



Instruction Manual

AC Servo controller

VC II Series

C1 Type

Model

NCR-CD*1

Ver. 3.8

Manual No. TI-13891A

Preface

We thank you very much for adopting the AC servo controller <VC II -C1 Type> this time. Before use, please read this manual carefully to fully exploit the performance of this device.

In the text of this instruction manual, "VC II -C1 Type Instruction Manual" is indicated as "this manual" and in the same way, "AC Servo Controller <VC II -C1 Type>" is indicated as "Device" or "this device".

Precautions in safety

Before installation, wiring, operation, maintenance and inspection, and abnormality diagnosis and countermeasures, carefully read this manual and all other related operating instruction manuals for proper usage.

Before use, be sure to fully acquaint with the equipment, safety information, and other related precautions.

In the table below, cautions for safety are ranked as "Danger" and "Caution".

And contents to follow are ranked as "Prohibition" and "Compulsion".

 Danger	If mishandling is made, dangerous situation as death or serious injury on a worker could occur.
 Caution	If mishandling is made, dangerous situation as medium or light injury could occur and damages on goods could be suspected. However, since Caution-marked item could also cause serious results depending on the actual conditions, please comply with the important instructions.
 Prohibition	Prohibitions (actions not to be done) are indicated.
 Compulsion	Compulsions (actions to be done) are indicated.

Precautions in handling

Danger

 Prohibition	- Never touch inside of this device and terminal blocks. - Do not give damages, apply excessive force, and put any heavy articles on cables, and do not pinch any cable.	Electric shock may occur.
 Prohibition	Never touch rotating blocks of a running motor.	Injury may occur.
 Compulsion	- Be sure to ground the earth terminal or earth cable of this device and the motor. - Use the earth cable specified in this manual or a thicker cable than that, for the class-D grounding or better. - Execute relocation, wiring, maintenance, and inspection, after five minutes or more of the power-off. In the case of machine model that incorporates "CHARGE" LED, start job after "CHARGE" LED is turned off. Never fail to shut off the control power, adding to the main power.	Electric shock may occur.

Caution

 Prohibition	Never use this device in the atmosphere such as water splash, corrosive or flammable gas, nor place it close to combustible materials.	Fire or failure may occur.
 Prohibition	- Since temperature of the motor, this device, and peripheral equipment raise high, do not touch them. - In supplying power or for a while after shutting power off, since a radiator, regenerative unit, motor, and other components could be very hot, do not touch them.	Burn may occur.
 Compulsion	Use the motor and this device in the specified combination.	Fire or failure may occur.
 Compulsion	Never conduct voltage withstanding test and Mega test of this device.	Failure may occur.
	When driving the motor with an 400VAC-specification device, higher surge voltage than the motor withstanding voltage can be applied because of the length between the device and motor, wiring conditions, and the wire diameter, which can induce breakdown because of the deterioration of the motor insulation. Consult our sales representative if you need to take measures.	Motor failure may occur.

Storage

 Caution		
 Prohibition	Do not store this device in a place of raining, water dripping, and harmful gas and liquid.	Failure may occur.
 Compulsion	- Store this device in a place of no direct sunshine or under controlled temperature and humidity within the range specified by this manual. - Be sure to contact our sales representative when the storage period after purchase has passed more than three years.	Failure may occur.

Transportation

 Caution		
 Prohibition	Do not hold a shaft when handling the cable and motor in transportation.	Injury or failure may occur.
 Compulsion	Piling up or overloading the products can induce collapse of cargo; thus, follow instructions.	Injury or failure may occur.

Installation

 Caution		
 Prohibition	Do not climb or put any heavy thing on this device.	Injury or failure may occur.
 Prohibition	Do not apply heavy shock.	Equipment may be damaged.
 Compulsion	- Never block air-intake/exhaust windows and do not allow foreign substance to go in. - Be sure to install this device to the specified directions. - Attach this device to a non-flammable thing as metal.	Fire may occur.
 Compulsion	Distance of alignments between this device and the internal walls of control panel and other equipment should follow the measurements specified by this manual.	Fire and failure may occur.
 Compulsion	Conduct proper attachment suitable for the output or weight of this unit.	Equipment may be damaged.

Wiring



Danger

⚠ Compulsion	To avoid electric shock and noise influence, be sure to make proper grounding (earth).	Motor runaway, electric shock, injury, or machine damage may occur.



Caution

⚠ Compulsion	Be sure to conduct correct wiring.	Motor runaway or burnout, injury, or fire may occur.
⚠ Compulsion	To avoid the impact of noise on this device, use cables having the adequate length and features (shielded, twisted, and other treatments) specified by this manual. For the control input/output (I/O) signal line of this device, prepare another line system separate from other power lines and motor power lines.	Motor runaway, injury, or machine damage may occur.

Operation and run



Caution

⊘ Prohibition	- Since excessive adjustment can make the operation unstable, avoid this situation. - Brake of the brake-incorporated motor is to keep the machine position. Thus, do not use it for braking or to secure the machine safeness.	Injury or machine damage may occur.
⊘ Prohibition	Do not turn on the power in the condition where the motor shaft is in rotation or in vibration.	Motor runaway, injury, or machine damage may occur.
⊘ Prohibition	While the main power supply is ON, make sure the control power supply to be ON as well, and avoid energizing the main power supply only.	Motor runaway, injury, or machine damage may occur. Failure may occur.
⚠ Compulsion	Protect the motor by such as an emergency stop circuit having the built-in thermostat. If a motor does not have a thermostat, add protective functions separately.	Injury or fire may occur.
⚠ Compulsion	Check the power specifications are normal.	Injury, fire, or machine damage may occur.
⚠ Compulsion	- Install an emergency stop circuit externally, to stop operation instantly and shut off the power. - For trial run, fix the motor, check this device and motor only for operation, and then attach them to the machine. - When alarm happened, be sure to remove the cause after reset, and then restart.	Injury or machine damage may occur.

 Caution		
! Compulsion	- When using τ DISC motor, allow an interval of 15 seconds or more for the device power restart. * When the interval of power restart is less than 15 seconds, operation becomes unstable and hunting can occur if the external force is applied to the motor rotating plane. This phenomenon is caused by characteristics of the built-in encoder and is not a failure. However, when restarting this device in the routine use, allow 15 seconds or more from shut-off to restart at the motor stop.	Injury or machine damage may occur.
! Compulsion	After sudden blackout and restoration of power, keep away from the machine as it may restart suddenly. Design the machine to secure safeness of man even if it restarts.	Injury may occur.
! Compulsion	- Set the electronic thermal (parameter: P144) according to the operation of the device to use. - Avoid turning ON/OFF repeatedly. It may cause the deterioration of main circuit element.	Failure may occur.

Maintenance and inspection

 Caution		
⊘ Prohibition	Overhaul/repair shall be conducted only by us or personnel designated by us.	Failure may occur.
! Compulsion	Be sure to use the device in the range of stipulated environmental temperature and humidity.	Unusual operation and failure may occur.
	- The lifetime of the device closely relates to the surrounding temperature in use. Such use in hot and humid conditions can shorten the lifetime of the device; thus, pay attention. General understanding is that 10°C-increase in temperature shortens the lifetime of the equipment half. - Capacitance of the main circuit electrolytic capacitor inside the device becomes low due to deterioration. To prevent secondary accidents caused by failures, it is recommended to replace them in about five years. Thus, consult our sales representative. - Cooling effect of an equipped cooling fan motor of this device will deteriorate as the time goes by. To prevent secondary accidents caused by failures, recommended is to replace them about every two to three years. Thus, consult our sales representative.	Failure may occur.

Precautions before installation (during transportation)

During transportation, please handle with care so as not to damage the device and motor.

* Caution

- Do not pile up devices and do not put any item on the cover.
- Never apply heavy shock to the motor shaft.
→ The encoder attached to the motor may be broken.
- Do not move the motor by pulling its cable.
→ Cable disconnection may occur.

Cautions in storage

If the products are not used soon after receiving, store them under the following conditions in order to prevent deterioration of insulation and rust formation. However, unpack the packages, soon after receiving and check any damage and other non-conformances incurred during transportation.

Storage conditions of the device and motor

Item		Description
Ambient conditions	Temperature	-20°C to +60°C
	Humidity	85% or less (non-condensing)
	Storage location	Store in a clean place free from dust and dirt. Do not store in a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, oil, etc.
Vibration		Store in a place free from vibration.
Others		If you store the product for a long period of time, conduct rust prevention treatments onto the screws at the terminal block and carry out periodic inspection. Rust prevention effective period on the motor is within 3 months after the shipment from our factory under the above-described ambient conditions. If the storage period is planned for a long time more than the above period, please conduct rust prevention treatments on the shaft and flange face and inspect them periodically.

Precautions in transportation

When it is necessary to transport the products after receive, satisfy following conditions.

Transporting conditions of the device and motor

Item		Description
Ambient conditions	Temperature	-20°C to +60°C
	Humidity	85% or less (non-condensing)
	Storage location	Do not transport the products in a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, oil, etc.
Vibration		0.5G or less (Device and motor)



Caution

Humidity conditions remarkably affect the life of the device, particularly on the LCD module at the device front panel and on the optional SDI device.

Recommended storing or transporting condition is in humidity of 65% RH or less.

If the humidity exceeds 65% RH, contact our sales representative.

About this manual

This manual explains installation, wiring, way of use, maintenance and inspection, abnormality diagnosis, and countermeasures about the device and AC servo motor.

In order to use this device correctly, deeply understand the contents of this manual.

At the time of installation, wiring, operation, maintenance and inspection, and in other works, follow the conditions and procedures described on this manual.

When using a customized device, read this manual in parallel with the specification document for that customized device.

Here, the specification document prevails over this manual, if description and items are overlapped.

- When using the τ linear motor, read the description for "torque" as the one for "thrust".
- In the τ linear/ τ DISC motor, if the machine cannot carry out "automated magnetic pole detection operation (motor amplitude operation)" at the time of power-on, due to interference on works, use "magnetic pole sensor".
- In this manual, below descriptions are adopted.
Synchronous motor → SM motor
Induction type motor → IM motor
- In the body text, P + 3-numeric-digit representation such as P000 refers to a parameter number.
- Contents in this manual are subject to change without prior notification in future.

Warranty period

Warranty period of our products is one year after shipment from our factory.

However, please note that any failure or abnormality resulting from the following causes is not covered by the warranty.

- 1) Modification by parties other than us.
 - 2) Nonstandard operation different from rules and regulations stipulated by this manual.
 - 3) Natural disasters.
 - 4) Connection with another maker's unit which is not approved by us.
- Warranty of this device is limited for repairing only. Any damage caused by the fault of delivered device, or lost opportunity on the customer's side, profit loss, secondary damage, and accident will not be covered.
 - Regardless of the warranty period, please inform our sales person whenever you find any failure or abnormality.



Caution

- Our products have been designed and manufactured for the aim of the general purpose applications in the general industry and the products are not intended to be used in any equipment and system that may involve human life.
For this reason, we are free from any responsibility if the products are used in any other applications than we intended. (Examples: Applications in the equipment and system for the purpose of atomic, aerospace, medical, and passenger vehicles that may greatly involve the human-life and assets)
- When installing the product to the facility that may involve serious accidents and loss by excessive exterior noises or failure on the motor, install the back-up and fail-safe functions systematically.
- If used under the conditions where sulfur or sulfide gas is produced, splitting due to corrosion on the tip resistors or poor connection on the contacts can occur.

Export control

If you have any concerns that the intended use and/or the end user of this product and/or the technology you are going to supply may be used for the development of weapons of mass destruction and/or conventional weapons, for example, you may be subject to the export control specified in the "Foreign Exchange and Foreign Trade Law". Before exporting it, perform adequate examination and the necessary export procedure.

Overseas safety standards (EC directive, UL standard)

Be sure to read the attached [AC Servo Driver Installation Manual] regarding the installation, wiring, and way of use to comply with the overseas safety standards. As for the description about the overseas safety standards, the attached [AC Servo Driver Installation Manual] has priority. As for the applicable devices, refer to [12-1-4 Device electrical specification].

- EC directive

EC directive has been announced to unify the regulations in the EU accession countries for smooth distribution of the products of which safety has been guaranteed. The products aimed to be distributed in the EC accession countries are required to label a CE Mark (CE Marking) satisfying the fundamental safety conditions under the machine directive (effected in January 1995), EMC directive (effected in January 1996), and the low voltage directive (effected in January 1997) among the EC directive.

- 1) Machine directive

As the servo controller is not a machine, it is not necessary to follow this directive.

- 2) EMC directive

EMC directive is not for a servo unit alone, but for the machine and device that incorporate the servo. Our controller of our made was combined with a motor of our made, and this combined unit passed the test under the EMC standards (EN-61800-3).

- 3) Low voltage directive

The low voltage directive is applicable to the servo unit alone.

For this reason, our product was designed to comply with this low voltage directive and has been passed the safety test based on the EN61800-5-1.

- UL standards

It is a nonprofit testing agency that has been established by an insurance service organization in 1894, and UL represents "Underwriters Laboratories Inc.". Currently, it carries out the qualification test on every electrical products, and in US, it is the most prominent NRTL (Nationally Recognized Testing Laboratories).

As US and Canada concluded the MRA (Mutual Recognition Arrangement) each other, mutual recognition is possible. Therefore, devices produced by us acquired the C-UL recognition mark that means the CSA standards conformity.

Conformed standards are listed below.

UL standards (UL File No)	CSA standards	Accreditation agency
UL508C (E251116)	CSA C22.2 No.14	UL

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Chapter 1 Outline

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This device supports τ Linear/ τ DISC/IM/SM motor control, and it is a general-purpose, multifunctional "NC servo controller" composed of an integrated combination of a 1-axis positioning unit and AC servo driver.

Having many features as listed below, this device allows positioning control for various industrial machines.

Features of VC II -C1 type

- 1) 1-axis positioning unit and AC servo driver integration realizes wiring saving and downsizing of the system.
- 2) Digital control through driftless, solution of adjustment mismatch, enhancement of man-machine interface, and other features pursue the reliability and user-friendly operation.
- 3) Adopting a custom LCD module (option for a product of 1.2kW or less), various monitors, alarm history record, and self-diagnosis function are enhanced, and the operability and maintenance easiness are improved.
- 4) Many custom LSI with wiringless construction realizes reliability and downsizing of the device.
- 5) Adoption of IPM (IGBT) to the power switching block realizes improvement of the servo performance and noise reduction.
- 6) Mode-select can cope with the positioning run and pulse train run, which allows a wide range of applications.
- 7) Program run is enabled with 280 internally stored data items.
- 8) External trigger positioning is enabled.
- 9) Position data, speed data, and others can be set with indirect data.
- 10) Linear/S-curve acceleration/deceleration (accel/decel), feed-forward, torque command filter, at-stop and low-speed gain changeover, disturbance correction control, and all these real software servo enables control, fitting the machine rigidity.
- 11) One device can cope with various types of servo motors according to the parameter setting.
- 12) Control of "full closed loop" is enabled using the output of the measuring encoder as feedback pulses according to the parameter setting.
- 13) Serial communication allows connection with such peripheral equipment as the touch panel and master controller.
- 14) Through USB communication, connection with the dedicated editing software is possible.
- 15) By using the absolute encoder, Zero Return is not necessary.
- 16) Auto-tuning function has been installed.
- 17) Torque control and speed control are enabled using commands.
- 18) 8-axis run (when using servo control communication or pulse train communication function) is enabled, synchronizing with the command value.
- 19) Identical operation can control each motor of the τ linear/ τ DISC/IM/SM motor.
- 20) By connecting our interpolator unit (IPU), which is an option, highly accurate positioning is possible.

* IPU compatible encoder only.

1-2 System configuration

For the NCR-CD*1 type, peripheral system configurations are as shown in Figure 1-1.

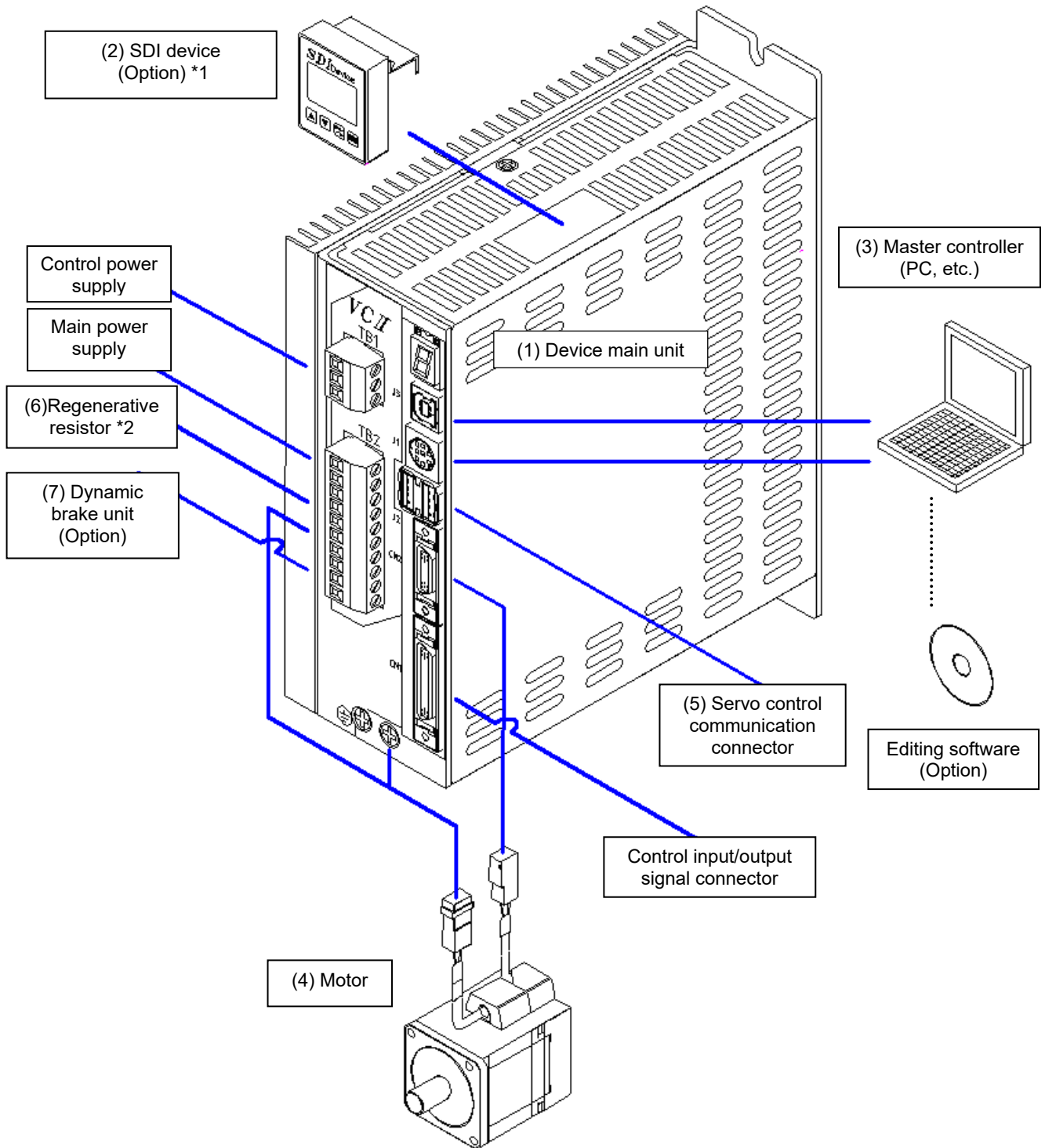


Figure 1-1 NCR-CD*1 type system configurations

*1 It is incorporated as standard in the device main unit as an LCD module for a product of 1.2kW or more capacity.

*2 Regenerative resistor is attached to a product of 800W or more capacity.

Outline

Names of parts

- 1) Device main unit
This device controls the τ linear/ τ DISC/IM/SM motor.
Using parameters, one device can cope with multiple kinds of AC servo motors and encoders.
- 2) SDI device (option)
Device status, input/output signal status display, and parameters are set with a cursor key.
It is incorporated as standard in the device main unit as an LCD module for a product of 1.2kW or more capacity.
- 3) Master controller (personal computer, etc).
Control software developed by us or end user can perform below:
 - Data display of status data (number of rotations, deviations, etc).
 - Control of the device control signal.
 - Parameter setting and backup.Some machine models cannot be connected with a commercial PC; so, please consult us upon necessary.
- 4) Motor
As standard, our AC servo motor is connected.
- 5) Servo control communication connector
This is connected to a servo control communication equipment, and up to 4-axis, synchronization control is possible.
(When using a pulse train communication function, possible up to 8-axis).
- 6) Regenerative resistor
This is used to consume regenerative energy that is produced at the motor braking.
It is attached to a product of 800W or more capacity.
- 7) Dynamic brake unit (option)
It can break motor coasting operation.
For information about the specifications and the connection method for the dynamic brake, refer to the Dynamic Brake Unit Instruction Manual.

* Setting of parameters and others are conducted with an LCD module of the device front panel or an SDI device (data creating unit) as an option. It is also possible to set through serial communication from the master controller or PC, or through USB communication between the dedicated editing software.

1-3 Mode configuration

1-3-1 Run mode

Each run mode is selected with parameters and control input signals as shown below. Each parameter can be set by an LCD module of the device front panel or by an optional SDI device or through serial communication from the master controller. It is also possible through USB communication from the editing software.

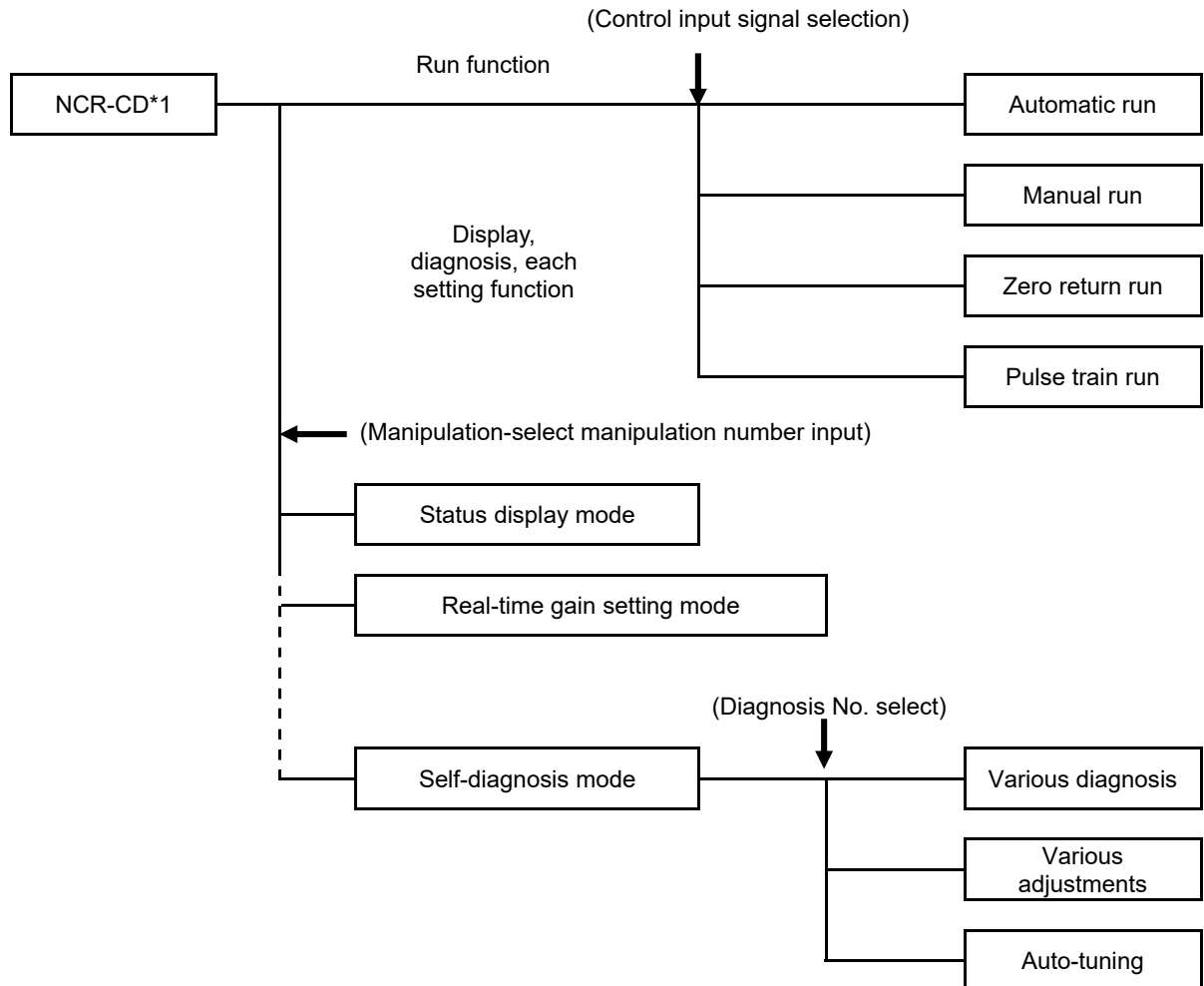


Figure 1-2 Mode configuration diagram

1-3-2 Operation mode

Operation block diagram on LCD block and SDI device (option)

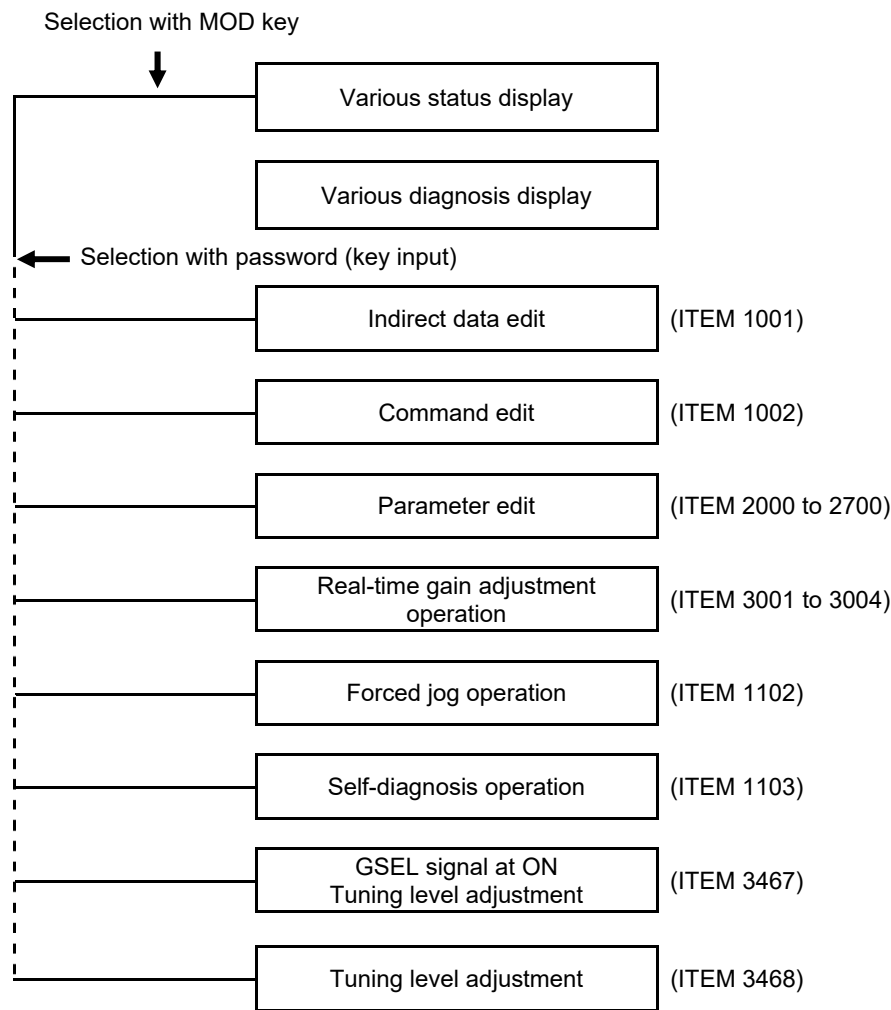


Figure 1-3 Operation block diagram

1-4 Procedure before run

To run this device, prepare according to the following procedure.

- 1 Product check at delivery
 - 1) No damages during transportation? (Check packages for no breakages and product surface for no abnormalities)
 - 2) Correct products? (Check the model and rated output, referring to Chapter 12, 12-1-1 Model)
 - 3) Accessories packaged? (Check the accessories, referring to Chapter 2, 2-1 Incoming check)
 - * If any short shipment or damages are found, please contact our sales representative immediately.

- 2 Installation

Correctly install the device, referring to Chapter 2, 2-2 Installation environment and 2-3 Installation method.

- 3 Wiring
 - 1) Wiring of the power supply block of the device main unit
Connect the power supply of the device main unit, referring to Chapter 3, 3-1, Power supply connection.
 - 2) Connecting of the motor
Connect the motor and the device main unit, referring to Chapter 3, 3-2 Motor connection.
 - 3) Grounding
Be sure to ground to prevent electric shock and for noise measures, referring to Chapter 3, 3-3 Grounding.
 - 4) Connecting the regenerative resistor
If the regenerative resistor is accessorized, refer to Chapter 3, 3-4 Regenerative resistor wiring.
 - 5) Control circuit wiring
The control circuit to connect with the device main unit is connected. Refer to Chapter 3, 3-5 Control circuit wiring.
 - 6) Noise prevention measures
To prevent troubles due to noise, be sure to take noise prevention measures and treatments, referring to Chapter 3, 3-6 Noise protection.

When carrying out each wiring, refer to Chapter 4, 4-1 External wiring diagram.

As for electric wire to use in wiring, adopt the one described in Chapter 3, 3-7 Applicable electric wire.

As for cables for the control circuit, adopt our options.

- 4 Inspection before run and start-up of the device
 - 1) Inspection before run
Be sure to carry out every item described in Chapter 5, 5-1 Before-run inspection.
 - 2) Start-up of the device
After completion of the inspection, carry out test run and adjustment, referring to Chapter 5, 5-4 Run procedure and the [Device start-up manual] provided as an additional volume.

Run start

Chapter 2 Installation

2-1	Incoming check	2-2
2-2	Installation environment	2-5
2-3	Installation method	2-6
2-3-1	Installation method for 15kW (11kW) or less capacity	2-6
2-3-2	Installation method for 20kW (15kW) or more capacity	2-7

2-1 Incoming check

At the time of product delivery, check below points.

- 1) Correct products as you ordered? (Model, rated output, etc).
- 2) No damages during transportation? (If no breakages in the package and no exterior abnormalities on products)
- 3) Found all accessories?

If found any short shipment or damages, please contact our sales representative immediately.

An accessory of the device differs depending on the model, as listed below.

Table 2-1 100V-device accessory list

Device model	Accessory	
	Model	Quantity
NCR-*D**A1A-051 Capacity: 0.05kW	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1
NCR-*D**A1A-101 Capacity: 0.1kW	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1
NCR-*D**A1A-201 Capacity: 0.2kW	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1

Table 2-2 200V-device accessory list (1/2)

Device model	Accessory	
	Model	Quantity
NCR-*D**A2A-101 Capacity: 0.1kW	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1
NCR-*D**A2A-201 Capacity: 0.2kW	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1
NCR-*D**A2A-401 Capacity: 0.4kW	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1
NCR-*D**A2A-801 Capacity: 0.8kW	Cement resistor [CAN60UT 82-ohm J]	1
	Thermostat [1NT01L0857L90-10]	1
	Thermostat fixing plate	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Main power supply input/motor power line output connector [MSTB2.5/10-ST-5.08]	1
NCR-*D**A2A-152(122)*1 Capacity: 1.5kW(1.2kW)*1	Cement resistor [CAN200UT 24-ohm J]	1
	Thermostat [1NT01L0857L90-10]	1
	Thermostat fixing plate	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2A-222 Capacity: 2.2kW	Cement resistor [CAN200UT 24-ohm J]	1
	Thermostat [1NT01L0857L90-10]	1
	Thermostat fixing plate	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1

*1 The model No. and capacity of IM type motors are mentioned in ().

Table 2-3 200V-device accessory list (2/2)

Device model	Accessory	
	Model	Quantity
NCR-*D**A2A-402 Capacity: 4.0kW	Cement resistor [CAN400UR 20-ohm J]	1
	Thermostat [1NT01L0857L90-10]	1
	Thermostat fixing plate	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2A-752(552)* ² Capacity: 7.5kW(5.5kW)* ²	Vitreous enamel resistor [RGH-300G-OS30J]	3
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2A-113(752)* ² Capacity: 11.0kW(7.5kW)* ²	Vitreous enamel resistor [RGH500G-OS22J]	3
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2A-153(113)* ² Capacity: 15.0kW(11.0kW)* ²	Vitreous enamel resistor [RGH500G-OS22J]	4
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2A-203(153)* ² Capacity: 20.0kW(15.0kW)* ²	Vitreous enamel resistor [RGH500G-OS22J]	6
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2B-303(223)* ² Capacity: 30.0kW(22.0kW)* ²	Vitreous enamel resistor [RGH500G-OS24J]	8
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2B-353(303)* ² Capacity: 35.0kW(30.0kW)* ²	Vitreous enamel resistor [RGH500G-OS24J]	8
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1
NCR-*D**A2B-373(373)* ² Capacity: 37.0kW(37.0kW)* ²	Vitreous enamel resistor [RGH500G-OS24J]	10
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
	Dynamic brake connector [MC1.5/2-ST-3.81]	1

*² The model No. and capacity of IM type motors are mentioned in ().

Table 2-4 400V-device accessory list

Device model	Accessory	
	Model	Quantity
NCR-*D**A3A-262 Capacity: 2.6kW	Cement resistor [CAN200UT 100-ohm J]	1
	Thermostat [1NT01L0857L90-10]	1
	Thermostat fixing plate	1
	Control power connector [MC1.5/2-STF-3.81]	1
NCR-*D**A3A-402 Capacity: 4.0kW	Cement resistor [CAN400UR 51-ohm J]	1
	Thermostat [1NT01L0857L90-10]	1
	Thermostat fixing belt	1
	Control power connector [MC1.5/2-STF-3.81]	1
NCR-*D**A3A-752(552)* ³ Capacity: 7.5kW(5.5kW)* ³	Vitreous enamel resistor [RGH300G-OS30J]	3
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
NCR-*D**A3A-113(752)* ³ Capacity: 11.0kW(7.5kW)* ³	Vitreous enamel resistor [RGH500G-OS82J]	3
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
NCR-*D**A3A-153(113)* ³ Capacity: 15.0kW(11.0kW)* ³	Vitreous enamel resistor [RGH500G-OS82J]	4
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
NCR-*D**A3A-203(153)* ³ Capacity: 20.0kW(15.0kW)* ³	Vitreous enamel resistor [RGH500G-OS82J]	5
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
NCR-*D**A3B-373(303)* ³ Capacity: 37.0kW(30.0kW)* ³	Vitreous enamel resistor [RGH500G-OS24J]	10
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1
NCR-*D**A3A-553(373)* ³ Capacity: 55.0kW(37.0kW)* ³	Vitreous enamel resistor [RGH500G-OS24J]	12
	Thermostat [03EN A130]	1
	Thermostat fixing belt	1
	Control power connector [MSTB2.5/3-ST-5.08]	1



Caution

If found damages on the package such as a cardboard box, please contact our sales representative without opening the package.

*³ The model No. and capacity of IM type motors are mentioned in ().

2-2 Installation environment

- (1) As for the ambient conditions of the device, refer to [12-1-2 General specification].
- (2) The device lifetime has a close relation with the temperature in use, and a use under the high temperature and high humidity environment may shorten the device lifetime. Generally it is said that an increase of 10°C in temperature can shorten the lifetime of equipment to half.
- (3) For the temperature inside the storage control panel, consider the surrounding temperature and the temperature increase due to a loss in the device and in the equipment inside the panel. Be sure to keep the surrounding temperature of the device within the permissible range. Calorific value of the device due to loss is about 7% + 50W of the motor capacity.
- (4) As the device is equipped with a fan to cool the radiator, secure an opening not to block airflow. When storing plural devices, align them so that ventilation does not influence each other. (Refer to Figure 2-1).
- (5) If there are nearby heating elements and vibrating sources, prepare an appropriate construction against the influence.
- (6) Do not install the product in a place of high temperature and high humidity or in places where excessive dust particles, metal powder, and cloud of steam exist, and in an environment where corrosive gas exists.
- (7) If there is a noise generation source such as a nearby electric welding machine, reinforce the grounding treatment to avoid mixture of induction noises. Depending on the using conditions, a noise filter may be required. Conduct the noise prevention measures, referring to [3-6 Noise protection].

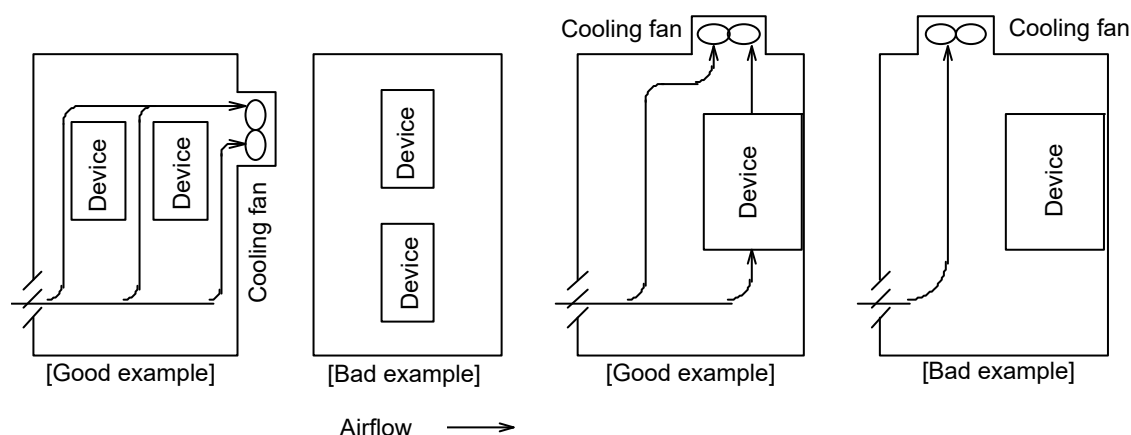


Figure 2-1 Alignment example when storing plural devices

 Caution
Be sure to use the device within the range of permissible surrounding temperature and humidity. Negligence may result in errors and failures.

2-3 Installation method

- (1) Be sure to install the device in the vertical direction to secure normal heat radiation effect.
- (2) Space around the device must be secured with the designated distance appointed by Figure 2-2 or Figure 2-4 (distance from other components or parts and a side wall of the control panel) in view of heat radiation efficiency and maintenance easiness.

2-3-1 Installation method for 15kW (11kW) or less capacity

*The capacity of IM type motors is mentioned in ().

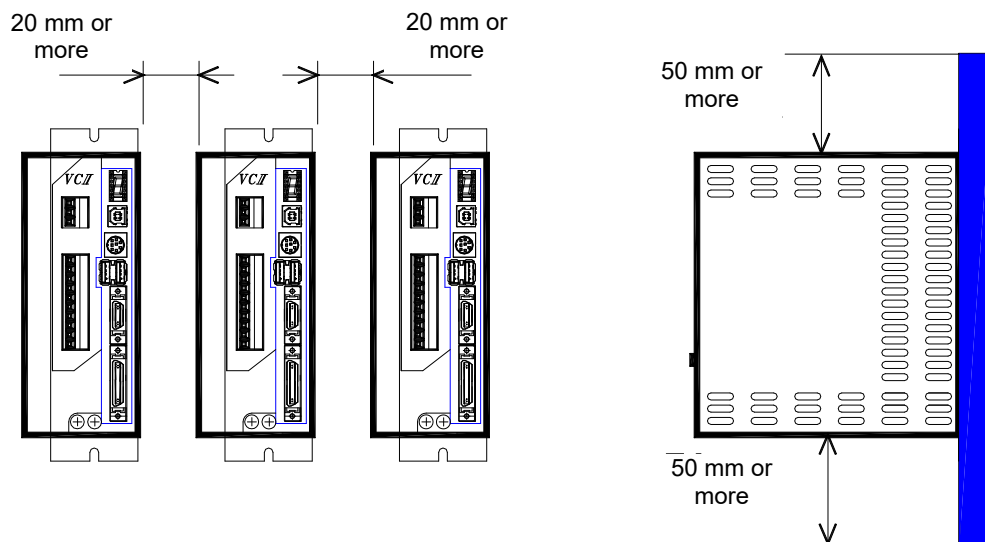


Figure 2-2 Installation and ventilation for a device of 15kW (11kW) or less product

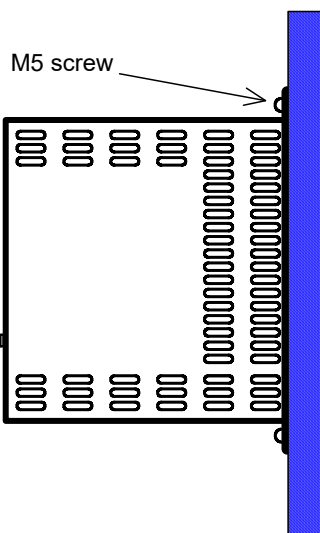


Figure 2-3 Installation method for a device of 15kW (11kW) or less product

2-3-2 Installation method for 20kW (15kW) or more capacity

*The capacity of IM type motors is mentioned in ().

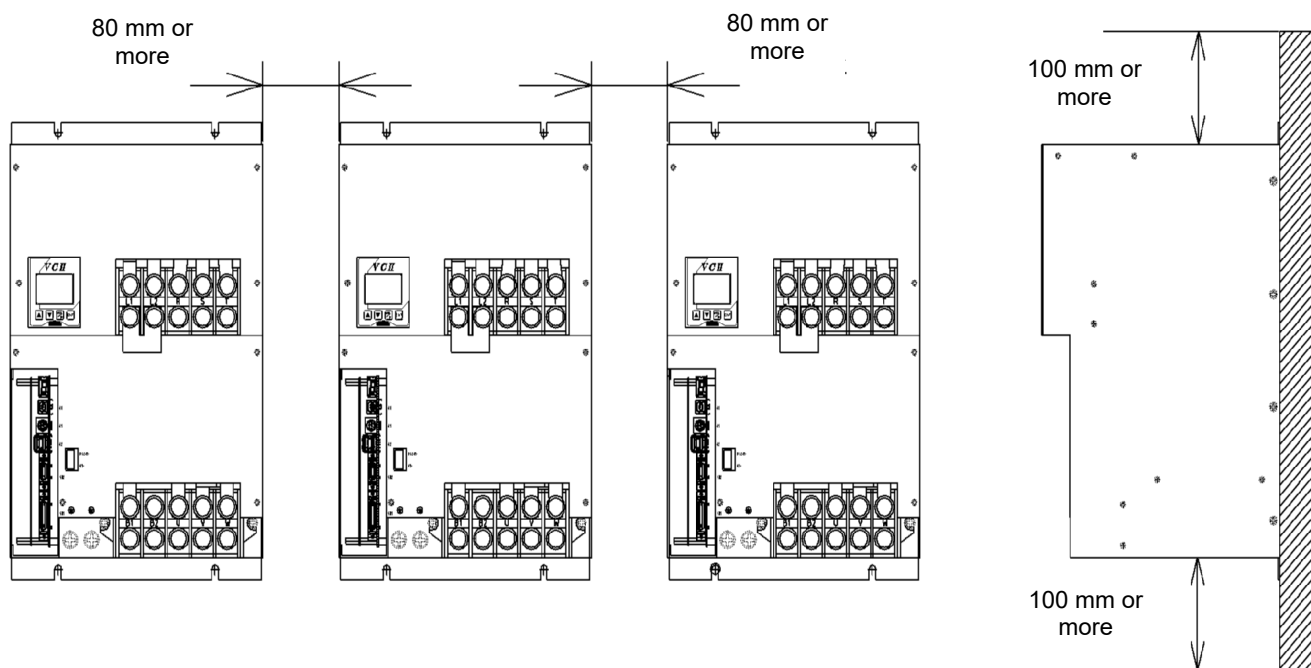


Figure 2-4 Installation and ventilation for a device of 20kW (15kW) or more product*⁴

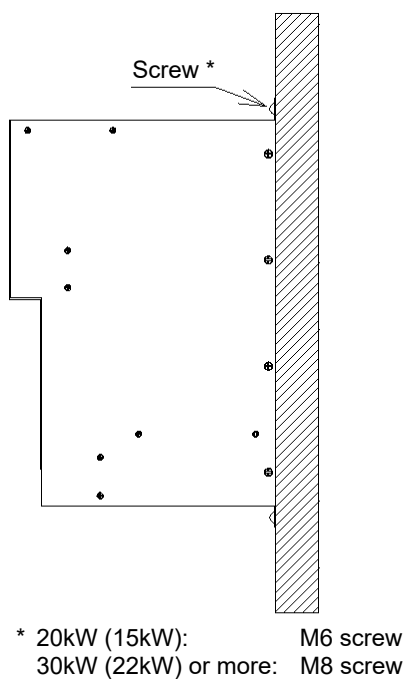


Figure 2-5 Installation method for a device of 20kW (15kW) or more product

*⁴ Above Figure 2-4 shows a 20kW device as references.

Chapter 3 Wiring

3-1-1	AC input power supply wiring	3-2
3-1-2	Power supply circuit	3-3
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3-2	Motor connection.....	3-7
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3-1 Power supply connection

3-1-1 AC input power supply wiring

- (1) AC input power supply is as follows.

NCR-*D**A1A-051 to	main power supply	100 to 115VAC, 50/60Hz	single-phase power supply
NCR-*D**A1A-201	control power supply	100 to 115VAC, 50/60Hz	single-phase power supply
NCR-*D**A2A-101 to	main power supply	200 to 230VAC, 50/60Hz	3-phase power supply
NCR-*D**A2A-1402	control power supply	200 to 230VAC, 50/60Hz	single-phase power supply
NCR-*D**A2*-752(552) to	main power supply	200 to 230VAC, 50/60Hz	3-phase power supply
NCR-*D**A2*-373(373)* ¹	control power supply	24VDC	DC power supply*
NCR-*D**A3A-262 to	main power supply	400 to 460VAC, 50/60Hz	3-phase power supply
NCR-*D**A3A-203(153)* ¹	control power supply	24VDC	DC power supply*
NCR-*D**A3B-373(303) to	main power supply	380 to 480VAC, 50/60Hz	3-phase power supply
NCR-*D**A3B-553(373)* ¹	control power supply	24VDC	DC power supply*

* Depending on the use conditions, over current protection may be activated for the 24VDC power supply due to inrush current. Thus, a power supply whose capacity is at least twice the rated capacity is recommended.

If there is a fluctuation in power supply due to the operating status of the factory, be sure not to exceed this limit.

- (2) For accident and fire prevention, install a molded case circuit breaker or fuse that is absolutely suitable for the line breaking capacity. When using an earth leakage circuit breaker, select a model that employs high-frequency measures for inverters.
- (3) As the main circuit of the device is the capacitor input type, big inrush current flows at the time of power-on. Therefore, voltage drop can be induced depending on the power capacity and power supply impedance. Allow enough spare or ample room in choosing the power capacity and electric wire.
- (4) Pay enough attention not to erroneously connect the AC input power supply (R, S, T, and E) to the motor connecting terminal (U, V, W, and E) of the device.
- (5) When the power supply capacity exceeds 500KVA, connect a reactor to coordinate power supply. (For information about the reactor, contact our sales representative.)



Caution

- Pay enough attention not to erroneously connect the AC input power supply (R, S, T, and E) to the motor connecting terminal (U, V, W, and E) of the device. Erroneous connection breaks the device.

*¹ The model No. of IM type motors are mentioned in ().

3-1-2 Power supply circuit

Representative power supply circuits are shown in Figure 3-1 to Figure 3-3.

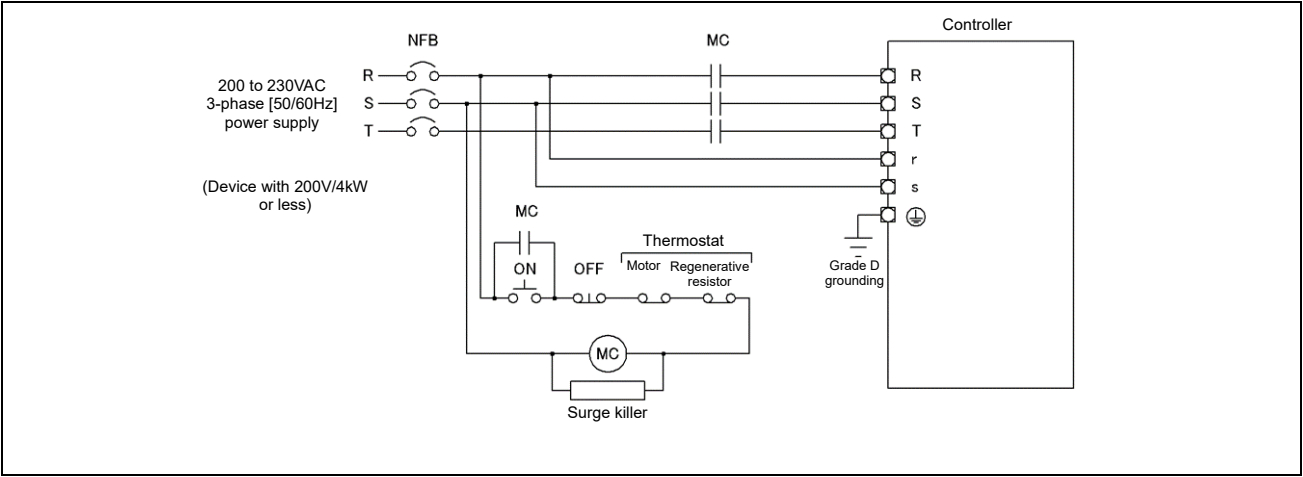


Figure 3-1 Representative power supply circuit in 3-phase power supply

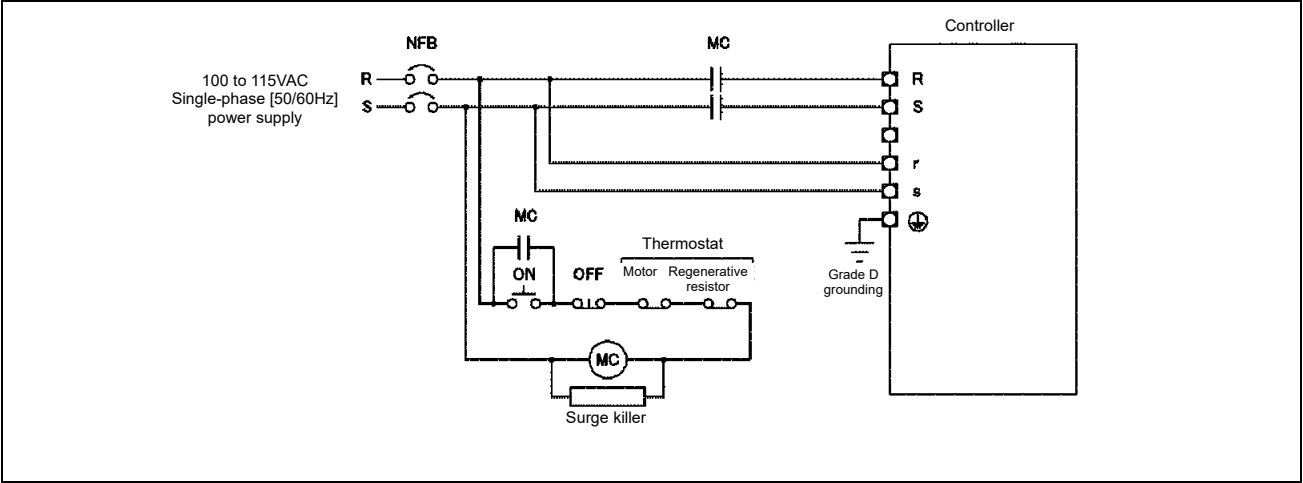


Figure 3-2 Representative power supply circuit in single-phase power supply

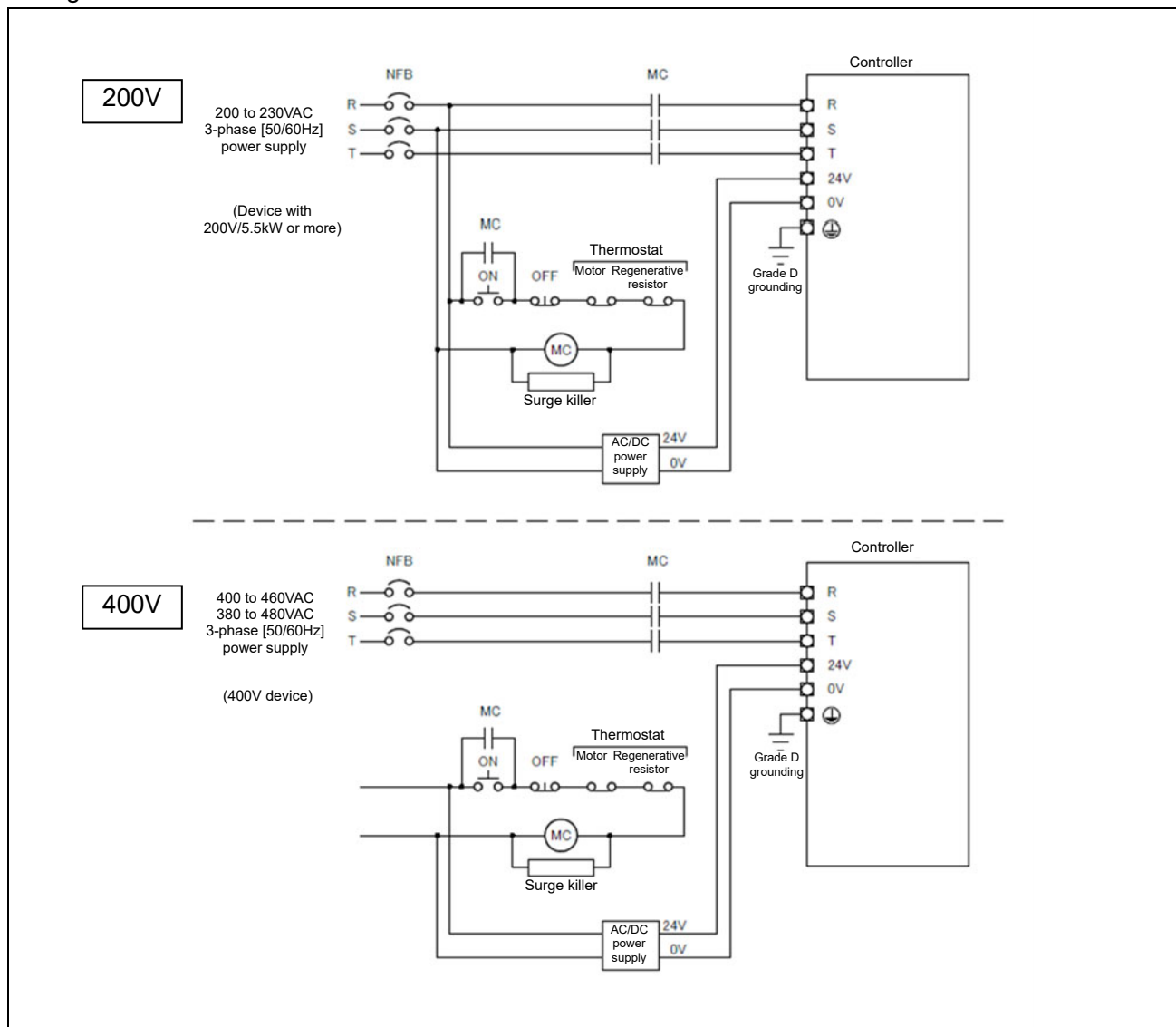


Figure 3-3 Representative power supply circuit in 24VDC power supply

⚠ Caution

- Never use by turning on the main power supply only. Device can be broken.
- Be sure to strictly keep the range of specifications for the power supply. Device can be broken.
- Install the molded case circuit breaker, for power supply line protection and for fire and accident prevention.
- As for the breaker capacity, refer to [Chapter 12 Data].
- When using the magnet contact, be sure to install the surge killer.
- Prepare special power supply for the device apart from the power supply for other high-power equipment when possible.

3-1-3 Power-on sequence

- (1) Avoid turning power ON/OFF repeatedly since the main circuit of the device is condenser input type, and it may cause the deterioration of main circuit element.
- (2) Turn on the control power supply before turning on the main power supply or at the same timing, and turn off the control power supply after turning off the main power supply or at the same timing.

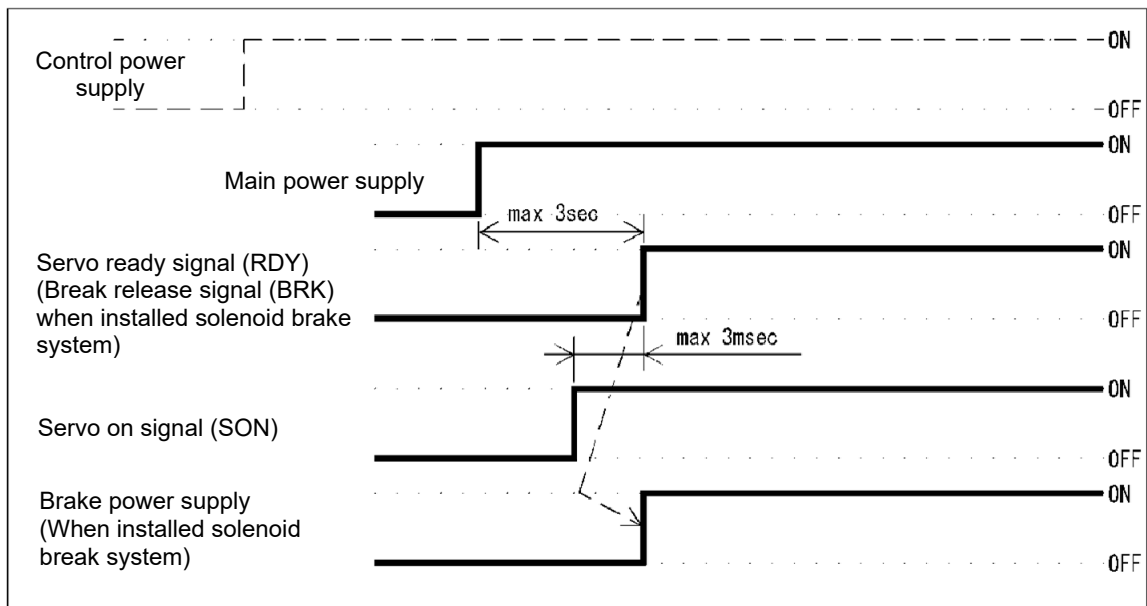


Figure 3-4 Timing chart at power-on

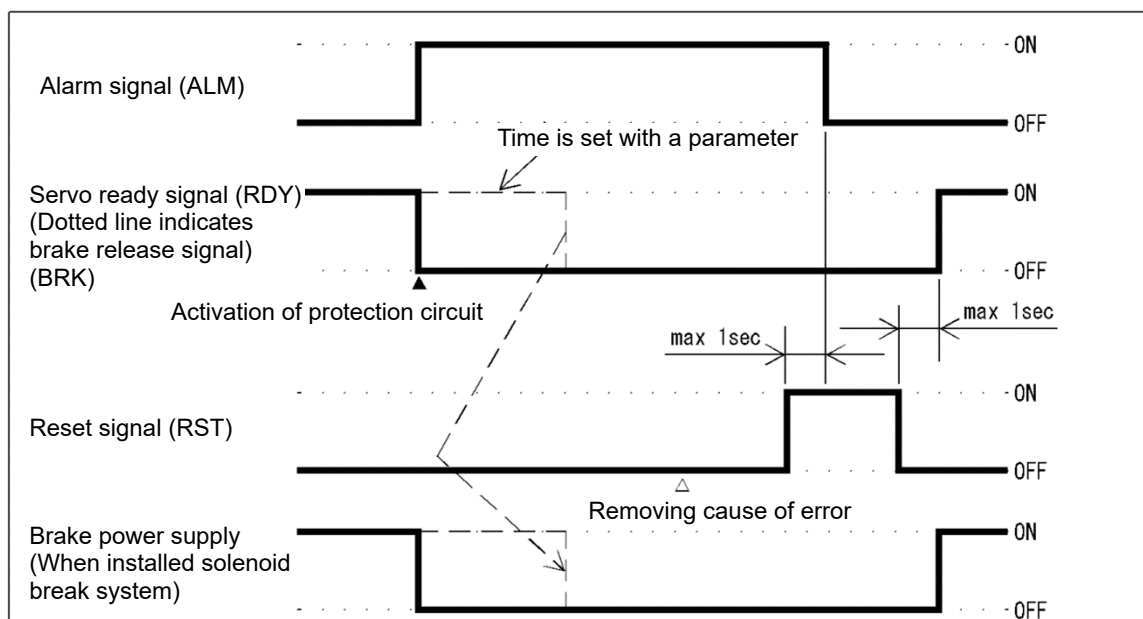


Figure 3-5 Timing chart at error-happening

3-1-4 Selecting molded case circuit breaker and earth leakage breaker

- For short circuit protection in case of device failure, select an appropriate breaker that has the rated breaking capacity suitable for the power capacity. For the breaker capacity per a device, refer to [12-1-4 Device electrical specification].
- When using the earth leakage circuit breaker, as the inverter block of the device is PWM control, its output contains harmonic components. Therefore, electrostatic capacitance against the ground in the electric line from the device to the motor and floating capacitance between the winding wire and the iron core in the motor generate leakage current.
- The leakage current of the harmonic components can activate the earth leakage circuit breaker. Thus, the earth leakage circuit breaker to use in the power supply circuit of the device should be selected in the inverter applicable type.



Caution

- The device may not function properly when the power is turned on immediately after power-off.
- If the over current or overload protection has been activated, remove the cause of abnormality, leave it for about 30 minutes for cooling, then restart the device. Repeated reset operation in a short period of time increases the device temperature abnormally, which leads to the device breakages.
- Set up the external sequence to stop the command upon the alarm occurrence due to the activation of protective function. On the contrary, when the power supply is restored after the electricity failure (including a sudden stop), do not set up the sequence that immediately runs the motor by entering commands (such as speed command voltage or pulse train).

3-2 Motor connection

3-2-1 Motor wiring

- (1) Connect correctly without mistakes in the phase sequence of the motor connecting terminal (U, V, W, E) and the device connecting terminal (U, V, W, E). (Connect U-U, V-V, and W-W respectively). Connection in the wrong phase sequence interrupts the normal operation, and the motor can vibrate and the motor can also run regardless of the input command, which is very dangerous.
- (2) Motor connecting terminals (U, V, W, E) of the SM motor, model NA720-122/182/242/402, NA830-162/332, and NA820-402/602/752/113/153, are the Cannon type (male). Prepare the Cannon connector for the wiring-side by the user or contact us for options. The table below indicates the Cannon model for the wiring-side (female), and Figure 3-6 indicates the motor connector No. and the connector connection table.

Table 3-1 Wiring-side (female) Cannon model

		NA720-122/182/242 NA830-162/332	NA720-402 NA820-402/602/752	NA820-113/153	NA820-113/153 For brakes
Motor-side Cannon connector		MS3102A20-18P	MS3102A24-11P	MS3102A32-17P	MS3102A10SL-4P
Option	Wiring-side Cannon connector	MS3106B20-18S	MS3106B24-11S	MS3106B32-17S	MS3106B10SL-4S
	Cannon cable clamp	MS3057-12A	MS3057-16A	MS3057-20A	MS3057-4A

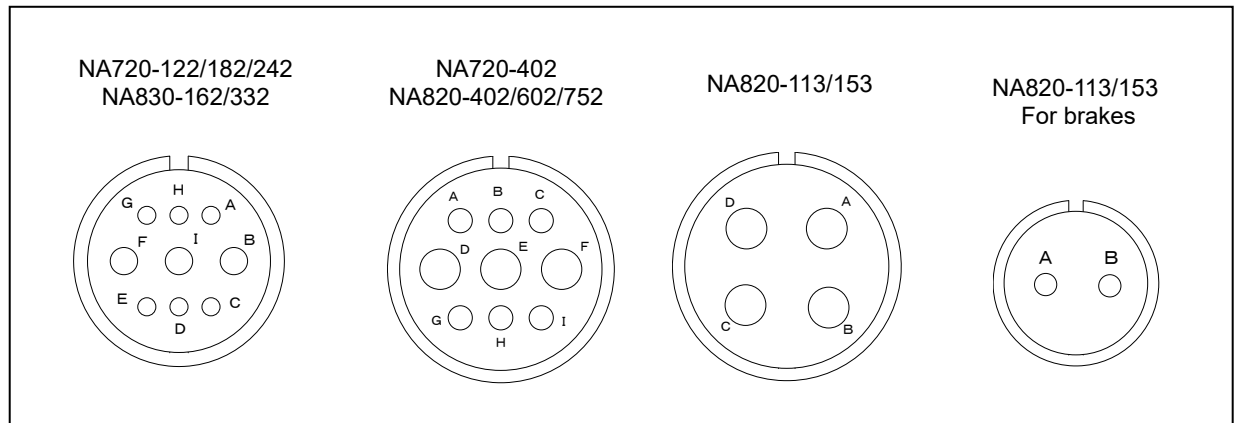


Figure 3-6 Layout of motor wire connector No.

Table 3-2 Connector connection table

Pin No.	NA720-122/182/242(BAMKS) NA830-162/332	NA720-402 (BAMKS) NA820-402/602/752	NA820-113/153	NA820-113/153 For brakes
A		(Brake)	U-phase	(Brake)
B	W-phase	(Brake)	V-phase	(Brake)
C			W-phase	
D		U-phase	Frame ground (E)	
E	Frame ground (E)	V-phase		
F	U-phase	W-phase		
G	(Brake)	Frame ground (E)		
H	(Brake)			
I	V-phase			

- (3) There is no polarity for the brake power supply. Specifications for the brake power supply are shown in the table below. Prepare a power supply with at least the stipulated capacity.

Table 3-3 Specifications for brake power supply

Motor model	NA720-122/182/242 NA830-162	NA830-332	NA720-402	NA820-402	NA820-602/752	NA820-113/153
Rated voltage [V]	DC 24	DC 24	DC 24	DC 24	DC 24	DC 24
Power consumption [W]	20	30	33	34.7	25	45

Wiring

- (4) Motor connecting terminal (U, V, W, E) of the τ linear/ τ DISC/NA70 motor employs either connector of a Mate-N-Lock (for products of 800W or lower in general) or of D5200 series (for products of 1.2kW or more in general) (both connectors are Tyco Electronics made, 4-pin). Prepare the wiring-side connector by the user or contact us for options.
[Table 3-4] and [Table 3-5] indicate the wiring-side model, motor connector No., and connector connection table.

Table 3-4 Wiring-side connector model for products less than 800W

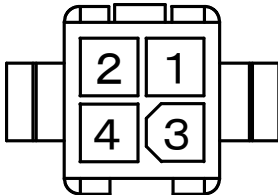
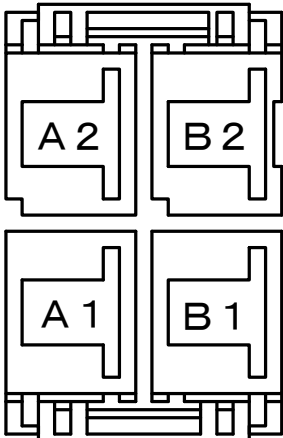
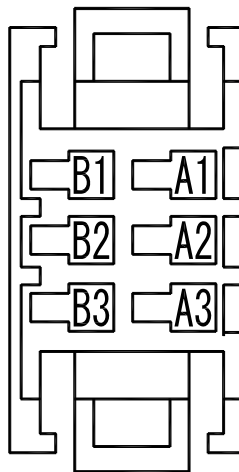
Connector to be used	Amp Miniuniversal Mate-N-Lock Connector (4-pin)/Tyco Electronics products											
	Motor-side connector	Wiring cable-side connector										
Connector main unit	Plug housing 172167-1	Cap housing 172159-1										
Contact	Pin 170360-1 or 170364-1	Socket 170362-1 or 170366-1										
Pin position	 <table><tr><th>Pin No.</th><th>Signal name</th></tr><tr><td>1</td><td>U</td></tr><tr><td>2</td><td>V</td></tr><tr><td>3</td><td>W</td></tr><tr><td>4</td><td>E</td></tr></table>		Pin No.	Signal name	1	U	2	V	3	W	4	E
Pin No.	Signal name											
1	U											
2	V											
3	W											
4	E											

Table 3-5 Wiring-side connector model for products of 1.2kW or more

Connector to be used	D5200 series connector (4-pin)/Tyco Electronics products										
	Motor-side connector	Wiring cable-side connector									
Connector main unit	Tab housing 1-917808-2	Receptacle housing 1-917807-2									
Contact	Tab contact 917804-2	Receptacle contact 316040-2									
Pin position											
	<table><tr><th>Pin No.</th><th>Signal name</th></tr><tr><td>B 1</td><td>U</td></tr><tr><td>B 2</td><td>V</td></tr><tr><td>A 1</td><td>W</td></tr><tr><td>A 2</td><td>E</td></tr></table>		Pin No.	Signal name	B 1	U	B 2	V	A 1	W	A 2
Pin No.	Signal name										
B 1	U										
B 2	V										
A 1	W										
A 2	E										

- (5) In the NA80 motor, motor connecting terminals (U, V, W, E) are compatible with the D2000 series connector. Prepare the wiring-side connector by the end user or contact us for options.
[Table 3-6] indicates the wiring-side model, motor connector No., and connector connection table.

Table 3-6 NA80 motor wiring-side connector model

Connector to be used	D2000 series connector (6-pin)/Tyco Electronics products															
	Motor-side connector	Wiring cable-side connector														
Connector main unit	Tab housing 178964-3	Receptacle housing 178289-3														
Contact	Tab contact 175289-2, 175288-2(B2,B3)	Receptacle contact 175218-2														
Pin position																
	<table border="1"><thead><tr><th>Pin No.</th><th>Signal name</th></tr></thead><tbody><tr><td>A 1</td><td>U</td></tr><tr><td>A 2</td><td>V</td></tr><tr><td>A 3</td><td>W</td></tr><tr><td>B 1</td><td>E</td></tr><tr><td>B 2</td><td>Brake</td></tr><tr><td>B 3</td><td>Brake</td></tr></tbody></table>		Pin No.	Signal name	A 1	U	A 2	V	A 3	W	B 1	E	B 2	Brake	B 3	Brake
	Pin No.	Signal name														
	A 1	U														
	A 2	V														
	A 3	W														
	B 1	E														
	B 2	Brake														
B 3	Brake															

- (6) Specifications for the brake power supply are shown in the table below. Prepare a power supply with at least the stipulated capacity.

Table 3-7 Specifications for brake power supply

Motor model	NA80-05/10	NA80-20/40	NA80-60/75
Rated voltage [V]	DC 24	DC 24	DC 24
Power consumption [W]	5	9	9.5

- (7) On the motor-device wiring, do not connect a magnet switch or a molded case circuit breaker.
- (8) When using a motor with a brake, be sure to release the brake before operating the motor. If the motor is operated without releasing the brake, the motor may be burn out. Thus, pay attention to the timing, referring to Figure 3-4.
- (9) The device is equipped with an electronic thermal unit. When adding a thermal relay externally, set the current value to the rated current of the motor. If the thermal relay is activated, set up the sequence to switch OFF the Servo-on signal (SON) by using the auxiliary contact of the thermal relay, and stop the motor operation. (Refer to Figure 3-7)

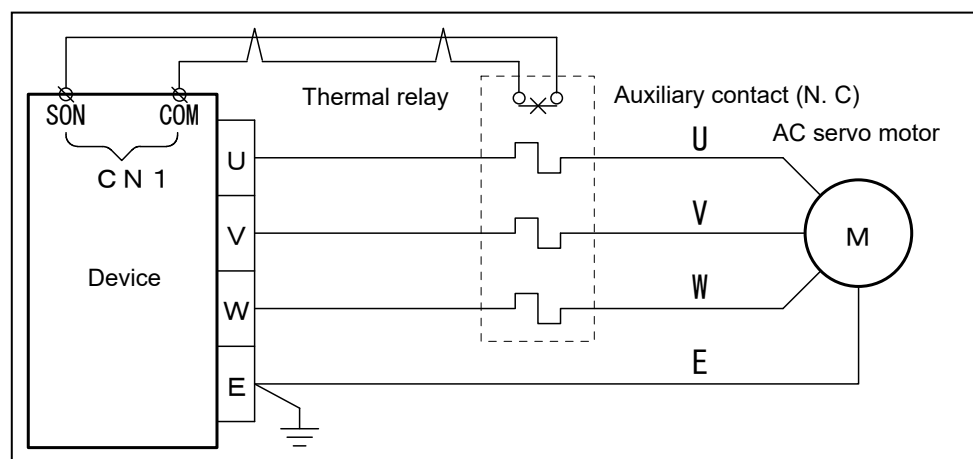


Figure 3-7 Motor wiring

Wiring

- (10) In the IM motor (NA100), a thermostat of B-contact (normally closed) is embedded for motor overheat protection. Wire the elements to cut off the main power supply when the contact is activated, referring to Figure 3-1 to Figure 3-3. Specifications of the thermostat contact are as follows.

Table 3-8 Specifications of thermostat contact

Contact voltage	Contact current (Max/Min)
24VDC	2A/0.05A
240VAC	2A/0.05A

- (11) If the motor is to be operated with a 400VAC device, the motor may be damaged due to the application of any surge voltage exceeding the motor withstand voltage to the motor. Thus, install an AC reactor between device and motor.

3-2-2 Setting motor run direction

Relations between each command and motor run direction are shown below, provided motor and encoder are connected in the standard specifications.

Confirm that the correct value for relations between encoder and magnetic pole sensor is input to [P008: Encoder & magnetic pole sensor direction selection].

1) Rotation direction of IM/SM motor

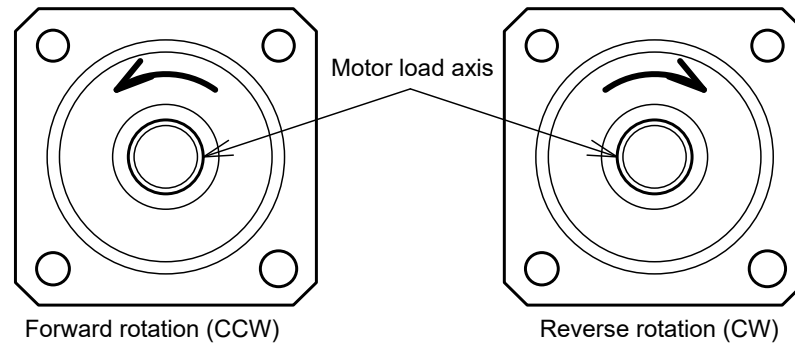


Figure 3-8 Rotation direction of IM/SM motor

Table 3-9 Each command input and motor rotation direction (with IM/SM motor)

Command input form	Polarity	Motor rotation direction
Positioning operation command	Forward direction	Checking motor load axis, axis rotates counter clockwise: Forward rotation (CCW)
	Reverse direction	Checking motor load axis, axis rotates clockwise: Reverse rotation (CW)
Directional pulse train command	Forward direction	Checking motor load axis, axis rotates counter clockwise: Forward rotation (CCW)
	Reverse direction	Checking motor load axis, axis rotates clockwise: Reverse rotation (CW)
90° phase difference pulse train command	B-phase ahead	Checking motor load axis, axis rotates counter clockwise: Forward rotation (CCW)
	A-phase ahead	Checking motor load axis, axis rotates clockwise: Reverse rotation (CW)

2) Rotation direction of τ DISC motor

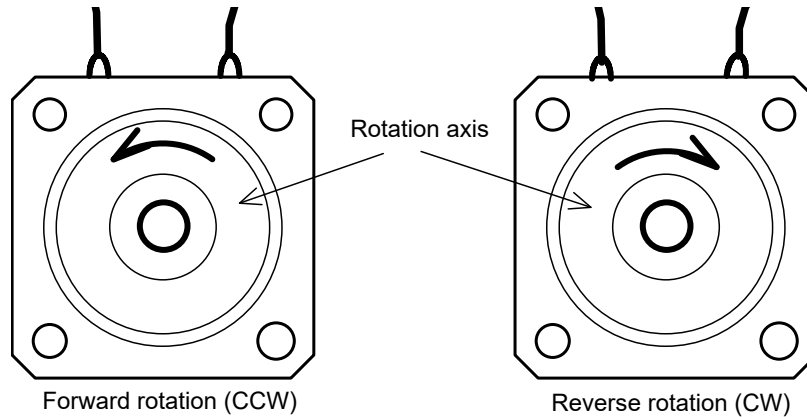


Figure 3-9 Rotation direction of τ DISC motor

Table 3-10 Each command input and motor rotation direction (with τ DISC motor)

Command input form	Polarity	Motor rotation direction
Positioning operation command	Forward direction	Checking rotation axis, axis rotates counter clockwise: Forward rotation (CCW)
	Reverse direction	Checking rotation axis, axis rotates clockwise: Reverse rotation (CW)
Directional pulse train command	Forward direction	Checking rotation axis, axis rotates counter clockwise: Forward rotation (CCW)
	Reverse direction	Checking rotation axis, axis rotates clockwise: Reverse rotation (CW)
90° phase difference pulse train command	B-phase ahead	Checking rotation axis, axis rotates counter clockwise: Forward rotation (CCW)
	A-phase ahead	Checking rotation axis, axis rotates clockwise: Reverse rotation (CW)

3) Operation direction of τ linear motor/Servo compass

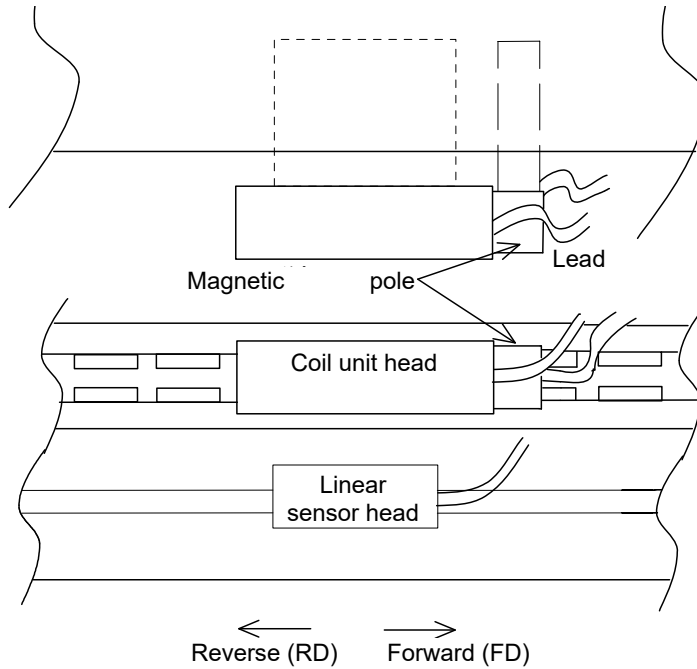


Figure 3-10 Moving direction of linear motor/Servo compass

Coil unit:

Forward travel: Direction to which lead wire comes out of the coil unit head

Reverse travel: Reverse direction to which lead wire comes out of the coil unit head

Linear sensor:

Forward travel (B-phase advance): Direction to which lead wire comes out of the linear sensor head, but when in operation

Reverse travel (B-phase delay): Reverse direction to which lead wire comes out of the linear sensor head, but when in operation

Magnetic pole sensor:

Forward travel (B-phase advance): Direction to which lead wire comes out of the linear sensor head, but when in operation

Reverse travel (B-phase delay): Reverse direction to which lead wire comes out of the linear sensor head, but when in operation

(Note) Set coil unit and linear sensor in the same direction.

Table 3-11 Each command input and motor run direction (with τ linear motor/Servo compass)

Command input form	Polarity	Motor moving direction
Positioning operation command	Forward direction	Forward travel (FD)
	Reverse direction	Reverse travel (RD)
Directional pulse train command	Forward direction	Forward travel (FD)
	Reverse direction	Reverse travel (RD)
90° phase difference pulse train command	B-phase ahead	Forward travel (FD)
	A-phase ahead	Reverse travel (RD)

Hereinafter in this document, "Forward direction of motor" means the time where the command input is in forward direction, and "Reverse direction of motor" means the time where the command input is in reverse direction.

When need to run the motor in reverse direction with positive voltage command or forward direction command, set parameter [P300: Rotation direction selection] to "REVERSE" in the state of standard connection.

Factory setting is in "FORWARD".

By setting [P008: Encoder & magnetic pole sensor direction selection], phase sequence of the encoder feedback pulse and attaching direction of the magnetic pole sensor can be changed.

3-2-3 Cooling blower motor wiring

- (1) Blower motor to cool the servo motor is built in the motor non-load-axis side. Install the thermal relay for the cooling blower motor. For the thermal relay, set the rated current value of the cooling blower motor. As for the rated current value of the cooling blower, refer to [12-4 Motor cooling blower electric specification].
- (2) Run the cooling blower motor and confirm that the rotating direction and wind direction coincide with the arrow mark. In the case of a 3-phase motor, wire paying attention to the phase sequence and confirm that the direction coincides with the arrow mark.

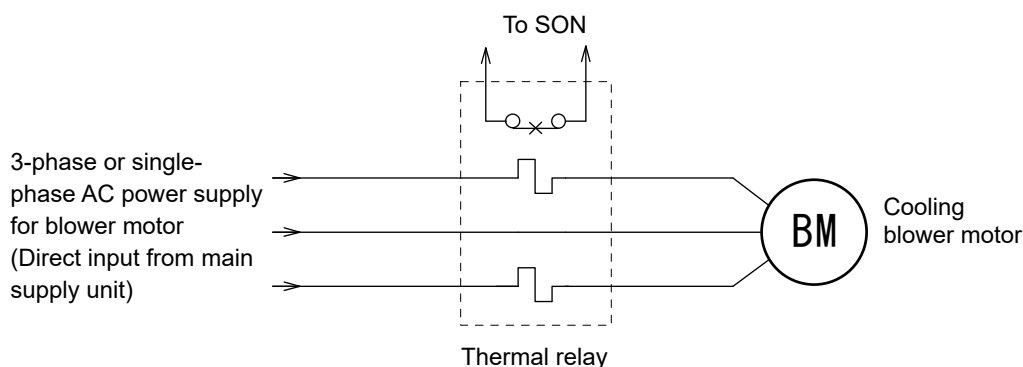


Figure 3-11 Wiring of cooling blower motor



Caution

- The device does not prepare the power supply for blower motor. Thus, prepare it separately.
- Pay attention not to connect the U, V, and W terminals of the device wrongly.

