hex	S-curve Acceleration Range Frequency at End	H58	R/W	0 to 100%	1
33FF hex	33FE hex	S-curve Deceleration Range Frequency at Starting	H59	R/W	0 to 100%	1
3400 hex	33FF hex	S-curve Deceleration Range Frequency at End	H60	R/W	0 to 100%	1
3401 hex	3400 hex	UP/DOWN Control Initial Value Selection	H61	R/W	0 to 1 0: Default value is 0.00 Hz 1: Initial value is last UP/DWN command value	1
3403 hex	3402 hex	Frequency Lower Limit Operation Selection	H63	R/W	0 to 1 0: Limit by F16 (Frequency Limiter: Low) and continue to run 1: If the output frequency lowers less than the one limited by F16 (Frequency Limiter: Low) decelerates to stop the motor.	1
3404 hex	3403 hex	Low Frequency during Protecting Overload	H64	R/W	0.0; 0.1 to 590.0 Hz 0.0: Depends on F16 (Frequency Limiter: Low) 0.1 to 590.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data		Data resolution
3407 hex	3406 hex	Auto Energy Saving Operation Condition Selection	H67	R/W	0 to 1		1
					0:	Enable only during running at constant speed	
					1:	Enable in all modes	
3408 hex	3407 hex	1st Slip Compensation Operating Conditions Selection	H68	R/W	0 to 3		1
					0:	Enable during acceleration/deceleration; enable at base frequency or higher	
					1:	Disable during acceleration/deceleration; enable at base frequency or higher	
					2:	Enable during acceleration/deceleration; disable at base frequency or higher	
					3:	Disable during acceleration/deceleration; disable at base frequency or higher	
3409 hex	3408 hex	Anti-regenerative Control Function Selection	H69	R/W	0 to 5		1
					0:	Disable	
					2:	Torque limit control with force-to-stop (Cancel limit control after three times of deceleration time has passed)	
					3:	DC link bus voltage control with force-to-stop (Cancel voltage control after three times of deceleration time has passed)	
					4:	Torque limit control without force-to-stop	
					5:	DC link bus voltage control without force-to-stop	
340A hex	3409 hex	Overload Prevention Control	H70	R/W	0.00; 0.01 to 100.00 Hz/s; 999		0.01
					0.00:	Depend on selected deceleration time	
					0.01 to 100.00 Hz/s		
					999:	Cancel	
340B hex	340A hex	Over-Excitation Control Selection during Deceleration Function Selection	H71	R/W	0 to 1		1
					0:	Disable	
					1:	Enable	

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
340E hex	340D hex	Torque Limit Function Selection	H74	R/W	0 to 1 0: Torque limit 1: Torque current limit	1
340F hex	340E hex	Torque Limit Operation Selection	H75	R/W	0 to 1 0: Four quadrants independent 1: Four quadrants identical	1
3410 hex	340F hex	Frequency Rising Limit for Torque Limit	H76	R/W	0.0 to 590.0 Hz	0.1
3411 hex	3410 hex	Service Life of Main Circuit Capacitor Remaining Time	H77	R	0 to 8760 (in 10 hours)	1
3412 hex	3411 hex	1st Motor Maintenance Interval	H78	R/W	0; 1 to 9999 0: Disable 1 to 9999 (in 10 hours)	1
3413 hex	3412 hex					
3414 hex	3413 hex	1st Preset Startup Count for Motor Maintenance	H79	R/W	0; 1 to 65535 0: Disable 1 to 65535	1
3415 hex	3414 hex	1st Output Current Fluctuation Damping Gain	H80	R/W	0.00 to 1.00	0.01
3416 hex	3415 hex	Light Alarm Selection 1	H81	R/W	0000 hex to FFFF hex (Hexadecimal)	1
3417 hex	3416 hex	Light Alarm Selection 2	H82	R/W	0000 hex to FFFF hex (Hexadecimal)	1
3419 hex	3418 hex	Pre-excitation Level	H84	R/W	100 to 400%	1
341A hex	3419 hex	Pre-excitation Timer	H85	R/W	0.00; 0.01 to 30.00 s 0.00: Disable 0.01 to 30.00 s	0.01
341E hex	341D hex	Motor Electronic Thermal Overload Protection Data Retention	H89	R/W	0 to 1 0: Invalid 1: Valid	1
3420 hex	341F hex	Current Input Wire Break Detection	H91	R/W	0.0; 0.1 to 60.0 s 0.0: Disable alarm detection 0.1 to 60.0 s: Issue alarm after set time	0.1
3421 hex	3420 hex	Continuous Running at the Momentary Power Failure P Proportional Gain	H92	R/W	0.000 to 10.000; 999 (Auto)	0.001

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3422 hex	3421 hex	Continuous Running at the Momentary Power Failure Integral Time	H93	R/W	0.010 to 10.000 s; 999 (Auto)	0.001
3423 hex	3422 hex	1st Cumulative Motor Run Time	H94	R	0 to 9999 (in 10 hours) The cumulative run time can be modified or reset.	1
3424 hex	3423 hex					
3425 hex	3424 hex	DC Injection Braking Start Characteristic Selection	H95	R/W	0 to 1 0: Slow response 1: Quick response	1
3426 hex	3425 hex	STOP Key Priority/Start Check Function	H96	R/W	0 to 3 0: STOP key priority disable / Start check function disable 1: STOP key priority enable / Start check function disable 2: STOP key priority disable / Start check function enable 3: STOP key priority enable / Start check function enable	1
3428 hex	3427 hex	Protection/Maintenance Function Mode Selection	H98	R/W	0 to 255 bit 0 to 2: Reserved bit 3: Main circuit capacitor life judgment selection (0: Factory default referenced; 1 User measurement value standard) bit 4: Judge the life of main circuit capacitor (0: Disable; 1: Enable) bit 5: Detect charge register overheat (0: Enable; 1: Disable) bit 6: Braking transistor error detection (0: Disable; 1: Enable) bit 7: Reserved	1
3429 hex	3428 hex	Password 2 Setting/Verification	H99	R	0000 hex to FFFF hex (Hexadecimal)	1
348F hex	348E hex	Anti-regenerative Control Level	H114	R/W	0.0 to 50.0%; 999 (Auto)	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
34B0 hex	34AF hex	Speed Control Jogging Feed Forward Gain	H147	R/W	0.00 to 99.99 s	0.01
34B7 hex	34B6 hex	Torque Bias Function Selection	H154	R/W	0 to 5 0: Disable 1: Operator (H155 to H157) 2: Analog input 4: RS-485 communication 5: Fieldbus	1
34B8 hex	34B7 hex	Torque Bias Level 1	H155	R/W	-300 to 300%	1
34B9 hex	34B8 hex	Torque Bias Level 2	H156	R/W	-300 to 300%	1
34BA hex	34B9 hex	Torque Bias Level 3	H157	R/W	-300 to 300%	1
34BB hex	34BA hex	Torque Bias Mechanical Loss Compensation	H158	R/W	0 to 300%	1
34BC hex	34BB hex	Torque Bias Startup Timer	H159	R/W	0.00 to 1.00 s	0.01
34BE hex	34BD hex	Torque Bias Shutdown Timer	H161	R/W	0.00 to 1.00 s	0.01
34BF hex	34BE hex	Torque Bias Limit	H162	R/W	0 to 300%	1
34CA hex	34C9 hex	Magnetic Flux Level at Light Load	H173	R/W	10 to 100%	1
34D1 hex	34D0 hex	Brake Error Detection Time	H180	R/W	0.00 to 10.00 s	0.01
34DE hex	34DD hex	User Preference Dataset Registration	H193	R/W	0 to 1 0: Disable 1: Save	1
34DF hex	34DE hex	User Preference Dataset Protection Function Selection	H194	R/W	0 to 1 0: Unprotected 1: Protected (Saving prohibited)	1
34E0 hex	34DF hex	DC Injection Braking Startup Time	H195	R/W	0.00 (Disable); 0.01 to 30.00 s *Only the motor 1 is effective	0.01

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
34E2 hex	34E1 hex	User password 1 Mode selection	H197	R/W	0 to 2 0: Display all the function co-des but prevent any change 1: Display and modify the function codes according to Q-setup 2: Hide customized logic (protect) *This specifies the protection of user password 1.	1
34E3 hex	34E2 hex	User Password 1 Setting/Verifica-tion	H198	R	0000 hex to FFFF hex (Hexadecimal)	1
34E4 hex	34E3 hex	User Password 1 Setting	H199	R/W	0 to 1 0: Disable 1: Protected	1
3605 hex	3604 hex	Co-Inverter Com-munication Func-tion Selection	H303	R/W	0 to 2 0: Inactive 1: Active EzCOM 2: Active EzCOM (administrator)	1
3606 hex	3605 hex	Co-inverter Com-munication Start-ing Station Num-ber (Administra-tor)	H304	R/W	1 to 8 Need to be set in administrator	1
3607 hex	3606 hex	Co-inverter Com-munication End-ing Station Num-ber (Administra-tor)	H305	R/W	1 to 8 Need to be set in administrator	1
3608 hex	3607 hex	Co-inverter Com-munication Start Selection (Ad-ministrator)	H306	R/W	0 to 1 0: 485 input 1: Always ON	1
360B hex	360A hex	Output Terminal [DO1] ON Delay Time	H309	R/W	0.0 to 100.0	0.1
360C hex	360B hex	Output Termi-nal[DO1] OFF Delay Time	H310	R/W	0.0 to 100.0	0.1
360D hex	360C hex	Output Termi-nal[DO2] ON De-lay Time	H311	R/W	0.0 to 100.0	0.1
360E hex	360D hex	Output Termi-nal[DO2] OFF Delay Time	H312	R/W	0.0 to 100.0	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
360F hex	360E hex	Output Terminal [ROA, ROB] ON Delay Time	H313	R/W	0.0 to 100.0	0.1
3610 hex	360F hex	Output Terminal [ROA, ROB] OFF Delay Time	H314	R/W	0.0 to 100.0	0.1
3611 hex	3610 hex	Logical Expres-sion 1 Operation Target 1	H315	R/W	Separate *27, 100, 206, 207, 208 can't be selected	1
3612 hex	3611 hex	Logical Expres-sion 1 Operation Target 2	H316	R/W	Separate *27, 100, 206, 207, 208 can't be selected	1
3613 hex	3612 hex	Logical Expres-sion 1 Logical Operator	H317	R/W	0 to 2 0: AND 1: OR 2: XOR	1
3614 hex	3613 hex	Logical Expres-sion 2 Operation Target 1	H318	R/W	Separate *27, 100, 206, 207, 208 can't be selected	1
3615 hex	3614 hex	Logical Expres-sion 2 Operation Target 2	H319	R/W	Separate *27, 100, 206, 207, 208 can't be selected	1
3616 hex	3615 hex	Logical Expres-sion 2 Logical Operator	H320	R/W	0 to 2 0: AND 1: OR 2: XOR	1
3617 hex	3616 hex	Logical Expres-sion 3 Operation Target 1	H321	R/W	Separate *27, 100, 206, 207, 208 can't be selected	1
3618 hex	3617 hex	Logical Expres-sion 3 Operation Target 2	H322	R/W	Separate *27, 100, 206, 207, 208 can't be selected	1
3619 hex	3618 hex	Logical Expres-sion 3 Logical Operator	H323	R/W	0 to 2 0: AND 1: OR 2: XOR	1
361A hex	3619 hex	Input Terminal [DI1] Response Time	H324	R/W	1 to 400 ms	1
361B hex	361A hex	Input Terminal [DI2] Response Time	H325	R/W	1 to 400 ms	1
361C hex	361B hex	Input Terminal [DI3] Response Time	H326	R/W	1 to 400 ms	1
361D hex	361C hex	Input Terminal [DI4] Response Time	H327	R/W	1 to 400 ms	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
361E hex	361D hex	Input Terminal [DI5] Response Time	H328	R/W	1 to 400 ms	1
361F hex	361E hex	Input Terminal [DI6] Response Time	H329	R/W	1 to 400 ms	1
3620 hex	361F hex	Input Terminal [DI7] Response Time	H330	R/W	1 to 400 ms	1
3622 hex	3621 hex	Torque Reference Selection	H332	R/W	0 to 5 0: Analog input 2: Operator (H333) 4: RS-485 communication 5: Fieldbus	1
3623 hex	3622 hex	Torque Reference	H333	R/W	0 to 200%	1
3624 hex	3623 hex	Torque Bias Polarity Selection	H334	R/W	0 to 1 0: Signed 1: Depends on the run direction	1
3629 hex	3628 hex	Number of Sent Data of All Stations in Co-inverter Communication	H339	R/W	1 to 5	1
362A hex	3629 hex	Recipient Station Number of All Stations in Co-inverter Communication 1	H340	R/W	1 to 247	1
362B hex	362A hex	Recipient Register of All Stations in Co-inverter Communication 1	H341	R/W	0000 hex to FFFF hex	1
362C hex	362B hex	Sender Register of All Stations in Co-inverter Communication 1	H342	R/W	0000 hex to FFFF hex	1
362D hex	362C hex	Recipient Station Number of All Stations in Co-inverter Communication 2	H343	R/W	1 to 247	1
362E hex	362D hex	Recipient Register of All Stations in Co-inverter Communication 2	H344	R/W	0000 hex to FFFF hex	1

Register No.	Modbus register spec. No.	Function name	Param- eter No.	R/W	Monitor or setting data	Data reso- lution
362F hex	362E hex	Sender Register of All Stations in Co-inverter Com- munication 2	H345	R/W	0000 hex to FFFF hex	1
3630 hex	362F hex	Recipient Station Number of All Stations in Co-in- verter Communi- cation 3	H346	R/W	1 to 247	1
3631 hex	3630 hex	Recipient Regis- ter of All Stations in Co-inverter Communication 3	H347	R/W	0000 hex to FFFF hex	1
3632 hex	3631 hex	Sender Register of All Stations in Co-inverter Com- munication 3	H348	R/W	0000 hex to FFFF hex	1
3633 hex	3632 hex	Recipient Station Number of All Stations in Co-in- verter Communi- cation 4	H349	R/W	1 to 247	1
3634 hex	3633 hex	Recipient Regis- ter of All Stations in Co-inverter Communication 4	H350	R/W	0000 hex to FFFF hex	1
3635 hex	3634 hex	Sender Register of All Stations in Co-inverter Com- munication 4	H351	R/W	0000 hex to FFFF hex	1
3636 hex	3635 hex	Recipient Station Number of All Stations in Co-in- verter Communi- cation 5	H352	R/W	1 to 247	1
3637 hex	3636 hex	Recipient Regis- ter of All Stations in Co-inverter Communication 5	H353	R/W	0000 hex to FFFF hex	1
3638 hex	3637 hex	Sender Register of All Stations in Co-inverter Com- munication 5	H354	R/W	0000 hex to FFFF hex	1
3639 hex	3638 hex	Modbus Mapping Function Selec- tion	H355	R/W	0 to 1 0: Standard 1: Free mapping	1
363A hex	3639 hex	Modbus Mapping 1 External Regis- ter	H356	R/W	0000 hex to FFFF hex	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
363B hex	363A hex	Modbus Mapping 2 External Register	H357	R/W	0000 hex to FFFF hex	1
363C hex	363B hex	Modbus Mapping 3 External Register	H358	R/W	0000 hex to FFFF hex	1
363D hex	363C hex	Modbus Mapping 4 External Register	H359	R/W	0000 hex to FFFF hex	1
363E hex	363D hex	Modbus Mapping 5 External Register	H360	R/W	0000 hex to FFFF hex	1
363F hex	363E hex	Modbus Mapping 6 External Register	H361	R/W	0000 hex to FFFF hex	1
3640 hex	363F hex	Modbus Mapping 7 External Register	H362	R/W	0000 hex to FFFF hex	1
3641 hex	3640 hex	Modbus Mapping 8 External Register	H363	R/W	0000 hex to FFFF hex	1
3642 hex	3641 hex	Modbus Mapping 9 External Register	H364	R/W	0000 hex to FFFF hex	1
3643 hex	3642 hex	Modbus Mapping 10 External Register	H365	R/W	0000 hex to FFFF hex	1
3644 hex	3643 hex	Modbus Mapping 1 External Register Sign	H366	R/W	0 to 1 0: Unsigned 1: Signed	1
3645 hex	3644 hex	Modbus Mapping 2 External Register Sign	H367	R/W	0 to 1 0: Unsigned 1: Signed	1
3646 hex	3645 hex	Modbus Mapping 3 External Register Sign	H368	R/W	0 to 1 0: Unsigned 1: Signed	1
3647 hex	3646 hex	Modbus Mapping 4 External Register Sign	H369	R/W	0 to 1 0: Unsigned 1: Signed	1
3648 hex	3647 hex	Modbus Mapping 5 External Register Sign	H370	R/W	0 to 1 0: Unsigned 1: Signed	1
3649 hex	3648 hex	Modbus Mapping 6 External Register Sign	H371	R/W	0 to 1 0: Unsigned 1: Signed	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
364A hex	3649 hex	Modbus Mapping 7 External Register Sign	H372	R/W	0 to 1 0: Unsigned 1: Signed	1
364B hex	364A hex	Modbus Mapping 8 External Register Sign	H373	R/W	0 to 1 0: Unsigned 1: Signed	1
364C hex	364B hex	Modbus Mapping 9 External Register Sign	H374	R/W	0 to 1 0: Unsigned 1: Signed	1
364D hex	364C hex	Modbus Mapping 10 External Register Sign	H375	R/W	0 to 1 0: Unsigned 1: Signed	1
364E hex	364D hex	Modbus Mapping 1 Scaling	H376	R/W	0.001 to 65.53	0.001
364F hex	364E hex	Modbus Mapping 2 Scaling	H377	R/W	0.001 to 65.53	0.001
3650 hex	364F hex	Modbus Mapping 3 Scaling	H378	R/W	0.001 to 65.53	0.001
3651 hex	3650 hex	Modbus Mapping 4 Scaling	H379	R/W	0.001 to 65.53	0.001
3652 hex	3651 hex	Modbus Mapping 5 Scaling	H380	R/W	0.001 to 65.53	0.001
3653 hex	3652 hex	Modbus Mapping 6 Scaling	H381	R/W	0.001 to 65.53	0.001
3654 hex	3653 hex	Modbus Mapping 7 Scaling	H382	R/W	0.001 to 65.53	0.001
3655 hex	3654 hex	Modbus Mapping 8 Scaling	H383	R/W	0.001 to 65.53	0.001
3656 hex	3655 hex	Modbus Mapping 9 Scaling	H384	R/W	0.001 to 65.53	0.001
3657 hex	3656 hex	Modbus Mapping 10 Scaling	H385	R/W	0.001 to 65.53	0.001
3658 hex	3657 hex	Modbus Mapping 1 Internal Register	H386	R/W	0000 hex to FFFF hex	1
3659 hex	3658 hex	Modbus Mapping 2 Internal Register	H387	R/W	0000 hex to FFFF hex	1
365A hex	3659 hex	Modbus Mapping 3 Internal Register	H388	R/W	0000 hex to FFFF hex	1
365B hex	365A hex	Modbus Mapping 4 Internal Register	H389	R/W	0000 hex to FFFF hex	1
365C hex	365B hex	Modbus Mapping 5 Internal Register	H390	R/W	0000 hex to FFFF hex	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
365D hex	365C hex	Modbus Mapping 6 Internal Register	H391	R/W	0000 hex to FFFF hex	1
365E hex	365D hex	Modbus Mapping 7 Internal Register	H392	R/W	0000 hex to FFFF hex	1
365F hex	365E hex	Modbus Mapping 8 Internal Register	H393	R/W	0000 hex to FFFF hex	1
3660 hex	365F hex	Modbus Mapping 9 Internal Register	H394	R/W	0000 hex to FFFF hex	1
3661 hex	3660 hex	Modbus Mapping 10 Internal Register	H395	R/W	0000 hex to FFFF hex	1
3662 hex	3661 hex	Modbus Mapping Endian Selection	H396	R/W	0 to 2 0: Big endian 1: Little endian 2: Special endian	1
36D0 hex	36CF hex	Input Phase Loss Protection Function Selection	H411	R/W	0 to 1 0: Disable (Continue to run) 1: Enable (Trip)	1
36D1 hex	36D0 hex	Output Phase Loss Protection Function Selection	H412	R/W	0 to 1 0: Disable (Continue to run) 1: Enable (Trip)	1
36EE hex	36ED hex	Touch Probe 1 Source	H435	R/W	1 to 6 1: External Latch Input 1 (EXT1) 2: External Latch Input 2 (EXT2) 6: Encoder Phase Z	1
36EF hex	36EE hex	Touch Probe 2 Source	H436	R/W	1 to 6 1: External Latch Input 1 (EXT1) 2: External Latch Input 2 (EXT2) 6: Encoder Phase Z	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
36F0 hex	36EF hex	Touch Probe Function	H437	R/W	0000 hex to FFFF hex bit 0: Latch function 1 (0: Disabled; 1: Enabled) bit 1: Latch mode 1 (0: Trigger First Event Mode; 1: Continuous Mode) bit2-3: Latch trigger 1 (00: EXT1; 01: Phase Z; 10: H435/H436 (0x60D0); 11: Reserved (No-trigger)) bit 4: Latch operation 1 (0: Disabled; 1: Enabled) bit 5-7: Fixed “0” bit 8: Latch function 2 (0: Disabled; 1: Enabled)	1
36F0 hex	36EF hex	Touch Probe Function	H437	R/W	bit 9: Latch mode 2 (0: Trigger First Event Mode; 1: Continuous Mode) bit 10-11: Latch trigger 2 (00: EXT2; 01: Phase Z; 10: H435/H436 (0x60D0); 11: Reserved (No-trigger)) bit 12: Latch operation 2 (0: Disabled; 1: Enabled) bit 13-15: Fixed “0”	1
36F1 hex	36F0 hex	Feedback Value Comparison Signal Off Level	H438	R/W	0.0 to 100.0% FBV signal output detection level	0.1
36F2 hex	36F1 hex	Feedback Value Comparison Signal On Level	H439	R/W	0.0 to 100.0% FBV signal output detection level	0.1
36F3 hex	36F2 hex	Free Run Stop Restart Allowable Time	H440	R/W	0.0 to 30.0 s	0.1
36F4 hex	36F3 hex	Free Run Stop Restart Operation Selection	H441	R/W	1 to 2 1: Starting with matching frequency 2: Starting with active matching frequency	1
36F5 hex	36F4 hex	Slip compensation Function Selection	H442	R/W	0 to 1 0: Invalid 1: Valid	1
3842 hex	3841 hex	2nd Maximum Output Frequency	A01	R/W	5.0 to 590.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3843 hex	3842 hex	2nd Base Fre-quency	A02	R/W	5.0 to 590.0 Hz	0.1
3844 hex	3843 hex	2nd Rated Volt-age at Base Fre-quency	A03	R/W	80 to 240 V (for 200 V class series); 160 to 500 V (for 400 V class series) 80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
3845 hex	3844 hex	2nd Rated Volt-age at Maximum Output Frequen-cy	A04	R/W	80 to 240 V (for 200 V class series); 160 to 500 V (for 400 V class series) 80 to 240 V: Output an AVR-controlled voltage (for 200 V class series) 160 to 500 V: Output an AVR-controlled voltage (for 400 V class series)	1
3846 hex	3845 hex	2nd Manual Tor-que Boost Volt-age	A05	R/W	0.0 to 20.0% A03: Percentage with respect to Rated Voltage at Base Frequency 2	0.1
3847 hex	3846 hex	2nd Motor Elec-tronic Thermal Characteristic se-lection	A06	R/W	1 to 2 1: For a general-purpose motor with shaft-driven cooling fan 2: For an inverter-driven mo-tor non-ventilated motor or motor with separately powered cooling fan	1
3848 hex	3847 hex	2nd Motor Elec-tronic Thermal Level	A07	R/W	0.00; 0.01 to 2000 A 0.00: Disable 0.01 to 2000 A *Setting range is from 1%(HHD) to 135% (ND) of inverter rated current.	0.01
3849 hex	3848 hex	2nd Motor Elec-tronic Thermal Time Constant	A08	R/W	0.5 to 75.0 min	0.1
384A hex	3849 hex	2nd DC Injection Braking Start Frequency	A09	R/W	0.0 to 60.0 Hz	0.1
384B hex	384A hex	2nd DC Injection Braking Level	A10	R/W	0 to 100% 0 to 100% (HHD mode) 0 to 80% (HD/HND mode) 0 to 60% (ND mode) Inverter rated current	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
384C hex	384B hex	2nd DC Injection Braking Time	A11	R/W	0.00; 0.01 to 30.00 s 0.00: Disable 0.01 to 30.00 s	0.01
384D hex	384C hex	2nd Starting Fre-quency	A12	R/W	0.0 to 60.0 Hz	0.1
384E hex	384D hex	2nd V/f Charac-teristics Selection	A13	R/W	0 to 1 0: Variable torque load 1: Constant torque load	1
384F hex	384E hex	2nd Drive Control Selection	A14	R/W	0 to 6 0: V/f control 1: Dynamic torque vector control 3: V/f control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor	1
3850 hex	384F hex	2nd Motor Pole Number	A15	R/W	2 to 128 poles	2
3851 hex	3850 hex	2nd Motor Ca-pacity	A16	R/W	0.01 to 1000 kW	0.01
3852 hex	3851 hex	2nd Motor Rated Current	A17	R/W	0.00 to 2000 A	0.01
3853 hex	3852 hex	2nd Auto-tuning Selection Func-tion Selection	A18	R/W	0 to 5 0: Disable 1: Tune the motor parame-ters while stopped 2: Tune the motor parame-ters while rotating 5: Tune the motor %R1 and %X while stopped	1
3854 hex	3853 hex	2nd Online tun-ing Function Selection	A19	R/W	0 to 1 0: Invalid 1: Valid	1
3855 hex	3854 hex	2nd Motor Arma-ture Resistance	A20	R/W	0.00 to 2000 A	0.01
3856 hex	3855 hex	2nd Motor Motor Constant %R1	A21	R/W	0.00 to 50.00%	0.01
3857 hex	3856 hex	2nd Motor Motor Constant %X	A22	R/W	0.00 to 50.00%	0.01
3858 hex	3857 hex	2nd Slip Com-pensation Gain for Driving	A23	R/W	0.0 to 200.0%	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3859 hex	3858 hex	2nd Slip Compensation Response Time	A24	R/W	0.01 to 10.00 s	0.01
385A hex	3859 hex	2nd Slip Compensation Gain for Braking	A25	R/W	0.0 to 200.0%	0.1
385B hex	385A hex	2nd Rated Slip Frequency	A26	R/W	0.00 to 15.00 Hz	0.01
385C hex	385B hex	2nd Iron Loss Factor 1	A27	R/W	0.00 to 20.00%	0.01
385F hex	385E hex	2nd Magnetic Saturation Factor 1	A30	R/W	0.0 to 300.0%	0.1
3860 hex	385F hex	2nd Magnetic Saturation Factor 2	A31	R/W	0.0 to 300.0%	0.1
3861 hex	3860 hex	2nd Magnetic Saturation Factor 3	A32	R/W	0.0 to 300.0%	0.1
3862 hex	3861 hex	2nd Magnetic Saturation Factor 4	A33	R/W	0.0 to 300.0%	0.1
3863 hex	3862 hex	2nd Magnetic Saturation Factor 5	A34	R/W	0.0 to 300.0%	0.1
3869 hex	3868 hex	2nd Slip Compensation Operating Conditions Selection	A40	R/W	0 to 3 0: Enable during acceleration/deceleration; enable at base frequency or higher 1: Disable during acceleration/deceleration; enable at base frequency or higher 2: Enable during acceleration/deceleration; disable at base frequency or higher 3: Disable during acceleration/deceleration; disable at base frequency or higher	1
386A hex	3869 hex	2nd Output Current Fluctuation Damping Gain	A41	R/W	0.00 to 1.00	0.01
386C hex	386B hex	Speed Control 2 Speed Command Filter	A43	R/W	0.000 to 5.000 s	0.001

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
386D hex	386C hex	Speed Control 2 Speed Detection Filter	A44	R/W	0.000 to 0.100 s	0.001
386E hex	386D hex	Speed Control 2 P Proportional Gain	A45	R/W	0.1 to 200.0	0.1
386F hex	386E hex	Speed Control 2 I Integral Time	A46	R/W	0.001 to 9.999 s; 999 999: Disable	0.001
3870 hex	386F hex	Speed Control 2 FF Gain	A47	R/W	0.00 to 99.99 s	0.01
3871 hex	3870 hex	Speed Control 2 Output Filter	A48	R/W	0.000 to 0.100 s	0.001
3872 hex	3871 hex	Speed Control 2 Notch Filter Resonance Frequency	A49	R/W	1 to 200 Hz	1
3873 hex	3872 hex	Speed Control 2 Notch Filter Attenuation Level	A50	R/W	0 to 40 dB	1
3874 hex	3873 hex	2nd Cumulative Motor Run Time	A51	R	0 to 9999 (in 10 hours) The cumulative run time can be modified or reset.	1
3875 hex	3874 hex	2nd Startup Counter for Motor	A52	R	0 to 65535 Indication of cumulative startup times	1
3876 hex	3875 hex	2nd Motor 2 %X Correction Factor 1	A53	R/W	0 to 200%	1
3878 hex	3877 hex	Torque Current for 2nd Vector Control	A55	R/W	0.00 to 2000 A	0.01
3879 hex	3878 hex	Induced Voltage Factor for 2nd Vector Control	A56	R/W	50 to 100%	1
387D hex	387C hex	2nd Speed Conversion Coefficient	A60	R/W	0.00 to 600.00 0.00: Using E50 value	0.01
387E hex	387D hex	2nd Display Coefficient for Transport time / Auxiliary Display Coefficient for Speed Monitor	A61	R/W	0.000 to 9999	0.001
387F hex	387E hex	2nd Starting Frequency Holding Time	A62	R/W	0.00 to 10.00 s	0.01
3880 hex	387F hex	2nd Stop Frequency	A63	R/W	0.0 to 60.0 Hz: 999 999(Inherit): According to F25	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3881 hex	3880 hex	2nd Stop Fre-quency Detection Method Selection	A64	R/W	0 to 100 0: Detected speed 1: Reference speed 100: According to F38	1
3882 hex	3881 hex	2nd Stop Fre-quency Holding Time	A65	R/W	0.00 to 10.00 s	0.01
392C hex	392B hex	Speed Control 3 Speed Com-mand Filter	b43	R/W	0.000 to 5.000 s	0.001
392D hex	392C hex	Speed Control 3 Speed Detection Filter	b44	R/W	0.000 to 0.100 s	0.001
392E hex	392D hex	Speed Control 3 P Proportional Gain	b45	R/W	0.1 to 200.0	0.1
392F hex	392E hex	Speed Control 3 I Integral Time	b46	R/W	0.001 to 9.999 s; 999 999: Disable	0.001
3930 hex	392F hex	Speed Control 3 FF Gain	b47	R/W	0.00 to 99.99 s	0.01
3931 hex	3930 hex	Speed Control 3 Output Filter	b48	R/W	0.000 to 0.100 s	0.001
3932 hex	3931 hex	Speed Control 3 Notch Filter Res-onance Frequen-cy	b49	R/W	1 to 200 Hz	1
3933 hex	3932 hex	Speed Control 3 Notch Filter At-tenuation Level	b50	R/W	0 to 40 dB	1
39EC hex	39EB hex	Speed Control 4 Speed Com-mand Filter	r43	R/W	0.000 to 5.000 s	0.001
39ED hex	39EC hex	Speed Control 4 Speed Detection Filter	r44	R/W	0.000 to 0.100 s	0.001
39EE hex	39ED hex	Speed Control 4 P Proportional Gain	r45	R/W	0.1 to 200.0	0.1
39EF hex	39EE hex	Speed Control 4 I Integral Time	r46	R/W	0.001 to 9.999 s; 999 999: Disable	0.001
39F0 hex	39EF hex	Speed Control 4 FF Gain	r47	R/W	0.00 to 99.99 s	0.01
39F1 hex	39F0 hex	Speed Control 4 Output Filter	r48	R/W	0.000 to 0.100 s	0.001
39F2 hex	39F1 hex	Speed Control 4 Notch Filter Res-onance Frequen-cy	r49	R/W	1 to 200 Hz	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
39F3 hex	39F2 hex	Speed Control 4 Notch Filter Attenuation Level	r50	R/W	0 to 40 dB	1
3A82 hex	3A81 hex	PID Control Function Selection	J01	R/W	0 to 3 0: Disable 1: Process (normal operation) 2: Process (inverse operation) 3: Speed control (Dancer) 4: Process (normal operation, opposite operation available) 5: Process (inverse operation, opposite operation available)	1
3A83 hex	3A82 hex	PID Control PID Command Selection	J02	R/W	0 to 4 0: or keys on Operator 1: Analog input 3: Terminal command UP / DWN control 4: Command via communications link	1
3A84 hex	3A83 hex	PID Control P Proportional Gain	J03	R/W	0.000 to 30.000	0.001
3A85 hex	3A84 hex	PID Control I Integral Time	J04	R/W	0.0 to 3600.0 s	0.1
3A86 hex	3A85 hex	PID Control D Differential Time	J05	R/W	0.00 to 600.00 s	0.01
3A87 hex	3A86 hex	PID Control Feedback Filter	J06	R/W	0.0 to 900.0 s	0.1
3A8B hex	3A8A hex	PID Control Anti-reset Windup Width	J10	R/W	0 to 200%	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3A8C hex	3A8B hex	PID Control Select Warning Output Selection	J11	R/W	0 to 7 0: Warning caused by process command value 1: Warning caused by process command value with hold 2: Warning caused by process command value with latch 3: Warning caused by process command value with hold and latch 4: Warning caused by PID error value 5: Warning caused by PID error value with hold 6: Warning caused by PID error value with latch 7: Warning caused by PID error value with hold and latch	1
3A8D hex	3A8C hex	PID Control Upper Limit of Warning (AH)	J12	R/W	-100 to 100%	1
3A8E hex	3A8D hex	PID Control Lower Limit of Warning (AL)	J13	R/W	-100 to 100%	1
3A90 hex	3A8F hex	PID Control Sleep Frequency for Process Control	J15	R/W	0.0; 1.0 to 590.0 Hz 0.0: Disable 1.0 to 590.0 Hz	0.1
3A91 hex	3A90 hex	PID Control Sleep Timer for Process Control	J16	R/W	0 to 60 s	1
3A92 hex	3A91 hex	PID Control Restart Frequency after Stopping for Process Control	J17	R/W	0.0 to 590.0 Hz	0.1
3A93 hex	3A92 hex	PID Control PID Output Upper Limit	J18	R/W	-150 to 150%; 999 999: Depends on setting of F15	1
3A94 hex	3A93 hex	PID Control PID Output Lower Limit	J19	R/W	-150 to 150%; 999 999: Depends on setting of F16	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3A98 hex	3A97 hex	PID Control Restart Feedback Deviation after Stopping for Process Control	J23	R/W	0.0 to 100.0%	0.1
3A99 hex	3A98 hex	PID Control Restart Delay Time after Stopping for Process Control	J24	R/W	0 to 3600 s	1
3ABA hex	3AB9 hex	PID Control Operator PID Reference Position for Dancer	J57	R/W	-100 to 0 to 100%	1
3ABB hex	3ABA hex	PID Control PID Reference Position Detection Width for Dancer	J58	R/W	0; 1 to 100% 0: Disable switching PID constant 1 to 100%: Manually set value	1
3ABC hex	3ABB hex	PID Control P Gain 2	J59	R/W	0.000 to 30.000	0.001
3ABD hex	3ABC hex	PID Control I Integral Time 2	J60	R/W	0.0 to 3600.0 s	0.1
3ABE hex	3ABD hex	PID Control D Differential Time 2	J61	R/W	0.00 to 600.00 s	0.01
3ABF hex	3ABE hex	PID Control Block Selection	J62	R/W	0 to 3 bit 0: PID output 0=Plus (Addition); 1=Minus (Subtraction) bit 1: Select compensation factor for PID output 0=Ratio (relative to the main setting) 1=Speed command (relative to maximum frequency)	1
3AC0 hex	3ABF hex	Overload Stop Item Selection	J63	R/W	0 to 1 0: Torque 1: Current	1
3AC1 hex	3AC0 hex	Overload Stop Detection Level	J64	R/W	20 to 200%	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3AC2 hex	3AC1 hex	Overload Stop Mode Selection	J65	R/W	0 to 3 0: Disable 1: Decelerate to stop 2: Coast to a stop 3: Hit mechanical stop Select operation when load set in J64 is exceeded. Disable: Cancel overload stop mode operation. Decelerate to stop: Deceleration stop using selected deceleration hold time. Coast to a stop: Inverter immediately shut down, and the motor free runs. Hit mechanical stop: Deceleration using torque limit operation, and current control applied ensure holding torque. Current control continues until operation commands are turned off. Apply the brake before turning off the operation command. During hit mechanical stop control, “IOL” and “IOL2” are output. Note) • Entering overload stop mode operation will retain this mode, and re-acceleration is not possible. To accelerate, turn off the operation command then turn this on again. • For the setting J65=3, torque limit (drive) is disabled.	1
3AC3 hex	3AC2 hex	Overload Stop Operation Mode	J66	R/W	0 to 2 0: During constant speed running and deceleration 1: During constant speed running 2: Anytime	1
3AC4 hex	3AC3 hex	Overload Stop Detection Timer	J67	R/W	0.00 to 600.00 s	0.01
3AC5 hex	3AC4 hex	Brake Control Brake-release Current	J68	R/W	0.00 to 300.00%	0.01
3AC6 hex	3AC5 hex	Brake Control Brake-release Frequency	J69	R/W	0.0 to 25.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3AC7 hex	3AC6 hex	Brake Control Brake-release Timer	J70	R/W	0.000 to 5.000 s	0.001
3AC8 hex	3AC7 hex	Brake Control Brake-applied Frequency	J71	R/W	0.0 to 25.0 Hz	0.1
3AC9 hex	3AC8 hex	Brake Control Brake-applied Timer	J72	R/W	0.000 to 5.000 s	0.001
3ADB hex	3ADA hex	Overload Stop Function P gain	J90	R/W	0.000 to 2.000 times; 999 999: Default value (=0.050)	0.001
3ADC hex	3ADB hex	Overload Stop Function Integral time	J91	R/W	0.001 to 9.999 s; 999 999: Default value (=0.025 s)	0.001
3ADD hex	3ADC hex	Overload Stop Function Current level	J92	R/W	50.0 to 150.0%	0.1
3AE0 hex	3ADF hex	Brake control Brake-release Torque	J95	R/W	0.00 to 300.00%	0.01
3AE1 hex	3AE0 hex	Brake Control Operation Selection	J96	R/W	00 hex to 1F hex (data is hexadecimal) bit 0: Speed detection / Speed command (0: Speed detection; 1: Speed command) bit 1: Manufacturer use bit 2: Not used bit 3: Not used bit 4: Brake-applied condition (0: Not applied run command “OFF”; 1: Applied run command “OFF”)	1
3AE2 hex	3AE1 hex	Servo Lock Gain	J97	R/W	0.000 to 9.999	0.001
3AE3 hex	3AE2 hex	Servo Lock Completion Timer	J98	R/W	0.000 to 1.000 s	0.001
3AE4 hex	3AE3 hex	Servo Lock Completion Range	J99	R/W	0 to 9999 pulses	1
3B47 hex	3B46 hex	PID Control Maximum Scale	J106	R/W	-999.00 to 0.00 to 9990.00	0.01
3B48 hex	3B47 hex	PID Control Minimum Scale	J107	R/W	-999.00 to 0.00 to 9990.00	0.01
3B65 hex	3B64 hex	PID Control Multistep PID Command 1	J136	R/W	-999.00 to 0.00 to 9990.00	0.01
3B66 hex	3B65 hex	PID Control Multistep PID Command 2	J137	R/W	-999.00 to 0.00 to 9990.00	0.01

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
3B67 hex	3B66 hex	PID Control Multistep PID Command 3	J138	R/W	-999.00 to 0.00 to 9990.00	0.01
3FC2 hex	3FC1 hex	Speed Control 1 Speed Command Filter	d01	R/W	0.000 to 5.000 s	0.001
3FC3 hex	3FC2 hex	Speed Control 1 Speed Detection Filter	d02	R/W	0.000 to 0.100 s	0.001
3FC4 hex	3FC3 hex	Speed Control 1 P Proportional Gain	d03	R/W	0.1 to 200.0	0.1
3FC5 hex	3FC4 hex	Speed Control 1 I Integral Time	d04	R/W	0.001 to 9.999 s; 999 999: Cancel integral term	0.001
3FC6 hex	3FC5 hex	Speed Control 1 FF Gain	d05	R/W	0.00 to 99.99 s	0.01
3FC7 hex	3FC6 hex	Speed Control 1 Output Filter	d06	R/W	0.000 to 0.100 s	0.001
3FC8 hex	3FC7 hex	Speed Control 1 Notch Filter Resonance Frequency	d07	R/W	1 to 200 Hz	1
3FC9 hex	3FC8 hex	Speed Control 1 Notch Filter Attenuation Level	d08	R/W	0 to 40 dB	1
3FCA hex	3FC9 hex	Speed Control Jogging Speed Command Filter	d09	R/W	0.000 to 5.000 s	0.001
3FCB hex	3FCA hex	Speed Control Jogging Speed Detection Filter	d10	R/W	0.000 to 0.100 s	0.001
3FCC hex	3FCB hex	Speed Control Jogging P Proportional Gain	d11	R/W	0.1 to 200.0	0.1
3FCD hex	3FCC hex	Speed Control Jogging I Integral Time	d12	R/W	0.001 to 9.999 s; 999 999: Disable	0.001
3FCE hex	3FCD hex	Speed Control Jogging Output Filter	d13	R/W	0.000 to 0.100 s	0.001

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3FCF hex	3FCE hex	Input Terminal [PIA][PIB] Pulse Input Format Selection	d14	R/W	0 to 4 0: Pulse train signing/pulse train input 1: Forward and reverse pulse 2: Quadrature A/B signal (B phase lead) 3: Quadrature A/B signal (A phase lead) 4: ABZ-UVW	1
3FD0 hex	3FCF hex	Input Terminal [PIA][PIB] Encoder Pulse Resolution	d15	R/W	20 to 60000	1
3FD1 hex	3FD0 hex	Input Terminal [PIA][PIB] Pulse Scaling Factor Denominator	d16	R/W	1 to 32767	1
3FD2 hex	3FD1 hex	Input Terminal [PIA][PIB] Pulse Scaling Factor Numerator	d17	R/W	1 to 32767	1
3FD3 hex	3FD2 hex	Input Terminal [PIA][PIB] Pulse Train Filter Time Constant	d18	R/W	0.000 to 5.000 s	0.001
3FD6 hex	3FD5 hex	Speed Agreement / Speed Deviation Error Hysteresis Width	d21	R/W	0.0 to 50.0%	0.1
3FD7 hex	3FD6 hex	Speed Agreement / Speed Deviation Error Detection Timer	d22	R/W	0.00 to 10.00 s	0.01
3FD8 hex	3FD7 hex	Speed Deviation Error Processing Selection	d23	R/W	0 to 5 0: Continue to run 1 1: Stop with alarm 1 2: Stop with alarm 2 3: Continue to run 2 4: Stop with alarm 3 5: Stop with alarm 4	1
3FD9 hex	3FD8 hex	Zero Speed Control	d24	R/W	0 to 2 0: Disable zero speed control at startup 1: Enable zero speed control at startup 2: Disable zero speed control	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
3FDA hex	3FD9 hex	Speed Control Speed Loop Switching Time at Parameter Change	d25	R/W	0.000 to 1.000 s	0.001
3FE1 hex	3FE0 hex	Speed Limit 1 in Forward	d32	R/W	0 to 110%	1
3FE2 hex	3FE1 hex					
3FE3 hex	3FE2 hex	Speed Limit 2 in Reverse	d33	R/W	0 to 110%	1
3FE4 hex	3FE3 hex					
3FE6 hex	3FE5 hex	Over Speed Detection Level	d35	R/W	0 to 120%; 999 999: Depend on d32 and d33	1
3FEC hex	3FEB hex	Special Control Selection	d41	R/W	0 to 4 0: Invalid (normal control) 1: Line speed control with speed sensor 2: Master-follower operation (immediate synchronization mode at start without Z phase) 3: Master-follower operation (start after synchronization mode) 4: Master-follower operation (immediate synchronization mode at the start with Z phase)	1
4006 hex	4005 hex	Motor Starting Mode Auto Search in Speed Sensor Vector Control	d67	R/W	0 to 2 0: Disable 1: Enable (Only at restart after momentary power failure) 2: Enable (At restart after momentary power failure and at normal start)	1
4009 hex	4008 hex	Speed Control Slip Frequency Limit	d70	R/W	0.00 to 100.00%	0.01
4013 hex	4012 hex	1st PM Motor Magnetic Pole Position Pull-in Frequency	d80	R/W	0.1 to 10.0 Hz	0.1
4015 hex	4014 hex	Magnetic Flux Weakening Control Function Selection	d82	R/W	0 to 1 0: Disable 1: Enable	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
4016 hex	4015 hex	Magnetic Flux Weakening Lower Limit	d83	R/W	10 to 70%	1
4019 hex	4018 hex	Acc/Dec Output Frequency Filter	d86	R/W	0.000 to 5.000 s	0.001
401C hex	401B hex	PM Motor High-efficiency Control Selection	d89	R/W	0 to 1 0: Disable 1: Enable	1
401D hex	401C hex	Magnetic Flux Level during Deceleration	d90	R/W	100 to 200%	1
4026 hex	4025 hex	Extension Function 1	d99	R/W	0000 hex to FFFF hex (Hexadecimal) bit 3: JOG command given via the communications link Other bits are for manufacturer use.	1
4142 hex	4141 hex	Position Control Feed Forward Gain	d201	R/W	0.00: Cancel 0.01 to 1.50	0.01
4143 hex	4142 hex	Position Control Feed Forward Filter	d202	R/W	0.000 to 5.000	0.001
4144 hex	4143 hex	Position Loop Gain 1	d203	R/W	0.1 to 300.0	0.1
4145 hex	4144 hex	Position Loop Gain 2	d204	R/W	0.1 to 300.0	0.1
4146 hex	4145 hex	Position Loop Gain Switch Frequency	d205	R/W	0.0 to 590.0 Hz	0.1
4147 hex	4146 hex	Electronic Gear Denominator	d206	R/W	1 to 65535	1
4148 hex	4147 hex	Electronic Gear Numerator	d207	R/W	1 to 65535	1
4149 hex	4148 hex	Orientation Selection	d208	R/W	0 to 1 0: Nearest direction (Valid for reverse rotation) 1: Command direction (Direction of operation command)	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
414A hex	4149 hex	Homing Opera-tion Selection	d209	R/W	00 hex to 0F hex bit 0: Homing shaft direction 0: Forward direction 1: Reverse direction bit 1: Homing start direction 0: Forward direction 1: Reverse direction bit 2: OT detected operation se-lection 0: Return at OT detection 1: Stop at OT detection (Origin search canceled) bit 3: Detection timing of hom-ing limit switch 0: By rising edge 1: By falling edge bit 7: Z phase correction 0: Invalid 1: Valid	1
414C hex	414B hex	Homing Refer-ence Signal Se-lection	d211	R/W	0 to 3 0: Z pulse of position encod-er 1: Origin limit switch 2: Overtravel switch in the positive direction 3: Overtravel switch in the negative direction	1
414D hex	414C hex	Reference Signal for Homing Off-set	d212	R/W	0 to 4 0: Z pulse of position encod-er 1: Origin limit switch ON edge 2: Overtravel switch in the positive direction (Enabled only at position control) 3: Overtravel switch in the negative direction (Enabled only at position control) 4: Stopper (hit and stop)	1
414E hex	414D hex	Homing Frequen-cy/Orientation Frequency	d213	R/W	0.1 to 590.0 Hz	0.1
414F hex	414E hex	Creep Frequency	d214	R/W	0.1 to 590.0 Hz	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
4150 hex	414F hex	Deceleration Time for Homing/ Orientation	d215	R/W	0.00 to 6000 s	0.01
4155 hex	4154 hex	Position Feedback Store Selection at Power Off	d220	R/W	0 to 1 0: Invalid 1: Store at low voltage status	1
4156 hex	4155 hex	Current Position Clear Signal Operation Selection	d221	R/W	0 to 1 0: Clear at selected effective edge (positive/negative OFF→ON) 1: Clear at selected effective level (positive/negative ON)	1
4157 hex	4156 hex	Overtravel Function Selection	d222	R/W	0 to 2 0: Invalid/Infinite rotation 1: Valid (Positioning at OT position at over traveling)/ normal PTP 2: Valid (Immediately stopped at over traveling)/ normal PTP	1
4158 hex	4157 hex	Detection Level of Excessive Positioning Deviation (MSB)	d223	R/W	0 to 268435455 (MSB: 0 to 4095)	1
4159 hex	4158 hex	Detection Level of Excessive Positioning Deviation (LSB)	d224	R/W	(LSB: 0 to 65535)	1
415A hex	4159 hex	Software Overtravel Detection Position in the Positive Direction (MSB)	d225	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
415B hex	415A hex	Software Overtravel Detection Position in the Positive Direction (LSB)	d226	R/W	(LSB: 0 to 65535)	1
415C hex	415B hex	Software Overtravel Detection Position in the Negative Direction (MSB)	d227	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
415D hex	415C hex	Software Over-travel Detection Position in the Negative Direction (LSB)	d228	R/W	(LSB: 0 to 65535)	1
4166 hex	4165 hex	Positioning Data Type	d237	R/W	0 to 1 0: Handle positioning data as absolute position (ABS) 1: Handle positioning data as relative position (INC)	1
4167 hex	4166 hex	Position Data Determination Time	d238	R/W	0.000 to 0.100 s Positioning data is switched when this timer data is exceeded when switching between [POS-SEL1][POS-SEL2][POS-SEL4].	0.001
4168 hex	4167 hex	Positioning Completed Range	d239	R/W	0 to 9999	1
416B hex	416A hex	Homing Offset (MSB)	d242	R/W	0 to 268435455 (MSB: 0 to 4095)	1
416C hex	416B hex	Homing Offset (LSB)	d243	R/W	(LSB: 0 to 65535)	1
418E hex	418D hex	Positioning Data Setting Selection via communication	d277	R/W	0 to 1 0: Communications positioning command invalid 1: Communications positioning command valid	1
418F hex	418E hex	Restarting Positioning Range Setting	d278	R/W	0: Invalid 1 to 9999	1
4191 hex	4190 hex	Over Travel Forced Stop Operation Selection	d280	R/W	0 to 1 0: Servo lock after deceleration stop 1: Er6 fault occurs after deceleration stop	1
420C hex	420B hex	RS-485 Communication Station No. Selection	y11	R/W	1 to 255	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
420D hex	420C hex	Operation Selection on Communication Error	y12	R/W	0 to 14 0: Immediately trip with alarm ErP 1: Trip with alarm ErP after running for the period specified by timer 2: Retry communications for the period specified by timer, and trip with alarm ErP if communications are not restored. Continue running if communications are restored. 3: Continue to run 11: Trip with alarm ErP after deceleration stop 13: Coast to a stop 14: Deceleration stop	1
420E hex	420D hex	RS-485 Error Detection Timer	y13	R/W	0.0 to 60.0 s	0.1
420F hex	420E hex	RS-485 Communication Baud Rate	y14	R/W	0 to 7 0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps 6: 76800 bps 7: 115200 bps	1
4211 hex	4210 hex	RS-485 Communication Parity Bit Selection	y16	R/W	0 to 3 0: None (Stop bit: 2 bits) 1: Even number parity (Stop bit: 1 bit) 2: Odd number parity (Stop bit: 1 bit) 3: None (Stop bit: 1 bit)	1
4213 hex	4212 hex	RS-485 Communication Timeout Time	y18	R/W	0: 1 to 60 s 0: No check for time out (OFF) 1 to 60 s	1
4214 hex	4213 hex	RS-485 Communication Response Interval Time	y19	R/W	0.00 to 1.00 s	0.01