3-2-4 Solenoid brake wiring

SM motor type

- (1) Our brake for motor is a sustaining brake during the stop time. The brake is of a de-energization operation (adsorption) type.
- (2) The brake release (disconnection) start time is about 0.5 second from the application of voltage.
- (3) Connection of power supply for brake is shown in Figure 3-12.
(User is requested to prepare power supply for brake.)

IM motor type

- (1) Our brake for motor is sustaining brake during the stop time. The brake is of a de-energization operation (adsorption) type.
- (2) The brake release (disconnection) start time is about 0.5 second from the application of voltage.
- (3) Connection of power supply for brake is shown in Figure 3-13.
- (4) Connect brake terminal P to output terminal No. 3, and brake terminal N to output terminal No. 4, respectively.
* Never short output terminal No. 3 and No. 4.
- (5) Use a suitable contact to connect output terminals of No. 5 and No. 6, allowing 5 to 6 times of rating capacity of the brake total capacity.

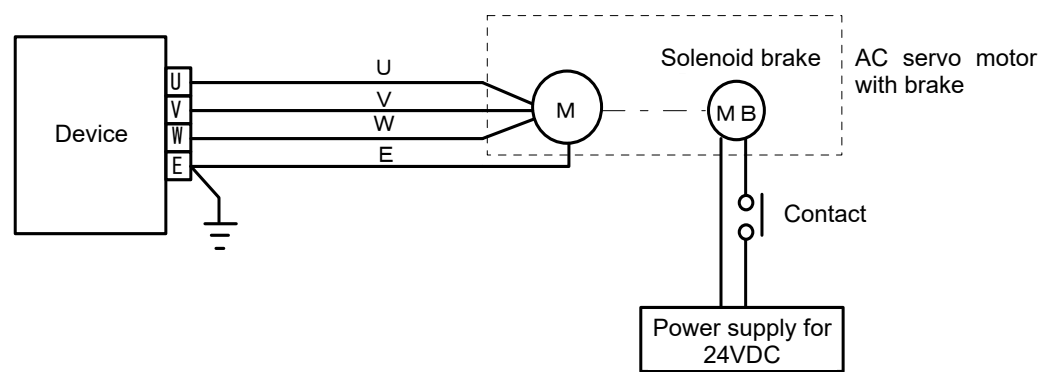


Figure 3-12 Connection of power supply for SM motor brake

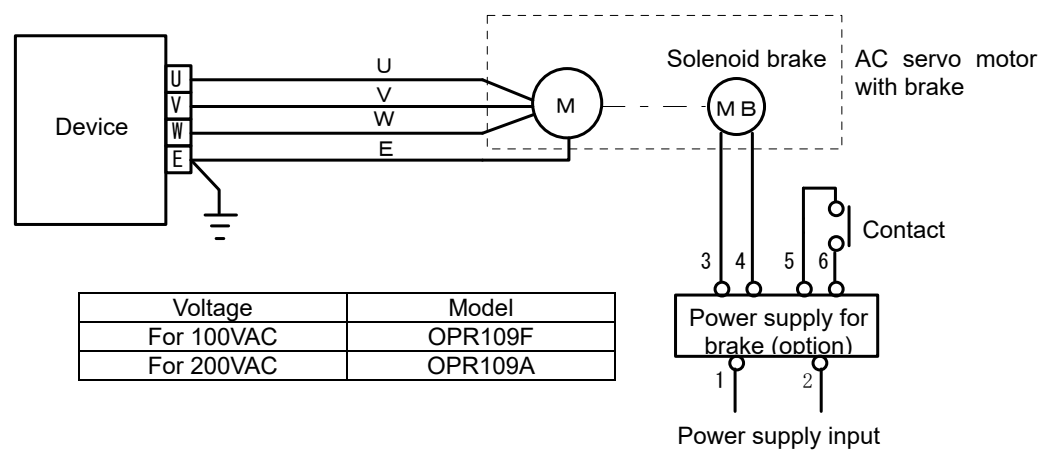


Figure 3-13 Connection of power supply for IM motor brake

 Caution

- Release (disconnection) of the electromagnetic brake starts about 0.5 second from the application of voltage. Adjust the timing between the release and the motor start command by considering this delay time.
- Before the release (disconnection) of the electromagnetic brake, be sure to turn OFF the motor operation command.
- For retainment, never activate the solenoid brake when motor is in operation.

3-3 Grounding

- (1) Be sure to ground for electric shock prevention and noise prevention measures.
- (2) Use a suitable electric wire for grounding which has a greater than or equal to the conductor cross-sectional area described in the later [Table 3-12 Applicable electric wire].
- (3) Connect grounding wire to grounding terminal (E) of the device.
- (4) Exclusive grounding is preferable as far as possible. If common grounding, secure one-point grounding at least.
- (5) Be sure to securely connect grounding terminal (E) of the motor to grounding terminal (E) of the device.



Caution

- To decrease common mode noise and to prevent erroneous run of the device, grounding should be the exclusive grounding better than D-class grounding (grounding resistance 100Ω or less) for 100VAC systems and 200VAC systems and C-class grounding (grounding resistance 10Ω or less) for 400VAC systems.
- If exclusive grounding is impossible, secure one-point common grounding to commonly ground with other equipment at the grounding spot.
- Be sure to avoid common grounding with high-power equipment and grounding to steel frames.
- Carefully wire not to loop the grounding wire. Failure in this can increase leakage current of the device and activate the earth leakage circuit breaker.

- (1) Use regenerative resistor attached as an accessory.
- (2) Heat is generated by the regenerative energy; thus, pay attention not to give influence to other equipment.
- (3) Regenerative resistor is used to consume remaining energy that cannot be absorbed by the regenerative capacitor due to big inertia (GD^2) of the load, among regenerative energy being generated in motor braking.
- (4) Regenerative resistor has a thermostat attached as an accessory. As the contact of thermostat is activated (open) when regenerative resistor is overheated, wire to cut the main power supply in this incident. (refer to Figure 3-1 to Figure 3-3) For information about the specifications and the installation of the thermostat, refer to [12-3-2 Regenerative resistor outline].
- (5) When plural regenerative resistors are attached as accessories, follow descriptions in [12-3-1 Regenerative resistor combination].
- (6) Keep the length of wiring between regenerative resistor and device within 3 m and make it as short as possible. The longer wiring becomes, the more the surge voltage that is generated by switching of power elements becomes high, and it can cause damages on the device.



Caution

If excessive current flows through regenerative resistor, the temperature becomes high in a short period of time, which is very dangerous. Be sure to construct a circuit to shut off the main power supply at the contact of thermostat.

3-5 Control circuit wiring

1 Analog command (speed, torque)

- (1) Current of each analog signal is very small; thus, use shielded twisted pair cables and be sure to connect the shield to the metal connector (FG) terminal of connector CN1.
- (2) Keep the length of cable within 3 m.

2 Pulse train input/output

- (1) Pulse train input and encoder pulse train output are of high-speed pulse train signal, thus, use shielded twisted pair cables and be sure to connect the shield to the metal connector (FG) terminal of connector CN1.
- (2) Keep the length of cable within 3 m. (In the case of open collector output, keep the length within 1.5 m)

3 Encoder feedback pulse signal

- (1) Using shielded twisted pair cable, be sure to connect the shield to the metal connector (FG) terminal of connector CN2.
- (2) For the purpose of movement of motor itself, keep the bending radius of motor as big as possible so as not to give stress.
- (3) The maximum cable length differs depending on the combination of motor. Exclusive encoder cable sets are available as options. Contact our sales representative for details.

4 Control input/output signals

- (1) When using relays and switches for control input/output signals, use an element for micro current.
- (2) To prevent erroneous run due to noises, be sure to install surge killers and diode to relays, magnet switches, solenoid brakes, and solenoids, that are used around the device and suppress noise generation.
- (3) Prepare the power supply +V (+12V, 2.5mA to +24V, 5mA/1 item) for control input signals by yourself.
- (4) Keep the length of cable within 3 m.

- 1 There are two intrusion routes for the incoming noise; one is [power supply line] and the other is [signal line]. Incoming noise can cause erroneous run, which induces troubles. To prevent troubles by noises, it is important to suppress noise generation and not to lead generated noises. Therefore, be sure to carry out following countermeasures and preventive treatments.
- 2 Setting surge absorptions and noise filters
 - (1) Be sure to attach surge killers (for AC power supply) and diodes (for DC power supply) to the relay, magnet switch, solenoid brake, and solenoid that are used around the device, and suppress noise generation.
 - (2) If the noise source such as electric welding machines and electric discharge machines exists close to the power supply line, and it makes the high noise environment, install noise filters or noise cut transformers on the main power supply and control power supply of the device to carry out noise prevention measures on the power supply line.
 - (3) When using noise filters, be sure to separate input wiring and output wiring of the filter and never bundle all wires together. Harness the grounding wire of filter separately from the filter output wire and be sure to carry out wiring (grounding) in the shortest distance.
 - (4) The device switching controls the motor at the high speed. For this reason, generated switching noise can affect other equipment. In this case, install noise filters or common mode choke coils to the main power supply of the device to prevent round-about noises to the power supply. Furthermore, carry out countermeasures against radiation noises by housing power supply lines and motor lines into an iron-made pipe.



Caution

- For control input/output signals wiring, use specified type of cable with the specified conductor cross-sectional area, and strictly follow precautions in wiring. No countermeasures may result in unexpected erroneous run due to noises and is very dangerous.
- Separate wiring of control input/output signals from power line (power supply line, motor line, etc.), and never put them into the same duct and avoid all-in-one wire bundling.

3-7 Applicable electric wire

Use electric wires shown in Table 3-12 to Table 3-18.

* As for cables for control circuit, use optional items.

Table 3-12 Applicable electric wire

	Item	Terminal	VC II series
Control circuit	Analog voltage command input Analog monitor output	INH,TQH TL+,TL-,GND MON1,MON2	- Shielded twisted pair cable of AWG28 (0.08mm²) or more - Length: 3m or less
	Pulse train command	FC/FC*	- In line driver method - Shielded twisted pair cable of AWG28 (0.08mm²) or more - Length: 3m or less
		RC/RC*	- In open collector method - Shielded twisted pair cable of AWG28 (0.08mm²) or more - Length: 1.5m or less
	Encoder pulse output	EA/EA*,EB/EB* EM/EM*,GND	- Shielded twisted pair cable of AWG28 (0.08mm²) or more - Length: 3m or less (GND: AWG20 (0.5mm²) or more)
	Encoder feedback pulse input	A/A*,B/B* Z/Z* (EP5,GND)	90° phase difference pulse encoder - Shielded twisted pair cable of AWG24 (0.2mm²) or more - EP5,GND: AWG20 (0.5mm²) or more - IM and SM length: 50m or less*² - τ DISC length: 20m or less*³ - τ linear length: 30m or less*⁴
		SD/SD* (EP5,GND)	- Serial encoder - Shielded twisted pair cable of AWG24 (0.2mm²) or more - EP5,GND: AWG20 (0.5mm²) or more - IM and SM length: 50m or less*² - τ τDISC length: 30m or less - τ linear length: 30m or less
	Magnetic pole sensor input	PS/PS* PC/PC*	- Shielded twisted pair cable of AWG24 (0.2mm²) or more - EP5,GND: AWG20 (0.5mm²) or more - Length: 50m or less
	Other control input/output		- Shielded cable of AWG28 (0.08mm²) or more - Length: 3m or less (+24V,COM: AWG20 (0.5mm²) or more)

* Electric wire diameter on Table 3-12 is decided based on PVC shielded twisted pair cable under the following conditions.

PVC shielded twisted pair cable: Rated 300V, 80°C, Surrounding maximum temperature: 40°C,
Wiring conditions: aerial, single-track line.



Caution

- Wire type and wire diameter can differ depending on use conditions and environment. For details, contact our sales representative.
- If control signal wire is long, it becomes easy to receive the influence of noises. Thus, wire within the stipulated length.
- As for cable type, be sure to use the stipulated type.

*² Wire diameter of EP5 and GND of the encoder feedback pulse input differs depending on encoder and the length of cable to combine. Thus, for details, contact our sales representative.

*³ If using a cable exceeding 20m, contact our sales representative.

*⁴ For the RENISHAW TONiC/RGH22 Series and the HEIDENHAIN LF171 and LIDA475, the cable used must be 20m or less.

Table 3-13 Applicable electric wire 100VAC specification

Unit: AWG (mm²)

	Item	Terminal	NCR- *D**A1A -051	NCR- *D**A1A -101	NCR- *D**A1A -201		
Main circuit	AC input power supply, grounding	R,S,E	16 (1.25)	16 (1.25)	16 (1.25)		
	AC input power supply for control	r,s	18 (0.75)	18 (0.75)	18 (0.75)		
	Motor	U,V,W	16 (1.25)	16 (1.25)	16 (1.25)		
	Regenerative resistor	B1,B2	18 (0.75)	18 (0.75)	18 (0.75)		

Table 3-14 Applicable electric wire 200VAC specification (1/3)

Unit: AWG (mm²)

	Item	Terminal	NCR- *D**A2A -101	NCR- *D**A2A -201	NCR- *D**A2A -401	NCR- *D**A2A -801	
Main circuit	AC input power supply, grounding	R,S,T,E	16 (1.25)	16 (1.25)	16 (1.25)	16 (1.25)	
	AC input power supply for control	r,s	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	
	Motor	U,V,W	16 (1.25)	16 (1.25)	16 (1.25)	16 (1.25)	
	Cooling blower motor	u,v,w	---	---	---	---	
	Regenerative resistor	B1,B2	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	

Table 3-15 Applicable electric wire 200VAC specification (2/3)

Unit: AWG (mm²)

	Item	Terminal	NCR- *D**A2A -152(122) *5	NCR- *D**A2A -222	NCR- *D**A2A -402	NCR- *D**A2A -752(552) *5	NCR- *D**A2A -113(752) *5
Main circuit	AC input power supply, grounding	R,S,T,E	14 (2)	12 (3.5)	10 (5.5)	6 (14)	6 (14)
	AC input power supply for control	r,s	18 (0.75)	18 (0.75)	18 (0.75)	---	---
	DC input power supply for control	24V,0V	---	---	---	18 (0.75)	18 (0.75)
	Motor	U,V,W	14 (2)	12 (3.5)	10 (5.5)	6 (14)	6 (14)
	Cooling blower motor	u,v,w	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)
	Regenerative resistor	B1,B2	18 (0.75)	18 (0.75)	18 (0.75)	12 (3.5)	10 (5.5)

Table 3-16 Applicable electric wire 200VAC specification (3/3)

Unit: AWG (mm²)

	Item	Terminal	NCR- *D**A2A -153(113) *5	NCR- *D**A2A -203(153) *5	NCR- *D**A2B -303(223) *5	NCR- *D**A2B -353(303) *5	NCR- *D**A2B -373(373) *5
Main circuit	AC input power supply, grounding	R,S,T,E	6 (14)* ⁶	2 (30)	1/0 (50)	1/0 (50)	2/0 (60)
	DC input power supply for control	24V,0V	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)
	Motor	U,V,W	6 (14)* ⁶	2 (30)	1/0 (50)	3/0 (80)	3/0 (80)
	Cooling blower motor	u,v,w	18 (0.75)	18 (0.75)	16 (1.25)	16 (1.25)	16 (1.25)
	Regenerative resistor	B1,B2	8 (8)	6 (14)	4 (22)	4 (22)	2 (30)

*⁵ The model No. of IM type motors are mentioned in ().*⁶ Use UL electric wire or MLFC electric wire with rated temperature of 105°C or more.

Table 3-17 Applicable electric wire 400VAC specification (1/2)

Unit: AWG (mm²)

	Item	Terminal	NCR- *D**A3A -262	NCR- *D**A3A -402	NCR- *D**A3A -752(552) *7	NCR- *D**A3A -113(752) *7	NCR- *D**A3A -153(113) *7
Main circuit	AC input power supply, grounding	R,S,T,E	16 (1.25)	12 (3.5)	12 (3.5)	10 (5.5)	8 (8)
	DC input power supply for control	24V,0V	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)
	Motor	U,V,W	16 (1.25)	12 (3.5)	12 (3.5)	10 (5.5)	8 (8)
	Cooling blower motor	u,v,w	---	---	---	18 (0.75)	18 (0.75)
	Regenerative resistor	B1,B2	18 (0.75)	18 (0.75)	18 (0.75)	14 (2)	12 (3.5)

Table 3-18 Applicable electric wire 400VAC specification (2/2)

Unit: AWG (mm²)

	Item	Terminal	NCR- *D**A3A -203(153) *7	NCR- *D**A3B -373(303) *7	NCR- *D**A3B -553(373) *7		
Main circuit	AC input power supply, grounding	R,S,T,E	6 (14)	4 (22)	1/0 (50)		
	DC input power supply for control	24V,0V	18 (0.75)	18 (0.75)	18 (0.75)		
	Motor	U,V,W	6 (14)	2 (30)	2/0 (60)		
	Cooling blower motor	u,v,w	18 (0.75)	16 (1.25)	16 (1.25)		
	Regenerative resistor	B1,B2	12 (3.5)	8 (8.0)	6 (14)		

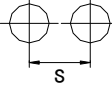
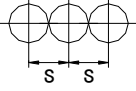
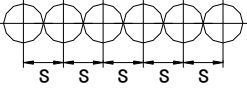
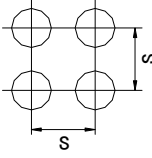
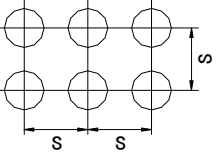
*7 The model No. of IM type motors are mentioned in ().

Wiring

- 1) Electric wire diameter on Table 3-13 to Table 3-18 is decided based on vinyl insulation electric wire (KIV electric wire) for electric equipment under the following conditions.
 - KIV electric wire: Rated 600V, 60°C, Operating temperature: 40°C, Wiring conditions: aerial, three-track (interval $s=d$) line.
- 2) Permissible current of electric wire differs depending on use conditions (operating temperature, wiring conditions, etc.), trunking, insulation, and maker. Thus, choose appropriate electric wire diameter depending on use environment and conditions.
- 3) In the case of calculating the permissible current by changing operating temperature and wiring conditions to be used, the permissible current reduction coefficient and permissible current compensatory coefficient should be calculated according to the objective temperature and conditions. Permissible current reduction coefficient (when cable permissible maximum temperature is 60°C) when operating temperature is 30°C or higher.

$$\text{Permissible current reduction coefficient} = \sqrt{\frac{(60 - \theta)}{30}} \quad (\theta = \text{using temperature } \theta < 60)$$

Table 3-19 Permissible current compensatory coefficients when wiring plural cables in air

Coefficient	1	2	3	6	4	6
Center-Interval Alignment						
$s=d$		0.85	0.80	0.70	0.70	0.60
$s=2d$	1.00	0.95	0.95	0.90	0.90	0.90
$s=3d$		1.00	1.00	0.95	0.95	0.95

3-8 Input voltage switching terminal

To use any of the devices listed below, check the nominal voltage(s) of the power input and set the input voltage switching terminal (TB4) before use.

- NCR-*DA*A3B-373*, NCR-*DB*A3B-373, NCR-*DC*A3B-303
- NCR-*DA*A3B-553*, NCR-*DB*A3B-553, NCR-*DC*A3B-373

Referring to Figure 3-14 to Figure 3-16, set the voltage switching shorting bar.

* For the factory settings, the nominal voltages are 440VAC and 400VAC.



Figure 3-14 If the nominal voltage is 380VAC

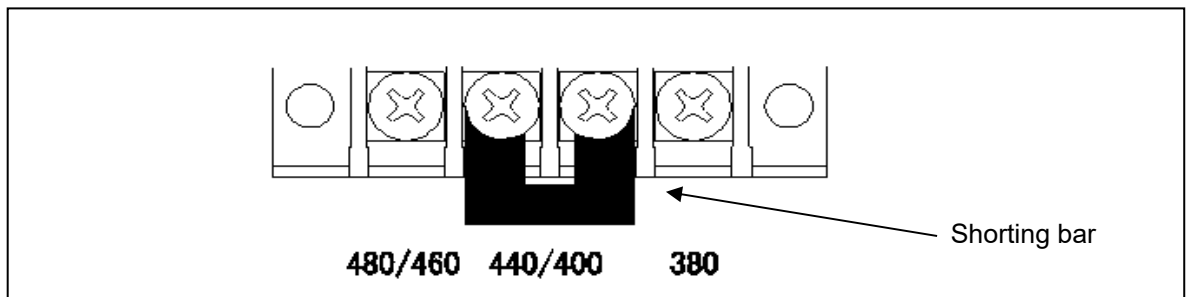


Figure 3-15 If the nominal voltages are 440VAC and 400VAC

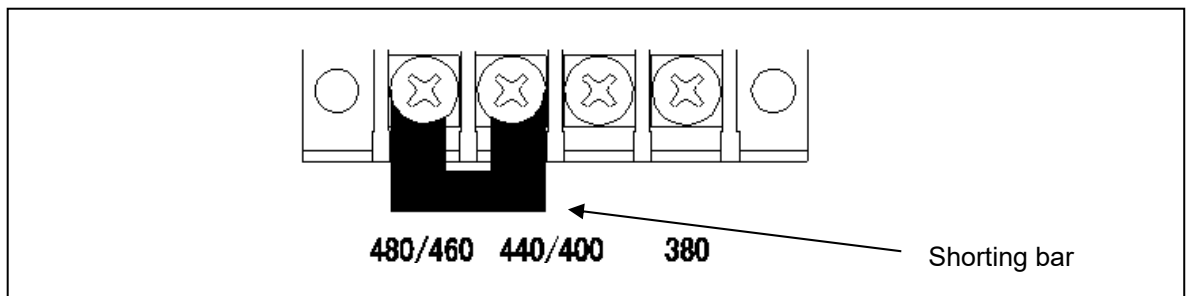


Figure 3-16 If the nominal voltages are 480VAC and 460VAC



Caution

- Set the input voltage switching terminal before turning on the control power supply and the main power supply.
- Do not change the setting of the input voltage switching terminal during the operation of the device.
- Before changing the setting, shut down the control power supply and the main power supply.

Chapter 4 Signal connection

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4-1 External wiring diagram

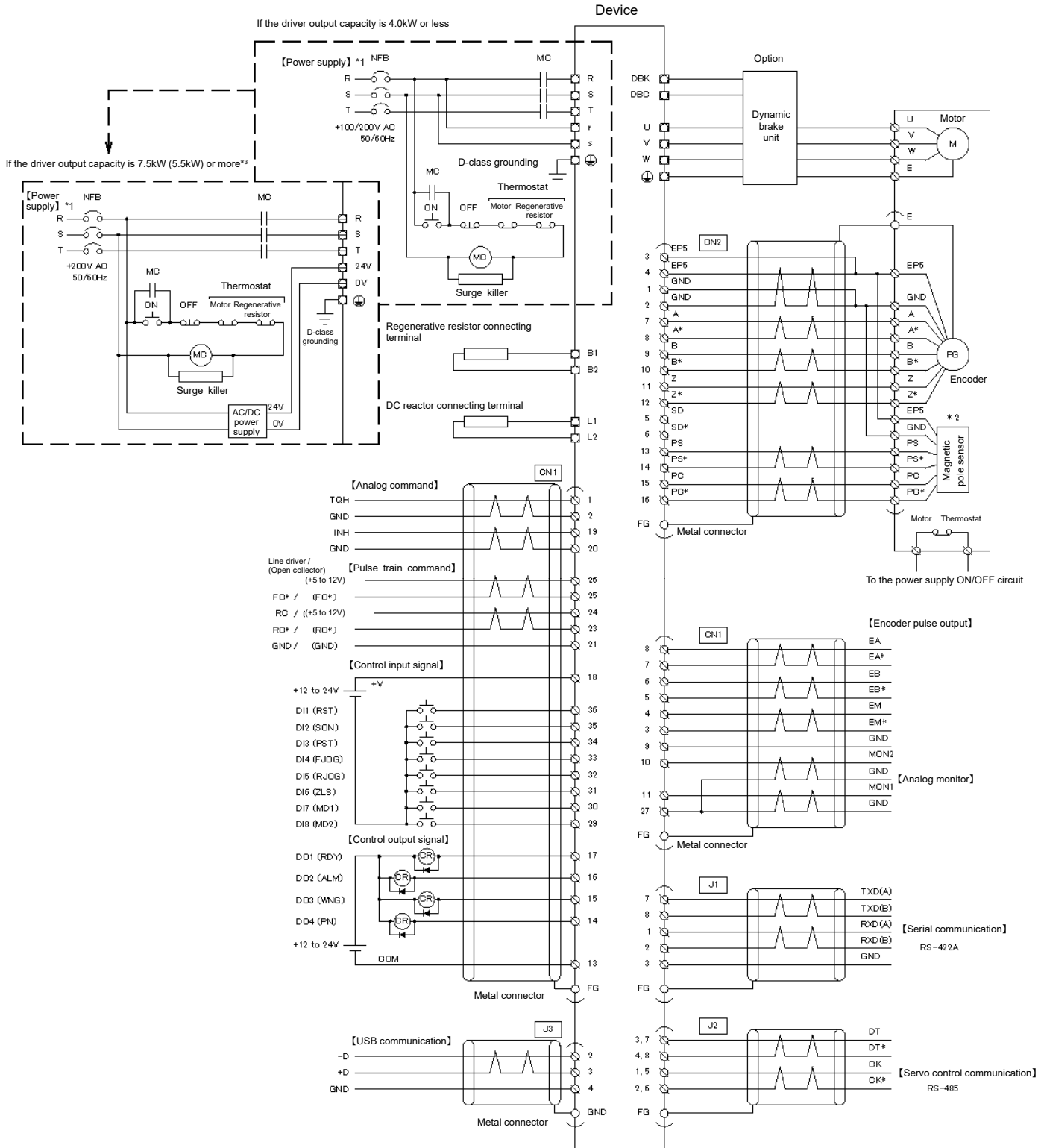


Figure 4-1 External wiring example (100V/200VAC specification)

- *1 For details of connecting the power supply, refer to [3-1 Power supply connection].
- *2 Wiring is required when using the magnetic pole sensor.
- *3 Enclosed in parentheses is the driver output capacity of the IM motor model.

- Note 1: User is requested to prepare power supply for control input signal in the rated voltage and current.
- Note 2: COM of CN1 connector is a common for control input/output signals. GND is a common for control power supply (+5V) in the device.
- Note 3: As COM of CN1 and GND are isolated, avoid common wiring and all-in-one wire bundling.
- Note 4: Status of switches connected to control input signal show OFF status of each input signal.
- Note 5: As for connection between motor and encoder, refer to each motor instruction manual.
- Note 6: A pin not mentioned in this connecting diagram is NC. If using a terminal block unit, note that the signal terminal block alignment differs. Refer to the "VC Series and VCII Series Option Instruction Manual".
- Note 7: Please refer to the "VC series VC II series option manual" when using the control input/output expansion unit.
- Note 8: Value in () in control input/output signal name is parameter initial value.
- Note 9: Connect GND of pulse train command, at line receiver input.
- Note 10: DC reactor terminal is installed for device capacity of 5.5kW or more. (DC reactor is an option.)
- Note 11: Dynamic brake activation signal connector (DBK, DBC) for device capacity of 1.2kW or more is found at the bottom of device. (Dynamic brake unit is an option.)
- Note 12: If using a terminal block unit, note that the number of the terminal to connect to connector CN1 differs. Refer to 4-3-1 Control input/output connector (CN1).

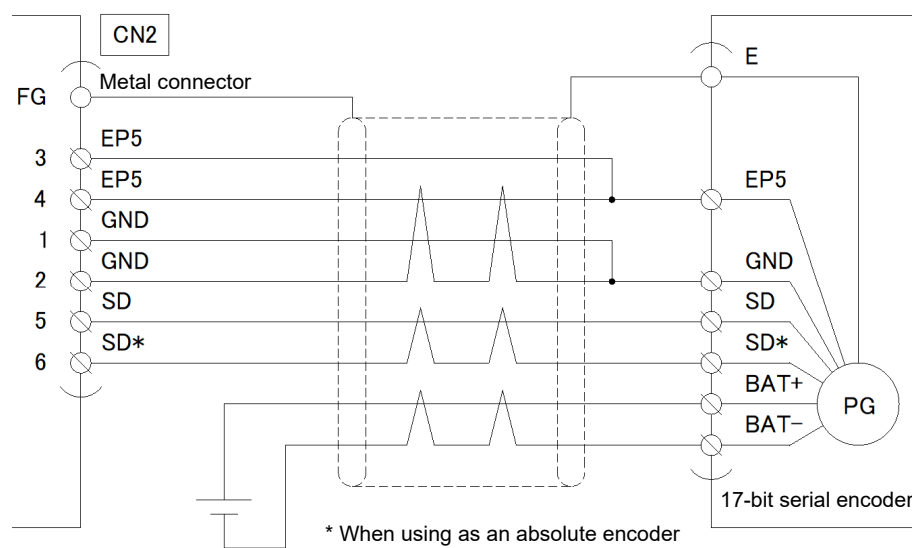


Figure 4-2 Serial encoder (NA80/800 Series motor) connecting diagram

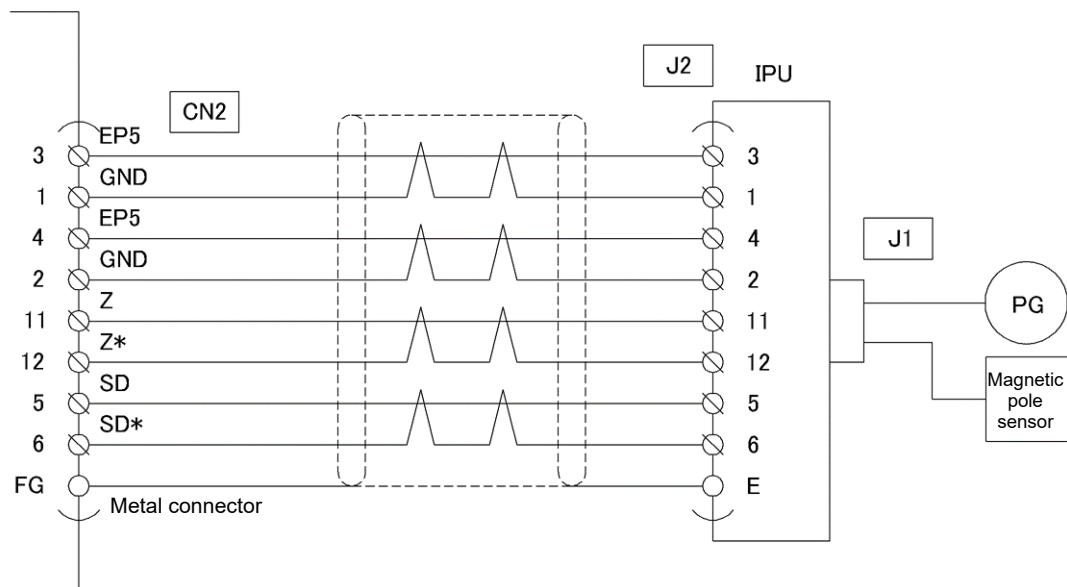


Figure 4-3 Serial encoder (τ linear/ τ DISC motor) connecting diagram

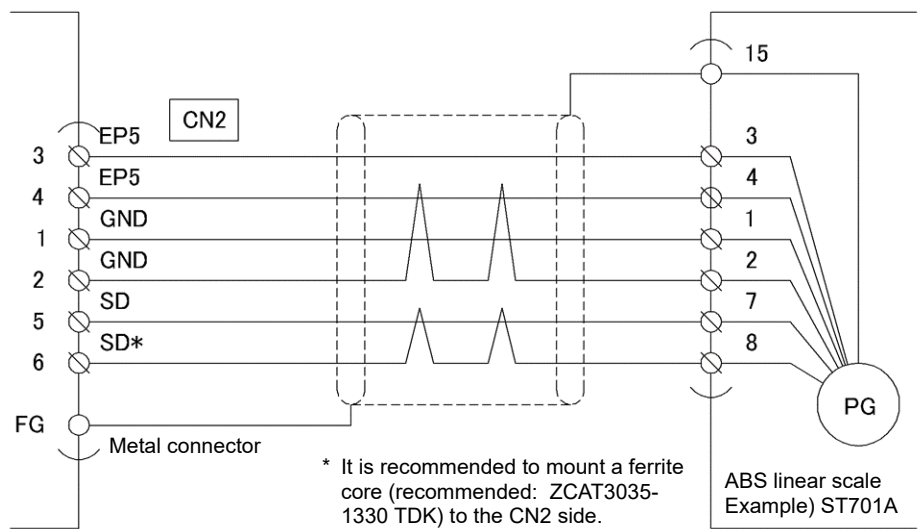


Figure 4-4 Serial encoder (ABS linear) connecting diagram

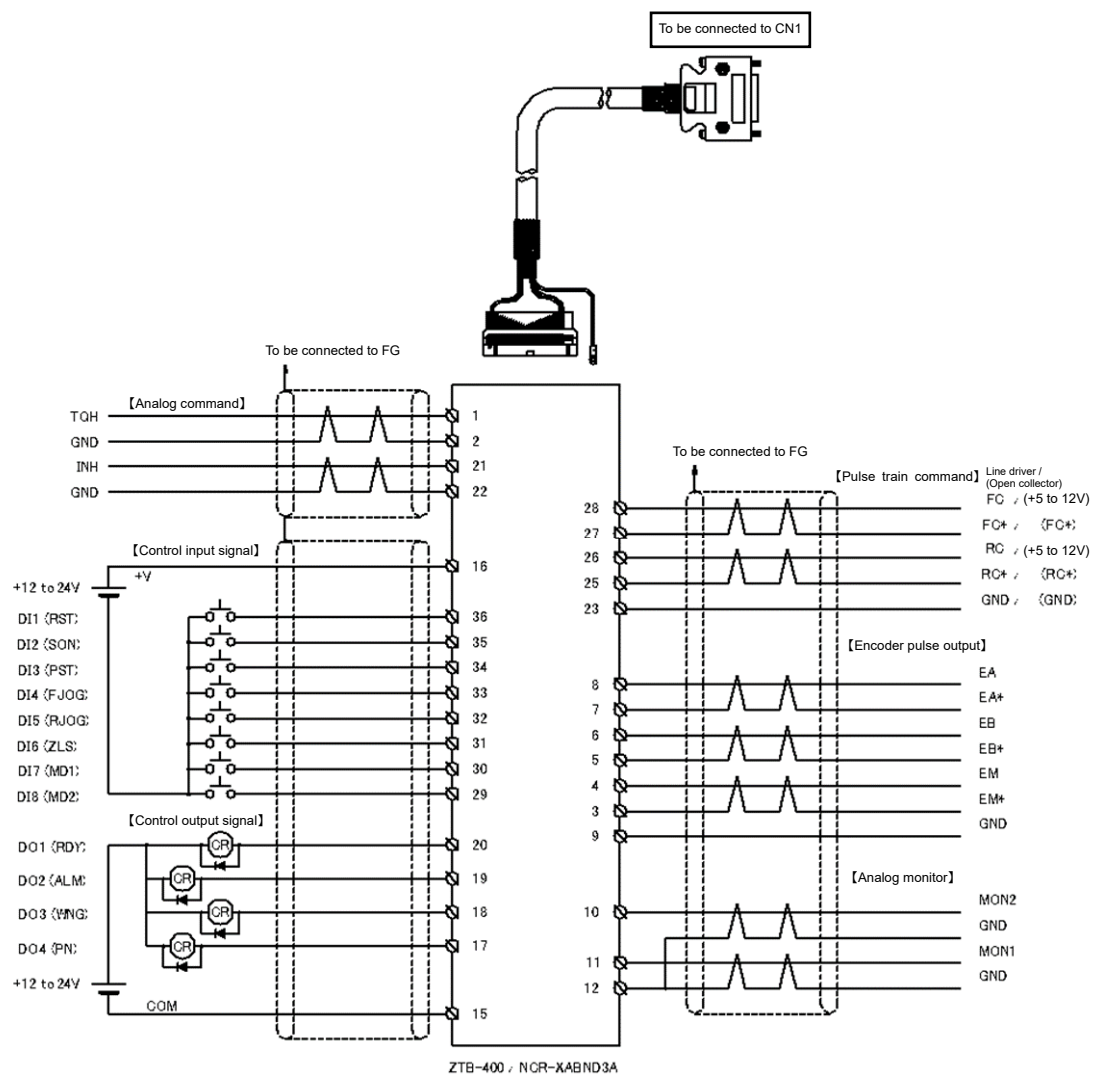


Figure 4-5 Connecting diagram to use when using an optional terminal block

Signal connection

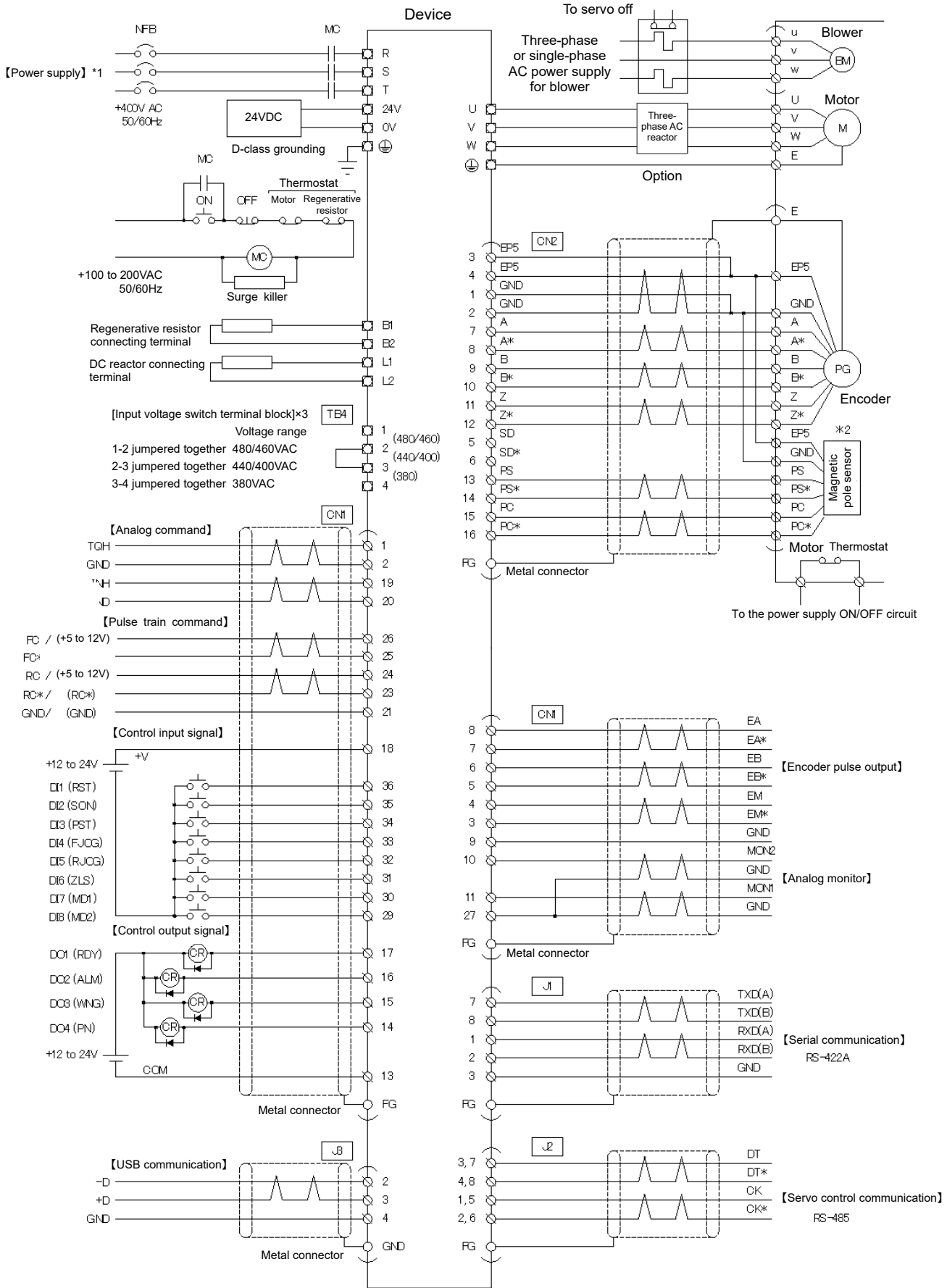


Figure 4-6 External wiring example (400V)

- *1 For details of connecting the power supply, refer to [3-1 Power supply connection].
- *2 Wiring is required when using the magnetic pole sensor.
- *3 Before turning on the power supply, change the wires of TB4 according to the voltage used. (30kW or more)

- Note 1: User is requested to prepare power supply for control input signal in the rated voltage and current.
- Note 2: COM of CN1 connector is a common for control input/output signals. GND is a common for control power supply (+5V) in the device.
- Note 3: As COM of CN1 and GND are isolated, avoid common wiring and all-in-one wire bundling.
- Note 4: Status of switches connected to control input signal show OFF status of each input signal.
- Note 5: As for connection between motor and encoder, refer to each motor instruction manual.
- Note 6: A pin not mentioned in this connecting diagram is NC. If using a terminal block unit, note that the signal terminal block alignment differs. Refer to the "VC Series and VCII Series Option Instruction Manual".
- Note 7: Please refer to the "VC series VC II series option manual" when using the control input/output expansion unit.
- Note 8: Value in () in control input/output signal name is parameter initial value.
- Note 9: Connect GND of pulse train command, at line receiver input.
- Note 10: DC reactor terminal is installed for device capacity of 5.5kW or more. (DC reactor is an option.)
- Note 11: The device-to-motor reactor is an option.
- Note 12: If using a terminal block unit, note that the number of the terminal to connect to connector CN1 differs. Refer to 4-3-1 Control input/output connector (CN1).

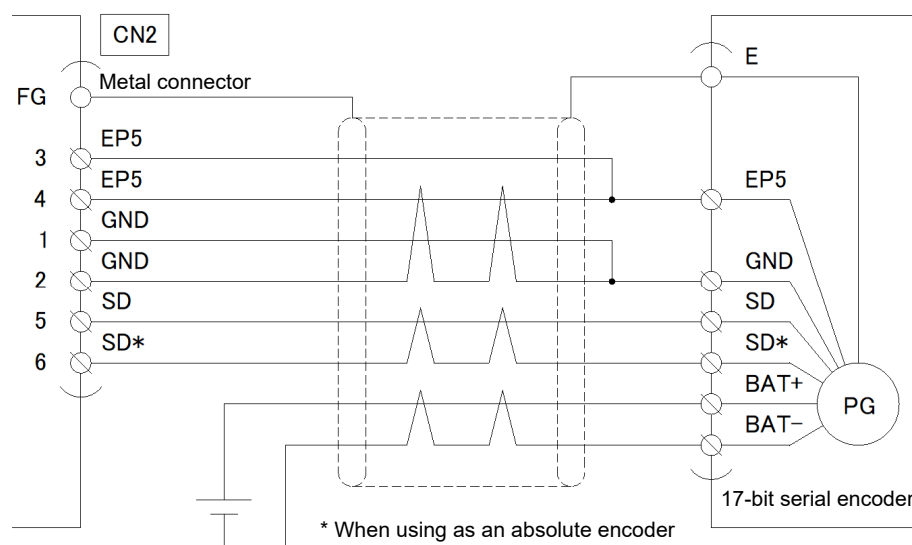


Figure 4-7 Serial encoder (NA80/800 Series motor) connecting diagram

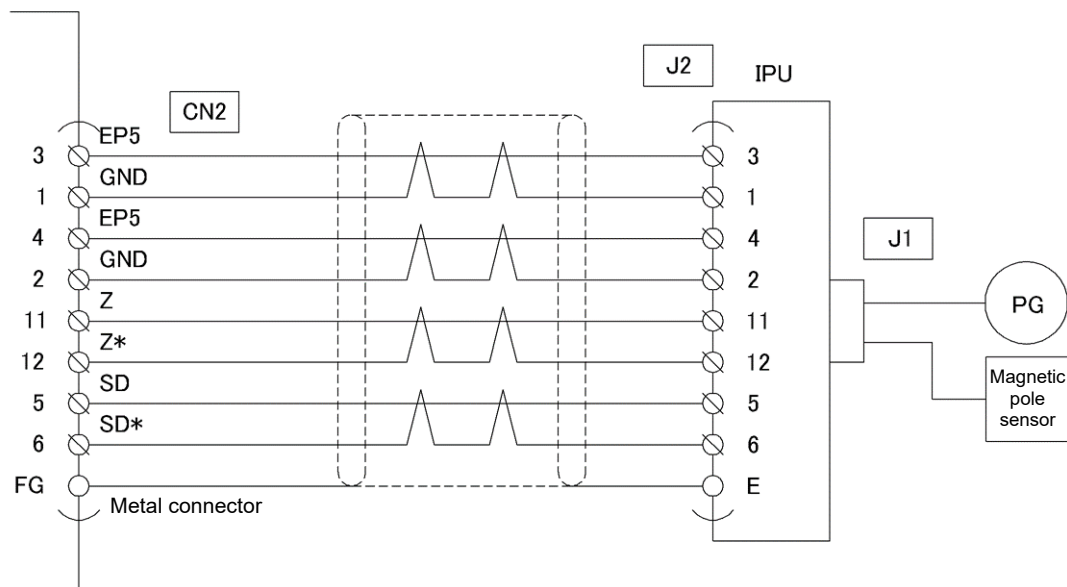


Figure 4-8 Serial encoder (τ linear/ τ DISC motor) connecting diagram

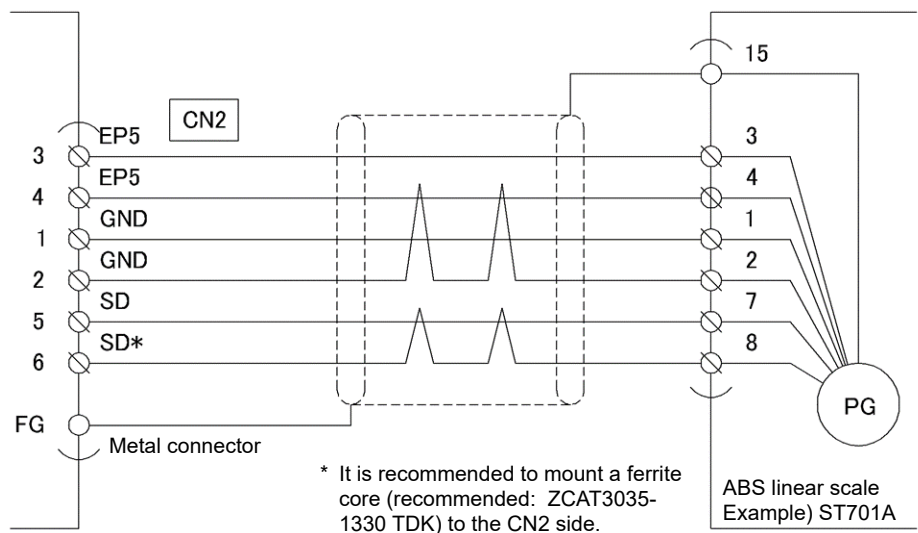


Figure 4-9 Serial encoder (ABS linear) connecting diagram

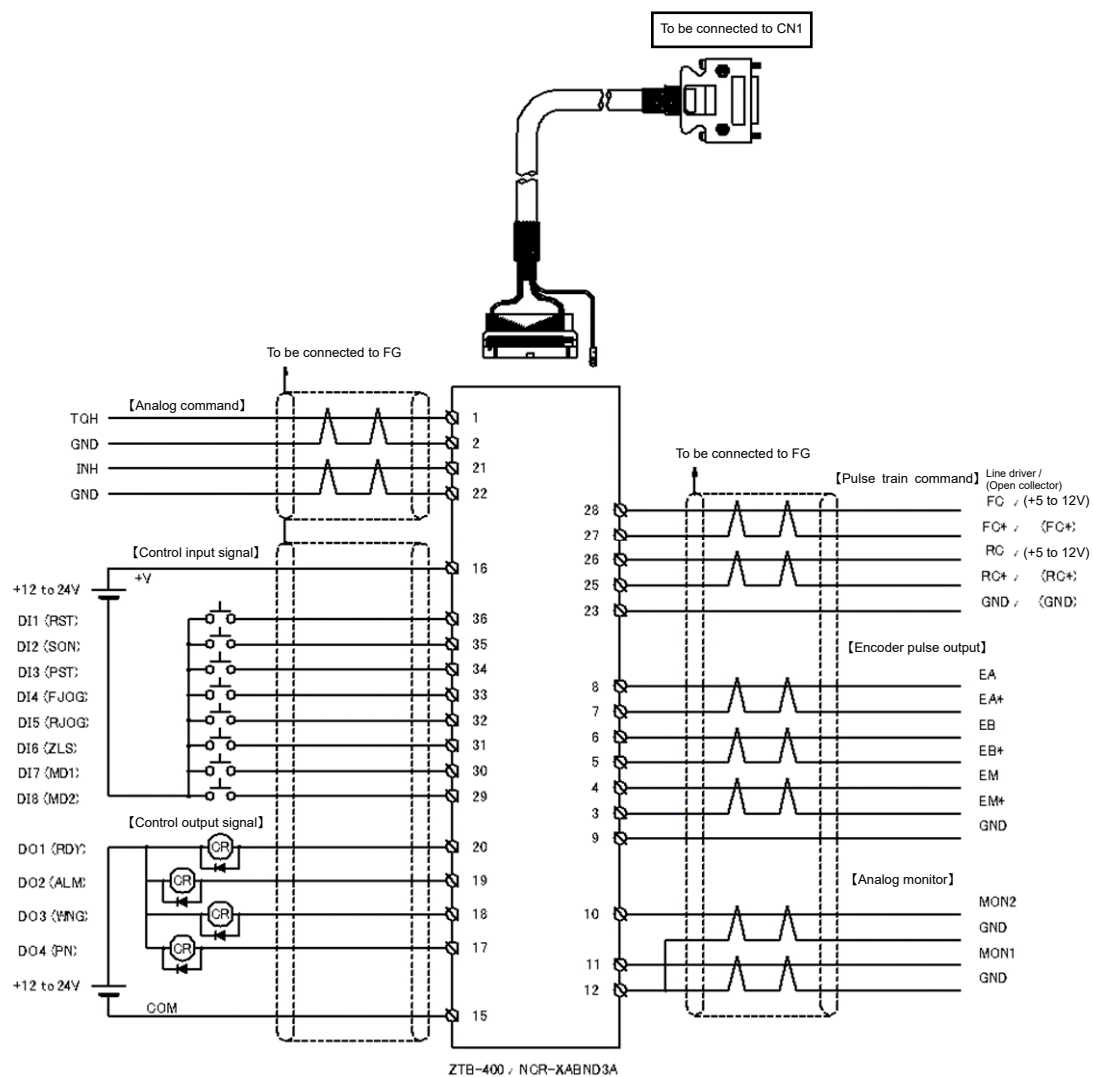


Figure 4-10 Connecting diagram to use when using an optional terminal block

4-2 Input/output signals

4-2-1 Control input signal list

In remote control signal, regardless of positive/negative logic, data "1" corresponds to signal "ON" and data "0" corresponds to signal "OFF".

Table 4-1 Control input signal list

Signal name	Code	Serial communication device No.*1
Reset	RST	X0000
Emergency Stop	EMG*	X0001
Servo On	SON(*)	X0002
Gain Select	GSEL	X0004
Deviation Clear	CLR	X0005
Forward Over Travel	FOT*	X0006
Reverse Over Travel	ROT*	X0007
Command Direction Select	SSD	X000A
Mode Select 1	MD1	X000B
Mode Select 2	MD2	X000C
Torque Limit	TL	X000D
Command Pulse Input Prohibition	CIH(*)	X000E
Compulsory Brake ON	BRON	X000F
Proportional Control	PC	X0010
Gain Select 2	GSEL2	X0012
Address Assignment 1	PS1	X0018
Address Assignment 2	PS2	X0019
Address Assignment 3	PS3	X001A
Address Assignment 4	PS4	X001B
Address Assignment 5	PS5	X001C
Address Assignment 6	PS6	X001D
Address Assignment 7	PS7	X001E
Address Assignment 8	PS8	X001F
Automatic start	PST	X0020
Forward Direction Jog	FJOG	X0021
Reverse Direction Jog	RJOG	X0022
Jog speed select	JOSP	X0023
M complete	MFIN	X0024
Block stop	BSTP	X0025
Program cancel	PCAN	X0026
External automatic start prohibit	EPIH	X0027
Speed Override 1	OR1	X0028
Speed Override 2	OR2	X0029
Speed Override 3	OR3	X002A
Speed Override 4	OR4	X002B
Hold	HLD	X002C
External trigger	TRG	X002D
Zero Point Deceleration	ZLS	-----
1st external latch input	EXT1	-----
2nd external latch input	EXT2	-----
3rd external latch input	EXT3	-----

*1 It indicates device number of remote control data area corresponding to each signal.

4-2-2 Control output signal list

In remote control signal, regardless of positive/negative logic, data "1" corresponds to signal "ON" and data "0" corresponds to signal "OFF".

Table 4-2 Control output signal list

Signal name	Code	Serial communication device No.*2
Alarm	ALM(*)	X0060
Warning	WNG(*)	X0061
Servo Ready	RDY	X0062
Speed Zero	SZ	X0063
Positioning Complete	PN	X0064
Rough match	PRF	X0065
Brake Release	BRK	X0066
Torque Limit In-Process	LIM	X0067
Program end	PEND	X0068
Automatic run ready	PRDY	X0069
Manual run mode In-Process	MMOD	X006A
Zero return run mode In-Process	HMOD	X006B
Automatic run mode In-Process	AMOD	X006C
Pulse train run mode In-Process	PMOD	X006D
Common output 1	OUT1	X0070
Common output 2	OUT2	X0071
Common output 3	OUT3	X0072
Common output 4	OUT4	X0073
Common output 5	OUT5	X0074
Common output 6	OUT6	X0075
Common output 7	OUT7	X0076
Common output 8	OUT8	X0077
Zero point return complete	HCMP	X007A
Positioning Complete B	PNB	X007B
Soft Limit Switch A	SLSA	X007E
Soft Limit Switch B	SLSB	X007F
M output 01	M01	X0080
M output 02	M02	X0081
M output 04	M04	X0082
M output 08	M08	X0083
M output 10	M10	X0084
M output 20	M20	X0085
M output 40	M40	X0086
M output 80	M80	X0087
M strobe	MSTB	X0089
Encoder Feedback Output	EA/EA* EB/EB* EM/EM*	
Analog Monitor	MON1/MON2	

*2 It indicates device number of remote control data area corresponding to each signal.

Signal connection

4-2-3 Control input and output signal list

In remote control signal, regardless of positive/negative logic, data "1" corresponds to signal "ON" and data "0" corresponds to signal "OFF".

Table 4-3 Control input and output signal list (Communication related signal)

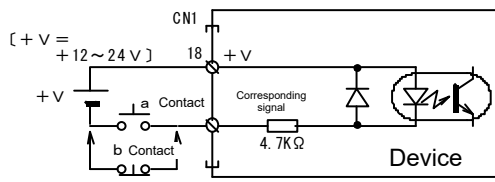
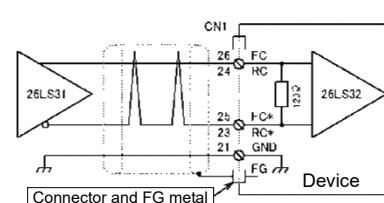
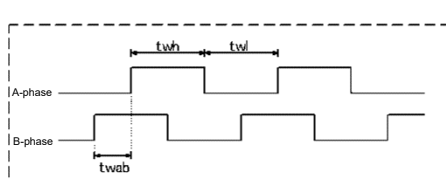
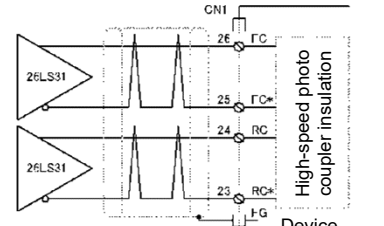
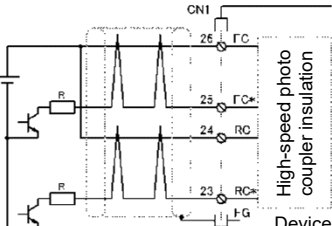
Signal name	Code	Serial communication device No.* ³
Serial communication	TXD(A)/TXD(B) RXD(A)/RXD(B)	
USB communication	D+/D-	
Servo Control Communication	DT/DT*/CK/CK*	

*³ It indicates device number of remote control data area corresponding to each signal.

4-2-4 Input/output interface

Type and equivalent circuit of input/output signals are shown in the table.

Type of each input/output signal is shown in the Circuit No. columns of the input/output terminal table in [4-2-5 Input/output signal list].

Circuit No.		Electrical specifications		Circuit							
I-1		Insulation method	Photo coupler insulation								
Corresponding signal DI1 to 8	Operating voltage range	10.2 to 26.4VDC									
	Ripple ratio	Within 5%									
	Rated input current (/1-point)	About 2.5mA / 12VDC About 5.0mA / 24VDC									
	Input resistance	About 4.7kΩ									
	Input filter time constant	About 120 μs									
		- As a contact element, use micro current on/off relay or open collector output transistor. - Signal, of which right end signal code is not "*", is positive logic signal. It is ON when contact is closed and OFF when contact is opened. - Signal, of which right end signal code is "*", is negative logic signal. It is ON when contact is opened and OFF when contact is closed.									
Circuit No.	Electrical specifications	Input method	Line receiver	Photo coupler Pulse train command open collector When receiving unit is optional*4							
I-2		Pulse train output form	Line driver	Line driver	Open collector						
Corresponding signal		Minimum input pulse width [t _{wh} · t _{wl}]	100ns(80ns)*5	500ns	2 μs						
Pulse train command FC,FC* RC,RC*		Maximum input frequency	5.00Mpps (6.25Mpps)*5	1Mpps	250Kpps						
		Edge distance [t _{wab}]	50ns(40ns)*5	250ns	1 μs						
		Line driver	26LS31 equivalent	26LS31 equivalent	—————						
		Transistor saturation voltage	—————	—————	0.9V or less						
		Operating voltage range	—————	—————	5.0 to 12.0VDC						
	Rated input current	—————	—————	About 10mA/1-point							
Circuit											
											
											
											
		<table><tr><td>External power</td><td>R value</td></tr><tr><td>5V</td><td>0</td></tr><tr><td>12V</td><td>1kΩ(1/4W)</td></tr></table>				External power	R value	5V	0	12V	1kΩ(1/4W)
External power	R value										
5V	0										
12V	1kΩ(1/4W)										
		* There are some preferable cases to connect the output side of the pulse train command to each GND of the device.									

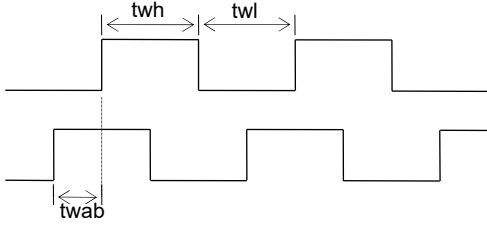
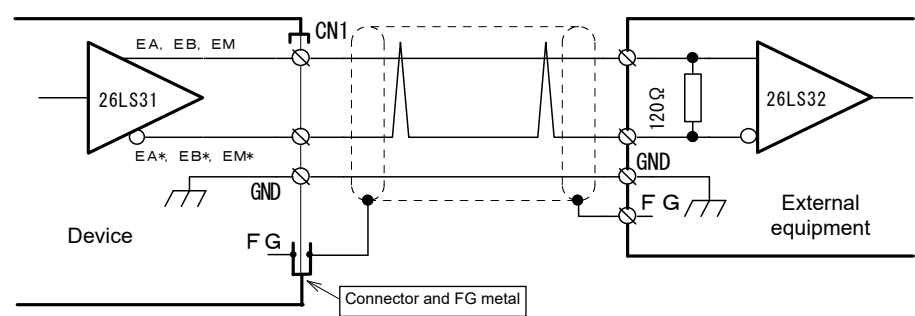
*4 Take necessary measures not to put noises on the supply voltage from external power supply unit.

*5 ⚠ The spec in () is applicable to the device of HARD VER 2.00 or later.

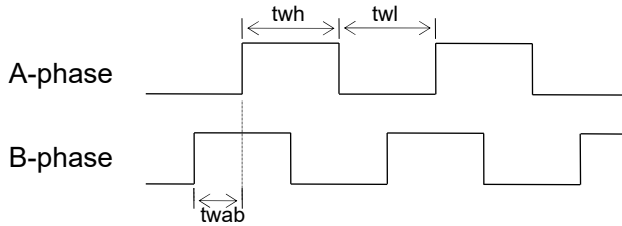
Circuit No.			
I-3			
Corresponding signal			
Encoder Feedback Pulse input			
A,A*			
B,B*			
Z,Z*			
SD,SD*			
IPU connection Encoder Feedback data input			
SD,SD*			
Z,Z*			
ABS linear scale (ST70* Series) Feedback data input			
SD,SD*			
	Electrical specifications		
	A-phase B-phase Z-phase		

*⁶ ⚠ The spec in () is applicable to the device of HARD VER 2.00 or later.

Circuit No.	Electrical specifications	PS-phase PC-phase When attaching magnetic pole sensor in the forward direction, let PC-phase go ahead of PS-phase in motor forward direction operation. If connected in the reverse direction, set the attaching direction with P008.		
I-5		Magnetic pole sensor input	Circuit	

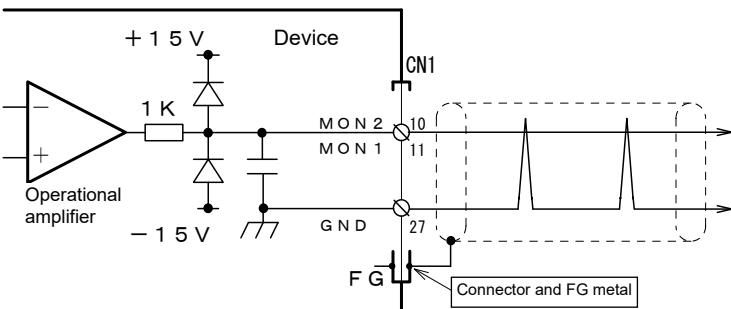
Circuit No.	Output method		Through output	Software frequency dividing output
0-2	Minimum output pulse width	t_{wh}	$12.5 \times m \text{ ns}$	75ns
Corresponding signal		t_{wl}	$12.5 \times m \text{ ns}$	75ns
		$\therefore m = \text{Each time of the input signal}/12.5 \text{ (integer part)}$		
Encoder Pulse Output (Earlier than SOFT Ver 2.50*7)	Minimum edge distance	t_{wab}	$12.5 \times (n-1) \text{ ns}$ $\therefore n = \text{Signal edge distance}/12.5 \text{ (integer part)}$	37.5ns
	Electrical specifications	A-phase B-phase  - Encoder pulse output signals are synchronized with the operating frequency of 80MHz (12.5ns) inside the device. - For encoder pulse output, through output (when P012 is set to 0) and software frequency dividing output (when P012 is set to a non-0 value) are possible. - For through output, perform sampling, referring to the above formula. - Software frequency dividing output is a function for outputting pulses at a fixed distance. With this function, the signal waveform is not that of a signal with a duty of 50% and the edge distance is not fixed. Thus, the external device requires sampling at 27MHz or more. - Depending on the length and the floating capacitance of the cable used, the output pulse width and the edge distance input to the external device may be shortened. Thus, perform a check before use. - When the motor is operating in the forward direction, the B-phase is output before the A-phase. The phase relationship between A-phase and B-phase always match the operation direction of the motor, not influenced by the operating direction setting with the parameter. - The maximum settable frequency is 20Mpps. For devices with HARD Ver 2.00 or later, the maximum settable frequency is 25Mpps only for through output. - For details of P012, refer to [6-3 Parameter specification]. - For up to two seconds after power ON, it is indefinite.		
		Circuit		
- As line driver (26LS31 equivalent) is used as the output, interface with line receiver (26LS32 equivalent). - Terminal resistor of receiving side should be 120Ω (1/2W or more).				

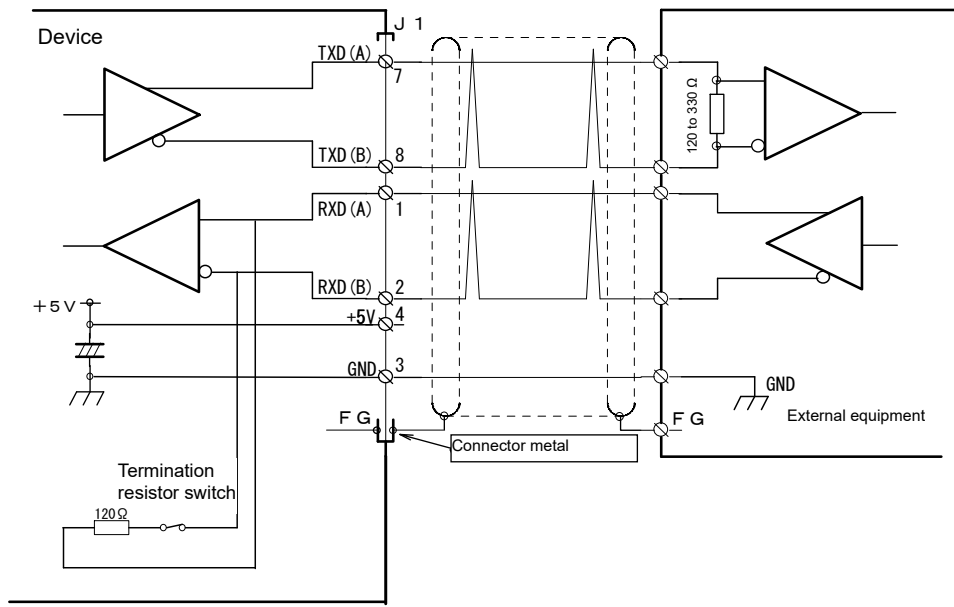
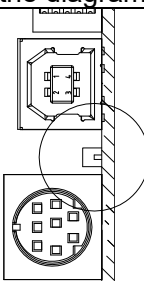
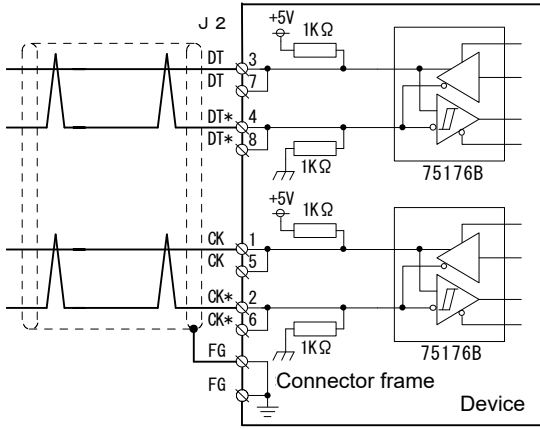
^{*7} For information about the encoder pulse output specifications for devices with SOFT Ver 2.50 or later, refer to the next page.

Circuit No.	Output method		Through output (through frequency dividing output)																				
0-2	Minimum output pulse width	t _{wh}	12.5×m ns																				
Corresponding signal		t _{wl}	12.5×m ns																				
		∴m = Each time of the input signal/12.5 (integer part)																					
Encoder Pulse Output (Earlier than SOFT Ver 2.50* ⁸) EA EA* EB EB* EM EM*	Minimum edge distance	t _{wab}	12.5×(n-1) ns ∴n = Signal edge distance/12.5 (integer part)																				
	Electrical specifications	 - Encoder pulse output signals are synchronized with the operating frequency of 80MHz (12.5ns) inside the device. - For encoder pulse output, through output (when P012 is set to 0) and software frequency dividing output (when P012 is set to a non-0 value) are possible. In addition, frequency dividing output (to be set with P038) in through output is also possible. - For through output and through frequency dividing output, perform sampling, referring to the above formula. - Software frequency dividing output is a function for outputting pulses at a fixed distances. The signal waveform is not that of a signal with a duty of 50% and the edge distance is not fixed. The edge distance varies with the setting of P039. Thus, an external device requires sampling at frequencies higher than those listed in the table below. <table><tr><th>P039 setting value</th><th>Operation conditions other than the ones on the right</th><th>①</th><th>②</th></tr><tr><td>0</td><td>27MHz</td><td>22MHz</td><td>22MHz</td></tr><tr><td>1</td><td>15MHz</td><td>12MHz</td><td>10MHz</td></tr><tr><td>2</td><td>6MHz</td><td>6MHz</td><td>5MHz</td></tr><tr><td>3</td><td>3MHz</td><td>3MHz</td><td>3MHz</td></tr></table> ① Applied when the Mitutoyo linear ABS encoder is used. ② Applied when the MECHATROLINK-III option is mounted and the device is in maintenance mode. - Depending on the length and the floating capacitance of the cable used, the output pulse width and the edge distance input to the external device may be shortened. Thus, perform a check before use. - When the motor is operating in the forward direction, the B-phase is output before the A-phase. The phase relationship between A-phase and B-phase always match the operation direction of the motor, not influenced by the operating direction setting with the parameter. - The maximum settable frequency is the setting value of P039. The maximum settable frequency is 25Mpps only for through output. - For details of P012, P038, and P039, refer to [6-3 Parameter specification]. - For up to two seconds after power ON, it is indefinite.		P039 setting value	Operation conditions other than the ones on the right	①	②	0	27MHz	22MHz	22MHz	1	15MHz	12MHz	10MHz	2	6MHz	6MHz	5MHz	3	3MHz	3MHz	3MHz
		P039 setting value	Operation conditions other than the ones on the right	①	②																		
0	27MHz	22MHz	22MHz																				
1	15MHz	12MHz	10MHz																				
2	6MHz	6MHz	5MHz																				
3	3MHz	3MHz	3MHz																				
Circuit	Same as the circuit on the previous page (devices with versions earlier than SOFT Ver 2.50).																						

^{*8} For information about the encoder pulse output specifications for devices with SOFT Ver 2.50 or later, refer to the next page.

Signal connection

Circuit No.	Circuit	
0-3		
Corresponding signal		
Analog Monitor		
MON1 MON2		
When cable length is longer than 1m, make sure to use the shielded twisted pair cable and connect the shield to metal connector (FG).		

Circuit No. I0-1 Corresponding signal	Circuit 										
Serial communication TXD(A) TXD(B) RXD(A) RXD(B)	Circuit • Communication method is RS-422A. • Usually, built-in terminal resistor is connected. Similarly, attach terminal resistor to external equipment. • It is possible to switch the built-in terminal resistor to effective or ineffective by the terminal resistor switch.*9 When the switch is set toward the back of the device: Terminal resistor effective. (factory setting) When the switch is set toward the front of the device: Terminal resistor ineffective. • The terminal resistor switch is located between connectors J3 and J1 as shown in the diagram below.  Codes and their corresponding functions are as listed below. <table border="1"> <thead> <tr> <th>Code</th><th>Function</th></tr> </thead> <tbody> <tr> <td>TXD(A)</td><td>Transmitting data + (a pair with TXD(B))</td></tr> <tr> <td>TXD(B)</td><td>Transmitting data - (a pair with TXD(A))</td></tr> <tr> <td>RXD(A)</td><td>Receiving data + (a pair with RXD(B))</td></tr> <tr> <td>RXD(B)</td><td>Receiving data - (a pair with RXD(A))</td></tr> </tbody> </table>	Code	Function	TXD(A)	Transmitting data + (a pair with TXD(B))	TXD(B)	Transmitting data - (a pair with TXD(A))	RXD(A)	Receiving data + (a pair with RXD(B))	RXD(B)	Receiving data - (a pair with RXD(A))
Code	Function										
TXD(A)	Transmitting data + (a pair with TXD(B))										
TXD(B)	Transmitting data - (a pair with TXD(A))										
RXD(A)	Receiving data + (a pair with RXD(B))										
RXD(B)	Receiving data - (a pair with RXD(A))										
Circuit No. I0-2 Corresponding signal Servo Control Communication DT DT* CK CK*	Circuit  • Communication method is RS-485. • As a device for termination of communication, connect a connector for terminal resistor.										

*9  The terminal resistor switch is equipped in the device HARD VER. 2.00 or after.



Caution

- COM (a common of power supply for control input/output signals) and GND (a common for internal control power supply +5V) are isolated. Therefore, avoid common wiring and all-in-one wire bundling.
- Note that this signal explanation includes other signals that are not used in the standard specifications.

* User is requested to prepare power supply +V (+24V, 0.5A) for control input/output signals.

Table 4-4 Control input signal list (1/14)

Signal name	Code	Terminal No.	Circuit number	Function
Deviation Clear	CLR	——	I-1	• When this signal is switched ON, position deviation counter is reset, and motor stops in the condition of zero at speed command. • If this signal is input when motor is in operation, motor stops quickly. • In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. • When this signal is ON, indication [CLR] of LCD module will light up.
Command Pulse Input Prohibition Related parameter (P600)	CIH (*)	——	I-1	• In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. • When this signal is ON, indication [CIH] of LCD module will light up. When P600 is set to "CIH CLOSE" • When CIH is switched ON, pulse train command becomes invalid and motor becomes servo-lock conditions. • If this signal is input when motor is in operation, motor stops after processing deviation pulse inside the position deviation counter. • This signal becomes valid in pulse train run. When P600 is set to "CIH OPNE" • In all conditions, the logic when P600 is set to "CIH CLOSE" can be reversed. When P600 is set to "PFB CLOSE" • When this signal is switched ON, the output of the motor encoder is used as feedback pulses for position control. When this signal is switched OFF, the output of the measuring encoder is used. • This signal is valid in all run modes. When P600 is set to "PFB OPNE" • In all conditions, the logic when P600 is set to "PFB CLOSE" can be reversed.
Reset	RST	CN1-36	I-1	• When this signal is switched ON, alarm under detection is reset, and alarm output signal is switched OFF. • When this signal is coming in, it becomes torque-free conditions, and Brake Release signal (BRK) and Servo Ready signal (RDY) are not output. When the signal is turned OFF again, Brake Release signal and Servo Ready signal come out, and the device returns to normal operating conditions. • This signal is valid in all modes. • This signal can be input with pulse signal of 3 msec or more. • This signal can also be used as a release signal for emergency stop. • Reset of alarm can also be done by restarting the device input power supply. • In the initial conditions, it is assigned to external input signal "DI1". • When RST is ON, indication [RST] of LCD module will light up. ⚠ Be sure to remove the cause of alarm first, and reset it.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-5 Control input signal list (2/14)

Signal name	Code	Terminal No.	Circuit number	Function
Emergency Stop Related parameters (P710) (P711) (P712)	EMG*	——	I-1	- When EMG is switched OFF, motor stops with stopping method and deceleration time that are specified by parameters. In this case, Servo Ready signal (RDY) is switched OFF. - After motor stop, motor becomes torque-free conditions when the time specified by the parameters is elapsed, and Brake Release signal (BRK) is switched OFF. - Emergency stop conditions can be reset by switching EMG ON and by inputting the Reset signal (RST). - In the condition of EMG ON, normal operation is enabled. - During an emergency stop, no alarms are detected. Note that if the device enters the emergency stop status after an alarm occurs, no new alarms will be detected. - This signal is valid for all modes. - This signal can be input with pulse signal of 3msec or more. - This signal has a priority over the over travel signals (FOT, ROT). - In the initial conditions, there is no assignment of external input signal. When necessary, perform assignment at [P737/P738]. - When EMG is switched OFF, indication [EMG] of LCD module will light up, and when emergency stop conditions are released, it is turned off.
Servo On Related parameter (P704)	SON (*)	CN1-35	I-1	- When SON is switched ON, power transistor is activated and motor becomes power-on conditions. - When SON is switched OFF, motor becomes torque-free conditions. - When SON is switched OFF while motor is in operation, motor coasts to stop. - When SON is OFF, Brake Release signal (BRK) and Servo Ready signal (RDY) are not output. - This signal is valid in all modes. - Effective logic of this signal can be changed by the parameter. By changing the logic, ON/OFF conditions of the above SON can be changed to all opposite. - In the initial conditions, it is assigned to external input signal "DI2". - At the signal input with effective logic, indication [SON] of LCD module will light up.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.
Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-6 Control input signal list (3/14)

Signal name	Code	Terminal No.	Circuit number	Function																																				
Mode Select 1,2 Related parameter (P706)				- When this signal is switched ON, each run mode is selected in the combination of MD1 and MD2 as shown in the table below.<table border="1"><tr><td>MD2</td><td>MD1</td><td>Run mode</td></tr><tr><td>OFF</td><td>OFF</td><td>Manual run</td></tr><tr><td>OFF</td><td>ON</td><td>Zero return run</td></tr><tr><td>ON</td><td>OFF</td><td>Automatic run</td></tr><tr><td>ON</td><td>ON</td><td>Pulse train run</td></tr></table> - The time from when both signals are switched to when the motor enters each mode can be set within 0 sec to 9.99 sec (resolution of 10 ms) with [P706]. (Initial value: 0.01 sec) However, the actual mode change time is obtained by adding 0.02 sec to this setting time. - When a switch is made during operation, the timing of operation mode changes is as below.<table border="1"><tr><td>Pre-switch operation mode</td><td>Stop mode</td><td>When to make the switch</td></tr><tr><td>Manual operation</td><td>JOG OFF</td><td>S</td></tr><tr><td rowspan="2">Zero point return operation</td><td>Zero point return complete</td><td>S</td></tr><tr><td>HLD stop</td><td>S</td></tr><tr><td rowspan="3">Automatic operation</td><td>PEND stop</td><td>S</td></tr><tr><td>PCAN stop</td><td>S</td></tr><tr><td>HLD stop</td><td>S</td></tr><tr><td>Pulse train operation</td><td>—</td><td>I</td></tr></table> I: When MD1 and MD2 are switched, the operation mode is changed immediately. S: After MD1 and MD2 are switched, the operation mode is changed when the operation is stopped. - In the initial conditions, assignment below is made. MD1: External input signal "DI7" MD2: External input signal "DI8" At the signal input, indication [MD1] and [MD2] of LCD module will light up respectively.	MD2	MD1	Run mode	OFF	OFF	Manual run	OFF	ON	Zero return run	ON	OFF	Automatic run	ON	ON	Pulse train run	Pre-switch operation mode	Stop mode	When to make the switch	Manual operation	JOG OFF	S	Zero point return operation	Zero point return complete	S	HLD stop	S	Automatic operation	PEND stop	S	PCAN stop	S	HLD stop	S	Pulse train operation	—	I
	MD2	MD1	Run mode																																					
	OFF	OFF	Manual run																																					
OFF	ON	Zero return run																																						
ON	OFF	Automatic run																																						
ON	ON	Pulse train run																																						
Pre-switch operation mode	Stop mode	When to make the switch																																						
Manual operation	JOG OFF	S																																						
Zero point return operation	Zero point return complete	S																																						
	HLD stop	S																																						
Automatic operation	PEND stop	S																																						
	PCAN stop	S																																						
	HLD stop	S																																						
Pulse train operation	—	I																																						
MD1	CN1-30	I-1																																						
MD2	CN1-29	I-1																																						
Command Direction Select	SSD	———	I-1	- When select command is "internal command", and when SSD is switched ON, it becomes reverse direction command. - This signal is valid for the [TRQ], [SPD], [CTRQ], and [CSPD] commands executed in the "automatic run" mode. - This signal is invalid in analog command. - For [SPD] or [CSPD], deceleration is made according to the setting of parameter [P216 Deceleration time 3], and acceleration is made according to the setting of parameter [P213 Acceleration time 3]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. At the signal input, signal corresponding to the assignment of [Diagnosis display mode], "STIN", becomes "1".																																				
Proportional Control Select	PC	———	I-1	- When PC is switched ON, Speed-loop changes from proportional/integral control to proportional control. - The signal is effective in other than [TRQ] and [CTRQ] commands. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. When PC is ON, indication [PC] of LCD module will light up.																																				

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-7 Control input signal list (4/14)

Signal name	Code	Terminal No.	Circuit number	Function
Torque Limit Related parameters (P125) (P126) (P127) (P128)	TL	——	I-1	- When TL is switched ON, motor output torque is limited by the value of External torque limit command voltage (TL+,TL-) (300% torque/+10V) when setting -1 to Torque Limit value 2(+/-) of parameters (P127,P128). And when setting 0 to 799, torque is limited by set value. External torque limit command voltage (TL+,TL-) is factory-installed option. - When TL is OFF, only the Torque Limit value 1(+/-) of parameter is valid. - When TL is ON, and when setting of Torque Limit value 1(+/-) of parameter is lower than (TL+,TL-) or Torque Limit value 2, Torque Limit value 1 has priority. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When TL is ON, indication [TL/RJ] of LCD module will light up.
Forward Over Travel Related parameter (P705)	FOT*	——	I-1	This signal is forward direction, travel limit (stroke end) signal. - When FOT is switched ON, motor stops quickly recognizing travel limits point and becomes servo-lock conditions. - In the FOT OFF conditions, only the reverse direction is operable. - In the FOT ON conditions, normal operation is possible recognizing it is in the range of normal operation. - This signal is valid in all modes. [Valid/Invalid] of this signal can be selected with parameter. - If emergency stop [ENG] signal is switched OFF, this signal becomes invalid. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When FOT is OFF, indication [FOT] of LCD module will light up.
Reverse Over Travel Related parameter (P705)	ROT*	——	I-1	This signal is reverse direction, travel limit (stroke end) signal. - When ROT is switched OFF, motor stops quickly recognizing travel limits point and becomes servo-lock conditions. - In the ROT OFF conditions, only the forward direction is operable. - In the ROT ON conditions, normal operation is possible recognizing it is in the range of normal operation. - This signal is valid in all modes. [Valid/Invalid] of this signal can be selected with parameter. - If emergency stop [ENG] signal is switched OFF, this signal becomes invalid. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When ROT is OFF, indication [ROT] of LCD module will light up.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-8 Control input signal list (5/14)

Signal name	Code	Terminal No.	Circuit number	Function																									
Speed Override				- This signal can be set at 15-step ratio from 10% to 150% (resolution 10%). - OR4 to OR1 are processed as binary data (4-bit) and corresponds to bit 3 to 0 respectively. <table><tr><th>Override</th><th>OR4(80%)</th><th>OR3(40%)</th><th>OR2(20%)</th><th>OR1(10%)</th></tr><tr><td>10%</td><td></td><td></td><td></td><td>○</td></tr><tr><td>50%</td><td></td><td>○</td><td></td><td>○</td></tr><tr><td>100%</td><td>○</td><td></td><td>○</td><td></td></tr><tr><td>150%</td><td>○</td><td>○</td><td>○</td><td>○</td></tr></table> *○: Signal ON, Blank: Signal OFF - When all OR4 to OR1 are OFF conditions, override becomes invalid. - In operation under pulse train command and external analog command, override becomes invalid. - Override becomes invalid in creep speed during Zero Return. - When OR4 to OR1 are switched to ON, override data is read out as 4-bit data and operation speed is changed in real-time. - Operation speed can be calculated in the following formula. (Example) Operation speed = Command speed × Override 1500[rpm] = 1000[rpm] × 150[%] 100[mm/s] = 1000[mm/s] × 10[%] * When operation is executed with internal command using the [SPD] or [CSPD] command, and if speed after override exceeds 120% of motor rated speed*¹⁰, the speed is clamped at 120% of rated speed*¹⁰. In other cases, it is clamped at 100% of rated speed*¹⁰. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - LCD module [Diagnosis display mode] displays currently selected override ratio (10 to 150%).	Override	OR4(80%)	OR3(40%)	OR2(20%)	OR1(10%)	10%				○	50%		○		○	100%	○		○		150%	○	○	○	○
	Override	OR4(80%)	OR3(40%)	OR2(20%)	OR1(10%)																								
	10%				○																								
	50%		○		○																								
	100%	○		○																									
150%	○	○	○	○																									
	OR1	———	I-1																										
	OR2	———	I-1																										
	OR3	———	I-1																										
	OR4	———	I-1																										
Forward Direction Jog				In Manual run mode																									
Related parameters (P400) (P401) (P402) (P403) (P404) (P405) (P406) (P407) (P408)	FJOG	CN1-33	I-1	- If FJOG signal continues ON conditions for 3[ms] or more, one-shot jog operation (travel in the distance of minimum setting unit) is executed in forward direction. If the signal continues ON conditions for 100[ms] or more, Forward Direction Jog operation is executed. - When FJOG is OFF, Forward Direction Jog operation is stopped. When this signal is in ON conditions and if Reverse Direction Jog signal (RJOG) becomes ON, Forward Direction Jog operation is stopped. In Zero return run mode - When FJOG is switched ON, forward direction Zero Return operation is executed. - In the initial conditions, it is assigned to external input signal "DI4". - When FJOG is ON, indication [DR/FJ] of LCD module will light up.																									

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

*¹⁰ If P005 or P006 is other than 0, the speed is the applicable maximum speed.

Table 4-9 Control input signal list (6/14)

Signal name	Code	Terminal No.	Circuit number	Function
Reverse Direction Jog Related parameters (P400) (P401) (P402) (P403) (P404) (P405) (P406) (P407) (P408)	RJOG	CN1-32	I-1	In Manual run mode - If RJOG signal continues ON conditions for 3[ms] or more, one-shot jog operation (travel in the distance of minimum setting unit) is executed in reverse direction. If the signal continues ON conditions for 100[ms] or more, Reverse Direction Jog operation is executed. - When RJOG is OFF, Reverse Direction Jog operation is stopped. When this signal is in ON conditions and if Forward Direction Jog signal (FJOG) becomes ON, Reverse Direction Jog operation is stopped. In Zero return run mode - When RJOG is switched ON, reverse direction Zero Return operation is executed. - In the initial conditions, it is assigned to external input signal "DI5". - When RJOG is ON, indicator [TL/RJ] of LCD module will light up.
Jog speed select Related parameters (P400) (P401)	JOSP	—	I-1	- When JOSP is ON, the jog speed becomes the setting value of [P401]. - JOSP is OFF, the jog speed becomes the setting value of [P400]. - The signal status affects operation instantly regardless of the jog direction. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - LCD module [Diagnosis display mode] displays the current selected jog speed.
Zero Point Deceleration Related parameters (P402) (P403) (P404) (P405) (P406) (P407) (P408) (P610)	ZLS	CN1-31	I-1	- When ZLS is switched ON during Zero Return operation, Zero Point Deceleration is started. In the standard Zero Return, this signal should be ON from the start of Zero Point Deceleration to the completion (ON condition must be kept even at Zero point position). - If the signal is already ON when starting Zero Return operation, move the motor to the opposite direction of Zero Return direction once, and confirm this signal is OFF, and then execute Zero Return operation. - In the initial conditions, it is assigned to external input signal "DI6". - When ZLS is ON, indication [ZLS] of LCD module will light up.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-10 Control input signal list (7/14)

Signal name	Code	Terminal No.	Circuit number	Function																											
Address Assignment	PS1	———	I-1	Select address to start automatic run. <table border="1"><tr><td>Select signal</td><td>PS8</td><td>PS7</td><td>PS6</td><td>PS5</td><td>PS4</td><td>PS3</td><td>PS2</td><td>PS1</td></tr><tr><td>Signal status</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr><tr><td></td><td>128</td><td>64</td><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr></table>	Select signal	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	Signal status	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0		128	64	32	16	8	4	2	1
	Select signal	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1																						
	Signal status	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0																						
		128	64	32	16	8	4	2	1																						
	PS2	———	I-1	(Example) Start address 11																											
	PS3	———	I-1	<table border="1"><tr><td>Select signal</td><td>PS8</td><td>PS7</td><td>PS6</td><td>PS5</td><td>PS4</td><td>PS3</td><td>PS2</td><td>PS1</td></tr><tr><td>Signal</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr></table>	Select signal	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	Signal	0	0	0	0	1	0	1	1									
	Select signal	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1																						
	Signal	0	0	0	0	1	0	1	1																						
	PS4	———	I-1																												
PS5	———	I-1	When the Automatic start signal (PST) is switched ON, it is read out as data of execution address.																												
PS6	———	I-1	This signal can assign 0 to 255 addresses.																												
PS7	———	I-1	PS8 to PS1 are processed as 8-bit binary data, and when each signal is ON, the corresponding bit becomes "1".																												
PS8	———	I-1	Relations between each signal and corresponding bit are as shown in the above table.																												
			- In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - Currently selected address and command of the address can be checked with LCD module [Diagnosis display mode].																												
Automatic start	PST	CN1-34	I-1	- When PST is switched ON, it executes command of address assigned with Address Select (PS1 to PS8). - It functions as a restart signal for hold or block stop in automatic run. - The External automatic start prohibit signal (EPIH) can inhibit the Automatic start signal input from an external input signal. - This signal can be input with pulse signal of 3 msec or more. - In the initial conditions, it is assigned to external input signal "DI3". - When PST is ON in automatic run, indication [PST] of LCD module will light up.																											
External automatic start prohibit	EPIH	———	I-1	- When EPIH is ON, the external input Automatic start signal is inhibited. (The Automatic start signal for serial communication, sequence control, and remote sequence control devices is not inhibited.) - When EPIH is switched OFF in the external input Automatic start signal ON status, the Automatic start signal is accepted. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When EPIH is ON, the signal corresponding to the assignment of [Diagnosis display mode], "STIN", becomes "1".																											

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-11 Control input signal list (8/14)

Signal name	Code	Terminal No.	Circuit number	Function
Hold	HLD	——	I-1	- When HLD is switched ON, run operation is stopped temporarily. - To recover from the temporary stop status, switch OFF this signal, and In zero return run: Switch ON the Forward Direction Jog signal (FJOG) or Reverse Direction Jog signal (RJOG). - In automatic run: Switch ON the Automatic start signal (PST). - In the initial conditions, there is no assignment of external input signal. When necessary assign it with [P737/P738]. - When HLD is ON, indication [HLD] of LCD module will light up.
External trigger Related parameter (P411) (P610)	TRG	——	I-1	- When TRG is switched ON during the execution of automatic run external trigger positioning valid operation, external trigger positioning operation is executed. During operation for which automatic operation external trigger positioning is valid, TRG signal ON cannot be received with a remote signal. - During CPOS/CSPD/CTRQ command operation, switching TRG ON causes the next command to be executed with the specified timing. - This signal is valid within the automatic run TRG signal valid range. - This signal can be input with a pulse signal of 200 μ sec or more. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When TRG is ON, indication [TRG] of LCD module will light up.
M complete	MFIN	——	I-1	- When MFIN is switched ON, the M strobe output signal (MSTB) is switched OFF, and control is passed to execute the next command. - This signal is valid in automatic run. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When MFIN is ON, the signal corresponding to the assignment of [Diagnosis display mode], "STIN", becomes "1".
Block stop	BSTP	——	I-1	- When BSTP is switched ON during the execution of an automatic run command, automatic run is stopped in block units, and it enters the restart waiting (block stop) status. - When automatic run operation is started in the BSTP ON status, it stops after the execution of one block and enters the restart waiting status. - Whether to detect this signal and processing performed when the signal is detected depend on the command. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When BSTP is ON, the signal corresponding to the assignment of [Diagnosis display mode], "STIN", becomes "1".
Program cancel	PCAN	——	I-1	- When PCAN is switched ON during the execution of an automatic run command, automatic run operation is canceled (Automatic run operation is interrupted, the temporary stop status is released, or the block stop status is released). - When PCAN is switched ON while the motor is in operation, the motor decelerates and stops with the deceleration time selected for each command. - When or after stopped, the motor enters the start waiting status according to Address Assignment. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - When the signal is input, the signal corresponding to the assignment of [Diagnosis display mode], "STIN", becomes "1".

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-12 Control input signal list (9/14)

Signal name	Code	Terminal No.	Circuit number	Function
Speed Command Related parameters (P005) (P006) (P129) (P130) (P132) (P133) (P211) (P214) (P300)	INH	CN1-19	I-4 Analog	- When external speed command is valid in the [SPD] or [CSPD] command run, motor runs at the proportional speed to speed command voltage. - In the case of $\pm 10\text{VDC}$ input, motor runs at rated speed^{*11}. - By setting [P129], it is possible to adjust and set speed command voltage for motor rated rotating speed^{*11} in the numeric value of $\pm 6\text{V}$ to 100V. The input voltage range is a rated voltage range from -10 to $+10\text{V}$. (Instantaneous maximum: $\pm 12\text{V}$) - Based on GND terminal, when positive voltage input, motor executes forward direction operation, while in negative voltage input, motor executes reverse direction operation. - Acceleration and deceleration time of motor can be set with parameter respectively. - In torque control command, it is possible to function as external speed limit by setting [P132]. Note) When control input/output expansion unit 1 is connected by option, the speed command from the basic connector CN1 will be ineffective.
Torque Command Related parameters (P131) (P132) (P133) (P300)	TQH	CN1-1	I-4 Analog	- When external torque command is valid in the [TRQ] or [CTRQ] command run, motor outputs torque proportionally to torque command voltage. - When $\pm 10\text{VDC}$ is input, the motor is operated with a torque of 300%. - If $\pm 10\text{V}$ is exceeded, the torque command is clamped to $\pm 10\text{V}$. - Based on GND terminal, In positive voltage input ... It generates driving torque in forward direction. In negative voltage input ... It generates driving torque in reverse direction. - It is possible to impose speed limit by the speed command (INH) by setting [P132]. Note) When control input/output expansion unit 1 is connected by option, the torque command from the basic connector CN1 will be ineffective.
Torque Limit Command +,- Related parameters (P127) (P128)	TL+ TL-	——— ———	I-4 I-4 Analog	- This signal is an exclusive signal for factory-installed option, [Control input/output expansion unit 1]. - If Torque Limit signal (TL) is input, output torque is limited by either small value of Torque Limit command or of Torque Limit value of parameter. - With TL+ command, driving torque of forward direction is limited. - With TL- command, driving torque of reverse direction is limited. - Based on GND terminal for both TL+ and TL-, positive voltage is input. Input range is 0 to $+10\text{VDC}$, and when $+10\text{VDC}$ are input respectively, limit value becomes 300% torque.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

^{*11} If P005 or P006 is other than 0, the speed is the applicable maximum speed.

Table 4-13 Control input signal list (10/14)

Signal name	Code	Terminal No.	Circuit number	Function																									
Gain Select Gain Select 2 Related parameters (P111 to P115) (P226 to P229) (P315 to P316) (P415 to P419) (P615 to P619)	GSEL GSEL2	—	I-1	- When this signal is switched ON, each run mode is selected in the combination of GSEL and GSEL2 as shown in the table below. <table border="1"> <thead> <tr> <th>GSEL2</th><th>GSEL</th><th>Conditions</th><th>Speed-loop</th><th>Position-loop</th></tr> </thead> <tbody> <tr> <td>OFF</td><td>OFF</td><td>Normal</td><td>P101 to P105 or P106 to P110</td><td>P200/P201</td></tr> <tr> <td>OFF</td><td>ON</td><td>GSEL1</td><td>P111 to P115</td><td>P226/P227</td></tr> <tr> <td>ON</td><td>OFF</td><td>GSEL2</td><td>P415 to P419</td><td>P228/P229</td></tr> <tr> <td>ON</td><td>ON</td><td>GSEL3</td><td>P615 to P619</td><td>P315/P316</td></tr> </tbody> </table> (In this manual, explanation is made provided this signal is in OFF state. Thus, always consider this signal is OFF unless otherwise there is special annotation of [when GSEL signal is at ON].) - This signal is valid in all modes. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738]. - At the signal input, signal corresponding to the assignment of [Diagnosis display mode], "STIN", becomes "1".	GSEL2	GSEL	Conditions	Speed-loop	Position-loop	OFF	OFF	Normal	P101 to P105 or P106 to P110	P200/P201	OFF	ON	GSEL1	P111 to P115	P226/P227	ON	OFF	GSEL2	P415 to P419	P228/P229	ON	ON	GSEL3	P615 to P619	P315/P316
GSEL2	GSEL	Conditions	Speed-loop	Position-loop																									
OFF	OFF	Normal	P101 to P105 or P106 to P110	P200/P201																									
OFF	ON	GSEL1	P111 to P115	P226/P227																									
ON	OFF	GSEL2	P415 to P419	P228/P229																									
ON	ON	GSEL3	P615 to P619	P315/P316																									
Compulsory Brake ON	BRON	—	I-1	- When BRON is switched ON, Brake Release signal (BRK) is forcibly switched to Brake conditions. (This manual explains, provided this signal is OFF conditions) - This signal is valid in all modes. - During the execution of the drop prevention function, do not switch this signal ON. Switching this signal ON makes the drop prevention function ineffective. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P737/P738] - When BRON is ON, signal corresponding to the assignment of [Diagnosis display mode], [STIN], becomes "1".																									
1st external latch input	EXT1	—	I-1	- This signal is used when the MECHATROLINK-III expansion board interface is mounted. - For details of this signal, refer to the instruction manual, "VCII-C1 TYPE MECHATROLINK-III".																									
2nd external latch input	EXT2	—	I-1																										
3rd external latch input	EXT3	—	I-1																										
Encoder Feedback Pulse Related parameters (P001) (P002) (P008)	A A* B B* Z Z* SD SD*	CN2	I-3	- Feedback pulse signal from encoder and linear sensor attached to motor is input. 90° phase difference 2 signals (A-phase, B-phase) and marker signal (Z-phase) of line driver output (26LS31 equivalent) are input. - When IPU is connected, serial data (SD, SD*) and marker signal (Z-phase) of line driver output (26LS31 equivalent) are input. - In this signal, phase sequence can be switched by changing [P008].																									
Magnetic Pole Sensor Input Related parameters (P008) (P010) (P011)	PS PS* PC PC*	CN2	I-5	- Feedback signal from magnetic pole sensor that is attached to motor is input. - In this signal, attaching direction of magnetic pole sensor can be switched by changing [P008].																									

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-14 Control input signal list (11/14)

Signal name	Code	Terminal No.	Circuit number	Function								
Pulse Train Command	FC FC*	CN1-26 CN1-25	I-2 Selectable option	- Directional or 90° phase difference pulse train is input. Input method can cope with line receiver and open collector (option). - In the case of line driver method, line driver output is connected between the FC and FC* and between the RC and RC* respectively. - In the case of open collector method, +V (external power supply for open collector circuit) is connected to FC and RC, and output of open collector is connected to FC* and RC* respectively. - For a pulse train command with a 90° phase difference, the motor operates in the forward direction if the FC-to-FC* or FC* pulse train (A-phase) is delayed from the RC-to-RC* or RC* pulse train (B-phase) in phase by 90° and operates in the reverse direction if it is advanced in phase by 90°. - In the case of directional pulse train command, motor runs in forward direction if pulse train is input to FC-FC* or FC*, or motor runs in reverse direction if pulse train is input to RC-RC* or RC*. - In the case of direction signal + feed pulse command, direction signal is input to RC-RC* or RC*, and feed pulse is input to FC-FC* or FC*.								
				Logic of direction signal is as follows. <table><tr><th>Connection method</th><th>Signal name</th><th>Forward rotation command</th><th>Reverse rotation command</th></tr><tr><td>Line driver</td><td>RC-RC*</td><td>"L"-"H"</td><td>"H"-"L"</td></tr><tr><td>Open collector</td><td>RC*</td><td>0V-open</td><td>0V-short</td></tr></table>	Connection method	Signal name	Forward rotation command	Reverse rotation command	Line driver	RC-RC*	"L"-"H"	"H"-"L"
Connection method	Signal name	Forward rotation command	Reverse rotation command									
Line driver	RC-RC*	"L"-"H"	"H"-"L"									
Open collector	RC*	0V-open	0V-short									
Related parameters (P300) (P601) (P602) (P610)	RC RC*	CN1-24 CN1-23	I-2 Selectable option	- With parameter [pulse train command phase order switch], it is possible to run motor in reverse direction with forward direction pulse train command. - Maximum input frequency of pulse train command is as follows, under standard specifications.								
				In line driver output 90° phase difference pulse: 5.00Mpps, 20Mpps with 4-time multiplications (6.25Mpps, 25Mpps with 4-time multiplications)*¹² Directional pulse: 5.00Mpps (6.25Mpps)*¹² Minimum pulse width: 100ns or more (80ns or more)*¹² - Maximum frequency when selected pulse train command open collector pulse train receiving unit at option is as follows. In line driver output 90° phase difference pulse: 1Mpps, 4Mpps with 4-time multiplications Directional pulse: 1Mpps Minimum pulse width: 500ns or more In open collector (using voltage 5-12V) output 90° phase difference pulse: 250kpps, 1Mpps with 4-time multiplications Directional pulse: 250kpps Minimum pulse width: 2μs or more - As for signals in each pulse command when using line driver, refer to next page. - As for signals in each pulse command when using open collector, refer to next page.								

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

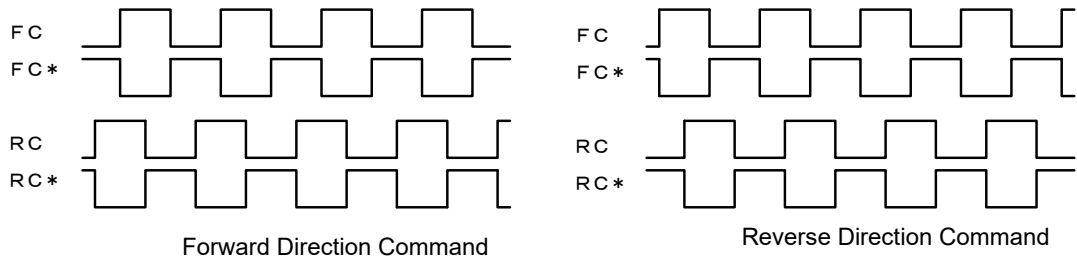
Note 2) Terminal No. is a number assigned in parameter initial conditions.

*¹²  The spec in () is applicable to the device of HARD VER 2.00 or later.

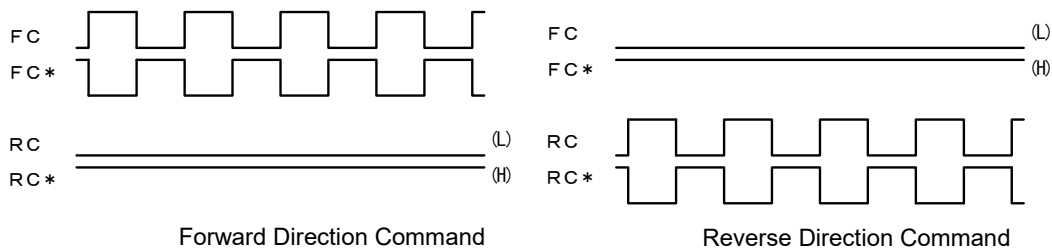
Table 4-15 Control input signal list (12/14)

- Input pulse form when using line driver
In case of line receiver input method

90° phase difference signal



Directional pulse



Direction signal + Feed pulse command

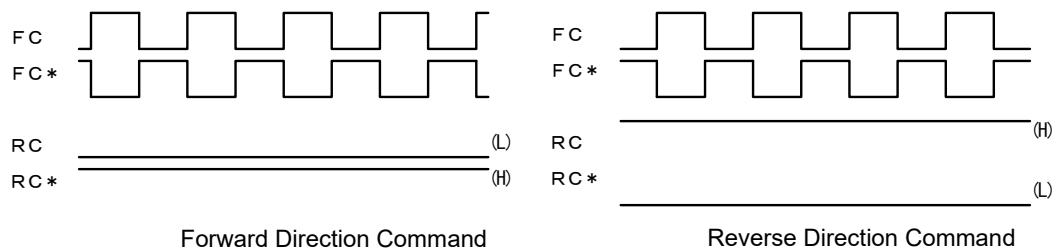


Table 4-16 Control input signal list (13/14)

• Input pulse form when using line driver
In case of photo coupler input method (option)

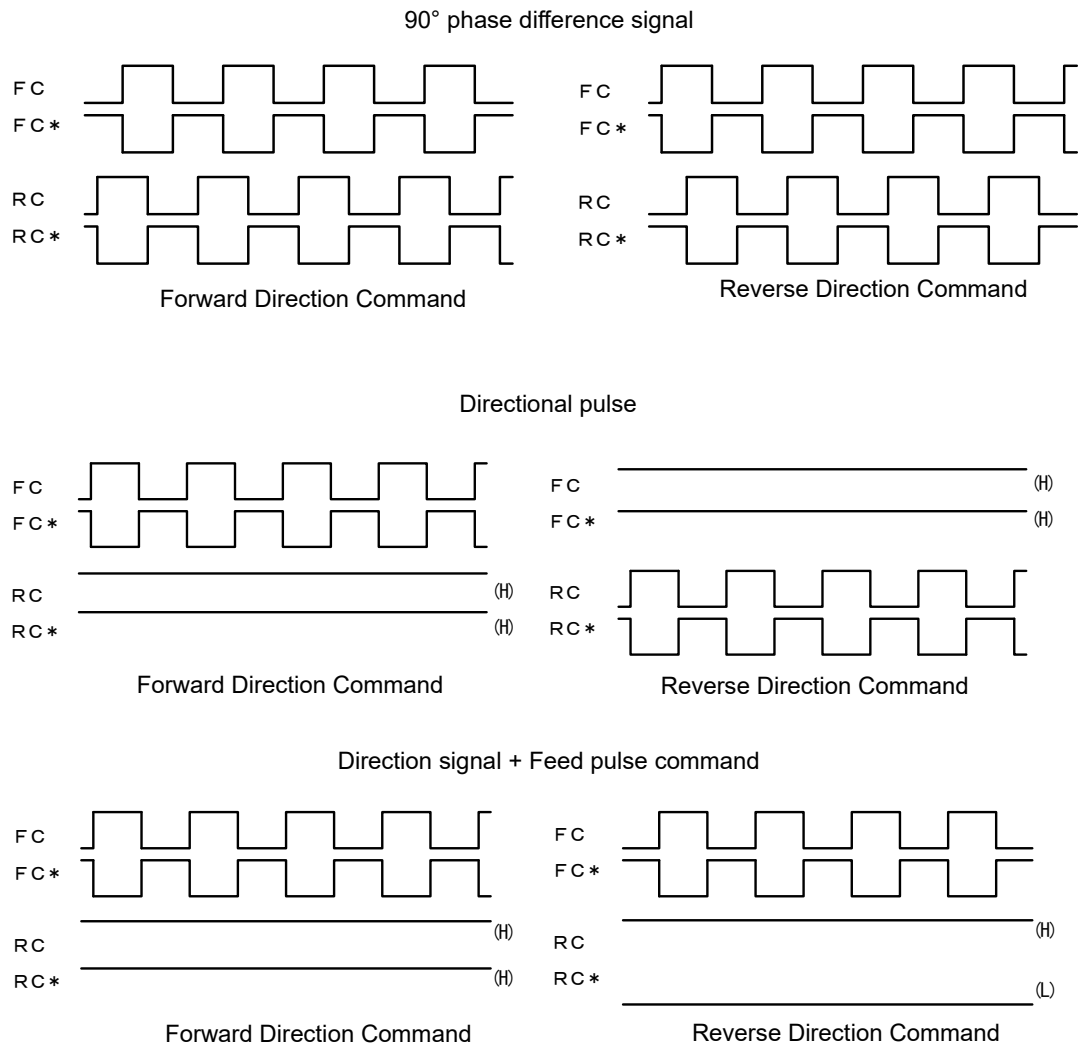
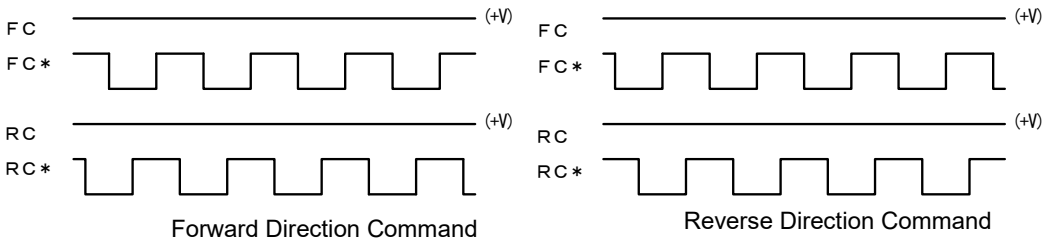


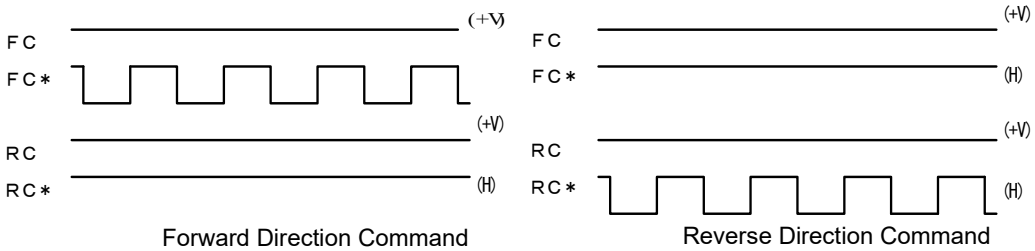
Table 4-17 Control input signal list (14/14)

- Input pulse form when using open collector
In case of photo coupler input method (option)

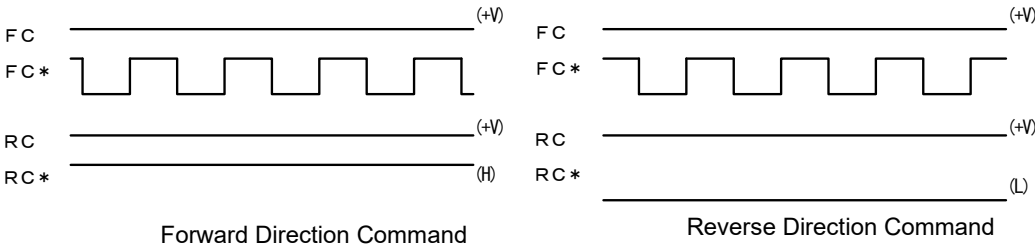
90° phase difference signal



Directional pulse



Direction signal + Feed pulse command



Note) +V is +5V to +12V power supply.

Table 4-18 Control output signal list (1/8)

Signal name	Code	Terminal No.	Circuit number	Function
Alarm Related parameter (P715)	ALM (*)	CN1-16	O-1	- This signal is open collector output that is isolated from internal control power supply. - If alarm is happened, motor goes in quick-stop or torque-free stop. - Upon alarm, this signal is switched ON, and at the same time, Servo Ready signal (RDY) is switched OFF. If motor becomes torque-free conditions, Brake Release signal (BRK) is switched OFF. - In normal operation, this signal is OFF. - Reset of alarm is conducted with input of Reset signal (RST) or power restart, and this signal is switched OFF upon the input of Reset signal. - In the initial conditions, it is assigned to external output signal "DO2". - When ALM is ON, indication [ALM] of LCD module will light up, and alarm contents are displayed on 7-segment LED for status display.
Servo Ready Related parameter (P716)	RDY	CN1-17	O-1	- This signal is open collector output that is isolated from internal control power supply. - When preparation of motor control operation is completed, this signal is switched ON. - For devices with SoftVer2.51 or later: When the τ DISC/τ linear/Servo Compass is connected, if the motor vibrates after the completion of automatic magnetic pole detection operation, this signal is switched ON after vibration stops. - When alarm happened and Servo On signal (SON) is OFF, and when motor enters torque-free conditions, this signal is switched OFF. - When alarm happened, and if alarm is reset by input of Reset signal (RST) or by power restart, this signal is recovered. - While Reset signal (RST) is input, this signal is OFF. When the Reset signal is switched OFF again, this signal is switched ON. - At the power-on, this signal is output after 3.0 seconds in maximum, due to power supply reset time of the device inside. When Servo On signal (SON) is input, this signal is output after 3msec in maximum, and when Reset signal (RST) is input, this signal is output after 1.0sec in maximum after reset-release due to internal arithmetic processing. - As for external power supply application and abnormal processing sequence, consider above timing. - In the initial conditions, it is assigned to external output signal "DO1". - When RDY is ON, indication [RDY] of LCD module will light up.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-19 Control output signal list (2/8)

Signal name	Code	Terminal No.	Circuit number	Function
Warning	WNG (*)	CN1-15	O-1	- This signal is open collector output that is isolated from internal control power supply. - If continuing current operation may activate error detection and stop operation, this signal is switched ON as warning signal. - When this signal is output, run operation does not stop. - When concern about the occurrence of abnormality is released, this signal is switched OFF. - This signal is output if items below are applicable. 1) Overload precaution 2) Deviation abnormal warning 3) Main power supply low voltage detection warning For descriptions, refer to [10-3-2 Warning list]. - In the initial conditions, it is assigned to external output signal "DO3". - When WNG is ON, indication [WNG] of LCD module will light up, and warning contents are displayed on 7-segment LED for status display.
Positioning Complete	PN	CN1-14	O-1	- In the zero return run, this signal is switched ON when Zero Return operation is completed. - In the automatic run, this signal is switched ON when difference between current position and positioning data falls within the range of value set with [P202], after completion of positioning command. - During pulse train operation, - If [P609] is "0" This signal is switched ON when the value of the position deviation counter falls within the range specified in [P202]. - If [P609] is "other than 0" This signal is switched ON when the value of the position deviation counter falls within the range specified in [P202] in the stop (no pulse train command) status. - By setting [P718], it is possible to set the time after which this signal is to be switched ON when the value of the position deviation counter falls within the range specified in [P202]. - This signal is also switched OFF in the incident of [automatic run start], [run mode change], [servo-off], [alarm happening], [when emergency stop is OFF], and [Reset, Deviation Clear, Program cancel signal ON]. - In the initial conditions, it is assigned to external output signal "DO4". - When PN is ON, indication [PN] of LCD module will light up.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-20 Control output signal list (3/8)

Signal name	Code	Terminal No.	Circuit number	Function
Positioning Complete B Related parameters (P613)	PNB	——	O-1	- During manual operation, zero point return operation, and automatic operation This signal is switched ON when the value of the position deviation counter falls within the range specified in [P613] in the stopped (no operation command) status. - During pulse train operation If [P609] is "0" This signal is switched ON when the value of the position deviation counter falls within the range specified in [P613]. If [P609] is "other than 0" This signal is switched ON when there is no pulse train command and the value of the position deviation counter falls within the range specified in [P613]. - This signal is also switched OFF [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], [in the Reset or Deviation clear signal ON status], and [when the SPD/TRQ/CSPD/CTRQ command are executed]. - In the initial status, no external output signals are allocated. Allocate them with [P742] when required. - During signal output, the signal corresponding to the allocation with "SOUT" in "diagnosis display mode" becomes "1".
Zero point return complete Related parameters (P001)	HCMP	——	O-1	<<Applied when an absolute encoder is used>> - Even if zero point return is not complete, this signal is switched ON when the device enters a state in which it can recognize an absolute position. An absolute encoder can be used if the setting value of [P001] is [S-ABS], [S-ABS2], [S-ABS3], [S-MABS], [L-ABS], or [S-ABS4]. - This signal is switched OFF [when the power is turned on] or [when zero point return is started]. <<Applied when an encoder other than an absolute encoder is used>> - This signal is switched ON if zero point return is completed at least once after the power is turned on so that the device can recognize an absolute position. - This signal is switched OFF [when an encoder alarm occurs], [when the power is turned on], or [when zero point return is started]. <<The following are applied regardless of the encoder used.>> - In the initial status, no external output signals are allocated. Allocate them with [P742] when required. - During signal output, the signal corresponding to the allocation with "SOUT" in "diagnosis display mode" becomes "1".
Speed/Torque Limit In-Process Related parameters (P125) (P126) (P127) (P128) (P133)	LIM	——	O-1	- In the TRQ/CTRQ command run, if the motor enters speed limit area, LIM is switched ON, and if the motor deviates from speed limit area, LIM is switched OFF. - In other run modes than the above command, if the motor enters Torque Limit area, this signal is switched ON, and if the motor deviates from Torque Limit area, then this signal is switched OFF. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When LIM is ON, indication [LIM] of LCD module will light up.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.
Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-21 Control output signal list (4/8)

Signal name	Code	Terminal No.	Circuit number	Function																		
Speed Zero Related parameter (P702)	SZ	———	O-1	- In all modes, SZ is switched ON when motor speed becomes slower than the speed set with parameter [P702: speed zero detecting range], and if deviated from this range, SZ is switched OFF. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When SZ is ON, indication [SZ] of LCD module will light up.																		
Brake Release Related parameter (P734)	BRK	———	O-1	- Externally configure motor brake releasing sequence at BRK ON. - This signal is switched OFF when the motor becomes torque-free in the incident of alarm happening, emergency stop, servo-off, and at Reset signal input. - This signal is switched OFF forcibly with the ON of Compulsory Brake ON signal (BRON). - The time to switch OFF this signal after the motor becomes torque-free can be set with parameter. - For drop prevention on the upper and lower axes, for example, it is possible to switch this signal OFF before the device enters the torque free status. For details, refer to [P734]. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When BRK is ON, indication [BRK] of LCD module will light up.																		
Soft Limit Switch Related parameters (P707) (P708) (P709)	SLSA SLSB	——— ———	O-1 O-1	- Following the area set with [P707] to [P709], signal is output corresponding to currently positioned area. - Parameters and output conditions of each signal are shown in the table below.<table border="1"><thead><tr><th>SLSB</th><th>SLSA</th><th>Output conditions</th></tr></thead><tbody><tr><td>OFF</td><td>OFF</td><td>Before Zero Return complete</td></tr><tr><td>OFF</td><td>OFF</td><td>Current position<[P707] setting value</td></tr><tr><td>OFF</td><td>ON</td><td>[P707] setting value≤Current position<[P708] setting</td></tr><tr><td>ON</td><td>ON</td><td>[P708] setting value≤Current position<[P709] setting</td></tr><tr><td>ON</td><td>OFF</td><td>[P709] setting value≤Current position</td></tr></tbody></table> - Output control of Soft Limit Switch signal is executed from the current command position. Therefore, the output generates errors in the amount of positional deviation against the actual position. - When the machine position is not recognized due to such as incomplete Zero Return, this signal is always OFF. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - In the signal output, a signal corresponding to the assignment of [Diagnosis display mode], "SOUT", becomes "1".	SLSB	SLSA	Output conditions	OFF	OFF	Before Zero Return complete	OFF	OFF	Current position<[P707] setting value	OFF	ON	[P707] setting value≤Current position<[P708] setting	ON	ON	[P708] setting value≤Current position<[P709] setting	ON	OFF	[P709] setting value≤Current position
SLSB	SLSA	Output conditions																				
OFF	OFF	Before Zero Return complete																				
OFF	OFF	Current position<[P707] setting value																				
OFF	ON	[P707] setting value≤Current position<[P708] setting																				
ON	ON	[P708] setting value≤Current position<[P709] setting																				
ON	OFF	[P709] setting value≤Current position																				
Marker output Related parameter (P742)	OCEM	———	O-1	- It outputs marker pulse corresponding to motor encoder marker signal. (When a 90° phase difference pulse encoder or a serial incremental encoder (for IPU) is used) - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - Even if this signal is assigned using extended external output signal parameter (P743, P744), this signal is not capable of being output. - The other functions are the same as the encoder pulse output EM and EM*.																		

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-22 Control output signal list (5/8)

Signal name	Code	Terminal No.	Circuit number	Function																														
Encoder pulse output	EA EA*	CN1-8 CN1-7	O-2	- Output division of this signal can be set with parameters. - Maximum output frequency of A/B-phase 2 signals is of 4-multiplication and is 20Mpps. It is 25Mpps when through output is set. ⚠ Devices with HARD Ver 2.00 or later support 25Mpps. - Encoder marker output will be as shown below by the type of encoder to be used and its output dividing frequency. - When other than 0 is set in [P012] at dividing frequency output setting																														
				<table><tr><th rowspan="2">P001</th><th rowspan="2">Marker output width</th><th colspan="2">Signal output delay</th></tr><tr><th>NCR-CDA***</th><th>NCR-CDB*** NCR-CDC***</th></tr><tr><td>INC1,INC2,INC3, L-SEN,C-SEN2</td><td>Same as that when through output is set.</td><td>100 μs</td><td>150 μs</td></tr><tr><td>S-INC,S-ABS</td><td>100 μs</td><td>250 μs</td><td>250 μs</td></tr><tr><td>S-INC2</td><td>Same as that when through output is set.</td><td>150 μs</td><td></td></tr><tr><td>S-ABS2,S-ABS3, S-MABS,S-ABS4</td><td>100 μs</td><td>150 μs</td><td></td></tr><tr><td>L-ABS</td><td>111 μs</td><td>167 μs</td><td></td></tr><tr><td>C-SEN1,L-LESS</td><td>Not output.</td><td>100 μs</td><td>150 μs</td></tr></table>	P001	Marker output width	Signal output delay		NCR-CDA***	NCR-CDB*** NCR-CDC***	INC1,INC2,INC3, L-SEN,C-SEN2	Same as that when through output is set.	100 μs	150 μs	S-INC,S-ABS	100 μs	250 μs	250 μs	S-INC2	Same as that when through output is set.	150 μs		S-ABS2,S-ABS3, S-MABS,S-ABS4	100 μs	150 μs		L-ABS	111 μs	167 μs		C-SEN1,L-LESS	Not output.	100 μs	150 μs
				P001			Marker output width	Signal output delay																										
NCR-CDA***	NCR-CDB*** NCR-CDC***																																	
INC1,INC2,INC3, L-SEN,C-SEN2	Same as that when through output is set.	100 μs	150 μs																															
S-INC,S-ABS	100 μs	250 μs	250 μs																															
S-INC2	Same as that when through output is set.	150 μs																																
S-ABS2,S-ABS3, S-MABS,S-ABS4	100 μs	150 μs																																
L-ABS	111 μs	167 μs																																
C-SEN1,L-LESS	Not output.	100 μs	150 μs																															
Related parameter (P012) (P013)	EB EB*	CN1-6 CN1-5	O-2	* The signal output delay time differs depending on the model type.																														
	EM EM*	CN1-4 CN1-3	O-2	When 0 is set in [P012] at thru output setting <table><tr><th>P001</th><th>Marker output width</th><th>Signal output delay</th></tr><tr><td>INC1,INC2,INC3, L-SEN,C-SEN2</td><td>*</td><td>No delay</td></tr><tr><td>S-INC,S-ABS</td><td>100 μs</td><td>Not output.</td></tr><tr><td>S-INC2</td><td>*</td><td>Not output.</td></tr><tr><td>S-ABS2,S-ABS3, S-MABS,S-ABS4</td><td>100 μs</td><td>Not output.</td></tr><tr><td>L-ABS</td><td>111 μs</td><td>Not output.</td></tr><tr><td>C-SEN1,L-LESS</td><td>Not output.</td><td>No delay</td></tr></table> * The marker signal output width is as below. Encoder marker signal (Z-phase) input marker width/ (Encoder resolution×Rotational speed [rps]) ⚠ When serial encoder (P001 is S-INC/S-ABS/S-INC2/S-ABS2/L-ABS/S-ABS3/S-MABS/S-ABS4 setting) is used, it will not output encoder pulse (EA/EA*/EB/EB*) if 0 is set in P012. ⚠ Please refer to [5-13 Servo control communication] when using servo control communication.	P001	Marker output width	Signal output delay	INC1,INC2,INC3, L-SEN,C-SEN2	*	No delay	S-INC,S-ABS	100 μs	Not output.	S-INC2	*	Not output.	S-ABS2,S-ABS3, S-MABS,S-ABS4	100 μs	Not output.	L-ABS	111 μs	Not output.	C-SEN1,L-LESS	Not output.	No delay									
P001	Marker output width	Signal output delay																																
INC1,INC2,INC3, L-SEN,C-SEN2	*	No delay																																
S-INC,S-ABS	100 μs	Not output.																																
S-INC2	*	Not output.																																
S-ABS2,S-ABS3, S-MABS,S-ABS4	100 μs	Not output.																																
L-ABS	111 μs	Not output.																																
C-SEN1,L-LESS	Not output.	No delay																																
Manual run mode In-Process	MMOD	——	O-1	- In the manual run mode, this signal is switched ON. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When MMOD is ON, status display [Mode display screen] of LCD module displays as [JOG].																														

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-23 Control output signal list (6/8)

Signal name	Code	Terminal No.	Circuit number	Function
Zero return run mode In-Process	HMOD	———	O-1	- In the zero return run mode, this signal is switched ON. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When HMOD is ON, status display [Mode display screen] of LCD module displays as [ORG].
Automatic run mode In-Process	AMOD	———	O-1	- In the automatic run mode, this signal is switched ON. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When AMOD is ON, status display [Mode display screen] of LCD module displays as [AUTO].
Pulse train run mode In-Process	PMOD	———	O-1	- In the pulse train run mode, this signal is switched ON. - In the initial conditions, there is no assignment of external output signal. When necessary, assign it with [P742]. - When PMOD is ON, status display [Mode display screen] of LCD module displays as [PULSE].
Rough match Related parameter (P703)	PRF	———	O-1	- In zero return run, it is switched ON when Zero Return operation is completed. - After positioning operation is started, when the difference between the current position and positioning data becomes less than or equal to the value set in [P703], this signal is switched ON. - This signal is also switched OFF [at the start of automatic run], [when the run mode is changed], [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], and [in the Reset, Deviation Clear, or Program cancel signal ON status]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P742]. - When PRF is ON, indication [PRF] of LCD module will light up.
Program end	PEND	———	O-1	- When the PEND command is executed or the POS, HOME, or INDX command is executed and completed in automatic run, this signal is switched ON. - This signal is switched OFF [at the start of automatic run], [when the run mode is changed], [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], or [in the Reset, Deviation Clear, or Program cancel signal ON status]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P742]. - When PEND is ON, the signal corresponding to the assignment of [Diagnosis display mode], "SOUT", becomes "1".
Automatic run ready Related parameter (P409)	PRDY	———	O-1	- PRDY is switched ON when the Automatic start signal (PST) "can be accepted" (automatic run waiting status, hold, restart waiting status, or block stop restart waiting status). - This signal is switched OFF [at the start of automatic run], [when the run mode is changed], [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], [in the Reset, Deviation Clear, or Program cancel signal ON status], or [when "After Zero Return completion" is selected as the condition with Automatic run permission condition selection (P409) and zero return is not completed]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P742]. - When PRDY is ON, the signal corresponding to the assignment of [Diagnosis display mode], "SOUT", becomes "1".

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-24 Control output signal list (7/8)

Signal name	Code	Terminal No.	Circuit number	Function
Common output	OUT1	———	O-1	- In automatic run, it is output when a command that makes common output valid is executed. - The status of the signal is held until the next command that makes common output valid is executed. - OUT8 to OUT1 are processed as binary data (8 bits) and correspond to bit 7 to 0, respectively. Each signal is ON when the corresponding bit is "1", or OFF when it is "0". - This signal is also switched OFF [when the run mode is changed], [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], [in the Reset, Deviation Clear, or Program cancel signal ON status], or [at the start of automatic run]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P742] - When this signal is ON, the signal corresponding to the assignment of [Diagnosis Display mode], "SOUT", becomes "1".
	OUT2	———	O-1	
	OUT3	———	O-1	
	OUT4	———	O-1	
	OUT5	———	O-1	
	OUT6	———	O-1	
	OUT7	———	O-1	
	OUT8	———	O-1	
M output	M01	———	O-1	- In automatic run, it is output when a command that makes M output valid is executed. - The status of the signal is held until the next command that makes M output valid is executed. - M80 to M01 are processed as binary data (8 bits) and correspond to bit 7 to 0, respectively. Each signal is ON when the corresponding bit is "1", or OFF when it is "0". - This signal is also switched OFF [when the run mode is changed], [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], [in the Reset, Deviation Clear, or Program cancel signal ON status], or [at the start of automatic run]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P742]. - When this signal is ON, the signal corresponding to the assignment of [Diagnosis Display mode], "SOUT", becomes "1".
	M02	———	O-1	
	M04	———	O-1	
	M08	———	O-1	
	M10	———	O-1	
	M20	———	O-1	
	M40	———	O-1	
	M80	———	O-1	
M strobe	MSTB	———	O-1	- In automatic run, it is switched ON as a strobe signal at the completion of the execution of a command that makes M output valid. - This signal is also switched OFF [at the start of automatic run], [when the run mode is changed], [in the servo-off status], [when an alarm occurs], [in the Emergency Stop OFF status], [in the Reset, Deviation Clear, or Program cancel signal ON status], or [when "After Zero Return completion" is selected as the condition with Automatic run permission condition selection (P409) and zero return is not completed]. - In the initial conditions, there is no assignment of external input signal. When necessary, assign it with [P742]. - When MSTB is ON, the signal corresponding to the assignment of [Diagnosis display mode], "SOUT", becomes "1".
Related parameter (P409)				

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

Table 4-25 Control output signal list (8/8)

Signal name	Code	Terminal No.	Circuit number	Function
Analog Monitor Related parameters (P700) (P701)	MON1 MON2 GND	CN1-11 CN1-10 CN1-27	O-3	- Analog monitor output to check operating conditions of the device and the motor.*¹³ - Using parameters (P700 and P701) [Monitor 1, 2 selection], monitor output can be selected among options below. - Speed command - Speed feedback - Torque command - External + Torque Limit - External - Torque Limit - Position deviation 1 (Range: ± 255 pulses) - Position deviation 2 (Range: ± 4080 pulses) - NC speed output - NC Target speed - Indirect data 62 - Indirect data 63 - Manufacturer exclusive use - Manufacturer exclusive use - Output of monitor is as follows. MON1: selection with P700 MON2: selection with P701 - As for monitor voltage value, refer to [5-3 Analog monitor]. - Output impedance is 1kΩ.
Serial communication Related parameters (P500th level)	TXD (A/B) RXD (A/B) +5V GND	J1	IO-1	- Being connected with external equipment or optional unit, it executes serial communication. - Communication protocol can be selected with parameter.
Servo control communication Related parameters (P521 to 528) (P602)	CK CK* DT DT*	J2	IO-2	- It connects to the other VC II device and executes the transmission/reception of servo control data. - When selecting Receive with parameter, received pulse train data can activate pulse train run.
USB communication	D+ D- GND	J3	IO-2	Communication with editing software (option) is executed through USB communication.

Note 1) *-marked signal is negative logic, and (*)-marked signal is possible to change logic by parameter.

Note 2) Terminal No. is a number assigned in parameter initial conditions.

*¹³ When the optional control input/output expansion unit is connected, no analog monitor output is sent from this terminal.
Output is sent from the expansion unit.

4-3 Connector pin alignment

4-3-1 Control input/output connector (CN1)

Table 4-26 Connector CN1 terminal alignment

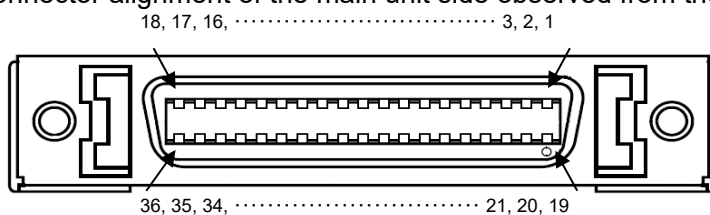
Number	Signal code	Signal name	Number	Signal code	Signal name
1	TQH	Torque command	19	INH	Speed command
2	GND	Internal control power supply common	20	GND	Internal control power supply common
3	EM*	Encoder marker output (negative pole)* ¹⁴	21	GND	Internal control power supply common
4	EM	Encoder marker output (positive pole)	22		Reserved (unable to use)
5	EB*	Encoder pulse B-phase output (negative pole)* ¹⁴	23	RC*	Reverse direction pulse train command (negative pole)* ¹⁴
6	EB	Encoder pulse B-phase output (positive pole)	24	RC	Reverse direction pulse train command (positive pole)
7	EA*	Encoder pulse A-phase output (negative pole)* ¹⁴	25	FC*	Forward direction pulse train command (negative pole)* ¹⁴
8	EA	Encoder pulse A-phase output (positive pole)	26	FC	Forward direction pulse train command (positive pole)
9	GND	Internal control power supply common	27	GND	Internal control power supply common
10	MON2	Monitor output 2	28	GND	Internal control power supply common
11	MON1	Monitor output 1	29	DI8	External input 8 (MD2)* ¹⁵
12		Reserved (unable to use)	30	DI7	External input 7 (MD1)* ¹⁵
13	COM	External power supply - common	31	DI6	External input 6 (ZLS)* ¹⁵
14	DO4	External output 4 (PN)* ¹⁵	32	DI5	External input 5 (RJO)* ¹⁵
15	DO3	External output 3 (WNG)* ¹⁵	33	DI4	External input 4 (FJO)* ¹⁵
16	DO2	External output 2 (ALM)* ¹⁵	34	DI3	External input 3 (PST)* ¹⁵
17	DO1	External output 1 (RDY)* ¹⁵	35	DI2	External input 2 (SON)* ¹⁵
18	+24V	External power supply + common	36	DI1	External input 1 (RST)* ¹⁵

Connector to be used : Receptacle /10236-52A2PL (3M-made)

Applicable cable side connector : Soldered plug /10136-3000PE

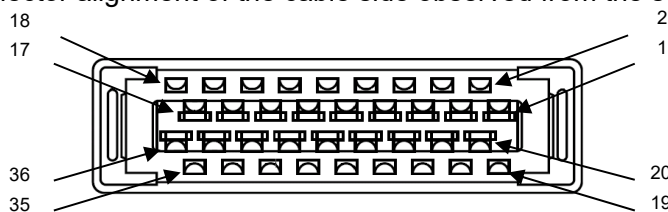
: Case (shell) /10336-52A0-008

Figure below is connector alignment of the main unit side observed from the connecting block.



CN1 connector alignment on the main unit side

Figure below is connector alignment of the cable side observed from the soldering terminal side.



Connector alignment on the cable side

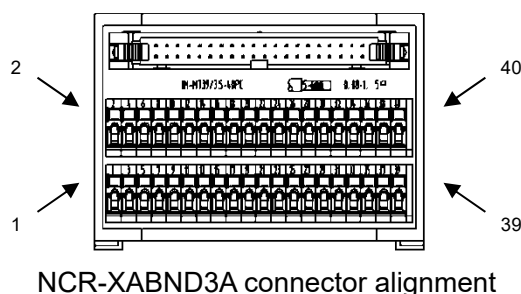
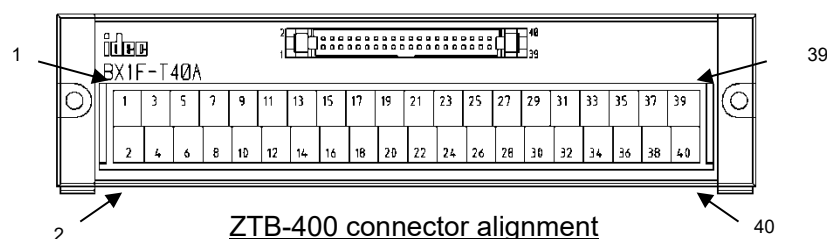
¹⁴ A signal that does not have "" as the rightmost character in its signal code is a positive logic signal. A signal that has "*" as the rightmost character in its signal code is a negative logic signal.

*¹⁵ Value in () of external output 1 to 4 and external input 1 to 8 is parameter initial value.

If using the optional terminal block unit ZTB-400 or NCR-XABND3A, note that the number of the terminal to connect to connector CN1 differs.

Table 4-27 Terminal alignment when using terminal block unit

Number	Signal code	Signal name	Number	Signal code	Signal name
1	TQH	Torque command	21	INH	Speed command
2	GND	Internal control power supply common	22	GND	Internal control power supply common
3	EM*	Encoder marker output (negative pole)* ¹⁶	23	GND	Internal control power supply common
4	EM	Encoder marker output (positive pole)	24		Reserved (unable to use)
5	EB*	Encoder pulse B-phase output (negative pole)* ¹⁶	25	RC*	Reverse direction pulse train command (negative pole)* ¹⁶
6	EB	Encoder pulse B-phase output (positive pole)	26	RC	Reverse direction pulse train command (positive pole)
7	EA*	Encoder pulse A-phase output (negative pole)* ¹⁶	27	FC*	Forward direction pulse train command (negative pole)* ¹⁶
8	EA	Encoder pulse A-phase output (positive pole)	28	FC	Forward direction pulse train command (positive pole)
9	GND	Internal control power supply common	29	DI8	External input 8 (MD2)* ¹⁷
10	MON2	Monitor output 2	30	DI7	External input 7 (MD1)* ¹⁷
11	MON1	Monitor output 1	31	DI6	External input 6 (ZLS)* ¹⁷
12	GND	Reserved (unable to use)	32	DI5	External input 5 (RJOG)* ¹⁷
13		Reserved (unable to use)	33	DI4	External input 4 (FJOG)* ¹⁷
14		Reserved (unable to use)	34	DI3	External input 3 (PST)* ¹⁷
15	COM	External power supply - common	35	DI2	External input 2 (SON)* ¹⁷
16	+24V	External power supply + common	36	DI1	External input 1 (RST)* ¹⁷
17	DO4	External output 4 (PN)* ¹⁷	37		Reserved (unable to use)
18	DO3	External output 3 (WNG)* ¹⁷	38		Reserved (unable to use)
19	DO2	External output 2 (ALM)* ¹⁷	39		Reserved (unable to use)
20	DO1	External output 1 (RDY)* ¹⁷	40		Reserved (unable to use)



¹⁶ A signal that does not have "" as the rightmost character in its signal code is a positive logic signal. A signal that has "*" as the rightmost character in its signal code is a negative logic signal.

*¹⁷ Value in () of external output 1 to 4 and external input 1 to 8 is parameter initial value.

Signal connection

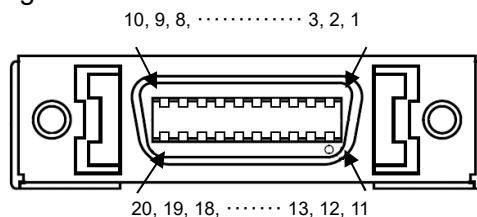
4-3-2 Encoder feedback pulse input connector (CN2)

Table 4-28 Connector CN2 terminal alignment

Number	Signal code	Signal name	Number	Signal code	Signal name
1	GND	Encoder power supply common	11	Z	Encoder marker signal input (positive)
2	GND	Encoder power supply common	12	Z*	Encoder marker signal input (negative)
3	EP5	Encoder power supply (+5V)	13	PS	Magnetic pole sensor input ^{*18*19}
4	EP5	Encoder power supply (+5V)	14	PS*	Magnetic pole sensor input ^{*18*19}
5	SD	ABS position data (positive pole) ^{*20}	15	PC	Magnetic pole sensor input ^{*18*19}
6	SD*	ABS position data (negative pole) ^{*21}	16	PC*	Magnetic pole sensor input ^{*18*19}
7	A	Encoder pulse A-phase input (positive pole) ^{*19}	17		Unused
8	A*	Encoder pulse A-phase input (negative pole) ^{*19}	18		Unused
9	B	Encoder pulse B-phase input (positive pole) ^{*19}	19		Unused
10	B*	Encoder pulse B-phase input (negative pole) ^{*19}	20		Unused

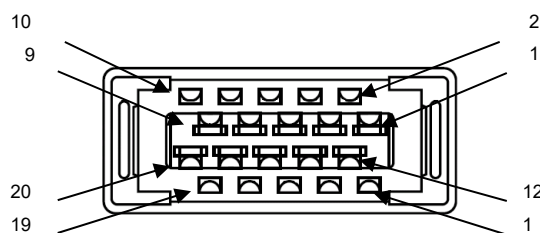
Connector to be used : Receptacle /10220-52A2PL (3M-made)
 Applicable cable side connector : Soldered plug /10120-3000PE
 : Case (shell) /10320-52A0-008

Figure below is connector alignment of the main unit side observed from the connecting block.



CN2 connector alignment on the main unit side

Figure below is connector alignment of the cable side observed from the soldering terminal side.



Connector alignment on the cable side

^{*18} Input signal to be used by magnetic pole sensor compatible encoder.

^{*19} In the IPU connection, it is unused.

^{*20} In the IPU connection, it becomes serial data (positive pole).

^{*21} In the IPU connection, it becomes serial data (negative pole).

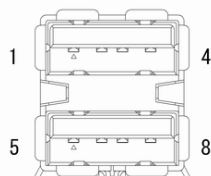
4-3-3 Servo control communication connector (J2)

Table 4-29 Connector J2 terminal alignment

Number	Signal code	Signal name	Number	Signal code	Signal name
1	CK	Clock signal (positive pole)	5	CK	Clock signal (positive pole)
2	CK*	Clock signal (negative pole)	6	CK*	Clock signal (negative pole)
3	DT	Data signal (positive pole)	7	DT	Data signal (positive pole)
4	DT*	Data signal (negative pole)	8	DT*	Data signal (negative pole)

Connector to be used : Receptacle / DUSB-ARB82-T11A(D2) (DDK-made)
 Applicable cable side connector : Plug harness / DUSB-HAN21-FBm (DDK-made)
 (m = 05,10,30)

Figure below is connector alignment of the main unit side observed from the connecting block.



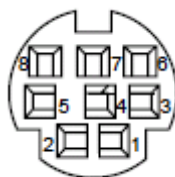
4-3-4 Serial communication connector (J1)

Table 4-30 Connector J1 terminal alignment

Number	Signal code	Signal name	Number	Signal code	Signal name
1	RXD(A)	Receiving data+ (a pair with RXD(B))	5		(Unused/Reserved)
2	RXD(B)	Receiving data- (a pair with RXD(A))	6		(Unused/Reserved)
3	GND	Internal control power supply common	7	TXD(A)	Sending data+ (a pair with TXD(B))
4	+5V	Internal control power supply +5V	8	TXD(B)	Sending data- (a pair with TXD(A))

Connector to be used : Receptacle / TCS7588-01-201 (Hosiden Co.)
 Applicable cable side connector : Plug / TCP8580 (Hosiden Co.) or equivalent

Figure below is connector alignment of the main unit side observed from the connecting block.



* Soldering type socket of this connector is available as an option.

Signal connection

4-3-5 USB communication connector (J3)

Table 4-31 Connector J3 terminal alignment

Number	Signal code	Signal name	Number	Signal code	Signal name
1		(Unconnected/Reserved)	3	+D	Communication data (a pair with -D)
2	-D	Communication data (a pair with +D)	4	GND	Internal control power supply common

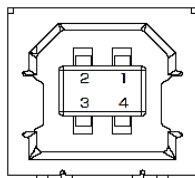
This connector is connected with USB terminal of a PC to communicate with editing software (option).

Connector to be used: Receptacle / DUSB-ARB42-T11 (DDK-made) or equivalent

Applicable cable: Marketed USB cable

Device side: B plug ↔ PC side: A plug

Figure below is connector alignment of the main unit side observed from the connecting block.



* We do not prepare USB cable as options. Please obtain marketed USB cable.

4-3-6 Control power supply input connector (TB1)

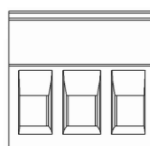
Device to use: 100VAC specification 0.05/0.1/0.2kW, 200VAC specification 0.1/0.2/0.4/0.8/15
(1.2)/2.2kW*²²

Table 4-32 Connector TB1 terminal alignment

Number	Signal code	Signal name
1	r	Control AC input power supply R-phase (100/200V)
2	s	Control AC input power supply S-phase(100/200V)
3		

Connector to be used : MSTB2.5/3-ST-5.08, recommendable wire fastening torque 0.5 to 0.6N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



1 2 3

Connect grounding to screw [E] at the top of the device casing.

4-3-7 Main power supply input/motor power line output connector (TB2)

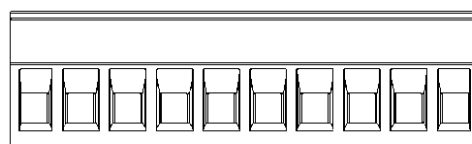
Device to use: 100VAC specification 0.05/0.1/0.2kW, 200VAC specification 0.1/0.2/0.4/0.8kW

Table 4-33 Connector TB2 terminal alignment

Number	Signal code	Signal name	Number	Signal code	Signal name
1	R	AC input power supply R-phase (100/200V)	6	U	Motor power U-phase
2	S	AC input power supply S-phase (100/200V)	7	V	Motor power V-phase
3	T	AC input power supply T-phase (200V)	8	W	Motor power W-phase
4	B1	Regenerative resistor	9	DBK	Dynamic brake signal
5	B2	Regenerative resistor	10	DBC	Dynamic brake signal common

Connector to be used : MSTB2.5/10-ST-5.08 recommendable wire fastening torque 0.5 to 0.6N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



1 2 3 4 5 6 7 8 9 10

Connect grounding to screw [E] at the top of the device casing.

*²² () indicates device capacity of IM type motor.

Signal connection

4-3-8 Main power supply input/motor power line output connector (TB2)

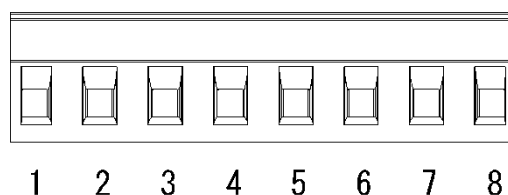
Device to use: 400VAC specification 2.6kW

Table 4-34 Connector TB2 terminal alignment

Number	Signal code	Signal name	Number	Signal code	Signal name
1	R	AC input power supply R-phase	6	U	Motor power U-phase
2	S	AC input power supply S-phase	7	V	Motor power V-phase
3	T	AC input power supply T-phase	8	W	Motor power W-phase
4	B1	Regenerative resistor			
5	B2	Regenerative resistor			

Connector to be used : GMSTB2.5/8-ST recommendable wire fastening torque 0.5 to 0.6N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



Connect grounding to screw [E] at the top of the device casing.

4-3-9 Control power supply input connector (TB3/TB5)

Device to use: 200VAC specification 7.5(5.5)kW/11.0(7.5)kW/15.0(11.0)kW/20.0(15.0)kW^{*23}

Device to use: 400VAC specification 7.5(5.5)kW/11.0(7.5)kW/15.0(11.0)kW/20.0(15.0)kW^{*23}

Table 4-35 Control power supply input connector name^{*23}

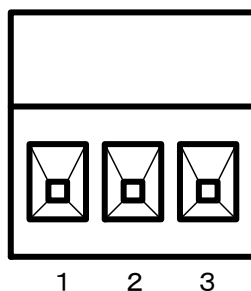
Device capacity [kW]	7.5(5.5)/11.0(7.5)/15.0(11.0)	20.0(15.0)
Connector name	TB5	TB3

Table 4-36 Control power supply input connector terminal alignment

Number	Signal code	Signal name
1	24V	Control DC input power supply +24V
2	Free	
3	0V	Control DC input power supply 0V

Connector to be used : MSTB2.5/3-ST-5.08 recommendable wire fastening torque 0.5 to 0.6N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



^{*23} () indicates device capacity of IM type motor.

4-3-10 Control power supply input connector (CN3)

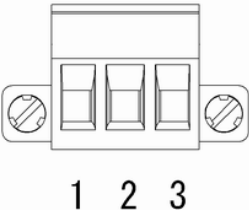
Device to use: 200VAC specification 30.0(22.0)/35.0(30.0)/37.0(37.0)kW^{*24}Device to use: 400VAC specification 37.0(30.0)/55.0(37.0)kW^{*24}

Table 4-37 Connector CN3 terminal alignment

Number	Signal code	Signal name
1	24V	Control DC input power supply +24V
2	Free	
3	0V	Control DC input power supply common

Connector to be used : MSTB2.5/3-STF-5.08 recommendable wire fastening torque 0.5 to 0.6N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



4-3-11 Control power supply input connector (TB1)

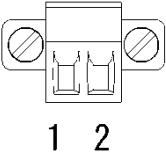
Device to use: 400VAC specification 2.6/4.0kW

Table 4-38 Connector TB1 terminal alignment

Number	Signal code	Signal name
1	24V	Control DC input power supply +24V
2	0V	Control DC input power supply common

Connector to be used : MC1.5/2-STF-3.81 recommendable wire fastening torque 0.22 to 0.25N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



^{*24} () indicates device capacity of IM type motor.

Signal connection

4-3-12 Dynamic brake activation signal connector (TB2/TB3/TB4)

Device to use:

200VAC specification 1.5(1.2)kW/2.2kW/4.0kW/7.5(5.5)kW/11.0(7.5)/15.0(11.0)/20.0(15.0)kW*25

Table 4-39 Dynamic brake activation signal connector name*26

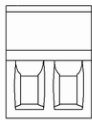
Device capacity [kW]	4.0*27	1.5(1.2)/2.2/4.0*28	7.5(5.5)/11.0(7.5)/ 15.0(11.0)/20.0(15.0)
Connector name	TB2	TB3	TB4

Table 4-40 Dynamic brake activation signal connector terminal alignment*26

Number	Signal code	Signal name
1	DBK	Dynamic brake signal
2	DBC	Dynamic brake signal common

Connector to be used : MC1.5/2-ST-3.81 recommendable wire fastening torque 0.22 to 0.25N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



1 2

4-3-13 Dynamic brake activation signal connector (CN4)

Device to use: 200VAC specification 30.0(22.0)/35.0(30.0)/37.0(37.0)kW*25

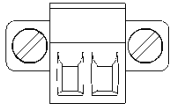
Device to use: 400VAC specification 37.0(30.0)/55.0(37.0)kW*25

Table 4-41 Dynamic brake activation signal connector terminal alignment*26

Number	Signal code	Signal name
1	DBK	Dynamic brake signal
2	DBC	Dynamic brake signal common

Connector to be used : MC1.5/2-STF-3.81 recommendable wire fastening torque 0.22 to 0.25N•m
(Phoenix Contact made, attached to the main unit)

Figure below illustrates connector alignment observed from cable insertion block.



1 2

*25 () indicates device capacity of IM type motor.

*26 Dynamic brake unit is an option.

*27 The target model is NCR-*D**A2B-402.

*28 The target model is NCR-*D**A2A-402.

Chapter 5 Run

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5-1 Before-run inspection

After completing installation and wiring, carry out following before-run inspection.

- 1) Isn't there any miswiring? Specially, is the power not connected to motor connection terminal U, V, W?
- 2) Isn't there any place in short-circuit status by cable chips, etc.?
- 3) Isn't there any place where excessive stress is on wires?
- 4) Isn't there any loose fit screw or terminal? Are connectors inserted tightly?
- 5) Is power supply voltage correct?
- 6) Isn't there any short-circuit or line-to-ground fault in external sequence circuit?
- 7) Is grounding method correct? Is the grounding grade D-class or better?



Caution

Never apply insulation test such as withstand voltage test and mega test, and noise test using noise simulators, to the device.	Those tests may damage the device.

Before starting this device, confirm following setting.

- | |
|---|
| <ul style="list-style-type: none"> Set motor type data to the standard motor setting parameter P000 according to [5-4 Run procedure]. In case of setting an exclusive motor, set "999" to P000 and motor-related parameters to P020 to P059 in accordance with specification sheet [Setting option]. Make sure negative logic input of Emergency Stop (EMG*), Forward/Reverse Over Travel (FOT*, ROT*) input signals (when in use). Check the parameter setting of Servo On (SON (*)) input signal for positive or negative logic operation. |
|---|

5-2 Run mode

Mode select signals 1 and 2 support run mode below.

Table 5-1 Mode select table

Run mode		Mode select signal 2 (MD2)	Mode select signal 1 (MD1)
Manual run	mode	○	○
Zero return run	mode	○	●
Automatic run	mode	●	○
Pulse train run	mode	●	●

Note) ○: signal OFF ●: signal ON

5-2-1 Manual run mode

In the manual run mode, if Forward Direction Jog signal (FJOG) or Reverse Direction Jog signal (RJOG) keeps ON state for 3ms or more, one-shot jog is performed in forward/reverse direction. If the signal keeps ON state for 100ms or more, jog operation is performed in forward/reverse direction.

* One-shot jog is to travel in the amount of minimum setting unit (one-shot operation) only.

The speed in jog operation is selected between the values set in [P400] and [P401] with the Jog speed select signal (JOSP).

1) Operating procedure

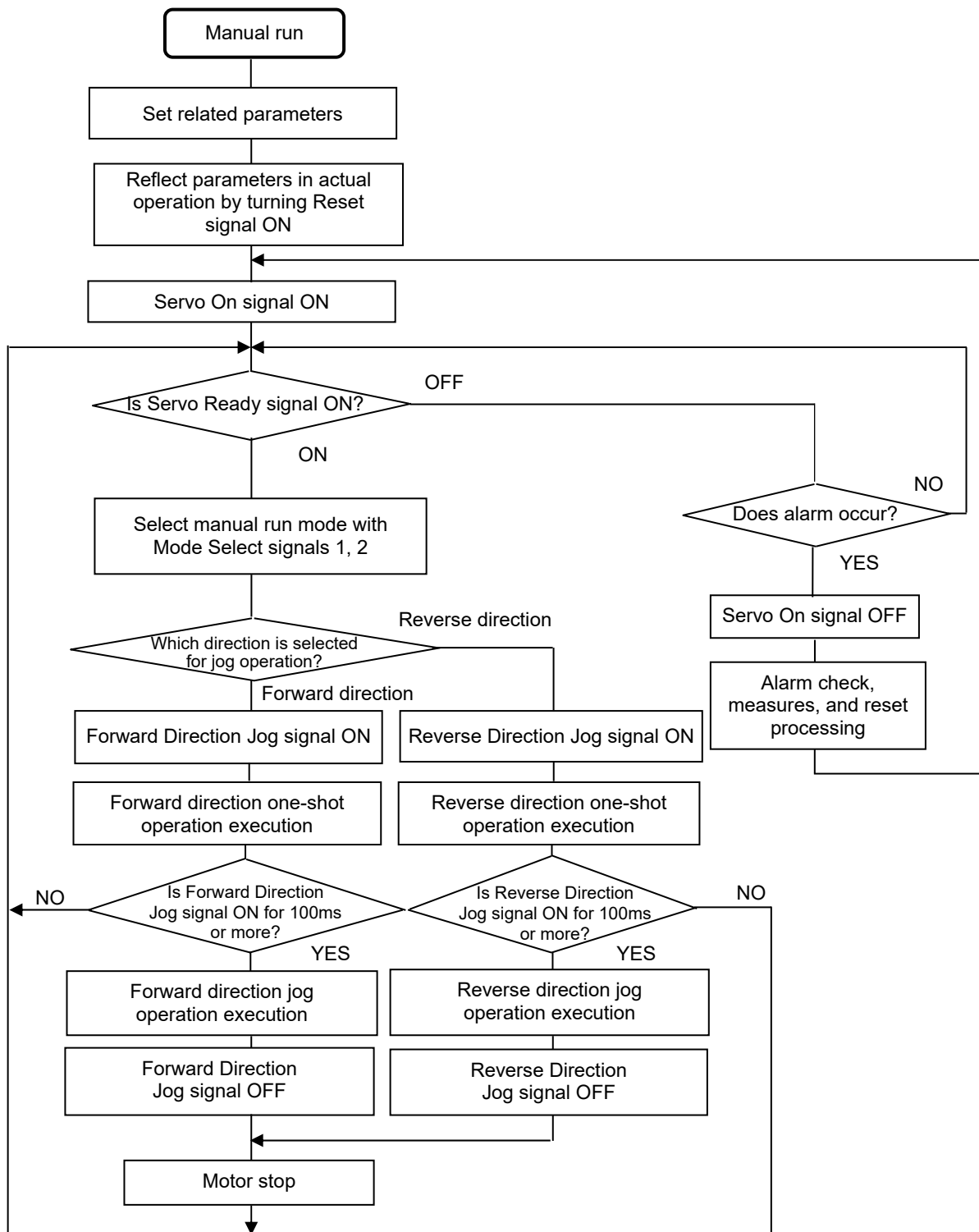
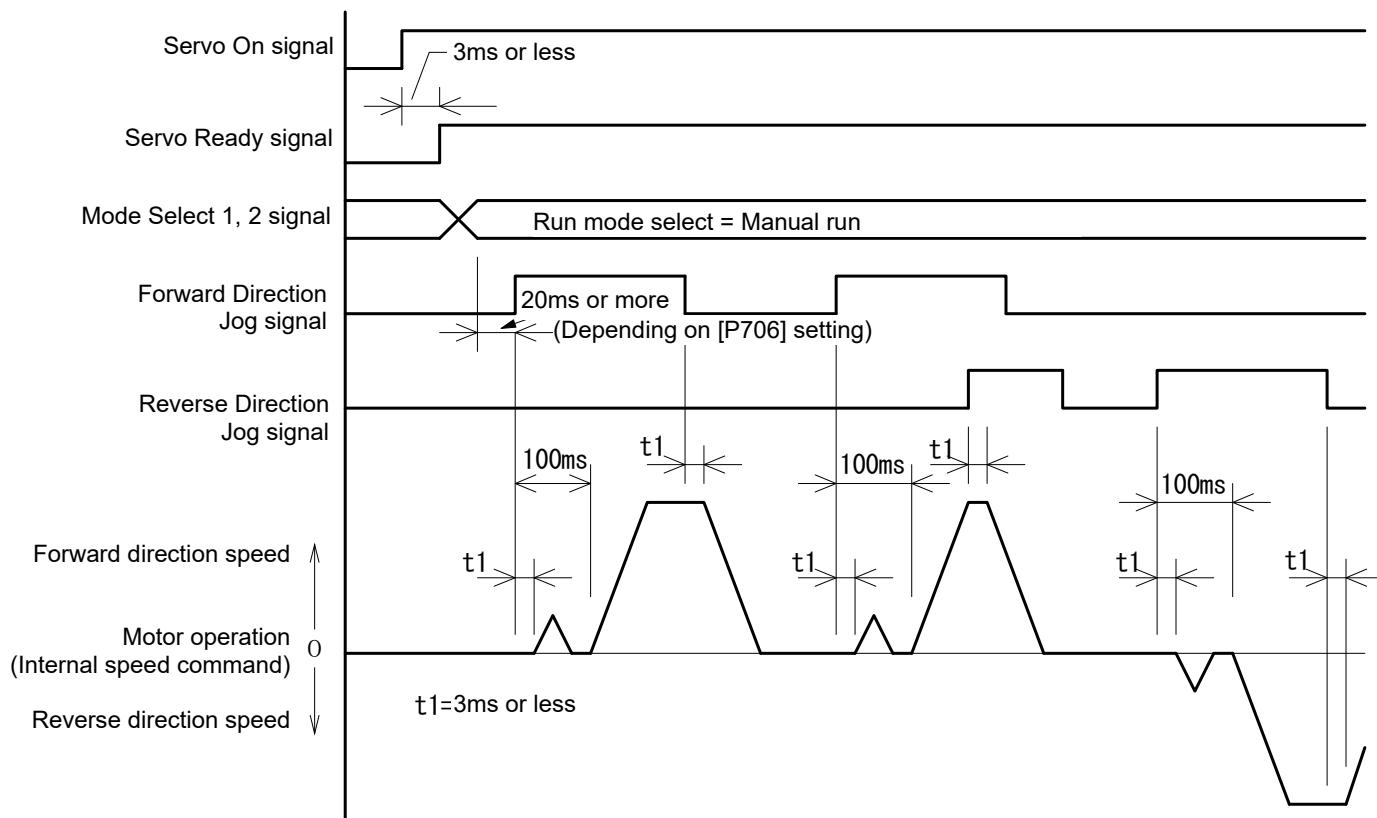


Figure 5-1 Manual run operating procedure

Run

2) Time chart



Note: If Forward Direction Jog signal (FJOG) and Reverse Direction Jog signal (RJOG) are input simultaneously, motor decelerates and stops.
 If the Forward/Reverse Direction Jog signal is input after both signals are switched OFF once, one-shot jog is executed again.
 Traveling amount of one-shot jog is fixed at the amount of minimum setting unit.

Figure 5-2 Manual run time chart

5-2-2 Zero return run mode

In the zero return run mode, Zero Return operation is executed at the speeds set in [P404: Zero return speed] and [P405: Zero return creep speed].

3 ms or more of Forward Direction Jog signal (FJOG) activates forward direction Zero Return operation.

3 ms or more of Reverse Direction Jog signal (RJOG) activates reverse direction Zero Return operation.

There are the following types of Zero Return methods.

Table 5-2 Setting and operation of zero return mode

Name of Zero Return method	Setting of [P402: Zero return method selection]	Operation specification
Standard Zero Return	STD.HOME	Zero Return using Zero Point Deceleration LS For details, refer to time chart (a) to (d).
LS less Zero Return	LS LESS	Zero Return using markers or ZLS only without Zero Point Deceleration For details, refer to time chart (e).
Current position Zero Return	STOP HOME	Without operation, the current position is set as zero point.
OT-return Zero Return	OT HOME	Zero point return using zero point deceleration LS. It is inverted if OT in the operation direction is detected before zero point deceleration LS is detected. For details, refer to time chart (f) and (g).
Absolute encoder current position automatic setting	ABS HOME	The absolute encoder position is set in P018, with the current position as P019. For details, refer to Time chart (i).

1) Operating procedure

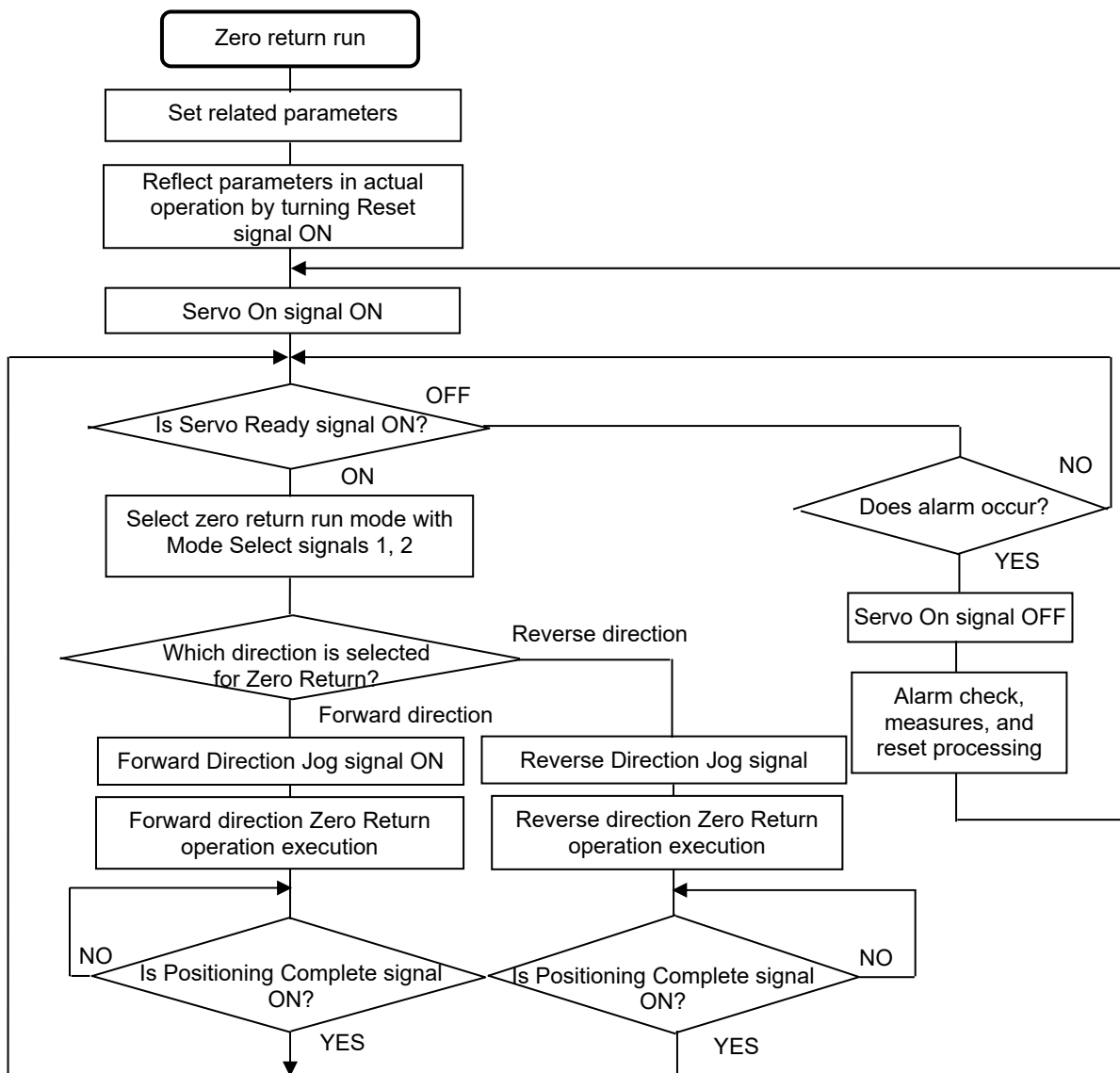


Figure 5-3 Zero return run operating procedure

2) Time chart

- Note 1: At the beginning of Zero Return, if Zero Point Deceleration limit signal is already ON, the motor travels in reverse direction against Zero Return starting direction once, and after switching OFF the Zero Point Deceleration limit signal it resumes Zero Return operation in regular direction.
- Note 2: If the Hold signal is input during Zero Return operation, the operation is stopped. At the restart, if the Zero Point Deceleration limit signal is ON, the motor travels in reverse direction against the Zero Return starting direction. After the Zero Point Deceleration limit signal is switched OFF, the motor resumes Zero Return operation in regular direction.
- Note 3: Marker signal is to select if encoder marker signal is used or not, with parameter.
- Note 4: During Zero Return operation, detection of soft limit is not performed.
- Note 5: Speed override does not affect Zero Return creep speed.
- Note 6: If Zero Return operation is interrupted in the middle, previously set forward/reverse direction soft limit is effective with no changes.