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
4260 hex	425F hex	Data Clear Processing for Communications Error	y95	R/W	0 to 3 0: Do not clear the data of function codes S when a communications error occurs. (compatible with the conventional inverters) 1: Clear the data of function codes S01, S05, S19 when a communications error occurs. 2: Clear the run command assigned bit of function code S06 when a communications error occurs. 3: Clear both data of 1, 2 above. *Related alarms are Er8, ErP and Ert	1
4262 hex	4261 hex	Communication Data Storage Selection	y97	R/W	0 to 2 0: Store into nonvolatile memory (Rewritable times are limited) 1: Write into temporary memory (Rewritable times are unlimited) 2: Save all data from temporary memory to nonvolatile memory (After all save return to Data 1)	1
4264 hex	4263 hex	Support Tool Link Function Selection	y99	R/W	0 to 3 0: Numerical setting(*) and terminal command (including operation command) by related parameter settings 1: Numerical setting uses communications command (support tools) 2: Terminal command uses communications command (support tools) 3: Numerical setting and terminal command both use communications command (support tools) *Numerical setting: Frequency reference, torque command, torque bias command	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5002 hex	5001 hex	Frequency Reference	S01	R/W	-32768 to 32767 +20000 or -20000 = maximum output frequency	1
5003 hex	5002 hex	Torque Reference	S02	R/W	-327.68 to 327.67%	0.01
5004 hex	5003 hex	Torque Current Command	S03	R/W	-327.68 to 327.67%	0.01
5006 hex	5005 hex	Frequency Reference	S05	R/W	0.00 to 655.35 Hz	0.01
5007 hex	5006 hex					
5008 hex	5007 hex	Input Terminal Monitor	S06	R/W	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: - bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
5009 hex	5008 hex	Communication Data Terminal [DO]	S07	R/W	0000 hex to FFFF hex (Hexadecimal)	1
500E hex	500D hex	Communication Data Terminal [AO]	S12	R/W	-32768 to 32767 +20000 or -20000 = ±full scale	1
500F hex	500E hex	PID Control PID Command via Communication	S13	R/W	-32768 to 32767 -20000 = -100% ; +20000 = +100%	1
5010 hex	500F hex	Alarm Reset Command	S14	R/W	0 to 1 0: Inactive 1: Alarm reset	1
5011 hex	5010 hex	Torque Bias Value via Communication	S15	R/W	-327.68 to 327.67%	0.01
5015 hex	5014 hex	Speed Command via Communication	S19	R/W	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5016 hex	5015 hex	Positioning Data via Communication (MSB)	S20	R/W	-268435455 to 268435455 (MSB: -4096 to 4095)	1
5017 hex	5016 hex	Positioning Data via Communication (LSB)	S21	R/W	(LSB: 0 to 65535)	1
5019 hex	5018 hex	Torque Current Command via Communication	S23	R/W	-327 to 327%	1
5020 hex	501F hex	PID Control Feedback Value via Communication	S30	R/W	-32768 to 32767 -20000 = -100% ; +20000 = +100%	1
50C2 hex	50C1 hex	Frequency Reference at Final	M01	R	-32768 to 32767 +20000 or -20000 = maximum output frequency	1
50C3 hex	50C2 hex	Torque Reference Monitor at Last	M02	R	-327.68 to 327.67	0.01
50C4 hex	50C3 hex	Torque Current Command at Final	M03	R	-327.68 to 327.67	0.01
50C5 hex	50C4 hex	Magnetic Flux Command Value	M04	R	-327.68 to 327.67	0.01
50C6 hex	50C5 hex	Frequency Reference at Final	M05	R	0.00 to 655.35	0.01
50C7 hex	50C6 hex					
50C8 hex	50C7 hex	Output Frequency 1 without Slip Compensation	M06	R	-32768 to 32767 +20000 or -20000 = maximum output frequency	1
50C9 hex	50C8 hex	Torque Value	M07	R	-327.68 to 327.67	0.01
50CA hex	50C9 hex	Torque Current Value	M08	R	-327.68 to 327.67	0.01
50CB hex	50CA hex	Output Frequency without Slip Compensation	M09	R	0.00 to 655.35	0.01
50CC hex	50CB hex					
50CD hex	50CC hex	Input Power	M10	R	0.00 to 399.99	0.01
50CE hex	50CD hex	Output Current Monitor	M11	R	0.00 to 399.99	0.01
50CF hex	50CE hex	Output Voltage Monitor	M12	R	0.0 to 1000.0	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
50D0 hex	50CF hex	Operation Com-mand at Final	M13	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
50D1 hex	50D0 hex	Operation Status 1 Monitor	M14	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RV; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
50D2 hex	50D1 hex	Output Terminal Monitor	M15	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1
50D7 hex	50D6 hex	Cumulative Operation Time	M20	R	0 to 65535	1
50D8 hex	50D7 hex					
50D9 hex	50D8 hex	Main Circuit DC Voltage	M21	R	0 to 1000 V	1
50DD hex	50DC hex	ROM Version	M25	R	0 to 9999	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
50DE hex	50DD hex	Transmission Error Transaction Code for RS-485 Port1	M26	R	0 to 127 1: Improper FC (specifies a non-existent parameter block) [RTU] 2: Improper address (specifies a non-existent parameter address) [RTU] 3: Improper data (range error) [RTU] 7: NAK (link priority; no right; write disabled) [RTU] 71: Checksum error; CRC error 72: Parity error 73: Framing error; overrun error; buffer full 74: Format error [FGI] 75: Command error [FGI] 76: Link priority error [FGI] 77: Parameter data write rights error [FGI] 78: Parameter error [FGI] 79: Write disabled [FGI] 80: Data error [FGI] 81: Write error [FGI]	1
50DF hex	50DE hex	Final Frequency Reference Monitor on Alarm Monitor	M27	R	-32768 to 32767 +20000 or -20000 = maximum output frequency	1
50E0 hex	50DF hex	Final Torque Command Monitor on Alarm	M28	R	-327.68 to 327.67	0.01
50E1 hex	50E0 hex	Final Torque Current Command Monitor on Alarm	M29	R	-327.68 to 327.67	0.01
50E2 hex	50E1 hex	Final Magnetic flux command Monitor on Alarm	M30	R	-327.68 to 327.67	0.01
50E3 hex	50E2 hex	Final Frequency Reference Monitor on Alarm	M31	R	0.00 to 655.35	0.01
50E4 hex	50E3 hex					
50E5 hex	50E4 hex	Output Frequency Monitor on Alarm without Slip Compensation	M32	R	-32768 to 32767 +20000 or -20000 = maximum output frequency	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
50E6 hex	50E5 hex	Output Torque Monitor on Alarm	M33	R	-327.68 to 327.67	0.01
50E7 hex	50E6 hex	Torque Current Monitor on Alarm	M34	R	-327.68 to 327.67	0.01
50E8 hex	50E7 hex	Output Frequency Monitor on Alarm	M35	R	0.00 to 655.35	0.01
50E9 hex	50E8 hex					
50EA hex	50E9 hex	Input Power Monitor on Alarm	M36	R	0.00 to 399.99	0.01
50EB hex	50EA hex	Output Current Effective Value Monitor on Alarm	M37	R	0.00 to 399.99	0.01
50EC hex	50EB hex	Output Voltage Effective Value Monitor on Alarm	M38	R	0.0 to 1000.0	0.1
50ED hex	50EC hex	Operation Command Monitor on Alarm	M39	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
50EE hex	50ED hex	Operation Status 1 Monitor on Alarm	M40	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FWR; During forward rotation bit 1: RVR; During reverse rotation bit 2: EXT; During DC braking (or during pre-exciting) bit 3: INT; Inverter shut down bit 4: BRK; During braking bit 5: NUV; DC link circuit voltage established bit 6: TL; Torque limiting bit 7: VL; During voltage limiting bit 8: IL; During current limiting bit 9: ACC; During acceleration bit 10: DEC; During deceleration bit 11: ALM; Alarm relay bit 12: RL; Communications effective bit 13: - bit 14: - bit 15: BUSY; During function code data writing	1
50EF hex	50EE hex	Latest Output Terminal Information Monitor on Alarm	M41	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1
5124 hex	5123 hex	Cumulative Operation Time Monitor on Alarm	M42	R	0 to 65535	1
5125 hex	5124 hex					
50F1 hex	50F0 hex	Main Circuit DC Voltage Monitor on Alarm	M43	R	0 to 1000 V	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
50F2 hex	50F1 hex	Inverter Internal Air Temperature Monitor on Alarm	M44	R	-32768 to 32767	1
50F3 hex	50F2 hex	Heat Sink Temperature Monitor on Alarm	M45	R	-32768 to 32767	1
50F4 hex	50F3 hex	Life of Main Circuit Capacitor Monitor	M46	R	0.0 to 100.0	0.1
50F5 hex	50F4 hex	Life of PC Board Electrolytic Capacitor	M47	R	0 to 65535 (in 10 hours)	1
50F6 hex	50F5 hex	Life of Cooling Fan	M48	R	0 to 65535 (in 10 hours)	1
50F7 hex	50F6 hex	Input Terminal [AI1] Input Voltage Monitor	M49	R	-32768 to 32767 20000: 10 V	1
50F8 hex	50F7 hex	Input Terminal [AI2] Input Current (AII) Monitor	M50	R	0 to 32767 0: 0 A 20000: 20 mA	1
50FC hex	50FB hex	Input Terminal [AI2] Input Voltage (AIV) Monitor	M54	R	-32768 to 32767 20000: 10 V	1
50FE hex	50FD hex	Input Terminal [PTC] Input Voltage Monitor	M56	R	-32768 to 32767 20000: 10 V	1
50FF hex	50FE hex	Electric Angle Monitor	M57	R	0.0 to 359.9 deg	0.1
5100 hex	50FF hex	Rotor Angle Monitor	M58	R	0.0 to 359.9 deg	0.1
5101 hex	5100 hex	Motor Electronic Thermal Monitor	M59	R	0 to 100%	1
5103 hex	5102 hex	Inverter Internal Air Temperature Monitor	M61	R	-3276.8 to 3276.7	0.1
5105 hex	5104 hex	Load Factor Monitor	M63	R	-327.68 to 327.67	0.01
5106 hex	5105 hex	Motor Output Monitor	M64	R	-327.68 to 327.67	0.01
5107 hex	5106 hex	Motor Output Monitor on Alarm	M65	R	-32768 to 32767	1
5108 hex	5107 hex	Speed Detection Monitor	M66	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5109 hex	5108 hex	Transmission Error Transaction Code for RS485 Port	M67	R	0 to 127 1: Improper FC (specifies a non-existent parameter block) [RTU] 2: Improper address (specifies a non-existent parameter address) [RTU] 3: Improper data (range error) [RTU] 7: NAK (link priority; no right; write disabled) [RTU] 71: Checksum error; CRC error 72: Parity error 73: Framing error; overrun error; buffer full 74: Format error [FGI] 75: Command error [FGI] 76: Link priority error [FGI] 77: Parameter data write rights error [FGI] 78: Parameter error [FGI] 79: Write disabled [FGI] 80: Data error [FGI] 81: Write error [FGI]	1
510B hex	510A hex	Inverter Rated Current	M69	R	0.00 to 9999 A	0.01

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
510C hex	510B hex	Running Status 3 Monitor	M70	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FAR; Frequency attained bit 1: FDT; Frequency detected bit 2: RDY; Operation ready bit 3: SWM2; 2nd motor selection bit 4: IPF; During restart after instantaneous power failure bit 5: OL; Motor overload bit 6: KP Digital Operator operating bit 7: FAN; Fan operating bit 8: TRY; During retry bit 9: OH; Heat sink overheat early warning bit 10: LIFE; Life warning bit 11: OLP; During overload prevention control bit 12: ID; Current detection bit 13: IDL; Low current detection bit 14: ID2; Current detection 2 bit 15: IDL2; Low current detection 2	1
510D hex	510C hex	Input Terminal Monitor	M71	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
510F hex	510E hex	PID Output Monitor	M73	R	-32768 to 32767 -20000 = -100% ; +20000 = +100%	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5110 hex	510F hex	Running Status 2 Monitor	M74	R	0000 hex to FFFF hex (Hexadecimal) bit 0 to bit 3: Control method 0: V/F control: No slip compensation 1: Dynamic torque vector control 2: V/F control: With slip compensation 3: V/F control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor 10: Torque control (sensorless vector control) 11: Torque control (vector control with speed sensor) bit 4 bit 5: Select motor 0: M1 1: M2 2: M3 3: M4 bit 7: During speed control (1 during control) bit 14: During STO circuit diagnosis bit 15: Motor type (1: PM motor / 0: induction motor)	1
5112 hex	5111 hex	Service Life of Main Circuit Capacitor Elapsed Time	M76	R	0 to 65535 (in 10 hours)	1
5113 hex	5112 hex	Service Life of Main Circuit Capacitor Remaining Time	M77	R	0 to 65535 (in 10 hours)	1
5114 hex	5113 hex	Rotation Speed Command Monitor	M78	R	-32768 to 32767	1
5115 hex 5116 hex	5114 hex 5115 hex	Rotation Speed Monitor	M79	R	-32768 to 32767	1
5118 hex	5117 hex	1st Remaining Time before the Next Motor Maintenance	M81	R	0 to 65535 (in 10 hours)	1

Register No.	Modbus register spec. No.	Function name	Param- eter No.	R/W	Monitor or setting data	Data reso- lution
511C hex	511B hex	1st Remaining Startup Times before the Next Motor Mainte- nance	M85	R	0 to 65535	1
511D hex	511C hex	Latest Light Alarm Factor	M86	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 34 (0x22): Er4: Option card commu- nications error 35 (0x23): Er5: Option card error 47 (0x2F): ErE Following error (ex- cessive speed deviation) 53 (0x35): ErP (RS-485 communica- tions error, Option card) 56 (0x38): Ero: Position control error 58 (0x3A): CoF: PID feedback dis- connection detected 100 (0x64): FAL Detect DC fan lock 101 (0x65): OL Motor overload early warning 102 (0x66): OH Heat sink overheat early warning 103 (0x67): LiF Lifetime alarm 104 (0x68): rEF Reference loss 105 (0x69): Pid PID alarm 106 (0x6A): UTL Low output torque detection 107 (0x6B): PTC PTC thermistor acti- vated 108 (0x6C): rTE Inverter life (Cumula- tive run time) 109 (0x6D): CnT (Inverter life, Number of startups)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
511E hex	511D hex	Light Alarm Factor Last	M87	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 47 (0x2F): ErE Following error (excessive speed deviation) 53 (0x35): ErP (RS-485 communications error, Option card) 56 (0x38): Ero: Position control error 58 (0x3A): CoF: PID feedback disconnection detected 100 (0x64): FAL Detect DC fan lock 101 (0x65): OL Motor overload early warning 102 (0x66): OH Heat sink overheat early warning 103 (0x67): LiF Lifetime alarm 104 (0x68): rEF Reference loss 105 (0x69): Pid PID alarm 106 (0x6A): UTL Low output torque detection 107 (0x6B): PTC PTC thermistor activated 108 (0x6C): rTE Inverter life (Cumulative run time) 109 (0x6D): CnT (Inverter life, Number of startups)	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
511F hex	511E hex	Light Alarm Factor 2nd Last	M88	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 47 (0x2F): ErE Following error (excessive speed deviation) 53 (0x35): ErP (RS-485 communications error, Option card) 56 (0x38): Ero: Position control error 58 (0x3A): CoF: PID feedback disconnection detected 100 (0x64): FAL Detect DC fan lock 101 (0x65): OL Motor overload early warning 102 (0x66): OH Heat sink overheat early warning 103 (0x67): LiF Lifetime alarm 104 (0x68): rEF Reference loss 105 (0x69): Pid PID alarm 106 (0x6A): UTL Low output torque detection 107 (0x6B): PTC PTC thermistor activated 108 (0x6C): rTE Inverter life (Cumulative run time) 109 (0x6D): CnT (Inverter life, Number of startups)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5120 hex	511F hex	Light Alarm Factor 3rd Last	M89	R	0 to 254 (00 hex to FE hex) 0 (0x00): No alarm 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 47 (0x2F): ErE Following error (excessive speed deviation) 53 (0x35): ErP (RS-485 communications error, Option card) 56 (0x38): Ero: Position control error 58 (0x3A): CoF: PID feedback disconnection detected 100 (0x64): FAL Detect DC fan lock 101 (0x65): OL Motor overload early warning 102 (0x66): OH Heat sink overheat early warning 103 (0x67): LiF Lifetime alarm 104 (0x68): rEF Reference loss 105 (0x69): Pid PID alarm 106 (0x6A): UTL Low output torque detection 107 (0x6B): PTC PTC thermistor activated 108 (0x6C): rTE Inverter life (Cumulative run time) 109 (0x6D): CnT (Inverter life, Number of startups)	1
5126 hex	5125 hex	Cumulative Running Time at Tripping	M95	R	0 to 65535 *Upper limit requires consideration	1
5127 hex	5126 hex					
519E hex	519D hex	PID Output Non Filter	M115	R	-150.0 to 150.0	0.1
5243 hex	5242 hex	Frequency Reference Monitor	W02	R	0.00 to 655.35	0.01
5244 hex	5243 hex					

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5245 hex	5244 hex	Output Frequency Monitor before Slip Compensation	W03	R	0.00 to 655.35	0.01
5246 hex	5245 hex					
5247 hex	5246 hex	Output Frequency after Slip Compensation	W04	R	0.00 to 655.35	0.01
5248 hex	5247 hex					
524C hex	524B hex	Rotate Speed Monitor	W08	R	0.00 to 99990	0.01
524D hex	524C hex					
524E hex	524D hex	Load Shaft Speed	W09	R	0.00 to 99990	0.01
524F hex	524E hex	Feed Speed	W10	R	0.00 to 99990	0.01
5250 hex	524F hex					
5251 hex	5250 hex	PID Process Command	W11	R	-999.00 to 0.00 to 9990.00	0.01
5254 hex	5253 hex	Analog Torque Limit Value Monitor	W13	R	-300 to 300%	1
5256 hex	5255 hex	Ratio value Monitor	W15	R	0.00 to 200.00	0.01
5257 hex	5256 hex	Motor Speed Set Value	W16	R	0.00 to 99990	0.01
5258 hex	5257 hex	Load Shaft Set Value	W17	R	0.00 to 99990	0.01
5259 hex	5258 hex	Feed Speed Set Value	W18	R	0.00 to 99990	0.01
525A hex	5259 hex	Transport Time Set Value for Specified Length	W19	R	0.00 to 99990	0.01
525B hex	525A hex	Transport Time for Specified Length	W20	R	0.00 to 99990	0.01
525C hex	525B hex	Power Consumption Monitor	W21	R	0.00 to 9999 kW	0.01
525D hex	525C hex	Motor Output Power Monitor	W22	R	0.00 to 9999 kW	0.01
525E hex	525D hex	Load Rate Monitor	W23	R	-999 to 999	1
525F hex	525E hex	Torque Current Monitor	W24	R	-999 to 999	1
5260 hex	525F hex	Output Current Monitor	W25	R	0.0 to 3276.7	0.1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5261 hex	5260 hex	Magnetic Flux Command Value	W26	R	-999 to 999	1
5262 hex	5261 hex	Timed Operation Remaining Time	W27	R	0 to 9999	1
5265 hex	5264 hex	Speed in Per-centage	W30	R	0.00 to 100.00	0.01
5266 hex	5265 hex	Speed Set Value in Percentage	W31	R	0.00 to 100.00	0.01
5268 hex	5267 hex	Analog Input Monitor	W33	R	-9990.00 to 0.00 to 9990.00	0.01
5271 hex	5270 hex	Communications Input Signal Monitor	W42	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: - bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
5272 hex	5271 hex	Communications Control Output Signal Monitor	W43	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5273 hex	5272 hex	Input Terminal [AI1] Input Voltage	W44	R	-12.0 to 12.0	0.1
5274 hex	5273 hex	Input Terminal [AI2]AII Input Current (AII)	W45	R	0.0 to 30.0	0.1
5275 hex	5274 hex	Output Terminal [AO]AOV Output Voltage	W46	R	0.0 to 12.0	0.1
5277 hex	5276 hex	Output Terminal [AO]PO Output Frequency	W48	R	0 to 6000	1
5278 hex	5277 hex	Input Terminal [AI2] Input Voltage (AIV)	W49	R	0.0 to 12.0	0.1
5279 hex	5278 hex	Output Terminal [AO]AOI Output Current	W50	R	0.0 to 30.0; 999	0.1
527C hex	527B hex	Pulse Input (A/B Phase of Ch1 Side)	W53	R	-327.68 to 327.67	0.01
527D hex	527C hex	Pulse Input (Z Phase of Ch1 Side)	W54	R	0 to 6000	1
527E hex	527D hex	Reserved	W55	R	-327.68 to 327.67	0.01
527F hex	527E hex	Reserved	W56	R	0 to 6000	1
528A hex	5289 hex	Cumulative Run Time of Capacitors on Printed Circuit Boards	W67	R	0 to 9999 (in 10 hours)	1
528B hex	528A hex	Cumulative Run Time of Cooling Fan	W68	R	0 to 9999 (in 10 hours)	1
5290 hex	528F hex	Internal Air Highest Temperature	W72	R	-32768 to 32767	1
5291 hex	5290 hex	Heat Sink Maximum Temperature	W73	R	-32768 to 32767	1
5292 hex	5291 hex	Maximum Effective Current Value	W74	R	0.00 to 9999 A	0.01
5293 hex	5292 hex	Main Circuit Capacitor's Capacitor Monitor	W75	R	0.00 to 100.0	0.1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5296 hex	5295 hex	Cumulative Run Time of Cooling Fan	W77	R	0 to 65535 (in 1 hours)	1
5297 hex	5296 hex					
5298 hex	5297 hex	Number of Start-ups	W78	R	0 to 65535	1
5299 hex	5298 hex	Cumulative Operation Time of Motor	W79	R	0 to 65535 (in 1 hours)	1
529A hex	5299 hex					
529C hex	529B hex	Integrated Power Monitor	W81	R	0.0 to 999900.0	0.1
529D hex	529C hex					
52A0 hex	529F hex	Number of Operator Comm Errors	W83	R	0 to 9999	1
52A1 hex	52A0 hex	Contents of Operator Comm error	W84	R	0 to 127 1: Improper FC (specifies a non-existent parameter block) [RTU] 2: Improper address (specifies a non-existent parameter address) [RTU] 3: Improper data (range error) [RTU] 7: NAK (link priority; no right; write disabled) [RTU] 71: Checksum error; CRC error 72: Parity error 73: Framing error; overrun error; buffer full 74: Format error [FGI] 75: Command error [FGI] 76: Link priority error [FGI] 77: Parameter data write rights error [FGI] 78: Parameter error [FGI] 79: Write disabled [FGI] 80: Data error [FGI] 81: Write error [FGI]	1
52A2 hex	52A1 hex	Number of RS-485 Errors	W85	R	0 to 9999	1
528D hex	528C hex	Total Power ON Time Monitor	W70	R	0 to 65535	1
528E hex	528D hex					

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
52AB hex	52AA hex	Contents of RS-485 Error	W94	R	0 to 127 1: Improper FC (specifies a non-existent parameter block) [RTU] 2: Improper address (specifies a non-existent parameter address) [RTU]	1
52AB hex	52AA hex	Contents of RS-485 Error	W94	R	3: Improper data (range error) [RTU] 7: NAK (link priority; no right; write disabled) [RTU] 71: Checksum error; CRC error 72: Parity error 73: Framing error; overrun error; buffer full 74: Format error [FGI] 75: Command error [FGI] 76: Link priority error [FGI] 77: Parameter data write rights error [FGI] 78: Parameter error [FGI] 79: Write disabled [FGI] 80: Data error [FGI] 81: Write error [FGI]	1
5322 hex	5321 hex	PIC Control PID Deviation	W132	R	-32768 to 32767 -20000 = -100% ; +20000 = +100%	1
5328 hex	5327 hex	Input Terminal [AI2] Input Voltage (AIV)	W138	R	0 to 1023 (1023=equivalent to 10.9 V)	1
532C hex	532B hex	Feedback Current Position Monitor (MSB)	W142	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
532D hex	532C hex	Feedback Current Position Monitor (LSB)	W143	R	(LSB: 0 to 65535)	1
532E hex	532D hex	Target Position Monitor (MSB)	W144	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
532F hex	532E hex	Target Position Monitor (LSB)	W145	R	(LSB: 0 to 65535)	1
5330 hex	532F hex	Position Deviation Monitor (MSB)	W146	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
5331 hex	5330 hex	Position Deviation Monitor (LSB)	W147	R	(LSB: 0 to 65535)	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5332 hex	5331 hex	Touch Probe 1 Positive Edge (MSB)	W148	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
5333 hex	5332 hex	Touch Probe 1 Positive Edge (LSB)	W149	R	(LSB: 0 to 65535)	1
5334 hex	5333 hex	Touch Probe 2 Positive Edge (MSB)	W150	R	-268435455 to 268435455 (MSB: -4096 to 4095)	1
5335 hex	5334 hex	Touch Probe 2 Positive Edge (LSB)	W151	R	(LSB: 0 to 65535)	1
5336 hex	5335 hex	Touch Probe Status	W152	R	0000 hex to FFFF hex (Hexadecimal) bit 0: Touch probe function 1 Enb bit 1: Touch probe function 1 PLc bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: Touch probe function 2 Enb bit 9: Touch probe function 2 PLc bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1
533F hex	533E hex	Braking Resistor Thermal Monitor	W161	R	0.0 to 100.0%	0.1
5350 hex	534F hex	Number of Start-ups	W178	R	0.00 to 655.35 (1.00 = 10000 times)	0.01
5352 hex	5351 hex	Tuning Progress	W180	R	0 to 100%	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5541 hex	5540 hex	Latest Alarm History/Number of Consecutive Same Alarms	X00	R	0 to 65535 (0000 hex to FFFF hex) 0 (0x00): No alarm 1 (0x01): OC1 Overcurrent protection (during acceleration) 2 (0x02): OC2 Overcurrent protection (during deceleration) 3 (0x03): OC3 Overcurrent protection (during constant speed operation) 6 (0x06): OU1 Overvoltage protection (during acceleration) 7 (0x07): OU2 Overvoltage protection (during deceleration) 8 (0x08): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5541 hex	5540 hex	Latest Alarm History/Number of Consecutive Same Alarms	X00	R	20 (0x14): OH4 Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE Following error (excessive speed deviation) 50 (0x32): ErC: Magnetic pole position detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP (RS-485 communications error, Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback disconnection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL DriveProgramming failure 68 (0x44): ErU: Support tool communication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5542 hex	5541 hex	Latest Multiple Alarm1	X01	R	0000 hex to FFFF hex (Hexadecimal)	1
5543 hex	5542 hex	Latest Multiple Alarm2	X02	R	0000 hex to FFFF hex (Hexadecimal)	1
5544 hex	5543 hex	Latest Alarm Sub Code 1	X03	R	0 to 9999	1
5545 hex	5544 hex	Latest Multiple Alarm Sub Code 2	X04	R	0 to 9999	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5546 hex	5545 hex	Last Alarm History/Number of Consecutive Same Alarms	X05	R	0 to 65535 (0000 hex to FFFF hex) 0 (0x00): No alarm 1 (0x01): OC1 Overcurrent protection (during acceleration) 2 (0x02): OC2 Overcurrent protection (during deceleration) 3 (0x03): OC3 Overcurrent protection (during constant speed operation) 6 (0x06): OU1 Overvoltage protection (during acceleration) 7 (0x07): OU2 Overvoltage protection (during deceleration) 8 (0x08): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4 Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5546 hex	5545 hex	Last Alarm History/Number of Consecutive Same Alarms	X05	R	47 (0x2F): ErE Following error (excessive speed deviation) 50 (0x32): ErC: Magnetic pole position detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP (RS-485 communications error, Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback disconnection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL DriveProgramming failure 68 (0x44): ErU: Support tool communication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1
5547 hex	5546 hex	Last Multiple Alarm 2	X06	R	0000 hex to FFFF hex (Hexadecimal)	1
5548 hex	5547 hex	Last Multiple Alarm 3	X07	R	0000 hex to FFFF hex (Hexadecimal)	1
5549 hex	5548 hex	Last Alarm Sub Code 1	X08	R	0 to 9999	1
554A hex	5549 hex	Last Multiple Alarm Sub Code	X09	R	0 to 9999	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
554B hex	554A hex	Second Last Alarm History/ Number of Con-secutive Same Alarms	X10	R	0 to 65535 (0000 hex to FFFF hex) 0 (0x00): No alarm 1 (0x01): OC1 Overcurrent protection (during acceleration) 2 (0x02): OC2 Overcurrent protection (during deceleration) 3 (0x03): OC3 Overcurrent protection (during constant speed operation) 6 (0x06): OU1 Overvoltage protection (during acceleration) 7 (0x07): OU2 Overvoltage protection (during deceleration) 8 (0x08): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4 Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 36 (0x24): Er6: Operation protection	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
554B hex	554A hex	Second Last Alarm History/ Number of Con-secutive Same Alarms	X10	R	37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out 46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE Following error (ex-cessive speed deviation) 50 (0x32): ErC: Magnetic pole posi-tion detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP (RS-485 communica-tions error, Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback dis-connection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL DriveProgramming failure 68 (0x44): ErU: Support tool commu-nication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1
554C hex	554B hex	Second last Mul-tiple Alarm2	X11	R	0000 hex to FFFF hex (Hexadecimal)	1
554D hex	554C hex	Second Last Mul-tiple Alarm3	X12	R	0000 hex to FFFF hex (Hexadecimal)	1
554E hex	554D hex	Second Last Alarm Sub Code	X13	R	0 to 9999	1
554F hex	554E hex	Second Last Mul-tiple Alarm Sub Code	X14	R	0 to 9999	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5550 hex	554F hex	Third Last Alarm History/Number of Consecutive Same Alarms	X15	R	0 to 65535 (0000 hex to FFFF hex) 0 (0x00): No alarm 1 (0x01): OC1 Overcurrent protection (during acceleration) 2 (0x02): OC2 Overcurrent protection (during deceleration) 3 (0x03): OC3 Overcurrent protection (during constant speed operation) 6 (0x06): OU1 Overvoltage protection (during acceleration) 7 (0x07): OU2 Overvoltage protection (during deceleration) 8 (0x08): OU3 Overvoltage protection (during constant speed operation or stopping) 10 (0x0A): LU: Undervoltage protection 11 (0x0B): Lin: Input phase loss protection 16 (0x10): PbF: Charger circuit fault 17 (0x11): OH1: Heat sink overheat 18 (0x12): OH2: External alarm input 19 (0x13): OH3: Inverter internal overheat 20 (0x14): OH4 Motor protection (PTC/NTC thermistor) 22 (0x16): dbH: Braking resistor overheat 23 (0x17): OL1: Motor 1 overload 24 (0x18): OL2: Motor 2 overload 25 (0x19): OLU: Inverter overload 27 (0x1B): OS: Over speed protection 28 (0x1C): Pg: PG disconnection 31 (0x1F): Er1: Memory error 32 (0x20): Er2 Operator communications 33 (0x21): Er3: CPU error 34 (0x22): Er4: Option card communications error 35 (0x23): Er5: Option card error 36 (0x24): Er6: Operation protection 37 (0x25): Er7: Tuning error 42 (0x2A): Erd: Detection of step-out	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5550 hex	554F hex	Third Last Alarm History/Number of Consecutive Same Alarms	X15	R	46 (0x2E): OPL: Output phase loss protection 47 (0x2F): ErE Following error (excessive speed deviation) 50 (0x32): ErC: Magnetic pole position detection error 51 (0x33): ErF: Data save error in case of undervoltage 52 (0x34): d0: Excessive positioning deviation 53 (0x35): ErP (RS-485 communications error, Option card) 56 (0x38): Ero: Position control error 57 (0x39): ECF: EN circuit failure 58 (0x3A): CoF: PID feedback disconnection detected 59 (0x3B): dbA: DB transistor trouble 65 (0x41): ECL DriveProgramming failure 68 (0x44): ErU: Support tool communication disconnection 70 (0x46): OH6: Charging resistor overheat 253 (0xFD): Lok: Locked by password 254 (0xFE): Err Mock alarm (Subcode = 9998) Err displayed for alarm codes other than the above (undefined alarms)	1
5551 hex	5550 hex	Third Last Multiple Alarm 2	X16	R	0000 hex to FFFF hex (Hexadecimal)	1
5552 hex	5551 hex	Third Last Multiple Alarm 3	X17	R	0000 hex to FFFF hex (Hexadecimal)	1
5553 hex	5552 hex	Third Last Alarm Sub Code 1	X18	R	0 to 9999	1
5554 hex	5553 hex	Third Last Multiple Alarm Sub Code 2	X19	R	0 to 9999	1
5558 hex	5557 hex	Latest Alarm Info. Output Voltage	X22	R	0 to 1000	1
5559 hex	5558 hex	Latest Alarm Info. Torque Monitor	X23	R	-999 to 999	1
555A hex	5559 hex	Latest Alarm Info. Frequency Command	X24	R	0.00 to 655.35	0.01
555B hex	555A hex					