(a) <Standard Zero Return> (Encoder marker used)

[When starting Zero Return, if Zero Point Deceleration limit is OFF]

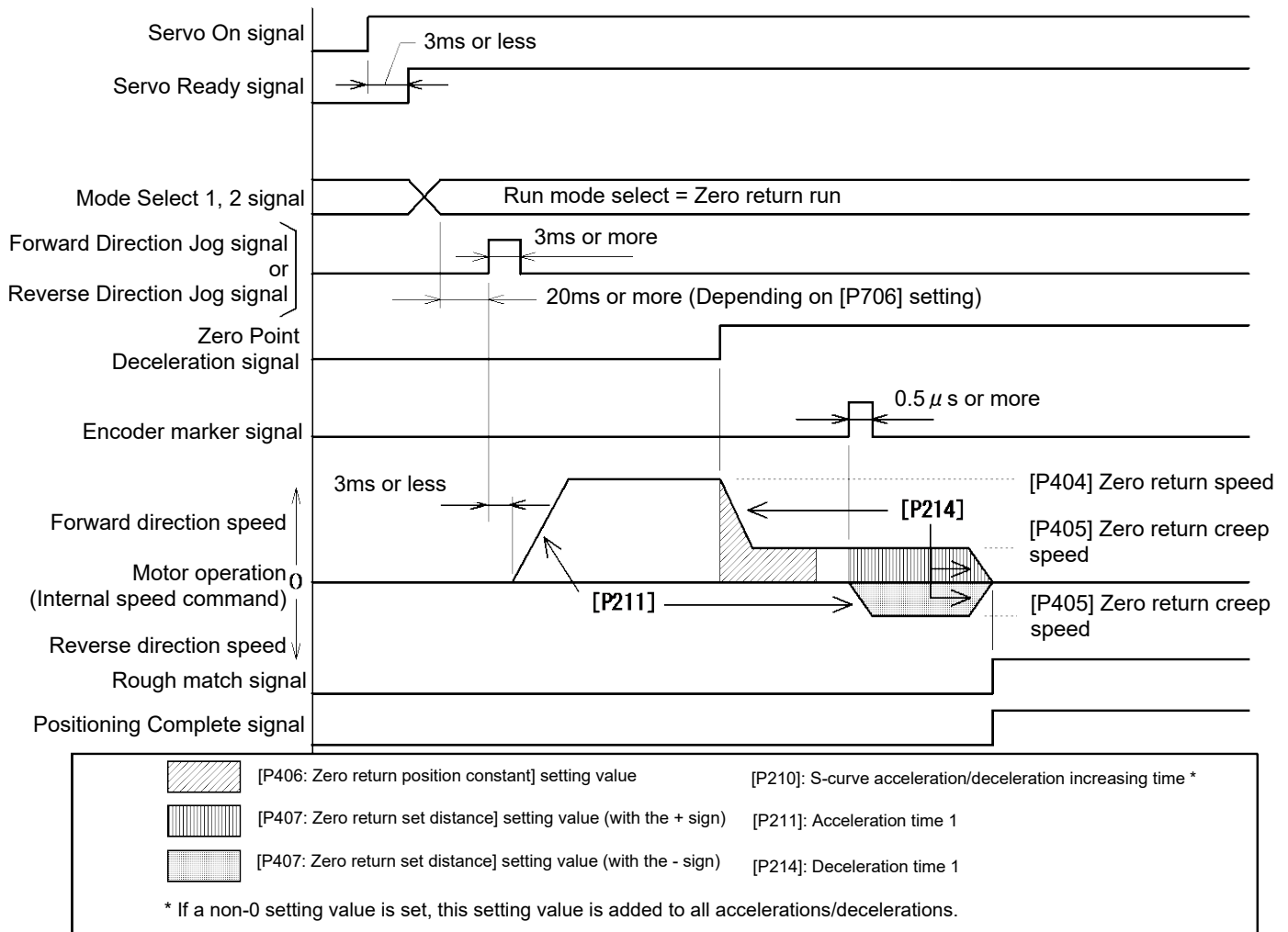


Figure 5-4 Standard zero return run time chart 1

Run

(b) <Standard Zero Return> (Encoder marker not used)

[When starting Zero Return, if Zero Point Deceleration limit is OFF]

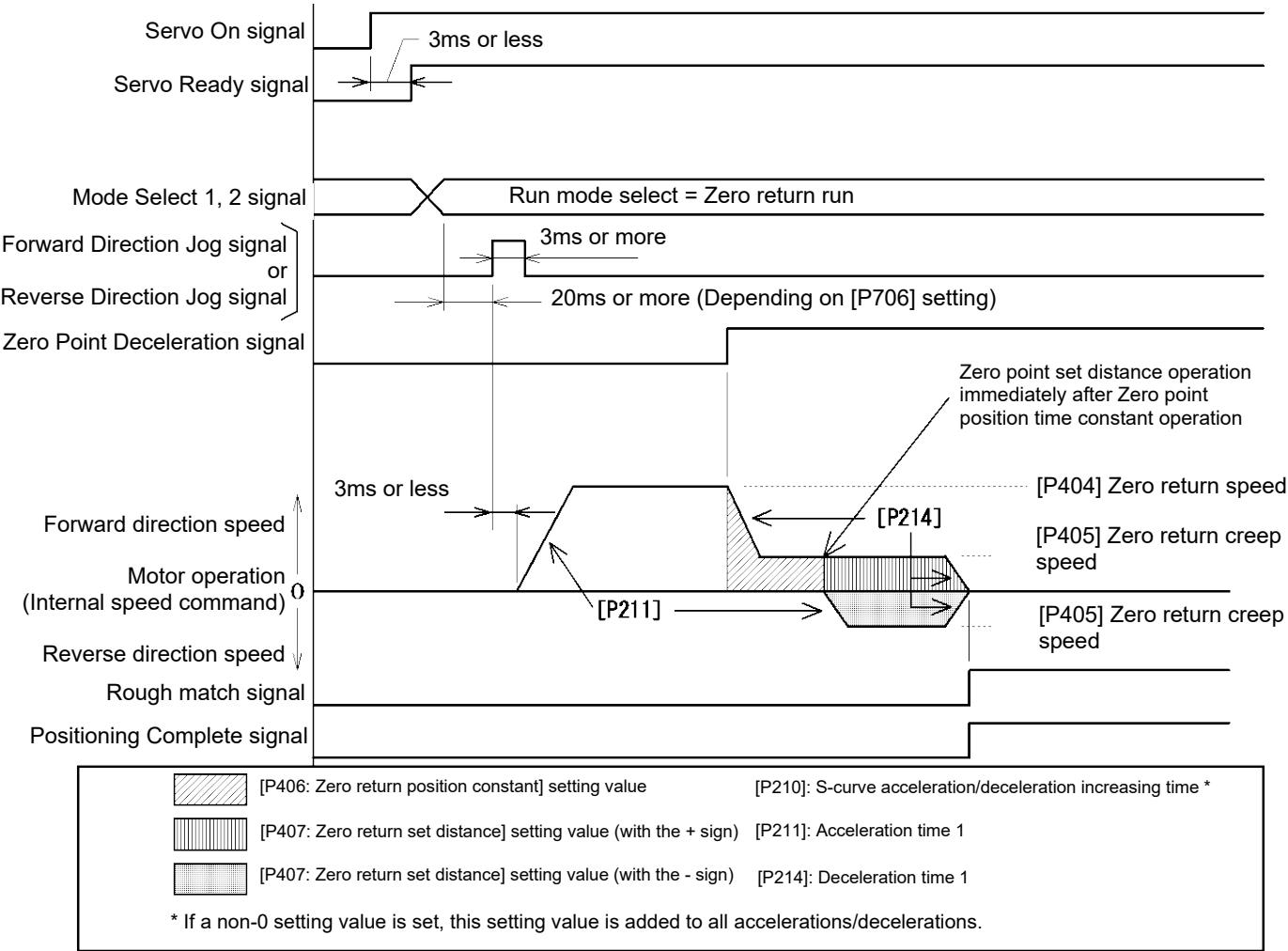


Figure 5-5 Standard zero return run time chart 2 (Encoder marker not used)

(c) <Standard Zero Return>

[When starting Zero Return, if Zero Point Deceleration limit is ON]

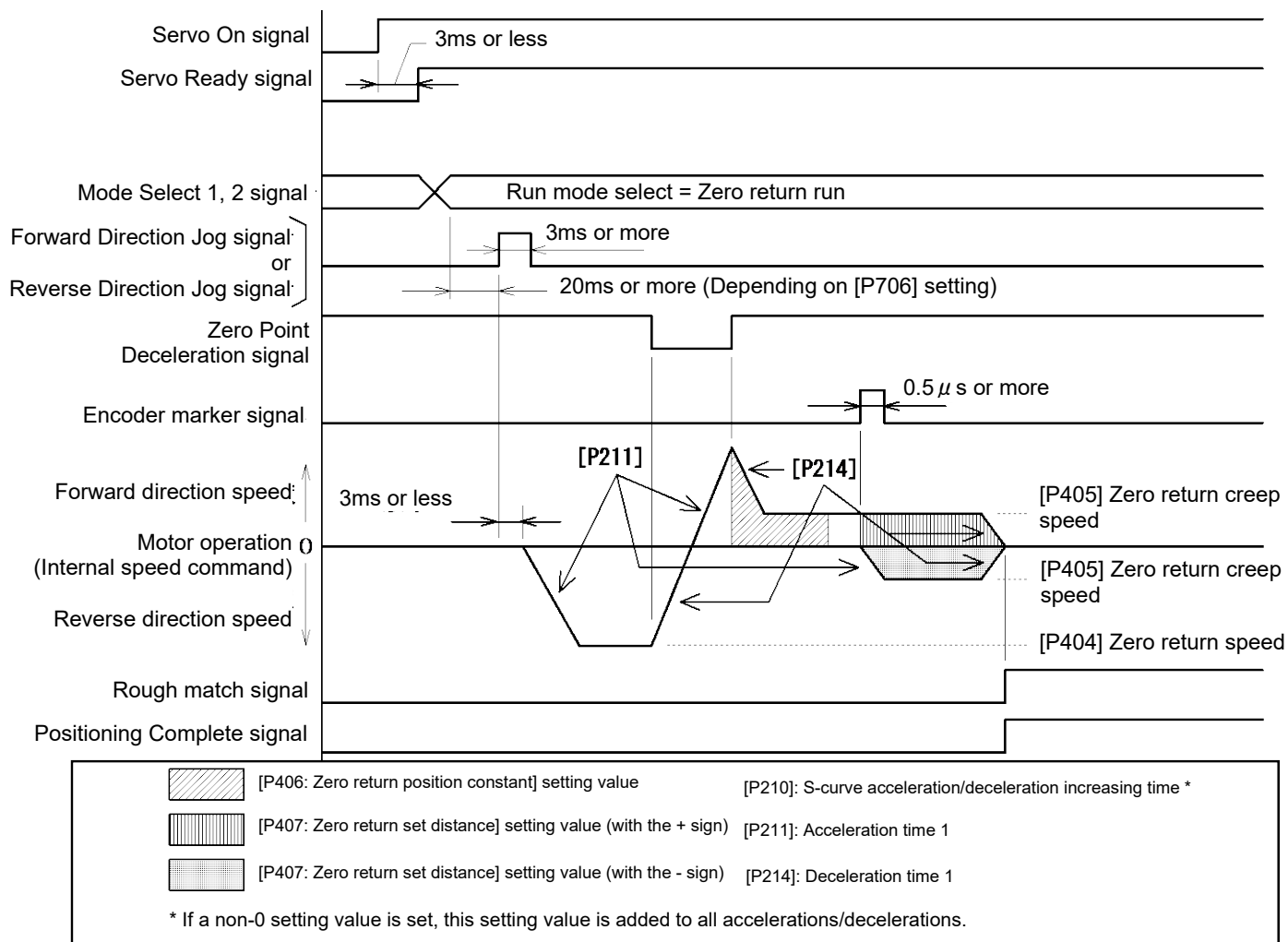


Figure 5-6 Standard zero return run time chart 3

Run
(d) <Standard Zero Return>

[When inputting Hold signal after detecting Zero Point Deceleration limit]

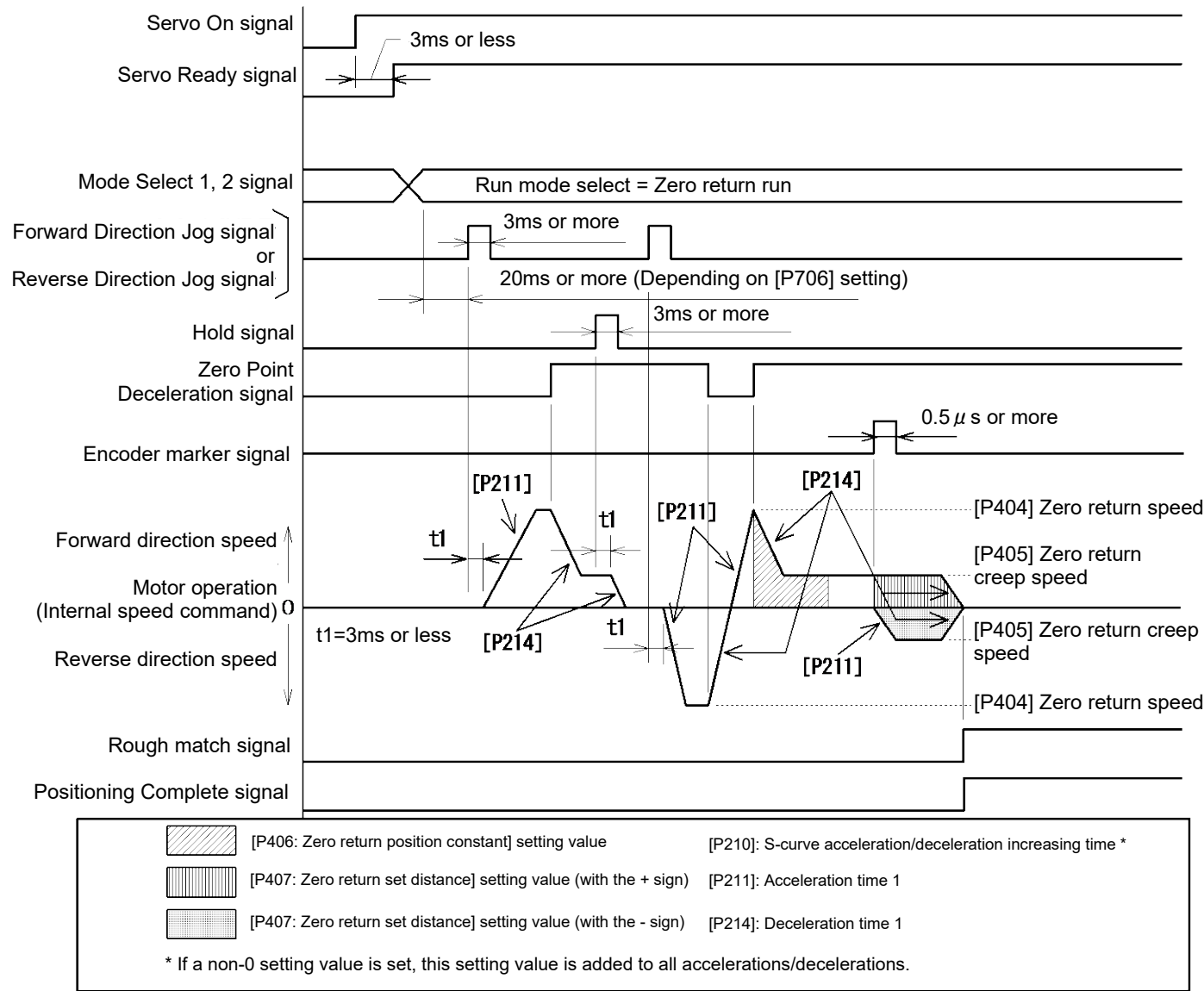


Figure 5-7 Standard zero return run time chart 4

(e) <LS less Zero Return>

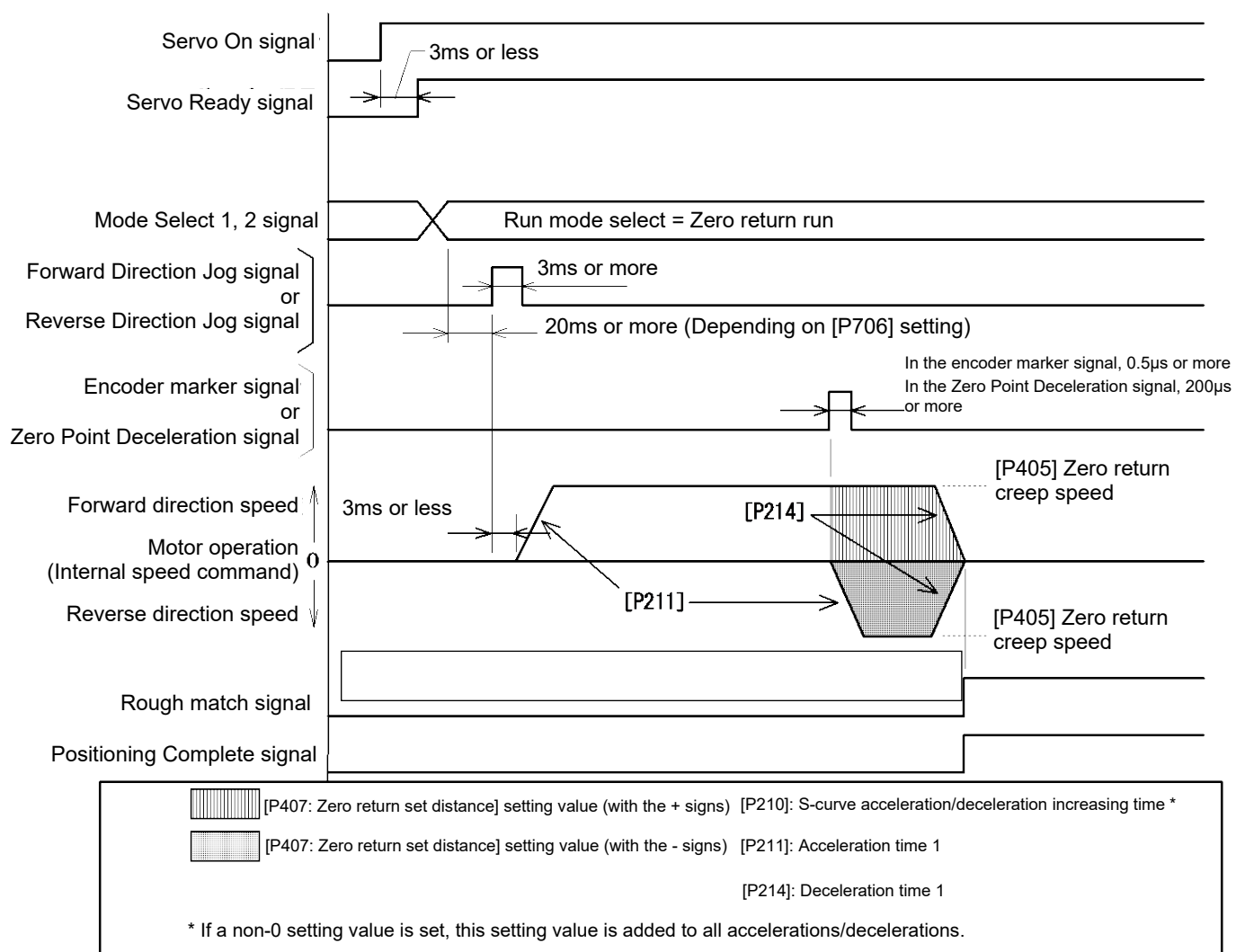
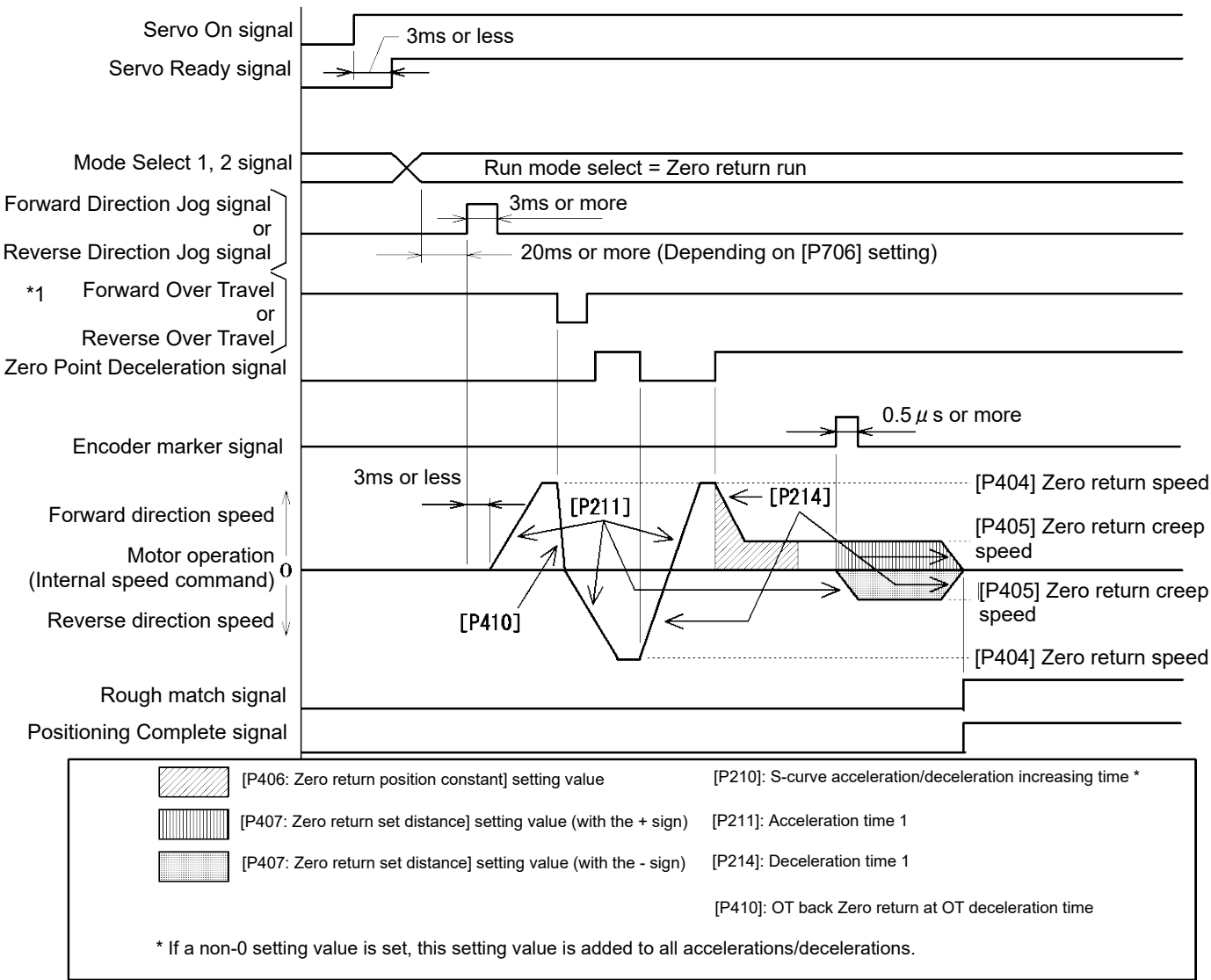


Figure 5-8 LS less zero return run time chart 5

Run
(f) <OT-return Zero Return>

[When starting Zero Return, and when Zero Point Deceleration limit is OFF, if Forward (Reverse) Over Travel is switched OFF before Zero Point Deceleration limit is switched ON]

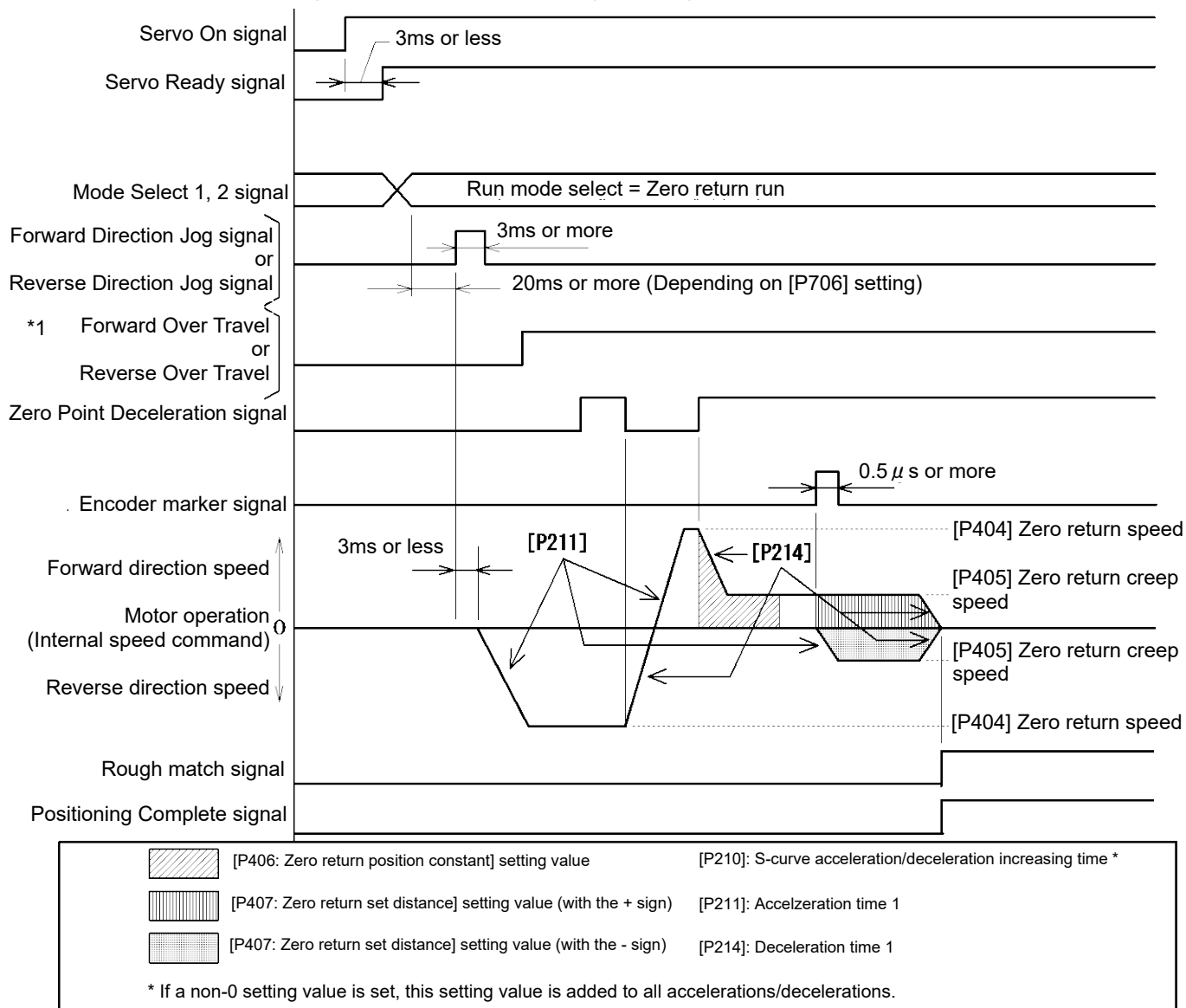


*1 When Zero Return direction is +: Forward Over Travel
When Zero Return direction is -: Reverse Over Travel

Figure 5-9 OT-return zero return run time chart 6

(g) <OT-return Zero Return>

[When starting Zero Return, if Forward (Reverse) Over Travel is OFF]



*1 When Zero Return direction is +: Forward Over Travel
When Zero Return direction is -: Reverse Over Travel

Figure 5-10 OT-return zero return run time chart 7

(h) <OT-return Zero Return>

[When starting Zero Return, and when Zero Point Deceleration limit is OFF, if Zero Point Deceleration limit is switched ON before Forward (Reverse) Over Travel is switched OFF (Encoder marker is used)]
Identical with [Figure 5-4] Standard zero return run time chart 1

[When starting Zero Return, and when Zero Point Deceleration limit is OFF, if Zero Point Deceleration limit is switched ON before Forward (Reverse) Over Travel is switched OFF (Encoder marker not used)]
Identical with [Figure 5-5] Standard zero return run time chart 2 (Encoder marker not used)

[When starting Zero Return, if Zero Point Deceleration limit is ON]
Identical with [Figure 5-6] Standard zero return run time chart 3

Note: If Over Travel is OFF at the execution of the [HOME] command in automatic run, an error occurs.

Run

(i) < Absolute encoder current position automatic setting >

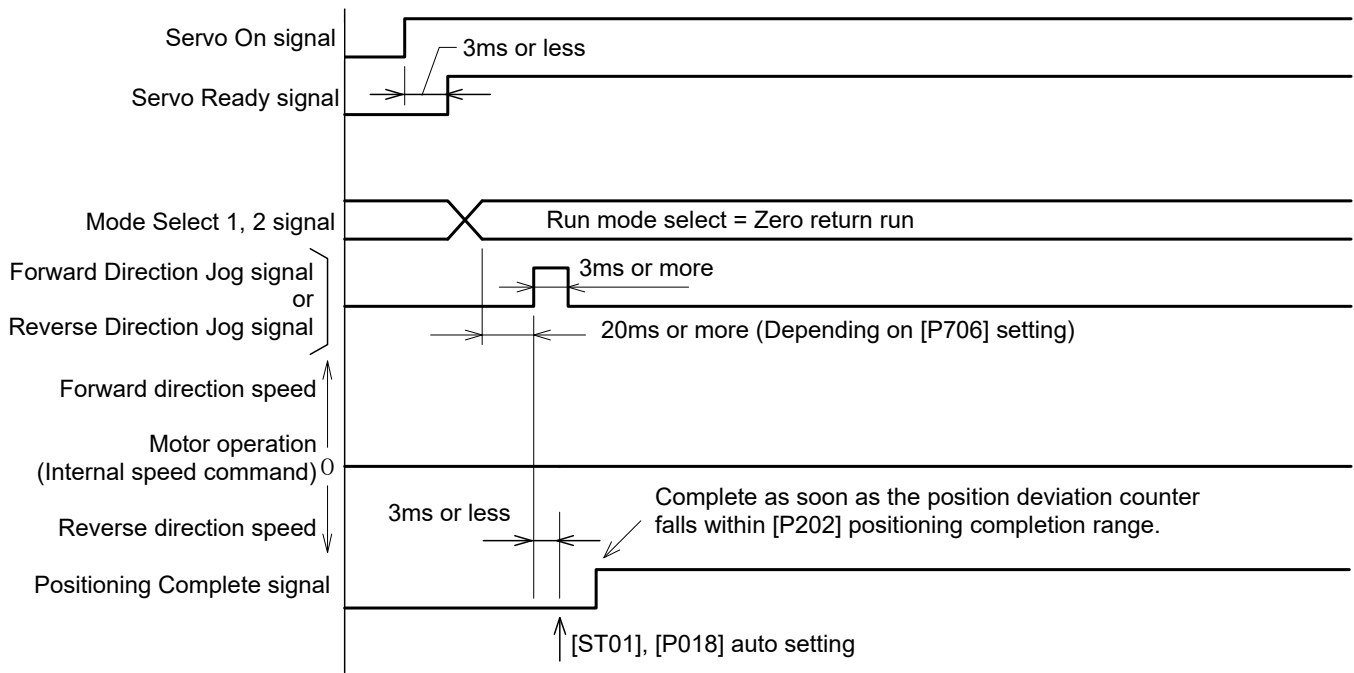


Figure 5-11 Absolute encoder current position auto setting time chart

Note 1: Can be implemented only when an absolute encoder (S-ABS/S-ABS2/L-ABS/S-ABS3/S-MABS/S-ABS4) is used.

Note 2: Do not implement it with the motor vibrating.

Note 3: For information about the method for setting an absolute encoder position using absolute encoder current position auto setting, refer to [5-9-5 Absolute encoder position re-adjustment].

5-2-3 Automatic run mode

[P409: Automatic run permission condition selection] can be used to disable the execution of automatic run before completion of Zero Return.

In automatic run, internally stored commands and commands set by external data are successively executed.

By setting Automatic start signal (PST) ON, a command of execution address specified by address is executed.

1) Operating procedure

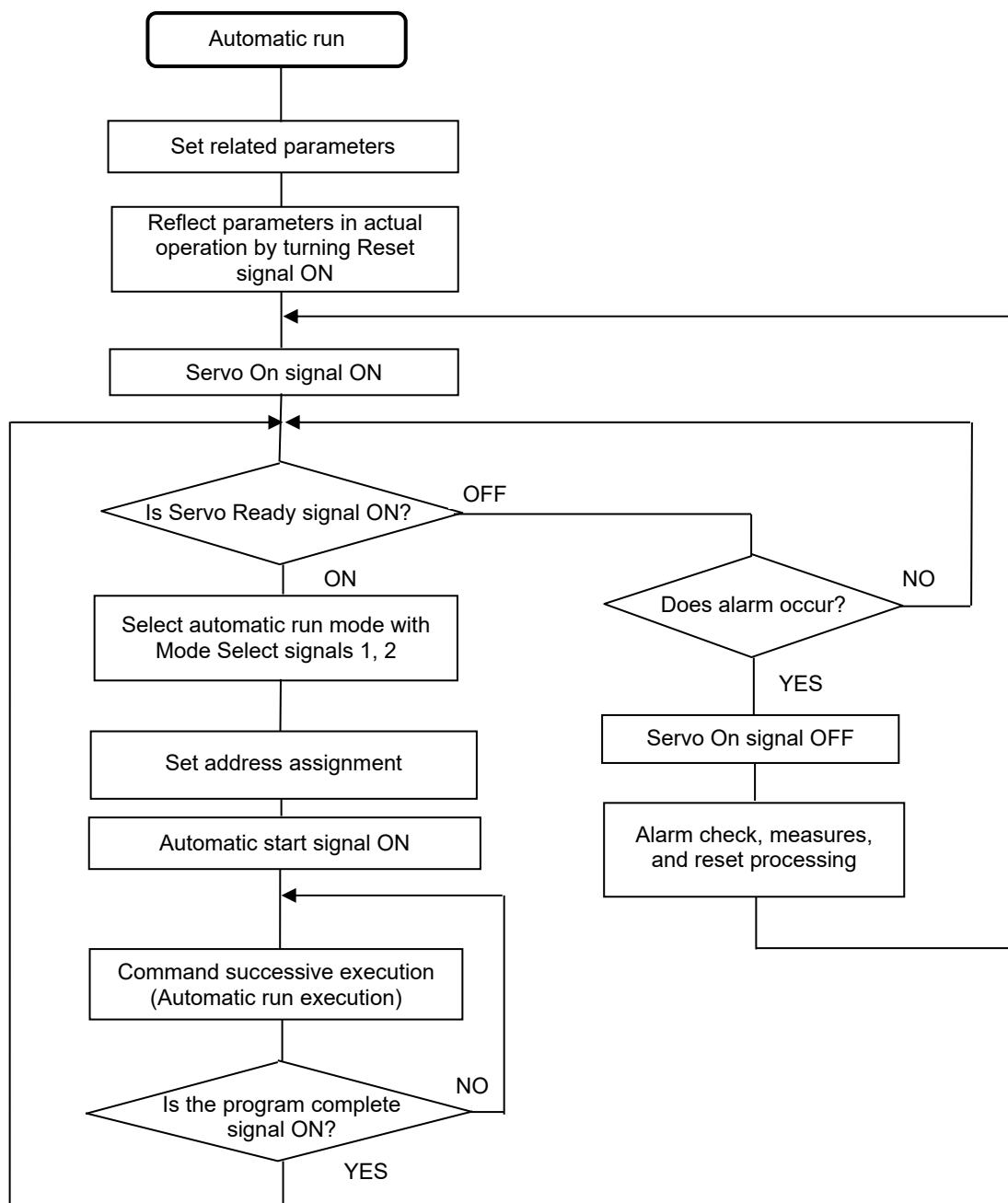


Figure 5-12 Automatic run operating procedure

Run

2) Time chart

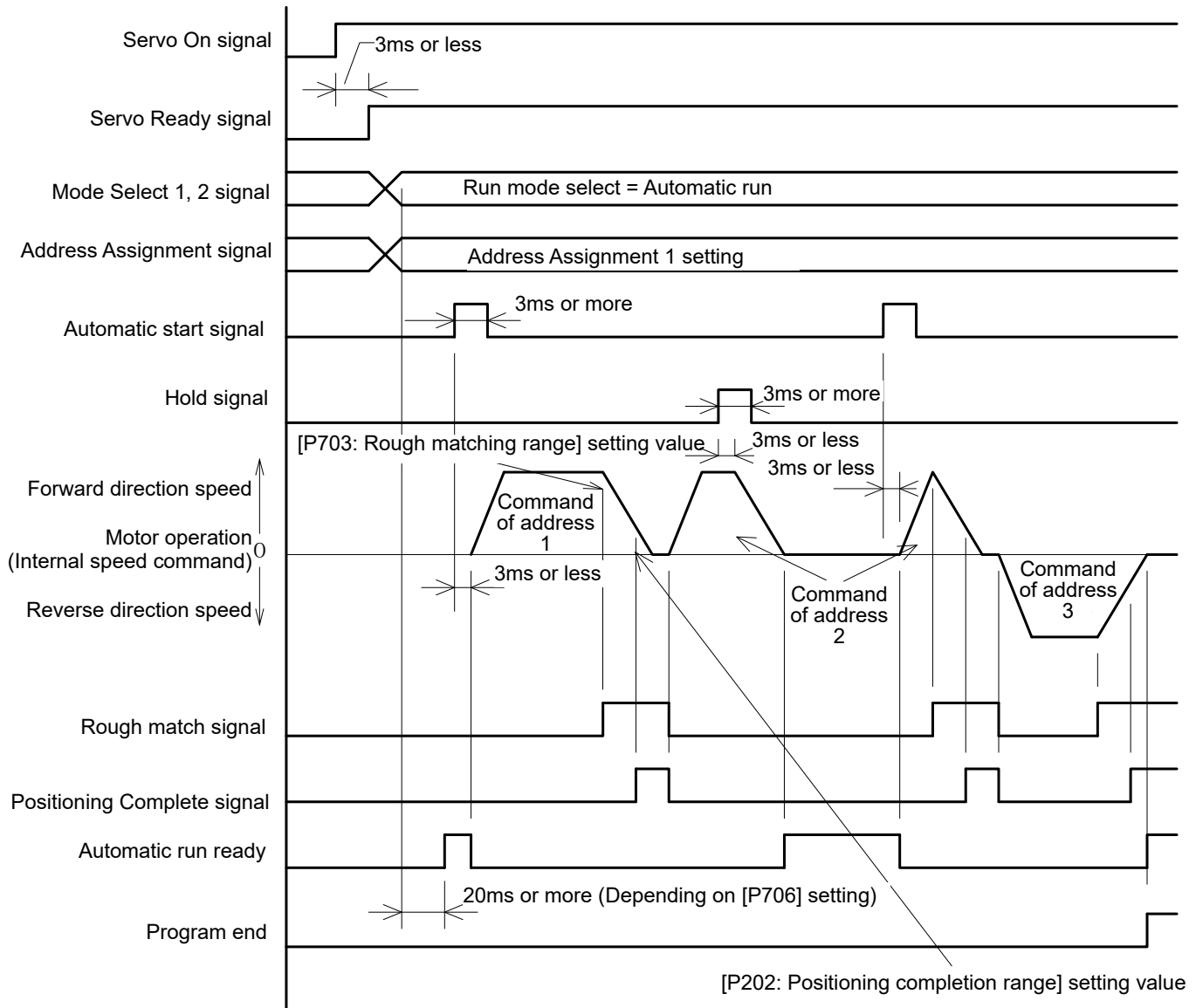


Figure 5-13 Automatic run time chart

About automatic run

- When the motor is temporarily stopped in automatic run or zero return run, the run mode can be changed in the temporary stop status.
- When Speed Override signal is input, practical operation speed will be obtained by multiplying speed command value by override ratio.

5-2-4 Pulse train run mode

In the pulse train mode, pulse train run is executed following pulse train command (line driver method or open collector method) or servo control communication.

1) Operating procedure

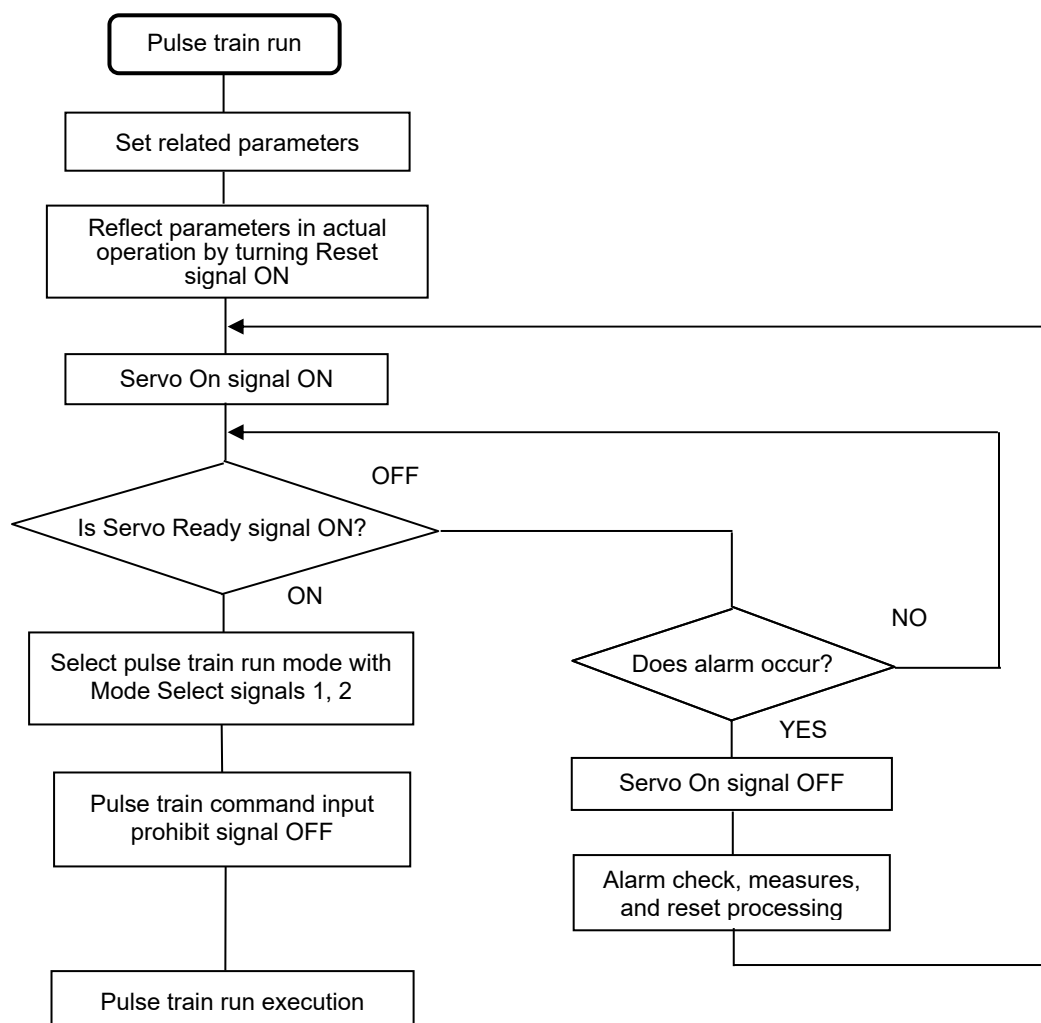


Figure 5-14 Pulse train run operating procedure

Run

2) Time chart

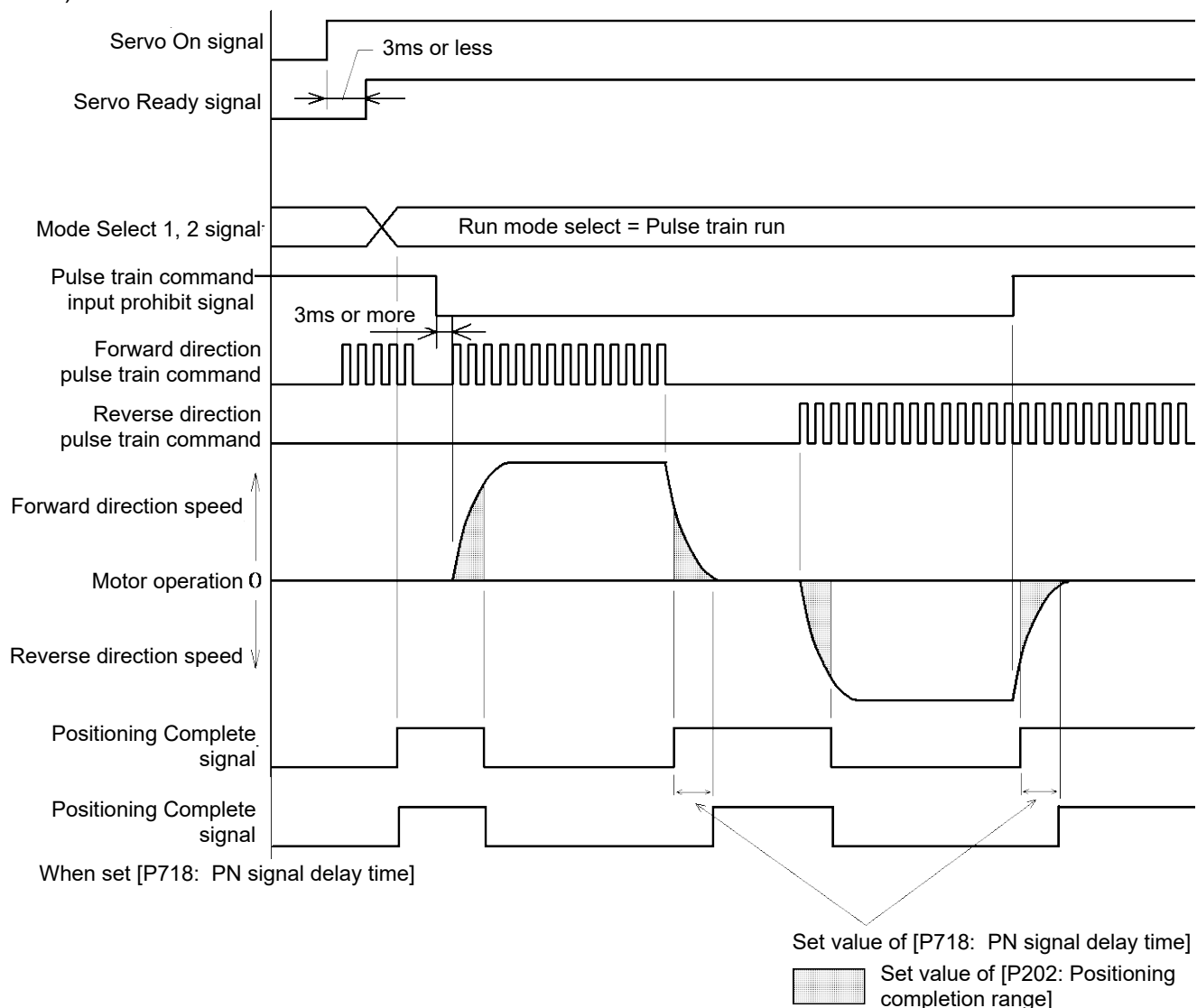


Figure 5-15 Pulse train run time chart

About pulse train run

- Command pulse input 1 pulse*¹
Amount of operation against it is amount of minimum setting unit.
- In the "Positioning Complete signal", output signal condition is decided with the setting of [P202: Positioning completion range] and volume of deviation at that time.
- Time from a point where deviation enters the positioning complete range to a point where Positioning Complete signal is output can be set with [P718: PN signal delay time].*²

*¹ A pulse after [P603: Pulse train command adjustment numerator]/[P604: Pulse train command adjustment denominator]

*² If [P202: Positioning completion range] is expanded, PN signal can be switched to ON state even when motor is in rotation.

5-3 Analog monitor

The analog monitor outputs the contents selected at [P700: Monitor 1 selection] and [P701: Monitor 2 selection] to each terminal of MON1 and MON2 of the control Input/output connector (CN1) by DC voltage.

Operating conditions (transient, steady) of motor can be checked by observing waveforms with oscilloscope.

Contents of monitoring items are described below.

Table 5-3 Contents of analog monitor

Code	Monitoring item	Monitoring contents
MON1 and MON2	Speed Command [SPD.REF.]	Speed command value of motor is output. Polarity: In the forward direction operation, positive voltage, while in the reverse direction operation, negative voltage Range: 0 to $\pm 10V \pm 10\%$ In the rated speed* ³ operation: full-range
	Speed Feedback [SPD.FB.]	Actual operation speed of motor is output. Polarity: In the forward direction operation, positive voltage, while in the reverse direction operation, negative voltage Range: 0 to $\pm 10V \pm 10\%$ 125% of rated speed* ³ : full-range (in the rated rotation* ³ : $\pm 8V$)
	Torque Command [TRQ.REF.]	Output torque value of motor is output. Polarity: In the forward direction torque generation, positive voltage, while in the reverse direction torque generation, negative voltage Range: 0 to $\pm 10V \pm 10\%$ In the rated torque generation: $\pm 3.3V$
	External + Torque Limit [TRQ.LIM. +] External - Torque Limit [TRQ.LIM. -]	External +/- torque limit value is output. Polarity: Positive voltage for both forward direction torque limit and reverse direction torque limit Range: 0 to $\pm 10V \pm 10\%$ In the rated torque limit: $\pm 3.3V$
	Position deviation 1 [P.RANGE.L] Position deviation 2 [P.RANGE.H]	Amount of position deviation is output. Polarity: In the + deviation, positive voltage, while in the - deviation, negative voltage Range: 0 to $\pm 10V \pm 10\%$ Position deviation 1: In the 255 pulses (4-multiplication), full-range Position deviation 2: In the 4080 pulses (4-multiplication), full-range
	NC Speed Command [SPD.OUT]	Speed command value for in-process positioning operation and for in-process pulse train run is output. Polarity: In the forward direction operation, positive voltage, while in the reverse direction operation, negative voltage Range: 0 to $\pm 10V \pm 10\%$ In the rated rotation* ³ : Full-range
	NC Target speed [SCL.OUT]	Target speed generated by internal calculation is output during positioning operation, jog operation, and zero return operation. Polarity: In the forward direction operation, positive voltage, while in the reverse direction operation, negative voltage Range: 0 to $\pm 10V \pm 10\%$ In the rated rotation* ³ : Full-range
	Indirect data 62 [IX62]	Data is output according to data stored in Indirect data 62. Polarity: For positive data, positive voltage, while for negative data, negative voltage Range: 0 to $\pm 10V \pm 10\%$ At 999: Full-range
	Indirect data 63 [IX63]	Data is output according to data stored in Indirect data 63. Polarity: For positive data, positive voltage, while for negative data, negative voltage Range: 0 to $\pm 10V \pm 10\%$ At 999: Full-range
	Reserved [OPT.W] Reserved [OPT.L]	For factory setting; do not set. For factory setting; do not set.

*³ If P005 or P006 is other than 0, the speed is the applicable maximum speed.

About analog monitor output

- In the output of analog monitor, step-like patterns in transient state waveforms can be found because resolution is 2000 in $\pm 10\text{V}$, and in the output, ripples are generated at the rate of $1(1/2000)$ against resolution 2000.
- When the optional control input/output expansion unit is connected, output is sent from the expansion unit.

5-4 Run procedure

Operate this device in accordance with following procedure.

- 1) Be sure to conduct trial run.
- 2) In order to avoid troubles in the trial run, at first run this device without any load and after confirming no fault, connect the device to the machine. Pay special attention not to cause accident.
- 3) When magnetic pole sensor is not used with τ linear/ τ DISC motor, at the power-on or after recovery from encoder errors, [automatic magnetic pole detection operation] is executed at the first Servo On. In this operation, note that motor performs Swing Motion. Swing motion in this operation depends on values in parameter P055 to P057 and P116 to P119 (Magnetic pole detection operation parameters). When this operation cannot be terminated successfully, the motor stops with an alarm [Magnetic pole detection error]. During this operation, [RDY signal] is not output. It is output after normal end.
- 4) A system that uses absolute encoder requires machine position adjustment. For details, refer to [5-9 Absolute encoder specifications and machine position adjustment].

 Caution		
 Prohibition	- Do not touch terminal block of the device carelessly. - Do not use the device leaving the cover of terminal block removed. - Please make sure to wait for 5 min. or longer (for the device with [CHARGE] LED in the front panel, after LED is OFF) before starting working since there is the remaining voltage after power is OFF.	Electric shock may occur.
 Prohibition	- After duly confirming safety, switch ON/OFF the power supply. - Note that motor performs swing motion in the automatic magnetic pole detection operation. - In the case of machine that cannot carry out automatic magnetic pole detection operation at the power-on with τ linear/ τ DISC motor (due to interference on works, etc) use [Magnetic pole sensor].	Injury or failure may occur.

5-4-1 Power supply voltage check

- Confirm that the power supply voltage for the device satisfies required specification.
- For specification of the power supply voltage, refer to [12-1-4 Device electrical specification].

5-4-2 Trial run

(1) Separation of motor and load

- 1) Remove connection between motor and machine system and make no-load status.

(2) Switch OFF the Servo On signal (SON (*))

- 1) Before the power-on, switch Servo On signal (SON (*)) to OFF status.

(3) Power-on

- 1) With the power-on, initial status is displayed on LCD module.

(4) Setting parameters

- 1) Set each parameter and positioning data, such as [P000: Motor type selection] to use conditions. (Refer to [Chapter 6 Parameters].)
- * Parameters that must be set for the trial run are shown below.

Table 5-4 Setting parameters required for trial run

Parameter No.	Name	Using motor		
		τ linear motor	τ DISC motor	IM/SM motor
P 0 0 0	Motor type selection	●	●	●
P 0 0 1	Encoder type selection	●	●	●
P 0 0 2	IM/SM motor encoder pulse number selection			●
P 0 0 3	Tau Linear motor linear sensor resolution	●		
P 0 0 4	Tau DISC motor encoder pulse number		●	
P 0 0 5	IM/SM/Tau DISC motor applicable maximum number of rotations		●	●
P 0 0 6	Tau Linear motor applicable maximum speed	●		
P 0 0 7	Tau Linear motor rated speed	●		
P 0 0 8	Encoder & magnetic pole sensor direction selection	●	●	●
P 0 1 0	Tau Linear/Tau DISC motor magnetic pole sensor type	▲	▲	
P 0 1 1	Tau Linear/Tau DISC motor magnetic pole sensor offset	▲	▲	

Note) ●: Always set. ▲: Set only when magnetic pole sensor is used.

- (5) Power restart
 - 1) To enable parameter value to affect practical operation, restart the power supply.
- (6) Confirming control input signals
 - 1) Switch ON/OFF the control input signals other than Servo On signal (SON (*)), and confirm if control input signals are correctly connected and if the logic is correct, through ON/OFF lighting indication respectively corresponding to each signal, on the LCD module and SDI device (input/output signal display block).
 - 2) As for Speed Override signal (OR1 to OR4) and Address Assignment signal (PS1 to PS8), confirm with LCD module, using diagnosis display mode.
- (7) Switching ON the Servo On signal (SON (*))
 - 1) After parameter setting and control input signal confirmation, switch ON the Over Travel signals (FOT*, ROT*) and Emergency Stop signal (EMG*), switch ON the Reset signal (RST), then switch OFF.
(LCD module and SDI device [FOT] [ROT] [EMG] lighting-off)
 - 2) Next, switch ON the Servo On signal (SON (*)). In this case, switch OFF all other control input signals.
If the Servo On signal (SON (*)) is switched ON, motor enters the status to generate torque and generates resisting torque against external force.
 - 3) If alarm is displayed or motor rotates simultaneously when the Servo On signal (SON (*)) is switched ON, remove the causes.
- (8) Selecting run mode
 - 1) Select the run mode with Mode Select 1, 2 signals (MD1, MD2).

LCD module

This is standard with 1.2kW or more capacity products.

SDI device

This is option for 800W or less capacity products.

(9) Confirming run operation

- 1) Run the motor with low-speed run command (jog operation, etc.) and confirm that operation speed is correct and that there is no unusual vibration or unusual sound.
- 2) Change the command speed and confirm that the motor speed changes in proportion to the command speed.
(In the case of IM/SM motor, it is recommended to measure by attaching the revolution indicator to the load axis).
- 3) In this case, if the motor operation speed is not increased or does not change in proportion to the command speed or if the motor generates vibration or unusual sound, remove the causes.
- 4) In the positioning operation, confirm that the amount of operation of the motor is correct against positioning data. (It is recommended to confirm the position with marking on the motor load axis).
- 5) In this case, if the amount of operation of the motor becomes some constant multiplied rates or inconstant, remove the causes.
- 6) Carry out this run operation confirmation in both forward and reverse directions.

(10) Load run

- 1) When trial run in the no-load status is finished, carry out another trial run linked with machine systems.
- 2) Carry out load run after confirming that emergency stop, Over Travel, and other operation can be reliably performed.
- 3) Check for unusual sound, vibration, and heat generation.
- 4) If the above unusual phenomena are observed or alarm is displayed, remove the causes.
- 5) Motor operating conditions and load status can be checked with the display of the LCD module and SDI device (status and diagnosis display mode).
- 6) If the amount of travel of a machine system is not as specified in the relevant NC position command, check the following parameters.

* The parameters listed below must be set to adjust machine system operation with the NC position command.

Table 5-5 Parameters required for positioning

Parameter No.	Name	Remarks
P301	Setting unit selection	
P302	Minimum setting unit	
P303	Electronic gear ratio numerator	* With these parameters, adjust the actual machine system travel amount with the NC position command setting.
P304	Electronic gear ratio denominator	
P310	Machine travel amount	

All the device adjustments are set by parameters.

For the motion gain adjustment, there are following methods:

- Use Auto-tuning (DG98, DG99) to automatically set the speed loop gain, and manually adjust the position loop gain.
- Also, Tuning level adjustment function or Real-time gain setting function can be used by manual adjustment for further gain tuning. Please refer to following descriptions for the manual adjustment method.

Due to the condition of load or mechanical play, auto-tuning or automatic response adjustment may be unable. In such cases, please refer to following instructions and set each parameter manually.

5-5-1 Adjustment at shipment

- For standard factory setting (initial value), refer to [6-3 Parameter specification].
- The device is preset standard (initial value) at the factory before shipment; however, when linked with machine systems, readjustment can be required depending on load status and method to be used.

5-5-2 Adjustment point of individual phenomenon (parameters)

For explanation and setting method for each parameter, refer to [6-3 Parameter specification] and [11-3 Operation mode].

Table 5-6 Adjustment point of individual phenomenon (parameters) 1/2

Phenomenon	Adjustment point (parameter)
Motor vibrates in stop status.	[P106: Speed loop gain / Low-speed range] [P107: Speed loop integral time constant / Low-speed range] [P108: Speed loop differential time constant / Low-speed range] P106 to P108 is valid in the range of P100 setting. [P120: Torque command filter frequency] [P201: Servo lock gain] P201 is valid in the range of P202 setting.
Motor vibrates while running.	[P101: Speed loop gain] [P102: Speed loop integral time constant] [P103: Speed loop differential time constant] [P120: Torque command filter frequency] [P200: Position loop gain] [P605: Pulse train feed forward ratio]
Motor vibrates when GSEL signal is ON.	[P111: Speed loop gain at GSEL1] [P112: Speed loop integral time constant at GSEL1] [P113: Speed loop differential time constant at GSEL1] [P120: Torque command filter frequency] [P226: Position loop gain at GSEL1] [P227: Servo lock gain at GSEL1]
Motor vibrates when GSEL2 signal is ON.	[P415: Speed loop gain at GSEL2] [P416: Speed loop integral time constant at GSEL2] [P417: Speed loop differential time constant at GSEL2] [P120: Torque command filter frequency] [P228: Position loop gain at GSEL2] [P229: Servo lock gain at GSEL2]

Table 5-7 Adjustment point of individual phenomenon (parameters) 2/2

Phenomenon	Adjustment point (parameter)
Motor vibrates when both GSEL signal and GSEL2 signal are ON.	[P615: Speed loop gain at GSEL3] [P616: Speed loop integral time constant at GSEL3] [P617: Speed loop differential time constant at GSEL3] [P120: Torque command filter frequency] [P315: Position loop gain at GSEL3] [P316: Servo lock gain at GSEL3]
Over-shoot and under-shoot are large at motor start or stop.	[P101: Speed loop gain] [P102: Speed loop integral time constant] [P103: Speed loop differential time constant] [P200: Position loop gain]
Over speed error occurs.	[P205: Feed forward ratio] [P605: Pulse train feed forward ratio] [P211 to 213: Acceleration time] [P214 to 216: Deceleration time]
Deviation overflow occurs.	[P200: Position loop gain] [P207: Overflow detecting pulse] [P205: Feed forward ratio] [P605: Pulse train feed forward ratio] [P211 to 213: Acceleration time] [P214 to 216: Deceleration time]
Positioning time is long.	[P200: Position loop gain] [P202: Positioning completion range] [P205: Feed forward ratio] [P605: Pulse train feed forward ratio]
Motor speed does not reach rated speed*4 by speed command voltage 10V. (When the external speed command is selected with the [SPD] command)	[P129: Speed command gain]
Motor runs slowly by speed command voltage 0V. (When the external speed command is selected with the [SPD] command)	[P130: Speed command offset]

*4 If P005 or P006 is other than 0, the speed is the applicable maximum speed.

5-5-3 Adjustment method for each phenomenon

(1) <Speed loop gain>

- 1) Low-speed range for gain change [P100]
 - Speed range of low speed gain at GSEL signal OFF is set.
 - Low speed gain range effective parameters are [P106], [P107], [P108], [P109] and [P110].
 - When setting value is 0, the low speed gain range parameter is not selected.
- 2) Speed loop gain [P101]/Low speed gain range [P106]/GSEL signal ON [P111]
GSEL2 signal ON [P415]/GSEL signal and GSEL2 signal ON [P615]
 - The larger the setting value is, the quicker the response is.
 - If setting value is increased too much, vibration occurs.
 - If setting value is decreased too much, response becomes slow and operation becomes unstable.
- 3) Speed loop integral time constant [P102]/Low speed gain range [P107]/GSEL signal ON [P112]
GSEL2 signal ON [P416]/GSEL signal and GSEL2 signal ON [P616]
 - The smaller the setting value, the quicker the response is.
 - If setting value is decreased too much, vibration (chatter vibration) occurs.
 - If setting value is increased too much, response becomes slow and operation becomes unstable.
- 4) Speed loop differential time constant [P103]/Low speed gain range [P108]/GSEL signal ON [P113]
GSEL2 signal ON [P417]/GSEL signal and GSEL2 signal ON [P617]
 - Setting this quickens response.
 - When the setting value becomes small, it affects the range of quicker operation characteristics, and if too large, it affects all ranges and generates vibrations.

(2) <Torque command filter>

- 1) Torque command filter frequency [P120]
 - If machine resonance occurs, enter a filter to torque command and fix it.
 - The larger the setting value is, the quicker the response is.
 - If setting value is decreased too much, response becomes slow and operation becomes unstable.

(3) <Position loop gain>

- 1) Position loop gain [P200]/GSEL signal ON [P226]
GSEL2 signal ON [P228]/GSEL signal and GSEL2 signal ON [P315]
 - The larger the setting value is, the quicker the response is.
 - If setting value is increased too much, over-shoot, under-shoot, or vibration occurs.
 - If setting value is decreased too much, positioning time becomes long and positioning accuracy becomes worse.
- 2) Servo lock gain [P201]/GSEL signal ON [P227]
GSEL2 signal ON [P229]/GSEL signal and GSEL2 signal ON [P316]
 - The larger the setting value is, the quicker the response in the servo lock is.
 - If setting value is increased too much, vibration occurs.
 - If setting value is decreased too much, servo lock becomes weak and the stop position shifts due to external force.

(4) <Feed forward ratio>

- 1) Feed forward ratio [P205]
 - The larger the setting value is, the higher the compliance to a command is.
 - If setting value is increased too much, over-shoot, under-shoot, or vibration occurs.
 - If setting value is decreased too much, positioning time becomes long.
- 2) Pulse train feed forward ratio [P605]
 - The larger the setting value is, the higher the compliance to pulse train command is.
 - If setting value is increased too much, over-shoot, under-shoot, or vibration occurs.
 - If setting value is decreased too much, positioning time becomes long.

(5) <Gain adjustment method>

Gain adjustment is carried out with an oscilloscope, by observing waveform of speed feedback. Adjust individual gain parameters of position loop and speed loop so that no over-shoot and no under-shoot exist and that no vibration occurs.

- In the operating conditions, carry out adjustment below.
 - 1) Set a little bit low value to [P200: Position loop gain] and [P201: Servo lock gain] and adjust [P101: Speed loop gain] as high as possible in the range where motor does not vibrate.
 - 2) Adjust and set an optimum value to [P102: Speed loop integral time constant] and re-adjust [P101: Speed loop gain] to set the optimum operating condition to motor.
 - 3) Set [P103: Speed loop differential time constant] to quicken response and to further diminish over-shoot and under-shoot. If a large value is set, vibration occurs.
 - 4) If machine resonance occurs, adjust [P120: Torque command filter frequency] as high as possible until machine resonance disappears.
 - 5) Adjust and set [P200: Position loop gain] as high as possible in the range where motor does not vibrate and over-shoot or under-shoot does not occur.
- In the stop status, carry out adjustment below.
 - 1) Copy parameter setting values in the above operating conditions to parameters in the stop status.
 - P201 ← P200 [Position loop gain]
 - P106 ← P101 [Speed loop gain]
 - P107 ← P102 [Speed loop integral time constant]
 - P108 ← P103 [Speed loop differential time constant]
 - 2) If motor vibrates after the above setting, adjust the following parameters in the same method taken in the operating conditions.
 - [P201: Servo lock gain]
 - [P100: Low-speed range for gain change]
 - [P106: Speed loop gain / Low-speed range]
 - [P107: Speed loop integral time constant / Low-speed range]
 - [P108: Speed loop differential time constant / Low-speed range]
 - 3) If machine resonance occurs, adjust [P120: Torque command filter frequency] as high as possible in the range where no machine resonance occurs.
- In the state of GSEL signal ON/GSEL2 signal OFF, carry out adjustment below.
(Adjustment is not required when Gain Select (GSEL signal) is not used.)
 - 1) Adjust and set [P111: Speed loop gain at GSEL1], [P226: Position loop gain at GSEL1], and [P227: Servo lock gain at GSEL1] as high as possible in the range where motor does not vibrate.
 - 2) Adjust and set the optimum value to [P112: Speed loop integral time constant at GSEL1], and re-adjust [P111: Speed loop gain at GSEL1] to set the optimum operating conditions to motor.
 - 3) Set [P113: Speed loop differential time constant at GSEL1] to quicken response and to further diminish over-shoot and under-shoot. If a large value is set, vibration occurs.
 - 4) If machine resonance occurs, adjust and set [P120: Torque command filter frequency] as high as possible until machine resonance disappears.
 - 5) Adjust and set [P226: Position loop gain at GSEL1] as high as possible in the range where motor does not vibrate and over-shoot or under-shoot does not occur.

Run

- In the state of GSEL signal OFF/GSEL2 signal ON, carry out adjustment below.
(Adjustment is not required when Gain Select (GSEL signal) is not used.)
 - 1) Adjust and set [P415: Speed loop gain at GSEL2], [P228: Position loop gain at GSEL2], and [P229: Servo lock gain at GSEL2] as high as possible in the range where motor does not vibrate.
 - 2) Adjust and set [P416: Speed loop integral time constant at GSEL2] to the optimum value, and re-adjust [P415: Speed loop gain at GSEL2] to set the optimum operating conditions to motor.
 - 3) Set [P417: Speed loop differential time constant at GSEL2] to quicken response and to further diminish over-shoot and under-shoot. If a large value is set, vibration occurs.
 - 4) If machine resonance occurs, adjust [P120: Torque command filter frequency] as high as possible until machine resonance disappears.
 - 5) Adjust and set [P228: Position loop gain at GSEL2] as high as possible in the range where motor does not vibrate and over-shoot or under-shoot does not occur.
 - In the state of GSEL signal ON/GSEL2 signal ON, carry out adjustment below.
(Adjustment is not required when Gain Select (GSEL signal) is not used.)
 - 1) Adjust and set [P615: Speed loop gain at GSEL3], [P315: Position loop gain at GSEL3], and [P316: Servo lock gain at GSEL3] as high as possible in the range where motor does not vibrate.
 - 2) Adjust and set [P616: Speed loop integral time constant at GSEL3] to the optimum value, and re-adjust [P615: Speed loop gain at GSEL3] to set the optimum operating conditions to motor.
 - 3) Set [P617: Speed loop differential time constant at GSEL3] to quicken response and to further diminish over-shoot and under-shoot. If a large value is set, vibration occurs.
 - 4) If machine resonance occurs, adjust and set [P120: Torque command filter frequency] as high as possible until machine resonance disappears.
 - 5) Adjust and set [P315: Position loop gain at GSEL3] as high as possible in the range where motor does not vibrate and over-shoot or under-shoot does not occur.
- (6) Speed adjustment
- If the external speed command is valid (SEL0) for speed control command (SPD) run in the automatic run mode, the motor speed shows the rated speed^{*5} when the speed command input voltage reaches $\pm 10\text{VDC}$.
- When using auxiliary power supply or depending on external power supply, rated speed^{*5} command could not be exactly $\pm 10\text{VDC}$.
- Adjust the value of parameter [P129: Speed command gain] so that motor rotates at the rated speed^{*5} when the rated speed^{*5} command is input.
- When [P129: Speed command gain] is set as "6.00 to 10.00", adjustments can be made so that the rated speed^{*5} is set when the speed command input voltage is in the range of ± 6 to 10VDC. When setting the parameter in the range of "10.01 to 100.00", refer to the function of [P129] in [6-3 Parameter specification].
- (7) Speed command offset adjustment
- If the external speed command is valid (SEL0) for speed control command (SPD) run in the automatic run mode, the motor can rotate slightly when the speed command input voltage is 0V. Adjust the value of parameter [P130: Speed command offset] to stop the motor.
- (8) Torque command offset adjustment
- If the external torque command is valid (SEL0) for torque control command (TRQ) run in the automatic run mode, the torque command input voltage of 0V can generate the motor torque and the motor may rotate.
- Make sure to adjust the value of parameter [P131: Torque command offset] to stop the motor and prevent the generation of torque.

^{*5} If P005 or P006 is other than 0, the speed is the applicable maximum speed.

5-6 Automatic magnetic pole detection operation

When magnetic pole sensor is not used with τ linear/ τ DISC motor, "automatic magnetic pole detection operation" is executed in the operation below so as to confirm magnetic pole position of the motor by the device.

- In the initial Servo On operation after the power-on
- In the initial Servo On operation after recovery from encoder errors

* When an absolute encoder (S-ABS2/L-ABS/S-ABS3/S-MABS/S-ABS4) is used, automatic magnetic pole detection operation is not performed.

- (1) Be careful as motor performs swing motion during this operation. Swing and motion in this operation depends on values in parameters P55 to P57 and P116 to P119 (magnetic pole detection operation parameters).

Table 5-8 Automatic magnetic pole detection operation related parameters

Parameter No.	Name	Input range (unit)
P055	Low pass filter frequency at auto magnetic pole detection	0 to 4999(Hz)
P056	Set landing torque at auto magnetic pole detection	0.0 to 100.0(%)
P057	Set landing torque holding time at auto magnetic pole detection	0.00 to 9.99(s)
P116	Torque limiting value at magnetic pole detection	0.0 to 799.9(%)
P117	Magnetic pole detection gain 1	0 to 9999
P118	Magnetic pole detection integral calculus time constant	0 to 65535(ms)
P119	Magnetic pole detection gain 2	0 to 9999(s ⁻¹)

- (2) Magnetic pole detection operation

Operation pattern during the automatic magnetic pole detection is as follows.*6*7

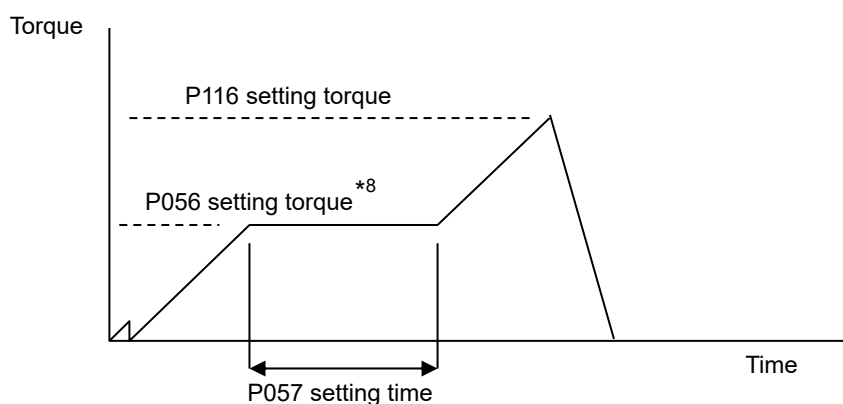


Figure 5-16 Automatic magnetic pole detection 1-time pattern operation

- (3) The [RDY signal] is not output during this operation. After normal end, it is output.

*6 Figure 5-16 indicates operation pattern for one time. In the actual automatic magnetic pole detection, it needs operation for two times.

However, if the setting value in P056 set landing torque is "0", automatic magnetic pole detection needs operation for three times.

The number of operations decided with P056 is reflected when the power is turned off and then on again.

*7 If the setting value in P056 or P057 is "0", the slope of output torque is linear until it reaches [P116 setting torque] from "0" status.

Required time to reach [P116 setting torque] from "0" status is 500 ms.

*8 The activating timing of P056 is real-time, but if the setting value when the power is turned on is "0", the activating timing is when the power is turned on.

Run

- (4) If this operation cannot end normally, operation stops with an alarm "Magnetic pole detection error". In this case, causes below can be suspected.
- Unbalanced load
 - Big friction
 - Big load inertia
 - Big change in load inertia
 - Too low rigidity in the loaded machine
 - Too big plays and backlash in the loaded machine
 - In the automatic magnetic pole detection operation (swing motion), the machine hits stoppers.
 - Errors in parameter group 0 [Motor, encoder parameter].
 - Improper setting in parameters relating magnetic pole detection operation
- (5) Automatic magnetic pole detection operation adjustment
- [P055: Low pass filter frequency at auto magnetic pole detection]
- If machine resonance occurs, enter a filter to torque command and fix it.
 - The larger the setting value is, the quicker the response is.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
- [P056: Set landing torque at auto magnetic pole detection]
- The landing torque value is set according to the torque limit value at magnetic pole detection.
 - If the setting value is decreased too much or too close in comparison to the torque limit value at magnetic pole detection, it makes magnetic pole detection difficult.
- [P057: Set landing torque holding time at auto magnetic pole detection]
- The landing torque holding time is set according to the torque limit value at magnetic pole detection.
 - The larger the setting value is, the more stable the magnetic pole detection operation in the landing torque becomes, but magnetic pole detection time becomes long.
- [P116: Torque limiting value at magnetic pole detection]
- Torque limit value is set according to the motor to use.
 - The larger the setting value is, the quicker the response is, while producing bigger torque by the motor.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
- [P117: Magnetic pole detection gain 1]
- The larger the setting value is, the quicker the response is.
 - If the setting value is increased too much, vibration occurs.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
- [P118: Magnetic pole detection integral calculus time constant]
- The smaller the setting value is, the quicker the response is.
 - If the setting value is decreased too much, vibration (chatter vibration) occurs.
 - If the setting value is increased too much, response becomes slow and it makes magnetic pole detection difficult.
- [P119: Magnetic pole detection gain 2]
- The larger the setting value is, the quicker the response is.
 - If the setting value is increased too much, over-shoot, under-shoot, or vibration occurs.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.

Caution

- In the case of machine that cannot carry out [automatic magnetic pole detection operation (swing motion of the motor)] at the power-on with τ linear/ τ DISC motor (due to interference between works, etc.), use the [magnetic pole sensor].
- Note that the motor performs swing motion in the automatic magnetic pole detection operation.

5-7 Disturbance correction function

In order to diminish speed variation due to disturbance as far as possible, assurance function by disturbance observer is supported in this device.

This function enables to diminish speed variation due to disturbance in a device which requires constant speed stability.

(1) Setting parameters

Set parameters below correctly, to make this function valid.

Use P312 and P313 for the parameter at GSEL1/2/3 condition.

Table 5-9 Disturbance correction function related parameters

Parameter No.	Name	Remarks
P146 (P312)	Mass/inertia* ⁹ (Mass/inertia at GSEL condition)	It is automatically set by executing auto-tuning (DG98, DG99). Please set logic value when using the system unable to execute auto-tuning (DG98, DG99).
P147 (P313)	Viscous friction* ⁹ (Viscous friction at GSEL condition)	It is automatically set by executing auto-tuning (DG98, DG99). Please set logic value when using the system unable to execute auto-tuning (DG98, DG99).
P148	Disturbance correction filter frequency* ⁹	Set filter (low pass) in order to reflect disturbance torque detected by disturbance observer.
P150	Disturbance correction filter invalid limit	Set the speed at which to start reducing the reflection rate of disturbance correction with the disturbance observer. If the speed is equal to or less than this setting value, the reflection rate of disturbance correction is reduced. If the speed is 0, disturbance correction is ineffective.

(2) Operation pattern

Disturbance correction operation is as follows.

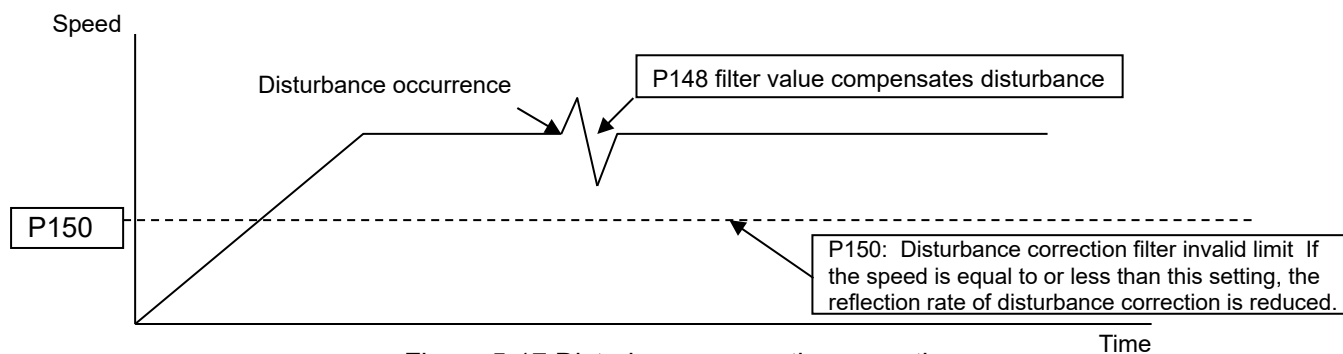


Figure 5-17 Disturbance correction operation

(3) Limits

In the motor-stop and low-speed operation, normal disturbance detection is not enabled.

According to the operation, set appropriate speed in [P150 Disturbance correction filter invalid limit].

⁹ If appropriate value is not set to all parameters of P146 (P312), P147 (P313), and P148 respectively, disturbance correction function does not operate correctly. If either parameter of P146 (P312) or P148 is set at "0", disturbance correction function becomes invalid.

This device is equipped with the active vibration control filter function, to cope with resonant frequency caused by minute vibration or to cope with low-rigidity machines.

This function can suppress resonance in the case of low frequency vibration.

(1) Setting parameters

When setting this function, correctly set the parameters below.

Table 5-10 Active vibration control filter related parameters

Parameter No.	Name	Input range (unit)	Remarks
P317	Active vibration control filter center frequency*10	0 to 4999(Hz)	
P318	Active vibration control filter bandwidth*10	0 to 4999(Hz)	
P319	Active vibration control filter ineffective range*10	0.00 to 100.00(%)	Ratio against rated speed or applied maximum speed

(2) Operation pattern

Operation with the active vibration control filter set is as follows.*11*12

Example) P317 Active vibration control filter center frequency 100 [Hz],
P318 Active vibration control filter bandwidth 20 [Hz]

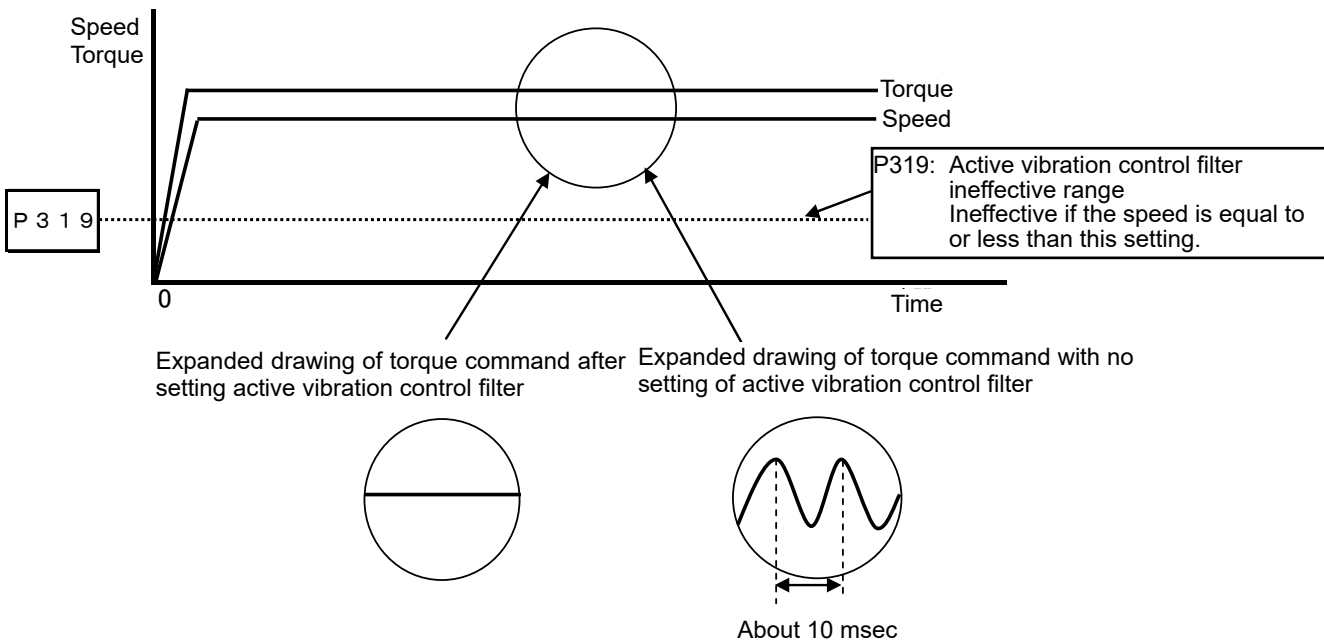


Figure 5-18 Active vibration control filter setting example in case of 100 [Hz] vibration occurrences

(3) Limits

When this function is valid, it can bring bad influence to motor acceleration/deceleration operation. Set the correct value to [P319 Active vibration control filter ineffective range], according to the contents of operation.