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
555E hex	555D hex	Latest Alarm Info. Number of Startups	X27	R	0 to 65535	1
5560 hex	555F hex	Latest Alarm Info. Internal Air Temperature	X29	R	-32768 to 32767	1
5561 hex	5560 hex	Latest Alarm Info. Heat Sink Temperature	X30	R	-32768 to 32767	1
5562 hex	5561 hex	Latest Alarm Info. Input Terminal	X31	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DI6 bit 1: DI7 bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN1 bit 12: EN2 bit 13: - bit 14: - bit 15: -	1
5563 hex	5562 hex	Latest Alarm Info. Output Terminal	X32	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5564 hex	5563 hex	Latest Alarm Info. Input Terminal via Communication	X33	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: - bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
5565 hex	5564 hex	Latest Alarm Info. Output Terminal via Communication	X34	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1
5566 hex	5565 hex	Latest Alarm Info. Input Power	X35	R	0.00 to 9999 kW	0.01

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5567 hex	5566 hex	Latest Alarm Info. Running Status 2	X36	R	0000 hex to FFFF hex (Hexadecimal) bit 0 to bit 3: Control method 0: V/F control: No slip compensation 1: Dynamic torque vector control 2: V/F control: With slip compensation 3: V/F control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor 10: Torque control (sensorless vector control) 11: Torque control (vector control with speed sensor) bit 4 bit 5: Select motor 0: M1 1: M2 2: M3 3: M4 bit 7: During speed control (1 during control)	1
5568 hex	5567 hex	Latest Alarm Info. Speed Detection	X37	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5569 hex	5568 hex	Latest Alarm Info. Running Status 3	X38	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FAR; Frequency attained bit 1: FDT; Frequency detected bit 2: RDY; Operation ready bit 3: SWM2; 2nd motor selection bit 4: IPF; During restart after instantaneous power failure bit 5: OL; Motor overload bit 6: KP Digital Operator operating bit 7: FAN; Fan operating bit 8: TRY; During retry bit 9: OH; Heat sink overheat early warning bit 10: LIFE; Life warning bit 11: OLP; During overload prevention control bit 12: ID; Current detection bit 13: IDL; Low current detection bit 14: ID2; Current detection 2 bit 15: -	1
5574 hex	5573 hex	Fault Counter	X49	R	0 to 65535	1
5582 hex	5581 hex	Last Alarm Info. Output Voltage	X62	R	0 to 1000	1
5583 hex	5582 hex	Last Alarm Info. Torque Monitor	X63	R	-999 to 999	1
5584 hex	5583 hex	Last Alarm Info. Frequency Command	X64	R	0.00 to 655.35	0.01
5585 hex	5584 hex					
5588 hex	5587 hex	Last Alarm Info. Number of Startups	X67	R	0 to 65535	1
558A hex	5589 hex	Last Alarm Info Internal Air Temperature	X69	R	-32768 to 32767	1
558B hex	558A hex	Last Alarm Info. Heat Sink Temperature	X70	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
558C hex	558B hex	Last Alarm Info. Input Terminal	X71	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DI6 bit 1: DI7 bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN1 bit 12: EN2 bit 13: - bit 14: - bit 15: -	1
558D hex	558C hex	Last Alarm Info. Output Terminal	X72	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
558E hex	558D hex	Last Alarm Info. Input Terminal via Communica-tion	X73	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: - bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
558F hex	558E hex	Last Alarm Info. Output Terminal via Communica-tion	X74	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5591 hex	5590 hex	Last Alarm Info. Running Status 2	X76	R	0000 hex to FFFF hex (Hexadecimal) bit 0 to bit 3: Control method 0: V/F control: No slip compensation 1: Dynamic torque vector control 2: V/F control: With slip compensation 3: V/F control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor 10: Torque control (sensorless vector control) 11: Torque control (vector control with speed sensor) bit 4 bit 5: Select motor 0: M1 1: M2 2: M3 3: M4 bit 7: During speed control (1 during control)	1
5592 hex	5591 hex	Last Alarm Info. Speed Detection	X77	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5593 hex	5592 hex	Last Alarm Info. Running Status 3	X78	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FAR; Frequency attained bit 1: FDT; Frequency detected bit 2: RDY; Operation ready bit 3: SWM2; 2nd motor selection bit 4: IPF; During restart after instantaneous power failure bit 5: OL; Motor overload bit 6: KP Digital Operator operating bit 7: FAN; Fan operating bit 8: TRY; During retry bit 9: OH; Heat sink overheat early warning bit 10: LIFE; Life warning bit 11: OLP; During overload prevention control bit 12: ID; Current detection bit 13: IDL; Low current detection bit 14: ID2; Current detection 2 bit 15: -	1
55A6 hex	55A5 hex	Input Input Terminal [PTC] Input Voltage	X97	R	0.0 to 12.0 V	0.1
5629 hex	5628 hex	4th last Alarm History/Number of Consecutive Same Alarms	X140	R	(LSB: 0 to 65535)	1
5633 hex	5632 hex	5th last Alarm History/Number of Consecutive Same Alarms	X150	R	0 to 9999	1
5784 hex	5783 hex	Second Last Alarm Info. Output Voltage	Z02	R	0 to 1000	1
5785 hex	5784 hex	Second Last Alarm Info. Torque Monitor	Z03	R	-999 to 999	1
5786 hex 5787 hex	5785 hex 5786 hex	Second Last Alarm Info. Frequency Command	Z04	R	0.00 to 655.35	0.01
578B hex	578A hex	Second Last Alarm Info. Number of Startups	Z07	R	0 to 65535	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
578D hex	578C hex	Second Last Alarm Info. Internal Air Temperature	Z09	R	-32768 to 32767	1
578E hex	578D hex	Second Last Alarm Info. Heat Sink Temperature	Z10	R	-32768 to 32767	1
578F hex	578E hex	Second Last Alarm Info. Input Terminal	Z11	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DI6 bit 1: DI7 bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN1 bit 12: EN2 bit 13: - bit 14: - bit 15: -	1
5790 hex	578F hex	Second Last Alarm Info. Output Terminal	Z12	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
5791 hex	5790 hex	Second Last Alarm Info. Input Terminal via Communication	Z13	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: - bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
5792 hex	5791 hex	Second Last Alarm Info. Out-put Terminal via Communication	Z14	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5794 hex	5793 hex	Second Last Alarm Info. Running Status 2	Z16	R	0000 hex to FFFF hex (Hexadecimal) bit 0 to bit 3: Control method 0: V/F control: No slip compensation 1: Dynamic torque vector control 2: V/F control: With slip compensation 3: V/F control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor 10: Torque control (sensorless vector control) 11: Torque control (vector control with speed sensor) bit 4 bit 5: Select motor 0: M1 1: M2 2: M3 3: M4 bit 7: During speed control (1 during control)	1
5795 hex	5794 hex	Second Last Alarm Info. Speed Detection	Z17	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Parameter No.	R/W	Monitor or setting data	Data resolution
5796 hex	5795 hex	Second Last Alarm Info. Running Status 3	Z18	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FAR; Frequency attained bit 1: FDT; Frequency detected bit 2: RDY; Operation ready bit 3: SWM2; 2nd motor selection bit 4: IPF; During restart after instantaneous power failure bit 5: OL; Motor overload bit 6: KP Digital Operator operating bit 7: FAN; Fan operating bit 8: TRY; During retry bit 9: OH; Heat sink overheat early warning bit 10: LIFE; Life warning bit 11: OLP; During overload prevention control bit 12: ID; Current detection bit 13: IDL; Low current detection bit 14: ID2; Current detection 2 bit 15: -	1
57AE hex	57AD hex	1st Cumulative Run Time	Z40	R	0 to 65535 (in 10 hours)	1
57AF hex	57AE hex	2nd Cumulative Run Time of motor	Z41	R	0 to 65535 (in 10 hours)	1
57B0 hex	57AF hex	2nd Number of Startups	Z44	R	0 to 65535	1
57B9 hex	57B8 hex	Third Last Alarm Info. Output Voltage	Z52	R	0 to 1000	1
57BA hex	57B9 hex	Third Last Alarm Info. Torque Monitor	Z53	R	-999 to 999	1
57BB hex	57BA hex	Third Last Alarm Info. Frequency Command	Z54	R	0.00 to 655.35	0.01
57BC hex	57BB hex					
57C0 hex	57BF hex	Third Last Alarm Info. Number of Startups	Z57	R	0 to 65535	1
57C2 hex	57C1 hex	Third Last Alarm Info. Internal Air Temperature	Z59	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
57C3 hex	57C2 hex	Third Last Alarm Info. Heat Sink Temperature	Z60	R	-32768 to 32767	1
57C4 hex	57C3 hex	Third Last Alarm Info. Input Terminal	Z61	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DI6 bit 1: DI7 bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5 bit 7: - bit 8: - bit 9: - bit 10: - bit 11: EN1 bit 12: EN2 bit 13: - bit 14: - bit 15: -	1
57C5 hex	57C4 hex	Third Last Alarm Info. Output Terminal	Z62	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1
57C6 hex	57C5 hex	Third Last Alarm Info. Input Terminal via Communication	Z63	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FW bit 1: RV bit 2: DI1 bit 3: DI2 bit 4: DI3 bit 5: DI4 bit 6: DI5	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
57C6 hex	57C5 hex	Third Last Alarm Info. Input Termi-nal via Communi-cation	Z63	R	bit 7: - bit 8: - bit 9: - bit 10: - bit 11: - bit 12: - bit 13: DI6 bit 14: DI7 bit 15: RST	1
57C7 hex	57C6 hex	Third Last Alarm Info. Output Ter-minal via Com-munication	Z64	R	0000 hex to FFFF hex (Hexadecimal) bit 0: DO1 bit 1: DO2 bit 2: - bit 3: - bit 4: - bit 5: - bit 6: - bit 7: - bit 8: RO bit 9: - bit 10: - bit 11: - bit 12: - bit 13: - bit 14: - bit 15: -	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
57C9 hex	57C8 hex	Third Last Alarm Info. Running Status 2	Z66	R	0000 hex to FFFF hex (Hexadecimal) bit 0 to bit 3: Control method 0: V/F control: No slip compensation 1: Dynamic torque vector control 2: V/F control: With slip compensation 3: V/F control with speed sensor 4: Dynamic torque vector control with speed sensor 5: Vector control without speed sensor 6: Vector control with speed sensor 10: Torque control (sensorless vector control) 11: Torque control (vector control with speed sensor) bit 4 bit 5: Select motor 0: M1 1: M2 2: M3 3: M4 bit 7: During speed control (1 during control)	1
57CA hex	57C9 hex	Third Last Alarm Info. Speed Detection	Z67	R	-32768 to 32767	1

Register No.	Modbus register spec. No.	Function name	Param-eter No.	R/W	Monitor or setting data	Data reso-lution
57CB hex	57CA hex	Third Last Alarm Info. Running Status 3	Z68	R	0000 hex to FFFF hex (Hexadecimal) bit 0: FAR; Frequency attained bit 1: FDT; Frequency detected bit 2: RDY; Operation ready bit 3: SWM2; 2nd motor selection bit 4: IPF; During restart after instantaneous power failure bit 5: OL; Motor overload bit 6: KP Digital Operator operating bit 7: FAN; Fan operating bit 8: TRY; During retry bit 9: OH; Heat sink overheat early warning bit 10: LIFE; Life warning bit 11: OLP; During overload prevention control bit 12: ID; Current detection bit 13: IDL; Low current detection bit 14: ID2; Current detection 2 bit 15: -	1
57DB hex	57DA hex	Output Current Monitor	Z84	R	0.00 to 9999 A	0.01

8-10 Command via Communications

The RUN command and Frequency Reference can be instructed via communication.
The RUN command and Frequency Reference are input according to the command value set to parameter S.
Reading and writing to parameter S is performed by accessing the coil No. or register No. of the applicable Modbus communication. (Refer to *8-9 Modbus Communication Data Lists* on page 8-34.)
Priority can forcibly be given to commands via communication also when a command other than via communication is currently selected.

8-10-1 RUN Command via Communications

To input the RUN command via communications, select “4: RS-485 communication” at RUN Command Selection (F02/E102).
The operation is performed according to the Forward command (FWD) or Reverse command (REV) from Operation command (S06).

Parameter No.	Function name	Data	Default data	Unit
F02 E102	1st RUN Command Selection 2nd RUN Command Selection*1	4: RS-485 communication	2	-
S06	Operation command	Bit1: REV Bit0: FWD	0	-
Related function		Input Terminal [DI6] Function Selection (E98), Input Terminal [DI7] Function Selection (E99) Refer to *5-9-1 Input Terminal Functions* on page 5-51.		

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

8-10-2 Frequency Reference via Communications

To input the Frequency Reference via communications, select “14: RS-485 communication” at Frequency Reference Selection (F01/C30).

- The Frequency Reference can be set in three formats via Modbus communication and the USB communication.

Frequency Reference (S01):	Value obtained by converting ±20000 as the Maximum Output Frequency (F03/A01)
Frequency Reference (S05):	Value in 0.01 Hz units
Speed Command via Communication (S19):	Value in 1 r/min units

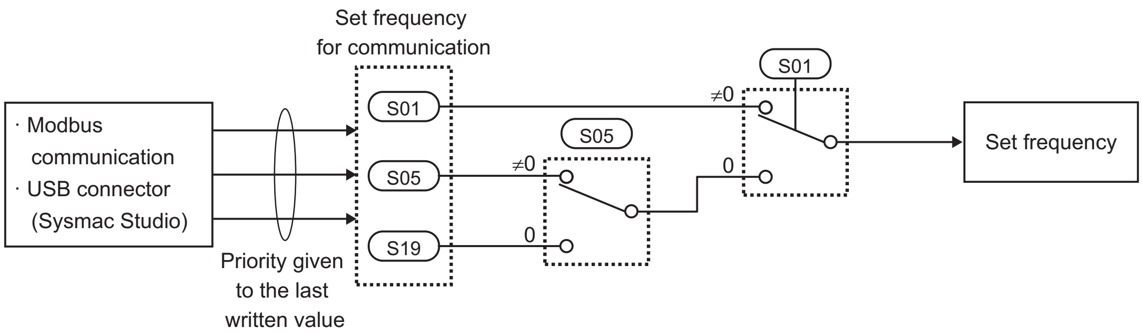
- Compensation values can be set for the frequency setting via communication at Set-point Factor Numerator via Communication (C89) and Set-point Factor Denominator via Communication (C90).

$$\text{Frequency reference} = \begin{array}{c}\text{Frequency setting}\\ \text{via communications}\end{array} \times \frac{\text{C89: Set-point Factor Numerator via Communication}}{\text{C90: Set-point Factor Denominator via Communication}}$$

Parameter No.	Function name	Data	Default data	Unit
F01	1st Frequency Reference Selection	14: RS-485 communication	0	-
C30	2nd Frequency Reference Selection*1		2	-
S01	Frequency Reference	-32,768 to 32,767 +20,000 or -20,000 = Maximum output frequency	0	-
S05	Frequency Reference	0.00 to 655.35 Hz	0.00	Hz
S19	Speed Command via Communication	-32768 to 32767	0	r/min
C89	Set-point Factor Numerator via Communication	-32768 to 32767	0	-
C90	Set-point Factor Denominator via Communication	-32768 to 32767	0	-

*1. To enable switching to the 1st and 2nd control, allocate “12: SET (2nd control)” to either of input terminal [DI1] to [DI7].

- S01, S05 and S19 that are set via Modbus communication or USB communication are converted to the final set frequency with priority given to the last written value.



8-10-3 Forced Commands via Communication

To forcibly give priority to commands via communication also when a command other than via communication is currently selected, set Support Tool Link Function Selection (y99).

Parameter No.	Function name	Data	Default data	Unit
y99	Support Tool Link Function Selection	0: Numerical setting and terminal command (including operation command) by related parameter settings 1: Numerical setting uses communications command (support tools) 2: Terminal setting uses communications command (support tools) 3: Both numerical setting and terminal command use communications command (support tools) Numerical setting means Frequency reference, torque command, or torque bias command.	0	-

Disable Support Tool Link Function (y99 = 0)

This is activated by the command selected by RUN Command Selection (F02/E102) and Frequency Reference selection (F01/C30).

Enable Support Tool Link Function Command Value (y99 = 1, 3)

This is instructed by setting Frequency Reference (S01)/Torque Reference (S02)/Torque Bias Value (S24) to the register No. of the applicable Modbus communication. (Refer to *8-9-2 Register List* on page 8-37.)

Parameter No.	Function name	Data	Default data	Unit
S01	Frequency Reference	-32,768 to 32,767 +20,000 or -20,000 = Maximum output frequency	0	-
S02	Torque Reference	-327.68 to 327.67 %	0	%
S24	Torque Bias Value	-327 to 327 %	0	%

Enable Support Tool Link Function Universal I/O Terminals (y99 = 2, 3)

- Input terminals [DI1] to [DI7], output terminals [DO1] to [DO2] and [ROA, ROB], and analog output terminal [AO] can be forcibly manipulated via communication by enabling universal I/O terminals.
- Normally, functions currently selected by Input Terminal [DI1] to [DI7] Function Selection can be operated not by signals that are input from input terminals [DI1] to [DI7] but by forcibly setting them via communication.
- Output to output terminals [DO1], [DO2] and [ROA, ROB] and analog output terminal [AO] by setting Communication Data Terminal [DO] (S07) and Communication Data Terminal [AO] (S12) and not the output signal selected by Output Terminal [DO1] to [DO2] and [ROA, ROB] Function Selection or Output Terminal [AO] Function Selection to the register No. of the applicable Modbus communication. (Refer to *8-9-2 Register List* on page 8-37.)

Parameter No.	Function name	Data	Default data	Unit
S06	Operation command	Bit15: RST Bit14: DI7 Bit13: DI6 Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: --- Bit7: --- Bit6: DI5 Bit5: DI4 Bit4: DI3 Bit3: DI2 Bit2: DI1 Bit1: REV Bit0: FWD	0	-
S07	Communication Data Terminal [DO]	Bit15: --- Bit14: --- Bit13: --- Bit12: --- Bit11: --- Bit10: --- Bit9: --- Bit8: RO Bit7: --- Bit6: --- Bit5: --- Bit4: --- Bit3: --- Bit2: --- Bit1: DO2 Bit0: DO1	0	-
S12	Communication Data Terminal [AO]	-32,768 to 32,767	0	%

9

Troubleshooting

This section describes how to analyze the cause and take countermeasures if the inverter fails, and provides troubleshooting for possible troubles.

9-1 Alarm Display and Remedies

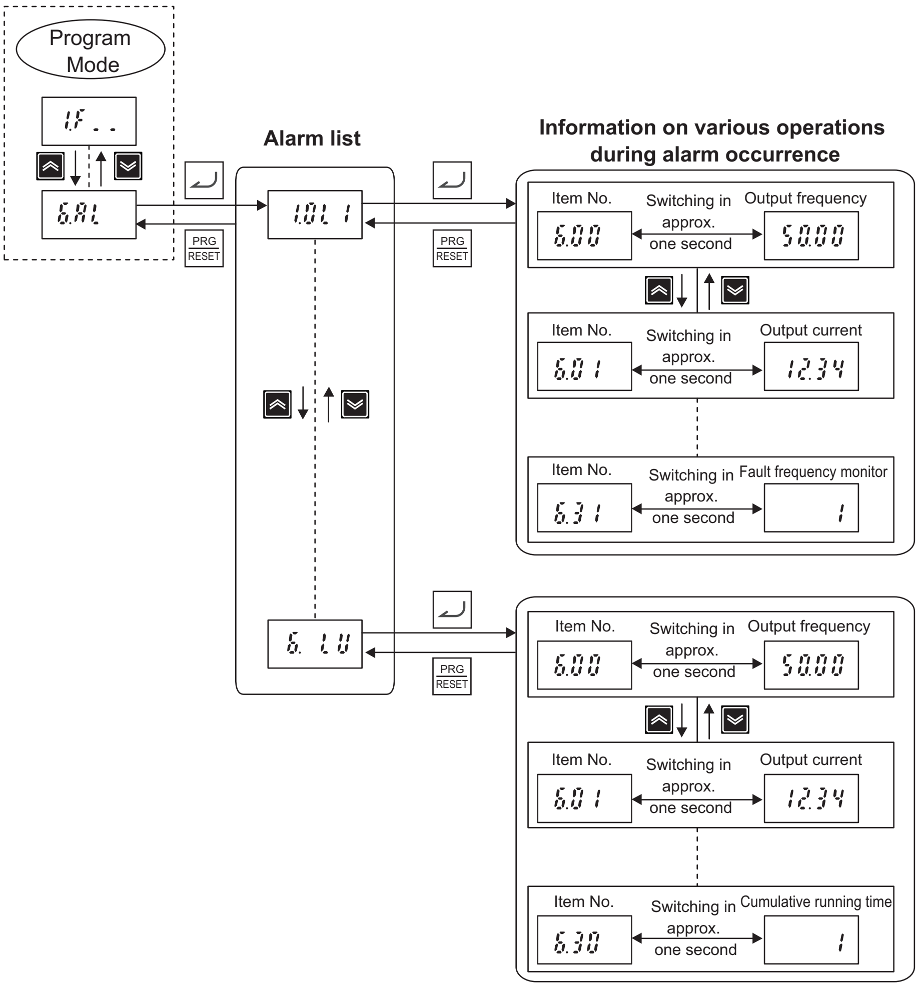
9-1-1 Alarm Display

If an error occurs, the inverter shuts off its output (“trip”), turns ON the ERROR LED, and displays an alarm code. After checking the RUN command and other signals, you can reset the alarm.
Before resetting the alarm, be sure to investigate the cause of the trip and remove the trip factor(s) according to the displayed alarm code.
This section describes how to deal with troubles that may occur after you start using the inverter.

Fault Monitor Display

Use the Alarm List 1 to 6 (Program Mode 6.AL) to check the current alarm, as well as the past alarms.

The Alarm List 1 displays information on the latest alarm.



How to Reset a Trip State

The inverter in a trip state can be reset in either of the following two methods.

- Press the PRG RESET key on the digital operator.

  The PRG RESET key is enabled even when other than the operator is set in the 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102).
- Input the reset signal via the control circuit terminal block.
  Set “8: RS (Reset)” to one of the Input Terminal [DI1] Function Selection to Input Terminal [DI7] Function Selection (E01 to E05, E98, E99).

  The above reset methods may not be effective depending on the trip factor.
  In such cases, cycle the power supply.

Data Clear Processing for Communications Error

Communications command parameter (S code) data can be automatically cleared when a communications error alarm (ErP) is generated with RS-485.
Clearing this will remove the frequency reference and RUN command, therefore the inverter will not start inadvertently when clearing the alarm.