*10 If appropriate value is not set to all parameters of P317/P318/P319 respectively, motor does not operate correctly.

If either parameter of P317 or P318 is set at "0", the active vibration control filter function becomes invalid.

*11 Setting method of filter value is restricted to manual setting only.

*12 Decision of filter value can be set based on torque/speed/deviation-waveform. Referring to Figure 5-18, set resonance frequency of one cycle to P317.

5-9 Absolute encoder specifications and machine position adjustment

5-9-1 Absolute encoder specifications

Table 5-11 Absolute encoder specification

Item	Contents	
1-rotation resolution	2^{17} (131072 pulses)	
Multi rotation indicator quantity	2^{15} (± 16383 rev from initialization position)	
Backup method	Battery backup	
Battery model	NCR-XBC4A (standard type)	NCR-XBG9A (large-capacity type)
Applied battery	Lithium battery (primary cell 3.6V rated)	
Battery backup time	About 2.5 years* ¹³	About 4.2 years* ¹³

⚠ For information about suggestions for battery replacement, refer to Table 12-54 Parts replacement guide 2.

5-9-2 Battery replacement and installation

(1) Battery replacement

- Replace battery if an absolute encoder battery error warning (WNG.ABS.BATT.) or absolute encoder battery error (ALM.ABS.BATT.) occurs.
- Carry out battery replacement while the control power supply is switched on. If battery replacement is carried out while the power supply is off, backup data in the encoder will be lost. Periodic battery replacement is recommendable, even when no particular above errors are noticed.

(2) Battery installation (NCR-XBC4A standard type)

- 1) Attach the battery holder to the encoder cable as shown in the figure below.

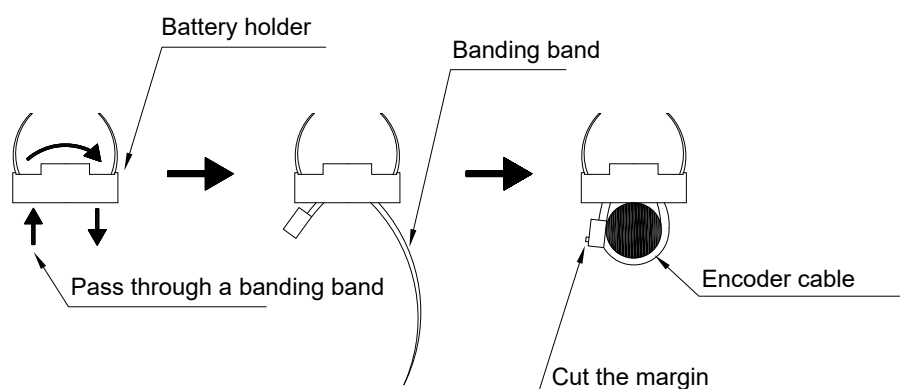


Figure 5-19 Battery holder fixation figure 1

- 2) Install a battery to the battery holder and connect it to the encoder cable.

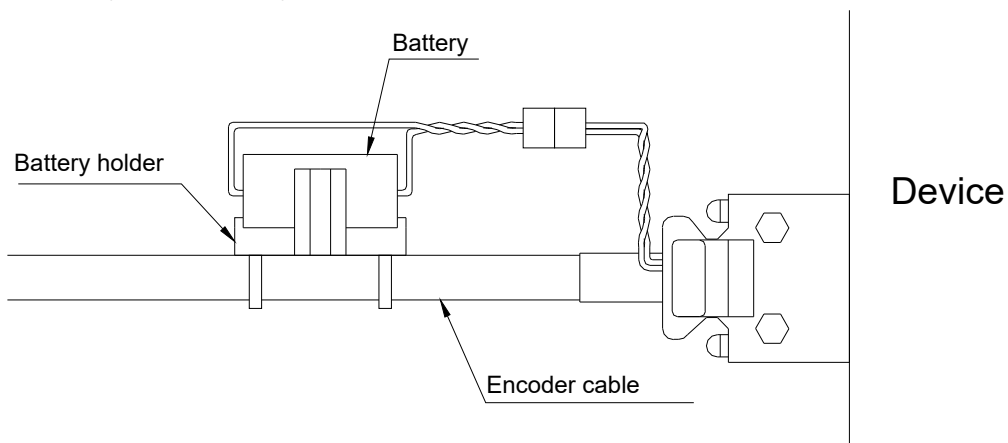


Figure 5-20 Battery holder fixation figure 2

*¹³ When operating 10h/day, 300 days/year.

Run

(3) Battery installation (NCR-XBG9A large-capacity type)

- 1) Attach the battery holder to the encoder cable as shown in the figure below.

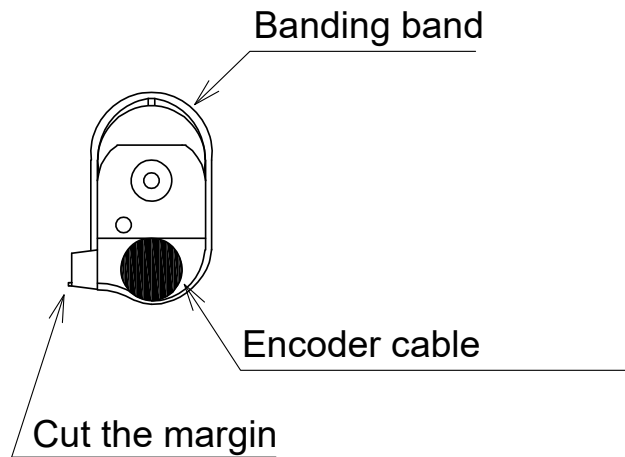


Figure 5-21 Battery holder fixation figure 3

- 2) Install a battery to the battery holder and connect it to the encoder cable.

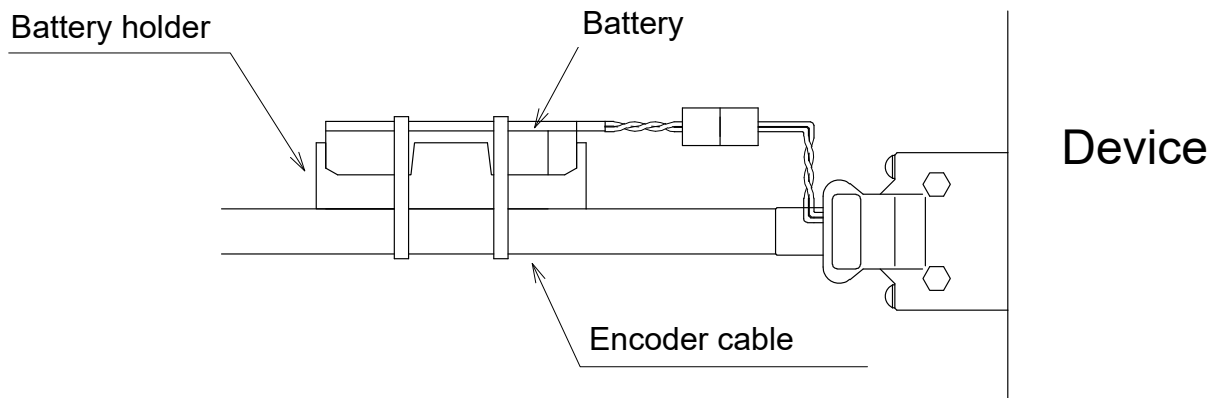
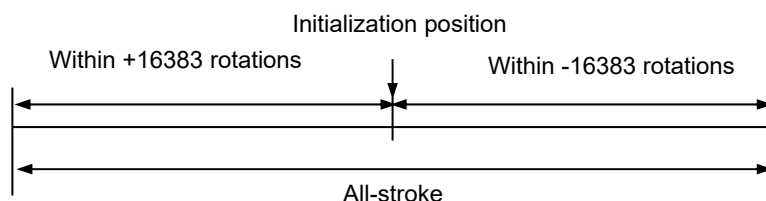


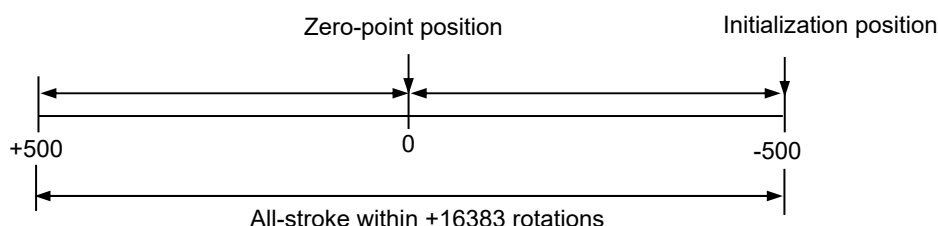
Figure 5-22 Battery holder fixation figure 4

5-9-3 Setting parameters

- (1) Encoder type selection (P001)
Select [S-ABS]. * When using IPU, and if selected [S-ABS2/S-ABS3/S-ABS4], refer to [5-10 Machine position adjustment of IPU absolute encoder].
- (2) IM/SM motor encoder pulse number selection (P002)
Select [17bit].
- (3) ABS standard data (P018)
To associate the standard position of the machine system with the current position (ST01), set the value of the absolute encoder at the standard position.
* Automatically set by initializing the absolute encoder.
- (4) ABS standard mechanical position (P019)
Input the position to execute initialization of the absolute encoder, with an absolute position.
Initialization position should be within multi rotation indicator quantity of absolute encoder.



- When executing initialization at Zero-point position, setting value is "0".
- When Zero-point position is in the center of stroke, while all-stroke is ± 500 mm, and if initialization is executed at the stroke end of - side, setting value is "-500".



- (5) Position adjustment parameter (P300th level)
When using absolute encoder, and if changed any position adjustment parameter (P300th level), power restart is necessary to activate the set parameter.
* If power restart is not carried out after this parameter is changed, the current position is not set according to the set parameter.

5-9-4 Absolute encoder initialization

In the case of situations below, carry out initialization of absolute encoder.

- At the initial machine start-up
- When replaced motor
- When errors below occur
- Absolute encoder backup error (ALM.ABS.BAKUP).
- Absolute encoder overflow error (ALM.ABS.OVER).
- Absolute encoder count error (ALM.ABS.COUNT).

Carry out following tasks in order to link the absolute encoder with machine position.

- (6) Shift to the position where initialization is executed. (Position set in P019)
When shifting the motor to initialization position with jog run or zero return run, release alarm once by the (2) operation below.
- (7) Execute DG97 (S-INC.CLR) in the self-diagnosis mode. If [OK!!] is displayed, it is the sign of completion. In the self-diagnosis mode, the motor is in torque-free status; thus, make sure that the motor does not move with external force and others.
* As for operating procedure of self-diagnosis, refer to [Chapter 9 Self-diagnosis].
- (8) Re-start the power supply.

Run

5-9-5 Absolute encoder position re-adjustment

If you want to re-adjust the relationship between absolute encoder position and current position, you can do so with zero point return operation, described below, instead of implementing the procedure described above in [5-9-3 Setting parameters].

- (1) Selecting a zero point return method (P402)
Select "ABS HOME" as a zero point return method.
- (2) Setting the ABS standard mechanical position (P019)
Input the position at which to re-adjust the absolute encoder as an absolute position. Make sure that the position at which to re-adjust it is within the multi rotation indicator quantity range of the absolute encoder.
* Refer to [(4) ABS standard mechanical position (P019)] in a previous section, [5-9-3 Setting parameters].
- (3) Move to the position at which you want to re-adjust it. (Position specified in P019)
- (4) Implement zero point return operation.
By implementing ABS HOME zero point return, the current position become [P019: ABS standard mechanical position], and the absolute encoder value at that time is automatically set in [P018: ABS standard data].
* If the encoder is not an absolute encoder, the absolute encoder positioning error (ABS.H.ERR) occurs.
* Do not implement ABS HOME zero point return with the motor vibrating.
* For information about the method for implementing ABS HOME zero point return, refer to Time chart (i) in [5-2-2 Zero return run mode].

5-10 Machine position adjustment of IPU absolute encoder

Carry out following tasks in order to link standard position with current position (ST01) of machine system.

- 1) Switch on power supply of the device.
- 2) Set P412 to 1 and turn the power off and then on again.
- 3) Shift motor to standard position of machine system.
- 4) Set "ABS.ENC." to P502 and set the value of ST01 to P018. (Set it by ignoring the decimal point.)
- 5) Set position (standard position) to P019 to display in current position (ST01).
- 6) Return P502 to "ABSOLUTE" and turn the power off and then on again.

To set the sign switching position within the 1 rotation range, refer to the description of P413 [Code switching position in one rotation range].

In 4) above and the subsequent steps, the settings can also be made with the zero point return method, "ABS HOME".

For information about the setting method, refer to a previous section, [5-9-5 Absolute encoder position re-adjustment].

[Setting example 1, when motor operating range is in 1-rotation]

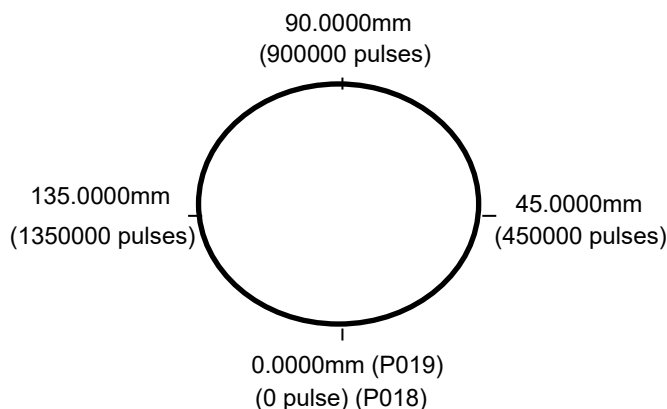
P004 Tau DISC motor encoder pulse number: 1800000 (ppr)

P018 ABS encoder value for machine base position: 0 (pulse = absolute encoder position)

P019 ABS standard mechanical position: 0.0000 (mm)

P301 Setting unit selection: mm

P302 Minimum setting unit: 0.0001



[Setting example 2, when motor operating range is in 1-rotation]

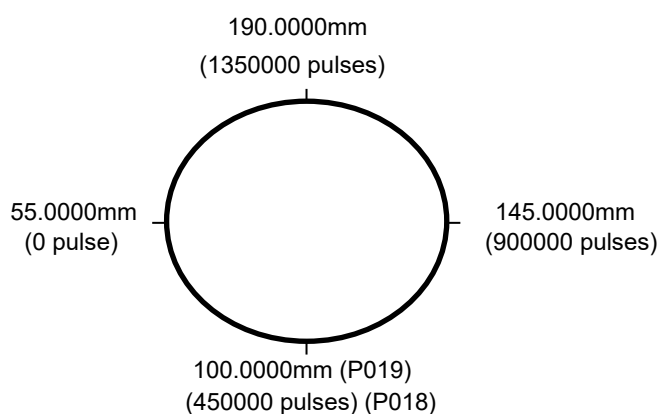
P004 Tau DISC motor encoder pulse number: 1800000 (ppr)

P018 ABS encoder value for machine base position: 450000 (pulses = absolute encoder position)

P019 ABS standard mechanical position: 100.0000 (mm)

P301 Setting unit selection: mm

P302 Minimum setting unit: 0.0001



5-11 Serial number check at power-on

In the device that incorporates absolute position compensation function, check for device and IPU [Motor serial number] is executed at the power-on during operation.

When both serial numbers are matched in the check, conventional run is started.

Depending on the result, whether both serial numbers are matched or unmatched, process described in the table below is executed.

Table 5-12 Serial number check at power-on

Case	Serial number		Countermeasures
	In-device	In-IPU	
I	x x x x	x x x x	1) Considers both serial numbers are matched. 2) Enters conventional run.
II	x x x x or n u l l	y y y y	1) Considers both serial numbers are unmatched. 2) By reading out absolute position correction data and motor serial number from IPU, stores it to the device. (About 70 to 80 seconds required) 3) During the operation 2), "3" "-" "F" " " light up orderly on 7-segment LED of the device, and "SERNO UNMATCHED" blinks on SDI device. * During this display, USB communication with a PC is not possible. To use USB communication, re-connect the USB connector after the end of this display. 4) When readout is completed, "3" "-" "6" " " light up orderly on 7-segment LED of the device, and [ALM SNO.UNMAT] is displayed on SDI device. 5) Switch off the power supply of the device once, and then restart the power. Both serial numbers become [yyyy] and the case I status is entered.
III	x x x x	n u l l	1) Considers both serial numbers are unmatched and that no data exists in IPU (Empty). 2) "3" "-" "7" " " light up on orderly 7-segment LED of the device, and [ALM SNO.EMPTY] is displayed on SDI device. 3) When device serial number and motor serial number are matched, [Diagnosis] function is selected on SDI device and by using [DG54] and [DG56], absolute position correction data and user parameter are transferred to IPU. Then, it goes to 5). 4) When device serial number and motor serial number are unmatched (for example, using another device that is being used for others), absolute position correction data and user parameter are transferred to the device from PC. Next, selecting [Diagnosis] function from SDI device, absolute position correction data and user parameter are transferred to IPU using [DG54] and [DG56]. 5) Switch off the power supply of the device once, and then restart the power. Both serial numbers become new values and the case I status is entered.
IV	n u l l	n u l l	1) Considers no data exists in the device and IPU (Empty). 2) "3" "-" "7" " " light up orderly on 7-segment LED of the device, and [ALM SNO.EMPTY] is displayed on SDI device. 3) Absolute position correction data and user parameter are transferred to the device from PC. Next, selecting [Diagnosis] function from SDI device, absolute position correction data and user parameter are transferred to IPU using [DG54] and [DG56]. 4) Switch off the power supply of the device once, and then restart the power. Both serial numbers become new values and the case I status is entered.

* When the user does not have factory setting master data of absolute position correction data and user parameter, this work should be done in our factory.

When the user carry out this work, the tools and data below are required.

Contact our sales representative.

- 1) IPU specification, absolute position correction data transferring software.
- 2) Master data for absolute position correction data and user parameter.

5-12 Servo compass basic setting

- This manual explains servo compass basic setting, and for other settings, refers to [Servo compass instruction manual] in parallel.
- 1) Basic setting (setting in arc operation)
 When arc operation is the base, make settings referring to the figure and table below for the setting method.
 When starting editing software, select τ linear motor in motor select.

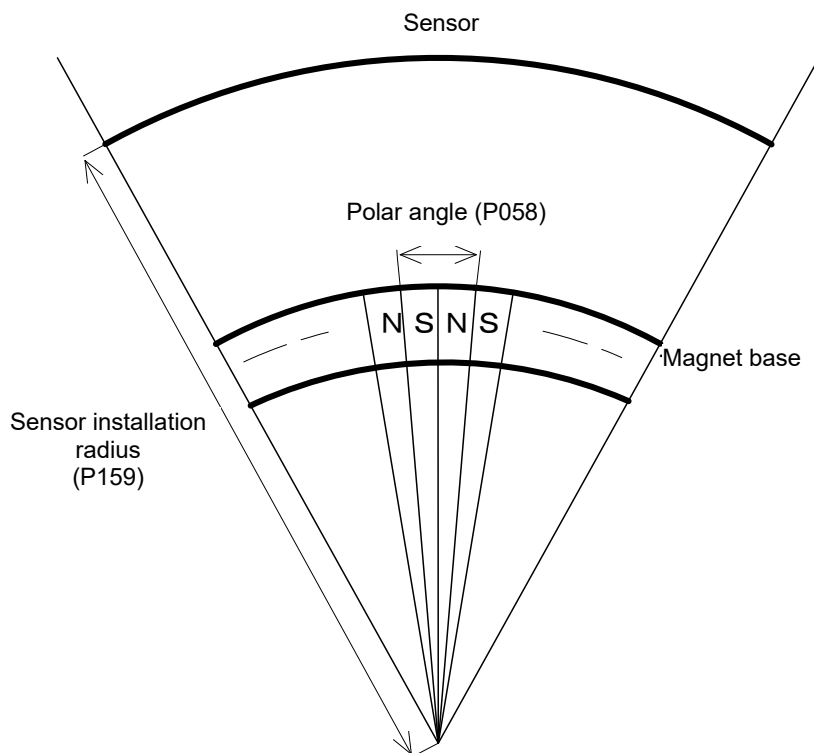


Table 5-13 Servo compass motor setting parameters

Parameter No.	Name	Servo compass setting parameter	
		Unit	Explanation
P000	Motor type selection		Correctly set referring to [12-5 Applicable motor list].
P001	Encoder type selection		Correctly set referring to [12-5 Applicable motor list].
P003	Tau Linear motor linear sensor resolution	μm	Set resolution for applied sensor. * Correctly set referring to [6-3 Parameter specification].
P006	Tau Linear motor applicable maximum speed	deg/sec	Correctly set referring to [12-5 Applicable motor list]. * Unit is in [deg/sec] but not in [mm/sec].
P007	Tau Linear motor rated speed	deg/sec	Correctly set referring to [12-5 Applicable motor list]. * Unit is in [deg/sec] but not in [mm/sec].
P010	Tau Linear/Tau DISC motor magnetic pole sensor type		Correctly set referring to [12-5 Applicable motor list].
P011	Tau Linear/Tau DISC motor magnetic pole sensor offset	mm	Correctly set referring to [12-5 Applicable motor list].
P159	Sensor installation radius	mm	Set scale setting radius referring to the above figure.

Run

- 2) When executing multi rotation operation (supported by Servo compass R200 only)
When executing multi rotation operation, for setting of the motor number, direct setting with "999" is required.
* When executing multi rotation operation, contact our sales representative for details.
- 3) About the support of electronic thermal
When selecting [STD] with [P144 Electronic-thermal detecting method selection], and when executing low-speed operation lower than 0.8% of the rated speed^{*14}, it detects changing to [O.L.70%].

For details, refer to [10-4 (8) Overload error/(9) IPM overload error].



Caution

- When executing electric conduction trial run, do not attach loads and works, and do it in the no-load status.

^{*14} If P005 or P006 is other than 0, the speed is the applicable maximum speed.

5-13 Servo control communication

Servo control communication is the communication function for sending and receiving pulse train data between our VC II devices.

⚠ Servo control communication cannot be done between VC device and VC II device due to communication speed difference.

For servo control communication, the following special communication cable is required separately:

- Synchronous communication cable SHCC series*¹⁵
- Terminal resistor for synchronous communication cable SHCC-R

Refer to [VC series VC II series option Inst. manual] for the details.

5-13-1 Servo control communication functions

The following functions can be implemented:

- Up to 7 axes of slave station can concurrently receive the data sent from the main station.
- Multi axes pulse train run, which follows the pulse command received from outside by the main station, can be done. (IDO.FCRC)
- By making [P602: Pulse train command type selection] for the slave station to be as [IDO. CMND. P], high accuracy synchronous operation is possible by receiving the command data of the main station.*¹⁶
- Multi axes pulse train run, which follows the encoder feedback pulse of the main station, can be done. (IDO. MTENC)

5-13-2 Cable connection method

- 1) Connect each J2 connectors of each device by synchronous communication cable.
- 2) Terminal resistor for synchronous communication cable should be connected to the terminal of main station and slave station for one piece each. Also, it is possible to connect the terminal resistor and synchronous communication cable to either side of J2 connector.

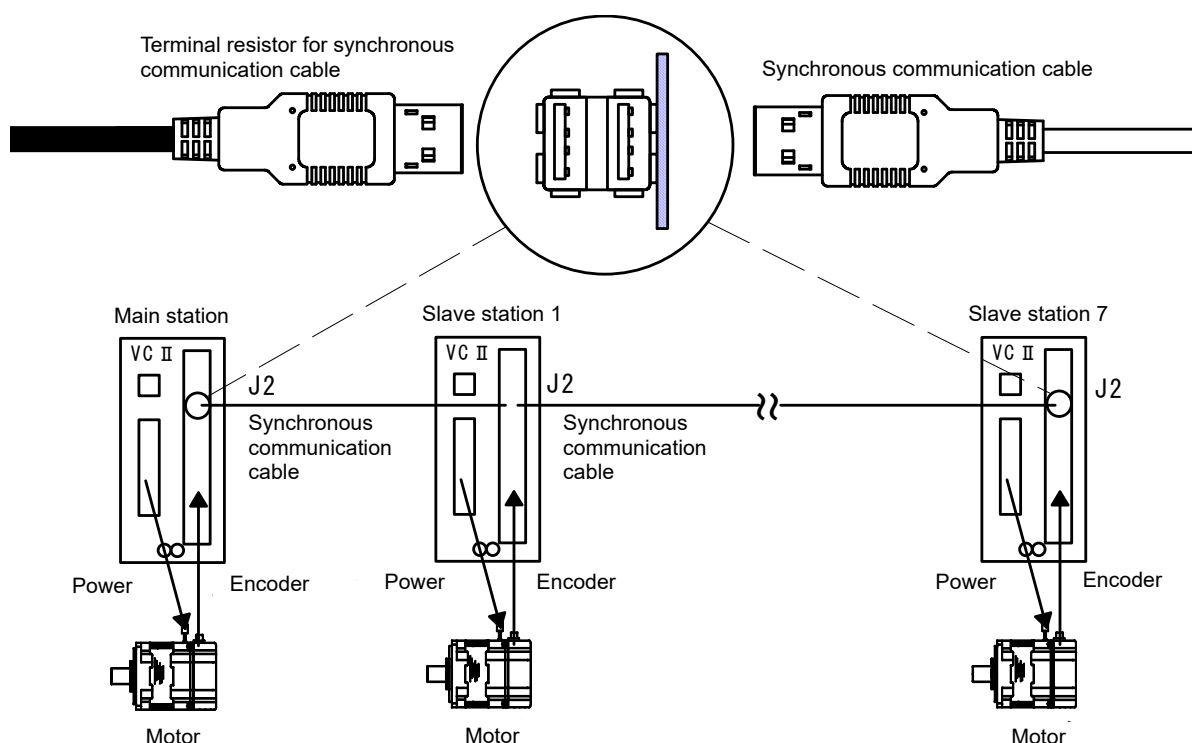


Figure 5-23 System configuration

*¹⁵ For synchronous operation for 8 axes, 7 cables are required.

*¹⁶ Effective only for manual run, zero return run, and automatic run (other than speed control and torque control)

Run

5-13-3 Parameter setting method

Following parameter setting is required for servo control communication.

Table 5-14 Servo control communication setting parameters

Parameter No.	Parameter name	Main station setting	Slave station setting
P521	Servo control communication-ID number	0	8
P522	Servo control communication control mode	PULSE	PULSE
P602	Pulse train command type selection	-	IDO.FCRC/IDO.CMNDP/IDO.MTENC

⚠ Turn the power ON again after parameter setting is changed.

⚠ This function is supported for pulse train communication only.

5-13-4 Run mode

Run mode for multi axes pulse train operation by servo control communication is listed as follows:

Main station . . . Run mode is changed by setting of slave station P602.

Table 5-15 Main station run mode

Slave station P602 setting	Main station run mode
IDO.FCRC	Pulse train run
IDO.CMNDP	• Manual run • Zero return run • Automatic run ^{*17}
IDO.MTENC	All run modes

Slave station . . . To be pulse train run mode.

5-13-5 Encoder pulse output

The limitation of encoder pulse output during servo control communication is as follows:

Main station . . . No limitation during servo control communication.

Slave station . . . Encoder pulse output is not done in following cases:

- The frequency division function is used (a non-"0" value is set in P012 or P013). Note that in this case, regardless of whether servo control communication is performed or not, encoder pulse output by the use of the frequency division function cannot be performed with the substation setting (P521 = 8).
- A serial encoder is used.

(The setting value of P001 is S-INC, S-ABS, S-INC2, S-ABS2, L-ABS, S-ABS3, S-MABS, or S-ABS4.)

⚠ Do not use S-MABS because it is under development.

5-13-6 Restrictions

The following restrictions are imposed on servo control communication:

- 1) When the ABS linear scale is used (the setting value of P001 is L-ABS), servo control communication is possible only with the ABS linear scale connection axis.
Note that the axis cannot be used concurrently with an axis on which another encoder is used.

^{*17} Other than speed control and torque control

5-14 Setting and adjustment of the ABS linear scale

For information about the setting and adjustment of the ABS linear scale, refer to the instruction manual, "τ linear Servo Motor Options".

The ABS linear scale applicable to this model is the following:

Mitutoyo Corporation
ABS ST70*A Series



Caution

- Never turn on the servo until the completion of electric angle adjustment.
"Motor runaway, injury, or machine damage may occur."



Compulsion

- Be sure to adjust the electric angle after the recombination and adjustment of the scale base, detection head, motor coil, and motor magnet.
"Motor runaway, injury, or machine damage may occur."

Chapter 6 Parameters

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6-1 Parameter group list

Parameters of this device are classified into each group as shown below.

Table 6-1 Parameter group list

Group	Parameter item	Parameter group
0	P000 to P059	Motor, encoder parameter
1	P100 to P159	Driver adjustment parameter
2	P200 to P229	NC adjustment parameter
3	P300 to P319	Position adjustment parameter
4	P400 to P419	Run operation parameter
5	P500 to P536	Display, communication, edit parameter
6	P600 to P619	Pulse train input parameter
7	P700 to P748	Input/output signals parameter

6-2 Parameter list

Parameter No., parameter name, initial value, and unit for each parameter group are shown below.
There are some units that can be changed in parameter setting.

6-2-1 Motor, encoder parameter (Group 0)

Parameter No.	Parameter name	Initial value	Unit
P000	Motor type selection	0	
P001	Encoder type selection	INC3	
P002	IM/SM motor encoder pulse number selection	6000	[PPR]
P003	Tau Linear motor linear sensor resolution	1.00000	[μ m]
P004	Tau DISC motor encoder pulse number	1	[PPR]
P005	IM/SM/Tau DISC motor applicable maximum number of rotations	0	[rpm]
P006	Tau Linear motor applicable maximum speed	0.00	[mm/sec][deg/sec]
P007	Tau Linear motor rated speed	0.01	[mm/sec][deg/sec]
P008	Encoder & magnetic pole sensor direction selection	0	
P009	Carrier frequency selection	10k	[Hz]
P010	Tau Linear/Tau DISC motor magnetic pole sensor type	0	
P011	Tau Linear/Tau DISC motor magnetic pole sensor offset	28.50	[mm]
P012	Encoder feedback output numerator value	0	
P013	Encoder feedback output denominator value	0	
P014	Manufacturer exclusive use	50	
P015	Manufacturer exclusive use	0	
P016	Derivative coefficient while stopping	0.0	[times]
P017	Filter time constant while stopping	0.0	[m sec]
P018	ABS encoder value for machine base position	0	[pulse]
P019	ABS standard mechanical position	0	[mm]
P020	Motor type pole number	0	
P021	Rated torque current	0	[10mA]
P022	Rated speed (Field system control base speed)	2000	[rpm]
P023	Max momentary torque ratio	100	[%]
P024	Exciting current	0	[10mA]
P025	Rated output	0.000	[kW]
P026	Current loop coefficient	0	[%]
P027	Number of rotations at which to start phase shift	0	[rpm]
P028	Phase shift angle	0	[deg]
P029	Motor electronic thermal time constant	54	[sec]
P030	Phase compensation angle	0	[deg]
P031	Device rated torque current	0	[10mA]
P032	Device max momentary torque ratio	100	[%]
P033	Device power source capacity	0.000	[kW]

Parameter No.	Parameter name	Initial value	Unit
P034	Manufacturer exclusive use	54.0	
P035	Manufacturer exclusive use	0	
P036	ABS zero position electric angle	0.00	[deg]
P037	Torque command change amount limit value	0	
P038	Encoder feedback pulse through output frequency division selection	0	
P039	Selection of highest frequency during encoder feedback pulse frequency dividing output	0	
P040	Primary resistance	0	[$\mu\Omega$]
P041	Secondary resistance	0	[$\mu\Omega$]
P042	Primary self-inductance	0	[μH]
P043	Secondary self-inductance	0	[μH]
P044	Mutual inductance	0	[μH]
P045	Leakage coefficient	0	[10^{-6}]
P046	Dead time compensation time	0	[10^{-7}sec]
P047	Current loop cut off frequency	4000	[rad/s]
P048	Current loop derivative time Constant	0	[μsec]
P049	Torque Constant	0	[$10^{-4}\text{N}\cdot\text{m/A}$]
P050	Magnetic pole sensor sin gain	2048	
P051	Magnetic pole sensor sin offset	0	
P052	Magnetic pole sensor cos gain	2048	
P053	Magnetic pole sensor cos offset	0	
P054	Tau DISC motor encoder compensation	0	[pulse]
P055	Low pass filter frequency at auto magnetic pole detection	0	[Hz]
P056	Set landing torque at auto magnetic pole detection	0.0	[%]
P057	Set landing torque holding time at auto magnetic pole detection	0.00	[sec]
P058	Distance between linear motor pole opposite	32.00	[mm][deg]
P059	Special encoder pulse number	0	[PPR]

6-2-2 Driver adjustment parameter (Group 1)

Parameter No.	Parameter name	Initial value	Unit
P100	Low-speed range for gain change	0.00	[%]
P101	Speed loop gain	25	
P102	Speed loop integral time constant	20.00	[m sec]
P103	Speed loop differential time constant	0	[μsec]
P104	Speed loop proportional gain division ratio	0.0	[%]
P105	Speed loop differential gain division ratio	0.0	[%]
P106	Speed loop gain / Low-speed range	25	
P107	Speed loop integral time constant / Low-speed range	20.00	[m sec]
P108	Speed loop differential time constant / Low-speed range	0	[μsec]
P109	Speed loop proportional gain division ratio / Low-speed range	0.0	[%]
P110	Speed loop differential gain division ratio / Low-speed range	0.0	[%]
P111	Speed loop gain at GSEL1	25	
P112	Speed loop integral time constant at GSEL1	20.00	[m sec]
P113	Speed loop differential time constant at GSEL1	0	[μsec]
P114	Speed loop proportional gain division ratio at GSEL1	0.0	[%]
P115	Speed loop differential gain division ratio at GSEL1	0.0	[%]
P116	Torque limiting value at magnetic pole detection	300.0	[%]
P117	Magnetic pole detection gain 1	80	
P118	Magnetic pole detection integral calculus time constant	200	[m sec]

Parameters

Parameter No.	Parameter name	Initial value	Unit
P119	Magnetic pole detection gain 2	20	[S ⁻¹]
P120	Torque command filter frequency	1000	[Hz]
P121	Notch filter center frequency 1	0	[Hz]
P122	Notch filter bandwidth 1	0	[Hz]
P123	Notch filter center frequency 2	0	[Hz]
P124	Notch filter bandwidth 2	0	[Hz]
P125	Torque limit value 1+	300.0	[%]
P126	Torque limit value 1-	300.0	[%]
P127	Torque limit value 2+	300.0	[%]
P128	Torque limit value 2-	300.0	[%]
P129	Speed command gain	10.00	[V]
P130	Speed command offset	0	[mV]
P131	Torque command offset	0	[mV]
P132	External speed limit effective/ineffective selection	SPD.LIM.N	
P133	Speed limit value	120.00	[%]
P134	Internal speed command value 1	50.00	[%]
P135	Internal speed command value 2	40.00	[%]
P136	Internal speed command value 3	30.00	[%]
P137	Internal torque command value 1	30.0	[%]
P138	Internal torque command value 2	50.0	[%]
P139	Internal torque command value 3	80.0	[%]
P140	Auto tuning trial run direction/ inertia selection	BOTH/N	
P141	Auto tuning trial run speed ratio	0.30	
P142	Torque limit selection at alarm stop	ALM.TL N	
P143	R2 compensation selection	R2 OFF	
P144	Electronic-thermal detecting method selection	STD	
P145	Magnetic pole sensor automatic adjustment operation	5	[%]
P146	Mass/inertia	0	[10 ⁻⁶ kg·m ²]
P147	Viscous friction	0	[10 ⁻⁶ N·m/rad/s]
P148	Disturbance correction filter frequency	0	[Hz]
P149	Tau DISC motor initialization operation	5	[%]
P150	Disturbance correction filter invalid limit	5.00	[%]
P151	Notch filter center frequency 3	0	[Hz]
P152	Notch filter bandwidth 3	0	[Hz]
P153	Notch filter center frequency 4	0	[Hz]
P154	Notch filter bandwidth 4	0	[Hz]
P155	Notch filter center frequency 5	0	[Hz]
P156	Notch filter bandwidth 5	0	[Hz]
P157	Torque command low pass filter order selection	0	
P158	Normal rated power of regeneration resistance	0.000	[kW]
P159	Sensor installation radius	0.000	[mm]

6-2-3 NC adjustment parameter (Group 2)

Parameter No.	Parameter name	Initial value	Unit
P200	Position loop gain	20	[S ⁻¹]
P201	Servo lock gain	20	[S ⁻¹]
P202	Positioning completion range	10	[pulse]
P203	Positioning time over	0.00	[sec]
P204	Backlash compensation value	0	[pulse]
P205	Feed forward ratio	80.0	[%]
P206	Feed forward shift ratio	1.0	[%]
P207	Overflow detecting pulse	24000	[pulse]
P208	Deviation error detecting pulse	0	[pulse]
P209	Motion selection at deviation error	CONTINUE	
P210	S-curve acceleration/deceleration increasing time	0.0	[m sec]
P211	Acceleration time 1	0.500	[sec]
P212	Acceleration time 2	0.500	[sec]
P213	Acceleration time 3	0.500	[sec]
P214	Deceleration time 1	0.500	[sec]
P215	Deceleration time 2	0.500	[sec]
P216	Deceleration time 3	0.500	[sec]
P217	Positioning feed forward differential addition ratio	0	
P218	Pulse train feed forward differential addition ratio	0	
P219	Manufacturer exclusive use	0	
P220	Position loop differential time constant	0	[μ sec]
P221	Servo lock differential time constant	0	[μ sec]
P222	Manufacturer exclusive use	0	
P223	Manufacturer exclusive use	0	
P224	Inertia feed forward ratio	0.0	[%]
P225	Viscous friction feed forward ratio	0.0	[%]
P226	Position loop gain at GSEL1	20	[S ⁻¹]
P227	Servo lock gain at GSEL1	20	[S ⁻¹]
P228	Position loop gain at GSEL2	20	[S ⁻¹]
P229	Servo lock gain at GSEL2	20	[S ⁻¹]

Parameters

6-2-4 Position adjustment parameter (Group 3)

Parameter No.	Parameter name	Initial value	Unit
P300	Rotation direction selection	FORWARD	
P301	Setting unit selection	mm	
P302	Minimum setting unit	0.01	
P303	Electronic gear ratio numerator	1	
P304	Electronic gear ratio denominator	1	
P305	Index data range	0	[mm]
P306	Forward software OT limit	0	[mm]
P307	Reverse software OT limit	0	[mm]
P308	Forward positioning amount max.value	0	[mm]
P309	Reverse positioning amount max.value	0	[mm]
P310	Machine travel amount	0	[mm]
P312	Mass/inertia at GSEL condition	0	[$10^{-6}\text{kg}\cdot\text{m}^2$]
P313	Viscous friction at GSEL condition	0	[$10^{-6}\text{N}\cdot\text{m}/\text{rad}/\text{s}$]
P314	Absolute position compensation function selection	0	
P315	Position loop gain at GSEL3	20	[S^{-1}]
P316	Servo lock gain at GSEL3	20	[S^{-1}]
P317	Active vibration control filter center frequency	0	[Hz]
P318	Active vibration control filter bandwidth	0	[Hz]
P319	Active vibration control filter ineffective range	0.00	[%]

6-2-5 Run operation parameter (Group 4)

Parameter No.	Parameter name	Initial value	Unit
P400	Jog speed 1	1000	[mm/sec]
P401	Jog speed 2	2000	[mm/sec]
P402	Zero return method selection	STD.HOME	
P403	Zero point maker selecting	ENC.MARK	
P404	Zero return speed	1000	[mm/sec]
P405	Zero return creep speed	100	[mm/sec]
P406	Zero return position constant	10000	[mm]
P407	Zero return set distance	0	[mm]
P408	Position data reference point	0	[mm]
P409	Automatic run permission condition selection	AUTO.N	
P410	OT back Zero return at OT deceleration time	0.50	[sec]
P411	External trigger level selection	TRG.EDGE	
P412	Current position set selection at power ON	0	
P413	Code switching position in one rotation range	0	[mm]
P414	Multi turn limit	0	
P415	Speed loop gain at GSEL2	25	
P416	Speed loop integral time constant at GSEL2	20.00	[m sec]
P417	Speed loop differential time constant at GSEL2	0	[μ sec]
P418	Speed loop proportional gain division ratio at GSEL2	0.0	[%]
P419	Speed loop differential gain division ratio at GSEL2	0.0	[%]

Parameters

6-2-6 Display, communication, edit parameter (Group 5)

Parameter No.	Parameter name	Initial value	Unit
P500	Manufacturer exclusive use	0	
P501	Manufacturer exclusive use	0	
P502	LCD current position display selection	ABSOLUTE	
P503	Feedback filter time constant	0.0	[m sec]
P504	1 phase concentration time electronic thermal detection selection	70	%
P505	Communication unit number selection	Exclusive software (S.COMM.5)	
P506	Communication ID number	1	
P507	Data length selection (serial communication)	8 BITS	
P508	Parity selection (serial communication)	ODD	
P509	Baud rate selection (serial communication)	9.6K	[BPS]
P510	Manufacturer exclusive use	0	
P511	Communication group-ID set 1	0	
P512	Communication group response Yes/No 1	RESP.OFF	
P513	Communication group-ID set 2	0	
P514	Communication group response Yes/No 2	RESP.OFF	
P515	Communication group-ID set 3	0	
P516	Communication group response Yes/No 3	RESP.OFF	
P517	Communication group-ID set 4	0	
P518	Communication group response Yes/No 4	RESP.OFF	
P519	Communication group-ID set 5	0	
P520	Communication group response Yes/No 5	RESP.OFF	
P521	Servo control communication-ID number	8	
P522	Servo control communication control mode	PULSE	
P523	Alarm stop selection at servo control communication stopped	ALM	
P524	Servo control communication real time data 1 device number	64	
P525	Servo control communication real time data 2 device number	54	
P526	Servo control communication real time data 3 device number	42	
P527	Servo control communication real time data 4 device number	40	
P528	Servo control communication real time data 5 device number	36	
P529	Manufacturer exclusive use	10M BPS	
P530	Remote write area 5	21000	
P531	Remote write area 6	21000	
P532	Manufacturer exclusive use	0	
P533	External input ON fixed selection 1	0	
P534	External input ON fixed selection 2	0	
P535	External input OFF fixed selection 1	0	
P536	External input OFF fixed selection 2	0	
P537	Manufacturer exclusive use	00000000	
P538	Brake release signal output speed during motor rotation	0.0	[%]
P539	Brake release signal OFF time from servo off during motor rotation	0.00	[sec]

6-2-7 Pulse train input parameter (Group 6)

Parameter No.	Parameter name	Initial value	Unit
P600	CIH signal function selection	CIH CLOSE	
P601	Pulse train command phase order switch	FORWARD	
P602	Pulse train command type selection	X1	
P603	Pulse train command adjustment numerator	1	
P604	Pulse train command adjustment denominator	1	
P605	Pulse train feed forward ratio	80.0	[%]
P606	Pulse train feed forward shift ratio	1.0	[%]
P607	Pulse train feed forward filter time constant	20.0	[m sec]
P608	Pulse train late compensating time	0.0	[m sec]
P609	Pulse train leveling filter time	0.0	[m sec]
P610	Pulse train command input selection when connecting to expansion board	EXT	
P612	Function selection in MECHATROLINK-III communication mode	0	
P613	PNB range	10	[pulse]
P614	Low speed gain switching delay time	0	[m sec]
P615	Speed loop gain at GSEL3	25	
P616	Speed loop integral time constant at GSEL3	20.00	[m sec]
P617	Speed loop differential time constant at GSEL3	0	[μ sec]
P618	Speed loop proportional gain division ratio at GSEL3	0.0	[%]
P619	Speed loop differential gain division ratio at GSEL3	0.0	[%]

6-2-8 Input/output signals parameter (Group 7)

Parameter No.	Parameter name	Initial value	Unit
P700	Monitor 1 selection	SPD.FB.	
P701	Monitor 2 selection	TRQ.REF.	
P702	Speed zero detecting range	0.10	[%]
P703	Rough matching range	100	[pulse]
P704	Servo ON signal logic selection	SERVO ON	
P705	Hardware OT effective/ineffective selection	OT.CHK.Y	
P706	Mode change check delay time	0.01	[sec]
P707	Soft limit switch position 1	0	[mm]
P708	Soft limit switch position 2	1	[mm]
P709	Soft limit switch position 3	2	[mm]
P710	Stopping method at emergency stop	QUICK	
P711	Deceleration time at emergency stop	0.00	[sec]
P712	Servo off delay time after emergency stop	0.00	[sec]
P713	Stopping method at AC power cut	FREE RUN	
P714	ALM output selection at AC power cut	ALM.OFF	
P715	ALM/WNG signal logic selection	ALM/WNG1	
P716	RDY signal specification selection	RDY1	
P717	Manufacturer exclusive use	0	
P718	PN signal delay time	0.000	
P719	PN signal specification selection	PN1	
P720	Remote write area 1	13700	
P721	Remote write area 2	13702	
P722	Remote write area 3	13704	
P723	Remote write area 4	13706	
P724	Remote read area 1	13708	
P725	Remote read area 2	13710	
P726	Remote read area 3	13712	
P727	Remote read area 4	13714	
P728	Remote read area 5	09302	

Parameters

Parameter No.	Parameter name	Initial value	Unit
P729	Remote read area 6	09100	
P730	Manufacturer exclusive use	0	
P731	Manufacturer exclusive use	0	
P732	Manufacturer exclusive use	0	
P733	Manufacturer exclusive use	0	
P734	Brake output signal delay time	0.00	[sec]
P735	External input invalid selection 1	194	
P736	External input invalid selection 2	0	
P737	Basic external input signal function allocation 1	34330301	
P738	Basic external input signal function allocation 2	13124735	
P739	Extended external input signal function allocation 1	0	
P740	Extended external input signal function allocation 2	0	
P741	Extended external input signal function allocation 3	0	
P742	Basic external output signal function allocation	5020103	
P743	Extended output signal function allocation 1	0	
P744	Extended output signal function allocation 2	0	
P745	Dynamic brake function selection	INVALID	
P746	Servo on delay time at dynamic brake	1	[m sec]
P747	Servo control abnormality detection adjustment value	0	
P748	Manufacturer exclusive use	0	

6-3 Parameter specification

6-3-1 Motor, encoder parameter (Group 0)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 0] [Motor, encoder parameter]										
P000	Motor type selection	P	A	M	Z	P	S	None	000 to 999	000
								Set type of servo motor to be used. Correctly set it referring to [12-5 Applicable motor list]. When selecting exclusive motor, enter "999" to setting number. When setting, enter exclusive motor parameters in P020 to P059. (Caution) ▪ With this setting, either one among P002 to P004 is applied. When setting IM/SM motor type P002 When setting τ linear motor type P003 When setting τ DISC motor type P004 * When setting "999", it varies depending on P020 setting value. ▪ Wrong setting can cause runaway or burn, which is very dangerous. Thus, do not set it wrongly.		
P001	Encoder type selection	P	A	M	Z	P	S	None	INC1/INC2/INC3/L-SEN/ S-INC/S-ABS/C-SEN1/ C-SEN2/S-INC2/S-ABS2/L-LESS/ L-ABS/S-ABS3/S-MABS/S-ABS4	INC3
								Select type of encoder to be used. Correctly set it referring to [12-5 Applicable motor list] and [Table 12-44 τ DISC encoder model].		
								Setting	Encoder type	
								INC1	Incremental for IM motor	
								INC2	Non-minimum-wiring type incremental for SM motor	
								INC3	Minimum-wiring type incremental for SM motor	
								L-SEN	τ linear sensor	
								S-INC	Serial incremental	
								S-ABS	Serial absolute	
								C-SEN1	For τ DISC motor, without marker	
								C-SEN2	For τ DISC motor, with marker	
								S-INC2	Serial incremental 2 (for IPU)	
								S-ABS2	Serial absolute 2 (for IPU)	
								L-LESS	Scale less sensor Note 1)	
								L-ABS	ABS linear scale	
								S-ABS3	Serial absolute 3 (for IPU)	
								S-MABS	Multi turn serial absolute (for IPU) Note 2)	
								S-ABS4	Serial absolute 4 (for IPU)	
								(Note 1) For information about selecting the scale less sensor (L-LESS), refer to the separate instruction manual, "Scale Less Sensor".		
								(Note 2) Do not use S-MABS because it is under development.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 0] [Motor, encoder parameter]										
P002	IM/SM motor encoder pulse number selection	P	A	M	Z	P	S	PPR	1000/2000/6000/17bit	6000
								Select number of pulses per one rotation of encoder to be used, when selecting [INC1/INC2/INC3/S-INC/S-ABS] with P001. (Caution) - The number of pulses becomes this parameter setting value x 4 (4-multiplication) when selecting [INC1/INC2/INC3] with P001. - When selecting [S-INC/S-ABS] with P001, set "17bit". In this case, number of pulses becomes 17bit = 131072 pulses. - Do not use this, when using IPU. - Wrong setting can cause runaway or burn, which is very dangerous. Thus, do not set it wrongly.		
P003	Tau Linear motor linear sensor resolution	P	A	M	Z	P	S	μm	-999.00000 to 100.00000	001.00000
								◆ In the selection of P001 L-SEN Set resolution (4-multiplication) per one pulse of linear sensor to be used. * Resolution of our τ linear motor sensor is 4-multiplication value. Set the original value mentioned on the specification. ◆ In the selection of P001 S-INC2 Set distance per one signal cycle or resolution per one pulse of linear sensor to be used. 1) When setting it with distance per one signal cycle of linear sensor to be used, set it by adding minus code (-) to distance. (Example) Setting value is -20.00000μm, when using sensor of 20μm-distance per one signal cycle. 2) When setting it with resolution per one pulse of using linear sensor, set it by adding plus sign (+) to setting value. Setting value is calculated with linear sensor resolution/IPU insertion resolution (=1024). (Example) When using linear sensor of which distance per one signal cycle is 20μm, setting value is 20μm / 1024 = 0.01953. (Caution) If fraction smaller than 0.00001μm is generated (0.00000125, in the above example) is generated as a result of division with 1024, an error occurs in travel amount. To avoid this, use 1) method. If "0" is set besides 1) and 2), it is handled as if [+0.00001] is set.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 0] [Motor, encoder parameter]										
P004	Tau DISC motor encoder pulse number	P	A	M	Z	P	S	PPR	00000001 to 99999999	00000001
								When selecting [C-SEN1/C-SEN2/S-INC2/S-ABS2/S-ABS3/S-MABS/S-ABS4] with P001, set the number of encoder pulses (4-multiplication) per one rotation of τ DISC motor. * Number of pulses per one rotation indicated on our τ DISC motor nameplate is 4-multiplication value. Set the indicated value as it is.		
P005	IM/SM/Tau DISC motor applicable maximum number of rotations	P	A	M	Z	P	S	rpm	00000 to 20000	00000
								Set applicable maximum number of rotations when using IM/SM/ τ DISC motor. When setting "0" it becomes rated speed. * Set this parameter paying attention to points below. 1) SM motor: Set lower value than rated speed for number of rotations. 2) τ DISC motor: Set lower speed than one on table in [12-5 Applicable motor list].		
P006	Tau Linear motor applicable maximum speed	P	A	M	Z	P	S	mm/sec deg/sec	0.00 to 100000.00	000000.00
								Set applicable maximum speed, when using τ linear motor. When setting "0.00", it becomes rated speed. Correctly set it referring to [12-5 Applicable motor list]. For this parameter, set lower speed than one on above table. * When selecting servo compass, unit is [deg/sec].		
P007	Tau Linear motor rated speed	P	A	M	Z	P	S	mm/sec deg/sec	0.01 to 100000.00	000000.01
								Set rated speed, when using τ linear motor. Correctly set it referring to [12-5 Applicable motor list]. * When selecting servo compass, unit is [deg/sec].		
P008	Encoder & magnetic pole sensor direction selection	P	A	M	Z	P	S	None	0 to 3	0
								Select directions of encoder and magnetic pole sensor.		
								Setting	Encoder direction (Phase sequence in CCW or forward direction operation)	Magnetic pole sensor attaching direction
								0	Positive (B-phase precedence)	Forward direction attachment
								1	Negative (A-phase precedence)	Forward direction attachment
								2	Positive (B-phase precedence)	Reverse direction attachment
								3	Negative (A-phase precedence)	Reverse direction attachment
* Set "0" for our standard motor. However, for setting of τ linear motor, refer to [3-2-2 Setting motor run direction]. (Note) Reverse direction attachment of magnetic pole sensor is not supported now. Thus, do not set it.										

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 0] [Motor, encoder parameter]										
P009	Carrier frequency selection	P	A	M	Z	P	S	Hz	7.5K/10K/15K/20K	10K
								Select PWM carrier frequency. (Caution)		
								- In τ motors, this function is not used. Do not change the setting. - Trend indicates, the higher the carrier frequency is, the better the frequency characteristic is. On the contrary, heat loss on the device becomes high, which can cause malfunction of the device.		
								For this setting value, use the table below as a rough guide.		
								Device capacity		Rough guide for this setting value
								0.8kW or less		7.5K/10K/15K/20K
								More than 0.8kW and less than 3.0kW		7.5K/10K/15K
								3.0kW or more and less than 30kW		7.5K/10K
30kW or more		7.5K								
⚠ The device of SOFT VER 2.02 or later supports 7.5K.										
P010	Tau Linear/Tau DISC motor magnetic pole sensor type	P	A	M	Z	P	F	None	0 to 9	0
								Set magnetic pole sensor to use with τ linear/ τ DISC motor. Correctly set it referring to [12-5 Applicable motor list]. If "0" is set, magnetic pole detection is performed with "automatic magnetic pole detection operation" involving motor operation. For details, refer to [5-6 Automatic magnetic pole detection operation].		
P011	Tau Linear/Tau DISC motor magnetic pole sensor offset	P	A	M	Z	P	F	mm	0.00 to 100.00	028.50
								Set offset value for magnetic pole sensor to use with τ linear/ τ DISC motor. Correctly set it referring to [12-5 Applicable motor list].		
P012	Encoder feedback output numerator value	P	A	M	Z	P	F	None	-99999999 to 99999999	0
								Set numerator value of encoder feedback output division. If this setting value is a negative value, the encoder feedback output is reversed. For details of the setting method, refer to the subsequent pages.		
P013	Encoder feedback output denominator value	P	A	M	Z	P	F	None	0 to 99999999	0
								Set denominator value of encoder feedback output division. For details of the setting method, refer to the subsequent pages.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																	
			Automatic	Manual	Zero return	Pulse train		Function																			
			A	M	Z	P																					
[Group 0] [Motor, encoder parameter]																											
P012 P013	<Setting Encoder feedback output division ratio> Encoder feedback output division ratio is set as follows. Division ratio = P012 setting value/P013 setting value (Note 1) The encoder feedback output has the following output delays if a non-0 value is set in P012. <table><tr><th rowspan="2">P001</th><th colspan="2">Signal output delay</th></tr><tr><th>NCR-CDA***</th><th>NCR-CDB*** NCR-CDC***</th></tr><tr><td>INC1,INC2,INC3, L-SEN, C-SEN1,C-SEN2, L-LESS</td><td>100 μs</td><td>150 μs</td></tr><tr><td>S-INC,S-ABS</td><td>250 μs</td><td>250 μs</td></tr><tr><td>S-INC2,S-ABS2, S-ABS3,S-MABS, S-ABS4</td><td>150 μs</td><td>-</td></tr><tr><td>L-ABS</td><td>167 μs</td><td>-</td></tr></table> (Note 2) If the encoder is not a serial encoder and 0 is set in P012, the output is performed with the frequency division ratio specified in P038. In this case, no output delays occur. (Note 3) When setting 0 to P012, with serial encoder, it does not output. (Note 4) When setting 0 to P013, denominator value is 16777216. (Note 5) If this frequency division ratio is used, the output feedback frequency must not exceed the limit value specified in P039. If this frequency value is exceeded, normal output is not possible. (Note 6) If this frequency division ratio is not used, the maximum allowable output feedback frequency is 25Mpps. ⚠ Supported by devices with HARD Ver 2.00 or later. For devices with earlier versions, the maximum allowable output feedback frequency is the same as that when the frequency division ratio is used. (Note 7) To use the frequency division function (set a non-"0" value in P012 or P013), set the servo control communication ID number to a main station (P521 = 0). If the servo control communication ID number is set to a substation (P521 = 8), encoder feedback output by the use of the frequency division function cannot be performed. For information about the encoder feedback output during servo control communication, refer to [5-13 Servo control communication]. (Note 8) When connecting MECHATROLINKⅢ, refer to the "Instruction Manual VCII Series MECHATROLINKⅢ". <Setting example of encoder feedback output division ratio> When setting output feedback pulse: 10000000 (pulses) against input encoder pulse: 20000000 (pulses) [P012] = [Number of output feedback pulses] = 10000000 [P013] = [Number of input encoder pulses] = 20000000 Division ratio in this case = P012 / P013 = 10000000 / 20000000 As it stands outside the parameter setting range, set the value below with reduction. [P012] = [Number of output feedback pulses] = 1 [P013] = [Number of input encoder pulses] = 2										P001	Signal output delay		NCR-CDA***	NCR-CDB*** NCR-CDC***	INC1,INC2,INC3, L-SEN, C-SEN1,C-SEN2, L-LESS	100 μs	150 μs	S-INC,S-ABS	250 μs	250 μs	S-INC2,S-ABS2, S-ABS3,S-MABS, S-ABS4	150 μs	-	L-ABS	167 μs	-
	P001	Signal output delay																									
		NCR-CDA***	NCR-CDB*** NCR-CDC***																								
	INC1,INC2,INC3, L-SEN, C-SEN1,C-SEN2, L-LESS	100 μs	150 μs																								
	S-INC,S-ABS	250 μs	250 μs																								
	S-INC2,S-ABS2, S-ABS3,S-MABS, S-ABS4	150 μs	-																								
	L-ABS	167 μs	-																								

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																				
			Automatic	Manual	Zero return	Pulse train																								
			A	M	Z	P																								
			Function																											
[Group 0] [Motor, encoder parameter]																														
P012 P013	<Absolute position compensation function and encoder feedback output frequency division ratio setting> During the absolute position compensation function, the encoder feedback output is as below. Relationship between absolute position compensation function and encoder feedback output depending on the frequency division ratio <table><tr><th colspan="2">Absolute position compensation function</th><th colspan="2">Frequency division ratio setting</th></tr><tr><th>P314</th><th>Function</th><th>P012 and P013 is 0 *</th><th>P012 and P013 is not 0</th></tr><tr><td>0</td><td>Effective</td><td>△</td><td>△</td></tr><tr><td>1</td><td>Effective</td><td>△</td><td>○</td></tr><tr><td>2</td><td>Ineffective</td><td>△</td><td>△</td></tr></table> △: The same pulses as those of the motor encoder feedback are output. ○: Pulses are output by compensating the motor encoder feedback so that it can match the command position. *: Not output if a serial encoder is selected. (Note 1) If the encoder is of an INC type, compensation takes effect at the time when it passes through the motor zero point marker*1. (P314 is not 2.) *1 Regardless of whether the servo is off or on. It also takes effect if you cause it to pass through the marker by turning it by hand when the servo is off. (Note 2) For the ABS type, compensation takes effect at the time when the power is turned on. (P314 is not 2.) <Encoder feedback output example based on the table above> For a command for positioning from 0 deg to 90.00 deg (1 Pulse = 0.01 deg), positioning is to be performed to 90.05 deg on the encoder FB with 0.05 deg absolute position compensation, • Pulse input (command) value: 9000 Pulses In the case of △: 9005 Pulses are output. In the case of ○: 9000 Pulses are output For the "P012 and P013 is not 0" column in the table above, the following are assumed: [P012 = 1] and [P013 = 1]. <Reference Encoder types> The encoder types in this explanation are as follows: • The encoder falls under the INC type if one of the following is selected for P001 Encoder type: INC1/INC2/INC3/S-INC/L-SEN/C-SEN1/C-SEN2/S-INC2/L-LESS • The encoder falls under the ABS type if one of the following is selected for P001 Encoder type: S-ABS/S-ABS2/L-ABS/S-ABS3/S-MABS/S-ABS4 • The encoder falls under the serial type if one of the following is selected for P001 Encoder type: S-INC/S-ABS/S-INC2/S-ABS2/L-ABS/S-ABS3/S-MABS/S-ABS4										Absolute position compensation function		Frequency division ratio setting		P314	Function	P012 and P013 is 0 *	P012 and P013 is not 0	0	Effective	△	△	1	Effective	△	○	2	Ineffective	△	△
	Absolute position compensation function		Frequency division ratio setting																											
	P314	Function	P012 and P013 is 0 *	P012 and P013 is not 0																										
	0	Effective	△	△																										
	1	Effective	△	○																										
	2	Ineffective	△	△																										

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
[Group 0] [Motor, encoder parameter]										
P014	Manufacturer exclusive use	-	.	.	.	.	F			050
								Be sure setting value of this parameter is always "50".		
P015	Manufacturer exclusive use	-	.	.	.	.	F			000000000
								Be sure setting value of this parameter is always "0".		
P016	Derivative coefficient while stopping	I	A	M	Z	P	F	times	0.0 to 9.9	0.0
								Set the derivative coefficient for vibration while stopping. If 0 is set, it is assumed to be 1.5. For SM and IM, it is assumed to be 1.0. Usually, set 0. Depending on the condition, make an adjustment as described below.		
								- If the load inertia is large and the stop friction is large so that the vibration while stopping cannot be suppressed even by adjusting P017, the vibration can be suppressed by setting it in a range of 1.1 to 3.0. - If there is hardly any stop friction and some sound is heard while stopping, the sound can be suppressed by setting it in a range of 0.5 to 1.4.		
P017	Filter time constant while stopping	I	A	M	Z	P	F	msec	00.0 to 99.9	00.0
								Set the filter time constant for vibration while stopping. When 0 is set, it is assumed to be 0.4 ms. Usually, set 0. Depending on the condition, make an adjustment as described below.		
								If the load inertia is large so that vibration occurs while stopping, the vibration can be suppressed by setting it in a range of 0.3 to 9.0.		
P018	ABS encoder value for machine base position	P	A	M	Z	P	F	Pulse	-99999999 to 99999999	00000000
								Set absolute data at machine standard position.		
P019	ABS standard mechanical position	P	A	M	Z	P	F	mm/°/in	-99999999 to 99999999	00000000
								Set machine position against machine standard position. (Position of decimal point depends on [P302: Minimum setting unit].)		
P020	Motor type pole number	P	A	M	Z	P	S	None	00000000 to 99999999	00000000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P021	Rated torque current	P	A	M	Z	P	S	10mA	00000 to 65535	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P022	Rated speed (Field system control base speed)	P	A	M	Z	P	S	rpm	00001 to 20000	02000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P023	Max momentary torque ratio	P	A	M	Z	P	S	%	100 to 799	100
								When setting "999" to [P000: Motor type selection], input this setting value.		
P024	Exciting current	P	A	M	Z	P	S	10mA	00000 to 65535	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

*P018 and P019 are also effective when zero point return operation [ABS HOME] is executed as the activating timing.

*For the parameter setting value used to set "999" in [P000: Motor type], check with our sales representative.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
S	T	P	N							
[Group 0] [Motor, encoder parameter]										
P025	Rated output	P	A	M	Z	P	S	kW	000.000 to 999.999	000.000
								When setting "999" to [P000: Motor type selection], set motor rated output value. When "0" is set, device power supply capacity becomes motor rated output value.		
P026	Current loop coefficient	P	A	M	Z	P	S	None	000 to 300	000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P027	Number of rotations at which to start phase shift	I	A	M	Z	P	F	rpm	00000 to 20000	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P028	Phase shift angle	I	A	M	Z	P	F	deg	-100 to 100	000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P029	Motor electronic thermal time constant	R	A	M	Z	P	F	sec	0000 to 9999	0054
								Set the time constant for calculating the load factor of motor. If the setting value is "0", it is handled in the same way as "54".		
P030	Phase compensation angle	P	A	M	Z	P	S	deg	-100 to 100	000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P031	Device rated torque current	P	A	M	Z	P	S	10mA	00000 to 65535	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P032	Device max momentary torque ratio	P	A	M	Z	P	S	%	100 to 799	100
								When setting "999" to [P000: Motor type selection], input this setting value.		
P033	Device power source capacity	P	A	M	Z	P	S	kW	000.000 to 999.999	000.000
								When setting "999" to [P000: Motor type selection], set device rated power supply capacity.		
P034	Manufacturer exclusive use	-	.	.	.	.	F	kW	000.000 to 999.999	54.0
								Make sure that the setting value of this parameter is "54.0".		
P035	Manufacturer exclusive use	-	.	.	.	.	F	kW	000.000 to 999.999	0
								Make sure that the setting value of this parameter is "0".		
P036	ABS zero position electric angle	P	A	M	Z	P	S	deg	0.00 to 360.00	0.00
								Set the electric angle phase of the linear motor when the ABS data for the ABS linear scale is zero. Basically, set it to "0" by executing self diagnosis [DG91] or [DG92]. By setting this data to 360.00, the electric angle adjustment function ([DG91] and [DG92]) can be implemented.		
P037	Torque command change amount limit value	P	A	M	Z	P	S	None	00000 to 65535	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

*For the parameter setting value used to set "999" in [P000: Motor type], check with our sales representative.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)	
			Automatic	Manual	Zero return	Pulse train		Function			
			S	T	P	N					
[Group 0] [Motor, encoder parameter]											
P038	Encoder feedback pulse through output frequency division selection	P	A	M	Z	P	S	None	0 to 5	0	
								Set the output frequency division used during encoder feedback pulse through output.			
								Setting	Frequency division value		
								0	1/1		
								1	1/2		
								2	1/4		
								3	1/8		
								4	1/16		
								5	1/32		
								* It is effective if the 9th digits of P012 and P748 are "0".			
P039	Selection of highest frequency during encoder feedback pulse frequency dividing output	P	A	M	Z	P	S	None	0 to 3	0	
								When frequency dividing output is performed by setting P012 or P013 in encoder feedback pulse output, the highest frequency is limited with this setting value.			
								Setting value	Highest frequency for pulse output		
									Other than the ones on the right	*1	*2
								0	20Mpps	18Mpps	16Mpps
								1	10Mpps	9Mpps	8Mpps
								2	5Mpps	4.5Mpps	4Mpps
								3	2.5Mpps	2.3Mpps	2Mpps
								*1: Applied with the Mitutoyo linear ABS encoder is used.			
								*2: Applied when the MECHATROLINKⅢ option is mounted and the device is in maintenance mode.			
* If the output frequency after frequency division exceeds this frequency, normal output is not possible.											
* It is effective if P012 is not "0" and the 7th digit of P748 is "0".											
P040	Primary resistance	P	A	M	Z	P	S	$\mu\Omega$	00000000 to 99999999	00000000	
								When setting "999" to [P000: Motor type selection], input this setting value.			
P041	Secondary resistance	P	A	M	Z	P	S	$\mu\Omega$	-00000200 to 99999999	00000000	
								When setting "999" to [P000: Motor type selection], input this setting value.			
P042	Primary self-inductance	P	A	M	Z	P	S	μH	00000000 to 99999999	00000000	
								When setting "999" to [P000: Motor type selection], input this setting value.			
P043	Secondary self-inductance	P	A	M	Z	P	S	μH	-00000060 to 99999999	00000000	
								When setting "999" to [P000: Motor type selection], input this setting value.			

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

*For the parameter setting value used to set "999" in [P000: Motor type], check with our sales representative.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
[Group 0] [Motor, encoder parameter]										
P044	Mutual inductance	P	A	M	Z	P	S	μ H	00000000 to 99999999	00000000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P045	Leakage coefficient	P	A	M	Z	P	S	10^{-6}	00000000 to 99999999	00000000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P046	Dead time compensation time	P	A	M	Z	P	S	10^{-7} sec	00000 to 65535	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P047	Current loop cut off frequency	P	A	M	Z	P	S	rad/s	00000 to 65535	04000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P048	Current loop derivative time Constant	P	A	M	Z	P	S	μ sec	00000 to 65535	00000
								When setting "999" to [P000: Motor type selection], input this setting value.		
P049	Torque Constant	P	A	M	Z	P	S	10^{-4} Nm/A	00000000 to 99999999	00000000
								When setting "999" to [P000: Motor type selection], input this setting value. The setting unit in τ linear motor becomes 10^{-4} [N/A].		
P050	Magnetic pole sensor sin gain	P	A	M	Z	P	S	None	0 to 4096	2048
								[Automatic setting with self-diagnosis magnetic pole sensor adjustment]		
P051	Magnetic pole sensor sin offset	P	A	M	Z	P	S	None	-2048 to 2047	000
								[Automatic setting with self-diagnosis magnetic pole sensor adjustment]		
P052	Magnetic pole sensor cos gain	P	A	M	Z	P	S	None	0 to 4096	2048
								[Automatic setting with self-diagnosis magnetic pole sensor adjustment]		
P053	Magnetic pole sensor cos offset	P	A	M	Z	P	S	None	-2048 to 2047	000
								[Automatic setting with self-diagnosis magnetic pole sensor adjustment]		
P054	Tau DISC motor encoder compensation	P	A	M	Z	P	S	Pulse	-99999999 to 99999999	00000000
								[Automatic setting with self-diagnosis τ DISC motor adjustment]		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

*For the parameter setting value used to set "999" in [P000: Motor type], check with our sales representative.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 0] [Motor, encoder parameter]										
P055	Low pass filter frequency at auto magnetic pole detection	I	A	M	Z	P	F	Hz	0 to 4999 (1Hz Unit)	0
								Set filter in the automatic magnetic pole detection. If resonance occurs due to combination with machine system, install low pass filter for countermeasures. (For resonance prevention) Setting "0" makes filter invalid. For details, refer to [5-6 Automatic magnetic pole detection operation].		
P056	Set landing torque at auto magnetic pole detection	I*1	A	M	Z	P	F	%	0.0 to 100.0	0.0
								Set landing torque of automatic magnetic pole detection. Limit value is same in both +/- directions. Setting "0" makes landing torque invalid. For details, refer to [5-6 Automatic magnetic pole detection operation].		
P057	Set landing torque holding time at auto magnetic pole detection	I	A	M	Z	P	F	sec	0.00 to 9.99	0.00
								Set landing torque sustaining time of automatic magnetic pole detection. Setting "0" makes landing torque invalid. For details, refer to [5-6 Automatic magnetic pole detection operation].		
P058	Distance between linear motor pole opposite	P	A	M	Z	P	S	mm, deg	0.01 to 1000.00	0032.00
								When setting "999" to [P000: Motor type selection], input this setting value. * When selecting servo compass, unit is [deg].		
P059	Special encoder pulse number	P	A	M	Z	P	S	PPR	00000000 to 99999999	00000000
								When setting "999" to [P000: Motor type selection], input this setting value. When setting value is "0" setting value of [P002: IM/SM motor encoder pulse select] or [P004: Tau DISC motor encoder pulse number] becomes valid.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

*For the parameter setting value used to set "999" in [P000: Motor type], check with our sales representative.

*1 The setting value when the power is turned on is "0", the activating timing is power ON.

Parameters

6-3-2 Driver adjustment parameter (Group 1)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 1] [Driver adjustment parameter]										
P100	Low-speed range for gain change	I	A	M	Z	P	F	%	000.00 to 100.00	000.00
								Set speed range of low speed gain in GSEL signal OFF/GSEL 2 signal OFF status, with rated speed or ratio against applicable maximum speed. When the number of rotations of motor is lower than this setting value, [Speed loop gain], [Speed loop integral time constant], [Speed loop differential time constant], [Speed loop proportional gain division ratio], [Speed loop differential gain division ratio] are changed to the control by low speed gain range-related parameters ([P106], [P107], [P108], [P109], [P110]). However, when setting value is "0", it is not changed. If the number of rotations of motor exceeds this setting value, control is executed under parameters ([P101], [P102], [P103], [P104], and [P105]).		
P101	Speed loop gain	I	A	M	Z	P	F	None	000 to 9999	0025
								Set gain of speed loop. The larger the setting value is, the quicker the response is. However, vibration can be generated depending on the rigidity of machine system. When setting is "0" motor enters torque-free status.		
P102	Speed loop integral time constant	I	A	M	Z	P	F	msec	0000.00 to 9999.99	0020.00
								Set time constant of speed loop, integral correction. The smaller the setting value is, the quicker the response is. However, too small setting value can easily generate vibration (chatter vibration). When setting is "0" integral correction is not executed.		
P103	Speed loop differential time constant	I	A	M	Z	P	F	μ sec	-9999 to 9999	0000
								Set time constant of speed loop, differential correction. The bigger the setting value is, the quicker the response is. However, too big setting value can easily generate vibration (chatter vibration). When setting is "0" differential correction is not executed. In case of setting is [-] (negative), it is temporary delay time constant. ⚠ [-] (Negative) value cannot be set for the device of SOFT VER1.**.		
P104	Speed loop proportional gain division ratio	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set proportional correction gain division ratio of Two-degree-of-freedom PID velocity control system. By setting a big value, over-shoot against speed command is suppressed and it becomes speed control system featuring good response against loads. If too big value is set, response against speed command becomes slow.		
P105	Speed loop differential gain division ratio	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set differential correction gain division ratio of Two-degree-of-freedom PID velocity control system. By setting a big value, over-shoot against speed command is suppressed and it becomes speed control system featuring good response against loads. If too big value is set, response against speed command becomes slow.		
P106	Speed loop gain/Low-speed range	I	A	M	Z	P	F	None	0000 to 9999	0025
								Set speed loop gain in the low speed gain range. (For details, refer to [P101]).		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
[Group 1] [Driver adjustment parameter]										
P107	Speed loop integral time constant /Low-speed range	I	A	M	Z	P	F	msec	0000.00 to 9999.99	0020.00
								Set time constant of integral correction for speed loop in low speed gain range. (For details, refer to [P102].)		
P108	Speed loop differential time constant / Low-speed range	I	A	M	Z	P	F	μ sec	-9999 to 9999	0000
								Set time constant of differential correction for speed loop in low speed gain range. (For details, refer to [P103].) ⚠ [-] (Negative) value cannot be set for the device of SOFT VER1.**.		
P109	Speed loop proportional gain division ratio / Low-speed range	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set proportional correction gain division ratio of Two-degree-of-freedom PID velocity control system in low speed gain range. (For details, refer to [P104].)		
P110	Speed loop differential gain division ratio / Low-speed range	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set differential correction gain division ratio of Two-degree-of-freedom PID velocity control system in low speed gain range. (For details, refer to [P105].)		
P111	Speed loop gain at GSEL1	I	A	M	Z	P	F	None	0000 to 9999	0025
								Set gain of speed loop in GSEL signal ON/GSEL 2 signal OFF status. (For details, refer to [P101].)		
P112	Speed loop integral time constant at GSEL1	I	A	M	Z	P	F	msec	0000.00 to 9999.99	0020.00
								Set time constant of integral correction of speed loop in GSEL signal ON/GSEL 2 signal OFF status. (For details, refer to [P102].)		
P113	Speed loop differential time constant at GSEL1	I	A	M	Z	P	F	μ sec	-9999 to 9999	0000
								Set time constant of differential correction of speed loop in GSEL signal ON/GSEL 2 signal OFF status. (For details, refer to [P103].) ⚠ [-] (Negative) value cannot be set for the device of SOFT VER1.**.		
P114	Speed loop proportional gain division ratio at GSEL1	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set proportional correction gain division ratio of Two-degree-of-freedom PID velocity control system in GSEL signal ON/GSEL 2 signal OFF status. (For details, refer to [P104].)		
P115	Speed loop differential gain division ratio at GSEL1	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set differential correction gain division ratio of Two-degree-of-freedom PID velocity control system in GSEL signal ON/GSEL 2 signal OFF status. (For details, refer to [P105]).		
P116	Torque limiting value at magnetic pole detection	I	A	M	Z	P	F	%	000.0 to 799.9	300.0
								Set torque limit value in magnetic pole detection. Limit value is the same in both +/- directions.		
P117	Magnetic pole detection gain 1	I	A	M	Z	P	F	None	0000 to 9999	0080
								Set proportional correction gain in magnetic pole detection. The larger the setting value is, the quicker the response is. However, vibration can be generated depending on rigidity of machine system. When setting is "0" magnetic pole detection does not run correctly.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 1] [Driver adjustment parameter]										
P118	Magnetic pole detection integral calculus time constant	I	A	M	Z	P	F	msec	00000 to 65535	00200
								Set time constant of integral correction in magnetic pole detection. The smaller the setting value is, the quicker the response is. However, too small setting value can easily generate vibration (chatter vibration). When setting is "0" integral correction is not executed.		
P119	Magnetic pole detection gain 2	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain in magnetic pole detection. By setting big value, response is quickened, but it can easily generate vibration. When setting value is "0" position loop becomes open and magnetic pole detection is not executed.		
P120	Torque command filter frequency	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	1000
								Set filter (low pass) frequency of torque command. If resonance occurs due to combination with machine system, install torque command filter for countermeasures. (For resonance prevention) When setting is "0" filter is invalid. If the device has an output capacity of 1.5kW or more and the type in each motor is "J", setting "0" or a value higher than "1000" may cause an "IPM error" to occur. As a rough guide, set "1000" Hz or less.		
P121	Notch filter center frequency 1	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								If resonance occurs due to combination with machine system, set that resonance frequency to prevent resonance. When setting is "0" notch filter 1 is invalid.		
P122	Notch filter bandwidth 1	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								Set bandwidth of notch filter 1. When setting is "0" notch filter 1 is invalid.		
P123	Notch filter center frequency 2	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								If resonance occurs due to combination with machine system, set that resonance frequency to prevent resonance. When setting is "0" notch filter 2 is invalid.		
P124	Notch filter bandwidth 2	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								Set bandwidth of notch filter 2. When setting is "0" notch filter 2 is invalid.		
P125	Torque limit value 1+	I	A	M	Z	P	F	%	000.0 to 799.9 (0.1% Unit)	300.0
								Set motor output torque limit value in forward direction. When setting exceeds motor peak torque, output torque is clamped with peak torque. When setting is "0" torque in forward direction is not generated.		
P126	Torque limit value 1-	I	A	M	Z	P	F	%	000.0 to 799.9 (0.1% Unit)	300.0
								Set motor output torque limit value in reverse direction. When setting exceeds motor peak torque, output torque is clamped with peak torque. When setting is "0" torque in reverse direction is not generated.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 1] [Driver adjustment parameter]										
P127	Torque limit value 2+	I	A	M	Z	P	F	%	-000.1, 000.0 to 799.9 (0.1% Unit)	300.0
								Set forward direction torque limit value, for TL signal ON and in alarm-stop (provided, it is activated by [P142: Torque limit selection at alarm stop]). When setting is "-000.1" analog torque limit command + (TL+) becomes valid. When setting is "000.0 to 799.9" it is limited with setting value. It is limited with either lower value in this parameter or in [P125: Torque limit value 1+]. In the above conditions, and when this parameter setting is "000.0" torque in forward direction is not generated.		
P128	Torque limit value 2-	I	A	M	Z	P	F	%	-000.1, 000.0 to 799.9 (0.1% Unit)	300.0
								Set reverse direction torque limit value, for TL signal ON and in alarm-stop (provided, it is activated by [P142: Torque limit selection at alarm stop]). When setting is "-000.1" analog torque limit command - (TL-) becomes valid. When setting is "000.0 to 799.9" it is limited with setting value. It is limited with either lower value in this parameter or in [P126: Torque limit value 1-]. In the above conditions, and when this parameter setting is "000.0", torque in reverse direction is not generated.		
P129	Speed command gain (voltage) ⚠ Caution: Input range of DC voltage is ±10V disregarding this setting.	I	A	.	.	.	F	V	006.00 to 100.00 (0.01V Unit)	010.00
								Set full-scale value (motor rated rotation command or applicable maximum speed command) of external speed command voltage (DC voltage). With the input of setting value of command voltage, it rotates at motor rated speed or applicable maximum speed. In setting, "10.01" or larger value can be accepted; however, maximum value in input voltage is ±10V. Motor regenerative operation in rotation area exceeding "10.00" is possible within motor maximum rotation. However, power running is impossible. (Example) When setting value is "100.00" and rated rotation is 2000rpm, motor power running rotation becomes as follows, provided 10V input of speed command voltage. 2000×10V/100.00=200rpm Speed command resolution reaches the maximum at 10V. When setting "06.00" speed command resolution becomes 6/10 of the value when setting "10.00".		
P130	Speed command offset	I	A	.	.	.	F	mV	-999 to 999	000
								Set offset voltage value of external speed command (DC voltage). When there is offset in external speed command voltage, motor rotates slowly due to this offset voltage. Set this parameter to stop motor rotation due to offset voltage.		
P131	Torque command offset	I	A	.	.	.	F	mV	-999 to 999	000
								Set offset voltage value of external torque command (DC voltage).		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
[Group 1] [Driver adjustment parameter]										
P132	External speed limit effective/ ineffective selection	R	A	.	.	.	F	None	SPD.LIM.N/SPD.LIM.Y	SPD.LIM.N
								In the torque control command, select whether to limit the number of motor rotations with external speed command (DC voltage). ◎SPD.LIM.N: Number of motor rotations is limited to [P133: Speed limit value]. No, not limit it ◎SPD.LIM.Y: Number of motor rotations is limited to either lower value of [P133: Speed limit value] or of external speed command. Yes, limit it		
P133	Speed limit value	I	A	.	.	.	F	%	000.00 to 120.00	120.00
								In the torque control command, set limit value of motor operation speed in the ratio against either rated speed or applicable maximum speed. * If the speed loop integral time constant is set to 0, integral correction is not performed, so that the specified speed limit value cannot be used.		
P134	Internal speed command value 1	I	A	.	.	.	F	%	-100.00 to 100.00	050.00
								In the speed control command, set motor operation speed and command direction of internal speed command 1 in the ratio against rated speed or applicable maximum speed.		
P135	Speed command value 2	I	A	.	.	.	F	%	-100.00 to 100.00	040.00
								In the speed control command, set motor operation speed and command direction of internal speed command 2 in the ratio against rated speed or applicable maximum speed.		
P136	Internal speed command value 3	I	A	.	.	.	F	%	-100.00 to 100.00	030.00
								In the speed control command, set motor operation speed and command direction of internal speed command 3 in the ratio against rated speed or applicable maximum speed.		
P137	Internal torque command value 1	I	A	.	.	.	F	%	-799.9 to 799.9	030.0
								In the torque control command, set command value and command direction of internal torque command 1.		
P138	Internal torque command value 2	I	A	.	.	.	F	%	-799.9 to 799.9	050.0
								In the torque control command, set command value and command direction of internal torque command 2.		
P139	Internal torque command value 3	I	A	.	.	.	F	%	-799.9 to 799.9	080.0
								In the torque control command, set command value and command direction of internal torque command 3.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 1] [Driver adjustment parameter]										
P140	Auto tuning trial run direction/ inertia selection	I	A	M	Z	P	F	None	BOTH/N, +ONLY/N, -ONLY/N, BOTH/H, +ONLY/H, -ONLY/H,	BOTH/N
								When auto-tuning function is in operation, select test-run direction of motor and inertia. If inertia is big and alarm occurs during auto-tuning execution, select [big inertia support].		
								Setting	Run direction	Inertia selection
								BOTH/N	Both directions	Regular
								+ONLY/N	Forward direction	Regular
								-ONLY/N	Reverse direction	Regular
								BOTH/H	Both directions	Big inertia support
								+ONLY/H	Forward direction	Big inertia support
								-ONLY/H	Reverse direction	Big inertia support
								* When selecting big inertia, precaution is required because amount of operation is increased than that of regular inertia. For operation method, refer to [9-4 Auto-tuning].		
P141	Auto tuning trial run speed ratio	I	A	M	Z	P	F	None	0.00 to 1.00	0.30
								When auto-tuning function is in operation, set speed of motor test run in the ratio against rated rotation speed or applicable maximum speed. When setting "1.00" motor rotates at rated speed or applicable maximum speed. * For operation method, refer to [9-4 Auto-tuning].		
P142	Torque limit selection at alarm stop	I	A	M	Z	P	F	None	ALM.TL N/ALM.TL Y	ALM.TL N
								Select torque limit function when stopping motor instantly in the alarm occurrence. ◎ALM.TL N: Executes torque limit in accordance with ON/OFF-status of torque limit signal (TL). ◎ALM.TL Y: Executes torque limit based on ON-status disregarding ON/OFF-status of torque limit signal (TL).		
P143	R2 compensation selection	I	A	M	Z	P	F	None	R2 OFF/R2 ID	R2 OFF
								Select R2 compensation (correction on output torque error due to motor temperature) method. ◎R2 OFF: Do not execute R2 compensation. ◎R2 ID : Execute correction fixing R2 based on motor current and voltage. * This function is not supported yet; thus, do not edit.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train			Function	
[Group 1] [Driver adjustment parameter]										
P144	Electronic-thermal detecting method selection	R	A	M	Z	P	F	None	STD/BIG/O.L. 110%/O.L. 50%/ O.L. 70%/ O.L. 90%/ O.L. 130%/ O.L. 150%/ O.L. 170%/ O.L. 190%	STD
Select detection method of electronic thermal. ◎STD: Standard ◎BIG: Big capacity ◎O.L. XXX%: Overload error detection at motor load ratio (ST15) XXX%. When detecting overload error with motor load ratio, generally, select [O.L. 110%]. ⚠ It will be electronic thermal detection method of [STD] even if it is set at [BIG] for the device capacity of 30kW or lower. ⚠ When using with BIG or O.L. 130% or more, contact our sales representative. * For detection method of electronic thermal, refer to [10-4 (8) Overload error/(9) IPM overload error].										
P145	Magnetic pole sensor automatic adjustment operation	I	A	M	Z	P	F	%	-100 to 100 (1% Unit)	005
Set operation direction and speed for the time of operation of self-diagnosis [DG84: Magnetic pole sensor automatic adjustment]. Relations between setting value and operation are as follows. Plus : Forward direction operation Minus : Reverse direction operation Speed : Ratio setting against rated (maximum) speed										
P146	Mass/inertia	I	A	M	Z	P	F	Refer to explanation	00000000 to 99999999	00000000
Set [Mass] or [Inertia] of control system. Unit is as follows. In the case of the τ linear motor and the Servo Compass motor (*1) τ : Mass (10 ⁻⁴ kg) In the case of the Servo Compass motor (*2) τ : Inertia (10 ⁻⁴ kg·m ²) In the case of a motor other than the above τ : Inertia (10 ⁻⁶ kg·m ²) *1: If P000 = "031 to 034" or P000 = "999" and P020 = "1538" *2: If P000 = "035 to 038" or P000 = "999" and P020 = "1794" [Caution] Do not set when not clear										
P147	Viscous friction	I	A	M	Z	P	F	Refer to explanation	00000000 to 99999999	00000000
Set viscous friction of control system. Unit is as follows. In the case of the τ linear motor and the Servo Compass motor (*1) τ : 10 ⁻⁴ N/m/s In the case of the Servo Compass motor (*2) τ : 10 ⁻⁴ N·m/rad/s In the case of a motor other than the τ linear motor τ : 10 ⁻⁶ N·m/rad/s *1: If P000 = "031 to 034" or P000 = "999" and P020 = "1538" *2: If P000 = "035 to 038" or P000 = "999" and P020 = "1794" [Caution] Do not set when not clear										

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 1] [Driver adjustment parameter]										
P148	Disturbance correction filter frequency	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								Set filter frequency of disturbance correction. When setting "0" disturbance correction becomes invalid. For details, refer to [5-7 Disturbance correction function].		
P149	Tau DISC motor initialization operation	I	A	M	Z	P	F	%	-100 to 100 (1% Unit)	005
								Set operation direction and speed for the time of operation of self-diagnosis [DG95: τ DISC motor automatic adjustment]. Relations between setting value and operation are as follows. Plus : Forward direction operation Minus : Reverse direction operation Speed : Ratio setting against rated (maximum) speed		
P150	Disturbance correction filter invalid limit	I	A	M	Z	P	F	%	000.00 to 100.00	005.00
								Set the speed at which to start reducing the reflection rate of disturbance correction. If the speed is equal to or less than this setting, the reflection rate of the disturbance correction function is reduced. If the speed is 0, the function is ineffective. For details, refer to [5-7 Disturbance correction function].		
P151	Notch filter center frequency 3	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								If resonance occurs due to combination with machine system, set that resonance frequency to prevent resonance. When setting is "0" notch filter 3 becomes invalid.		
P152	Notch filter bandwidth 3	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								Set bandwidth of notch filter 3. When setting is "0" notch filter 3 becomes invalid.		
P153	Notch filter center frequency 4	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								If resonance occurs due to combination with machine system, set that resonance frequency to prevent resonance. When setting is "0" notch filter 4 becomes invalid.		
P154	Notch filter bandwidth 4	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								Set bandwidth of notch filter 4. When setting is "0" notch filter 4 becomes invalid.		
P155	Notch filter center frequency 5	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								If resonance occurs due to combination with machine system, set that resonance frequency to prevent resonance. When setting is "0" notch filter 5 becomes invalid.		
P156	Notch filter bandwidth 5	I	A	M	Z	P	F	Hz	0000 to 4999 (1Hz Unit)	0000
								Set bandwidth of notch filter 5. When setting is "0" notch filter 5 becomes invalid.		
P157	Torque command low pass filter order selection	I	A	M	Z	P	F	None	0 or 1	0
								Select the order for the torque command low pass filter (P120). 0: Primary 1: Secondary		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 1] [Driver adjustment parameter]										
P158	Normal rated power of regeneration resistance	R	A	M	Z	P	F	kW	-999.999 to 999.999	000.000
								Set rated power value of regenerative resistor that is connected to the device. According to this power value, display of status display [ST16] (regenerative load ratio) and regenerative overload error are detected. If not using a regenerative resistor or in the case of continuous regeneration operation, set "0". When this setting is "0" see below. [ST16] (Regenerative load ratio) displays regenerative power ratio that is stored inside the device. If this display shows 50% or more, excessive voltage error can occur; thus, attach regenerative resistor. Note, however, that continuous regeneration operation is not supported. Thus, ignore the display value of [ST16] (regenerative load factor). - Regeneration overload error detection becomes invalid. When thermostat protects regenerative resistor, set regenerative resistor power value of negative (-). When this setting is negative, display of [ST16] (regenerative load ratio) is based on this power value; however, regenerative overload error detection becomes invalid. [Setting example] If connecting three regenerative resistors with a rated power value of 300W - No thermostat used: 300W×3 = 900W → Set 0.900kW. - Thermostat used: By adding a "-" to the setting value for the case in which no thermostat is used, set -0.900kW.		
P159	Sensor installation radius	P	A	M	Z	P	F	mm	0.000 to 10000.000	0.000
								Set sensor installation radius of servo compass motor. * As for setting method, refer to [5-12 Servo compass basic setting].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

6-3-3 NC adjustment parameter (Group 2)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 2] [NC adjustment parameter]										
P200	Position loop gain	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain for the time of operation in automatic/manual/zero return/pulse train run mode. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0" normal positioning operation cannot be executed.		
P201	Servo lock gain	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain in the servo-lock status when position deviation is in the range of [P202: Positioning completion range]. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0" normal servo-lock status cannot be entered.		
P202	Positioning completion range	R	A	·	Z	P	F	Pulse	000 to 999	010
								Set output range of Positioning Complete signal (PN). Setting differs depending on encoder type to use. ◎Unit of the number of pulses for encoder resolution to be used when selecting [L-SEN/S-INC/S-INC2/S-ABS/S-ABS2/S-ABS3/S-MABS/C-SEN1/C-SEN2/L-LESS/L-ABS/S-ABS4] with P001 ◎4-multiplication unit of number of encoder pulses of encoder to be used when selecting [INC1/INC2/INC3] with P001 (Example) - In the setting of [P001: L-SEN], and when putting ±10 pulses to positioning complete range, setting value becomes "010". - In the setting of [P001: INC3], and when putting ±10 pulses to positioning complete range, setting value becomes "040".		
P203	Positioning time over	R	A	·	Z	·	F	sec	0.00 to 9.99 (10msec Unit)	0.00
								Set the permissible time until the actual position reaches the completion range after the completion of the command in positioning/zero return run mode. The Alarm signal (ALM) is output if positioning is not completed within the set time. However, when the setting value is "0.00", positioning time over is not detected.		
P204	Backlash compensation value	R	A	M	Z	P	F	Pulse	-999 to 999	000
								Set the machine system backlash compensation value. In each operation of automatic, manual, zero return, and pulse train run, if the moving direction is reversed, the backlash compensation value is added or subtracted for operation. Sign "+" means addition (pushing); sign "-" means subtraction (pulling). Setting is same as [P202: Positioning completion range]. When the setting value is "0", backlash compensation is not executed.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 2] [NC adjustment parameter]										
P205	Feed forward ratio	I	A	M	Z	•	F	%	000.0 to 120.0	080.0
								Set the feed forward ratio against the speed command in each operation of automatic, manual, and zero return run. By setting big value, the compliance becomes better. However, vibration can occur depending on the suitability with machine system. In this case, allow some deviations by decreasing the setting value. This measure can make the operation stable. When the setting is "0" feed/forward control is not executed. * Make sure that this setting value is such that the formula described in the supplementary information for P310 holds.		
P206	Feed forward shift ratio	I	A	M	Z	•	F	%	000.0 to 100.0	001.0
								Set the feed forward shift ratio against the speed command in each operation of automatic, manual, and zero return run.		
P207	Overflow detecting pulse	R	A	M	Z	P	F	Pulse	00001000 to 99999999	00024000
								Set overflow detection value of position deviation. Setting is same as [P202: Positioning completion range].		
P208	Deviation error detecting pulse	R	A	M	Z	P	F	Pulse	00000000 to 99999999	00000000
								Set permissible range of position deviation. Setting is same as [P202: Positioning completion range]. When setting value is "0" detection of deviation error is not executed.		
P209	Motion selection at deviation error	I	A	M	Z	P	F	None	STOP/CONTINUE	CONTINUE
								Select operation when position deviation results in deviation error, exceeding setting value of [P208: Deviation error detecting pulse]. ◎STOP (Alarm-stop) Motor stops instantly, sending out Alarm signal (ALM). ◎CONTINUE (Operation-continue) Upon detecting deviation error, position deviation is controlled to become lower than deviation error detection pulse, and operation continues. Warning signal (WNG) is output in the duration from deviation error detection to completion in the case of each operation in automatic run/zero return run, or for the duration of operation-stop in the case of each operation in manual run/pulse train run. When selecting CONTINUE (Operation-continue), following cautions should be taken. - Positioning time is extended. - Overload error may easily occur. - If excessive deviation is found in the deceleration time, set "000" in [P205: Feed forward ratio] and [P605: Pulse train feed forward ratio].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)	
			Automatic	Manual	Zero return	Pulse train		Function			
			A	M	Z	P					
[Group 2] [NC adjustment parameter]											
P210	S-curve acceleration/ deceleration increasing time	R	A	M	Z	•	F	msec	0000.0 to 1000.0 (0.1msec Unit)	0000.0	
								Set the increase time when "S-curve" motor acceleration/deceleration in each operation of automatic, manual, and zero return run is executed. When setting value is "0" it becomes linear accel-decel. Acceleration time is prolonged only by S-letter increase time than the set time in [P211], [P212], and [P213]. Deceleration time is prolonged only by S-letter increase time than the set time in [P214], [P215], and [P216]. The set time is rounded to the applicable one of the units listed below and used for control.			
								Operation condition		Unit for rounding	
								Other than the ones below		0.4msec unit When 0.7msec is set, 0.8msec(=0.4 × 2)	
								A linear ABS encoder is used.		0.444 msec unit When 0.7msec is set, 0.888msec(=0.444 × 2)	
								MECHATROLINKⅢ is connected.		Refer to the "Instruction Manual VCII Series MECHATROLINKⅢ".	
P211	Acceleration time 1	R	A	M	Z	•	F	sec	00.000 to 99.999 (1msec Unit)	00.500	
								Set acceleration time to reach rated speed or applicable maximum speed from the time of motor stop. However, it will run at the acceleration time obtained by adding the value set in [P210] (increase time) to this parameter setting. It is valid for the operation in automatic/manual/zero return mode.			
P212	Acceleration time 2	R	A	•	•	•	F	sec	00.000 to 99.999 (1msec Unit)	00.500	
								Function is same as [P211]. However, this parameter is valid only for the operation in automatic run mode.			

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 2] [NC adjustment parameter]										
P213	Acceleration time 3	R*1	A	.	.	.	F	sec	00.000 to 99.999 (1msec Unit) -00.099 to -00.001(Indirect data assignment)	00.500
								Function when set to 00.000 to 99.999 is same as [P211]. However, this parameter is valid only for the operation in automatic run mode. *1: Only if the POS/SPOS/INDX/SIND command is used, the acceleration/deceleration time data is reflected when the command is started. (Both direct specification and indirect data specification are possible.) Indirect data can be specified by setting a numeric value with a minus sign. The sign and decimal point in the indirect data setting are ignored, and the setting unit is 1msec. [Example] Setting value: -00.045 → -0.0500 is set for indirect data 45. (When 0.0001 is set in [P302: Minimum setting unit]) Indirect data 45 is used for acceleration time 3, and the value is [500(msec)] with the sign and position of the decimal point ignored. * IX00 cannot be specified.		
P214	Deceleration time 1	R	A	M	Z	.	F	sec	00.000 to 99.999 (1msec Unit)	00.500
								Set deceleration time from rated speed or applicable maximum speed to stop of the motor. However, it will run at the deceleration time obtained by adding the value set in [P210] (increase time) to this parameter setting. It is valid for the operation in automatic/manual/zero return mode.		
P215	Deceleration time 2	R	A	.	.	.	F	sec	00.000 to 99.999 (1msec Unit)	00.500
								Function is same as [P214]. However, this parameter is valid only for the operation in automatic run mode.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 2] [NC adjustment parameter]										
P216	Deceleration time 3	R*1	A	.	.	.	F	sec	00.000 to 99.999 (1msec Unit) -00.099 to -00.001 (Indirect data assignment)	00.500
								Function when set to 00.000 to 99.999 is same as [P214]. However, this parameter is valid only for the operation in automatic run mode. *1: Only if the POS/SPOS/INDX/SIND command is used, the acceleration/deceleration time data is reflected when the command is started. (Both direct specification and indirect data specification are possible.) Indirect data can be specified by setting a numeric value with a minus sign. The sign and decimal point in the indirect data setting are ignored, and the setting unit is 1msec. [Example] Setting value: -00.045 → -0.0500 is set for indirect data 45. (When 0.0001 is set in [P302: Minimum setting unit]) Indirect data 45 is used for deceleration time 3, and the value is [500(ms)] with the sign and position of the decimal point ignored. The setting value of indirect data 45 is [500 (msec)] even when 0.0500 is set. * IX00 cannot be specified.		
P217	Positioning feed forward differential addition ratio	I	A	M	Z	.	F	None	-1 to 31	0
								Set differential adding volume of feed/forward data in the operation in automatic/manual/zero return mode. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0" it is same as "16". When setting value is "-1" it becomes invalid.		
P218	Pulse train feed forward differential addition ratio	I	.	.	.	P	F	None	-1 to 31	0
								Set differential adding volume of feed/forward data in the operation of pulse train run. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0" it is same as "16". When setting value is "-1" it becomes invalid.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
[Group 2] [NC adjustment parameter]										
P219	Manufacturer exclusive use	-	.	.	.	.	F			0
								Be sure setting value of this parameter is always "0".		
P220	Position loop differential time constant	I	A	M	Z	P	F	μ sec	0 to 9999	0
								Set time constant of differential correction of position loop. The bigger the setting value is, the quicker the response is. However, too big setting value can easily generate vibration (chatter vibration). When setting is "0" differential correction is not executed.		
P221	Servo lock differential time constant	I	A	M	Z	P	F	μ sec	0 to 9999	0
								Set position loop differential time constant in servo-lock status while position deviation is in the range of [P202: Positioning completion range]. The bigger the setting value is, the quicker the response is. However, too big setting value can easily generate vibration (chatter vibration). When setting is "0" differential correction is not executed.		
P222	Manufacturer exclusive use	-	.	.	.	.	F			0
								Be sure setting value of this parameter is always "0".		
P223	Manufacturer exclusive use	-	.	.	.	.	F			0
								Be sure setting value of this parameter is always "0".		
P224	Inertia feed forward ratio	I	A	M	Z	P	F	%	0.0 to 200.0	0.0
								Set feed/forward ratio against load inertia [when normal P146, when GSEL P312]. 100% setting makes the compliance better. However, vibration can occur depending on the suitability with machine system. Generally, set "0". When setting value is "0", this feed/forward control is not executed. * In τ linear motor, replace name and "inertia" mentioned above in this text with "mass". If P146 or P312 is not properly set, it will not function normally. ⚠ Setting range is 0 to 100 for the device of SOFT VER 1.**.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
A	M	Z	P							
[Group 2] [NC adjustment parameter]										
P225	Viscous friction feed forward ratio	I	A	M	Z	P	F	%	0.0 to 200.0	0.0
								Set feed/forward ratio against load viscous friction [when normal P147, when GSEL P313]. 100% setting makes the compliance better. However, vibration can occur depending on the suitability with machine system. Generally, set "0". When setting value is "0", this feed/forward control is not executed. If P147 or P313 is not properly set, it will not function normally. ⚠ Setting range is 0 to 100 for the device of SOFT VER 1.**.		
P226	Position loop gain at GSEL1	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain for the time of GSEL signal ON/GSEL 2 signal OFF. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0", positioning operation is not executed correctly.		
P227	Servo lock gain at GSEL1	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain in servo-lock status for the time of GSEL signal ON/GSEL 2 signal OFF. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0" servo-lock status is not correct.		
P228	Position loop gain at GSEL2	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain for the time of GSEL signal OFF/GSEL 2 signal ON. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0", positioning operation is not executed correctly.		
P229	Servo lock gain at GSEL2	I	A	M	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain in servo-lock status for the time of GSEL signal OFF/GSEL 2 signal ON. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0", servo-lock status is not correct.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

6-3-4 Position adjustment parameter (Group 3)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 3] [Position adjustment parameter]										
P300	Rotation direction selection	R	A	M	Z	P	F	None	FORWARD/REVERSE	FORWARD
								Select operation direction of motor for each command.		
								FORWARD	Forward direction	Motor forward direction operation against forward direction or positive data command
								REVERSE	Reverse direction	Motor reverse direction operation against forward direction or positive data command
P301	Setting unit selection	R	A	M	Z	P	F	None	[mm]/[°]]/[in]	[mm]
									Select basic unit in setting for positioning data and others. Every setting of position and speed is carried out based on this unit. ([mm]: mm/ [°]: angle/[in]: inch)	
P302	Minimum setting unit	R	A	M	Z	P	F	mm/ ° /in	0.00001/0.0001/0.001/0.01 /0.1/1/0.000001/0.0000001	0.01
								Select minimum setting unit for positioning data. By this parameter, position of decimal point for each position data and speed data is decided and it affects each data display.		
								<u>For a linear system motor</u> Select the minimum setting unit per pulse after pulse train command compensation. If "1" is set in this parameter, the setting unit of P301 becomes ineffective and the unit is [pulse]. If a value other than "1" is set, the setting unit of P301 is [mm]. With this parameter, the decimal point position for each piece of position data and speed data is decided and is reflected in each data display. [Linear system motor example] When "0.001" is set When a linear sensor with a resolution of 1.0μm is used, the following hold true if a command for 1000 pulses is given after pulse train command compensation with the current position (status display ST01 display) being "0": Motor operating amount: 1mm (1000 pulses) Current position display (ST01): 1000		
P303	Electronic gear ratio numerator	R	A	M	Z	P	F	None	00000001 to 99999999	00000001
								Set the gear ratio between the drive shaft of the machine system and the motor shaft in combination with [P304: Electronic gear ratio denominator]. For a machine system in which the load axis rotates n times when the motor rotates m times, set the n value with this parameter. When the machine system is used in the direct drive mode, set "1". For examples of setting an electronic gear ratio and notes on setting it, refer to [P310: Machine travel amount].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 3] [Position adjustment parameter]										
P304	Electronic gear ratio denominator	R	A	M	Z	P	F	None	00000001 to 99999999	00000001
								Set the gear ratio between the drive shaft of the machine system and the motor shaft in combination with [P303: Electronic gear ratio numerator]. For a machine system in which the load axis rotates n times when the motor rotates m times, set the m value with this parameter. When the machine system is used in the direct drive mode, set "1". For examples of setting an electronic gear ratio and notes on setting it, refer to [P310: Machine travel amount].		
P305	Index data range	R	A	M	Z	P	F	mm/° /in	00000000 to 99999999	00000000
								Set the data range of 1 rotation for a machine with a rotating object. (The position of the decimal point depends on [P302: Minimum setting unit].) With this setting, the absolute position (ABSOLUTE) data range is between 0 and ([this setting value] - 1). Set 00000000 for purposes other than [index positioning] or [spinner]. If a value of 00000000 is set, index positioning commands (INDX and SIND) and spin commands (SPNS, SPNT, and SPNP) cannot be used.		
P305	[Example 1: When the position range of the rotating object is 1 rotation, 360°] Setting value 360° → The operating range is from 0° to 359°. 1) Forward direction operation (CCW) crosses over 0° 359° → 0° 2) Reverse direction operation (CW) crosses over 0° 0° → 359°									
	① 0° CCW 90° 180° 270° ② 0° CW 90° 180° 270°									

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 3] [Position adjustment parameter]										
P306	Forward software OT limit	I	A	M	Z	P	F	mm/ ° /in	-99999999 to 99999999	00000000
									Set the travel limit point in the forward direction with the distance from [P408: Position data reference point]. (The position of the decimal point depends on [P302: Minimum setting unit].) This parameter is always valid after power-on and completion of zero return. When an absolute encoder is used, this is effective even if zero point return is not performed. An absolute encoder can be used if the setting value of [P001] is [S-ABS], [S-ABS2], [S-ABS3], [S-MABS], [L-ABS], or [S-ABS4]. When the setting value is "0", the limit is not detected. (Caution) Be sure to execute zero return after power-on. Since [P408: Position data reference point] is set at the completion of zero return, the software OT limit is not detected until zero return is completed. If there is much delayed deviation, the motor may stop before the software OT limit position is reached since the software OT limit is detected based on the command position.	
P307	Reverse software OT limit	I	A	M	Z	P	F	mm/ ° /in	-99999999 to 99999999	00000000
									Set the travel limit point in the reverse direction with the distance from [P408: Position data reference point]. (The position of the decimal point depends on [P302: Minimum setting unit].) This parameter is always valid after power-on and completion of zero return. When an absolute encoder is used, this is effective even if zero point return is not performed. When the setting value is "0", the limit is not detected. (Caution) Be sure to execute zero return after power-on. Since [P408: Position data reference point] is set at the completion of zero return, the software OT limit is not detected until zero return is completed. If there is much delayed deviation, the motor may stop before the software OT limit position is reached since the software OT limit is detected based on the command position.	
P308	Forward positioning amount max. value	I	A	.	.	.	F	mm/ ° /in	00000000 to 99999999	00000000
									Set the maximum amount of positioning in the forward direction for the following commands as an increment. (The position of the decimal point depends on [P302: Minimum setting unit].) If the amount of positioning by an executed command is greater than this setting value, the command is terminated with an alarm. However, when the setting value is "0", the amount of positioning in the forward direction is not checked. Target commands: POS, INDX, SPOS, CONT, REPT, and SIND	

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
[Group 3] [Position adjustment parameter]										
P309	Reverse positioning amount max. value	I	A	.	.	.	F	mm/ ° /in	-99999999 to 00000000	00000000
								Set the maximum amount of positioning in the reverse direction for the following commands as an increment. (The position of the decimal point depends on [P302: Minimum setting unit].) If the amount of positioning by an executed command is greater than this setting value, the command is terminated with an alarm. However, when the setting value is "0", the amount of positioning in the reverse direction is not checked. Target commands: POS, INDX, SPOS, CONT, REPT, and SIND		
P310	Machine travel amount	R	A	M	Z	P	F	mm/ ° /in	00000000 to 99999999	00000000
								Set the amount of travel of the load per rotation of the drive shaft (load axis) of the machine system. <u>In a rotation system motor</u> [Example of a ball screw stage] To drive the ball screw (load axis) + stage (load) Stage (load)  Ball screw (10.00mm pitch) Motor When the ball screw (load axis) is 10.00mm pitch, set 0.01mm in [P302: Minimum setting unit]. When the ball screw (load axis) rotates once, the stage moves by 10.00mm. → Setting value: 10.00mm However, when the setting value is "0", operation is performed with assuming this parameter value to be [number of used encoder pulses (4-time multiplications)]. (Caution) If the speed according to the electronic gear ratio and machine travel amount settings is beyond the range of 100 to 40M (setting unit/sec) as the motor rated speed or applicable maximum speed, an alarm occurs and operation is impossible. (The setting unit depends on [P301] and [P302].) For details, refer to 10-4 (11) Rated speed command invalid (STD.SPD.1/STD.SPD.2). <u>In a linear system motor</u> When a linear system motor is used, normally set "0".		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

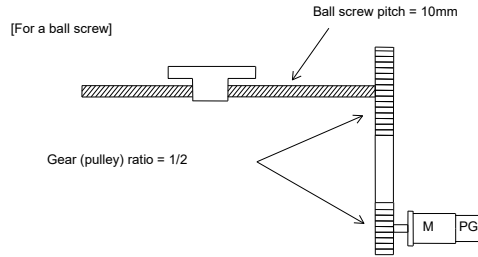
*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

P303

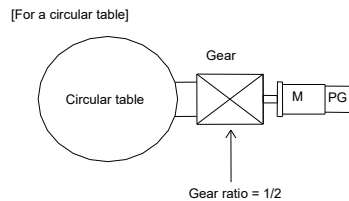
P304

P310

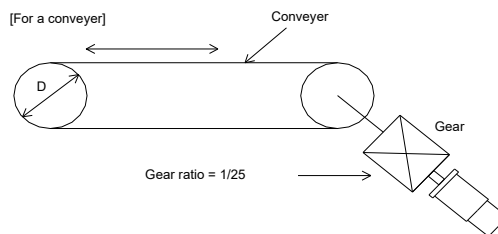
[Examples of setting electronic gear ratio and machine travel amount parameters]



P302: Minimum setting unit = 0.01mm
 P303: Electronic gear ratio numerator = 1
 P304: Electronic gear ratio denominator = 2
 P310: Machine travel amount = 10.00mm
 (When the motor rotates once, the ball screw rotates 0.5 times, and the stage moves by 5.00mm.)



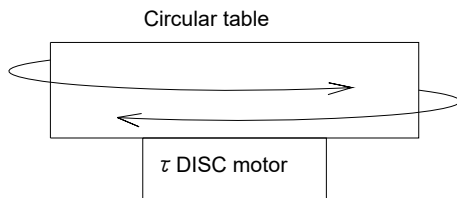
P302: Minimum setting unit = 0.1°
 P303: Electronic gear ratio numerator = 1
 P304: Electronic gear ratio denominator = 2
 P310: Machine travel amount = 360.0°
 (When the motor rotates once, the circular table rotates 0.5 times and moves by 180.0° .)



P302: Minimum setting unit = 0.001mm
 P303: Electronic gear ratio numerator = 1
 P304: Electronic gear ratio denominator = 25
 P310: Machine travel amount = πD mm
 (When the motor rotates 25 times, the conveyer moves by πD mm.)

[For direct drive 1]

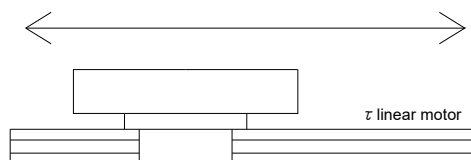
A circular table rotates once (360°).



P302: Minimum setting unit = 0.1°
 P303: Electronic gear ratio numerator = 1
 P304: Electronic gear ratio denominator = 1
 P310: Machine travel amount = 360.0°
 (When the motor rotates once, the circular table moves by 360.0° .)

[For direct drive 2]

Linear sensor resolution: 1 μm



P302: Minimum setting unit = 0.001mm
 P303: Electronic gear ratio numerator = 1
 P304: Electronic gear ratio denominator = 1
 P310: Machine travel amount = 0
 (When the motor moves by 10.000mm, the stage moves by 10.000mm.)

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Make sure that this setting value is such that the formula below holds.

For a rotation system motor

$$\frac{18750}{P005[\text{rpm}] \times \frac{P303}{P304} \times \frac{P310 [\text{setting unit}]}{P302} \times K} \times \frac{P205[\%]}{100} \leq 32767$$

P005: Applicable maximum number of rotations (when "0" is set, rated motor speed)

P302: Command unit (when P310 is set to "0", P302 = "1")

P310: Mechanical movement (when "0" is set, number of encoder pulses per rotation (4-multiplication))

K: Internal coefficient (to be calculated by entering the values below depending on the use conditions below.)

P205: Feed forward ratio

P303: Electronic gear numerator

P304: Electronic gear denominator

Use condition	τ motor	IM/SM motor
MECHATROLINK-III is connected.	125.0×10^{-6}	250.0×10^{-6}
MECHATROLINK-III is not connected	100.0×10^{-6}	200.0×10^{-6}

Rotation system motor calculation example 1

P005 = 300[rpm]

P302 = 0.001

P310 = 10.000[mm]

K = 100.0×10^{-6} (τ motor connected, MECHATROLINK-III not connected)

P205 = 80.0[%]

P303 = 1

P304 = 2

$$\frac{18750}{(300[\text{rpm}] \div 60[\text{sec}]) \times \frac{1}{2} \times \frac{10.000[\text{mm}]}{0.001} \times (100.0 \times 10^{-6})} \times \frac{80.0[\%]}{100} = 6000 < 32767$$

Rotation system motor calculation example 2

Rated motor speed = 300 [rpm]

P005 = 0[rpm] (replaced by rated motor speed)

P302 = 0.01 (replaced by "1" because P310 = "0")

P310 = 0.00 (replaced by pulse count per motor rotation)

K = 100.0×10^{-6} (τ motor connected, MECHATROLINK-III not connected)

Pulse count per motor rotation = 3200000[ppr]

P205 = 80.0[%]

P303 = 360000

P304 = 3200000

$$\frac{18750}{(300[\text{rpm}] \div 60[\text{sec}]) \times \frac{360000}{3200000} \times \frac{3200000[\text{ppr}]}{1} \times (100.0 \times 10^{-6})} \times \frac{80.0[\%]}{100} = 83.333 < 32767$$

P302
P303
P304
P310

For a linear system motor

$$\frac{18750}{P006[\text{mm/sec}] \times \frac{P303}{P304 \times P302} \times K} \times \frac{P205[\%]}{100} \leq 32767$$

P006: Applicable maximum speed (when "0" is set, P007 [mm/sec])

P302: Command unit (when "1" is set, "P003[um]÷1000")

K: Internal coefficient (same as that for a rotation system motor)

P205: Feed forward ratio

P303: Electronic gear numerator

P304: Electronic gear denominator

Linear system motor calculation example 1

P006 = 1600.00[mm/sec]

P302 = 0.001

K = 100.0×10^{-6} (MECHATROLINK-III not connected)

P205 = 80.0[%]

P303 = 1

P304 = 1

$$\frac{18750}{1600.00[\text{mm/sec}] \times \frac{1}{1 \times 0.001} \times (100.0 \times 10^{-6})} \times \frac{80.0[\%]}{100} = 93.75 \leq 32767$$

Linear system motor calculation example 2

P003 = 0.10000[um]

P006 = 0.00[mm/sec] (replaced by P007)

P302 = 1 (replaced by "P003 [um]÷1000")

K = 100.0×10^{-6} (MECHATROLINK-III not connected)

P007 = 1600.00[mm/sec]

P205 = 80.0[%]

P303 = 1

P304 = 1

$$\frac{18750}{1600.00[\text{mm/sec}] \times \frac{1}{1 \times (0.1[\text{um}] \div 1000)} \times (100.0 \times 10^{-6})} \times \frac{80.0[\%]}{100} = 9.375 \leq 32767$$

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)												
			Automatic	Manual	Zero return	Pulse train		Function														
											A	M	Z	P								
[Group 3] [Position adjustment parameter]																						
P312	Mass/inertia at GSEL condition	I	A	M	Z	P	F	Refer to explanation	00000000 to 999999999	00000000												
								Effective parameter at GSEL1, GSEL2, or GSEL3 condition. Set the control related [Mass] and [Inertia]. Also, the unit is as follows: In the case of the τ linear motor and the Servo Compass motor (*1) : Mass (10^{-4} kg) In the case of the Servo Compass motor (*2) : Inertia (10^{-4} kg·m ²) In the case of a motor other than the above : Inertia (10^{-6} kg·m ²) *1: If P000 = "031 to 034" or P000 = "999" and P020 = "1538" *2: If P000 = "035 to 038" or P000 = "999" and P020 = "1794" (Caution) Do not set if it is uncertain. ⚠ This parameter cannot be used for the device of SOFT VER 1.**.														
P313	Viscous friction at GSEL condition	I	A	M	Z	P	F	Refer to explanation	00000000 to 999999999	00000000												
								Effective parameter at GSEL1, GSEL2, or GSEL3 condition. Set the control related viscous friction. Also, the unit is as follows: In the case of the τ linear motor and the Servo Compass motor (*1) : 10^{-4} N/m/s In the case of the Servo Compass motor (*2) : 10^{-4} N·m/rad/s In the case of a motor other than the τ linear motor : 10^{-6} N·m/rad/s *1: If P000 = "031 to 034" or P000 = "999" and P020 = "1538" *2: If P000 = "035 to 038" or P000 = "999" and P020 = "1794" (Caution) Do not set if it is uncertain. ⚠ This parameter cannot be used for the device of SOFT VER 1.**.														
P314	Absolute position compensation function selection	P	A	M	Z	P	F	None	0 to 2	0												
								Select the absolute position compensation function and an encoder feedback pulse output method. <table><tr><th colspan="2">Absolute position compensation function</th><th colspan="2">Frequency division ratio setting</th></tr><tr><th>P314</th><th>Function</th><th>P012 and P013 is 0 *</th><th>P012 and P013 is not 0</th></tr><tr><td>0</td><td>Effective</td><td>△</td><td>△</td></tr><tr><td>1</td><td>Effective</td><td>△</td><td>○</td></tr><tr><td>2</td><td>Ineffective</td><td>△</td><td>△</td></tr></table> △: The same pulses as those of the motor encoder feedback are output. ○: Pulses are output by compensating the motor encoder feedback so that it can match the command position. *: Not output if a serial encoder is selected. For this parameter, the absolute position compensation option must be effective. For details, refer to "<<Absolute position compensation function and encoder feedback output frequency division ratio setting>>" in the functional explanation of the [P012] and [P013].			Absolute position compensation function		Frequency division ratio setting		P314	Function	P012 and P013 is 0 *	P012 and P013 is not 0	0	Effective	△	△
Absolute position compensation function		Frequency division ratio setting																				
P314	Function	P012 and P013 is 0 *	P012 and P013 is not 0																			
0	Effective	△	△																			
1	Effective	△	○																			
2	Ineffective	△	△																			

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
A	M	Z	P							
[Group 3] [Position adjustment parameter]										
P315	Position loop gain at GSEL3	I	•	•	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain for the time of GSEL signal ON/GSEL2 signal ON. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0", positioning operation is not executed normally.		
P316	Servo lock gain at GSEL3	I	•	•	Z	P	F	S ⁻¹	0000 to 9999	0020
								Set position loop gain for the time of GSEL signal ON/GSEL2 signal ON in servo-lock status. By setting big value, response is improved, but it can easily generate vibration. When setting value is "0", normal servo-lock status cannot be entered.		
P317	Active vibration control filter center frequency	I	A	M	Z	P	F	Hz	0 to 4999	0
								Set resonance frequency to avoid resonance when low frequency vibration occurs due to low rigidity in machine system configurations. When setting is "0", active vibration control filter becomes invalid.		
P318	Active vibration control filter bandwidth	I	A	M	Z	P	F	Hz	0 to 4999	0
								Set bandwidth of active vibration control filter. When setting is "0", active vibration control filter becomes invalid.		
P319	Active vibration control filter ineffective range	I	A	M	Z	P	F	%	0.00 to 100.00	0.00
								Set invalid speed range of active vibration control filter in the ratio against rated speed or applicable maximum speed. At the slower speed than this setting, active vibration control filter becomes invalid.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

6-3-5 Run operation parameter (Group 4)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 4] [Run operation parameter]										
P400	Jog speed 1	S	•	M	•	•	F	mm/sec ° /sec in/sec	00000001 to 99999999	00001000
								Set the jog speed when the Jog speed select signal (JOSP signal) is OFF. (Position of decimal point depends on [P302: Minimum setting unit].)		
P401	Jog speed 2	S	•	M	•	•	F	mm/sec ° /sec in/sec	00000001 to 99999999	00002000
								Set the jog speed when the Jog speed select signal (JOSP signal) is ON. (Position of decimal point depends on [P302: Minimum setting unit].)		
P402	Zero return method selection	S	A	•	Z	•	F	None	STD.HOME/LS LESS/STOP HOME/OT HOME/ABS HOME	STD.HOME
								Select Zero Return method. ◎STD.HOME (Standard Zero Return) After Zero point deceleration LS detection, the position of positioning with marker detection is set as Zero-point. ◎LS LESS (LS less Zero Return) Without deceleration control by Zero point deceleration LS, the position of positioning with marker detection is set as Zero-point. ◎STOP HOME (Current position Zero Return) Without operation, the current position is set as Zero-point. ◎OT HOME (OT-return Zero Return) After Zero point deceleration LS detection, the position of positioning with marker detection is set as Zero-point. If OT of operation direction is detected before Zero point deceleration LS detection, the direction is reversed. ◎ABS HOME (absolute encoder current position auto setting) Associate the encoder position when an absolute encoder is used with the machine position. This operation is possible only in zero point return mode. (A selection cannot be made with [HOME] or [SHOM].) For details, refer to [5-9-5 Absolute encoder position re-adjustment]. When P403 is set to [NON.MARK], motor operates based on Zero point deceleration LS, not using marker signal. For details, refer to [5-2-2 Zero return run mode].		
P403	Zero point maker selecting	R	A	•	Z	•	F	None	ENC.MARK/NON.MARK	ENC.MARK
								Select signal to use as Zero-point marker. ◎ENC.MARK : Encoder Marker ◎NON.MARK : No marker		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 4] [Run operation parameter]]										
P404	Zero return speed	S	A	•	Z	•	F	mm/sec ° /sec in/sec	00000001 to 99999999	00001000
								Set initial speed in Zero Return operation. (Position of decimal point depends on [P302: Minimum setting unit].) Startup at zero return mode makes both FJOG and RJOG signals valid. The operation speed of the HOME command depends on this setting value. The upper limit of the operation speed is the rated speed or applicable maximum speed of the motor to use.		
P405	Zero return creep speed	R	A	•	Z	•	F	mm/sec ° /sec in/sec	00000001 to 99999999	00000100
								Set creep operation speed after Zero point deceleration LS detection in Zero Return operation. (Position of decimal point depends on [P302: Minimum setting unit].) Generally, set lower than 1/100 of motor rated speed or applicable maximum speed. In LS less Zero Return, motor operates at the speed of this setting value from the beginning.		
P406	Zero return position constant	R	A	•	Z	•	F	mm/ ° /in	00000000 to 99999999	00010000
								Set distance to start marker signal detection after Zero point deceleration LS detection in Zero Return operation. (Position of decimal point depends on [P302: Minimum setting unit].) Set a value more than decelerable distance from Zero Return speed to Zero Return creep speed. When [P403] is set to [NON.MARK], motor operates based on Zero point deceleration LS, not using marker signal. For details, refer to [5-2-2 Zero return run mode]. (Caution) Small setting value in high-speed Zero Return requires rapid deceleration and instant stop. Thus, set ample time enabling deceleration to creep speed.		
P407	Zero return set distance	R	A	•	Z	•	F	mm/ ° /in	—99999999 to 99999999	00000000
								Set +α traveling distance from the point of marker signal detection in Zero Return operation. It is used to minutely adjust marker signal position and machine Zero-point position. (Position of decimal point depends on [P302: Minimum setting unit].) Positioning is executed toward same direction as Zero Return direction when code is "+" or toward reverse direction when code is "-" When setting value is "0", Zero Return is completed upon marker signal detection. When setting value is equal to or lower than stop distance from Zero Return creep speed, it overshoots at the completion of Zero Return. When [P403] is set to [NON.MARK], motor operates based on Zero point deceleration LS, not using marker signal. For details, refer to [5-2-2 Zero return run mode].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 4] [Run operation parameter]										
P408	Position data reference point	R	A	.	Z	.	F	mm/° /in	-99999999 to 99999999	00000000
									Set standard position of absolute position data in the distance from machine Zero-point. (Position of decimal point depends on [P302: Minimum setting unit].) Setting value is set upon completion of Zero Return. If positioning operation is executed without Zero Return after power-on, position where power supply is switched on becomes standard position of absolute position data. Parameters [P306] and [P307] soft OT limit values are based on this position data standard point.	
P409	Automatic run permission condition selection	S	A	.	.	.	F	None	AUTO.N/AUTO.Y	AUTO.N
									Select conditions of start permission for automatic run. ◎AUTO.N (After Zero Return completion) After completion of Zero Return, automatic run can be started. However, it is disabled if external run-impossible factor exists. ◎AUTO.Y (Unconditional) Automatic run can be started at anytime. However, it is disabled if external run-impossible factor exists.	
P410	OT back Zero return at OT deceleration time	R	A	.	Z	.	F	sec	00.00 to 99.99 (10msec Unit)	00.50
									Set deceleration time of motor from rated speed or applicable maximum speed to stop. When S-letter accel-decel curve is selected in [P210], deceleration time of motor becomes long by this setting value. This setting is valid only in OT reverse operation of OT-return Zero Return.	
P411	External trigger level selection	R	A	.	.	.	F	None	TRG.EDGE/TRG.LEVEL	TRG.EDGE
									Select which of the "ON edge" and "ON level" to use to receive an external trigger signal when executing external trigger positioning. ◎ TRG.EDGE: Receives an external trigger signal at its ON edge. ◎ TRG.LEVEL: Receives an external trigger signal at the ON level. (The signal is received when it is ON at the automatic start or restart after hold or block stop.) (Note) When TRG.LEVEL is set, it can be received with a remote signal at automatic start, or at restart from temporary stop or block stop. During operation for which automatic operation external trigger positioning is valid, TRG signal ON cannot be received with a remote signal regardless of this setting.	

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
A	M	Z	P	[Group 4] [Run operation parameter]						
P412	Current position set selection at power ON	P	A	M	Z	P	F	None	0 to 2	0
								Select current position in accordance with the purpose of use.		
								Setting	Contents	
								0	Adjust to machine Zero-point by executing Zero Return operation, as the current position (ST01) at the power-on becomes "0". It is used in motor multi rotation operation. The soft OT limit, HCMP signal, and soft limit switch become effective when the power is turned on. * P018, P019, and P413 become invalid.	
								1	Set current position (ST01) based on absolute encoder position at the power-on. It can be used when motor operating range is within motor 1 rotation. For the current position, refer to setting example of P413. The soft OT limit, HCMP signal, and soft limit switch become effective when the power is turned on.	
2	Adjust to machine Zero-point by executing Zero Return operation, as the current position (ST01) at the power-on becomes "0". It is used in motor multi rotation operation. The soft OT limit, HCMP signal, and soft limit switch remain ineffective until zero point return is complete. * P018, P019, and P413 become invalid.									
* It becomes valid when P001 is [S-ABS2/S-ABS3/S-MABS/S-ABS4].										
P413	Code switching position in one rotation range	P	A	M	Z	P	F	mm/°/in	00000000 to 99999999	00000000
								Set maximum position of + area of current position (ST01) within motor 1 rotation area. Position of decimal point depends on [P302: Minimum setting unit]. When this function is invalid, current position (ST01) is in + area in forward rotation against 0 position or in - area in reverse rotation.		
								* If P001 is [S-ABS2/S-ABS3/S-ABS4], the function becomes effective when P412 is set to "1".		
								* If P001 is [S-MABS], the function becomes effective when P412 is set to "1" and P414 is set to "1".		
								* This function becomes invalid in the following setting status or when operation is in process. - When setting value is "0" - When executed Zero Return - When set smaller value than a value of P019 - When P305 is set - When set a value equal to or greater than the value of P310		

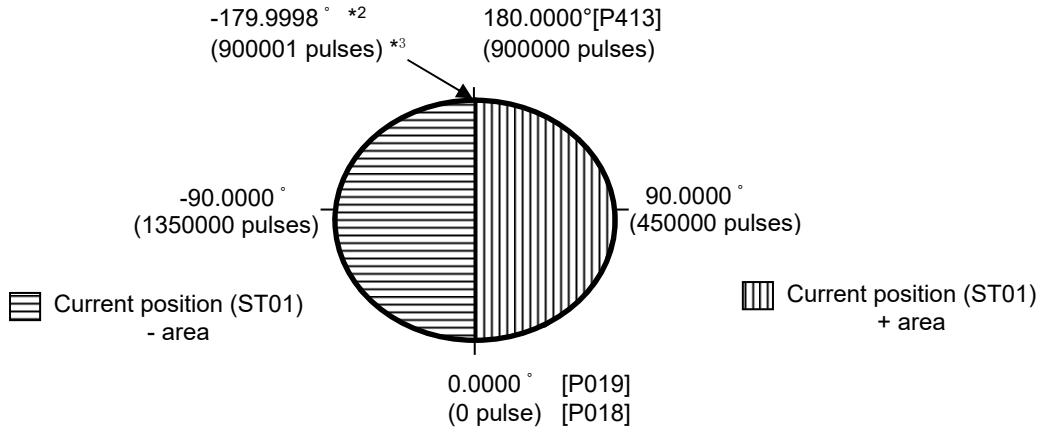
*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

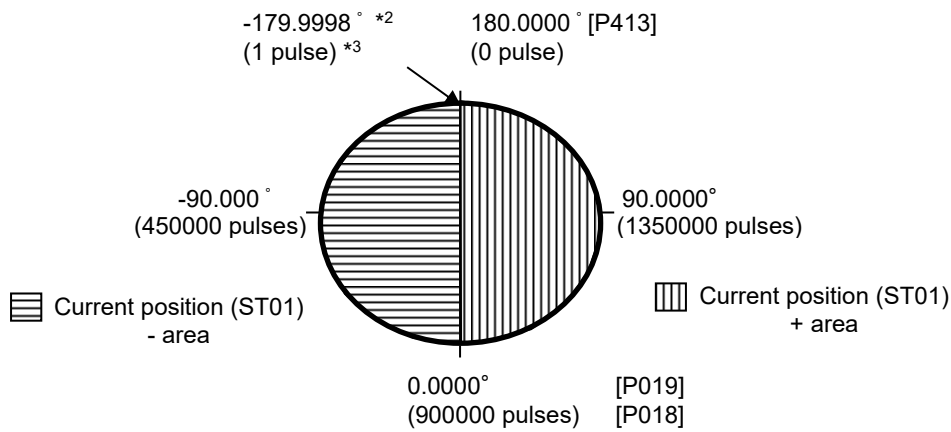
[Setting example of sign switching position in 1-rotation range]

P004 Tau DISC motor encoder pulse number : 1800000[ppr]
P018 ABS encoder value for machine base position : 0 (Pulse=absolute encoder position)
P019 ABS standard mechanical position : 0.0000[°]
P301 Setting unit selection : [°]
P302 Minimum setting unit : 0.0001[°]
P310 Machine travel amount : 360.0000[°]
P412 Current position set selection at power ON : 1
P413 Code switching position in one rotation range : 180.0000[°]



[Setting example of sign switching position in 1-rotation range (ABC encoder value offset)]

P004 Tau DISC motor encoder pulse number : 1800000[ppr]
P018 ABS encoder value for machine base position : 900000(Pulse=absolute encoder position)
P019 ABS standard mechanical position : 0.0000[°]
P301 Setting unit selection : [°]
P302 Minimum setting unit : 0.0001[°]
P310 Machine travel amount : 360.0000[°]
P412 Current position set selection at power ON : 1
P413 Code switching position in one rotation range : 180.0000[°]



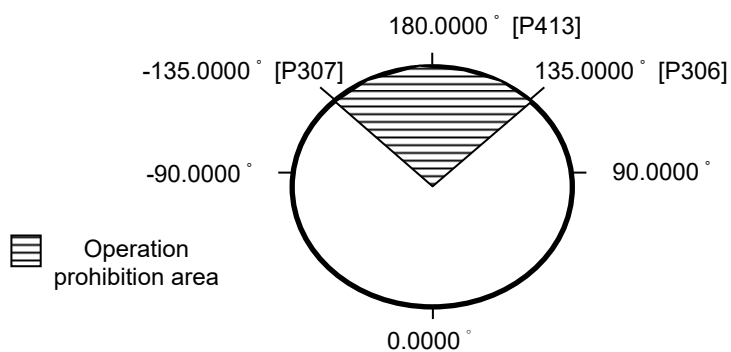
*2 Display position displayed as the current position (ST01).

*3 Absolute encoder position.

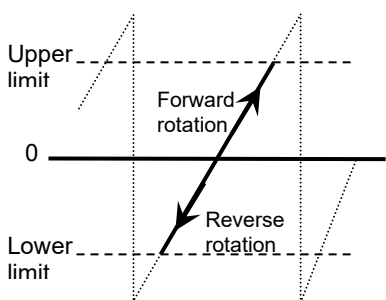
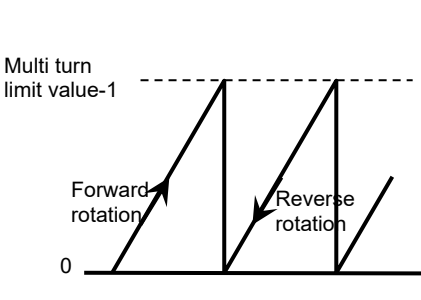
[Example of an operation prohibition area in 1-rotation range]

An operation prohibition area can be set in 1-rotation range by setting P413 and P306/P307 in combination.

P301 Setting unit selection	: [°]
P302 Minimum setting unit	: 0.0001[°]
P306 Forward software OT limit	: 135.0000[°]
P307 Reverse software OT limit	: -135.0000[°]
P310 Machine travel amount	: 360.0000[°]
P412 Current position set selection at power ON	: 1
P413 Code switching position in one rotation range	: 180.0000[°]



Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 4] [Run operation parameter]										
P414	Multi turn limit	P	A	M	Z	P	F	None	000 to 255	000
								Set the maximum number of rotations of the motor if it is operated with an infinite length. If the motor rotates only in one direction about the machine as a rotating body, the upper limit of the operation range is the upper limit of the rotation speed of the absolute encoder. For a machine system in which when the load axis rotates n times, the motor rotates m times, setting m in this parameter causes the rotation speed of the absolute encoder to return to 0 according to this setting, so that infinite length operation can be performed. If this setting is "0", finite length operation can be performed at up to the upper limit of the rotation speed of the absolute encoder. * It is effective if P001 is [S-MABS].		
								Function based on the setting value of the multi turn limit		
								Multi turn limit	= 0	= 1 to 255
								Operation range limit	Yes (finite length operation)	No (infinite length operation)
Absolute encoder overflow error	Detection	No detection								
Rotation speed of the absolute encoder	 Upper limit Forward rotation 0 Reverse rotation Lower limit If the upper limit or the lower limit is exceeded, an overflow error occurs.	 Multi turn limit value-1 Forward rotation Reverse rotation 0 Rotation amount								
P415	Speed loop gain at GSEL2	I	A	M	Z	P	F	None	0000 to 9999	0025
								Set gain of speed loop in GSEL signal OFF/GSEL 2 signal ON. (For details, refer to [P101].)		
P416	Speed loop integral time constant at GSEL2	I	A	M	Z	P	F	msec	0000.00 to 9999.99	0020.00
								Set time constant of integral correction of speed loop in GSEL signal OFF/GSEL 2 signal ON. (For details, refer to [P102].)		
P417	Speed loop differential time constant at GSEL2	I	A	M	Z	P	F	μ sec	-9999 to 9999	0000
								Set time constant of differential correction of speed loop in GSEL signal OFF/GSEL 2 signal ON. (For details, refer to [P103].) ⚠ [-] (Negative) value cannot be set for the device of SOFT VER 1.**.		
P418	Speed loop proportional gain division ratio at GSEL2	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set proportional correction gain division ratio of Two-degree-of-freedom PID velocity control system in GSEL signal OFF/GSEL 2 signal ON. (For details, refer to [P104].)		
P419	Speed loop differential gain division ratio at GSEL2	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set differential correction gain division ratio of Two-degree-of-freedom PID velocity control system in GSEL signal OFF/GSEL 2 signal ON. (For details, refer to [P105].)		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

6-3-6 Display, communication, edit parameter (Group 5)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 5] [Display, communication, edit parameter]										
P500	Manufacturer exclusive use	-	.	.	.	.	F			00000
								Be sure setting value of this parameter is always "0".		
P501	Manufacturer exclusive use	-	.	.	.	.	F			00000
								Be sure setting value of this parameter is always "0".		
P502	LCD current position display selection	I	A	M	Z	P	F	None	ABSOLUTE/MACHINE/INCREMENT/ ABS.ENC./ENC.FB	ABSOLUTE
								Select contents of current position to display in status display mode [ST01] on LCD. ◎ABSOLUTE (Absolute position) It displays distance (position) from position data standard point. When a value other than 0 is set to the Index data range (P305), it displays the position or angle on the rotating object. ◎MACHINE (Machine position) Same display as absolute position. However, when a value other than 0 is set to the Index data range (P305), it displays the accumulated operation distance. ◎INCREMENT (Relative position) It displays distance (position) from positioning start position. ◎ABS.ENC. (ABS encoder data) It displays position controlled by ABS encoder. ◎ENC.FB (Encoder feedback data) It displays value (position) came from encoder as feedback. * The current position when ABSOLUTE/MACHINE/INCREMENT is set is as below depending on the position control effective status (mainly RDY signal ON status) and the ineffective status (mainly RDY signal OFF status). Position control effective: The target (command) position is displayed. Position control ineffective: The encoder feedback position is displayed.		
P503	Feedback filter time constant	P	A	M	Z	P	F	msec	00.0 to 50.0	00.0
								This parameter is effective only if the setting of P001 is S-ABS4. Set the speed feedback filter time constant to use when using S-ABS4. If 0 is set, the filter is ineffective. * Do not set this parameter unless otherwise instructed by us.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																								
			Automatic	Manual	Zero return	Pulse train		Function																										
			A	M	Z	P																												
[Group 5] [Display, communication, edit parameter]																																		
P504	1 phase concentration time electronic thermal detection selection	R	A	M	Z	P	F	%	0 to 200	70																								
Set 1 phase concentration time electronic thermal detection selection for preventing 1 phase concentration thermal damage at one location of the coil unit * If setting a value other than "70" for this setting value, contact our sales representative. * If this setting value is less than "70", detection is performed by assuming this setting value to be "70". * Under one of the conditions below, electronic thermal detection is performed according to the setting of P144 even during 1 phase concentration. • P144 is set to "O.L. XXX%". • For a device whose device capacity exceeds 30kW, P144 is set to [BIG]. • An SM motor/IM motor is used. * For information about the electronic thermal detection method, refer to [10-4 (8) Overload error].																																		
P505	Communication unit number selection	R	A	M	Z	P	F	None	0 to 9	5																								
Select external equipment (protocol) to be connected in serial communication.																																		
<table><tr><th>Setting</th><th>External equipment</th><th>Setting</th><th>External equipment</th></tr><tr><td>0</td><td>Reserved</td><td>5</td><td>Exclusive PC software</td></tr><tr><td>1</td><td>Reserved</td><td>6</td><td>Reserved</td></tr><tr><td>2</td><td>PC</td><td>7</td><td>Reserved</td></tr><tr><td>3</td><td>Touch panel</td><td>8</td><td>Reserved</td></tr><tr><td>4</td><td>Reserved</td><td>9</td><td>Reserved</td></tr></table>											Setting	External equipment	Setting	External equipment	0	Reserved	5	Exclusive PC software	1	Reserved	6	Reserved	2	PC	7	Reserved	3	Touch panel	8	Reserved	4	Reserved	9	Reserved
Setting	External equipment	Setting	External equipment																															
0	Reserved	5	Exclusive PC software																															
1	Reserved	6	Reserved																															
2	PC	7	Reserved																															
3	Touch panel	8	Reserved																															
4	Reserved	9	Reserved																															
P506	Communication ID number	R	A	M	Z	P	F	None	00 to 16	01																								
Set ID No. (Station number) when connecting daisy-chain in serial communication. (Set "01" when connecting 1 unit only.)																																		
P507	Data length selection (serial communication)	R	A	M	Z	P	F	BITS	7 BITS/8 BITS	8 BITS																								
Select transceiving data length for serial communication.																																		
P508	Parity selection (serial communication)	R	A	M	Z	P	F	None	NONE/ODD/EVEN	ODD																								
Select parity for serial communication. ◎NONE : No parity ◎ODD : Odd parity ◎EVEN : Even parity																																		
P509	Baud rate selection (serial communication)	R	A	M	Z	P	F	BPS	4.8K/9.6K/19.2K/56K/115.2K	9.6K																								
Select baud rate for serial communication. * Currently, 115.2KBPS is not supported. Do not select it.																																		
P510	Manufacturer exclusive use	-	.	.	.	.	F			00000000																								
Be sure setting value of this parameter is always "0".																																		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 5] [Display, communication, edit parameter]										
P511	Communication group-ID set 1	R	A	M	Z	P	F	None	000 to 255	000
								When executing simultaneous transmissive communication by connecting plural number of this device, select ID number to allocate to the same group. ◎ 0 : Does not set communication group. ◎1 to 255 : Participate in a group to which number is set. If ID is set in either of area 1 to 5, it means the participation in a group of the same ID number. It does not depend on setting area number (1 to 5).		
P512	Communication group response Yes/No 1	R	A	M	Z	P	F	None	RESP.OFF/RESP. ON	RESP.OFF
								Set this parameter with Communication group-ID set 1 as a pair. Based on this, when simultaneous transmissive communication is executed to the participated groups, designate Yes/No of response to master unit. ◎RESP.OFF : Does not respond to master unit. ◎RSEP. ON : Respond to master unit in simultaneous transmissive communication.		
P513	Communication group-ID set 2	R	A	M	Z	P	F	None	000 to 255	000
								This is the 2nd area to set communication group ID number. Setting method is same as Communication group-ID set 1.		
P514	Communication group response Yes/No 2	R	A	M	Z	P	F	None	RESP.OFF/RESP. ON	RESP.OFF
								Set this parameter with Communication group-ID set 2 as a pair. Setting method is same as Communication group response Yes/No 1.		
P515	Communication group-ID set 3	R	A	M	Z	P	F	None	000 to 255	000
								This is the 3rd area to set communication group ID number. Setting method is same as Communication group-ID set 1.		
P516	Communication group response Yes/No 3	R	A	M	Z	P	F	None	RESP.OFF/RESP. ON	RESP.OFF
								Set this parameter with Communication group-ID set 3 as a pair. Setting method is same as Communication group response Yes/No 1.		
P517	Communication group-ID set 4	R	A	M	Z	P	F	None	000 to 255	000
								This is the 4th area to set communication group ID number. Setting method is same as Communication group-ID set 1.		
P518	Communication group response Yes/No 4	R	A	M	Z	P	F	None	RESP.OFF/RESP. ON	RESP.OFF
								Set this parameter with Communication group-ID set 4 as a pair. Setting method is same as Communication group response Yes/No 1.		
P519	Communication group-ID set 5	R	A	M	Z	P	F	None	000 to 255	000
								This is the 5th area to set communication group ID number. Setting method is same as Communication group-ID set 1.		
P520	Communication group response Yes/No 5	R	A	M	Z	P	F	None	RESP.OFF/RESP. ON	RESP.OFF
								Set this parameter with Communication group-ID set 5 as a pair. Setting method is same as Communication group response Yes/No 1.		
P521	Servo control communication-ID number	P	A	M	Z	P	F	None	0 to 8	8
								Set master/slave station in servo control communication. By setting "0" it becomes master station. In the case of pulse train communication function, set ID number of all slave stations to "8". * This function currently supports pulse train communication function only.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 5] [Display, communication, edit parameter]										
P522	Servo control communication control mode	P	A	M	Z	P	F	None	PULSE/CNTRL	PULSE
								Select control mode in servo control communication. ◎PULSE : Pulse train communication function ◎CNTRL : Control block construction function Alarm occurs if set mode and received text is not matched. * This function currently supports pulse train communication function only. Use with [PULSE] setting.		
P523	Alarm stop selection at servo control communication stopped	P	A	M	Z	P	F	None	NON ALM/ALM	ALM
								Select operation in case of communication interruption of the device during connection in servo control communication. ◎NON ALM : Operation is continued without stopping motor. ◎ALM (Alarm-stop): : Alarm signal (ALM) is output, and motor stops instantly.		
P524	Servo control communication real time data 1 device number	R	A	M	Z	P	F	None	0 to 29999	00064
								Designate device number of data to set to real-time data 1 in servo control communication. * This function is not supported yet; thus, do not edit.		
P525	Servo control communication real time data 2 device number	R	A	M	Z	P	F	None	0 to 29999	00054
								Designate device number of data to set to real-time data 2 in servo control communication. * This function is not supported yet; thus, do not edit.		
P526	Servo control communication real time data 3 device number	R	A	M	Z	P	F	None	0 to 29999	00042
								Designate device number of data to set to real-time data 3 in servo control communication. * This function is not supported yet; thus, do not edit.		
P527	Servo control communication real time data 4 device number	R	A	M	Z	P	F	None	0 to 29999	00040
								Designate device number of data to set to real-time data 4 in servo control communication. * This function is not supported yet; thus, do not edit.		
P528	Servo control communication real time data 5 device number	R	A	M	Z	P	F	None	0 to 29999	00036
								Designate device number of data to set to real-time data 5 in servo control communication. * This function is not supported yet; thus, do not edit.		
P529	Manufacturer exclusive use	-	.	.	.	.	F		5MBPS/10MBPS/3.3MBPS/6.6MBPS	10 MBPS
								Be sure to set "10 MBPS" to this parameter.		
P530	Remote write area 5	R	A	M	Z	P	F		00000 to 29999	21000
								Function is same as [P720]. With the initial value, the remote write function is set to be ineffective.		
P531	Remote write area 6	R	A	M	Z	P	F		00000 to 29999	21000
								Function is same as [P720]. With the initial value, the remote write function is set to be ineffective.		
P532	Manufacturer exclusive use	-	.	.	.	.	F			00
								Be sure to set "00" to this parameter.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																																																								
			Automatic	Manual	Zero return	Pulse train		Function																																																										
			A	M	Z	P																																																												
[Group 5] [Display, communication, edit parameter]																																																																		
P533	External input ON fixed selection 1	R	A	M	Z	P	F	None	000000000 to 268435455	000000000																																																								
								Set signal desired to be always ON with external input signal. Signal set here is always ON disregarding external input signal. Whether setting is valid or invalid is indicated with 1/0 of 1 bit and set by converting it to decimal number. (1: ON-fix/0: No changes) - Even when signal is set to ON-fix, OFF-fix has priority if the same signal is set to OFF-fix in [P535: External input OFF fixed selection 1]. - As for correspondence between signal name and setting bit, see below. [Setting example] When setting [TL, MD2, and MD1] to ON-fix - Set "1" to bits 13, 12, and 11 (00003800 in hexadecimal number). - Set 14336, which is converted to decimal number, to parameter.																																																										
								<Correspondence between signal name and setting bit> Bit <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr><tr><td>-</td><td>-</td><td>-</td><td>-</td><td>PS8</td><td>PS7</td><td>PS6</td><td>PS5</td><td>PS4</td><td>PS3</td><td>PS2</td><td>PS1</td><td>-</td><td>GSEL2</td><td>-</td><td>PC</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>BRON</td><td>CIH</td><td>TL</td><td>MD2</td><td>MD1</td><td>-</td><td>-</td><td>-</td><td>ROT</td><td>FOT</td><td>CLR</td><td>GSEL</td><td>-</td><td>SON</td><td>EMG</td><td>RST</td></tr></table>			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	-	-	-	-	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	-	GSEL2	-	PC	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	BRON	CIH	TL	MD2	MD1	-	-	-
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16																																																			
-	-	-	-	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	-	GSEL2	-	PC																																																			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																			
BRON	CIH	TL	MD2	MD1	-	-	-	ROT	FOT	CLR	GSEL	-	SON	EMG	RST																																																			
P534	External input ON fixed selection 2	R	A	M	Z	P	F	None	000000000 to 268435455	000000000																																																								
								Set signal desired to be always ON with external input signal. Signal set here is always ON disregarding external input signal. Whether setting is valid or invalid is indicated with 1/0 of 1 bit and set by converting it to decimal number. (1: ON-fix/0: No changes) - Even when signal is set to ON-fix, OFF-fix has priority if the same signal is set to OFF-fix in [P536: External input OFF fixed selection 2]. - As for correspondence between signal name and setting bit, see below. [Setting example] When setting [JOSP, OR1, and OR2] to ON-fix - Set "1" to bits 3, 8, and 9 (00000308 in hexadecimal number) - Set 776, which is converted to decimal number, to parameter.																																																										
								<Correspondence between signal name and setting bit> Bit <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr><tr><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>EXT3</td><td>EXT2</td><td>EXT1</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>-</td><td>ZLS</td><td>TRG</td><td>HLD</td><td>OR4</td><td>OR3</td><td>OR2</td><td>OR1</td><td>EPIH</td><td>PCAN</td><td>BSTP</td><td>MFIN</td><td>JOSP</td><td>RJOG</td><td>FJOG</td><td>PST</td></tr></table>			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	-	-	-	-	-	-	-	-	-	-	-	-	-	EXT3	EXT2	EXT1	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	-	ZLS	TRG	HLD	OR4	OR3	OR2	OR1
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16																																																			
-	-	-	-	-	-	-	-	-	-	-	-	-	EXT3	EXT2	EXT1																																																			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																			
-	ZLS	TRG	HLD	OR4	OR3	OR2	OR1	EPIH	PCAN	BSTP	MFIN	JOSP	RJOG	FJOG	PST																																																			

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																																																								
			Automatic	Manual	Zero return	Pulse train		Function																																																										
			A	M	Z	P																																																												
[Group 5] [Display, communication, edit parameter]																																																																		
P535	External input OFF fixed selection 1	R	A	M	Z	P	F	None	000000000 to 268435455	000000000																																																								
								Set signal desired to be always OFF with external input signal. Signal set here is always OFF disregarding external input signal. Whether setting is valid or invalid is indicated with 1/0 of 1 bit and set by converting it to decimal number. (1: OFF-fix/0: No changes) ▪ Even when signal is set to ON-fix in [P533: External input ON fixed selection 1], OFF-fix has priority. ▪ As for correspondence between signal name and setting bit, see below. [Setting example] When setting [TL, MD2, and MD1] to OFF-fix 1) Set "1" to bits 13, 12, and 11 (00003800 in hexadecimal number). 2) Set 14336, which is converted to decimal number, to parameter.																																																										
								<Correspondence between signal name and setting bit> Bit																																																										
								<table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr><tr><td>-</td><td>-</td><td>-</td><td>-</td><td>PS8</td><td>PS7</td><td>PS6</td><td>PS5</td><td>PS4</td><td>PS3</td><td>PS2</td><td>PS1</td><td>-</td><td>GSEL2</td><td>-</td><td>PC</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>BRON</td><td>CIH</td><td>TL</td><td>MD2</td><td>MD1</td><td>-</td><td>-</td><td>-</td><td>ROT</td><td>FOT</td><td>CLR</td><td>GSEL</td><td>-</td><td>SON</td><td>EMG</td><td>RST</td></tr></table>			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	-	-	-	-	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	-	GSEL2	-	PC	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	BRON	CIH	TL	MD2	MD1	-	-	-
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16																																																			
-	-	-	-	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	-	GSEL2	-	PC																																																			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																			
BRON	CIH	TL	MD2	MD1	-	-	-	ROT	FOT	CLR	GSEL	-	SON	EMG	RST																																																			
P536	External input OFF fixed selection 2	R	A	M	Z	P	F	None	000000000 to 268435455	000000000																																																								
								Set signal desired to be always OFF with external input signal. Signal set here is always OFF disregarding external input signal. Whether setting is valid or invalid is indicated with 1/0 of 1 bit and set by converting it to decimal number. (1: OFF-fix/0: No changes) ▪ Even when signal is set to ON-fix in [P534: External input ON fixed selection 2], OFF-fix has priority. ▪ As for correspondence between signal name and setting bit, see below. [Setting example] When setting [RJOG and JOSP] to OFF-fix 1) Set "1" to bits 2 and 3 (00000000C in hexadecimal number). 2) Set 12, which is converted to decimal number, to parameter.																																																										
								<Correspondence between signal name and setting bit> Bit																																																										
								<table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr><tr><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>EXT3</td><td>EXT2</td><td>EXT1</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>-</td><td>ZLS</td><td>TRG</td><td>HLD</td><td>OR4</td><td>OR3</td><td>OR2</td><td>OR1</td><td>EPIH</td><td>PCAN</td><td>BSTP</td><td>MFIN</td><td>JOSP</td><td>RJOG</td><td>FJOG</td><td>PST</td></tr></table>			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	-	-	-	-	-	-	-	-	-	-	-	-	-	EXT3	EXT2	EXT1	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	-	ZLS	TRG	HLD	OR4	OR3	OR2	OR1
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16																																																			
-	-	-	-	-	-	-	-	-	-	-	-	-	EXT3	EXT2	EXT1																																																			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																			
-	ZLS	TRG	HLD	OR4	OR3	OR2	OR1	EPIH	PCAN	BSTP	MFIN	JOSP	RJOG	FJOG	PST																																																			
P537	Manufacturer exclusive use	-	.	.	.	.	F			00000000																																																								
									Be sure to set "00000000" to this parameter.																																																									

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 5] [Display, communication, edit parameter]										
P538	Brake release signal output speed during motor rotation	R	A	M	Z	P	F	%	0.0 to 100.0	0.0
								Set the speed at which the control output signal (BRK) is switched OFF after the motor enters the torque free status when an alarm, emergency stop, servo off, or reset occurs. This parameter is effective if one of the above occurs when [P734] is set to a negative value and the motor is rotating (SZ signal OFF). The actual operation is performed if the condition for [P538] or [P539] is met first. For details, refer to [P734].		
P539	Brake release signal OFF time from servo off during motor rotation	R	A	M	Z	P	F	sec	0.00 to 9.99 (10msec Unit)	0.00
								Set the delay time after which the control output signal (BRK) is switched OFF after the motor enters the torque free status when an alarm, emergency stop, servo off, or reset occurs. This parameter is effective if one of the above occurs when [P734] is set to a negative value and the motor is rotating (SZ signal OFF). The actual operation is performed if the condition for [P538] or [P539] is met first. If the setting value is "0.00", this function is ineffective, and operation is performed only under the condition for P538. For details, refer to [P734].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

6-3-7 Pulse train input parameter (Group 6)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 6] [Pulse train input parameter]										
P600	CIH signal function selection	R	A	M	Z	P	F	None	CIH CLOSE/CIH OPEN/ PFB CLOSE/PFB OPEN	CIH CLOSE
								Select effective logic of control input signal (CIH). CIH: Function which prohibits the command pulse input PFB: Function which switches between the measuring encoder and motor encoder The following options (combinations of the CIH or PFB function and effective logic) are available. (CIH-COM terminals, Short: ON, Open: OFF) Ⓒ CIH CLOSE Pulse train command Signal ON: Invalid/OFF: Valid Ⓒ CIH OPEN Pulse train command Signal ON: Valid/OFF: Invalid Ⓒ PFB CLOSE Position feedback Signal ON: Uses the motor encoder./OFF: Uses the measuring encoder (pulse train input). Ⓒ PFB OPEN Position feedback Signal ON: Uses the measuring encoder (pulse train input)./OFF: Uses the motor encoder. * CIH is effective only during pulse train operation. * When [CIH OPEN] or [PFB OPEN] is selected: If it is used only remotely with CC-Link/Device Net, etc., no external input is used, so that CIH is fixed to the ON status. Use the parameter [P735: External input ineffective selection 1] to set the CIH signal to be ineffective. If it is used remotely, the operation is the same as that when [CIH CLOSE] or [PFB CLOSE] is used.		
P601	Pulse train command phase order switch	R	.	.	.	P	F	None	FORWARD/REVERSE	FORWARD
								Select operation direction of motor by pulse train command input. Ⓒ FORWARD (forward direction select) Motor executes forward direction operation with pulse train command of forward direction or B-phase precedence. Ⓒ REVERSE (reverse direction select) Motor executes reverse direction operation with pulse train command of forward direction or B-phase precedence. However, by selecting [REVERSE] in [P300: Rotation direction selection], above operation direction is reversed.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 6] [Pulse train input parameter]										
P602	Pulse train command type selection	P	A	M	Z	P	F	None	X1/X2/X4/F/R PULSE/P+F/R/ID0.FCRC/ID0.CMNDP/ID0.MTENC	X1
								Select signal input form and multiplication ratio of pulse train command. [ID0.XXX] below selects command pulse of master station (ID0) in servo control communication. ◎ X1 : 1 time with 90° phase difference pulse ◎ X2 : 2 times with 90° phase difference pulse ◎ X4 : 4 times with 90° phase difference pulse ◎F/R PULSE : Directional pulse (1 time only) ◎P + F/R : Direction signal + feed pulse (1 time only) ◎ID0.FCRC : Pulse train command by servo control communication Receives external pulse train (pulse train input by CN1, FC/RC). (In the case of 90° phase difference pulse, it receives 4-multiplication pulse train). ◎ID0.CMNDP : Receives position command generated inside pulse train command in servo control communication. (Receives pulse train of 1-pulse in [302: Minimum setting unit]). ◎ID0.MTENC : Receives pulse train of pulse train command motor encoder 4-multiplication in servo control communication.		
Please refer to [5-13 Servo control communication] for the details.										

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 6] [Pulse train input parameter]										
P603	Pulse train command adjustment numerator	I	.	.	.	P	F	None	00000001 to 99999999	00000001
								Set number of pulse train command input pulses per a unit of operation command (=pulse train correction ratio), in combination with [P604: Pulse train command adjustment denominator]. (The unit of operation command is decided with parameters [P301] and [P302].) Assuming that pulse train command input pulses is n when operation command volume is m, set n value with this parameter.		
P604	Pulse train command adjustment denominator	I	.	.	.	P	F	None	00000001 to 99999999	00000001
								Set operation command volume per a unit of operation command (=pulse train correction ratio), in combination with [P603: Pulse train command adjustment numerator]. (The unit of operation command is decided with parameters [P301] and [P302].) Assuming that number of pulse train command input pulses is n when operation command volume is m, set m value with this parameter.		
P603 P604	[Setting example of pulse train correction ratio] Setting operation command volume (load travel volume) of 10.00 mm (Position of decimal point depends on [P302: Minimum setting unit]) to support pulse train command input 1500 pulses Setting value $\left\{ \begin{array}{l} [P603]= [\text{Number of pulse train command input pulses}] = 1500 \\ [P604]= \frac{[\text{Operation command volume}]}{[\text{P302: Minimum setting unit}]} = 1000 \end{array} \right.$ $\frac{[\text{Operation command volume}]}{[\text{P302: Minimum setting unit}]} \times \frac{[\text{P603: Pulse train command adjustment numerator}]}{[\text{P604: Pulse train command adjustment denominator}]} = [\text{Number of pulse train command input pulses}]$									
P605	Pulse train feed forward ratio	I	.	.	.	P	F	%	000.0 to 120.0	080.0
								Set feed/forward ratio for speed command in pulse train operation. By setting big value, the compliance becomes better. However, vibration can occur depending on the suitability with machine system. In this case, allow some deviations by decreasing the setting value. This measure can make the operation stable. When the setting is "0", feed/forward control is not executed.		
P606	Pulse train feed forward shift ratio	I	.	.	.	P	F	%	000.0 to 100.0	001.0
								Feed/forward volume in pulse train operation is reduced. Feed/forward volume= Input pulse speed - (rated speed or applicable maximum speed x setting value (%)) However, if the sign changes against input pulse speed in the above formula, it is clamped with "0".		
P607	Pulse train feed forward filter time constant	I	.	.	.	P	F	msec	000.0 to 100.0	020.0
								Set filter time constant of response adjustment for feed/forward control in pulse train operation.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)	
			Automatic	Manual	Zero return	Pulse train		Function			
			A	M	Z	P					
[Group 6] [Pulse train input parameter]											
P608	Pulse train late compensating time	I	•	•	•	P	F	msec	0000.0 to 1000.0 (0.1msec Unit)	0000.0	
								Set control delay compensation time in pulse train operation.			
P609	Pulse train leveling filter time	R	•	•	•	P	F	msec	0000.0 to 1000.0 (0.1msec Unit)	0000.0	
								Set averaging filter time against command in pulse train operation. Actual operation is as follows, due to pulse train command. ◎In step response Linear accel-decel with this time ◎In linear accel-decel The set time is rounded to the applicable one of the units listed below and used for control.			
								Operation condition		Unit for rounding	
								Other than the ones below		0.4msec unit When 0.7msec is set, 0.8msec(=0.4 × 2)	
								A linear ABS encoder is used.		0.444 msec unit When 0.7msec is set, 0.888msec(=0.444 × 2)	
MECHATROLINKⅢ is connected.		Refer to the "Instruction Manual VCII Series MECHATROLINKⅢ".									
P610	Pulse train command input selection when connecting to expansion board	P	•	•	•	P	F	None	EXT/STD	EXT	
								Select whether the pulse train command input is done from control input/output expansion unit connector CN3 or basic connector CN1 when optional control input/output expansion unit is connected. ◎EXT Executes from optional control input/output expansion unit connector CN3. ◎STD Executes from basic connector CN1. (Caution) ZLS and TRG signals input from connector that is selected here become valid. Even if EXT is selected, allocation to the EI9 to EI20 (to be set with P739 to P741) of the ZLS and TRG signals in ineffective. Use fixed allocation in EI22 and EI23.			