Parameter No.	Function name	Data	Default data	Unit
y95	Data Clear Processing for Communications Error	0: Do not clear the data of function codes S when a communications error occurs. (compatible with the conventional inverters) 1: Clear the data of function codes S001, S005, and S019 when a communications error occurs 2: Clear the run command assigned bit of function code S06 when a communications error occurs 3: Clear both data 1 and 2 above	0	-

9-1-2 Alarm Code List

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
(Cof)	1	Current input terminal AI2(AII) signal disconnection	(1) Current input command disconnection	Check that current input terminals AI2(AII)* are receiving current. → Terminal AI2(AII) disconnection detection “Subcode: 1”
			(2) Strong noise received from surrounds	Check measures against noise (grounding conditions, signal wiring and communication cable/main circuit wiring and installation methods, etc.) → Strengthen measures against noise. → Separate main circuit wiring and control circuit wiring as much as possible.
(dbA)		Braking transistor error	Error in braking resistor connection terminal wiring	Check that the braking resistor is correctly wired in to the [P+] and [DB] terminals on the main circuit terminal block. Check that the motor wiring is not erroneously connected to the terminal [DB]. → If there is no miswiring, request repair of the inverter.
			The braking transistor is damaged.	Check that the braking resistor value is correct, and that it is not miswired. → If there is no problem, request repair of the inverter.
(dbH)	0	Braking resistor overheat	(1) High braking load	Re-calculate the relationship between braking load calculations and braking capacity. → Reduce braking load. → Review braking resistor selection, and increase braking capacity. (Resetting of parameters F50, F51, F52 data is necessary)
	0		(2) Short deceleration time	Recalculate deceleration torque and deceleration time required from the moment of inertia of the load and deceleration time. → Lengthen deceleration time (parameters F08, E11, E13, E15, H56) → Review braking resistor selection, and increase braking capacity. (Resetting of parameters F50, F51, F52 data is necessary)

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
ECF (ECF)		EN circuit failure	(1) Bad connection in control terminal block board	Check that the control terminal block board is firmly mounted in the inverter unit. → Cycle the power to clear the alarm.
			(2) Enable circuit logic failure	• Check that the output from the safety switch is input using the same logic (High/High or Low/Low) to both terminals [SF1]/[SF2]. • Check that both of the two poles of SW9 on the control board are turned ON/ON or OFF/OFF. → The alarm is canceled through use of the PRG RESET key or by cycling the power.
			(3) Enable circuit (safe stop circuit) damage (single failure) detected	If this is not resolved by the procedure above, the inverter is faulty. → Please contact OMRON.
Er1 (Er1)		Memory error	(1) Power disconnected during parameter data writing (in particular during initialization and data copying) and control power dropped	Initialize data with Data Initialization (H03), and when complete, use the PRG RESET key to check that the alarm can been canceled. → Restore the initialized parameter data, and restart operation.
			(2) During parameter data writing (in particular during initialization), strong noise received from surrounds	Check methods for measures against noise (grounding conditions, control/main circuit wiring and installation). Additionally, perform the same checks as in (1). → Perform measures against noise, restore the initialized parameter data, and restart operation.
			(3) Error occurred in control circuit	Initialize data with Data Initialization (H03), and when initialization is complete, use the PRG RESET key to check if the alarm continues even when trying to cancel this. → Board (including CPU) error, so contact OMRON.
			(4) Power disconnected during saving of user settings with parameter H193, and control power dropped	Save user settings with parameter (H193), and when saving is complete, use the PRG RESET key to check if the alarm continues even when trying to cancel this. → Board (including CPU) error, so contact OMRON.
			(5) During saving of user settings with parameter H193, strong noise received from surrounds	Check methods for measures against noise (grounding conditions, control/main circuit wiring and installation). Additionally, perform the same checks as in (4). → Board (including CPU) error, so contact OMRON.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
Er2 (Er2)		Digital Operator communications error	(1) Communications cable disconnection or bad connection	Check for cable continuity, contacts, or bad connections. → Check that connectors are correctly inserted. → Replace the communications cable.
			(2) Large numbers of control wires mean that the surface cover is not mounted securely, and the Digital Operator is floating	Check the mounting of the surface cover. → Reduce the wire size. (Recommended wire size (0.3 to 0.75 mm^2)) → Change the routing of wiring within the unit so that the surface cover can be mounted securely.
			(3) Strong noise received from surrounds	Check methods for measures against noise (grounding conditions, communications cable/main circuit wiring and installation). → Implement measures against noise. (For details, refer to *2-3-4 Wiring for Main Circuit Terminals* on page 2-13.)
			(4) Digital Operator damage	Use a different Digital Operator to check if er2 occurs. → Replace the Digital Operator.
Er3 (Er3)		CPU error	(1) Strong noise received from surrounds	Check measures against noise (grounding conditions, signal wiring and communication cable/main circuit wiring and installation methods, etc.). → Improve measures against noise.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
Er6 (Er6)	1	Operation error	(1) STOP key is pressed while the STOP key is enabled (parameter H96=1, 3)	Check if the STOP key has been pressed while there is a RUN command in the terminal block or communication path. → If unintended operation, review parameter H96 settings.
	2 to 6		(2) With the start check function enabled (parameter H96=2,3), the start check function has operated	Check if the following operation has been performed while there is a RUN command input. • Power supply ON • Alarm cancel • Switch to link RUN command → With er6 occurring, review sequences, etc. so that a RUN command is not input. If unintended operation, review parameter H96 settings. (Before clearing the alarm, turn the RUN command OFF.)
	1		(3) Forced stop “STOP” (digital input terminal) turned OFF	Check if forced stop “STOP” has been turned OFF. → If unintended operation, review terminal DI1 to DI7 parameter E01 to E05, E98, E99 settings.
	8		(4) Brake check signal “BRKE” and brake control signal “BRKS” mismatch	Check that the signal input into the X terminal to which brake check signal “BRKE” is assigned and the brake control signal "BRKS" output from the Y terminal match. • Signal disconnection • Check that the logic matches • If there is a delay, adjust the parameter H180 (brake control signal) time.
	30		(5) A RUN command (FW/REV signals are ON) is input while the power recovery restart prevention (USP) signal is input	Check the power recovery restart prevention (USP) signal.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
Er7 (Er7)		Tuning error	(1) The connection between the inverter and the motor is missing phases	→ Ensure a correct connection between the inverter and motor.
			(2) V/f settings and motor rated current are not set correctly	Check that parameter (F04*, F05*, E166, E167, E169, E170, E171, E172, E173, E174, E175, E176, E177, E178, E179) data matches motor specifications.
			(3) Wiring between the inverter and motor is too long	Check that wiring between the inverter and motor does not exceed 50 m. (Smaller inverter capacity will be more impacted by wiring length) → Review layout so that wiring between the inverter and motor can be made shorter. Alternatively, shorten wiring lengths as much as possible. → Does not use automatic tuning, and does not use automatic torque boost (Set parameter E112*/E113*=0)
Er7 (Er7)		Tuning error	(4) Major discrepancy between the inverter rated capacity and the capacity of the connected motor	Check that the capacity of the connected motor is lower than three or more ranks of the inverter rated capacity, or higher than two or more ranks. → Review the inverter capacity. → Manually set the motor constant (parameter P06*,P07*,P08*). → Does not use automatic tuning, and does not use automatic torque boost (Set parameter E112*/E113*=0)
			(5) A special motor, such as a high-speed motor	→ Does not use automatic tuning, and does not use automatic torque boost (Set parameter E112*/E113*=0)
			(6) Tuning operation during which the motor is rotated with the brake applied (parameter P04*=2) performed	→ Tune the motor while stopped (parameter P04*=1). → Release the brake then tune the motor (parameter P04*=2).

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
ErP (ErP)		RS-485 communications error (communications port 2)	(1) Different communications conditions with host equipment	Check that parameter (y11 to y19) data matches host equipment settings. → Correct the difference.
			(2) Communication time-out detection timer (parameter y18) is set, but communications are not performed at a defined cycle	Inspect the host controller side. → Change the host controller software settings, or disable the communication time-out detection timer (parameter {y08}/y18=0). Set (parameter y18 = 0) to disabled.
			(3) Error in host controller (software, settings, hardware, etc.)	Inspect the host controller (programmable controller, PC, etc.). → Eliminate the cause of the error in the host controller.
			(4) Error in the RS-485 converter (connection, settings, hardware, etc.)	Inspect the RS-485 converter (bad connection, etc.). → Change RS-485 converter settings, reconnect, or replace hardware (replace with recommended equipment).
			(5) Communications cable disconnection, bad connection	Check cable continuity and connections of the cable. → Replace the communications cable.
			(6) Strong noise received from surrounds	Check methods for measures against noise (grounding conditions, communications cable/main circuit wiring and installation). → Implement measures against noise. → Implement measures against noise for the host controller. → Replace the RS-485 converter with the recommended equipment (isolated type).
			(7) Termination resistance is not set correctly	Check if this inverter is the network terminal device. → Set the RS-485 communications terminating resistor selector switch (SW3/SW2) correctly. (If terminal, switch is ON)

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
Erd (Erd)		Stall detection/ startup magnetic pole position detection failure	(1) Different motor characteristics	Check that parameter (F04,F05,P01,P02,P03,P60,P61,P62,P63,P64) data matches motor constants. → Perform auto tuning.
			(2) Magnetic pole position detection method is not appropriate	Check that the magnetic pole position detection method matches the motor type. → Match the magnetic pole position detection method (parameter P30) selection to the motor type.
			(3) Insufficient starting frequency (holding time) (parameter F24)	Check that, when setting the magnetic pole position detection method selection (parameter P30*) to 0 or 3, the starting frequency (holding time) (parameter F24) is set optimally. → Set a time that enables the motor to rotate one revolution or more. F24 ≥ P01/2/F23 (P01: pole, F23: starting frequency)
			(4) Insufficient starting torque	Check acceleration time (parameter F07, E10, E12, E14) and reference current at starting (parameter P74) data. → Set an acceleration time that matches the load. → Raise the reference current at starting.
			(5) Low braking load	Check reference current at starting (parameter P74*) data. → Lower the reference current at starting. When a motor is run on its own, such as during a test run, set to 80% or lower.
			(6) The connection between the inverter and the motor is missing phases	→ Ensure a correct connection between the inverter and motor.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
ErC (ErC)		Magnetic pole position detection error	(1) Inverter settings are not appropriate	Check presence and model of the used motor, and of the speed/magnetic pole position sensor, and that 1st Drive Control Selection (F42)/Input Terminal [PIA][PIB] Pulse Input Format Selection (d14) and Input Terminal [PIA][PIB] Encoder Pulse Resolution (d15) are coordinated. → Check the equipment configuration (model and specifications of motor, speed/magnetic pole position sensor), and set F42/d14/d15 correctly. Set the 1st PM Motor Starting Method (P30) to 0 or 3, and check if the 1st PM Motor Magnetic Pole position Offset (P95) is set to “999: offset has not been adjusted.” → Set P95 correctly. (Auto-tuning also is possible. Refer to *Offline Auto-tuning of Synchronous Motor (PM Motor)* on page 6-67.)
			(2) Error with speed/ magnetic pole position sensor connection	Check for errors with speed/magnetic pole position sensor output wiring connection, and the phase sequence of AB or UVW phase. → Correctly connect the feedback input terminal block board with the speed/ magnetic pole position sensor. Check for bad connections in the motor wiring, and the phase sequence. → Ensure a correct connection with the inverter and motor.
			(3) Motor rotation direction and sensor output do not match	
			(4) Error in terminal block board connection	Check if the terminal block board connector and inverter unit connector are correctly connected. → Mount the terminal block board correctly in the inverter unit.
			(5) Strong noise received from surrounds	Check measures against noise (grounding conditions, signal wiring and communication cable/main circuit wiring and installation methods, etc.). → Implement measures against noise.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
ErE (ErE)		Inconsistent speed and excessive speed deviation	(1) Error in parameter settings	Check 1st Motor Pole Number (P01*). → Set P01* to match the motor used.
			(2) Excessive load	Measure the output current. → Reduce the load.
				Check if mechanical braking is occurring. → Eliminate any mechanical braking.
			(3) Speed does not increase because of current limiter operation	Check 1st Overload Protect Level (F44*) data. → Change F44 to appropriate values, or if current limiter operation is not necessary, change F43 data to 0 (Disable).
				Check that parameter (F04*, F05*, P01* to P12*) data to ensure that V/f settings are correct. → Coordinate V/f settings with motor ratings. → Change settings to match the motor used.
			(4) Parameter settings and the motor have different characteristics	Check that P01*, P02*, P03*, P06*, P07*, P08*, P09*, P10*, P12* match motor constants. → Perform auto tuning with P04*.
			(5) Erroneous wiring to motor	Check wiring to the motor. → Wire the inverter output wiring (U, V, W) to motor wiring (U, V, W) respectively.
			(6) Speed does not increase because of torque limit operation	Check Torque Limit 3 (E16) data. → Change Torque Limit 3 (E16) to appropriate value, or if torque limit operation is not necessary, set it to 300%.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
(ErF)		Data save error in case of undervoltage	(1) During data save at power interruptions, the control power supply dropped suddenly as a result of rapid discharge of the Main Circuit DC Voltage, etc.	Check the power drop time at Main Circuit DC Voltage at power interruption. → Eliminate the cause of rapid discharge of the Main Circuit DC Voltage, etc. After pressing the PRG RESET key to cancel the alarm, return the commands for frequency reference, PID command, and UP/DOWN signals set from the Digital Operator to their original settings, and restart operation.
			(2) Strong noise received from surrounds during data saving at power interruption.	Check methods for measures against noise (grounding conditions, control/main circuit wiring and installation). → Implement measures against noise. After pressing the PRG RESET key to cancel the alarm, return the commands for frequency reference, PID command, and UP/DOWN signals set on the Digital Operator to their original settings, and restart operation.
			(3) Error occurred in control circuit	Check that erf occurs every time at power on. → Board (including CPU) error, so contact OMRON.
(ErH)		Hardware error	(1) Error in combination of control PCB and power PCB	Replacement of control PCB or power PCB is necessary. → Please contact OMRON.
(Ero)		Position control error	(1) Position control system insufficient gain (servo lock)	Readjust Servo Lock Gain (J97) and Speed Control 1 P Proportional Gain (d03).
(Err)		Mock alarm	(1) Press and hold the STOP key + ↵ key for five seconds or longer.	→ Press the PRG RESET key to reset.
			(2) Parameter H45 (Mock Alarm) set to 1.	
(ErU)		Tool communication disconnection	(1) A disconnection occurred on the tool during a test run.	Check if the USB cable or a connector is disconnected.
			(2) A disconnection occurred on the tool during forced status changing of multifunction output.	→ Press the PRG RESET key to reset.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
Lin (Lin)		Input phase loss	(1) Main power supply input terminal wiring disconnected	Measure the input voltage. → Repair or replace the main power supply input wiring or input equipment (molded case circuit breaker, magnetic contactor, etc.)
			(2) Loose main power supply input terminal connection	Check if main power supply input terminal screws are loose. → Tighten to the recommended tightening torque.
			(3) High phase imbalance in three-phase power supply	Measure the input voltage. → Install an AC reactor (ACR) to reduce the phase imbalance. → Increase the inverter capacity.
			(4) Frequent excessive load	Measure the ripple waveform of the Main Circuit DC Voltage. → If a ripple in the Main Circuit DC Voltage is high, increase the inverter capacity.
			(5) Three-phase power supply connected to a product with three-phase power supply specifications	Recheck the inverter model. → Reselect an inverter matching the power supply specifications.
LoK (LoK)		Password cancellation error	(1) User password 1 or 2 entered incorrectly more than a specified number of times	Cancel the alarm. → Turn OFF the inverter power supply, then turn ON the power supply again. Or 20 minutes elapse after the occurrence of the error. If you have forgotten the password. → Set Data Initialization (H03) to 1 and execute parameter initialization.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
LU (LU)	1 3	Undervoltage	(1) Momentary power failure occurred	→ Cancel the alarm. → To restart without an alarm, set the Power Interruption Restart Mode Selection (F14) data to 3, 4, or 5 depending on the type of load.
	2		(2) Short interval when cycling power (if F14=1)	Check if the power supply has been turned ON with the control power supply already ON (determine using Digital Operator display). → Turn the power supply ON again after the Digital Operator display has gone out.
			(3) The power supply voltage has not reached the inverter specification range (three-phase 200 V: 180 VDC/three-phase 400 V: 360 VDC/single-phase 200 V: 160 VDC)	Measure the input voltage. → Increase the power supply voltage to within the specified range.
			(4) Equipment damage or miswiring in power supply circuit	Measure the input voltage and identify the damaged equipment or miswiring. → Replace damaged equipment, or repair miswiring.
			(5) A large starting current flows to a different load connected to the same power supply, and the power supply voltage temporarily drops	Measure the input voltage, and check for voltage fluctuations. → Review the power supply system.
			(6) Insufficient capacity in the power supply transformer resulting in drop in power supply voltage due to inverter inrush current.	Check that an alarm occurs when the molded case circuit breaker, ground leakage circuit breaker (with overcurrent protection function), and magnetic contactor are on. → Review the power supply transformer capacity.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
0Cn (0Cn)		Instantaneous overcurrent	(1) Short in inverter output	Remove wiring from the inverter output terminal (U, V, W), and measure the resistance between motor wiring phases. Check for phases with very low resistance. → Remove the shorted section (including replacement of wiring, relay terminals, and motors) If an overcurrent is displayed when run with wiring removed from the inverter output terminal (U, V, W). → This indicates an inverter fault possibility. Please contact OMRON.
			(2) Inverter output terminal has a ground fault	Remove wiring from the inverter output terminal (U, V, W), and perform a megger test. → Remove ground faults (including replacement of wiring, relay terminals, and motors). If an overcurrent is displayed when run with wiring removed from the inverter output terminal (U, V, W). → This indicates an inverter fault possibility. Please contact OMRON.
			(3) High load	Measure current going in to the motor, establish current trends, and determine if this is larger than the load calculation values designed in to the system. → If overload, either decrease the load or increase the inverter capacity.
				Check current trends, and check if there are rapid changes in current. → If the current changes rapidly, either decrease the load or increase the inverter capacity. → Enable instantaneous overcurrent limiting (H12=1).
			(4) Thigh torque boost (If manual torque boost (E112*/E113*=0))	Check if the current drops when 1st Manual Torque Boost Voltage (F09*) is reduced, or if there is a stall. → If it is determined that there is no stall, lower F09*.
			(5) Short acceleration/ deceleration time	Recalculate torque required from the moment of inertia of the load and acceleration/ deceleration time, and determine if appropriate. → Lengthen the acceleration/deceleration time (F07, F08, E10 to E15, H56). → Enable 1st Overload Protect Function Selection (F43) and torque limit (F40, F41, E16, E17). → Increase the inverter capacity.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
0Cn (0Cn)		Instantaneous overcurrent	(6) Internal braking transistor short detection has operated	Check that the braking resistor connection terminal (P+, DB) is not shorted. Check if the connected braking resistor resistance value is very low. → Connect the appropriate braking resistor.
			(7) Malfunction because of noise	Check methods for measures against noise (grounding conditions, control/main circuit wiring and installation). → Implement measures against noise. For details, refer to *2-3-4 Wiring for Main Circuit Terminals* on page 2-13. → Enable the retry function (H04). → Connect a surge absorber to coils, solenoids, etc. in magnetic contactors that are the cause of noise.
0H1 (0H1)		Cooling fin overheating	(1) The ambient temperature exceeds the inverter specification range	Measure the ambient temperature. → Reduce the ambient temperature such as by improving the air flow to the panel.
			(2) The airflow path is blocked	Check that there is sufficient installation space. → Re-install at a site where sufficient installation space can be ensured.
				Check for fin clogging. → Clean.
			(3) Reduced fan airflow because of the cooling fan service life or of damage	Check Cumulative Run Time of Cooling Fan (H43). → Replace the cooling fan.
				Visually check that the cooling fan is operating correctly. → Replace the cooling fan.
			(4) High load	Measure the output current. → Set 28:OHF (Cooling fin overheat warning) to Output Terminal [DO1] Function Selection (E20), Output Terminal [DO2] Function Selection (E21) or Output Terminal [ROA, ROB] Function Selection (E27) whose load is to be reduced. Alternatively, reduce the load before an overload occurs using the Overload early warning 2 Level (OL2) (E34).
				→ Reduce the Carrier Frequency (F26).
				→ Enable Overload Prevention Control (H70).

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
0H2 (0H2)		External trip	(1) External equipment alarm function is operating	Inspect the operation of the external equipment. → Remove the cause of the alarm caused in the external equipment.
			(2) Miswiring or bad connection in external trip wiring	Check that wiring is correctly connected to the terminal for which "9: External trip (EXT)" is selected from E01 to E05, E98, E99. → Connect the external alarm wiring correctly.
			(3) Error in parameter settings	Check if "9: External trip (EXT)" is selected for an unused terminal from E01 to E05, E98, E99. → Change assignment.
				Check that the "EXT" logic set in E01 to E05, E98, E99 and the external signal logic (positive/negative) match. → Set the logic correctly.
0H3 (0H3)	0	Inverter internal overheat	(1) The ambient temperature exceeds the inverter specification range	Measure the ambient temperature. → Reduce the inverter ambient temperature such as by improving the air flow to the panel.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
0H4 (0H4)		Motor protection (PTC thermistor)	(1) The motor ambient temperature exceeds the specification range	Measure the ambient temperature. → Reduce the ambient temperature.
			(2) Motor cooling system damaged	Check that the motor cooling system is operating correctly. → Replace or repair the motor cooling system.
			(3) High load	Measure the output current. → Reduce the load (use the Overload early warning 2 Level (OL2) (E34), and reduce the load before an overload occurs.) (During winter, the load may increase.) → Reduce the ambient temperature. → Increase the Carrier Frequency (F26).
			(4) Incorrect PTC thermistor operating level (H27*)	Check the PTC thermistor specifications, and recalculate the detection voltage. → Change the parameter data.
			(5) Inappropriate PTC thermistor settings	Check the Thermistor Function Selection (MOH) (H26*) and terminal AO function toggle switch (SW5). → Change the thermistor that uses H26* to suitable settings, and set SW5 to PO.
			(6) 1st Manual Torque Boost Voltage (F09*) too high	Check F09* data, and readjust so that this does not stall even if data is lowered. → Adjust F09*.
			(7) Error in V/f settings	Check that 1st Base Frequency (F04*) and 1st Rated Voltage at Base Frequency (F05*) match the rated nameplate value. → Match these to the rated nameplate value.
			(8) Error in parameter settings	While not using PTC thermistor, the Thermistor Function Selection (MOH) (H26*) is in an operation state. → Change Thermistor Function Selection (MOH) (H26*) to 0 (Disable).
0H6 (0H6)		Inrush current prevention resistor overheat	(1) The inverter power supply has been turned OFF and then ON frequently.	Reduce the frequency at which the power supply is turned OFF and then ON. → Turn OFF and then ON less than once every 30 minutes.
			(2) The inverter power supply has not been turned OFF and then ON frequently.	An error is generated each time the power supply is turned OFF and then ON. → The inrush current protection circuit is damaged. Request repair.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
0Ln (0Ln)		Motor overload 1 to 2	(1) The thermal characteristics of the electronics and the motor overload characteristics do not match	Check motor characteristics. → Review parameter (F10*, F12*) data. → Use an external thermal relay.
			(2) Inappropriate electronics thermal operating level	Recheck motor allowable continuous current. → Reconsider and change parameter (F11*) data.
			(3) Short acceleration/ deceleration time	Recalculate acceleration/deceleration torque and acceleration/deceleration time required from the moment of inertia of the load and acceleration/deceleration time. → Lengthen the acceleration/deceleration time (F07, F08, E10 to E15, H56).
			(4) High load	Measure the output current. → Reduce the load (use the Overload early warning 2 Level (OL2) (E34), and reduce the load before an overload occurs.) (During winter, the load may increase.)
			(5) 1st Manual Torque Boost Voltage (F09*) too high	Check F09* data, and readjust so that this does not stall even if data is lowered. → Adjust F09*.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
0LU (0LU)		Inverter over-load	(1) The ambient temperature exceeds the inverter specification range	Measure the ambient temperature. → Reduce the ambient temperature such as by improving the air flow to the panel.
			(2) 1st Manual Torque Boost Voltage (F09*) too high	Check 1st Manual Torque Boost Voltage (F09*) and readjust so that this does not stall even if data is lowered. → Adjust F09*.
			(3) Short acceleration/ deceleration time	Recalculate acceleration/deceleration torque and acceleration/deceleration time required from the moment of inertia of the load and acceleration/deceleration time. → Lengthen the acceleration/deceleration time (F07, F08, E10 to E15, H56).
			(4) High load	Measure the output current. → Reduce the load (use the Overload early warning 2 Level (OL2) (E34), and reduce the load before an overload occurs.) (During winter, the load may increase.) → Decrease the Carrier Frequency (F26). → Enable Overload Prevention Control (H70)
			(5) The airflow path is blocked	Check that there is sufficient installation space. → Ensure sufficient installation space. Check for fin clogging. → Clean.
			(6) Reduced fan airflow because of the cooling fan service life or of damage	Check the cumulative run time of the cooling fan. (Refer to *7-8-12 Cooling Fan Life Warning Signal (WAF)* on page 7-97.) → Replace the cooling fan. Visually check that the cooling fan is operating correctly. → Replace the cooling fan.
			(7) Long output wiring, with high leakage current	Measure the leakage current → Insert an output circuit filter (OFL).
0PL (0PL)		Output phase loss detection	(1) Disconnected invert output wiring	Measure the output current. → Replace the output wiring.
			(2) Motor windings broken	Measure the output current. → Replace the motor.
			(3) Loose inverter output terminal connection	Check if inverter output terminal screws are loose. → Tighten to the recommended tightening torque.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
(0S)		Excessive speed protection	(1) Error in parameter settings	Check 1st Motor Pole Number (P01*). → Set P01* to match the motor used.
				Check 1st Maximum Output Frequency (F03*) settings. → Set F03* to match the output frequency.
				Check Speed Limit 1 in Forward (d32) and Speed Limit 2 in Reverse (d33) settings. → Disable Speed Limit 1 in Forward (d32) and Speed Limit 2 in Reverse (d33).
				Check Over Speed Detection Level (d35) settings. → Set Over Speed Detection Level (d35) to 120%.
			(2) Insufficient speed regulator gain	Check that the speed does not overshoot during high-speed running. → Increase the Speed Control 1 P Proportional Gain (d03*). (In some cases, a review of filters and integral time will be necessary.)
			(3) Noise superimposed on the PG signal	Check the PG signal input monitor, and check measures against noise (grounding conditions, signal wiring/main circuit wiring and installation methods, etc.). → Implement measures against noise.
			(4) Output frequency and motor rotation speed exceeded 599 Hz	If using at near 590Hz, check that the acceleration time is not short, there is no load variation, and that the speed regulator Speed Control 1 P Proportional Gain (d03*) and Speed Control 1 I Integral Time (d04*) are appropriate. → Decrease the run frequency.
(0Un)		Overvoltage	(1) The power supply voltage exceeds the inverter specification range (three-phase 200 V and single-phase 200 V: 420 VDC/three-phase 400 V: 840 VDC)	Measure the input voltage. → Decrease the power supply voltage to within the specified range. → If the power supply voltage is within the specification range, this indicates an inverter fault. Please contact OMRON.
			(2) Surge in the input power supply	When a phase advance capacitor is turned ON/OFF or a thyristor converter operates on the same power supply system, a transient abnormal surge may occur in input voltage. → Set a DC reactor.

Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
			(3) Short deceleration time for the moment of inertial of the load.	Recalculate the deceleration torque from the moment of inertia of the load and the deceleration time. → Lengthen the deceleration time (F08, E11, E13, E15, H56). → Enable Anti-regenerative Control Function Selection (H69) or Over-Excitation Control Selection during Deceleration Function Selection (H71). → Enable torque limit (F40, F41, E16, E17). → Set 1st Rated Voltage at Base Frequency (F05*) to 0, and increase braking performance. → Consider use of braking resistor.
			(4) Short acceleration time	Check if an overvoltage alarm occurs at the end of sudden acceleration. → Lengthen the acceleration time (F07, E10, E12, E14). → Use Acceleration/Deceleration Pattern Selection (H07). → Consider use of braking resistor.
0Un (0Un)		Overvoltage	(5) High braking load	Compare load braking torque and inverter braking torque. → Set 1st Rated Voltage at Base Frequency (F05*) to 0, and increase braking performance. → Consider use of braking resistor.
			(6) Output has a ground fault	If this operates correctly when run with wiring removed from the inverter output terminal (U, V, W). → Check that the output wiring or the motor do not have a ground fault. If an overvoltage is displayed when run with wiring removed from the inverter output terminal (U, V, W). → This indicates an inverter fault possibility. Please contact OMRON.
			(7) Malfunction because of noise	Check that the Main Circuit DC Voltage at the time of overvoltage is at or below the overvoltage level. → Implement measures against noise. → Enable Retry Count at Trip (H04). → Connect a surge absorber to coils, solenoids, etc. in magnetic contactors that are the cause of noise.
PbF (PbF)		Charging circuit malfunction (1.5 kW min.)	(1) The charging circuit is damaged	Repair of the inverter is required. → Please contact OMRON.

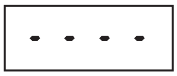
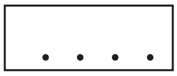
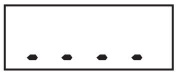
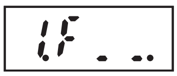
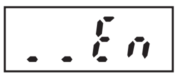
Alarm code	Alarm sub-code	Name	Description	Check point and remedy reference
PG (PG)		PG disconnection	(1) Break in wiring between pulse generator and option	Check that the pulse generator is correctly connected, and that there is no break in wiring. → Check that the pulse generator is correctly connected, or tighten screws. → Check that the connecting sections are not caught. → Replace with wiring that is not broken.
			(2) Strong noise received from surrounds	Check measures against noise (grounding conditions, signal wiring and communication cable/main circuit wiring and installation methods, etc.). → Implement measures against noise. → Separate main circuit wiring and control circuit wiring as much as possible.
d0 (d0)		Excessive positioning deviation	(1) Encoder disconnection	Check that there are no breaks in encoder wiring.
			(2) Mismatch between the encoder rotation direction (wiring phase sequence) and motor rotation direction (inverter output phase sequence)	Connect so that all directions match, and review settings. Review d14 to d17 settings values.
			(3) Deviation over settings values are too low	Review d223, d224 settings values. If settings values are low, increase these.
			(4) Position control gain is too low	Review d203, d204 settings values. If settings values are low, increase these.
			(5) Speed control gain is too low.	Review d03(A45,b45,r45) settings values. If settings values are low, increase these.
			(6) Torque is limited	If a torque limit is operating, then position control and speed control will not operate correctly. Take the following measures so that the torque limit is not applied. • Reduce load • Review acceleration/deceleration time • To reduce load, review the speed reduction ratio, motor capacity, and other equipment configuration.

Parameters marked with * are for 1st control only. When using 2nd control, refer to *2nd Control Function (SET)* on page 5-52 and replace these values.

9-1-3 Minor Fault Code List

Alarm code	Alarm subcode	Name	Description	Check point and remedy reference
CnT (CnT)		Equipment service life (number of startups)	(1) Equipment service life (number of start-ups)	Displayed when the motor number of start-ups reaches the number set in 1st Preset Startup Count for Motor Maintenance (H79). Additionally, the current number of startups can be confirmed in 1st Startup Count for Motor (H44), therefore before reset, set H44 data to 0000.
LiF (LiF)		Life prediction	(1) Life prediction	Any one of the main circuit capacitor used in the inverter, the capacitors on the printed circuit board, and the cooling fan has reached the end of its life. Referring to *7-8-10 Capacitor Life Warning Signal (WAC)* on page 7-94, *7-8-12 Cooling Fan Life Warning Signal (WAF)* on page 7-97 and *7-8-13 Life Warning (LIFE)* on page 7-97, check the status of consumable parts.
0H (0H)		Cooling fin overheat prediction	(1) Cooling fin overheat prediction	Displayed as a prediction before the cooling fine overheat trip OH1 occurs. For measures, refer to "OH1 Heat sink overheat (page 9-17)."
0L (0L)		Motor overload prediction	(1) Motor overload prediction	Displayed as a prediction prior to a motor overload 0l1 alarm occurring, and sets the current value at which the Overload early warning 2 Level (OL2) (E34) operates. Check that the actual current flowing in the motor is not higher than the value set in E34.
Pid (Pid)		PID warning output	(1) PID warning output	Displayed when a warning (warning from absolute value, warning from PID error) is output during PID operation. For details, refer to *PID Deviation Excessive (OD)* on page 7-126.
rEF (rEF)		Command loss	(1) Command loss	When the analog frequency setting (terminals AI1, AI2(AII), AI2(AIV)) command suddenly decreases to 10% or less, it is judged to be a wire break and ref is displayed. Check the wiring.
rTE (rTE)		Equipment service life (cumulative operation time of motor)	(1) Equipment service life (cumulative operation time of motor)	Displayed when the cumulative operation time of motor reaches the time set in parameter H78 (Maintenance interval). Cumulative motor run time can be checked in H94* (Cumulative operation time of motor). This can also be reset by setting the H94* value to 0.
LoK (LoK)		Password cancellation error	(1) User password 1 or 2 entered incorrectly 5 times.	Cancel the alarm. → Turn OFF the inverter power supply, then turn ON the power supply again. Or 20 minutes elapse.

9-1-4 Other Display List

Name	Description	Digital operator display
Disable selection display	Displayed when the operation selection of the control mode to handle data selected within Operator Display Selection during Run (E43) is disabled.	Lit or blinking 
No data	Displayed when the data assigned in the parameter and submenu does not exist.	
I/O all OFF display	Displayed when all points are OFF in the I/O check terminal I/O binary display.	
Communications not established display	Displayed when communications with the inverter have not been established, such as at power supply ON, etc.	
Measuring capacitor capacity	Displayed during measurement of capacitors at a primary voltage drop.	
RUN command display at insufficient voltage levels	Displayed when at or below the insufficient voltage level and there is a RUN command when monitoring inverter output results from amongst LED monitors. Covered LED monitor items: Speed monitor, output current, consumption power, torque detection value, output voltage, motor output, load rate, PID output Non-covered LED monitor items: PID process, PID feedback, analog monitor	
Data overflow display	Displayed when the display coefficient is set too high, when selecting rotation speed, load speed, and line speed in the LED monitor and run monitor, and the display speed is 100000 or higher (at display data overflow).	
Parameter disable selection display	Displayed when disable is selected while setting parameters.	
Password protection status display	Displays the password protection status by lighting or blinking the least significant digit dot during display of the main menu or lower level parameters. Lit: Password protection enabled Blinking: Password is temporarily not protected Off: Password protection disabled	Least significant dot lit or blinking (Display example) 
STO state display	Displays the STO state when the functional safety STO input terminal is turned OFF when there is a RUN command in the operation mode.	
Run/operation complete display	Displayed at operation completion of timer operation or transport operation in the operation mode. Additionally, this is displayed at operation completion of auto-tuning.	
During jogging operation	Indicates that the inverter is in jogging operation status in the operation mode.	

Name	Description	Digital operator display
During DC output	Indicates that DC output is in progress in the operation mode. DC output cause: DC braking, auxiliary excitation If this occurs at the same time as during jogging operation, this display has priority.	dc
Favorite display	Displays favorite registration status by lighting the most significant digit dot during display of the main menu parameters. Lit: Favorite registration complete Off: Favorite registration canceled	Most significant dot display (Display example) F. 00

9-2 Troubleshooting

If you feel that the inverter operation is strange or that the inverter does not operate as intended, use the following information as a reference, even if the inverter displays no alarm indication.
If the inverter trips with an alarm indication, refer to *9-1 Alarm Display and Remedies* on page 9-2.

Symptom	Possible cause	Remedy	Reference page
The power supply is not turned on. (The POWER LED on the inverter is not lit.)	The short-circuit bar between the terminal +1 and P/+2 is removed, or no DC reactor is connected.	Install the short-circuit bar, or connect a DC reactor.	page 2-8 page 2-43
	Input wiring is disconnected.	Check the input wiring.	
The RUN command is input, but the motor does not rotate.	1st RUN Command Selection (F02) is incorrect.	Set 1st RUN Command Selection (F02) correctly.	page 5-25
	1st Frequency Reference Selection (F01) is incorrect.	Set 1st Frequency Reference Selection (F01) correctly according to the frequency reference input method, and specify the frequency.	
	There frequency is set to 0 Hz.	When the 1st Frequency Reference Selection (F01) is set to “1, 2, 3, 5: Analog voltage input,” input the analog voltage or current signal corresponding to the frequency to the terminal AI1 or AI2. For details on switching between the analog voltage and current signals, refer to *5-5-1 Frequency Reference Selection* on page 5-27.	page 5-27
		When the 1st Frequency Reference Selection (F01) is set to “0: Digital Operator,” set the frequency with the operator “ /  key.” The set values are reflected in C99 (Digital Reference Frequency (multi-step speed reference 0)) / E109 (2nd Digital Reference Frequency (2nd multi-step speed reference 0)) in accordance with No. 1 control / No. 2 control.	
		Input the frequency according to the 1st Frequency Reference Selection (F01). (The input frequency will be displayed in the frequency reference monitor (monitor mode: 3_02).)	
		For the multi-step speed operation, set the frequency to the multi-step speed reference 0 to 15 (C99, E109, C05 to C19).	page 5-57

Symptom	Possible cause	Remedy	Reference page
The RUN command is input, but the motor does not rotate.	No multifunction input terminal is allocated for the RUN command.	To input the RUN command via a multifunction input terminal, set the used terminal to "98: FW (forward rotation)" or "99: RV (reverse rotation)." To input the RUN command via the 3-wire input function, set them to "98: FW," "6: STP" and "97: F/R."	page 5-55 page 5-56
	Multi-step speed settings "0: CF1" to "03: CF4" are set to the multi-function input terminal, and these are ON.	Disable the multi-step speed setting. (When this setting is enabled, multi-step speed operation is performed, so the motor does not rotate if the frequency values in the Multi-step Frequency Reference 1 to 15 (C05 to C19) are 0 (default).)	page 5-57
	Both the forward and reverse input terminals are ON.	To input the RUN command via the forward/reverse input terminal, turn ON either of them.	page 5-55
	The Reverse Rotation Prevention Function (H08) is set to limit the forward or reverse rotation.	Set Reverse Rotation Prevention Function (H08) correctly.	page 7-114
	The input terminal wiring or short-circuit bar connection for the RUN command is incorrect.	Wire correctly. (The multi-function input terminal status can be checked in the Input Terminal Monitor (W40)/Output Signal Monitor (W41).)	page 2-8 page 2-10 page 2-49
	The analog input or variable resistor wiring for the frequency reference is incorrect.	Wire correctly. • For the analog voltage or variable resistor input, measure the voltage between the terminals AI1 to AIC or AI2 to AIC with a tester etc. to check that the voltage is correct. • For the analog current input, with the wires disconnected, measure the current flowing between the power supply and AII terminals with a tester etc. to check that the current is correct.	page 2-8 page 7-32
	Although the inverter is operated via the digital operator, the multi-function input terminal is set to "162: F-TM (Forced terminal block)" and that terminal is ON.	Turn OFF the terminal to which the function is allocated.	page 7-74
	Although the inverter is operated via the control circuit terminal block, the multifunction input terminal is set to "35 OPE (Forced operator function)" and that terminal is ON.	Turn OFF the terminal to which the function is allocated.	page 7-74
	An inverter trip occurred. (The ERR LED lights and the alarm code is displayed)	Press the PRG RESET key to reset the trip and, after determining the cause and taking countermeasures based on the alarm code, restart the inverter.	page 5-49 page 9-2

Symptom	Possible cause	Remedy	Refer-ence page
The RUN command is input, but the motor does not rotate.	When the safety function selector switch (SW9) is OFF, either the multifunction input terminal SF1 or SF2 is OFF.	To use the safety function, turn ON both of the safety input terminals SF1 and SF2. To disable this function, set the safety function selector switch to ON.	page 7-68
	The multifunction input terminal is set to “8: RS (Reset),” “15: CS (Commercial switching),” “16: SW60 (Commercial switching)” or “7: FRS (Free-run stop),” and that terminal is ON.	Turn OFF the terminal to which the function is allocated.	page 7-59 page 5-49 page 7-136
	The multifunction input terminal is set to “38: ROK: (Permission of run command)” and that terminal is ON.	Turn ON the terminal to which the function is allocated.	page 7-114
	The wiring from the inverter to the motor, or the internal wiring of the motor, is disconnected.	Check the input wiring.	page 2-8 page 2-46
	The load is too heavy.	Reduce the load.	-
	The motor brake is applied.	Release the brake.	-
	There is a contact failure for the analog input or variable resistor.	Check the input wiring. • For the analog voltage or variable resistor input, measure the voltage between the terminals AI1 to AIC or AI2 to AIC with a tester etc. to check that the voltage is correct. • For the analog current input, with the wires disconnected, measure the current flowing between the power supply and AII terminals with a tester etc. to check that the current is correct.	page 2-8 page 7-32
	The overload limit or overcurrent suppression function is active.	Disable the function, or increase the level at which the function is activated.	page 7-81 page 7-85
	The 1st Maximum Output Frequency (F03) and 1st Frequency Upper Limit (F15)/2nd Frequency Upper Limit (E117) are set too low.	Change the set value.	page 5-19 page 5-32
	The acceleration time is too long.	Decrease the acceleration time (F07/E10/E12/E14).	page 5-39
	The multifunction input terminal is set to “10: J0G: (Jogging)” and that terminal is ON.	Turn OFF the terminal to which the function is allocated.	page 5-60

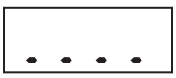
Symptom	Possible cause	Remedy	Reference page
The motor rotation speed does not increase.	Multi-step speed settings “0: CF1” to “3: CF4” are set to the multi-function input terminal, and these are ON.	Disable the multi-step speed setting. (When this setting is enabled, multi-step speed operation is performed, so the motor runs according to the frequency set in the Multi-step Frequency Reference 1 to 15 (C05 to C19).)	page 5-58
	The load is too heavy.	Reduce the load.	-
	The motor brake is applied.	Release the brake.	-
The frequency cannot be set at 1st Frequency Reference/1st Multi-step Frequency Reference 0 (C99)/2nd Frequency Reference/2nd Multi-step Frequency Reference 0 (E109) on the Digital Operator.	The 1st Frequency Reference Selection (F01) is set to other than digital operator.	Set the 1st Frequency Reference Selection (F01) to “0: (Digital Operator).”	page 5-27
	The multifunction input terminal is set to “162: F-TM (Forced terminal block)” and that terminal is ON.	Turn OFF the terminal to which the function is allocated.	page 7-74
The specified parameter does not appear.	The Operator Display Selection (E52) is set to “1: Parameter data check mode.”	Set Operator Display Selection (E52) to “2: Full menu mode.”	page 5-3
The parameter settings cannot be changed.	The inverter is in operation.	Stop the inverter. Then, set the parameters again after the motor stops with deceleration.	-
	Soft lock is enabled.	Disable the Operator Protection Function Selection (F00).	page 7-73
The motor rotates in reverse.	The phase sequence of wiring to the motor is incorrect. (The motor is not designed to rotate forward in the phase sequence: U/T1, V/T2, W/T3.)	Reverse the order of two wires connected to U/T1, V/T2, W/T3, or change the phase sequence to match that of the motor.	page 2-9
	The 3-wire input function is enabled, but the forward/reverse logic is incorrect.	Check the logic of the “97: F/R (3-wire forward/reverse)” allocated to a multifunction input terminal.	page 5-56
The motor rotates in reverse when the RUN key is pressed.	The operation direction based on the FW and RV terminals is incorrect.	Input the FW and RV terminals correctly.	page 5-25

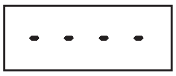
Symptom	Possible cause	Remedy	Reference page
The inverter trips with an overcurrent protection during operation.	The acceleration time is set too short.	Increase the value set in the acceleration time (F07/E10/E12/E14).	page 5-39 page 5-43
		Use the acceleration/deceleration stop function to change the operation pattern to stop accelerating temporarily.	page 5-42
	The load is too heavy.	Reduce the load.	-
		Use the torque boost function to adjust the torque.	page 5-73
		With 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) to “0: IM V/f control,” set “Free V/f voltage (E167/E169/E171/E173/E175/E177/E179)” or “5: (IM Vector control without speed sensor)” and “15: (PM Vector control without speed and pole position sensor)” and perform tuning.	page 5-10 page 6-16
	The 1st Overload Protect Function Selection (F43)/2nd Overload Protect Function Selection (E146) is set to “0: Disable (Current limiter does not work.).”	Enable the 1st Overload Protect Function Selection (F43)/2nd Overload Protect Function Selection (E146).	page 7-81
	If an overcurrent trip occurs during operation although the overload limit function is enabled:		
	1st Overload Protect Level (F44)/2nd Overload Protect Level (E147) is too high.	Decrease the 1st Overload Protect Level (F44)/2nd Overload Protect Level (E147).	page 7-81
PRG RESET key is disabled.	Anti-regenerative Control Function Selection (H69) is enabled.	Set Anti-regenerative Control Function Selection (H69) to “0: (Disable),” or adjust the operation level of the function.	page 7-84

Symptom	Possible cause	Remedy	Reference page
The motor or machine causes a loud noise.	The carrier frequency is too low.	Increase the Carrier Frequency (F26). However, this may increase noise or leakage current from the inverter. In addition, the output current must be derated depending on the model. For details, refer to *A-1 Derating Table* on page A-2.	page 7-109 page A-2
	The frequency of the motor in rotation resonates with the machine's natural frequency.	Change the frequency setting. If resonance occurs during acceleration/deceleration, use the Jump Frequency (C01 to C04) to avoid the resonance frequency.	page 7-113
	The motor is overexcited.	Set the 1st Base Frequency (F04)/2nd Base Frequency (A02), 1st Rated Voltage at Maximum Output Frequency (F06)/2nd Rated Voltage at Maximum Output Frequency (A04) according to the motor ratings. If this does not improve the condition, slightly lower the 1st Rated Voltage at Base Frequency (F05)/2nd Rated Voltage at Base Frequency (A03) value. Or set the 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) to “0: V/f control (No slip compensation),” or, if using “V/f control with speed sensor,” use Non-linear V/f Frequency 1 (E166)/Non-linear V/f Voltage 7 (E179) and perform tuning.	page 5-10 page 5-19
The inverter trips with an overcurrent protection (OLU).	The thermistor trip is not set appropriately.	Disable Thermistor Function Selection (MOH) (H26). Alternatively, adjust 1st Thermistor Error Detection Level (MOH) (H27).	page 7-86
The inverter trips with an overvoltage protection (OUn) during deceleration.	The set deceleration time is too short.	Increase the value set in the deceleration time (F08/E11/E13/E15).	page 5-39 page 5-43
	Anti-regenerative Control Function Selection (H69) is set to “0: Disable.”	Enable Anti-regenerative Control Function Selection (H69). However, when this function is enabled, the actual deceleration time may be longer than the set value. For details, refer to *7-8-2 Overvoltage Suppression Function during Deceleration* on page 7-84.	page 7-84
	If an overvoltage trip occurs during deceleration although Anti-regenerative Control Function Selection (H69) is enabled:		
	The Frequency Rising Limit for Torque Limit (H76) value is inappropriate.	Change the set values. For details, refer to *7-8-2 Overvoltage Suppression Function during Deceleration* on page 7-84.	page 7-84
The inverter trips with a thermistor error (OH4).	24-VDC voltage is input to the PTC terminal.	Remove 24-VDC voltage from the PTC terminal.	page 7-86

Symptom	Possible cause	Remedy	Reference page
The output frequency is unstable.	The parameter settings are inappropriate.	Change the output frequency value slightly away from the power supply frequency.	page 5-27
		Change 1st Output Current Fluctuation Damping Gain (H80) and 2nd Output Current Fluctuation Damping Gain (A41).	page 7-139
	The load changes significantly.	Increase the motor/inverter capacity.	-
	The power supply voltage fluctuates.	Take measure to reduce the fluctuation.	-
The torque is insufficient.	The parameter settings are inappropriate. (During acceleration/ constant speed)	Increase 1st Manual Torque Boost Voltage (F09)/2nd Manual Torque Boost Voltage (A05).	page 5-73
		Set the 1st Torque Boost Function Selection (E112) and 2nd Torque Boost Function Selection (E113) to “1: Automatic torque boost.”	page 5-73
		Decrease the Carrier Frequency (F26).	page 7-109
		Set the 1st Drive Control Selection (F42)/2nd Drive Control Selection (A14) to “5: IM Vector control without speed sensor.”	page 6-16
	The parameter settings are inappropriate. (During deceleration)	Increase the value set in the deceleration time (F08/E11/E13/E15).	page 5-39
		Set 1st AVR Function Selection (E122)/2nd AVR Function Selection (E123) to OFF.	page 7-117
		Use braking resistors or regenerative braking units.	-
Operator communications error (Er2) occurred.	Broken wiring between the operator and the inverter unit.	Check the connection between the digital operator and the inverter unit.	page 7-75
The operation/ setting via Modbus communication is not possible.	1st RUN Command Selection (F02)/2nd RUN Command Selection (E102) are incorrect.	Set 1st RUN Command Selection (F02)/2nd RUN Command Selection (E102) to “4. RS-485 communication (terminal block).”	page 5-25
	1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) are incorrect.	Set 1st Frequency Reference Selection (F01)/2nd Frequency Reference Selection (C30) to “14. RS-485 communication (terminal block).”	page 5-27
	The communications speed setting is incorrect.	Set a correct communications speed in the RS-485 Communication Baud Rate (y14).	page 8-5
	The unit number setting is incorrect or overlaps.	Set a correct station number in the RS-485 Communication Station No. Selection (y11).	page 8-5
	The communications parity setting is incorrect.	Set a correct parity type in the RS-485 Communication Parity Bit Selection (y16).	page 8-5
	The wiring is incorrect.	Connect the wiring correctly to the terminal SP/SN on the control circuit terminal block.	page 8-4
	The address is incorrect.	• Check that the coil or register address setting is correct, which is 1 less than the coil or register No. • If the Modbus mapping function is in use, check if the function settings are correct and, if necessary, make corrections.	page 8-11 page 8-23

Symptom	Possible cause	Remedy	Reference page
Operating the inverter activates the earth leakage breaker.	The leakage current from the inverter is too large.	Decrease the Carrier Frequency (F26) value.	page 7-109
		Increase the sensitivity current of the earth leakage breaker. Or, replace the earth leakage breaker with one with a higher sensitivity current.	page 2-40
The DC injection braking function does not work.	The DC injection braking power is not set.	Set 1st DC Injection Braking Level (F21)/2nd DC Injection Braking Level (A10).	page 7-63
	The DC injection braking time is not set.	Set the 1st DC Injection Braking Time (F22)/2nd DC Injection Braking Time (A11).	page 7-63
The inverter trips with an undervoltage (LU).	The voltage dropped because the power supply capacity is insufficient.	Increase the power supply capacity.	-
Noise enters in the TV or radio located near the inverter.	The TV or radio is affected by the radiated noise from inverter.	Move the TV or radio as far away as possible from the inverter.	-
An option error (Er5) occurred.	The inverter received an error detected in the option unit.	Refer to the manual for the option unit.	-
	Inverter fault: The option connector does not work normally.	The connector may be faulty if the problem persists even after taking a remedy on the option unit side. If the problem persists even after checking the option connector for loose fitting and dirt on the contacts, replace the inverter.	-
An option communications error (Er5) occurred.	The inverter stops communicating with the option unit after recognizing it. The option unit is not mounted securely.	Check the option connector for loose fitting and dirt on terminal contacts. Check that the terminal block cover of the inverter is fit securely on the inverter.	-
	The Modbus mapping endian function setting is inappropriate.	Set Modbus Mapping Endian Selection (H396) to “00: (Big endian).”	page 8-23
Sysmac Studio cannot make an online connection.	The USB cable is not connected correctly.	Fully insert the USB cable into both the PC and controller.	-
	Sysmac Studio “Communications Settings” > “Communications Method” is not set to “USB-Direct Connection.”	Set Sysmac Studio “Communications Settings” > “Communications Method” to “USB-Direct Connection.”	-
	The USB driver is not correctly installed.	Install the USB driver. For details of USB driver installation methods, refer to the appendix of *Sysmac Studio Version 1 Operation Manual (SBCA-470)*.	-
The brake control function causes an overload protection alarm (OLU).	The inverter is in operation with the brake force.	Turn OFF the RUN command to the inverter in the brake force state. Even under DC injection braking, an overload protection alarm may occur.	page 6-72
	With at or lower than the Brake Control Brake-release Frequency (J69) set frequency, the brake does not release.	Set the frequency to a value exceeding the Brake Control Brake-release Frequency (J69) value.	page 6-72

Symptom	Possible cause	Remedy	Reference page
Brake transistor error (dbA) occurred.	The brake transistor is damaged.	Replace the inverter.	-
Brake error (Er6) occurred.	The output current does not reach the set brake release current value.	Increase the Brake Control Brake-release Timer (J70) or decrease the Brake Control Brake-release Current (J68).	page 6-72
	The brake confirmation signal is not input.	• Correct the wiring for the brake confirmation signal (57: BRK). If not used, deallocate the brake confirmation function from the multi-function input setting. • Review the operation sequence so that the brake confirmation signal (57: BRK) is input after the brake is released. • Replace the brake if it is faulty.	page 6-72
	Brake confirmation signal is not input within the time set in Brake Error Detection Time (H180).	Adjust the Brake Error Detection Time (H180).	page 6-72
The brake control function causes the load to fall.	The set brake release current is insufficient.	Increase the Brake Control Brake-release Current (J68) value.	page 6-72
	The frequency setting for releasing/forcing the brake is too low.	Increase the Brake Control Brake-release Frequency (J69), Brake Force Frequency (J71), or Brake Control Brake-applied Frequency (J71) setting values.	page 6-72
The PM motor rotates during startup.	The magnetic pole position of the motor during startup is incorrect.	Set the 1st PM Motor Starting Method (P30) to "1: IPM (Embedded magnet motor method 1)," and reduce initial rotation at startup. If 0 or 3 are used in P30, reduce 1st PM Motor Reference Current at Starting (P74) to make reverse rotation more difficult.	page 6-22
	The PM motor stalls.	Increase the 1st PM Motor Reference Current at Starting (P74) value. Or perform adjustments according to *6-4-4 Adjustment of PM Motor Mode Settings* on page 6-22.	page 6-22
	The load is too heavy.	Reduce the load. Or, increase the acceleration/deceleration time.	-
Underbar display 	(1) The Main Circuit DC Voltage is dropped	• Connect a power supply with voltage specifications that match the input voltage.	-
	(2) Only control power supply auxiliary input on, without main power supply.	• Turn the power supply ON.	-
		• Install a shorting bar or DC reactor between terminal P1 and P(+), or tighten screws.	page 2-9
	(3) Main power supply input terminal wiring disconnected	• Repair or replace the main power supply input wiring or input equipment (molded case circuit breaker, magnetic contactor, etc.)	page 2-13

Symptom	Possible cause	Remedy	Reference page
Center bar display 	(1) With PID control not operating (J01 = 0), Operator Display Selection during Run (E43) is set to 10 or 12	• Set E43 to other than 10 or 12.	page 7-75
	While PID control is operating (J01 = 1, 2, 3), and "PID process command" or "PID feedback value" set to display on the LED monitor using the  key, PID control has been set to disable (J01 = 0).	• Turn J01 to 1, 2, or 3.	page 7-118
	(2) Operator connection error	• Replace the remote operation extension cable.	-
Parentheses display 	(1) Displayed data is an overflow	• Review E50 data.	page 7-75
The parameter settings cannot be changed (changed from link function)	(1) Attempted to change a parameter that cannot be changed during operation	• Stop operation and then change the parameter.	-
	(2) Parameter F02 data cannot be changed	• Turn both terminal signals "FW" and "RV" OFF.	page 5-55
Underbar and En display	(1) SF1 and SF2 terminals are OFF	• Turn SF1 and SF2 ON.	page 7-68
		• When FW/RV signals are ON, turn the FW/RV signals OFF.	page 5-55

10

Maintenance and Inspection

This section describes the daily maintenance and periodical inspection items.

10-1 Maintenance and Inspection

10-1-1 Daily Inspection

Check the following during operation.

- The motor operates according to the settings.
- There are no faults in the installation environment.
- There are no faults in the cooling system.
- There is no abnormal vibration or sound.
- There is no abnormal overheat or discoloration.
- There is no abnormal odor.
- There is no alarm display.

Check the input voltage of the inverter during operation by using a tester or other measuring equipment.

- There is no frequent power supply voltage fluctuation.
- The line voltage is balanced.

10-1-2 Cleaning

Always keep the inverter clean.
Lightly wipe the exterior surfaces of the inverter with a soft cloth moistened with a neutral detergent to remove dirt.

Do not use solutions such as acetone, benzene, toluene, or alcohol for cleaning. Doing so may cause the inverter surfaces to dissolve or its coating to come off.
In particular, do not use any detergent or alcohol to clean the digital operator display.

10-1-3 Periodic Inspection

Check the parts that must be checked with the operation stopped, as well as those that require periodic inspection.
Even if the power supply is turned OFF, it takes time for the smoothing capacitor of the main circuit DC section to discharge. Since this can be dangerous, use a tester or something similar to confirm that the Main Circuit DC Voltage has dropped down to a safe value (25 VDC or below), and then perform inspection.

- There are no faults in the cooling system.
  →Clean the air filter etc.
- Check for loose screws, and retighten.
  →The screws, bolts and other tightened parts may become loose due to vibration, temperature change, or other influences. Check these parts carefully and retighten them if necessary.
- Check for corrosion or damage to conductors and insulators.
- Measure the insulation resistance.
- Check the cooling fan, smoothing capacitor and relay.