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 6] [Pulse train input parameter]										
P612	Function selection in MECHATROLINK-III communication mode	P	.	.	.	.	F	None	0 to 100001111	0
								Effective when the MECHATROLINK-III expansion board interface is mounted and the start mode selection switch (MODE) is in communication mode. For the settings, a 1-digit value represents each selection setting.		
								◎1st digit: Electronic gear ratio selection 0: Uses the common parameters Nos. 21 and 22. 1: Uses the device parameters Nos. P303/P304.		
								◎2nd digit: Feed forward correction selection 0: Uses the common parameter No. 64. 1: Uses the device parameter No. P205.		
								◎3rd digit: Positioning completion range selection 0: Uses the common parameter No. 66. 1: Uses the device parameter No. P202.		
								◎4th digit: Moving average time selection 0: Uses the common parameter No. 82. 1: Uses the device parameter No. P210.		
								◎5th to 8th digits: Reserved Set 0.		
								◎9th digit: OT detection selection during the execution of the INTERPORATE command 0: Checks OT detection. 1: Does not check OT detection.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 6] [Pulse train input parameter]										
P613	PNB range	R	A	M	Z	P	F	pulse	0 to 999	010
								Set the output range of the positioning complete B signal (PNB). The setting differs depending on the encoder type to use. ◎ When [L-SEN/S-INC/S-INC2/S-ABS/S-ABS2/S-ABS3/S-MABS/C-SEN1/C-SEN2/L-LESS/L-ABS/S-ABS4] is selected with P001, the number-of-pulses unit of the resolution of the encoder to use. ◎ When [INC1/INC2/INC3] is selected with P001, the 4-multiplication unit of the number of pulses of the encoder to use. <<Example>> · To set ±10 pulses as the PNB range when [P001: L-SEN] is set, the setting value is "010". · To set ±10 pulses as the PNB range when [P001: INC3] is set, the setting value is "040".		
P614	Low speed gain switching delay time	I	A	M	Z	P	F	ms	-1000 to 1000	0
								Set the delay time after which the gain is switched to low speed gain after low speed detection (parameter P100). ● When the data is positive: The switching time becomes effective after the target position command no longer exists (stop command status) and the device enters the low speed range. ● When the data is negative: The switching time (time with the sign ignored) becomes effective after the device enters the low speed range regardless of the status of the target position command. Usually, set 0. If the status becomes unstable due to the switching from normal gain to low speed gain depending on the difference between normal and low speed gain settings, set the time after which the low speed status becomes stable.		
P615	Speed loop gain at GSEL3	I	A	M	Z	P	F	None	0000 to 9999	0025
									Set speed loop gain in GSEL signal ON/GSEL 2 signal ON. (For details, refer to [P101].)	
P616	Speed loop integral time constant at GSEL3	I	A	M	Z	P	F	msec	0000.00 to 9999.99	0020.00
								Set time constant of speed loop integral correction in GSEL signal ON/GSEL 2 signal ON. (For details, refer to [P102].)		
P617	Speed loop differential time constant at GSEL3	I	A	M	Z	P	F	μ sec	-9999 to 9999	0000
								Set time constant of speed loop differential correction in GSEL signal ON/GSEL 2 signal ON. (For details, refer to [P103].) ⚠ [-] (Negative) value cannot be set for the device of SOFT VER 1.**.		
P618	Speed loop proportional gain division ratio at GSEL3	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set proportional correction gain division ratio of Two-degree-of-freedom PID velocity control system in GSEL signal ON/GSEL 2 signal ON. (For details, refer to [P104].)		
P619	Speed loop differential gain division ratio at GSEL3	I	A	M	Z	P	F	%	-100.0 to 100.0	000.0
								Set differential correction gain division ratio of Two-degree-of-freedom PID velocity control system in GSEL signal ON/GSEL 2 signal ON. (For details, refer to [P105].)		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

6-3-8 Input/output signals parameter (Group 7)

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P700	Monitor 1 selection	I	A	M	Z	P	F	None	SPD.REF./SPD.FB./TRQ.REF./ TRQ.LIM.+ /TRQ.LIM.-/ P.RANGE.L/P.RANGE.H/SPD.OUT/ SCL.OUT/IX62/IX63/OPT.W/OPT.L	SPD.FB.
								Select output data of analog monitor MON1. ◎SPD.REF : Speed command ◎SPD.FB. : Speed feedback ◎TRQ.REF. : Torque command ◎TRQ.LIM.+ : External torque limit + command ◎TRQ.LIM.- : External torque limit - command ◎P.RANGE.L : Position deviation 1 ◎P.RANGE.H : Position deviation 2 ◎SPD.OUT : NC speed command ◎SCL.OUT : NC target speed ◎IX62 : Depending on the data with indirect data number 62 ◎IX63 : Depending on the data with indirect data number 63 ◎OPT.W : Manufacturer exclusive use (Do not set) ◎OPT.L : Manufacturer exclusive use (Do not set)		
P701	Monitor 2 selection	I	A	M	Z	P	F	None	SPD.REF./SPD.FB./TRQ.REF./ TRQ.LIM.+ /TRQ.LIM.-/ P.RANGE.L/P.RANGE.H/SPD.OUT/ SCL.OUT/IX62/IX63/OPT.W/OPT.L	TRQ.REF.
								Select output data of analog monitor [MON2]. * Selection is same as [P700: Monitor 1 selection].		
P702	Speed zero detecting range	R	A	M	Z	P	F	%	000.00 to 100.00	000.10
								Select output range of speed zero signal (SZ).		
P703	Rough matching range	R	A	.	Z	.	F	Pulse	00000001 to 99999999	00000100
								Set the output range of the Rough match signal (PRF). Setting is same as [P202: Positioning completion range]. (Example) To output the Rough match signal at the position of 1000 pulses ahead of the target position using the 6000P/R encoder, set 04000.		
P704	Servo ON signal logic selection	R	A	M	Z	P	F	None	SERVO ON/SHUT OFF	SERVO ON
								Select effective logic of Servo On signal (SON). (SON-COM terminals, Short: ON, Open: OFF) ◎SERVO ON : Signal ON-status, Servo-on (Motor control status) ◎SHUT OFF : Signal ON-status, Servo-off (Motor torque-free status) * If [SHUT OFF] is selected, SON signal of external input signal becomes ON-fix. When using SON signal only remotely, such as in CC-Link/Device Net, make it invalid in [P735: External input invalid selection 1].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P705	Hardware OT effective/ineffective selection	R	A	M	Z	P	F	None	OT.CHK.Y／OT.CHK.N	OT.CHK.Y
								Select effective/ineffective of over travel signal (FOT, ROT). ◎ OT.CHK.Y : Effective ◎ OT.CHK.N : Ineffective		
P706	Mode change check delay time	R	A	M	Z	P	F	sec	0.00 to 9.99 (10msec Unit)	0.01
								Set determined delay time from switching on or off of Mode Select signal (MD1, MD2) to completion of change to each mode. This parameter is not to take in uncertain status in mode change as a signal. (Caution) Actual changing time is time obtained by adding about 20 msec internal processing time to this setting time.		
P707	Soft limit switch position 1	I	A	M	Z	P	F	mm/°/in	-99999999 to 99999999	00000000
								Set output changing position of Soft Limit Switch signal (SLSA, SLSB). (Position of decimal point depends on [P302: Minimum setting unit].) * As for relations with [P708, P709], see below.		
P708	Soft limit switch position 2	I	A	M	Z	P	F	mm/°/in	-99999999 to 99999999	00000001
								Function is same as [P707]. * As for relations with [P707, P709], see below.		
P709	Soft limit switch position 3	I	A	M	Z	P	F	mm/°/in	-99999999 to 99999999	00000002
								Function is same as [P707]. * As for relations with [P707, P708], see below.		
P707 P708 P709	<Soft limit switch position 1 to 3> Set area changing position of current position in distance from [P408: Position data reference point]. It becomes valid after power-on and completion of Zero Return. (The signal is not output before completion of Zero Return). <Setting conditions> [P707: Soft limit switch position 1] < [P708: Soft limit switch position 2] < [P709: Soft limit switch position 3] Negligence in this condition results in incorrect operation. (Caution 1) As for soft limit switch signal, refer to [Chapter 4 Signal connection]. (Caution 2) Since output of Soft Limit Switch signal is controlled with current command position, the signal is output with position deviation error against actual position.									
P710	Stopping method at emergency stop	I	A	M	Z	P	F	None	FREE RUN / QUICK	QUICK
								Select motor stop method in emergency stop. ◎ FREE RUN (Coasting to stop) The motor coasts to stop without torque. ◎ QUICK (Brake stop) Brake stop is activated in deceleration time set in [P711: Deceleration time at emergency stop], and after stop, it becomes servo-off (torque free) after the set time in [P712: Servo off delay time after emergency stop].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P711	Deceleration time at emergency stop	R	A	M	Z	P	F	sec	00.00 to 50.00 (10msec Unit)	00.00
								Set deceleration time for motor from rated speed or applicable maximum speed, when brake stop is selected in [P710: Stopping method at emergency stop]. When setting value is "0", motor stops instantly at the maximum torque (torque limit value). When coasting to stop is selected in [P710: Stopping method at emergency stop], this parameter becomes invalid.		
P712	Servo off delay time after emergency stop	R	A	M	Z	P	F	sec	0.00 to 9.99 (10msec Unit)	0.00
								Set time from motor stop to servo-off (torque free) when brake stop is selected in [P710: Stopping method at emergency stop]. When setting value is "0", motor stops instantly and it goes to servo-off (torque free) simultaneously. When coasting to stop is selected in [P710: Stopping method at emergency stop], this parameter becomes invalid.		
P713	Stopping method at AC power cut*4	I	A	M	Z	P	F	None	FREE RUN/QUICK	FREE RUN
								Select motor stopping method in AC-off detection (power supply OFF). ◎FREE RUN (Coasting to stop) Motor coasts to stop without torque. ◎QUICK (Brake stop) Motor executes brake stop. (Caution) 1) When necessary to output Alarm signal (ALM) at AC-off, select parameter [ALM.ON] in [P714: ALM output selection at AC power cut]. (If set [ALM.OFF], Alarm signal is not output.) 2) In brake stop, differences appear in brake stop torque depending on conditions of the device or load. Particularly, when AC-off detection is executed during acceleration, the motor may coast to stop.		
P714	ALM output selection at AC power cut*4	I	A	M	Z	P	F	None	ALM.OFF/ALM.ON	ALM.OFF
								Select whether to output Alarm signal (ALM) or not in AC-off detection (power supply OFF). ◎ALM.OFF : Alarm signal (ALM) is not output. ◎ALM.ON : Alarm signal (ALM) is output. * Motor stopping method in the case of AC-off detection is set in [P713: Stopping method at AC power cut].		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

*4 AC-off is detected by control power source (r, s). It functions when AC-off occurs at its terminal power source. Control power source 24VDC input device will function by the voltage shut down (drop) of control power source. It does not run when AC-off occurs.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P715	ALM/WNG signal logic selection	R	A	M	Z	P	F	None	ALM/WNG1,ALM/WNG2, ALM/WNG3,ALM/WNG4	ALM/WNG1
								Select output logic of control output signal (ALM, WNG). ◎ ALM/WNG1 ALM-COM1 terminals disconnected: ON, WNG-OM terminals connected: ON ◎ ALM/WNG2 ALM-COM1 terminals connected: ON, WNG-COM terminals connected: ON ◎ ALM/WNG3 ALM-COM1 terminals disconnected: ON, WNG-COM terminals disconnected: ON ◎ ALM/WNG4 ALM-COM1 terminals connected: ON, WNG-COM terminals disconnected: ON		
P716	RDY signal specification selection	R	A	M	Z	P	F	None	RDY1/RDY2/RDY3/RDY4	RDY1
								Select output specification of control output signal (RDY). 1): Hard OT alarm, soft OT alarm 2): Alarm that is detected when the motor operates under the servo lock condition and that needs Reset signal (RST) to release it ◎ RDY1 In motor drive (1, 2 included) RDY-COM1 terminals connected In motor free RDY-COM1 terminals disconnected ◎ RDY2 In motor drive (1 included) and RDY-COM1 terminals connected when not 2 In motor free or RDY-COM1 terminals disconnected when 2 ◎ RDY3 In motor drive (2 included) and RDY-COM1 terminals connected when not 1 In motor free or RDY-COM1 terminals disconnected when 1 ◎ RDY4 In motor drive and RDY-COM1 terminals connected when not 1, 2 In motor free or RDY-COM1 terminals disconnected when 1, 2		
P717	Manufacturer exclusive use	-	.	.	.	.	F			00000000
Be sure to set "0" to this parameter.										

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P718	PN signal delay time	R	.	.	.	P	F	sec	0.000 to 9.999	0.000
								Set time for PN signal to become ON after its deviation enters [P202: Positioning completion range] in pulse train run. (Example 1) When waiting for the last completion just after the end of pulse train run		
								(Example 2) When it deviates completion range momentarily due to disturbance when PN signal is ON		
P719	PN signal specification selection	R	A	.	.	.	F	None	PN1/PN2	PN1
								Select output specification of control output signal (PN) in automatic mode. ◎ PN1 When positioning operation enters completion range, PN is output even when PST is OFF. ◎ PN2 When Automatic start signal (PST) is OFF, output of Positioning Complete signal (PN) is absolutely OFF. Thus, even if positioning operation enters completion range, PN is not output when PST is OFF.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P720	Remote write area 1	R	A	M	Z	P	F	None	00000 to 29999	13700
								Set data number to write into the device with remote sequence program. This parameter becomes valid in remote connection. The initial value is set to the indirect data 50. (Caution) If this parameter is set carelessly, the device can operate unusually. Set correct data number as data is mentioned in annexed instruction manual, [data section].		
P721	Remote write area 2	R	A	M	Z	P	F	None	00000 to 29999	13702
								Function is same as [P720]. The initial value is set to the indirect data 51.		
P722	Remote write area 3	R	A	M	Z	P	F	None	00000 to 29999	13704
								Function is same as [P720]. The initial value is set to the indirect data 52.		
P723	Remote write area 4	R	A	M	Z	P	F	None	00000 to 29999	13706
								Function is same as [P720]. The initial value is set to the indirect data 53.		
P720 P721 P722 P723 P530 P531	< Remote write area 1 to 4: setting range > x x x x x Indicates device number. (0000 to 9999) 0: Indicates D device. 1: Indicates R device. 2: System reserved (Not for user).									
P724	Remote read area 1	R	A	M	Z	P	F	None	00000 to 29999	13708
								Set data number to read from the device with remote sequence program. This parameter becomes valid in remote connection. The initial value is set to the indirect data 54. (Caution) Set correct data number as data is mentioned in annexed instruction manual, [data section].		
P725	Remote read area 2	R	A	M	Z	P	F	None	00000 to 29999	13710
								Function is same as [P724]. The initial value is set to the indirect data 55.		
P726	Remote read area 3	R	A	M	Z	P	F	None	00000 to 29999	13712
								Function is same as [P724]. The initial value is set to the indirect data 56.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P727	Remote read area 4	R	A	M	Z	P	F	None	00000 to 29999	13714
								Function is same as [P724]. The initial value is set to the indirect data 57.		
P728	Remote read area 5	R	A	M	Z	P	F	None	00000 to 29999	09302
								Function is same as [P724]. The initial value is set to the current position (absolute position).		
P729	Remote read area 6	R	A	M	Z	P	F	None	00000 to 29999	09100
								Function is same as [P724]. The initial value is set to ST00: Actual operation speed of motor.		
P724 P725 P726 P727 P728 P729	< Remote read area 1 to 6: setting range> x x x x x Indicates device number. (0000 to 9999) 0: Indicates D device. 1: Indicates R device. 2: System reserved (Not for user).									
P730	Manufacturer exclusive use	-	.	.	.	.	F			00000
								Be sure setting value of this parameter is always "0".		
P731	Manufacturer exclusive use	-	.	.	.	.	F			00000000
								Be sure setting value of this parameter is always "0".		
P732	Manufacturer exclusive use	-	.	.	.	.	F			00000
								Be sure setting value of this parameter is always "0".		
P733	Manufacturer exclusive use	-	.	.	.	.	F			00000000
								Be sure setting value of this parameter is always "0".		
P734	Brake output signal delay time	R	A	M	Z	P	F	sec	-9.99 to 9.99 (10msec Unit)	0.00
								Set delay time when control output signal (BRK) becomes OFF after the motor enters the torque-free status in alarm happening, emergency stop, servo-off, and reset. When a minus sign is set, the drop prevention function for the upper and lower axes switches the control output signal (BRK) OFF first and then causes the device to enter the torque free status after the elapse of the set time (time with the minus sign ignored). Switching the forcible brake ON signal (BRON) ON makes the drop prevention function ineffective. During the execution of the drop prevention function, do not switch the forcible brake ON signal (BRON) ON. For information about the brake release signal output specifications, refer to "Brake release (BRK) signal specifications" on the subsequent pages.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

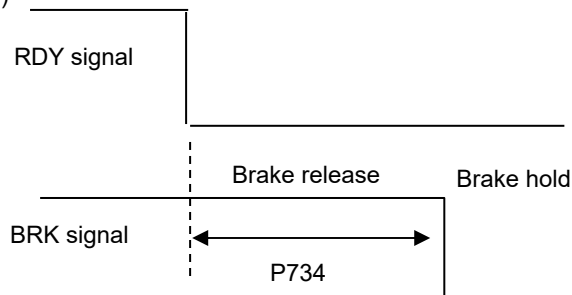
*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Brake release (BRK) signal specifications (1/5)

1. If P734 is positive (0 or more)

Delay time after which the BRK signal is switched OFF after the motor enters the torque free status (RDY signal OFF).

Example)



After servo off (RDY signal OFF), the [BRK (brake release)] signal is switched OFF after the elapse of the time of P734.

2. If P734 is negative

If P734 is negative, the BRK signal output timing differs depending on whether the motor is stopped or operating. To judge whether the motor is stopped, use the speed zero (SZ) signal. Adjust the setting of P702 Speed zero range so that the SZ signal will become stable when the BRK signal is operated.

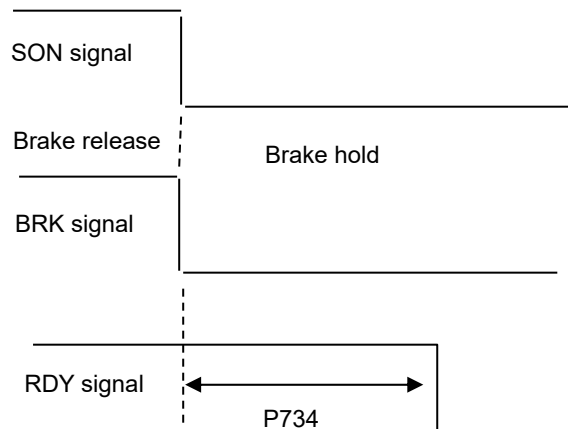
1) When the motor is stopped (if the SZ signal is ON)

① If the SON signal is OFF (it is longer than the set time of P734)

After the SON signal is switched OFF, the BRK signal is switched OFF, and the device enters the servo off status after the set time of P734 (the minus sign ignored).

(In the servo on status, the BRK signal is switched OFF, and drop prevention is performed for the upper and lower axes.)

Example)



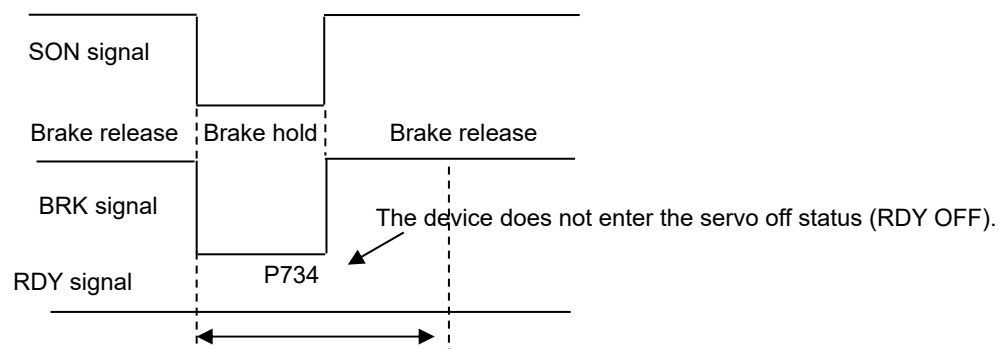
During this time, the device is in the servo on status and the BRK signal is OFF

② If the SON signal is OFF (shorter than the set time of P734)

If the SON signal OFF→ON interval is shorter than the set time of P734 (the minus sign ignored), the BRK signal is switched OFF simultaneously as the SON signal is switched OFF, and the BRK signal is also switched ON simultaneously as the SON signal is switched ON.

In this case, the device does not enter the servo off status (RDY signal OFF) because the set time of P734 (the minus sign ignored) has not elapsed.

Example)

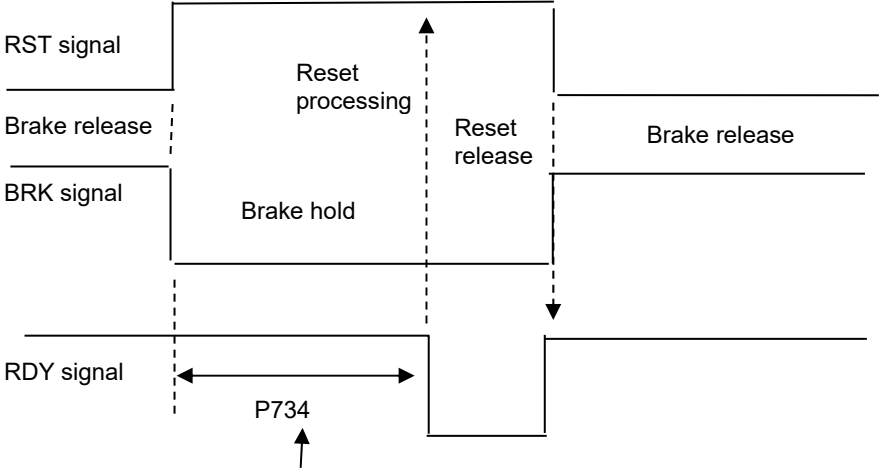


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P539

Brake release (BRK) signal specifications (2/5)

- ③ If the RST signal is ON (if it is held ON for a time longer than the set time of P734)
After the RST signal is switched OFF, the BRK signal is switched OFF, and the device enters the reset (servo off) status after the elapse of the set time of P734 (the minus sign ignored).
When the RST signal is switched OFF, the RDY signal and the BRK signal are switched ON again (servo on status).
* The operation starts when the SON signal is switched ON and the device enters the servo on status.

Example)

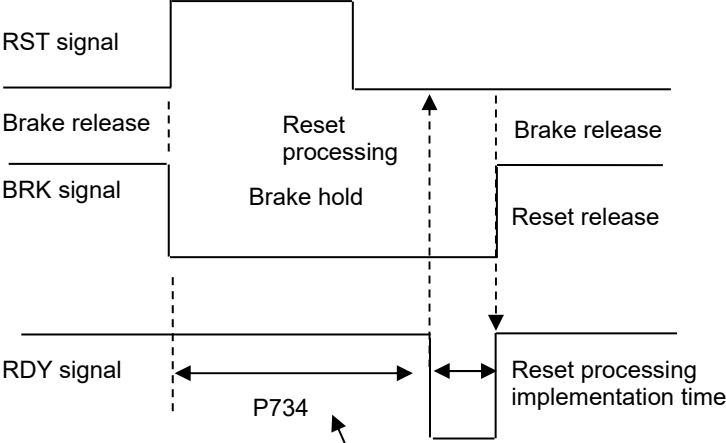


After the elapse of the set time of P734, the device enters the servo off status (RDY signal is OFF).

* Before the elapse, the device is in the servo on status and the brake is held.

- ④ If the RST signal is ON (if it is held for a time shorter than the set time of P734)
After the RST signal is switched ON, the BRK signal is switched OFF. Because the RST signal is OFF before the set time of P734 (the minus sign ignored), the device is in the servo off status only during internal RST processing time.
* The operation starts when the SON signal is switched ON and the device enters the servo on status.

Example)



After the elapse of the set time of P734 from an ON edge of the RST signal, reset processing is implemented.
During reset processing, the servo off status (RDY signal OFF).
After the end of internal reset processing, reset release.

P734
P538
P539

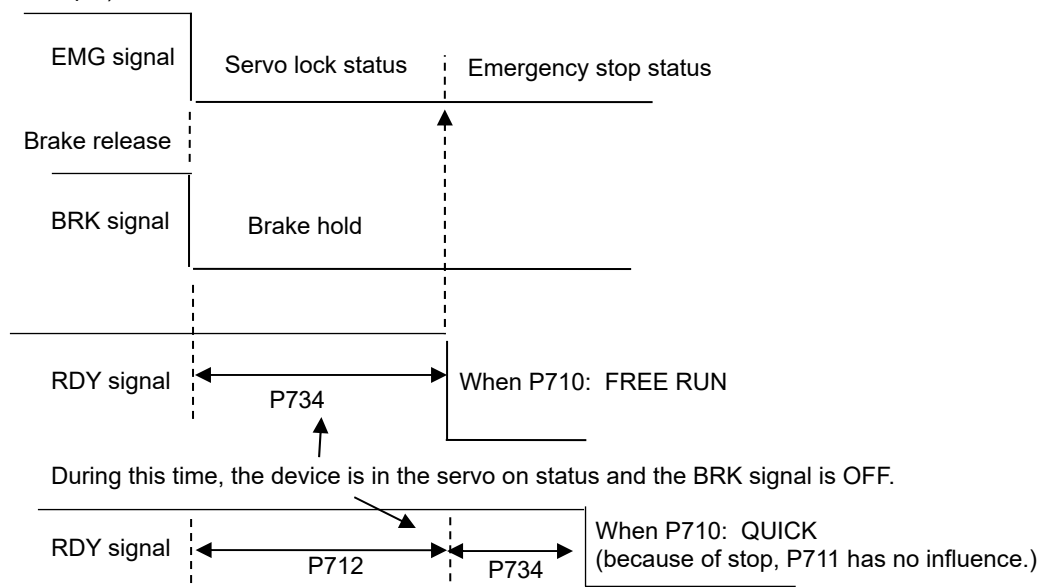
Brake release (BRK) signal specifications (3/5)

⑤ If the EMG signal is OFF (emergency stop)

After the EMG signal is switched OFF, the BRK signal is switched OFF, and the device enters the emergency stop status after the elapse of the set time of P734 (the minus sign ignored).

(In the servo on status, the BRK signal is switched OFF, and drop prevention is performed for the upper and lower axes.)

Example)



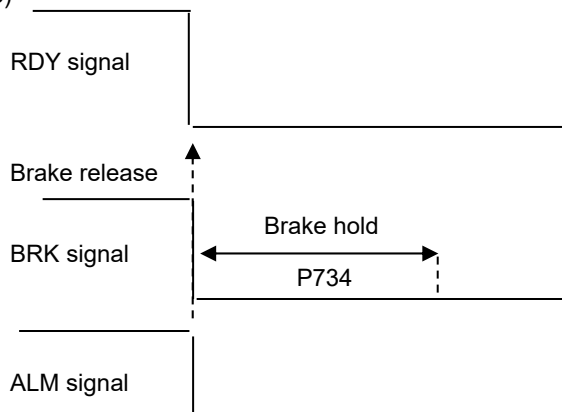
P734
P538
P539

⑥ When a torque free alarm and a warning occur

When a torque free alarm and a warning occur, the device immediately enters the torque free & brake hold status.

It takes time for brake holding to be actually effective (the holding of the electromagnetic brake to be effective), so during that time, the motor is in the dropping status.

Example)

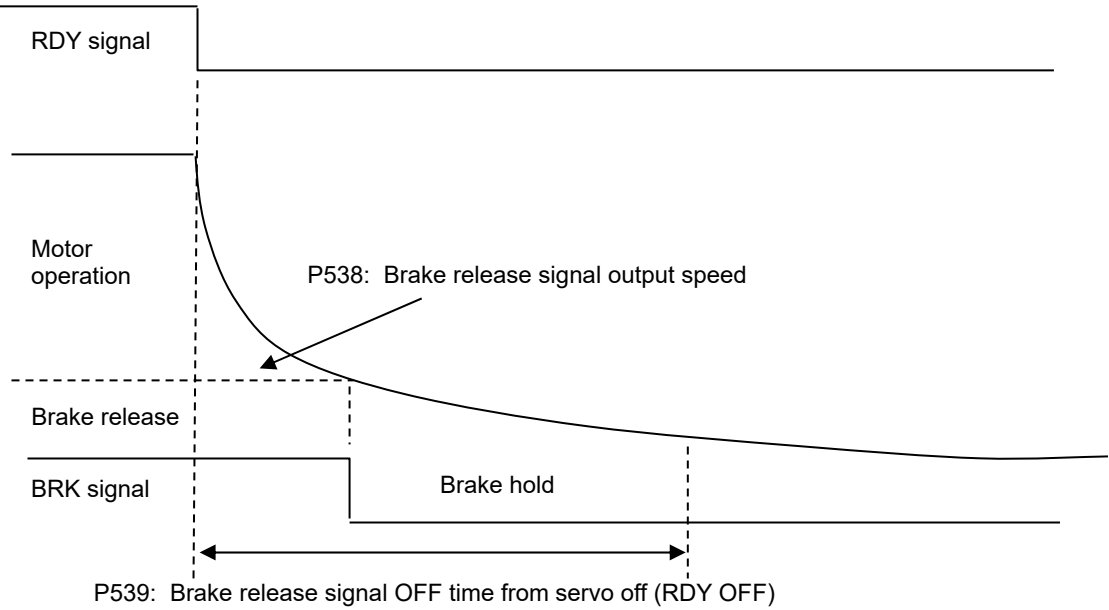


Note) Be careful because the device also enters the torque free status in the event of the main power supply undervoltage detection warning.

Brake release (BRK) signal specifications (4/5)

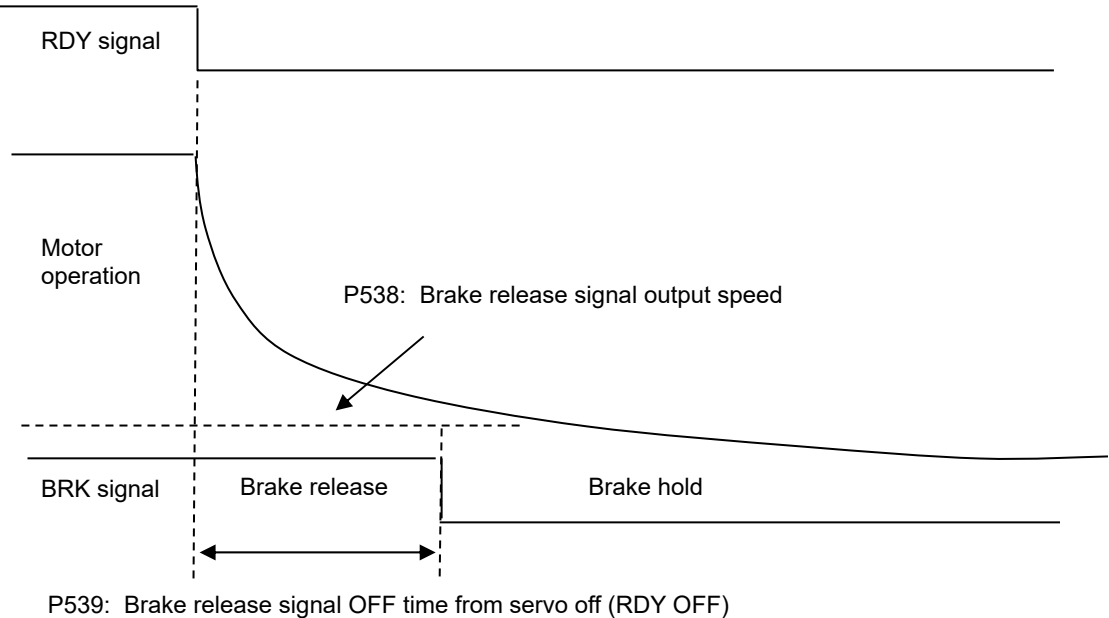
- 2) When the motor is operating (if the SZ signal is OFF)
During motor operation, the BRK signal is switched OFF when the condition for either of the settings below is met first.
- P538: Brake release signal output speed
 - P539: Brake release signal OFF time from servo off (RDY OFF)
- * During motor operation, there is no time at which braking holding is performed in the servo on status.
The time that can be set is a time when the motor can hold the brake while it is in the servo off status.

① If the condition for P538: Brake release signal output speed is met first
Example)



P734
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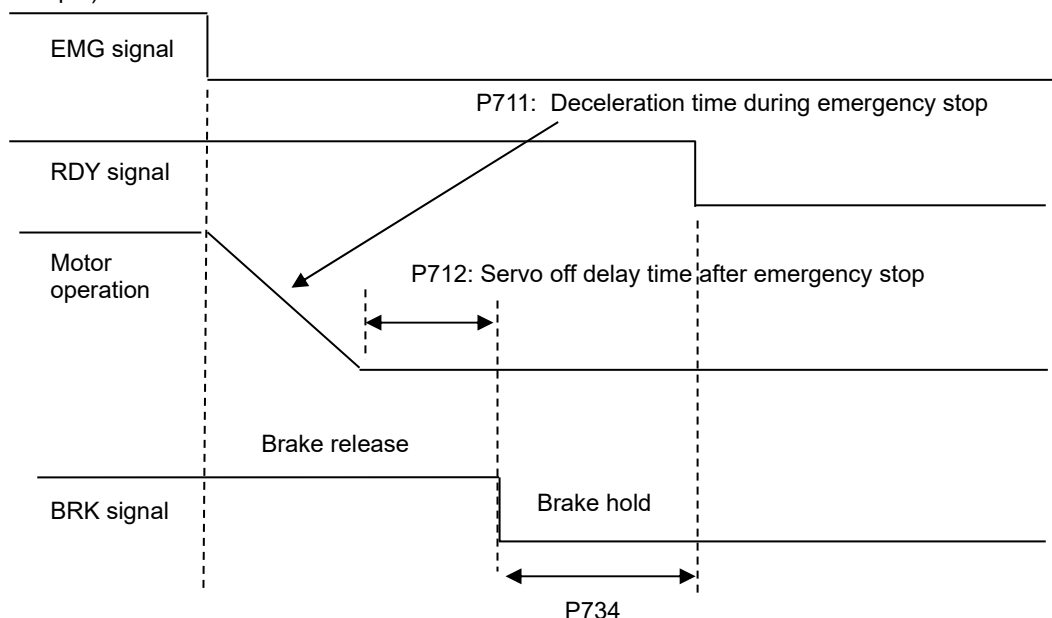
② If the condition for P539: Brake release OFF time after servo off (RDY OFF) is met first
Example)



Brake release (BRK) signal specifications (5/5)

- ③ If the EMG signal is OFF (emergency stop) during motor operation * In the case of braking stop (P710 = QUICK)
 After the EMG signal is switched OFF, the motor comes to a braking stop based on P711: Emergency stop time deceleration time, and after the elapse of P712: Servo off delay time after emergency stop, the BRK signal is switched OFF (brake hold), and after the elapse of the set time of P734 (the minus sign ignored), the device enters the servo off status.
 (In the servo on status, the BRK signal is switched OFF, and drop prevention is performed for the upper and lower axes.)

Example)



P734
P538
P539

* In the case of free run stop (P710 = FREE RUN), the motor operates as described in ① or ② above.

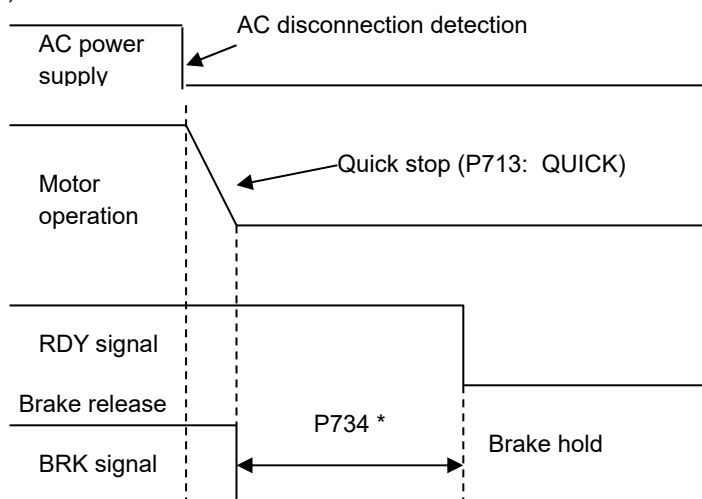
3. Power discontinuity

To prevent dropping during power discontinuity, operation is possible with the following settings:

P713: AC instantaneous stop method: QUICK

P734: Brake delay output time: Minus setting

Example)



* Note that the device may enter the torque free status before the elapse of the time of P734 (the minus sign ignored), depending on the status of the device

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																																																								
			Automatic	Manual	Zero return	Pulse train		Function																																																										
			A	M	Z	P																																																												
[Group 7] [Input/output signals parameter]																																																																		
P735	External input invalid selection 1	R	A	M	Z	P	F	None	000000000 to 268435455	000000194																																																								
								Set external input signal to make it invalid. Set valid/invalid of each signal with 0/1 of 1 bit, converting it into decimal number. (0: Valid/1: Invalid) - With the initial value, for signals excluding FOT, ROT, and EMG, external input is valid. - As for correspondence between signal name and setting bit, see below. (Setting example) When making [FOT, ROT, EMG] invalid 1) Set "1" to bits 7, 6, and 1. (000000C2 in hexadecimal number) 2) Set 194 that is converted into decimal number to parameter.																																																										
								<Correspondence between signal name and setting bit> Bit																																																										
								<table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr><tr><td>-</td><td>-</td><td>-</td><td>-</td><td>PS8</td><td>PS7</td><td>PS6</td><td>PS5</td><td>PS4</td><td>PS3</td><td>PS2</td><td>PS1</td><td>-</td><td>GSEL2</td><td>-</td><td>PC</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>BRON</td><td>CIH</td><td>TL</td><td>MD2</td><td>MD1</td><td>-</td><td>-</td><td>-</td><td>ROT</td><td>FOT</td><td>CLR</td><td>GSEL</td><td>-</td><td>SON</td><td>EMG</td><td>RST</td></tr></table>			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	-	-	-	-	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	-	GSEL2	-	PC	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	BRON	CIH	TL	MD2	MD1	-	-	-
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16																																																			
-	-	-	-	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	-	GSEL2	-	PC																																																			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																			
BRON	CIH	TL	MD2	MD1	-	-	-	ROT	FOT	CLR	GSEL	-	SON	EMG	RST																																																			
P736	External input invalid selection 2	R	A	M	Z	P	F	None	000000000 to 268435455	000000000																																																								
								Set external input signal to make it invalid. Set valid/invalid of each signal with 0/1 of 1 bit, converting it into decimal number. (0: Valid/1: Invalid) As for correspondence between signal name and setting bit, see below. (Setting example) When making [EPIH, PCAN, BSTP, MFIN] invalid 1) Set "1" to bits 7, 6, 5, and 4. (000000f0 in hexadecimal number) 2) Set 240 that is converted into decimal number to parameter.																																																										
								<Correspondence between signal name and setting bit> Bit																																																										
								<table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr><tr><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>EXT3</td><td>EXT2</td><td>EXT1</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>-</td><td>ZLS</td><td>TRG</td><td>HLD</td><td>OR4</td><td>OR3</td><td>OR2</td><td>OR1</td><td>EPIH</td><td>PCAN</td><td>BSTP</td><td>MFIN</td><td>JOSP</td><td>RJOG</td><td>FJOG</td><td>PST</td></tr></table>			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	-	-	-	-	-	-	-	-	-	-	-	-	-	EXT3	EXT2	EXT1	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	-	ZLS	TRG	HLD	OR4	OR3	OR2	OR1
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16																																																			
-	-	-	-	-	-	-	-	-	-	-	-	-	EXT3	EXT2	EXT1																																																			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																																			
-	ZLS	TRG	HLD	OR4	OR3	OR2	OR1	EPIH	PCAN	BSTP	MFIN	JOSP	RJOG	FJOG	PST																																																			

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

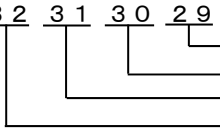
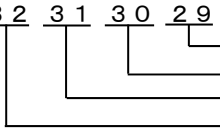
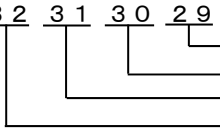
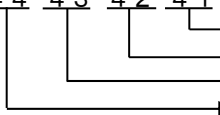
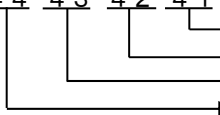
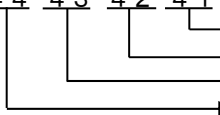
Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P737	Basic external input signal function allocation 1	R	A	M	Z	P	F	None	00000000 to 99999999	34330301
								Allocate external input signal of basic connector CN1-DI1 to DI4. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with input signal allocation table (See page 6-81). If "00" is set, set input signal becomes invalid. (Example) 34330301 DI1: Allocation to RST signal DI2: Allocation to SON signal DI3: Allocation to PST signal DI4: Allocation to FJOG signal		
P738	Basic external input signal function allocation 2	R	A	M	Z	P	F	None	00000000 to 99999999	13124735
								Allocate external input signal of basic connector CN1-DI5 to DI8. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with input signal allocation table (See page 6-81). If "00" is set, set input signal becomes invalid. (Example) 13124735 DI5: Allocation to RJOG signal DI6: Allocation to ZLS signal DI7: Allocation to MD1 signal DI8: Allocation to MD2 signal		
P739	Extended external input signal function allocation 1	R	A	M	Z	P	F	None	00000000 to 99999999	00000000
								Allocate the external input signal of the optional control input/output expansion unit connector CN3-EI9 to EI12. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with input signal allocation table (See page 6-81). If "00" is set, set input signal becomes invalid. (With the initial value, all signals are invalid). (Example) 28272625 EI9: Allocation to PS1 signal EI10: Allocation to PS2 signal EI11: Allocation to PS3 signal EI12: Allocation to PS4 signal		

*[Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*[Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)																														
			Automatic	Manual	Zero return	Pulse train		Function																																
			A	M	Z	P																																		
[Group 7] [Input/output signals parameter]																																								
P740	Extended external input signal function allocation 2	R	A	M	Z	P	F	None	00000000 to 99999999	00000000																														
Allocate the external input signal of the optional control input/output expansion unit connector CN3-EI13 to EI16. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with input signal allocation table (See page 6-81). If "00" is set, set input signal becomes invalid. (With the initial value, all signals are invalid). (Example) <table><tr><td>3 2</td><td>3 1</td><td>3 0</td><td>2 9</td><td></td></tr><tr><td colspan="4"></td><td></td></tr><tr><td colspan="4"></td><td>EI13: Allocation to PS5 signal</td></tr><tr><td colspan="4"></td><td>EI14: Allocation to PS6 signal</td></tr><tr><td colspan="4"></td><td>EI15: Allocation to PS7 signal</td></tr><tr><td colspan="4"></td><td>EI16: Allocation to PS8 signal</td></tr></table>											3 2	3 1	3 0	2 9											EI13: Allocation to PS5 signal					EI14: Allocation to PS6 signal					EI15: Allocation to PS7 signal					EI16: Allocation to PS8 signal
3 2	3 1	3 0	2 9																																					
																																								
				EI13: Allocation to PS5 signal																																				
				EI14: Allocation to PS6 signal																																				
				EI15: Allocation to PS7 signal																																				
				EI16: Allocation to PS8 signal																																				
P741	Extended external input signal function allocation 3	R	A	M	Z	P	F	None	00000000 to 99999999	00000000																														
Allocate the external input signal of the optional control input/output expansion unit connector CN3-EI17 to EI20. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with input signal allocation table (See page 6-81). If "00" is set, set input signal becomes invalid. (With the initial value, all signals are invalid). (Example) <table><tr><td>4 4</td><td>4 3</td><td>4 2</td><td>4 1</td><td></td></tr><tr><td colspan="4"></td><td></td></tr><tr><td colspan="4"></td><td>EI17: Allocation to OR1 signal</td></tr><tr><td colspan="4"></td><td>EI18: Allocation to OR2 signal</td></tr><tr><td colspan="4"></td><td>EI19: Allocation to OR3 signal</td></tr><tr><td colspan="4"></td><td>EI20: Allocation to OR4 signal</td></tr></table>											4 4	4 3	4 2	4 1											EI17: Allocation to OR1 signal					EI18: Allocation to OR2 signal					EI19: Allocation to OR3 signal					EI20: Allocation to OR4 signal
4 4	4 3	4 2	4 1																																					
																																								
				EI17: Allocation to OR1 signal																																				
				EI18: Allocation to OR2 signal																																				
				EI19: Allocation to OR3 signal																																				
				EI20: Allocation to OR4 signal																																				

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
A	M	Z	P							

[[Group 7] [Input/output signals parameter]]										
P737 P738 P739 P740 P741	Input signal allocation table									
	Allocation number	Code	Signal name		Allocation number	Code	Signal name			
	00	----	Invalid		32	PS8	Address Assignment 8			
	01	RST	Reset		33	PST	Automatic start			
	02	EMG	Emergency Stop		34	FJOG	Forward Direction Jog			
	03	SON	Servo On		35	RJOG	Reverse Direction Jog			
	04		Reserved		36	JOSP	Jog speed select			
	05	GSEL	Gain Select		37	MFIN	M complete			
	06	CLR	Deviation Clear		38	BSTP	Block stop			
	07	FOT	Forward Over Travel		39	PCAN	Program cancel			
	08	ROT	Reverse Over Travel		40	EPIH	External automatic start prohibit			
	09		Reserved		41	OR1	Speed Override 1			
	10		Reserved		42	OR2	Speed Override 2			
	11	SSD	Command Direction Select		43	OR3	Speed Override 3			
	12	MD1	Mode Select 1		44	OR4	Speed Override 4			
	13	MD2	Mode Select 2		45	HLD	Hold			
	14	TL	Torque Limit		46	TRG	External trigger			
	15	CIH	Command Pulse Input Prohibition		47	ZLS	Zero Point LS			
	16	BRON	Compulsory Brake ON		48		Reserved			
	17	PC	Proportional Control		49	EXT1	1st external latch input			
	18		Reserved		50	EXT2	2nd external latch input			
	19	GSEL2	Gain Select 2		51	EXT3	3rd external latch input			
	20		Reserved		52		Reserved			
	21		Reserved		53		Reserved			
	22		Reserved		54		Reserved			
	23		Reserved		55		Reserved			
	24		Reserved		56		Reserved			
	25	PS1	Address Assignment 1		57		Reserved			
	26	PS2	Address Assignment 2		58		Reserved			
	27	PS3	Address Assignment 3		59		Reserved			
	28	PS4	Address Assignment 4		60		Reserved			
	29	PS5	Address Assignment 5		61		Reserved			
	30	PS6	Address Assignment 6		62		Reserved			
	31	PS7	Address Assignment 7		63		Reserved			
	(Supplements)									
If the above allocation number appointed is in duplicate in P737 to P741, the duplicated signal is controlled with OR.										

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)										
			Automatic	Manual	Zero return	Pulse train		Function												
			A	M	Z	P														
[Group 7] [Input/output signals parameter]																				
P742	Basic external output signal function allocation	R	A	M	Z	P	F	None	00000000 to 99999999	05020103										
Allocate external output signal of basic connector CN1-DO1 to DO4. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with output signal allocation table (See page 6-83). If "00" is set, set output signal becomes invalid. (Example) <table><tr><td>0 5</td><td>0 2</td><td>0 1</td><td>0 3</td><td></td></tr><tr><td colspan="4"></td><td></td></tr></table>											0 5	0 2	0 1	0 3						
0 5	0 2	0 1	0 3																	
P743	Extended output signal function allocation 1	R	A	M	Z	P	F	None	00000000 to 99999999	00000000										
Allocate the external output signal of the optional control input/output expansion unit connector CN3-EO1 to EO4. In this allocation setting, each signal is indicated separately with 2 digits as shown in below example. To this 2-digit section, allocation number is set in accordance with output signal allocation table (See page 6-83). If "00" is set, set output signal becomes invalid. <With the initial value, all signals are invalid. Also, it is unable to output since OCEM (encoder marker) does not correspond to the control input/output unit.> (Example) <table><tr><td>0 4</td><td>0 3</td><td>0 2</td><td>0 1</td><td></td></tr><tr><td colspan="4"></td><td></td></tr></table>											0 4	0 3	0 2	0 1						
0 4	0 3	0 2	0 1																	
P744	Extended output signal function allocation 2	R	A	M	Z	P	F	None	00000000 to 99999999	00000000										
Allocate the external output signal of the optional control input/output expansion unit connector CN3-EO5 to EO8. In this allocation setting, each signal is indicated separately with 2 digits as shown in example below. To this 2-digit section, allocation number is set in accordance with output signal allocation table (See page 6-83). If "00" is set, set output signal becomes invalid. <With the initial value, all signals are invalid. Also, it is unable to output since OCEM (encoder marker) does not correspond to the control input/output unit.> (Example) <table><tr><td>0 8</td><td>0 7</td><td>0 6</td><td>0 5</td><td></td></tr><tr><td colspan="4"></td><td></td></tr></table>											0 8	0 7	0 6	0 5						
0 8	0 7	0 6	0 5																	

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

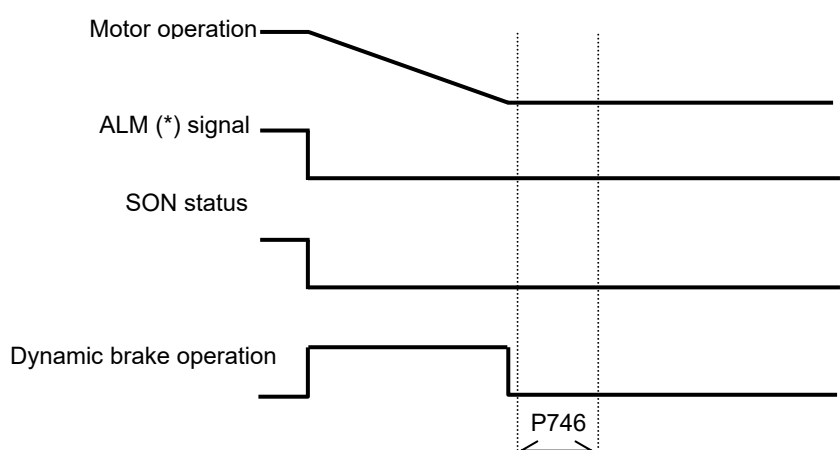
*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
A	M	Z	P							

[Group 7] [Input/output signals parameter]										
P742 P743 P744	Output signal allocation table									
	Allocation number	Code	Signal name		Allocation number	Code	Signal name			
	00	----	Invalid		25		Reserved			
	01	ALM	Alarm		26		Reserved			
	02	WNG	Warning		27	HCMP	Zero point return complete			
	03	RDY	Servo Ready		28	PNB	Positioning Complete B			
	04	SZ	Speed Zero		29	OCEM	Marker output			
	05	PN	Positioning Complete		30		Reserved			
	06	PRF	Rough match		31	SLSA	Soft Limit Switch A			
	07	BRK	Brake Release		32	SLSB	Soft Limit Switch B			
	08	LIM	Torque Limit In-Process		33	M01	M output 01			
	09	PEND	Program end		34	M02	M output 02			
	10	PRDY	Automatic run ready		35	M04	M output 04			
	11	MMOD	Manual run mode In-Process		36	M08	M output 08			
	12	HMOD	Zero return run mode In-Process		37	M10	M output 10			
	13	AMOD	Automatic run mode In-Process		38	M20	M output 20			
	14	PMOD	Pulse train run mode In-Process		39	M40	M output 40			
	15		Reserved		40	M80	M output 80			
	16		Reserved		41		Reserved			
	17	OUT1	Common output 1		42	MSTB	M strobe			
	18	OUT2	Common output 2		43		Reserved			
	19	OUT3	Common output 3		44		Reserved			
	20	OUT4	Common output 4		45		Reserved			
	21	OUT5	Common output 5		46		Reserved			
	22	OUT6	Common output 6		47		Reserved			
	23	OUT7	Common output 7		48		Reserved			
	24	OUT8	Common output 8		49		Reserved			

Parameters

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P745	Dynamic brake function selection	R	A	M	Z	P	F	None	INVALID/DMB ON/DMB OFF	INVALID
								Select specification of dynamic brake. ◎INVALID (Not connected) Dynamic brake operation is not executed. ◎DMB ON (Dynamic brake operates) Conventional dynamic brake operation is executed. ◎DMB OFF (Operation with SON signal is invalid) DMB operation is not executed by switching OFF external input SON signal. Dynamic brake operates when SON is OFF by an alarm or other causes.		
P746	Servo on delay time at dynamic brake	R	A	M	Z	P	F	msec	0 to 10	01
								Set time to enable SON again after confirming stop status of motor operation by dynamic brake.		
P745 P746	<Dynamic brake operation> - Set this function in [P745: Dynamic brake function selection]. - Dynamic brake becomes valid in servo-off status during motor operation, and after confirming motor stop, and when the time specified in [P746: Servo on delay time at dynamic brake] elapsed, it becomes invalid. - This brake is emergency purpose brake in the time of emergency stop. Brake operation is not executed during motor stop. - To use this function, optional dynamic brake unit is necessary. - Basic operation of dynamic brake (During motor operation, and at torque free alarm occurrence) 									

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Parameter No.	Parameter name	Activating timing	Supported run mode				Level	Setting unit	Setting range	Factory setting (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
[Group 7] [Input/output signals parameter]										
P747	Servo control abnormality detection adjustment value	I	A	M	Z	P	F	None	-1000 to 1000	0000
								Set adjustment value to loosen the level of servo control error detection or set detection of servo control error to be invalid. Generally, set it to 0. In the case of servo system in which external force pushes motor to operate, servo control error may be detected even when motor operates normally. In that case, set this adjustment value so that ST17 indicates about 50%. When adjustment value of servo control error detection is set larger, this error detection becomes lenient. In the following cases, servo control error detection becomes invalid. 1) When this setting is minus value (- value) In this case, ST17 indicates adjustment value coping with set numeric value. 2) When this setting value is 0 and IM motor is connected ST17 indication is executed.		
P748	Manufacturer exclusive use	-	.	.	.	.	F			00000000
								Be sure to set "00000000" to this parameter.		

*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.

*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.

*When [xxx/xxx/xxx] is indicated in the setting range, one of the items shall be selected from the menu.

Chapter 7 Indirect data

- 7-1 Indirect data list 7-2
- 7-2 Indirect data specification (handling in each command)..... 7-3
- 7-3 Internal end condition specification (data in successive control commands)..... 7-5
 - 7-3-1 Overall view of internal end condition setting 7-5
 - 7-3-2 Items in internal end condition data..... 7-6

Indirect data No.	Indirect data name	Type	Function
IX00 to IX49	Indirect data 00 to Indirect data 49	Sustain	Indirect data sustained even after the power is switched OFF However, the data can be rewritten up to 10,000 times.
IX50 to IX59	Indirect data 50 to Indirect data 59	0 clear *1	Arbitrary indirect data that is not sustained after the power is switched OFF When the power is switched ON, the data becomes "0".
IX60	Indirect data 60		Indirect data for storing the current speed
IX61	Indirect data 61	0 clear *1	Arbitrary indirect data that is not sustained after the power is switched OFF When the power is switched ON, the data becomes "0".
IX62	Indirect data 62	0 clear *1	Indirect data for storing data used to output voltage to the analog monitor Data value: Related to output voltage - When output to a device -1000: -10V, 0: 0V, 1000: +10V - When output to a control input/output expansion unit -500: -10V, 0: 0V, 500: +10V
IX63	Indirect data 63	0 clear *1	Indirect data for storing data used to output voltage to the analog monitor Data value: Related to output voltage - When output to a device -1000: -10V, 0: 0V, 1000: +10V - When output to a control input/output expansion unit -500: -10V, 0: 0V, 500: +10V
IX64	Indirect data 64		Indirect data for storing a speed command analog input value Data value: Related to input voltage - When input to a device -6827: -10V, 6826: 10V - When input to a control input/output expansion unit -2048: -10V, 0: 0V, 2048: 10V
IX65	Indirect data 65		Indirect data for storing a torque command analog input value -8192: -10V, 8191: 10V
IX66	Indirect data 66		Indirect data for storing the current position An integer value indicating absolute position display data displayed for status display ST01 is stored with no decimal point.
IX67	Indirect data 67	0 clear *1	Indirect data for counting down at every 10msec when it is a numeric value other than "0"
IX68	Indirect data 68	0 clear *1	Arbitrary indirect data that is not sustained after the power is switched OFF When the power is switched ON, the data becomes "0".
IX69	Indirect data 69	0 clear *1	Indirect data for storing data to be output as a common output signal
IX70 to IX99	Indirect data 70 to Indirect data 99	0 clear *1	Arbitrary indirect data that is not sustained after the power is switched OFF When the power is switched ON, the data becomes "0".

*1 Indirect data for which [0 clear] is set in the Type field is cleared to 0, not sustained when the power is switched OFF. It is suitable for data that changes and can be cleared with no problem when the power is switched OFF, such as the current position.

7-2 Indirect data specification (handling in each command)

Setting item	How indirect data is handled (In the example, [P302: Minimum setting unit] is set to 0.1.)
Positioning position (signed)	Handled as is. (Example) Indirect data setting -125.6 → Position -125.6mm
Positioning position (unsigned)	- Handled as is when it is a positive value. (Example) Indirect data setting 125.6 → Position 125.6° - Ignores the sign when it is a negative value. (Example) Indirect data setting -325.6 → Position 325.6°
External trigger position (unsigned)	- Handled as is when it is a positive value. (Example) Indirect data setting 125.6 → Position 125.6mm - Ignores the sign when it is a negative value. (Example) Indirect data setting -325.6 → Position 325.6mm
External trigger position (signed)	Handled as is. (Example) Indirect data setting -125.6 → Position -125.6mm (Note) This data is used in successive control commands (group 6).
Speed (unsigned)	- Handled as is when it is a positive value. (Example) Indirect data setting 125.6 → Speed 125.6mm/s - Ignores the sign when it is a negative value. (Example) Indirect data setting -325.6 → Speed 325.6mm/s - Assumes the speed of the minimum setting unit when it is 0. (Example) Indirect data setting 0.0 → Speed 0.1mm/s - Assumes the rated speed*² when it exceeds the rated speed*².
Speed (signed)	- Handled as is. (Example) Indirect data setting -125.6 → Speed -125.6mm (speed in the negative direction) - Assumes the rated speed*² when it exceeds the rated speed*². (Note) This data is used in successive control commands (group 6).
Rotation speed (signed)	- Ignores the decimal point. (Example) Indirect data setting -125.6 → Rotation speed -1256rpm - Assumes the rated rotation speed*² when it exceeds the rated rotation speed*².
Time (unsigned/signed)	[Other than the spin speed command or spin timer command] - Ignores the sign and assumes data in units of 10msec. (Example) Indirect data setting -125.6 → Time 12.56sec - Assumes the maximum value in the setting range when it exceeds the range. [Spin speed command and spin timer command] - Assumes data in units of 10msec when it is a positive value. (Example) Indirect data setting 125.6 → Time 12.56sec - Cancels the subsequent spin speed and spin timer commands when it is a negative value. - Assumes the maximum value in the setting range when it exceeds the range.
Common output (unsigned)	Ignores the decimal point and sign and assumes data consisting of eight low-order bits of setting data converted from decimal to binary. (Example) Indirect data setting -52.7 → Common output 4000001111 (binary number)

*² If P005 or P006 is other than 0, the speed is the applicable maximum speed.

Indirect data

Setting item	How indirect data is handled (In the example, [P302: Minimum setting unit] is set to 0.1.)
M output (unsigned)	• Ignores the decimal point and sign and assumes data consisting of two low-order digits of setting data. (Example) Indirect data setting -162.5 → M output 25
Address (unsigned)	• Ignores the decimal point. (Example) Indirect data setting 1.2 → Address 12 • Stops the command with an alarm when it exceeds the setting range or is a negative value.
Number of repetitions (unsigned)	• Ignores the decimal point and sign. (Example) Indirect data setting -1.2 → Number of repetitions 12 • Assumes the maximum value in the setting range when it exceeds the range.
Arithmetic operation data (signed)	• Ignores the decimal point. (Example) Indirect data setting -1.2 → Arithmetic operation data -12 • Assumes the maximum value in the setting range when the operation result exceeds the range.
COND: Internal end condition	• Refer to [7-3 Internal end condition specification]. (Note) This data is used in successive control commands (group 6).
TRQ%: Torque value (signed)	• Ignores the decimal point and assumes % data obtained when the rated torque is assumed to be 100%. (Example) Indirect data setting -12.7 → Torque value -12.7% • (Note) This data is used in successive control commands (group 6).
LIM%: Torque control value (unsigned)	• Ignores the decimal point and assumes % data obtained when the rated torque is assumed to be 100%. (Example) Indirect data setting 12.7 → Torque control value 12.7% • Ignores the sign when it is a negative value. (Example) Indirect data setting -25.6 → Torque control value 25.6% • (Note) This data is used in successive control commands (group 6).
Acceleration time 3 Deceleration time 3 (unsigned)	• Ignores the decimal point and sign and assumes data in units of 1msec. (Example) Indirect data setting -100.5 → Time 1.005 sec • Assumes the maximum value in the setting range when it exceeds the range.

7-3 Internal end condition specification (data in successive control commands)

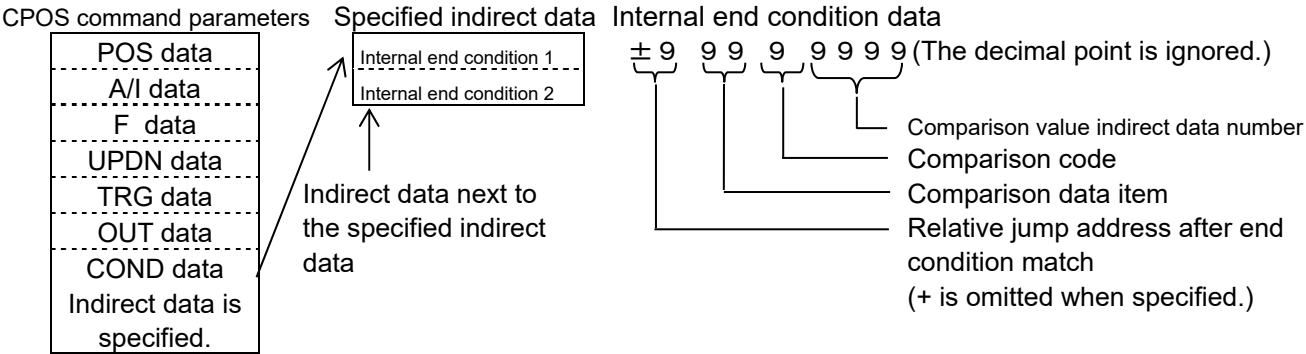
An internal end condition terminates a successive control command. It is set in command parameter [COND] of a successive control command.

Two types of internal end conditions are available: Internal end conditions 1 and 2.

Internal end conditions 1 and 2 are individually checked in this device. When either condition is satisfied, the command being executed is terminated and control jumps to the address indicated in the condition.

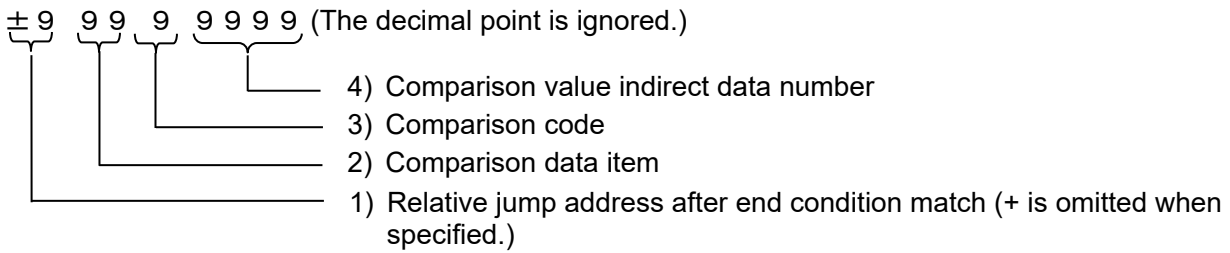
7-3-1 Overall view of internal end condition setting

The internal end condition setting is shown below using the CPOS command as an example.



7-3-2 Items in internal end condition data

Internal end condition data



1) Relative jump address after end condition match

Specify the jump address after the internal end condition is satisfied.

Specify a relative address, assuming that the current execution address is "0".

However, there are the following exceptions:

- When "0" is specified, the internal end condition is made invalid.
- When "+9" is specified, control jumps to the last address of the currently executed successive control command.

Example)

Current execution address	Setting value of the relative jump address after end condition match	Execution address after end condition match
15	-5	10 (15 - 5)
15	0	Internal end condition invalid
15	+1	16 (15 + 1)
15	+5	20 (15 + 5)
15	+9	CEND command address

2) Comparison data item

Specify a comparison data item of the internal end condition.

The following table lists the setting value and description of each comparison data item.

Setting value	Description	Unit
00 *3	Data 0	None
01 *4	Remaining travel amount for positioning	Setting unit
02	Relative position (when the command start position is assumed to be 0)	Setting unit
03	Absolute position	Setting unit
04	Feedback speed	Setting unit/sec
05	Actual torque command value	%
06	Time (when the command start time is assumed to be 0)	10ms
07	Indirect data 64 (speed command analog input value)	AD resolution
08	Indirect data 65 (torque command analog input value)	AD resolution
09 to 99	Manufacturer exclusive use (Do not select them.)	

*3 The comparison value is compared with comparison data assumed to be "0".

*4 The remaining travel amount for positioning is valid for the CPOS command. However, the internal end condition is invalid during external trigger delay operation. When the remaining travel amount for positioning is specified in other than the CPOS command, the internal end condition is invalid.

3) Comparison code

Specify a code used for comparing the comparison data item of the internal end condition and data of the comparison value indirect data number.

The following table lists comparison code setting values and their corresponding comparison codes.

Setting value	Comparison code
0	$\geq$ (comparison data item $\geq$ data of the comparison value indirect data number)
1	$\leq$ (comparison data item $\leq$ data of the comparison value indirect data number)
2	$>$ (comparison data item $>$ data of the comparison value indirect data number)
3	$<$ (comparison data item $<$ data of the comparison value indirect data number)
4	$=$ (comparison data item $=$ data of the comparison value indirect data number)

4) Comparison value indirect data number

Specify the number of indirect data containing a value to be compared with the comparison data item of the internal end condition.

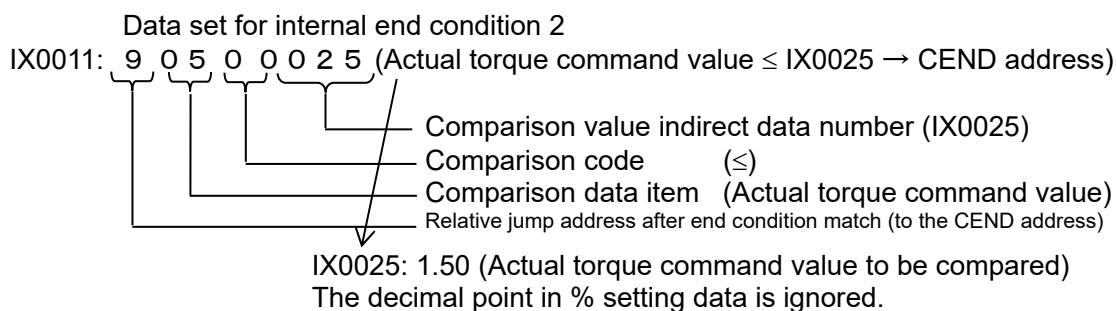
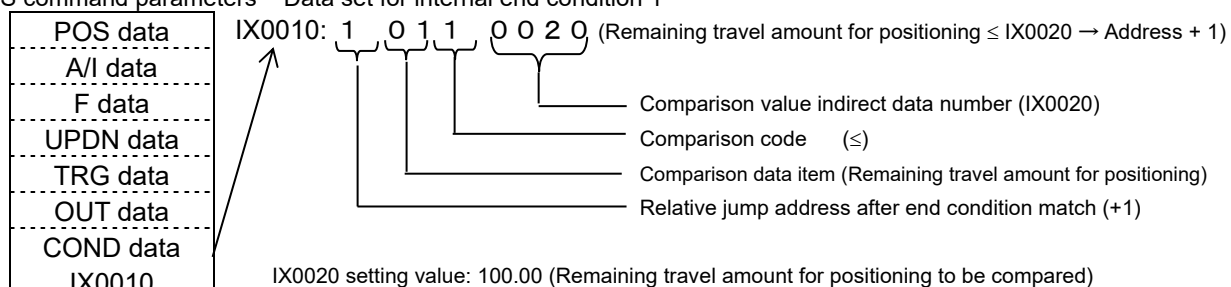
5) Example of setting internal end conditions

Example of setting the following internal end conditions

Internal end condition 1: When the remaining travel amount for positioning becomes less than or equal to 100.00mm, control jumps to the next address.

Internal end condition 2: When the actual torque command value is 150% or more, successive control is terminated.

CPOS command parameters Data set for internal end condition 1



6) Restrictions on internal end conditions

- In the following cases, the command is stopped with an alarm:
- The jump address after internal end condition match is outside the address range. [ADDR ERR] alarm
- The comparison value indirect data number setting is outside the setting range. [IXNO ERR] alarm
- When internal end conditions 1 and 2 are satisfied simultaneously, internal end condition 1 has priority.
- Internal end condition data is determined at the start of a command.
That is, even if internal end condition data is changed during execution, the change does not take effect.
However, when the comparison value indicated by the comparison value indirect data number is changed during execution, the changed comparison value is used for comparison.
- Do not specify indirect data 99 (IX99) in any internal end condition.
If this indirect data is specified, internal end condition 2 is invalid.

Chapter 8 Commands

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Group	Title	Command name	Function outline
0 Operation command	NOP	No operation [No OPERATION]	Executes no operation.
	POS	Positioning [POSitioning]	Executes positioning operation.
	HOME	Zero return [HOME positioning]	Executes zero return operation.
	INDX	Index positioning [INDeX positioning]	Executes positioning for a rotating object in the direction in which the travel distance is shorter.
1 Non-operation command	M	M output [M out]	Outputs M output and M strobe signals, and waits for the completion of M.
	TIME	Timer [TIMEr]	Waits for the specified time.
	PEND	Program end [Program END]	Terminates the execution of the program.
	CALL	Sub routine call [sub-routine CALL]	Repeats a sub-routine the specified number of times.
	RET	Sub routine return [sub-routine RETurn]	Indicates the end of a called sub-routine and returns to the calling program.
	GSEL	Gain Select [Gain SElect]	Switches to the selected operation gain after the specified time has elapsed.
2 Arithmetic and logic operation command	IMOV	Transfer [Indirect MOVE]	Transfers the specified data to indirect data.
	ADD	Addition [ADDition]	Executes addition, and transfers the operation result to indirect data.
	SUB	Subtraction [SUBtraction]	Executes subtraction, and transfers the operation result to indirect data.
	MUL	Multiplication [MULtiplication]	Executes multiplication, and transfers the operation result to indirect data.
	DIV	Division [DIVision]	Executes division, and transfers the operation result to indirect data.
	AND	Logical multiplication [AND]	Executes AND operation, and transfers the operation result to indirect data.
	OR	Logical addition [OR]	Executes OR operation, and transfers the operation result to indirect data.
	XOR	Exclusive logical addition [eXclusive OR]	Executes exclusive OR operation, and transfers the operation result to indirect data.
3 Jump command	JMP	Uncondition jump [JuMP]	Jumps to the specified address unconditionally.
	JZ	Zero jump [Jump if Zero]	Jumps to the specified address when the branch judgment result (indirect data) is 0.
	JNZ	Jump other than zero [Jump if Not Zero]	Jumps to the specified address when the branch judgment result (indirect data) is other than 0.
	JG	Jump 1 or more [Jump if Greater than zero]	Jumps to the specified address when the branch judgment result (indirect data) is 1 or greater.
	JL	Jump -1 or less [Jump if Less than zero]	Jumps to the specified address when the branch judgment result (indirect data) is -1 or less.

Group	Title	Command name	Function outline
4 Driver command	TRQ	Torque control [ToRQue]	Executes torque control with an external torque command (analog input command) or internal torque command.
	SPD	Speed control [SPeeD]	Executes speed control with an external speed command (analog input command) or internal speed command.
5 Successive operation command	SPNS	Spin speed [SPiN Speed]	Sets the specified rotation speed with the specified acceleration/deceleration time.
	SPNT	Spin timer [SPiN Timer]	Sustains the rotation status set by Spin speed for the specified time.
	SPNP	Spin positioning [SPiN POSitioning]	Executes positioning to the specified position with the specified time in the rotation status at the spin speed.
	SPOS	Positioning [Sequential POSitioning]	The function is the same as for the [POS] command. The program continues after the completion of operation.
	CONT	Simple successive positioning [CONTinue POSitioning]	Executes successive positioning operation without stop when this command is successively specified. Executes the same operation as for SPOS for the last CONT or single CONT command.
	REPT	Repeat positioning [REPeaT POSitioning]	Repeats the specified positioning operation the specified number of times.
	SHOM	Zero return [Sequential HOME positioning]	The function is the same for as the [HOME] command. The program continues after the completion of operation.
	SIND	Index positioning [Sequential iNDeX positioning]	The function is the same for as the [INDX] command. The program continues after the completion of operation.
6 Successive control command	CPOS	Successive position control [Continual POSitioning]	Executes positioning operation. However, allows switching to successive torque control or successive speed control during positioning operation.
	CTRQ	Successive torque control [Continual ToRQue]	Executes torque control. However, allows switching to successive speed control during torque control operation.
	CSPD	Successive speed control [Continual SPeeD]	Executes speed control. However, allows switching to successive torque control during speed control operation.
	CEND	Successive control end [Continual END]	Terminates successive control operation, and executes servo-lock after the motor decelerates and stops.

This section outlines the commands supported by this machine model.

If you require details of command operation, refer to annexed VCII series instruction manual, [command section].

The BS field indicates the classification of the block stop function in each command.

The block stop function stops the operation at the end of the relevant command according to the Block stop signal (BSTP) during automatic operation.

[U1]): Ignores the Block stop signal and executes the command specified at the next address.

[U2]): Ignores the Block stop signal and executes the program to the end.

[A1]): Places the program in the restart waiting status at the completion of the command.

Executes the command specified at the next address at the restart.

[A2]): Places the program in the restart waiting status when successive operation is completed and the motor stops.

Executes the command specified at the address next to that at which block stop is completed.

[A3]): Places the program in the restart waiting status when positioning operation has been repeated the specified number of times.

Executes the command specified at the next address at the restart.

[A4]): Places the program in the restart waiting status after calling the specified address.

At the restart, executes the command at the specified address, then continues or restarts the calling command.

8-2-1 Operation commands (group 0)

Title	Command name	BS	Setting data			
			Data	Setting unit	Setting range (direct data)	
					Setting range (indirect data)	
					Function	
NOP	No operation [No OPeration]	U1)	None	None	None	
• NOP executes no operation.						
POS	Positioning [POSitioning]	U2)	POS [Positioning position/ direction]	mm/° /in	-99999999 to 99999999	
			IX00 to IX99			
			A/I [Absolute position/ relative position]	None	ABSOLUTE/INCREMENT	
			F [Positioning speed]	mm,° ,in /sec	00000000 to 99999999	
			IX00 to IX99			
			UPDN [Acceleration/ deceleration time]	None	SEL.1/SEL.2/SEL.3	
			TRG [External trigger position]	mm/° /in	00000000 to 99999999	
			IX00 to IX99			
			OUT [Common output]	Binary number	00000000 to 11111111	
			IX00 to IX99			
• POS executes positioning operation. • It allows external trigger positioning. As the external trigger position, set the travel amount after the TRG signal is input. • Common output is enabled at the start of operation. • By setting a numeric value with a minus sign in parameters [P213] and [P216], indirect data values can be set when SEL.3 is selected for UPDN. For the setting method, refer to [6-3 Parameter specification]. • When SEL.3 is selected, the acceleration/deceleration time is reflected at the execution of the command. • This command terminates the program after the completion of operation.						
HOME	Zero return [HOME positioning]	U2)	TYPE [Zero return method]	None	STD.HOME/LS LESS/ STOP HOME/OT HOME	
			DIR [Direction of operation]	None	FORWARD/REVERSE	
			OUT [Common output]	Binary number	00000000 to 11111111	
			IX00 to IX99			
• HOME executes zero return operation. • The zero return method and direction can be set. • Operation is executed following the parameters related to zero return other than data set in the command. • Common output is enabled at the start of operation. • This command terminates the program after the completion of operation.						

Commands

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
					Function
INDX	Index positioning [INDeX positioning]	U2)	POS [Positioning position/ direction]	mm/° /in	00000000 to 99999999 IX00 to IX99
			F [Positioning speed]	mm, ° ,in /sec	00000000 to 99999999 IX00 to IX99
			UPDN [Acceleration/ deceleration time]	None	SEL.1/SEL.2/SEL.3
			OUT [Common output]	Binary number	00000000 to 11111111 IX00 to IX99
			• INDX executes positioning for a rotating object in the direction in which the travel distance is shorter. • Common output is enabled at the start of operation. • By setting a numeric value with a minus sign in parameters [P213] and [P216], indirect data values can be set when SEL.3 is selected for UPDN. For the setting method, refer to [6-2 Parameter list] • When SEL.3 is selected, the acceleration/deceleration time is reflected at the execution of the command. • This command terminates the program after the completion of operation.		

8-2-2 Non-operation commands (group 1)

Non-operation commands (group 1)					
Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
Function					
M	M output [M out]	A1)	M	None	00 to 99
			[M output]		IX00 to IX99
			▪ M outputs M output and M strobe signals, and waits for the completion of M. ▪ M output once output keeps data until the next command in the M output enable setting status is executed. ▪ When this command is executed in the M complete signal (MFIN) ON status, the M strobe signal is not output until the M complete signal (MFIN) is switched OFF.		
TIME	Timer [TIMER]	A1)	TIME	0.01sec	000000.00 to 999999.99
			[Timer time]		IX00 to IX99
			OUT	Binary number	00000000 to 11111111
			[Common output]		IX00 to IX99
▪ TIME waits for the specified time. ▪ Common output is enabled at the start.					
PEND	Program end [Program END]	U2)	None	None	None
			▪ PEND terminates the execution of the program. ▪ The Program end signal (PEND) and Automatic run ready signal (PRDY) are output with the completion of this command. ▪ Common output and M output are sustained.		
CALL	Sub routine call [sub-routine CALL]	A4)	CADR	None	000 to 279
			[Call destination address]		IX00 to IX99
			REPT	None	00000 to 65535
			[Number of repetitions]		IX00 to IX99
▪ CALL repeats the sub-routine specified by CADR REPT times. ▪ Up to eight levels of nesting (the number of times this command can be executed without return) is allowed. ▪ When the number of repetitions is "0", this command is ignored, and the command specified at the next address is executed.					
RET	Sub routine return [sub-routine RETurn]	A1)	None	None	None
			▪ RET terminates the called sub-routine, and returns to the calling program. ▪ This command changes the execution address to the address next to that of the calling program when the sub-routine is executed the specified number of times.		
GSEL	Gain Select [Gain SElect]	A1)	SEL	None	SEL/ON/OFF/GSEL2/GSEL3
			[Gain select]		
			TIME	0.001sec	00000.000 to 99999.999
			[Timer time]		IX00 to IX99
▪ GSEL switches to the selected operation gain after the specified time has elapsed. ▪ Operation gain specified in this command becomes invalid [at the end of program (PEND)], [at RST/PCAN], [when an alarm occurs], or [in other than the automatic run mode]. After that, operation gain follows the GSEL/GSEL2 input signals. ▪ Gain select operation is executed as follows: - SEL: Follows the GSEL signal/GSEL2 signal. - ON: Operates as in the GSEL signal ON/GSEL2 signal OFF status. - OFF: Operates as in the GSEL signal OFF/GSEL2 signal OFF status. - GSEL2: Operates as in the GSEL signal OFF/GSEL2 signal ON status. - GSEL3: Operates as in the GSEL signal ON/GSEL2 signal ON status.					

Commands

8-2-3 Arithmetic and logic operation commands (group 2)

Title	Command name	BS	Setting data			
			Data	Setting unit	Setting range (direct data)	
					Setting range (indirect data)	
Function						
IMOV	Transfer [Indirect MOVE]	U1)	DST [Transfer destination]	None		
			IX00 to IX99			
			SOC [Transfer data]	None	-99999999 to 99999999	
			IX00 to IX99			
• IMOV transfers the specified data to indirect data. Operation expression: DST (indirect) ← SOC						
ADD	Addition [ADDition]	U1)	DST [Addition result transfer destination]	None		
			IX00 to IX99			
			SOC1 [Addition element 1]	None	-99999999 to 99999999	
			IX00 to IX99			
• ADD executes addition, and transfers the operation result to indirect data. • The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.) • The operation result is clamped at ±99999999. Operation expression: DST (indirect) ← SOC1 + SOC2						
SUB	Subtraction [SUBtraction]	U1)	DST [Subtraction result transfer destination]	None		
			IX00 to IX99			
			SOC1 [Subtraction element 1]	None	-99999999 to 99999999	
			IX00 to IX99			
• SUB executes subtraction, and transfers the operation result to indirect data. • The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.) • The operation result is clamped at ±99999999. Operation expression: DST (indirect) ← SOC1 - SOC2						
MUL	Multiplication [MULtiplication]	U1)	DST [Multiplication result transfer destination]	None		
			IX00 to IX99			
			SOC1 [Multiplication element 1]	None	-99999999 to 99999999	
			IX00 to IX99			
• MUL executes multiplication, and transfers the operation result to indirect data. • The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.) • The operation result is clamped at ±99999999. Operation expression: DST (indirect) ← SOC1 x SOC2						

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
Function					
DIV	Division [DIVision]	U1)	DST1 [Division remainder transfer destination]	None	
			IX00 to IX99		
			DST2 [Division quotient transfer destination]	None	
			IX00 to IX99		
			SOC1 [Dividend]	None	-99999999 to 99999999
			IX00 to IX99		
			SOC2 [Divisor]	None	-99999999 to 99999999
IX00 to IX99					
			• DIV executes division, and transfers the operation result to indirect data. • The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.) Operation expression: DST2 (indirect) ← SOC1 ÷ SOC2 DST1 (indirect) ← Remainder		
AND	Logical multiplication [AND]	U1)	DST [Logical multiplication result transfer destination]	None	
			IX00 to IX99		
			SOC1 [AND element 1]	None	-99999999 to 99999999
			IX00 to IX99		
			SOC2 [AND element 2]	None	-99999999 to 99999999
			IX00 to IX99		
• AND executes AND operation, and transfers the operation result to indirect data. • The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.) Operation expression: DST (indirect) ← SOC1 AND SOC2					
OR	Logical addition [OR]	U1)	DST [Logical addition result transfer destination]	None	
			IX00 to IX99		
			SOC1 [OR element 1]	None	-99999999 to 99999999
			IX00 to IX99		
			SOC2 [OR element 2]	None	-99999999 to 99999999
			IX00 to IX99		
• OR executes OR operation, and transfers the operation result to indirect data. • The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.) Operation expression: DST (indirect) ← SOC1 OR SOC2					

Commands

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
Function					
XOR	Exclusive logical addition [eXclusive OR]	U1)	DST [Exclusive logical addition result transfer destination]	None	
					IX00 to IX99
			SOC1 [Exclusive OR element 1]	None	-99999999 to 99999999
					IX00 to IX99
			SOC2 [Exclusive OR element 2]	None	-99999999 to 99999999
					IX00 to IX99
			▪ XOR executes exclusive OR operation, and transfers the operation result to indirect data. ▪ The decimal point in indirect data is ignored and the data is assumed to be an integer value for operation. (Example: 1.25 is assumed to be 125 for operation.)		
			Operation expression: DST (indirect) ← SOC1 XOR SOC2		

8-2-4 Jump commands (group 3)

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
					Function
JMP	Unconditional jump [JuMP]	A1)	JADR [Jump destination address]	None	000 to 279
					IX00 to IX99
			▪ JMP jumps to the specified address unconditionally.		
JZ	Zero jump [Jump if Zero]	A1)	JADR [Jump destination address]	None	000 to 279
					IX00 to IX99
			SOC [Branch condition judgment data]	None	
					IX00 to IX99
▪ JZ jumps to the specified address when the branch judgment result is 0.					
JNZ	Jump other than zero [Jump if Not Zero]	A1)	JADR [Jump destination address]	None	000 to 279
					IX00 to IX99
			SOC [Branch condition judgment data]	None	
					IX00 to IX99
▪ JNZ jumps to the specified address when the branch judgment result is other than 0.					
JG	Jump 1 or more [Jump if Greater than zero]	A1)	JADR [Jump destination address]	None	000 to 279
					IX00 to IX99
			SOC [Branch condition judgment data]	None	
					IX00 to IX99
▪ JG jumps to the specified address when the branch judgment result is 1 or greater.					
JL	Jump -1 or less [Jump if Less than zero]	A1)	JADR [Jump destination address]	None	000 to 279
					IX00 to IX99
			SOC [Branch condition judgment data]	None	
					IX00 to IX99
▪ JL jumps to the specified address when the branch judgment result is -1 or less.					