10-1-4 Daily/Periodic Inspection Items

Inspection category	Inspection item	Inspection point	Inspection frequency			Inspection method	Criteria	Meter
			Daily	Periodic				
				1 year	2 years			
General	Ambient environment	Check ambient temperature, humidity and surrounding atmosphere (presence of dust, gas, oil mist, water droplets, etc.).	Required			Refer to *2-1 Installation* on page 2-2.	Ambient temperature: -10 to 50°C, no freezing Operating humidity: 95% max., no condensation	Thermometer Hygrometer Recorder
	Entire system	There is no abnormal vibration or sound.	Required			Perform visual and acoustic inspection.	No faults	
	Power supply voltage	Check main circuit voltage.	Required			Measure line voltage between inverter main circuit terminals L1/R, L2/S and L3/T.	Within allowable AC voltage fluctuation range	Tester, digital multimeter
	Structural components such as the casing or cover	Check for deformation or damage.	Required			Perform visual inspection.	No faults	
		No deposition of dirt or dust	Required			Perform visual inspection.	No faults	

Inspection category	Inspection item	Inspection point	Inspection frequency			Inspection method	Criteria	Meter
			Daily	Periodic				
				1 year	2 years			
Main circuit	General	Perform megger check (Between main circuit terminals and ground terminal).		Required		Disconnect I/O wires from the inverter main circuit terminal block and remove the control terminal block PCB. Then, after removing the short-circuit bar for switching the inverter built-in filter function, measure using a megger the resistance between the ground terminal and the short-circuited terminals L1/R, L2/S, L3/T, U, V, W, P(+), P1, N(-) and DB.	5 MΩ min.	500-VDC class megger
		Check for loose bolts and screws.		Required		Retighten loose bolts and screws.	No faults	
		Check each part for traces of overheating.		Required		Perform visual inspection.	No faults	
	Conductors/ wires	Check for distorted conductors.		Required		Perform visual inspection.	No faults	
		Check for broken cable sheaths.		Required				
	Terminal Blocks	Check for damage.		Required		Perform visual inspection.	No faults	
	Smoothing capacitor*1	Check that there is no liquid leakage.	Required			Perform visual inspection.	No faults	Capacity meter
		Check that the safety valve does not come out and that there is no bulge.	Required					
	Relay	Check for chattering sound during operation.		Required		Perform acoustic inspection.	No faults	
		Check for rough contact surface.		Required		Perform visual inspection.	No faults	

Inspection category	Inspection item	Inspection point	Inspection frequency: Daily	Periodic: 1 year	Periodic: 2 years	Inspection method	Criteria	Meter
Control circuit, protection circuit	Operation check	Check output voltage balance between phases during stand-alone inverter operation.		Required		Measure the line voltage between the inverter main circuit terminals U, V and W.	Phase-to-phase voltage balance 200-V class: 4 V max. 400-V Class: 8 V max.	Digital multimeter Rectifier Voltmeter
		Check that there is no error in protection and display circuits through sequence protection function test.		Required		Short-circuit or open the inverter protection circuit output under simulated conditions.	Error is found in the sequence.	
Cooling system	Cooling fan	There is no abnormal vibration or sound.	Required			Rotate the fan manually with the power off.	Smooth rotation, no faults*2	
		Check for loose connections.		Required		Perform visual inspection.		
	Cooling fin	Check for clogging.		Required		Perform visual inspection.	No clogging.	
Display	Display	Check that the LED indicators are lit properly.	Required			Perform visual inspection.	The LED indicators are lit.	
		Perform cleaning.		Required		Clean with rags.		
	Meter	Check indicated value.	Required			Check the indicated values on panel meters.	Specified value, control value	Voltmeter, ammeter, etc.

Inspection category	Inspection item	Inspection point	Inspection frequency			Inspection method	Criteria	Meter
			Daily	Periodic				
				1 year	2 years			
Motor	General	There is no abnormal vibration or sound.	Required			Perform acoustic, sensory and visual inspection.	No faults	
		There is no abnormal odor.	Required			Check for abnormal odor due to overheating, damage, etc.	No faults	
	Isolation resistance	Perform megger check (between motor terminals and ground terminal).			Required	Disconnect wires from the inverter main circuit terminals U, V, W and short-circuit the three-phase motor wires. Then, use a megger to measure the resistance between each motor wire and the ground terminal.	5 MΩ min.	500-VDC class megger

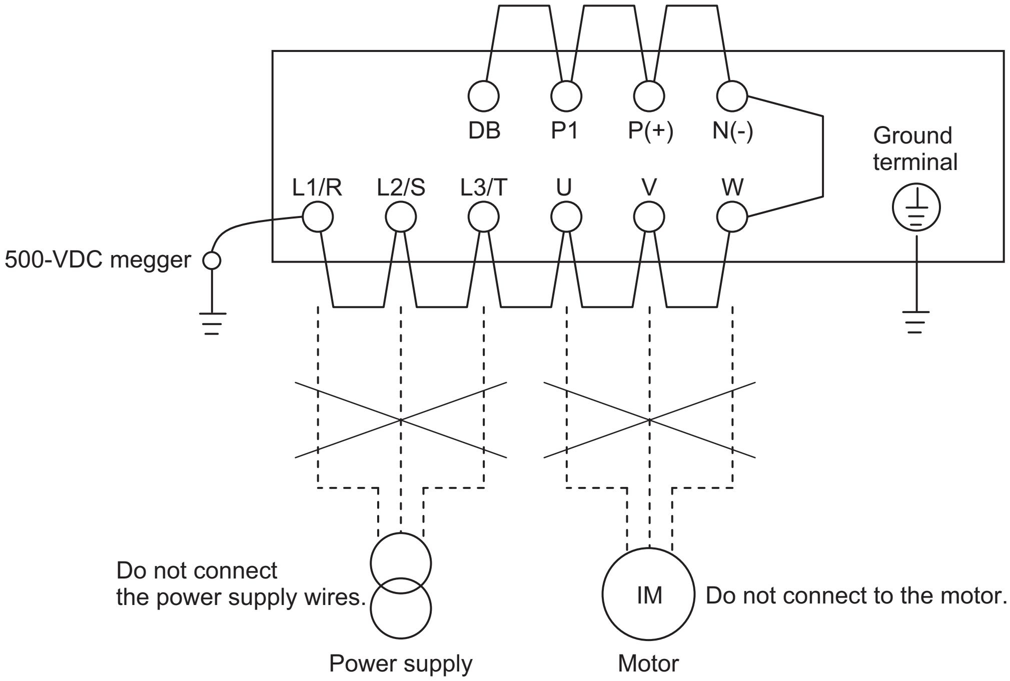
*1. The capacitor service life is influenced by the ambient temperature.
For inverter replacement guidelines, refer to *A-2 Smoothing Capacitor Life Curve* on page A-6.

*2. The life of the cooling fan depends on environmental conditions, such as the ambient temperature and/or dust. Check the operating conditions in daily inspection.

10-1-5 Megger Test

Before performing a megger test on external circuits, be sure to disconnect all the terminals of the inverter and not to apply the test voltage to the inverter. Use a 500 VDC megger for a megger test.
For a megger test on the inverter main circuit, short-circuit the terminals L1/R, L2/S, L3/T, U, V, W, DB, P1, P(+) and N(-) with wires, as shown below.
Because the insulation resistance rating of the single inverter unit is 5 MΩ or higher, it is normal if the resistance is 5 MΩ or higher.

- For the inverter, do not perform a megger test on the control circuit. Perform it only on the main circuit.
- Use a tester (in a high resistance range) for a power-on test on the control circuit. Do not use a megger or buzzer.

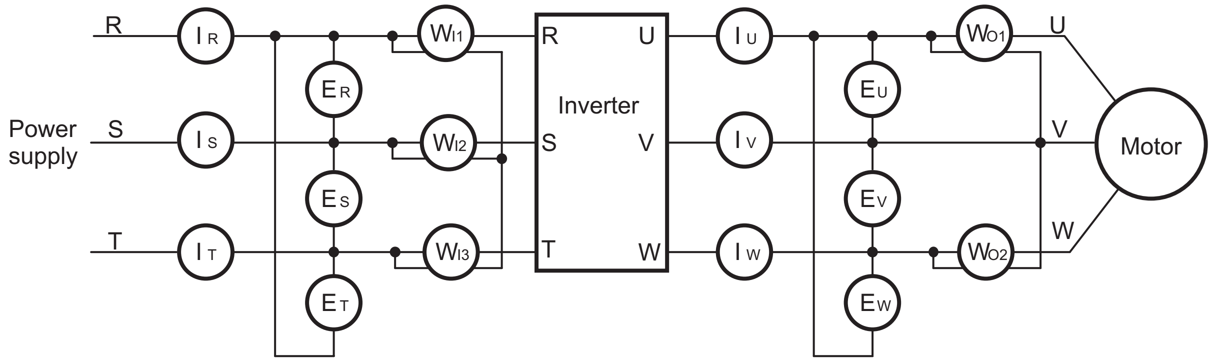


10-1-6 Withstand Voltage Test

Do not conduct a withstand voltage test on any part of the inverter.
Doing this test is dangerous because it may cause damage to or deterioration of the parts inside the inverter.

10-1-7 I/O Voltage/Current/Electric Power Measurement Method

Measuring instruments commonly used for input/output voltage, current, or electric power measurement are shown below.

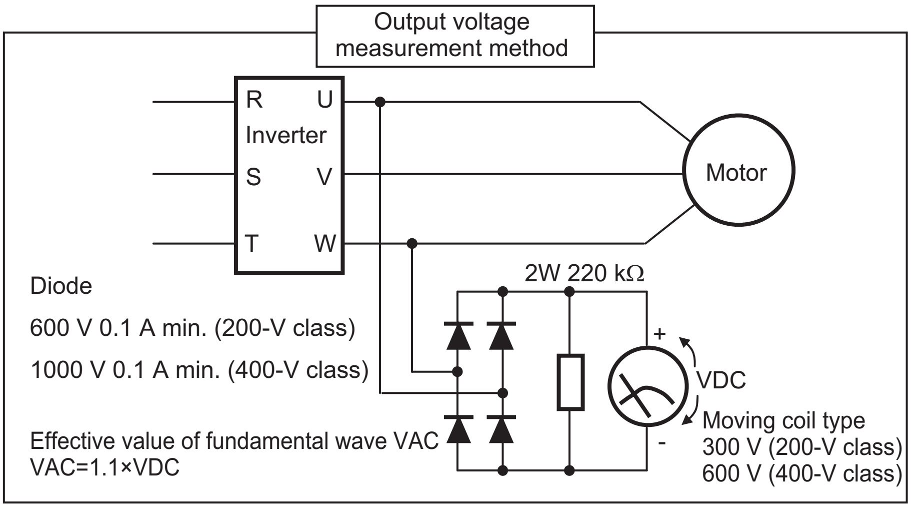


Measurement item	Measurement point	Measuring instrument	Remarks	Measurement value reference
Power supply voltage E_{IN}	Between L1/R and L2/S (E_R) Between L2/S and L3/T (E_S) Between L3/T and L1/R (E_T)	Moving-iron voltmeter or rectifier type voltmeter	All effective values	200-V class: 200 to 240 V, 50/60 Hz 400-V class: 380 to 480 V, 50/60 Hz

Measurement item	Measurement point	Measuring instrument	Remarks	Measurement value reference
Power supply current I_{IN}	Current in L1/R, L2/S, L3/T (I_R), (I_S), (I_T)	Moving iron ammeter	All effective values	When input current is not balanced: I_{IN}= (I_R+I_S+I_T)/3
Input electric power W_{IN}	Between L1/R and L2/S (W_{I1}) Between L2/S and L3/T (W_{I2}) Between L3/T and L1/R (W_{I3})	Electrodynamic wattmeter	All effective values	Three-wattmeter method (W_{I1}) + (W_{I2}) + (W_{I3})
Input power factor Pf_{IN}	Calculate this from the measured values of power supply voltage E_{IN}, power supply current I_{IN}, and input electric power W_{IN}. $Pf_{IN} = \frac{W_{IN}}{\sqrt{3} \cdot E_{IN} \cdot I_{IN}} \times 100\ [\%]$			-
Output voltage E_{OUT}	Between U and V (E_U) Between V and W (E_V) Between W and U (E_W)	Refer to the figure on the next page, or rectifier type voltmeter.	Effective value of fundamental wave	-
Output current I_{OUT}	Current of U, V and W (I_U), (I_V), (I_W)	Moving iron ammeter	All effective values	-
Output power W_{OUT}	Between U and V (W_{O1}) Between V and W (W_{O2})	Electrodynamic wattmeter	All effective values	Two-wattmeter method (or three-wattmeter method) (W_{O1}) + (W_{O2})
Output power factor Pf_{OUT}	Calculate this from the measured values of output voltage E_{OUT}, output current I_{OUT}, and output electric power W_{OUT}. $Pf_{OUT} = \frac{W_{OUT}}{\sqrt{3} \cdot E_{OUT} \cdot I_{OUT}} \times 100\ [\%]$			-

Note 1. For the output voltage, use a measuring instrument that shows effective values of fundamental wave. For the current and the electric power, use a measuring instrument that shows all effective values.

Note 2. The output waveform of the inverter has a margin of error, especially at low frequencies, because it was generated under PWM control. Note that many general-purpose testers may not be usable due to noise.


Output voltage
measurement method
R
U
Inverter
S
V
T
W
Motor
2W 220 kΩ
Diode
600 V 0.1 A min. (200-V class)
1000 V 0.1 A min. (400-V class)
+
VDC
-
Moving coil type
300 V (200-V class)
600 V (400-V class)
Effective value of fundamental wave VAC
VAC=1.1×VDC

A

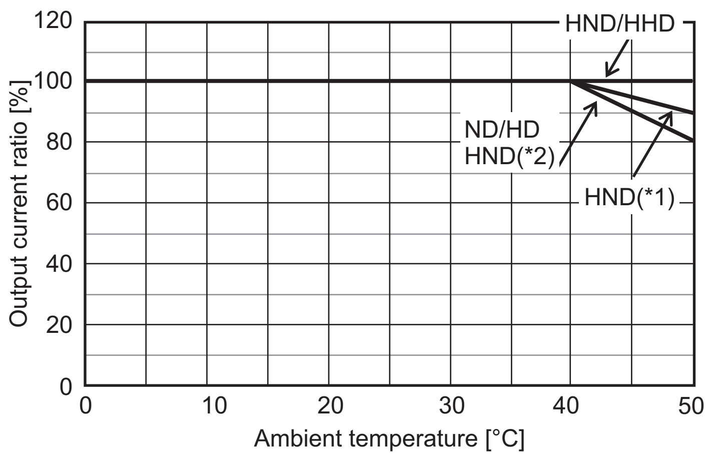
A

Appendix

This section provides information on derating, capacitor life curve and inverter selection.

A-1 Derating Table

If you intend to use the inverter models with HND/HD/ND modes at the temperature of 40°C or higher, derating is required. Refer to the following output current derating depending on ambient temperature.

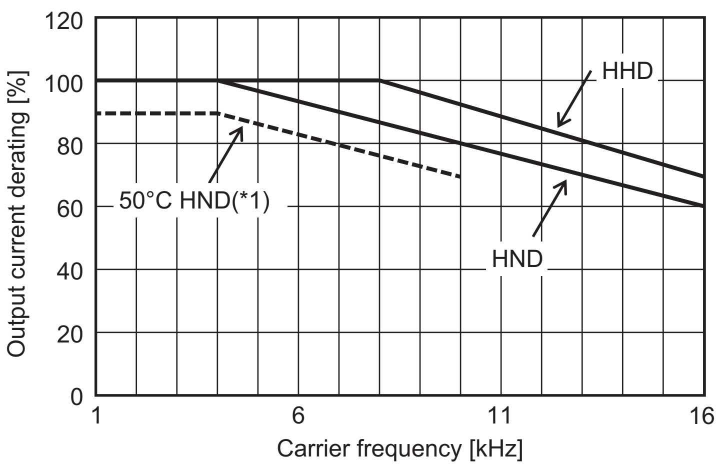


*1. If using the 3G3M1-A2022/A2037/A4022/A4040 at 50°C, refer to the following *When Changing the Carrier Frequency for Use* on page A-2.
*2. If using the 3G3M1-A4022/AB004/AB007/AB015/AB022 at 50°C, refer to the following *When Changing the Carrier Frequency for Use* on page A-2.

When Changing the Carrier Frequency for Use

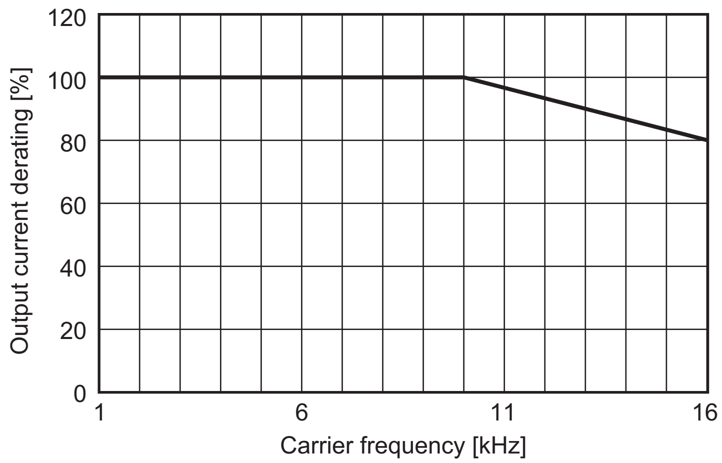
Refer to the following for derating output current when the carrier frequency is changed from the factory default. However, when using it side-by-side, the following derating is used in an ambient temperature of 40°C for HHD/HND and in an ambient temperature of 30°C for HD/ND.

● 3G3M1-A2001/A2002/A2004/A2007/A2015/A2022/A2037

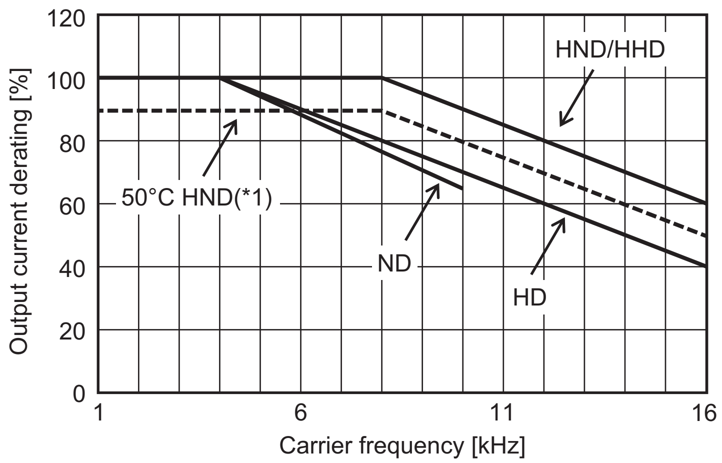


*1. When using 3G3M1-A2022/A2037 at 50°C.

- **3G3M1-A2055/A2075/A2110/A2150/A2185**

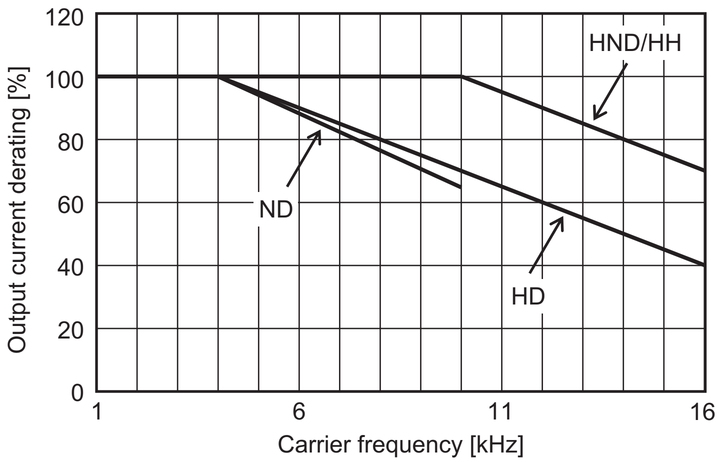


- **3G3M1-A4004/A4007/A4015/A4030/A4040/AB037**

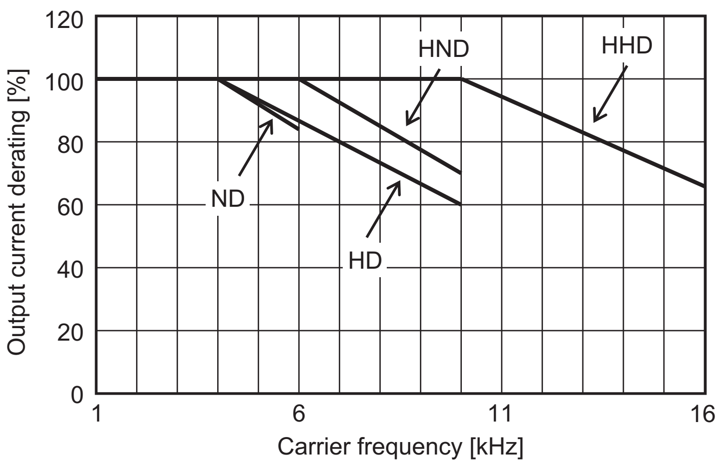


*1. When using 3G3M1-A4040 at 50°C.

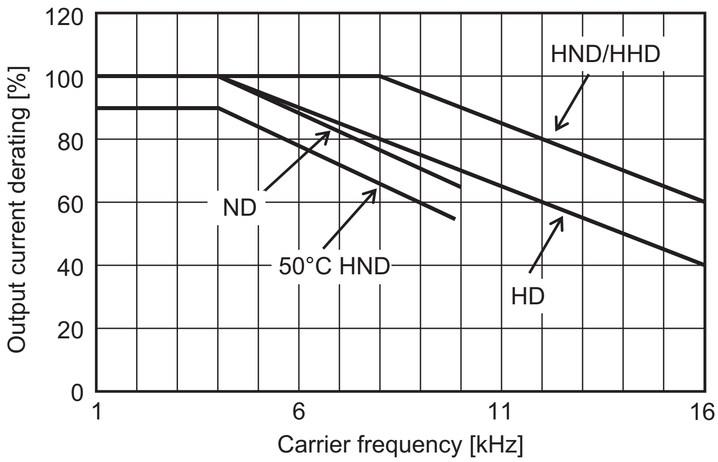
● **3G3M1-A4055/A4075/A4110/A4150/A4185**



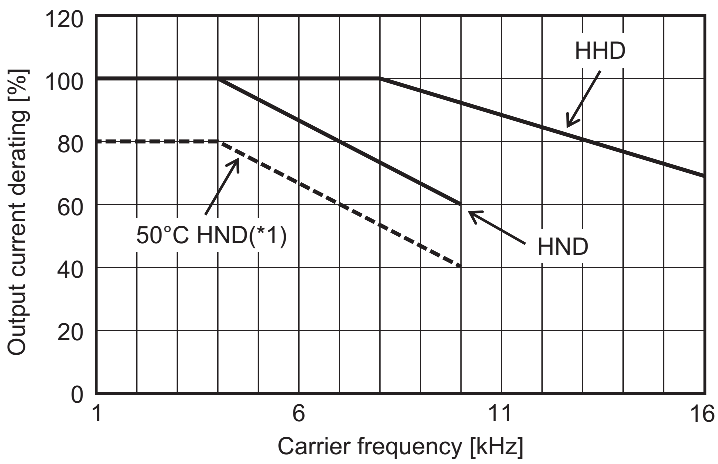
● **3G3M1-A4220**



- **3G3M1-A4022**

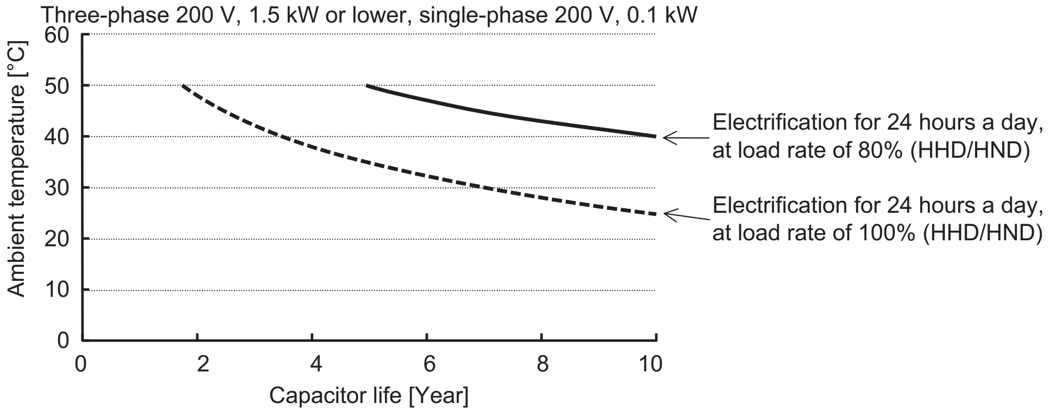


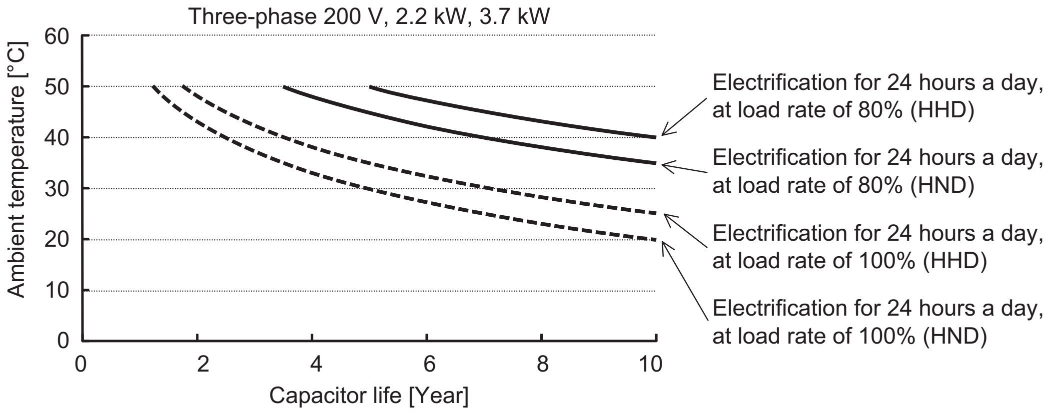
- **3G3M1-AB001/AB002/AB004/AB007/AB015/AB022**

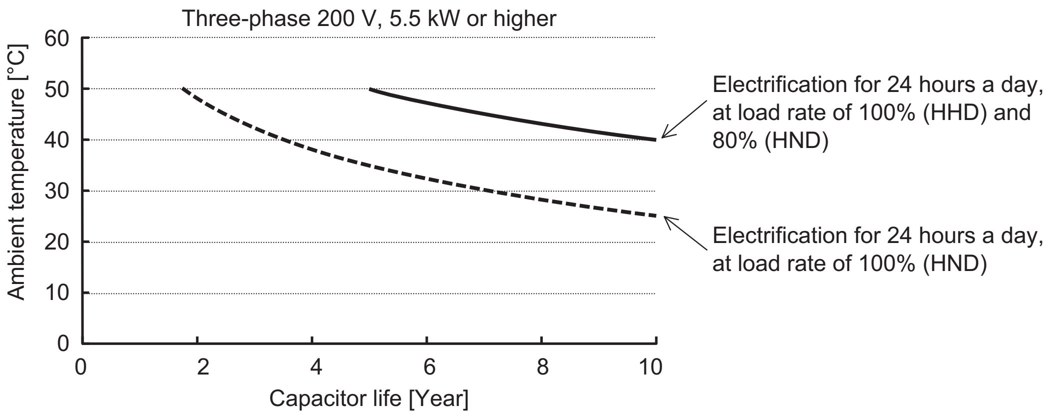


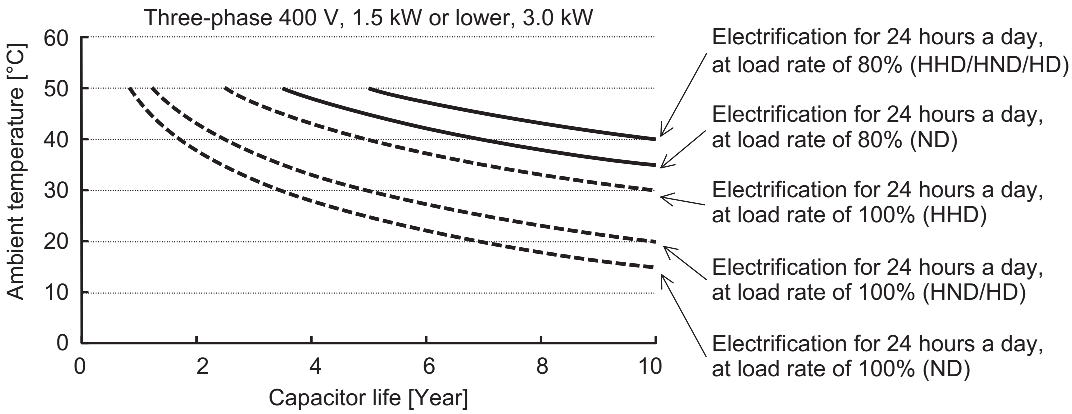
*1. When using 3G3M1-AB004/AB007/AB015/AB022 at 50°C.

A-2 Smoothing Capacitor Life Curve

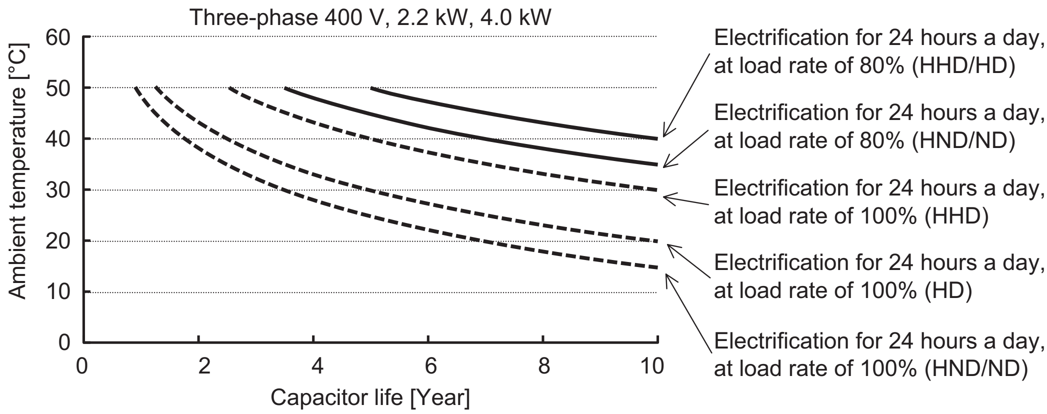




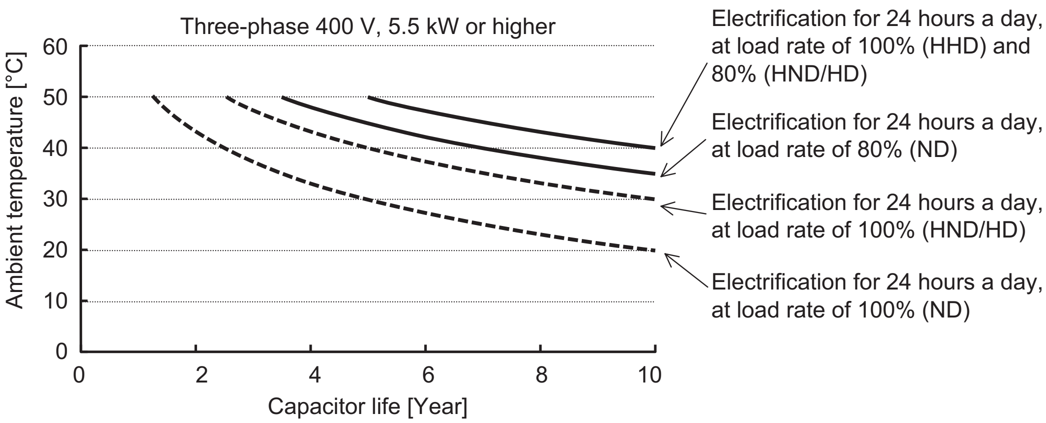




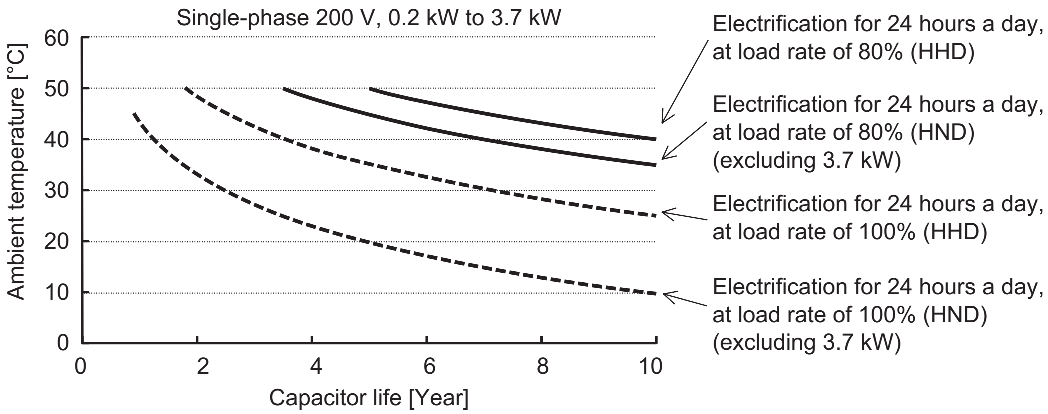
Three-phase 400 V, 1.5 kW or lower, 3.0 kW
Ambient temperature [°C]
60
50
40
30
20
10
0
0
2
4
6
8
10
Capacitor life [Year]
Electrification for 24 hours a day, at load rate of 80% (HHD/HND/HD)
Electrification for 24 hours a day, at load rate of 80% (ND)
Electrification for 24 hours a day, at load rate of 100% (HHD)
Electrification for 24 hours a day, at load rate of 100% (HND/HD)
Electrification for 24 hours a day, at load rate of 100% (ND)



Three-phase 400 V, 2.2 kW, 4.0 kW
Ambient temperature [°C]
60
50
40
30
20
10
0
0
2
4
6
8
10
Capacitor life [Year]
Electrification for 24 hours a day, at load rate of 80% (HHD/HD)
Electrification for 24 hours a day, at load rate of 80% (HND/ND)
Electrification for 24 hours a day, at load rate of 100% (HHD)
Electrification for 24 hours a day, at load rate of 100% (HD)
Electrification for 24 hours a day, at load rate of 100% (HND/ND)



Three-phase 400 V, 5.5 kW or higher
Ambient temperature [°C]
60
50
40
30
20
10
0
0
2
4
6
8
10
Capacitor life [Year]
Electrification for 24 hours a day, at load rate of 100% (HHD) and 80% (HND/HD)
Electrification for 24 hours a day, at load rate of 80% (ND)
Electrification for 24 hours a day, at load rate of 100% (HND/HD)
Electrification for 24 hours a day, at load rate of 100% (ND)



Note 1. "Ambient temperature" refers to the temperature measured at a distance of approximately 1 cm from the bottom center of the inverter (atmospheric temperature).
It refers to an interior temperature if the inverter is stored in a cabinet.

Note 2. The smoothing capacitor has a limited life because it is subjected to chemical reaction inside the part and, as a guide, the inverter needs to be replaced once a decade approximately. (This period is an expected design life, and not the guaranteed value.)
However, if the inverter is used at a high ambient temperature or in a heavy loaded environment, such as at the over-rated current, its life will be significantly shortened.

A-3 Life Alarm Output

The inverter can output an alarm by the self-diagnostic function when the service life of each consumable part incorporated in the inverter (main circuit capacitor, cooling fan, PC board electrolytic capacitor) comes close to the end. Use this as a guide to know the time for the parts replacement.
Note that this alarm is output by the self-diagnosis based on the expected design life (not guaranteed value). It has a margin of error depending on your environment or operation conditions.
For details, refer to *7-8-10 Capacitor Life Warning Signal (WAC)* on page 7-94, *7-8-12 Cooling Fan Life Warning Signal (WAF)* on page 7-97, and *7-8-13 Life Warning (LIFE)* on page 7-97.

A-4 Overview of Inverter Selection

A-4-1 Motor Capacity Selection

Before selecting an inverter, first the motor should be chosen. In selecting the motor, calculate the load inertia appropriate to the application, and then calculate the required capacity and torque.

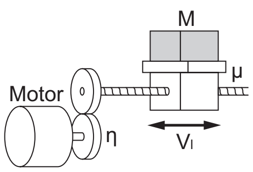
Simplified Selection Method (Required Output Calculation)

This method of calculation helps you select a motor by calculating the output (kW) required by the motor to maintain its steady rotations. To use this method for motor selection, make allowance for the calculated result because it does not include acceleration/deceleration and other transient state calculations. The simplified selection method is suitable for fan, conveyor, mixer and other applications where a constant state continues for a while.

Note The simplified selection method cannot be used for the following applications. For these applications, use the detailed selection method.

- Those requiring rapid startup (acceleration).
- Those that frequently repeat run and stop.
- Those that have a large inertia at the power transfer part.
- Those that have an inefficient power transfer part.

● For linear motion: Steady power P_0 [kW]

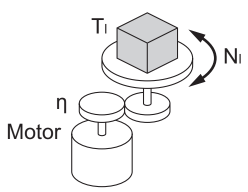


$$P0\ [kW] = \frac{\mu \cdot Mg \cdot V_l}{60 \cdot \eta} \times 10^{-3}$$

μ : Friction coefficient
M : Mass of linear motion part [kg]
g : Acceleration of gravity (g ≈ 9.8 [m/s²])
V_l : Speed of linear motion part [m/min]
η : Efficiency of transfer part (η ≤ 1)

Note The same calculating formula is applicable to belt conveyors.

● For rotation motion: Steady power P_0 [kW]



$$P0\ [kW] = \frac{2\pi \cdot T_l \cdot N_l}{60 \cdot \eta} \times 10^{-3}$$

T_l : Load torque (Load shaft) [N·m]
N_l : Rotation speed of load shaft [r/min]
η : Efficiency of transfer part (η ≤ 1)

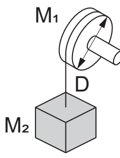
Detailed Selection Method (RMS Calculation)

This method helps you select a motor by calculating the effective torque and maximum torque values required to achieve a certain pattern of operation for the application. It selects a motor that is optimal for a particular operation pattern.

● Calculation of load inertia and motor-shaft conversion inertia

Depending on the type of the motor transfer system, calculate the inertia for all parts and convert it into the motor-shaft inertia.

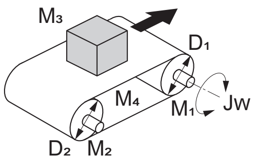
- Example in hoist application



$$J_W\,[\mathrm{kg\cdot m^2}] = J_1 + J_2 = \left(\frac{M_1 \cdot D^2}{8} + \frac{M_2 \cdot D^2}{4}\right) \times 10^{-6}$$

J_W : Shaft conversion inertia [kg·m²]
J_1 : Inertia of cylinder (Shaft conversion) [kg·m²]
J_2 : Inertia of workpiece (Shaft conversion) [kg·m²]
M_1 : Mass of cylinder [kg]
M_2 : Mass of workpiece [kg]
D : Diameter of cylinder [mm]

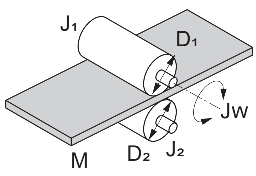
- Example in conveyor application



$$J_W\,[\mathrm{kg\cdot m^2}] = J_1 + J_2 + J_3 + J_4 = \left(\frac{M_1 \cdot D_1^2}{8} + \frac{M_2 \cdot D_2^2}{8} \cdot \frac{D_1^2}{D_2^2} + \frac{M_3 \cdot D_1^2}{4} + \frac{M_4 \cdot D_1^2}{4}\right) \times 10^{-6}$$

J_W : Shaft conversion inertia (Cylinder-1-shaft conversion) [kg·m²]
J_1 : Inertia of cylinder 1 (Cylinder-1-shaft conversion) [kg·m²]
J_2 : Inertia of cylinder 2 (Cylinder-1-shaft conversion) [kg·m²]
J_3 : Inertia of workpiece (Cylinder-1-shaft conversion) [kg·m²]
J_4 : Inertia of belt (Cylinder-1-shaft conversion) [kg·m²]
M_1 : Mass of cylinder 1 [kg]
M_2 : Mass of cylinder 2 [kg]
M_3 : Mass of workpiece [kg]
M_4 : Mass of belt [kg]
D_1 : Diameter of cylinder 1 [mm]
D_2 : Diameter of cylinder 2 [mm]

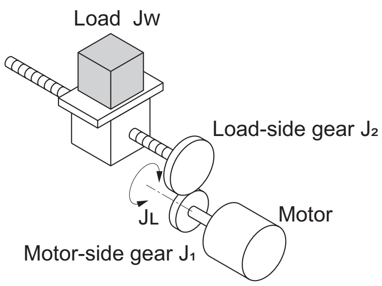
- Example in roller application



$$J_W\,[\mathrm{kg\cdot m^2}] = J_1 + \left(\frac{D_1^2}{D_2^2}\right) J_2 + \frac{M \cdot D_1^2}{4} \times 10^{-6}$$

J_W : Shaft conversion inertia (Roller-1-shaft conversion) [kg·m²]
J_1 : Inertia of roller 1 (Roller-1-shaft conversion) [kg·m²]
J_2 : Inertia of roller 2 (Roller-2-shaft conversion) [kg·m²]
M : Mass of workpiece [kg]
D_1 : Diameter of roller 1 [mm]
D_2 : Diameter of roller 2 [mm]

- Example of conversion into motor-shaft inertia



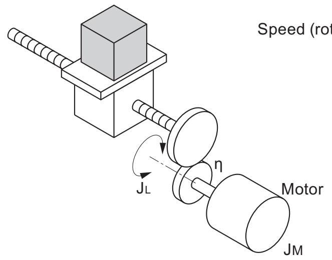
$$J_L\,[\mathrm{kg\cdot m^2}] = J_1 + G^2 (J_2 + J_W)$$

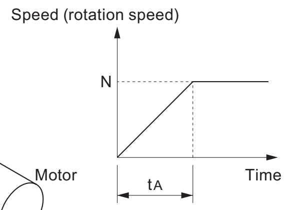
J_L : Motor-shaft conversion inertia [kg·m²]
J_W : Load inertia (Load-side gear-shaft conversion) [kg·m²]
J_1 : Inertia of motor-side gear [kg·m²]
J_2 : Inertia of load-side gear [kg·m²]
Z_1 : Number of motor-side gear teeth
Z_2 : Number of load-side gear teeth
G : Gear ratio (Speed reduction ratio) = Z_1 / Z_2

● Calculation of motor-shaft conversion torque and effective torque

Calculate the acceleration torque from the motor-shaft conversion load inertia, the motor-rotor inertia and the acceleration. Then, calculate the load torque from the external force (gravity and tension) and friction force applied to the load. Finally, combine these calculation results to calculate the torque required for the motor.

- Calculation of acceleration torque (T_A)

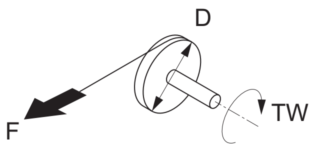




$$T_A[\mathrm{N\cdot m}] = \frac{2\pi \cdot N}{60 \cdot t_A}\left(J_M + \frac{J_L}{\eta}\right)$$

T_A : Acceleration torque [N·m]
J_L : Motor-shaft conversion load inertia [kg·m^2]
J_M : Motor-rotor inertia [kg·m^2]
η : Efficiency of transfer part ($\eta \leqq 1$)
t_A : Acceleration time [s]
N : Motor rotation speed [r/min]

- Calculation of motor-shaft conversion load torque (T_L)



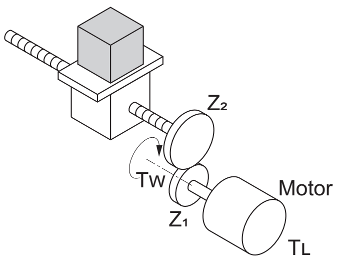
$$TW\ [\mathrm{N\cdot m}] = F \cdot \frac{D}{2} \times 10^{-3}$$

TW: Load torque (Load-shaft conversion) [N·m]
F: External force [N]
D: Diameter of cylinder [mm]

(Generally, the friction force can be calculated as below:)

$$F = \mu Mg\ [\mathrm{N}]$$

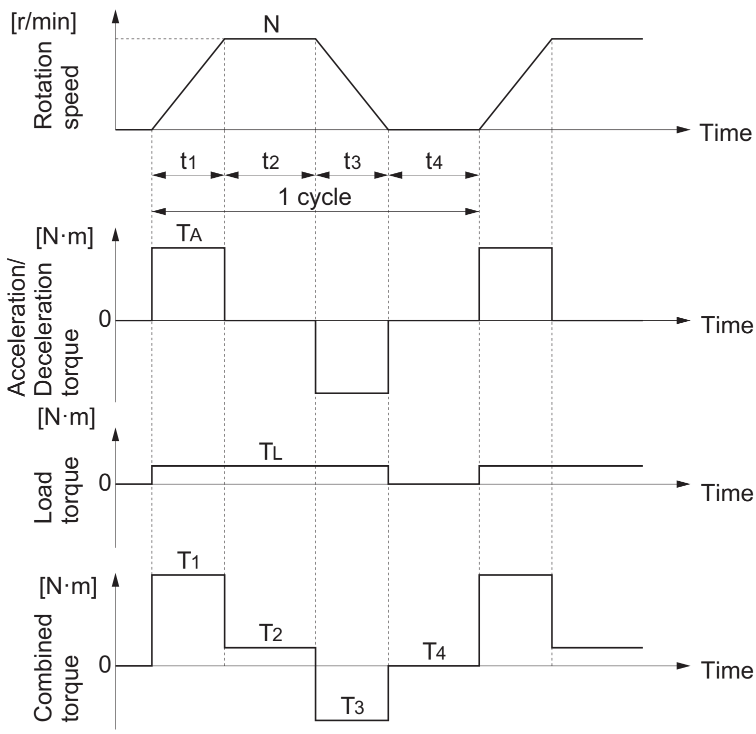
μ: Coefficient of friction
M: Mass of motion part [kg]
g: Acceleration of gravity ($g \approx 9.8$ [m/s^2])



$$T_L\ [\mathrm{N\cdot m}] = T_W \cdot \frac{G}{\eta}$$

T_L : Motor-shaft conversion load torque [N·m]
T_W : Load torque (Load-shaft conversion) [N·m]
Z_1 : Number of motor-side gear teeth
Z_2 : Number of load-side gear teeth
G : Gear ratio (Speed reduction ratio) = Z_1 / Z_2

- Calculation of combined torque and effective torque



- Effective torque T_{RMS} [N·m]

$$= \sqrt{\frac{\Sigma(T_i^2 \cdot t_i)}{\Sigma t_i}}$$

$$= \sqrt{\frac{T_1^2 \cdot t_1 + T_2^2 \cdot t_2 + T_3^2 \cdot t_3 + T_4^2 \cdot t_4}{t_1 + t_2 + t_3 + t_4}}$$

- Maximum torque T_{MAX} [N・m] = $T_1 = T_A + T_L$

● Motor selection

Based on the above calculation results, select the motor capacity by using the following formulae. Select the larger of the two calculated values as the motor capacity. Also, when selecting a motor, take into consideration the errors in calculation and modeling. Select a motor whose capacity is at least approximately 20% larger.

- Motor capacity conversion to effective torque

$$\text{Motor capacity [kW]} = \frac{2\pi \cdot T_{RMS} \cdot N}{60} \times 10^{-3}$$

N : Maximum rotation speed [r/min]

- Motor capacity required for maximum torque output

$$\text{Motor capacity [kW]} = \frac{2\pi \cdot T_{MAX} \cdot N}{60 \times 1.5} \times 10^{-3}$$

N : Maximum rotation speed [r/min]

Note The above calculation formulae assume that the maximum motor toque is 150% of the rated torque.

A-4-2 Inverter Capacity Selection

Select an inverter that can be used with the motor you selected based on the result of motor capacity selection.

Basically, select an inverter which fits the maximum applicable motor capacity of the selected motor. After selecting an inverter, check if it meets both of the following conditions. If not, select an inverter with one size larger in capacity and check again.

Rated motor current ≤ Rated output current of inverter
Max. continuous torque output time for application ≤ 1 min

Note 1. In the light load mode, the overload capacity of the inverter is 150% of the rated torque for 5 seconds. Use the 5-seconds rating when determining the maximum continuous torque.
Note 2. If you want to use 0 Hz sensorless vector control, need a holding torque at a rotation speed of 0 (r/min), or frequently require 150% of the rated torque or more, use an inverter with one size larger in capacity than the one selected by the above method.

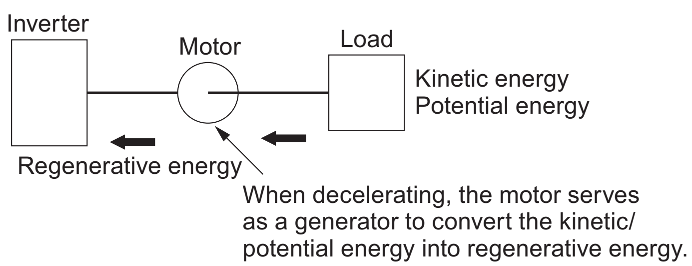
A-4-3 Overview of Braking Resistor Selection

Requirement of Braking Resistor

If the regenerative energy generated in deceleration or descent in an application is too large, the main circuit voltage in the inverter may increase, which results in damage to the inverter.
Normally, the inverter has a built-in overvoltage protection function, which detects an overvoltage (0 V) in the main circuit to prevent inverter damage. However, because it detects a fault to stop the motor, stable and continuous operation will be prevented.
Therefore, you need to use one or more braking resistors/regenerative braking units to absorb this regenerative energy outside the inverter.

● What is regenerative energy?

The load connected to a motor has kinetic energy when rotating, and potential energy when it is subject to the gravity. When the motor decelerates, or when the load descends, the energy is fed back to an inverter. This phenomenon is known as regeneration, and the energy is called regenerative energy.



● Preventing an overvoltage (0 V) in the main circuit without use of braking resistors

The following are methods to prevent the occurrence of an overvoltage (0 V) in the main circuit without connection of braking resistors.
Since these methods prolong the deceleration time, check that the selected method will not cause application problems.

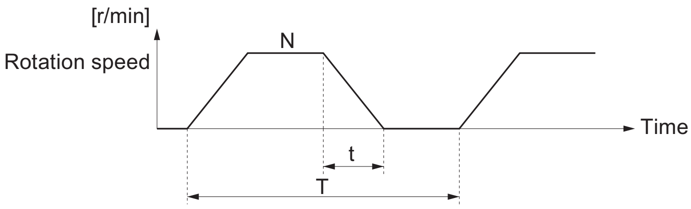
- Enable the overvoltage suppression function during deceleration
  The overvoltage suppression function during deceleration is enabled by default.

It automatically increases the deceleration time to prevent the occurrence of an overvoltage in the main circuit.

- Set a longer deceleration time
  Increase the deceleration time to prevent the occurrence of an overvoltage in the main circuit. This decreases the amount of regenerative energy per unit time.
- Select free-run stop
  This prevents the regenerative energy from being fed back to the inverter.

Simplified Braking Resistor Selection

This is a simple method to select an appropriate braking resistor based on the percentage of the time in which regenerative energy is produced in a normal operation pattern.



Usage rate [%ED] = 100 × t / T

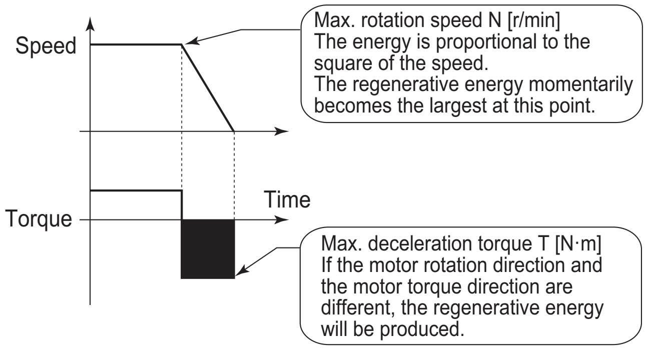
t : Deceleration time (regenerative time) [s]
T : 1cycle operation time [s]

All models of the 3G3M1 Series Inverter have built-in regenerative braking circuit.
Select a braking resistor based on the usage rate calculated from the operation pattern.
Connect a braking resistor suitable for your inverter according to the braking resistor list provided in the inverter manual/catalog.

Detailed Braking Resistor Selection

When the usage rate of the braking resistor selected on the previous section exceeds 10% ED, or when an extremely large braking torque is required, use the method below to calculate a regenerative energy and make your selection.

● Calculation of Required Braking Resistance



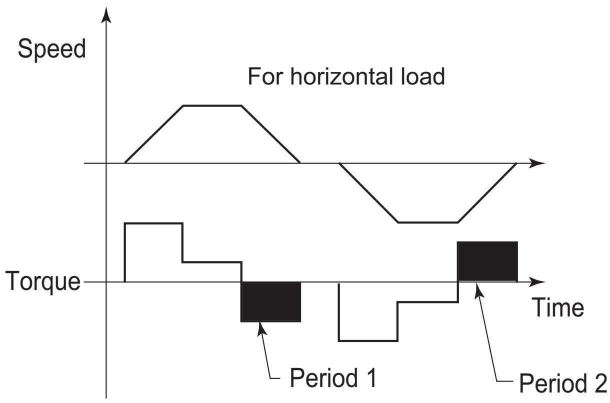
Resistance of braking resistor : $R \leq \dfrac{60 \times V^2}{2\pi \cdot (T - 0.2 \times T_m) \cdot N}$

V : 200-V class inverter 362.5 [V]
400-V class inverter 725 [V]
T : Maximum braking torque [N·m]
T_m : Motor rating torque [N·m]
N : Maximum rotation speed [r/min]

Note Calculate a braking torque according to Inverter Capacity Selection in the Motor Capacity Selection section.

● Calculation of average regenerative energy

Regenerative energy is produced when the motor rotation and the torque are opposite in direction. Use the following formula to calculate the regenerative energy for each period in a cycle.



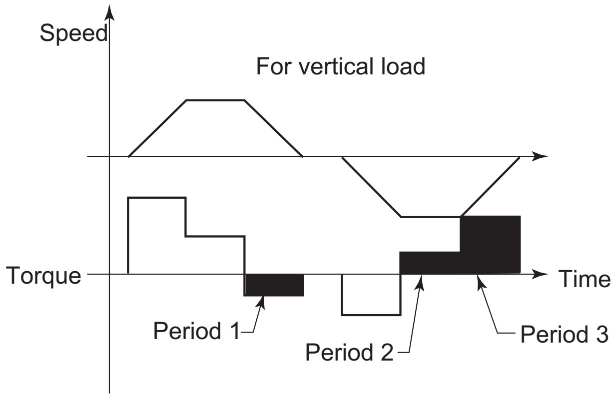
$P_i = N \times T \times t \times 1.047 \times 10^{-1}$

P_i : Regenerative energy in Period *i* [J]
N : Motor rotation speed [r/min]
When the number of rotations changes, take an average value.

ex. For linear deceleration
$(N_{max}+N_{min})/2$

T : Deceleration torque [N·m]
t : Deceleration time [s]

For the average regenerative energy, calculate the time average by adding the regenerative energy for all periods in a cycle and dividing it by the cycle time, as shown below.



Average regenerative energy [W]

$$= \frac{(P1+P2 \ldots +Pi)[J]}{1 \text{ cycle time [s]}}$$

Note 1. For Speed, the forward rotation direction is indicated as positive. For Torque, the torque in the forward rotation direction is indicated as positive.

Note 2. Calculate a braking torque according to Inverter Capacity Selection in the Motor Capacity Selection section.

● Braking Resistor Selection

Select a braking resistor from the required braking resistance and the average regenerative energy obtained in this calculation.

- Required braking resistance ≥ Resistance of braking resistor ≥ Min. connection resistance of inverter
- Average regenerative energy ≤ Resistance capacity of braking resistor

Note 1. Connecting a braking resistor whose resistance is less than the minimum connection resistance value of the inverter results in damage to the internal braking transistor. If the required braking resistance is less than the minimum connection resistance, change the inverter to one having a larger capacity and ensure that the required braking resistance is not less than the minimum connection resistance.

Note 2. Make allowance for the resistance capacity of the braking resistor. Select a braking resistor whose capacity is at least 20% larger than the calculated value. Otherwise, it may be overheated.

OMRON Corporation **Industrial Automation Company**

Kyoto, JAPAN **Contact : www.ia.omron.com**

Regional Headquarters

OMRON EUROPE B.V.
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31) 2356-81-300 Fax: (31) 2356-81-388

OMRON ELECTRONICS LLC
2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900 Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.
438B Alexandra Road, #08-01/02 Alexandra
Technopark, Singapore 119968
Tel: (65) 6835-3011 Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222 Fax: (86) 21-5037-2200

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