Commands

8-2-5 Driver commands (group 4)

Driver commands (group 1)					
Title	Command name	BS	Setting data		
			Data	Setting unit	
				Setting range (direct data) Setting range (indirect data)	
Function					
TRQ	Torque control [ToRQue]	A1)	TRQ	None	SEL0 to SEL3
			[Torque command selection]		
			M	None	00 to 99
			[M output]		IX00 to IX99
			• TRQ executes torque control according to torque command selection. • When "SEL0" is selected for torque command selection, operation is performed according to the external torque command. • When "SEL1" to "SEL3" is selected for torque command selection, operation is performed according to the setting of parameter [P137 to P139: Internal torque command value 1 to 3]. • When the selected command is an [internal command], switching ON Command Direction Select (SSD) reverses the specified direction. • This command executes M output at the start of operation and completes operation with M complete signal (MFIN) ON. • During completion operation, servo-lock is executed after the motor decelerates and stops, then the next command is executed. • When Hold (HLD) is input during the execution of this command, the motor decelerates and stops. • Completion operation, and deceleration and stop at Hold (HLD) are performed according to [P216: Deceleration time 3]. • When this command is executed in the M complete signal (MFIN) ON status, torque control is not executed, and the M strobe signal (MSTB) is not also output until the M complete signal (MFIN) is switched OFF.		
SPD	Speed control [SPeeD]	A1)	SPD	None	SEL0 to SEL3
			[Speed command selection]		
			M	None	00 to 99
			[M output]		IX00 to IX99
			• SPD executes speed control according to speed command selection. • When "SEL0" is selected for speed command selection, operation is performed according to the external speed command. • When "SEL1" to "SEL3" is selected for speed command selection, operation is performed according to the setting of parameter [P134 to P136: Internal speed command value 1 to 3]. • When the selected command is an [internal command], switching ON Command Direction Select (SSD) reverses the specified direction. • Acceleration (deceleration) operates with the time resulting from rounding the setting of [P213: Acceleration time 3] ([P216: Deceleration time 3]) to msec units. If a time of 1 to 9 msec is set, it operates by assuming the time to be 10 msec. • This command executes M output at the start of operation and completes operation with M complete signal (MFIN) ON. • During completion operation, servo-lock is executed after the motor decelerates and stops, then the next command is executed. • When Hold (HLD) is input during the execution of this command, the motor decelerates and stops. • Completion operation, and deceleration and stop at Hold (HLD) are performed according to [P216: Deceleration time 3]. • When this command is executed in the M complete signal (MFIN) ON status, speed control is not executed, and the M strobe signal (MSTB) is not also output until the M complete signal (MFIN) is switched OFF.		

8-2-6 Successive operation commands (group 5)

			Setting data		
Title	Command name	BS	Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
Function					
SPNS	Spin speed [SPiN Speed]	U1)	RPM	rpm	-9999 to 9999
			[Rotation speed]		IX00 to IX99
			TIME	0.01sec	000.00 to 655.35
			[Acceleration/deceleration time]		IX00 to IX99
			M	None	00 to 99
			[M output]		IX00 to IX99
• SPNS sets the specified rotation speed with the specified acceleration/deceleration time. However, when the acceleration/deceleration setting time exceeds any upper limit in the restriction below, acceleration/deceleration is executed with the upper limit. During the excess time, rotation is kept constant at the reached speed. Restriction: Acceleration time upper limit from 0rpm to the rated speed or applicable maximum speed: 300.00sec Deceleration time upper limit from the rated speed or applicable maximum speed to 0rpm: 300.00sec • This command can execute M output at the start of operation and wait for the completion of M. • When Hold (HLD) is input during the execution of this command, the motor decelerates and stops according to the setting in [P214: Deceleration time 1]. The output of the M strobe signal is switched OFF at the restart. • When negative data is specified for the acceleration/deceleration time (with indirect data), the subsequent spin speed and spin timer commands are canceled. • When this command is executed in the M complete signal (MFIN) ON status, the M strobe signal is not output until the M complete signal (MFIN) is switched OFF.					
SPNT	Spin timer [SPiN Timer]	U1)	TIME	0.01 sec	000000.00 to 999999.99
			[Sustaining time]		IX00 to IX99
			M	None	00 to 99
			[M output]		IX00 to IX99
• SPNT sustains the rotation status set by Spin speed for the specified time. • This command can execute M output at the start of operation and wait for the completion of M. • When Hold (HLD) is input during the execution of this command, the motor decelerates and stops according to the setting in [P214: Deceleration time 1]. The output of the M strobe signal is switched OFF at the restart. • When negative data is specified for the acceleration/deceleration time (with indirect data), the subsequent spin speed and spin timer commands are canceled. • When this command is executed in the M complete signal (MFIN) ON status, the M strobe signal is not output until the M complete signal (MFIN) is switched OFF.					
SPNP	Spin positioning [SPiN Positioning]	A1)	POS	mm/° /in	00000000 to 99999999
			[Positioning position]		IX00 to IX99
			DOWN	None	SEL.1/SEL.2/SEL.3
			[Deceleration time selection]		
			M	None	00 to 99
[M output]	IX00 to IX99				
• SPNP executes positioning to the specified position with the specified time in the rotation status at the spin speed. • This command can execute M output at the start of operation and wait for the completion of M. • When Hold (HLD) is input during the execution of this command, the motor decelerates and stops according to the setting in DOWN. • When this command is executed in the M complete signal (MFIN) ON status, the M strobe signal is not output until the M complete signal (MFIN) is switched OFF.					

Commands

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
Function					
SPOS	Positioning [Sequential POSitioning]	A1)	POS [Positioning position/ direction]	mm/° /in	-99999999 to 99999999 IX00 to IX99
			A/I [Absolute position/ relative position]	None	ABSOLUTE/INCREMENT
			F [Positioning speed]	mm,° ,in /sec	00000000 to 99999999 IX00 to IX99
			UPDN [Acceleration/ deceleration time]	None	SEL.1/SEL.2/SEL.3
			TRG [External trigger position]	mm/° /in	00000000 to 99999999 IX00 to IX99
			OUT [Common output]	Binary number	00000000 to 11111111 IX00 to IX99
			▪ Operation is the same as for the POS (positioning) command. However, the command specified at the next address is executed after the completion of operation.		
CONT	Simple successive positioning [CONTinue positioning]	A2)	POS [Positioning position/ direction]	mm/° /in	-99999999 to 99999999 IX00 to IX99
			A/I [Absolute position/ relative position]	None	ABSOLUTE/INCREMENT
			F [Positioning speed]	mm,° ,in /sec	00000000 to 99999999 IX00 to IX99
			UPDN [Acceleration/ deceleration time]	None	SEL.1/SEL.2/SEL.3
			TRG [External trigger position]	mm/° /in	00000000 to 99999999 IX00 to IX99
			OUT [Common output]	Binary number	00000000 to 11111111 IX00 to IX99
			▪ CONT executes successive positioning operation without stop when this command is successively specified during operation in the same direction. ▪ This command executes the same operation as for SPOS when it is specified once. ▪ It allows external trigger positioning. As the external trigger position, set the travel amount after the TRG signal is input. ▪ Common output is enabled at the start of operation. ▪ The acceleration/deceleration time and external trigger positioning during successive operation follow the [UPDN] and [TRG] setting in the successive operation start block.		

Title	Command name	BS	Setting data			
			Data	Setting unit	Setting range (direct data)	
					Setting range (indirect data)	
Function						
REPT	Repeat positioning [REPeaT positioning]	A3)	POS [Positioning position/direction]	mm/° /in	-99999999 to 99999999 IX00 to IX99	
			A/I [Absolute position/relative position]	None	ABSOLUTE/INCREMENT	
			F [Positioning speed]	mm,° ,in /sec	00000000 to 99999999 IX00 to IX99	
			UPDN [Acceleration/deceleration time]	None	SEL.1/SEL.2/SEL.3	
			TRG [External trigger position]	mm/° /in	00000000 to 99999999 IX00 to IX99	
			M [M output]	None	00 to 99 IX00 to IX99	
			REPT [Number of repetitions]	None	00000 to 65535 IX00 to IX99	
			• REPT repeats the specified positioning operation the specified number of times.			
			• It allows external trigger positioning. As the external trigger position, set the travel amount after the TRG signal is input.			
			• This command can execute M output at the start of operation and wait for the completion of M.			
			• When the number of repetitions is "0", repeat positioning is not executed.			
			• When this command is executed in the M complete signal (MFIN) ON status, the M strobe signal is not output until the M complete signal (MFIN) is switched OFF.			
			SHOM	Zero return [Sequential HOME positioning]	A1)	TYPE [Zero return method]
DIR [Direction of operation]	None	FORWARD/REVERSE				
OUT [Common output]	Binary number	00000000 to 11111111 IX00 to IX99				
• Operation is the same as for the HOME (zero return) command. However, the command specified at the next address is executed after the completion of operation.						
SIND	Index positioning [Sequential INDEX positioning]	A1)	POS [Positioning position/direction]	mm/° /in	00000000 to 99999999 IX00 to IX99	
			F [Positioning speed]	mm,° ,in /sec	00000000 to 99999999 IX00 to IX99	
			UPDN [Acceleration/deceleration time]	None	SEL.1/SEL.2/SEL.3	
			OUT [Common output]	Binary number	00000000 to 11111111 IX00 to IX99	
			• Operation is the same as for the INDX (index positioning) command. However, this command terminates the program after the completion of operation.			

Commands

8-2-7 Successive control commands (group 6)

			Setting data				
Title	Command name	BS	Data	Setting unit	Setting range (direct data)		
					Setting range (indirect data)		
Function							
CPOS	Successive position control [Continual POSitioning]	U1)	POS [Position/direction]	mm/° /in	-99999999 to 99999999		
					IX00 to IX99		
			A/I [Absolute position/ relative position]	None	ABSOLUTE/INCREMENT		
			F [Positioning speed]	mm,° ,in /sec	00000000 to 99999999		
					IX00 to IX99		
			UPDN [Acceleration/ deceleration time]	None	SEL.1/SEL.2/SEL.3		
			TRG [External trigger delay distance]	mm/° /in	-99999999 to 99999999		
					IX00 to IX99		
			OUT [Common output]	Binary number	00000000 to 11111111		
					IX00 to IX99		
COND [Internal end condition]	None	00000 to 65535					
		IX00 to IX99					
• CPOS executes positioning operation. • External trigger delay operation is enabled. • When the internal end condition is satisfied during operation, another successive control command can be executed in the operating conditions. • Common output is enabled at the start of operation. • If a negative value is set for TRG, the next command is executed when the external trigger signal is input.							
CTRQ	Successive torque control [Continual ToRQue]	U1)	TRQ% [Torque command]	%	-799.9 to 799.9		
					IX00 to IX99		
			F [Speed limit]	mm,° ,in /sec	00000000 to 99999999		
					IX00 to IX99		
			TRG [External trigger delay distance]	mm/° /in	-99999999 to 99999999		
					IX00 to IX99		
			OUT [Common output]	Binary number	00000000 to 11111111		
					IX00 to IX99		
			COND [Internal end condition]	None	00000 to 65535		
					IX00 to IX99		
			• CTRQ executes torque control operation. • External trigger delay operation is enabled. • When the internal end condition is satisfied during operation, another successive control command can be executed in the operating conditions. However, the motor stops immediately when the CPOS command is executed. • Common output is enabled at the start of operation. • If a negative value is set for TRG, the next command is executed when the external trigger signal is input.				

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (direct data)
					Setting range (indirect data)
					Function
CSPD	Successive speed control [Continual SPeeD]	U1)	LIM% [Torque limit]	%	000 to 799.9
					IX00 to IX99
			F+- [Speed command]	mm, ° ,in /sec	-99999999 to 99999999
					IX00 to IX99
			TRG [External trigger delay distance]	mm/° /in	-99999999 to 99999999
					IX00 to IX99
			OUT [Common output]	Binary number	00000000 to 11111111
					IX00 to IX99
			COND [Internal end condition]	None	00000 to 65535
					IX00 to IX99
			• CSPD executes speed control operation. • External trigger delay operation is enabled. • When the internal end condition is satisfied during operation, another successive control command can be executed in the operating conditions. However, the motor stops immediately when the CPOS command is executed. • Common output is enabled at the start of operation. • If a negative value is set for TRG, the next command is executed when the external trigger signal is input. • Acceleration (deceleration) operates with the time resulting from rounding the setting of [P213: Acceleration time 3] ([P216: Deceleration time 3]) to msec units. If a time of 1 to 9 msec is set, it operates by assuming the time to be 10 msec.		
CEND	Successive control end [Continual END]	A1)	OUT [Common output]	Binary number	00000000 to 11111111
					IX00 to IX99
			• CEND terminates successive control operation, and executes servo-lock after the motor decelerates and stops. • Common output is enabled at the start of operation.		

Chapter 9 Self-diagnosis

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- 9-2 Diagnosis items 9-4
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Self-diagnosis mode is executed through LCD module and SDI device or our dedicated editing software. Executing procedure of self-diagnosis mode through LCD module and SDI device is shown below. (As for self-diagnosis with dedicated editing software, refer to on-line manual attached to the software.)

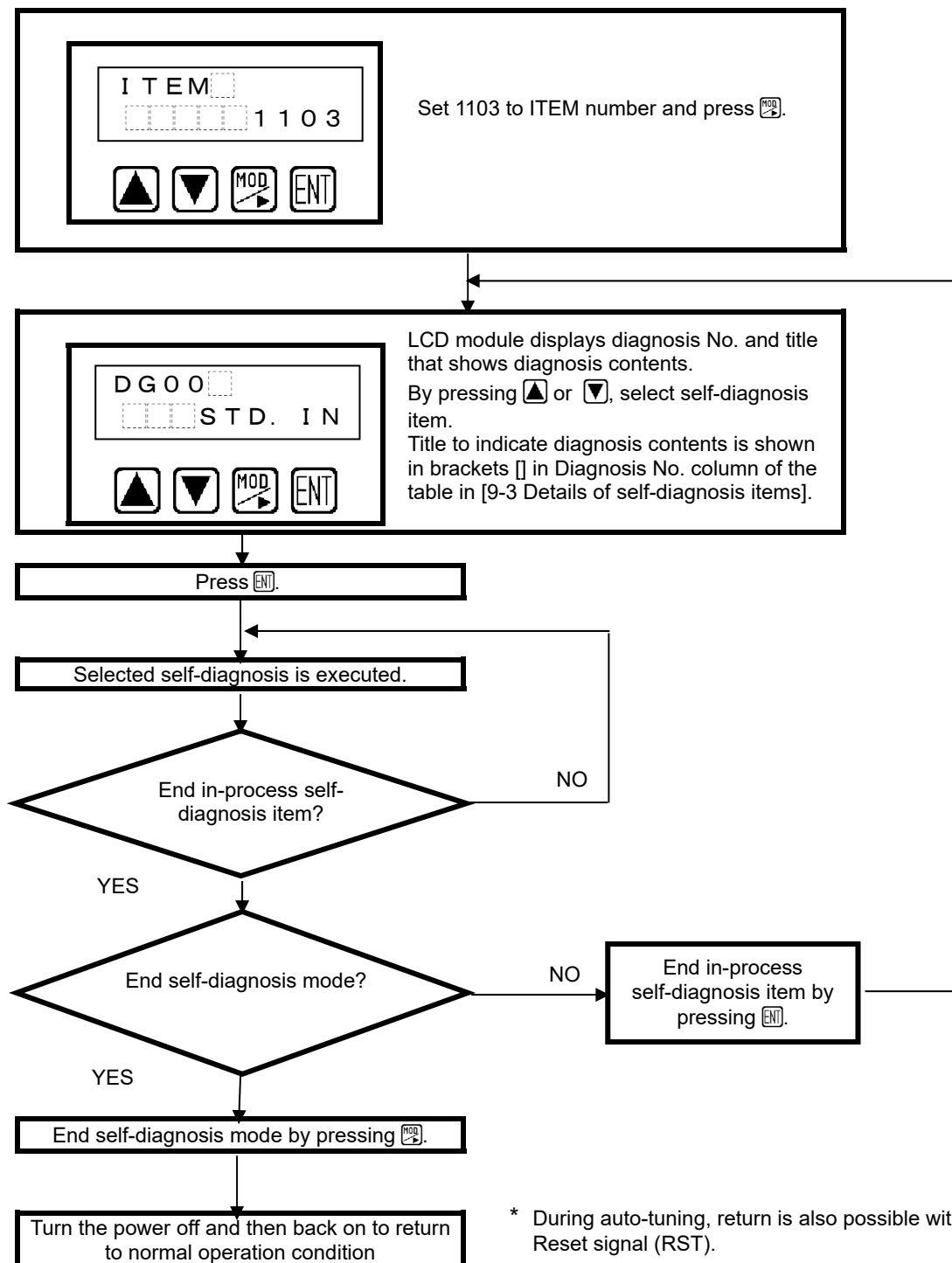


Figure 9-1 Executing procedure of self-diagnosis mode

In the case of absolute position correction data transceiving, user data transceiving, and IPU parameter transceiving, execution confirmation is indicated again after function selection. To execute actually, or to cancel it, operate as follows.

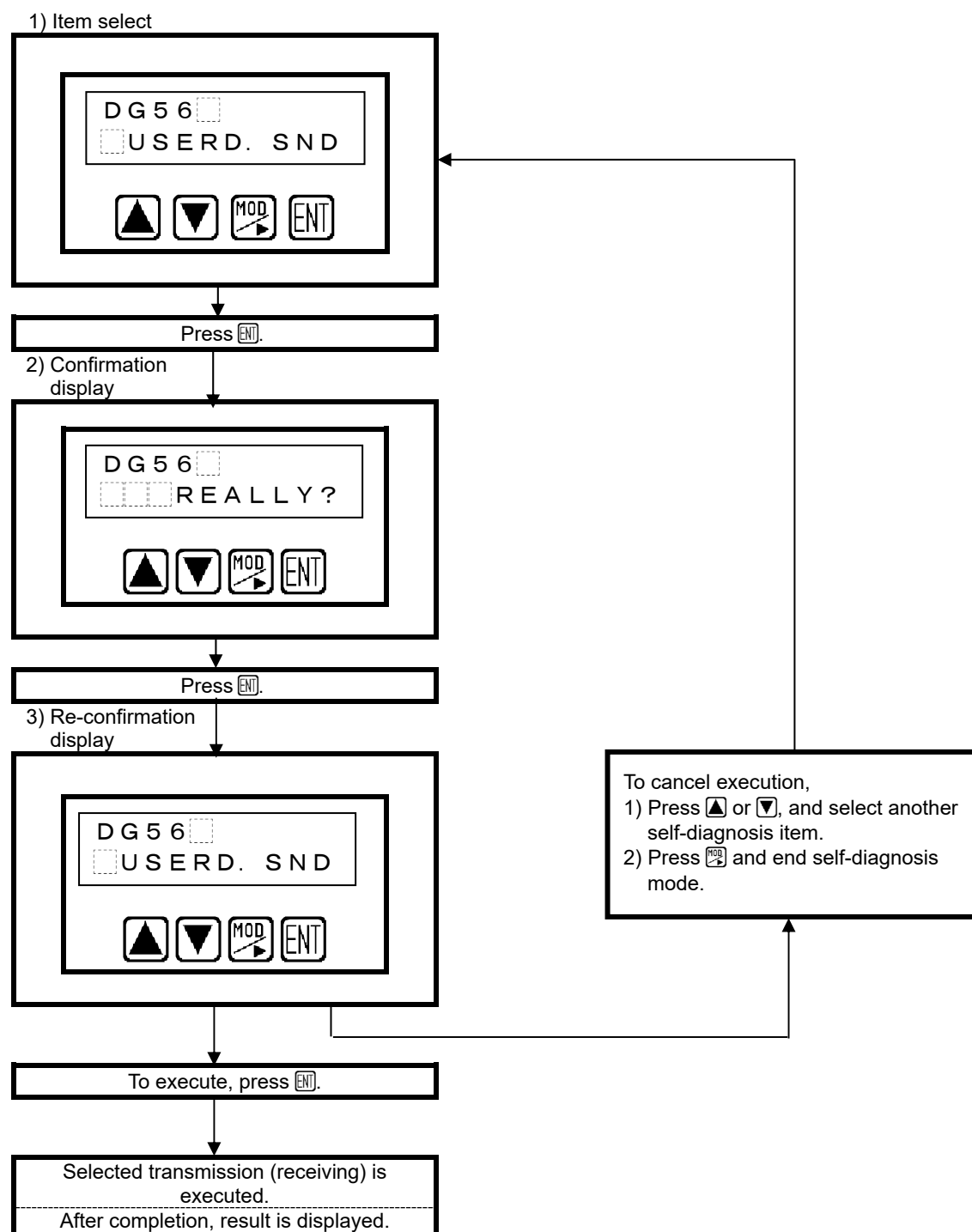


Figure 9-2 Executing procedure of absolute position correction data, user data, and IPU parameter transceiving



Caution

- Self-diagnosis items of DG22, DG53, DG70-76, DG80-88 (excluding DG84), and DG96 are for factory shipping adjustment only. Thus, never execute them.

Table 9-1 Self-diagnosis items (1/3)

DG number	Name	Function
D G 0 0	Basic input signal check	Status of basic input port (CN1-29 to 36: DI8 to DI1) is displayed on LCD module.
D G 0 1	Extension input signal check 1	Status of optional extension input port (CN3: EI8 to EI1) is displayed on LCD module.
D G 0 2	Extension input signal check 2	Status of optional extension input port (CN3: EI16 to EI9) is displayed on LCD module.
D G 0 3	Extension input signal check 3	Status of optional extension input port (CN3: EI24 to EI17) is displayed on LCD module.
D G 0 4	Extension input signal check 4	Status of optional extension input port (CN3: EI32 to EI25) is displayed on LCD module.
D G 0 5	Machine model information data check	Machine model information is displayed on LCD module.
D G 0 6	Extension interruption ZLS signal check	Receiving status of ZLS signal of optional control input/output expansion unit is displayed on LCD module.
D G 0 7	Extension interruption TRG signal check	Receiving status of TRG signal of optional control input/output expansion unit is displayed on LCD module.
D G 1 0	Pulse train command check	Operating conditions (value of command counter) of internal command counter by pulse train command input is displayed on LCD module.
D G 1 1	Encoder FB check	Operating conditions (value of feedback pulse counter) of internal feedback pulse counter by encoder feedback pulse is displayed on LCD module.
D G 1 2	Encoder speed detection check	Operating conditions (frequency of encoder feedback pulse) of internal speed detection counter by encoder feedback pulse is displayed on LCD module.
D G 1 3	Serial encoder FB check	Position of serial encoder 1-rotation is displayed on LCD module.
D G 1 4	Marker capture check	Receiving status of encoder marker signal is displayed on LCD module.
D G 2 0	Analog input speed command check	Input voltage of external speed command (INH) is displayed on LCD module.
D G 2 1	Analog input torque command check	Input voltage of external torque command (TQH) is displayed on LCD module.
D G 2 2	Analog input select command check	This item is for factory shipping adjustment. Never execute.
D G 2 3	Analog input magnetic pole sensor SIN check	Input voltage of optional magnetic pole sensor SIN is displayed on LCD module.
D G 2 4	Analog input magnetic pole sensor COS check	Input voltage of optional magnetic pole sensor COS is displayed on LCD module.
D G 2 5	Extension analog input check 1	Input voltage of optional extension analog input is displayed on LCD module.
D G 2 6	Extension analog input check 2	Input voltage of optional extension analog input is displayed on LCD module.
D G 2 7	Extension analog input check 3	Input voltage of optional extension analog input is displayed on LCD module.
D G 2 8	Extension analog input check 4	Input voltage of optional extension analog input is displayed on LCD module.

Table 9-2 Self-diagnosis items (2/3)

DG number	Name	Function
D G 3 0	Basic output signal check	Status of basic output port (CN1-14 to 17: DO4 to DO1) is displayed on LCD module.
D G 3 1	Extension output signal check	Status of optional extension output port (CN3: EO8 to EO1) is displayed on LCD module.
D G 3 2	7-segment LED check	Numeric value of 0 to 9 is displayed on 7-segment LED in order.
D G 3 3	LCD signal display check	Signal display blocks of LCD module all blink.
D G 4 0	Analog monitor 0V check	0V is output to analog monitor terminals (MON1, MON2).
D G 4 1	Analog monitor +5V check	+5V is output to analog monitor terminals (MON1, MON2).
D G 4 2	Analog monitor -5V check	-5V is output to analog monitor terminals (MON1, MON2).
D G 4 3	Analog monitor +10V check	+10V is output to analog monitor terminals (MON1, MON2).
D G 4 4	Analog monitor -10V check	-10V is output to analog monitor terminals (MON1, MON2).
D G 5 0	RAM check	Execute read/write against device internal RAM, and check if no errors. Result is displayed on LCD module.
D G 5 1	FLASH check	In C6 machine model, execute read/write against FLASH memory for pattern data, and check if no errors are found. Result is displayed on LCD module.
D G 5 2	EEPROM check	Execute read/write against device internal EEPROM (nonvolatile memory), and check if no errors are found. Result is displayed on LCD module.
D G 5 3	Memory initialization	This item is for factory shipping adjustment. Never execute. If executed, parameter contents are all rewritten to initial status.
D G 5 4	Absolute position correction data transmission	Absolute position correction data is transmitted to IPU. Result is displayed on LCD module.
D G 5 5	Absolute position correction data receiving	Absolute position correction data is received from IPU. Result is displayed on LCD module.
D G 5 6	User data transmission	User data is transmitted to IPU. Result is displayed on LCD module.
D G 5 7	User data receiving	User data is received from IPU. Result is displayed on LCD module.
D G 5 9	IPU parameter receiving	IPU parameter is received from IPU. Result is displayed on LCD module.
D G 6 0	SIO check	By shorting connector J1, TXD (A)-RXD (A), confirm whether transceiving is executed usually. Result is displayed on LCD module.

Table 9-3 Self-diagnosis items (3/3)

DG number	Name	Function
D G 6 1	Servo control communication transmission check	Data transmission check is executed with servo control communication of connector J2. It checks in combination with DG62.
D G 6 2	Servo control communication receiving check	Data receiving check is executed with servo control communication of connector J2. It checks in combination with DG61.
D G 7 0	DCCT adjustment	This item is for factory shipping adjustment. Never execute.
D G 7 1	DCCT U-phase post-correction check	This item is for factory shipping adjustment.
D G 7 2	DCCT V-phase post-correction check	This item is for factory shipping adjustment.
D G 7 3	DCCT W-phase post-correction check	This item is for factory shipping adjustment.
D G 7 4	DCCT U-phase check	This item is for factory shipping adjustment.
D G 7 5	DCCT V-phase check	This item is for factory shipping adjustment.
D G 7 6	DCCT W-phase check	This item is for factory shipping adjustment.
D G 8 0	Test run	This item is for factory shipping adjustment. Never execute.
D G 8 4	Magnetic pole sensor automatic adjustment	Gain and offset value of the magnetic pole sensor are measured, and set to parameters below. [P050: Magnetic pole sensor sin gain] [P051: Magnetic pole sensor sin offset] [P052: Magnetic pole sensor cos gain] [P053: Magnetic pole sensor cos offset]
D G 8 5	Current amplifier adjustment 10V output	This item is for factory shipping adjustment. Never execute.
D G 8 6	Current amplifier adjustment 0V output	This item is for factory shipping adjustment. Never execute.
D G 8 7	Current amplifier adjustment 0.5V output	This item is for factory shipping adjustment. Never execute.
D G 8 8	DC energization	This item is for factory shipping adjustment. Never execute.
D G 9 1	Electric angle zero drawing ABS zero set	Draws the linear motor to the nearest electric angle of 0° and initializes the ABS data for the ABS linear scale to 0.
D G 9 2	ABS zero set	Initializes the ABS data for the ABS linear scale to 0.
D G 9 5	τ DISC motor automatic adjustment	Number of sensor pulses per 1 rotation of τ DISC motor is measured, and the difference from value set to [P004: Tau DISC motor encoder pulse number] is set to [P054: Tau DISC motor encoder compensation] as correction value.
D G 9 6	Serial encoder 1-rotation data initialization	This item is for factory shipping adjustment. Never execute.
D G 9 7	Serial encoder multi-rotation data initialization	Initialization of serial encoder multi-rotation data is executed.
D G 9 8	GSEL auto-tuning	It automatically sets speed loop gain and position loop gain at GSEL1, GSEL2, and GSEL3 condition.
D G 9 9	Auto-tuning	It automatically sets speed loop gain and position loop gain. (When GSEL signal OFF/GSEL 2 signal OFF)

9-3 Details of self-diagnosis items

Table 9-4 Self-diagnosis item details (1/13)

Diagnosis No.	LCD display in execution	Diagnosis contents
Basic input signal check		
D G 0 0 [_STD.IN]		When basic input signal of connector CN1 is switched ON, the bit of each signal of [DI8] to [DI1] is displayed on data display block. Each displayed bit becomes "1" with signal ON and "0" with signal release (OFF).
Extension input signal check 1		
D G 0 1 [_EXT.IN1]		When the control input signal of optional control input/output expansion unit connector CN3 is switched ON, the bit of each signal of [EI8] to [EI1] is displayed on the data display block. Each displayed bit becomes "1" with signal ON and "0" with signal release (OFF).
Extension input signal check 2		
D G 0 2 [_EXT.IN2]		When the control input signal of optional control input/output expansion unit connector CN3 is switched ON, the bit of each signal of [EI16] to [EI9] is displayed on the data display block. Each displayed bit becomes "1" with signal ON and "0" with signal release (OFF).
Extension input signal check 3		
D G 0 3 [_EXT.IN3]		When the control input signal of optional control input/output expansion unit connector CN3 is switched ON, the bit of each signal of [EI24] to [EI17] is displayed on the data display block. Each displayed bit becomes "1" with signal ON and "0" with signal release (OFF).

Table 9-5 Self-diagnosis item details (2/13)

Diagnosis No.	LCD display in execution	Diagnosis contents																																																															
Extension input signal check 4 D G 0 4 [_EXT.IN4]	D G 0 4 EI25 EI26 EI27 EI28 EI29 EI30 EI31 EI32	When control input signal of optional control input/output expansion unit connector CN3 is switched ON, the bit of each signal of [EI32] to [EI25] is displayed on the data display block. Each displayed bit becomes "1" with signal ON and "0" with signal release (OFF).																																																															
Machine model information data check D G 0 5 [_POWER.ID]	D G 0 5 (4) (4) (3) (2) (2) (2) (2) (1)	Machine model information power ID is displayed in bit. <table><tr><th colspan="2">(1) Control specification</th></tr><tr><td>0</td><td>τ type motor</td></tr><tr><td>1</td><td>IM/SM type motor</td></tr></table> <table><tr><th colspan="3">(2) Power ID (device power capacity ID)</th></tr><tr><th colspan="3">Power specifications 100V/200V</th></tr><tr><th>Number (hex)</th><th>Device power capacity (W)*1</th><th>Dead time (μ sec)*2</th></tr><tr><td>0(0)</td><td>50</td><td>2.6(2)</td></tr><tr><td>1(1)</td><td>100</td><td>2.6(2)</td></tr><tr><td>2(2)</td><td>200</td><td>2.6(2)</td></tr><tr><td>3(3)</td><td>400</td><td>2.6(2)</td></tr><tr><td>4(4)</td><td>800</td><td>2.6(2)</td></tr><tr><td>5(5)</td><td>1.5(1.2)k</td><td>2.6(2)</td></tr><tr><td>6(6)</td><td>2.2k</td><td>2.6(2)</td></tr><tr><td>7(7)</td><td></td><td></td></tr><tr><td>8(8)</td><td>4.0k</td><td>6(2)</td></tr><tr><td>9(9)</td><td>7.5(5.5)k</td><td>6(6)</td></tr><tr><td>10(A)</td><td>11(7.5)k</td><td>6(6)</td></tr><tr><td>11(B)</td><td>15(11)k</td><td>6(6)</td></tr><tr><td>12(C)</td><td>20(15)k</td><td>6(6)</td></tr><tr><td>13(D)</td><td>30(22)k</td><td>6(6)</td></tr><tr><td>14(E)</td><td>37(37)k</td><td>6(6)</td></tr><tr><td>15(F)</td><td>35(30)k</td><td>6(6)</td></tr></table>	(1) Control specification		0	τ type motor	1	IM/SM type motor	(2) Power ID (device power capacity ID)			Power specifications 100V/200V			Number (hex)	Device power capacity (W)*1	Dead time (μ sec)*2	0(0)	50	2.6(2)	1(1)	100	2.6(2)	2(2)	200	2.6(2)	3(3)	400	2.6(2)	4(4)	800	2.6(2)	5(5)	1.5(1.2)k	2.6(2)	6(6)	2.2k	2.6(2)	7(7)			8(8)	4.0k	6(2)	9(9)	7.5(5.5)k	6(6)	10(A)	11(7.5)k	6(6)	11(B)	15(11)k	6(6)	12(C)	20(15)k	6(6)	13(D)	30(22)k	6(6)	14(E)	37(37)k	6(6)	15(F)	35(30)k	6(6)
(1) Control specification																																																																	
0	τ type motor																																																																
1	IM/SM type motor																																																																
(2) Power ID (device power capacity ID)																																																																	
Power specifications 100V/200V																																																																	
Number (hex)	Device power capacity (W)*1	Dead time (μ sec)*2																																																															
0(0)	50	2.6(2)																																																															
1(1)	100	2.6(2)																																																															
2(2)	200	2.6(2)																																																															
3(3)	400	2.6(2)																																																															
4(4)	800	2.6(2)																																																															
5(5)	1.5(1.2)k	2.6(2)																																																															
6(6)	2.2k	2.6(2)																																																															
7(7)																																																																	
8(8)	4.0k	6(2)																																																															
9(9)	7.5(5.5)k	6(6)																																																															
10(A)	11(7.5)k	6(6)																																																															
11(B)	15(11)k	6(6)																																																															
12(C)	20(15)k	6(6)																																																															
13(D)	30(22)k	6(6)																																																															
14(E)	37(37)k	6(6)																																																															
15(F)	35(30)k	6(6)																																																															

*¹ () indicates device capacity of IM type motor.*² () is the dead time of τ type motor.

Table 9-6 Self-diagnosis item details (3/13)

Diagnosis No.	LCD display in execution	Diagnosis contents																																																																							
		<table><tr><th colspan="3">(2) Power ID (device power capacity ID)</th></tr><tr><th colspan="3">Power specifications 400V</th></tr><tr><th>Number (hex)</th><th>Device power capacity (W)*³</th><th>Dead time (μ sec)*⁴</th></tr><tr><td>0(0)</td><td></td><td></td></tr><tr><td>1(1)</td><td></td><td></td></tr><tr><td>2(2)</td><td>2.6k</td><td>6(6)</td></tr><tr><td>3(3)</td><td>4.0k</td><td>6(6)</td></tr><tr><td>4(4)</td><td>7.5(5.5)k</td><td>6(6)</td></tr><tr><td>5(5)</td><td>11(7.5)k</td><td>6(6)</td></tr><tr><td>6(6)</td><td>15(11)k</td><td>6(6)</td></tr><tr><td>7(7)</td><td>20(15)k</td><td>6(6)</td></tr><tr><td>8(8)</td><td>37(30)k</td><td>6(2)</td></tr><tr><td>9(9)</td><td>55(37)k</td><td>6(6)</td></tr><tr><td>10(A)</td><td>75(55)k</td><td>6(6)</td></tr><tr><td>11(B)</td><td>110(75)k</td><td>6(6)</td></tr><tr><td>12(C)</td><td></td><td></td></tr><tr><td>13(D)</td><td></td><td></td></tr><tr><td>14(E)</td><td></td><td></td></tr><tr><td>15(F)</td><td></td><td></td></tr></table> <table><tr><th colspan="2">(3) Control power supply type</th></tr><tr><td>0</td><td>Separated</td></tr><tr><td>1</td><td>Integrated</td></tr></table> <table><tr><th colspan="2">(4) Power specifications</th></tr><tr><td>0</td><td>100V</td></tr><tr><td>1</td><td>200V</td></tr><tr><td>2</td><td>400V</td></tr></table>	(2) Power ID (device power capacity ID)			Power specifications 400V			Number (hex)	Device power capacity (W)* ³	Dead time (μ sec)* ⁴	0(0)			1(1)			2(2)	2.6k	6(6)	3(3)	4.0k	6(6)	4(4)	7.5(5.5)k	6(6)	5(5)	11(7.5)k	6(6)	6(6)	15(11)k	6(6)	7(7)	20(15)k	6(6)	8(8)	37(30)k	6(2)	9(9)	55(37)k	6(6)	10(A)	75(55)k	6(6)	11(B)	110(75)k	6(6)	12(C)			13(D)			14(E)			15(F)			(3) Control power supply type		0	Separated	1	Integrated	(4) Power specifications		0	100V	1	200V	2	400V
(2) Power ID (device power capacity ID)																																																																									
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2(2)	2.6k	6(6)																																																																							
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(3) Control power supply type																																																																									
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1	Integrated																																																																								
(4) Power specifications																																																																									
0	100V																																																																								
1	200V																																																																								
2	400V																																																																								
Extension interruption ZLS signal check		It checks interruption signal (ZLS) of optional control input/output expansion unit connector CN3 for operating conditions.* ⁵ Signal ON-edge, if received, sets the bit to "1". If the bit becomes "1" once, it never turns to "0" during this test.																																																																							
D G 0 6 [_ZLS.CAP]	D G 0 6 [_ZLS.CAP] 																																																																								
Extension interruption TRG signal check		It checks interruption signal (TRG) of optional control input/output expansion unit connector CN3 for operating conditions.* ⁵ Signal ON-edge, if received, sets the bit to "1". If the bit becomes "1" once, it never turns to "0" during this test.																																																																							
D G 0 7 [_TRG.CAP]	D G 0 7 [_TRG.CAP] 																																																																								

*³ () indicates device capacity of IM type motor.*⁴ () is the dead time of τ type motor.*⁵ When optional control input/output expansion unit is not connected, interruption signal from basic connector CN1 executes operation check of this signal. Further, even when optional control input/output expansion unit is connected, and if STD is selected with [P610 Pulse train command input selection when connecting to expansion board], interruption signal from basic connector CN1 becomes valid.

Table 9-7 Self-diagnosis item details (4/13)

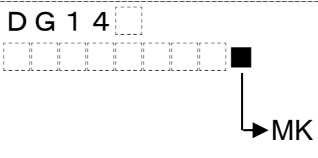
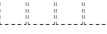
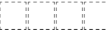
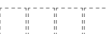
Diagnosis No.	LCD display in execution	Diagnosis contents
Pulse train command counter check D G 1 0 [_ PLS.REF.]	D G 1 0 	It displays internal counter value of pulse train command. When 90° phase difference pulse is input, 4-multiplication value of input pulse is displayed. Display range is 0 to 65535 and is increased at forward rotation command.
Feedback pulse positioning counter check D G 1 1 [_ ENC.FB.]	D G 1 1 	It displays value of internal position counter of encoder feedback pulse. Counter indicates 4-multiplication value of input pulse. Display range is 0 to 65535 and is increased at forward rotation command.
Feedback pulse speed detection counter check D G 1 2 [SPD.COUNT]	D G 1 2 ★ 	It displays value of internal speed detection counter of encoder feedback pulse. Counter indicates 4-multiplication value of input pulse. To "★" in left figure, sign ("-") in reverse rotation) is displayed.
Serial encoder feedback check D G 1 3 [_ S-ENC.FB]	D G 1 3 	It displays position of serial encoder 1-rotation.
Encoder marker check D G 1 4 [_ ENC.MK]	D G 1 4 	It checks encoder marker signal for input status. Signal ON-edge, if received, sets the bit to "1". If the bit becomes "1" once, it never turns to "0" during this test.

Table 9-8 Self-diagnosis item details (5/13)

Diagnosis No.	LCD display in execution	Diagnosis contents
Speed command input voltage check		
D G 2 0 [_SPD.REF.]	D G 2 0 ★  ■■. ■■	It displays external speed command input voltage.*6 To "★" in left figure, sign ("-") in negative voltage) is displayed.
Torque command input voltage check		
D G 2 1 [_TRQ.REF.]	D G 2 1 ★  ■■. ■■	It displays external torque command input voltage. *6 To "★" in left figure, sign ("-") in negative voltage) is displayed.
Analog command input voltage check		
D G 2 2 [_SEH.REF.]	D G 2 2 ★  ■■. ■■	This item is for factory shipping adjustment. Never execute.
Analog input magnetic pole sensor SIN check		
D G 2 3 [M-SEN.SIN]	D G 2 3 ★  ■■. ■■	It displays value of analog input magnetic pole sensor PS when optional magnetic pole sensor is connected. To "★" in left figure, sign ("-") for negative waveform) is displayed.
Analog input magnetic pole sensor COS check		
D G 2 4 [M-SEN.COS]	D G 2 4 ★  ■■. ■■	It displays value of analog input magnetic pole sensor PC when optional magnetic pole sensor is connected. To "★" in left figure, sign ("-") for negative waveform) is displayed.
Extension analog input check 1		
D G 2 5 [EXT.A-IN1]	D G 2 5 ★  ■■. ■■	It displays the analog input terminal (INH) value of the optional control input/output expansion unit. To "★" in left figure, sign ("-") in negative voltage) is displayed.
Extension analog input check 2		
D G 2 6 [EXT.A-IN2]	D G 2 6 ★  ■■. ■■	It displays the analog input terminal (THQ) value of the optional control input/output expansion unit. To "★" in left figure, sign ("-") in negative voltage) is displayed.
Extension analog input check 3		
D G 2 7 [EXT.A-IN3]	D G 2 7  ■■. ■■	It displays the analog input terminal (TL+) value of the optional control input/output expansion unit.
Extension analog input check 4		
D G 2 8 [EXT.A-IN4]	D G 2 8  ■■. ■■	It displays the analog input terminal (TL-) value of the optional control input/output expansion unit.

*6 If control input/output expansion unit is connected as an option, this self-diagnosis becomes invalid.

Table 9-9 Self-diagnosis item details (6/13)

Diagnosis No.	LCD display in execution	Diagnosis contents
Basic output signal check		
D G 3 0 [_ I/O_OUT]	D G 3 0 S. OUT ■ ON	Control output signal of connector CN1 turns ON at every one second in the order as shown below. While output signal is ON, output signal number is displayed to "■" in left figure.
Start 		
Extension output signal check		
D G 3 1 [EXI/O OUT]	D G 3 1 E. OUT ■ ! !	The control output signal of the optional input/output expansion unit connector CN3 turns ON every one second in the order as shown below. While output signal is ON, output signal number is displayed to "■" in left figure. In the case of machine model in which extension board is not installed, [NO I/F] is displayed.
Start 		
7-segment LED check		
D G 3 2 [_ SEG.DSP]	D G 3 2 ■■■■■■■ ■	7-segment LED at the device front is displayed in the order as shown below. To "■" in left figure, it displays according to display data. Start → 0 → 1 → 2 → 3 → 4 ↑ ↓ 9 ← 8 ← 7 ← 6 ← 5
LCD signal display check		
D G 3 3 [_ LCD.IO]	D G 3 3 RUNNING	Signal display block of LCD module blinks.

Table 9-10 Self-diagnosis item details (7/13)

Diagnosis No.	LCD display in execution	Diagnosis contents
Analog monitor 0V output check		
D G 4 0 [A.MON. 0V]	D G 4 0 0. 0 0	0[V] is output to analog monitor output terminal (MON1, MON2).
Analog monitor +5V output check		
D G 4 1 [A.MON.+5V]	D G 4 1 5. 0 0	+5[V] is output to analog monitor output terminal (MON1, MON2).
Analog monitor -5V output check		
D G 4 2 [A.MON.-5V]	D G 4 2 5. 0 0	-5[V] is output to analog monitor output terminal (MON1, MON2).
Analog monitor +10V output check		
D G 4 3 [A.MON+10V]	D G 4 3 1 0. 0 0	+10[V] is output to analog monitor output terminal (MON1, MON2).
Analog monitor -10V output check		
D G 4 4 [A.MON-10V]	D G 4 4 1 0. 0 0	-10[V] is output to analog monitor output terminal (MON1, MON2).

Table 9-11 Self-diagnosis item details (8/13)

Diagnosis No.	LCD display in execution	Diagnosis contents																					
RAM check		It checks RAM within the device and displays diagnosis results as shown in the table below.																					
D G 5 0 [____RAM]	D G 5 0 [____] R U N N I N G																						
		<table> <tr> <th>Display</th><th>Diagnosis results</th><th>Error contents</th></tr> <tr> <td>[____OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[_ERROR1!!]</td><td>Error No. 1</td><td>Data [0000] Read/Write error</td></tr> <tr> <td>[_ERROR2!!]</td><td>Error No. 2</td><td>Data [5555] Read/Write error</td></tr> <tr> <td>[_ERROR3!!]</td><td>Error No. 3</td><td>Data [AAAA] Read/Write error</td></tr> <tr> <td>[_ERROR4!!]</td><td>Error No. 4</td><td>Data [FFFF] Read/Write error</td></tr> </table>	Display	Diagnosis results	Error contents	[____OK!!]	Normal end		[_ERROR1!!]	Error No. 1	Data [0000] Read/Write error	[_ERROR2!!]	Error No. 2	Data [5555] Read/Write error	[_ERROR3!!]	Error No. 3	Data [AAAA] Read/Write error	[_ERROR4!!]	Error No. 4	Data [FFFF] Read/Write error			
Display	Diagnosis results	Error contents																					
[____OK!!]	Normal end																						
[_ERROR1!!]	Error No. 1	Data [0000] Read/Write error																					
[_ERROR2!!]	Error No. 2	Data [5555] Read/Write error																					
[_ERROR3!!]	Error No. 3	Data [AAAA] Read/Write error																					
[_ERROR4!!]	Error No. 4	Data [FFFF] Read/Write error																					
FLASH check		It checks FLASH within the device and displays diagnosis results as shown in the table below.																					
D G 5 1 [____EXT RAM]	D G 5 1 [____] R U N N I N G																						
		<table> <tr> <th>Display</th><th>Diagnosis results</th><th>Error contents</th></tr> <tr> <td>[____OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[_ERROR1!!]</td><td>Error No. 1</td><td>Data [0000] Read/Write error</td></tr> <tr> <td>[_ERROR2!!]</td><td>Error No. 2</td><td>Data [5555] Read/Write error</td></tr> <tr> <td>[_ERROR3!!]</td><td>Error No. 3</td><td>Data [AAAA] Read/Write error</td></tr> <tr> <td>[_ERROR4!!]</td><td>Error No. 4</td><td>Data [FFFF] Read/Write error</td></tr> <tr> <td>[_ERROR5!!]</td><td>Error No. 5</td><td>Original data recovery error</td></tr> </table>	Display	Diagnosis results	Error contents	[____OK!!]	Normal end		[_ERROR1!!]	Error No. 1	Data [0000] Read/Write error	[_ERROR2!!]	Error No. 2	Data [5555] Read/Write error	[_ERROR3!!]	Error No. 3	Data [AAAA] Read/Write error	[_ERROR4!!]	Error No. 4	Data [FFFF] Read/Write error	[_ERROR5!!]	Error No. 5	Original data recovery error
Display	Diagnosis results	Error contents																					
[____OK!!]	Normal end																						
[_ERROR1!!]	Error No. 1	Data [0000] Read/Write error																					
[_ERROR2!!]	Error No. 2	Data [5555] Read/Write error																					
[_ERROR3!!]	Error No. 3	Data [AAAA] Read/Write error																					
[_ERROR4!!]	Error No. 4	Data [FFFF] Read/Write error																					
[_ERROR5!!]	Error No. 5	Original data recovery error																					
EEPROM check		It checks EEPROM within the device and displays diagnosis results as shown in the table below.																					
D G 5 2 [____EEPROM]	D G 5 2 [____] R U N N I N G																						
		<table> <tr> <th>Display</th><th>Diagnosis results</th><th>Error contents</th></tr> <tr> <td>[____OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[_ERROR1!!]</td><td>Error No. 1</td><td>Data [0000] Read/Write error</td></tr> <tr> <td>[_ERROR2!!]</td><td>Error No. 2</td><td>Data [5555] Read/Write error</td></tr> <tr> <td>[_ERROR3!!]</td><td>Error No. 3</td><td>Data [AAAA] Read/Write error</td></tr> <tr> <td>[_ERROR4!!]</td><td>Error No. 4</td><td>Data [FFFF] Read/Write error</td></tr> <tr> <td>[_ERROR5!!]</td><td>Error No. 5</td><td>Original data recovery error</td></tr> </table>	Display	Diagnosis results	Error contents	[____OK!!]	Normal end		[_ERROR1!!]	Error No. 1	Data [0000] Read/Write error	[_ERROR2!!]	Error No. 2	Data [5555] Read/Write error	[_ERROR3!!]	Error No. 3	Data [AAAA] Read/Write error	[_ERROR4!!]	Error No. 4	Data [FFFF] Read/Write error	[_ERROR5!!]	Error No. 5	Original data recovery error
Display	Diagnosis results	Error contents																					
[____OK!!]	Normal end																						
[_ERROR1!!]	Error No. 1	Data [0000] Read/Write error																					
[_ERROR2!!]	Error No. 2	Data [5555] Read/Write error																					
[_ERROR3!!]	Error No. 3	Data [AAAA] Read/Write error																					
[_ERROR4!!]	Error No. 4	Data [FFFF] Read/Write error																					
[_ERROR5!!]	Error No. 5	Original data recovery error																					
Memory initialization		This item is for factory shipping adjustment. Never execute. This operation gets parameters back to original status at factory shipment; thus, pay attention.																					
D G 5 3 [____MEM.INI]	D G 5 3 [____] R U N N I N G																						
		<table> <tr> <th>Display</th><th>Adjusting results</th><th>Error contents</th></tr> <tr> <td>[____OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[_ERROR1!!]</td><td>Abnormal end</td><td>Initialization is not permitted.</td></tr> <tr> <td>[_ERROR2!!]</td><td>Abnormal end</td><td>Initialization uncompleted.</td></tr> </table>	Display	Adjusting results	Error contents	[____OK!!]	Normal end		[_ERROR1!!]	Abnormal end	Initialization is not permitted.	[_ERROR2!!]	Abnormal end	Initialization uncompleted.									
Display	Adjusting results	Error contents																					
[____OK!!]	Normal end																						
[_ERROR1!!]	Abnormal end	Initialization is not permitted.																					
[_ERROR2!!]	Abnormal end	Initialization uncompleted.																					

Table 9-12 Self-diagnosis item details (9/13)

Diagnosis No.	LCD display in execution	Diagnosis contents
Absolute position correction data transmission		It transmits absolute position correction data to IPU and displays transmission results as shown in the table below.*7
D G 5 4 [ABSDT.SND]	D G 5 4 ☐ ☐ R U N N I N G	
Absolute position correction data receiving		It receives absolute position correction data from IPU and displays receiving results as shown in the table below.*7
D G 5 5 [ABSDT.RCV]	D G 5 5 ☐ ☐ R U N N I N G	
User data transmission		It transmits user data to IPU. Transmission result identical to one in DG54 is displayed.*7
D G 5 6 [USERD.SND]	D G 5 6 ☐ ☐ R U N N I N G	
User data receiving		It receives user data from IPU. Receiving result identical to one in DG55 is displayed.*7
D G 5 7 [USERD.RCV]	D G 5 7 ☐ ☐ R U N N I N G	
IPU parameter receiving		It receives IPU parameters from IPU. Receiving result identical to one in DG55 is displayed.*7
D G 5 9 [IPARA.RCV]	D G 5 9 ☐ ☐ R U N N I N G	

*7 Self-diagnosis relating to DG54 to DG59 absolute position correction is not displayed if absolute position compensation function is in invalid status. For details, refer to [5-11 Serial number check at power-on].

Table 9-13 Self-diagnosis item details (10/13)

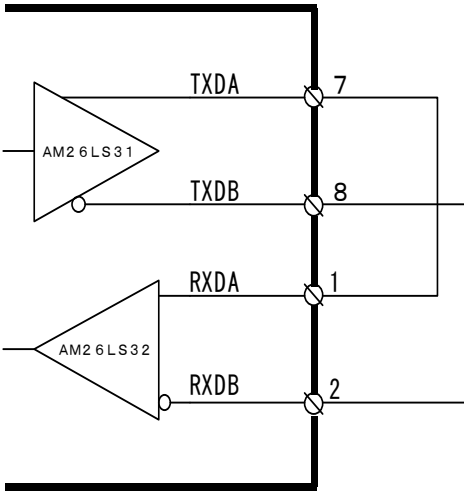
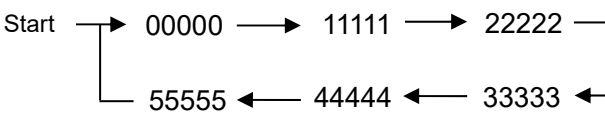
Diagnosis No.	LCD display in execution	Diagnosis contents												
Serial communication I/F check														
D G 6 0 [_S.COMM.]	D G 6 0 RUNNING	It displays as follows: In normal end "OK!!" In abnormal end "ERROR!!" Before execution, short TXD (A)-RXD (A) and TXD (B)-RXD (B) of connector J1. Connection diagram is shown below. 												
Servo control communication transmission check														
D G 6 1 [_PLS.TRS.]	D G 6 1 ■■■■■	It executes data transmission from servo control communication of connector J2 at every 0.5 seconds in the order as shown below. It displays according to transmission data to left figure "■■■■■". 												
Servo control communication receiving check														
D G 6 2 [_PLS.RCV.]	D G 6 2 RUNNING	It receives data with servo control communication of connector J2. In this check, connection is necessary with VC II device that transmits data via DG61. Receiving data is the data that is transmitted from VC II device where DG61 is being executed. Diagnosis result in received data is displayed as shown below. <table border="1"> <thead> <tr> <th>Display</th><th>Diagnosis results</th><th>Error contents</th></tr> </thead> <tbody> <tr> <td>[___OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[SUM.ERROR]</td><td>Abnormal end</td><td>Communication data sum check error</td></tr> <tr> <td>[_TIME.OUT]</td><td>Abnormal end</td><td>Not received communication data at all</td></tr> </tbody> </table>	Display	Diagnosis results	Error contents	[___OK!!]	Normal end		[SUM.ERROR]	Abnormal end	Communication data sum check error	[_TIME.OUT]	Abnormal end	Not received communication data at all
Display	Diagnosis results	Error contents												
[___OK!!]	Normal end													
[SUM.ERROR]	Abnormal end	Communication data sum check error												
[_TIME.OUT]	Abnormal end	Not received communication data at all												

Table 9-14 Self-diagnosis item details (11/13)

Diagnosis No.	LCD display in execution	Diagnosis contents
DCCT adjustment		
D G 7 0 [DCCT.ADJ]	D G 7 0 ■■■■■■■■■■	This item is for factory shipping adjustment. Never execute.
DCCT U-phase post-correction check		
D G 7 1 [DCCT. U]	D G 7 1 0 0 0 0 0	This item is for factory shipping adjustment.
DCCT V-phase post-correction check		
D G 7 2 [DCCT. V]	D G 7 2 0 0 0 0 0	This item is for factory shipping adjustment.
DCCT W-phase post-correction check		
D G 7 3 [DCCT. W]	D G 7 3 0 0 0 0 0	This item is for factory shipping adjustment.
DCCT U-phase check		
D G 7 4 [*DCCT. U]	D G 7 4 0 0 0 0 0	This item is for factory shipping adjustment.
DCCT V-phase check		
D G 7 5 [*DCCT. V]	D G 7 5 0 0 0 0 0	This item is for factory shipping adjustment.
DCCT W-phase check		
D G 7 6 [*DCCT. W]	D G 7 6 0 0 0 0 0	This item is for factory shipping adjustment.

Table 9-15 Self-diagnosis item details (12/13)

Diagnosis No.	LCD display in execution	Diagnosis contents												
Test run		This item is for factory shipping adjustment.												
D G 8 0 [TST.DRIVE]	D G 8 0 ■■■■■■■■■■	Never execute. If this item is executed, motor starts running, which is very dangerous.												
Magnetic pole sensor automatic adjustment		Gain and offset of magnetic pole sensor are measured and set to [P050 to P053]. However, if other than [L-SEN] is set in [P001: Encoder type selection], it always becomes [_ERROR1!!].												
D G 8 4 [M-SEN.ADJ]	D G 8 4 R U N N I N G	⚠ Caution When executing this adjustment, motor operates three times of the maximum [P058: Distance between linear motor pole opposite] at the speed and in the operation direction set in [P145: Magnetic pole sensor automatic adjustment operation]. <table border="1"> <thead> <tr> <th>Display</th><th>Adjusting results</th><th>Error contents</th></tr> </thead> <tbody> <tr> <td>[_OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[_ERROR1!!]</td><td>Abnormal end</td><td> - Encoder is not L-SEN. - There is no magnetic pole sensor. </td></tr> <tr> <td>[_ERROR2!!]</td><td>Abnormal end</td><td> - Error occurred. </td></tr> </tbody> </table>	Display	Adjusting results	Error contents	[_OK!!]	Normal end		[_ERROR1!!]	Abnormal end	- Encoder is not L-SEN. - There is no magnetic pole sensor.	[_ERROR2!!]	Abnormal end	Error occurred.
Display	Adjusting results	Error contents												
[_OK!!]	Normal end													
[_ERROR1!!]	Abnormal end	- Encoder is not L-SEN. - There is no magnetic pole sensor.												
[_ERROR2!!]	Abnormal end	Error occurred.												
Current amplifier adjustment 10V output		This item is for factory shipping adjustment.												
D G 8 5 [CURCK. 10]	D G 8 5 1 0 . 0 0	Never execute. If this item is executed, motor runs, which is dangerous.												
Current amplifier adjustment 0V output		This item is for factory shipping adjustment.												
D G 8 6 [CURCK. 0]	D G 8 6 0 . 0 0	Never execute. If this item is executed, motor runs, which is dangerous.												
Current amplifier adjustment 0.5V output		This item is for factory shipping adjustment.												
D G 8 7 [CURCK.0.5]	D G 8 7 R U N N I N G	Never execute. If this item is executed, motor runs, which is dangerous.												
DC energization		This item is for factory shipping adjustment.												
D G 8 8 [DC.EXCT]	D G 8 8 R U N N I N G	Never execute. If this item is executed, motor runs, which is dangerous.												
Electric angle zero drawing ABS zero set		Draws the linear motor to the nearest electric angle of 0° and initializes the ABS data for the ABS linear scale to 0.												
D G 9 1 [LABS.ADJ]	D G 9 1 R U N N I N G													
ABS zero set		Initializes the ABS data for the ABS linear scale to 0.												
D G 9 2 [LABS.INI]	D G 9 2 R U N N I N G													

Table 9-16 Self-diagnosis item details (13/13)

Diagnosis No.	LCD display in execution	Diagnosis contents																		
τ DISC motor automatic adjustment		Number of sensor pulses per 1 rotation of τ DISC motor is measured, and the difference from setting value to [P004: Tau DISC motor encoder pulse number] is set to [P054: Tau DISC motor encoder compensation] as correction value. ⚠ Caution - When executing this adjustment, motor operates for nine rotations in maximum at the speed and in the operation direction set in [P149: Tau DISC motor initialization operation]. - When starting this adjustment, start from OFF position of reference marker. (If it is started from ON position, accurate adjustment value cannot be detected.) - When reference marker is not connected, motor keeps on rotating. (Alarm is not activated.)																		
D G 9 5 [DISC.INI]	D G 9 5 ☐ ☐ R U N N I N G																			
		<table border="1"> <thead> <tr> <th>Display</th><th>Adjusting results</th><th>Contents</th></tr> </thead> <tbody> <tr> <td>[Pulse count]</td><td>Normal end</td><td>Displays number of pulses of 1 rotation.</td></tr> <tr> <td>[_ ERROR1!!]</td><td>Abnormal end</td><td>Not τ DISC motor.</td></tr> <tr> <td>[_ ERROR2!!]</td><td>Abnormal end</td><td>Data deviated range.</td></tr> <tr> <td>[_ ERROR3!!]</td><td>Abnormal end</td><td>Twice-reading error.</td></tr> <tr> <td>[_ ERROR4!!]</td><td>Abnormal end</td><td>Error occurred.</td></tr> </tbody> </table>	Display	Adjusting results	Contents	[Pulse count]	Normal end	Displays number of pulses of 1 rotation.	[_ ERROR1!!]	Abnormal end	Not τ DISC motor.	[_ ERROR2!!]	Abnormal end	Data deviated range.	[_ ERROR3!!]	Abnormal end	Twice-reading error.	[_ ERROR4!!]	Abnormal end	Error occurred.
Display	Adjusting results	Contents																		
[Pulse count]	Normal end	Displays number of pulses of 1 rotation.																		
[_ ERROR1!!]	Abnormal end	Not τ DISC motor.																		
[_ ERROR2!!]	Abnormal end	Data deviated range.																		
[_ ERROR3!!]	Abnormal end	Twice-reading error.																		
[_ ERROR4!!]	Abnormal end	Error occurred.																		
Serial encoder 1-rotation data initialization		This item is for factory shipping adjustment. Never execute.																		
D G 9 6 [S-INC.INI]	D G 9 6 ☐ ☐ R U N N I N G																			
Serial encoder multi-rotation data initialization		It initializes the counter for multi-rotation data in the serial encoder.																		
D G 9 7 [S-INC.CLR]	D G 9 7 ☐ ☐ R U N N I N G																			
		<table border="1"> <thead> <tr> <th>Display</th><th>Adjusting results</th><th>Error contents</th></tr> </thead> <tbody> <tr> <td>[_ _ _ OK!!]</td><td>Normal end</td><td></td></tr> <tr> <td>[_ _ _ ERROR!!]</td><td>Abnormal end</td><td>Not serial encoder.</td></tr> </tbody> </table>	Display	Adjusting results	Error contents	[_ _ _ OK!!]	Normal end		[_ _ _ ERROR!!]	Abnormal end	Not serial encoder.									
Display	Adjusting results	Error contents																		
[_ _ _ OK!!]	Normal end																			
[_ _ _ ERROR!!]	Abnormal end	Not serial encoder.																		
GSEL auto-tuning		This is the function to automatically set the proper servo control parameter by measuring the load characteristics (mechanical) of GSEL1, GSEL2, and GSEL3 condition. Operate the function referring to [9-4 Auto-tuning].																		
D G 9 8 [_ GSELTUNE]	D G 9 8 ☐ ☐ R U N N I N G Display during test run ↓ D G 9 8 ☐ C A L C U L A T E Display during parameter calculation																			
Auto-tuning		This item is a function to automatically set the proper servo control parameter by measuring load characteristics (mechanical). Operate the function referring to [9-4 Auto-tuning].																		
D G 9 9 [_ AUTOTUNE]	D G 9 9 ☐ ☐ R U N N I N G Display during test run ↓ D G 9 9 ☐ C A L C U L A T E Display during parameter calculation																			

9-4 Auto-tuning

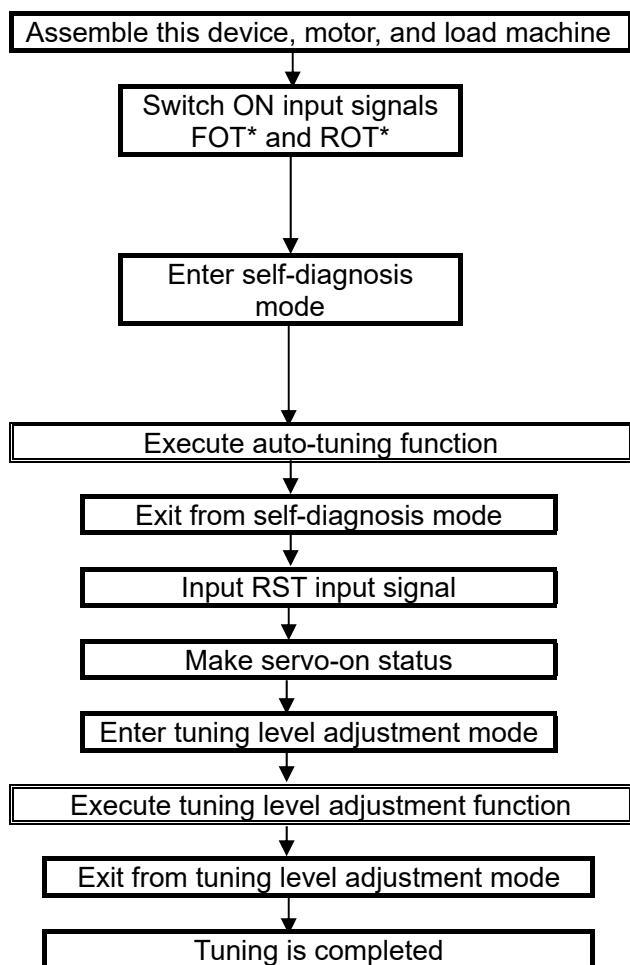
- Auto-tuning is a function that the device itself sets or supports setting of adequate servo control parameter for machine (motor load).
- Auto-tuning consists of two functions of [Auto-tuning function] and [Tuning level adjustment function].
- Auto-tuning function is to set adequate value of servo control parameter, by rotating motor in test run (internal run pattern operation) and through its appropriate machine actions.
- Tuning level adjustment function supports setting of more adequate servo control parameter for the machine by increasing or decreasing gain in accordance with machine characteristics measured by auto-tuning function.
- This device has servo control parameter changing function (selected with GSEL signal) and auto-tuning at two kinds of motor load status can be used for the purpose.

In the practical execution

- Since in auto-tuning run, motor shaft rotates in accordance with setting of parameters [P140] and [P141], confirm that a loaded machine stays in movable range. If Over Travel signal (FOT*/ROT*) is not connected, this function results in an error. (FOT* and ROT* can be set invalid with [P705] setting.)
- When auto-tuning function is in operation, input signals other than FOT* and ROT* are invalid. Reset signal (RST), Emergency Stop signal (EMG*) and others cannot interrupt (stop) it.

 Caution		
!Compulsion	- After execution of auto-tuning function and tuning level adjustment function, and if there is a change in load due to minute adjustment on the load machine, be sure to execute auto-tuning function again and measure load characteristics. - If vibration or any other such errors occurred while auto-tuning function is in operation, immediately press  key and stop operation. In this case, after motor makes sudden stop, it becomes torque-free status. - In the cases below, auto-tuning may not calculate gain correctly. In this case, set the gain manually. - Unbalance in load is big. - Friction is big. - Load inertia fluctuates. - Rigidity of load machine is low. - Load machine has play or backlash. - Load inertia is three times or less of motor inertia.	Load machine can induce oscillation or runaway.
	When set big inertia to parameter [P140: Auto tuning trial run direction/inertia selection], time and amount of operation are also expanded as acceleration/deceleration expands; thus, pay attention.	Injury may occur.
	Do not execute auto-tuning on such as vertical shafts to which external torque is always applied. If auto-tuning function is executed, it becomes torque-free status and it moves depending on external torque.	Injury or damage on equipment may occur.

Auto-tuning execution procedure is as follows.



⚠ When auto-tuning function is in process, only FOT* and ROT* are valid as input signal. It is impossible to interrupt (stop) with RST, EMG*, and others. ([P705] can make FOT* and ROT* invalid.)

⚠ Do not start other self-diagnosis functions than auto-tuning function carelessly.

* Refer to [9-4-2 Auto-tuning function].

* Refer to [9-4-3 Tuning level adjustment function].

Figure 9-3 Auto-tuning execution procedure

9-4-2 Auto-tuning function

Auto-tuning function is operated with diagnosis No. DG98 and DG99 of self-diagnosis mode.

- DG99 measures machine characteristics by test run and sets adequate values to parameters for servo control as shown below.

Thus, be sure to connect motor with load before executing DG99.

Table 9-17 Auto-tuning setting parameters

No.	Parameter name	Remarks
P101	Speed loop gain	Set adequate value.
P102	Speed loop integral time constant	Set adequate value.
P103	Speed loop differential time constant	Set 0. (Usually, 0 is the adequate value.)
P104	Speed loop proportional gain division ratio	Set 0. (Usually, 0 is the adequate value.)
P105	Speed loop differential gain division ratio	Set 0. (Usually, 0 is the adequate value.)
P106	Speed loop gain / Low-speed range	Setting value same as P101
P107	Speed loop integral time constant / Low-speed range	Setting value same as P102
P109	Speed loop proportional gain division ratio / Low-speed range	Set 0. (Usually, 0 is the adequate value).
P110	Speed loop differential gain division ratio / Low-speed range	Set 0. (Usually, 0 is the adequate value).
P146	Mass/inertia	Set adequate value.
P147	Viscous friction	Set adequate value.

Self-diagnosis

- DG98 sets the servo control parameters in GSEL1, GSEL2, GSEL3 conditions as indicated below. Since it measures the machine characteristics by test run, be sure to connect motor with the load in GSEL1, GSEL2, and GSEL3 conditions before executing DG98.

Table 9-18 Auto-tuning setting parameters (for GSEL1, GSEL2, and GSEL3 conditions)*⁸

No.	Parameter name	Remarks
P111	Speed loop gain at GSEL1	Set adequate value.
P112	Speed loop integral time constant at GSEL1	Set adequate value.
P113	Speed loop differential time constant at GSEL1	Set 0. (Usually, 0 is the adequate value.)
P114	Speed loop proportional gain division ratio at GSEL1	Set 0. (Usually, 0 is the adequate value.)
P115	Speed loop differential gain division ratio at GSEL1	Set 0. (Usually, 0 is the adequate value.)
P312	Mass/inertia at GSEL condition	Set adequate value.
P313	Viscous friction at GSEL condition	Set adequate value.
P415	Speed loop gain at GSEL2	Setting value same as P111.
P416	Speed loop integral time constant at GSEL2	Setting value same as P112.
P417	Speed loop differential time constant at GSEL2	Setting value same as P113.
P418	Speed loop proportional gain division ratio at GSEL2	Setting value same as P114.
P419	Speed loop differential gain division ratio at GSEL2	Setting value same as P115.
P615	Speed loop gain at GSEL3	Setting value same as P111.
P616	Speed loop integral time constant at GSEL3	Setting value same as P112.
P617	Speed loop differential time constant at GSEL3	Setting value same as P113.
P618	Speed loop proportional gain division ratio at GSEL3	Setting value same as P114.
P619	Speed loop differential gain division ratio at GSEL3	Setting value same as P115.

- When machine load or other load characteristics are changed, be sure to measure load characteristics again through auto-tuning function.
- Auto-tuning function sets adequate gain when load inertia is in the range of 3 to 30 times of motor inertia. If load inertia exceeds 30 times, as gain is set a bit low, confirm safety, and then readjust it through tuning level adjustment function.
- If load inertia is big and alarm is activated during auto-tuning operation, set [P140: Auto tuning trial run direction/inertia selection] to [Big inertia support].
- P312 and P313 will be common at GSEL1, GSEL2, and GSEL3 conditions.

*⁸ Note that GSEL2 (GSEL signal OFF/GSEL2 signal ON) and GSEL3 (GSEL signal ON/GSEL2 signal ON) do not have auto-tuning function.

(1) Auto-tuning function execution procedure

Operation for executing of auto-tuning function is as follows. (DG98 operation is same.)

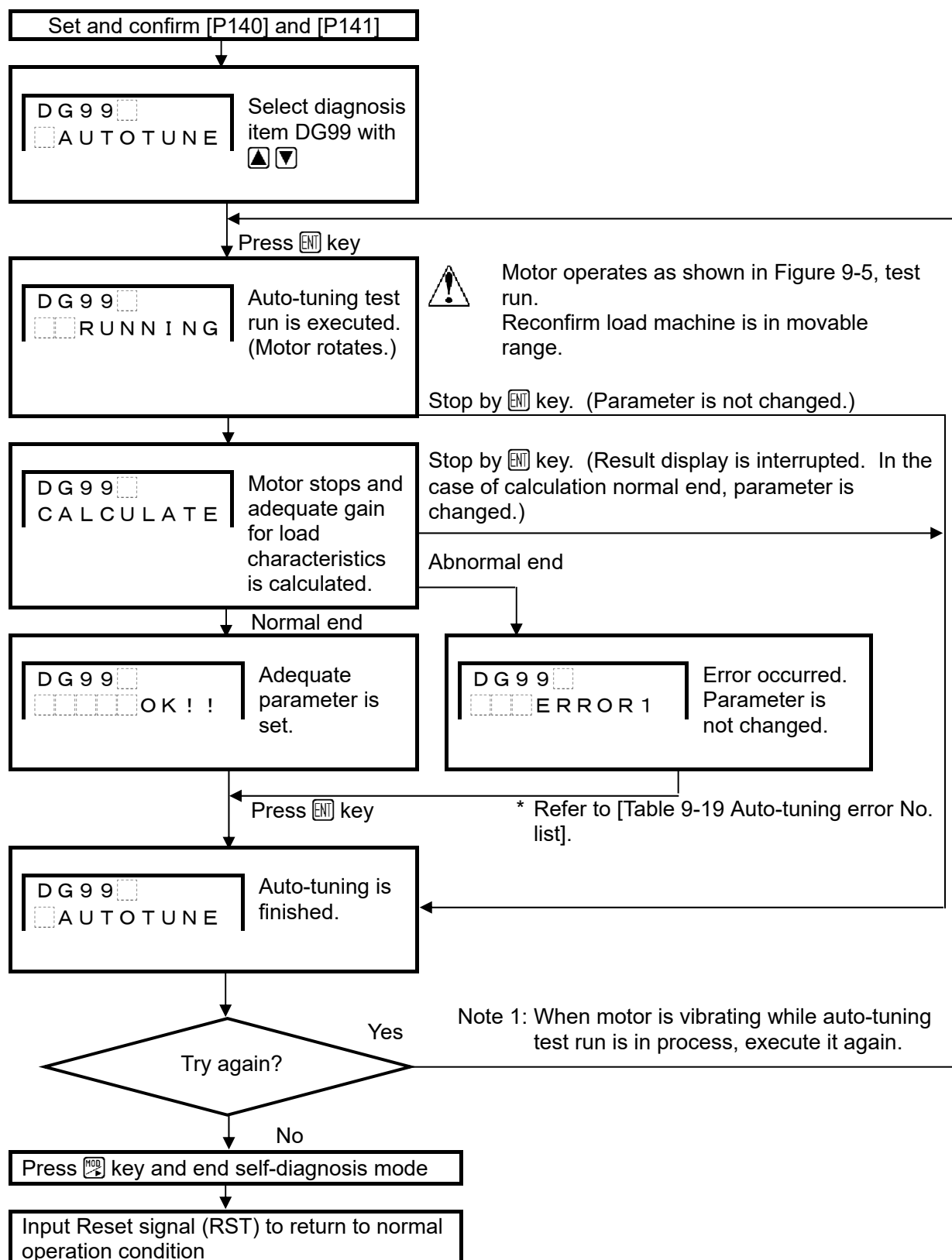


Figure 9-4 Self-diagnosis mode execution procedure

Self-diagnosis

(2) Setting of parameters

Set and confirm [P140] and [P141], at the execution of auto-tuning function.

[P140] Auto tuning trial run direction/inertia selection

1 Function

When auto-tuning function is in operation, select test-run direction of motor and inertia.

- BOTH/N, BOTH/H: Motor operates in forward direction, and then it operates in reverse direction.
- +ONLY/N, +ONLY/H: Motor operates in forward direction only.
- -ONLY/N, -ONLY/H: Motor operates in reverse direction only.

Note: * /H supports big inertia.

Usually, select [BOTH/N]. Change it for a load machine that is capable of operating in either forward or reverse direction only.

If inertia is big and error occurred in the selection of regular inertia, select [Big inertia support].

When selecting big inertia, operation distance is extended; thus, caution is required.

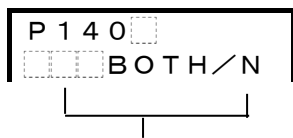
Also, setting of [P300 Rotation direction selection] makes operation direction reverse; thus, pay attention.

2 Unit, setting range

- (1) Unit : Menu selection
(2) Setting range : BOTH/N , BOTH/H , +ONLY/N , +ONLY/H , -ONLY/N , -ONLY/H
(3) Initial value : BOTH/N

3 Display

<Auto-tuning test run direction selection>



It displays direction of auto-tuning test run and inertia in order.
(BOTH/N,BOTH/H,+ONLY/N,+ONLY/H,-ONLY/N,-ONLY/H)
In the left-figure example, both directions and regular inertia is selected.

Figure below shows motor operation pattern when auto-tuning test run is in process.

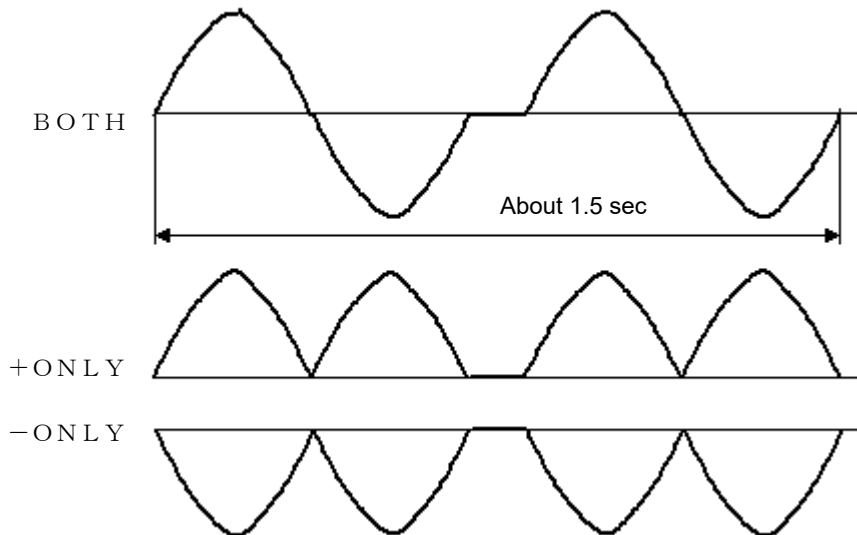


Figure 9-5 Auto-tuning test run*⁹

*⁹ Figure 9-5 is an example when regular inertia is selected. When big inertia is selected, operation distance and operation time are doubled; thus, pay attention.

[P141] Auto tuning trial run speed ratio

1 Function

When auto-tuning function is in operation, set speed of motor test run in the ratio against rated rotation speed or applicable maximum speed.

When 0.00 is set, motor does not run and error occurs.

When 1.00 is set, motor operates at the rated speed or applicable maximum speed.

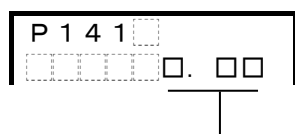
Usually, set initial value. Amount of operation of motor changes depending on this parameter value; thus, pay attention.

2 Unit, setting range

- (1) Unit : Nil
 (2) Setting range : 0.00 to 1.00
 (3) Initial value : 0.30

3 Display

<Auto-tuning test run speed ratio>



Ratio of auto-tuning test run speed is displayed.



Caution

Amount of operation of motor becomes as shown below according to the values of [P140] and [P141]. Before executing auto-tuning function, be sure that the load machine is in the movable range.

- When [P140] is "BOTH/N"

- ◆ In τ DISC/IM/SM motor

$$\text{Motor shaft rotation volume [Rotation]} = \frac{\text{P141 setting value} \times \text{Rated rotation speed} \times 0.4}{120}$$

- ◆ In the case of τ linear/Servo Compass

$$\text{Motor operation volume [Setting unit]} = \frac{\text{P141 setting value} \times \text{Rated speed} \times 0.4}{2}$$

(Example 1) When [P141] is "0.30" with IM/SM motor and rated rotation speed is 3000 rpm

$$\text{Motor shaft rotation volume [Rotation]} = \frac{0.3 (\text{P141 setting value}) \times 3000 (\text{Rated rotation speed}) \times 0.4}{120} = 3 [\text{Rotation}]$$

After about three rotations in forward direction, the motor shaft rotates in reverse direction for about three rotations.

* When big inertia is selected, rotation volume is doubled; thus, pay attention.

(Example 2) [P141] is "0.30" with linear motor and rated speed is 1000 mm/sec

$$\text{Motor operation volume [Setting unit]} = \frac{0.3 (\text{P141 setting value}) \times 1000 (\text{rated speed}) \times 0.4}{2} = 60 [\text{mm}]$$

After moving for about 60 mm in forward direction, the motor moves in reverse direction for about 60 mm.

* When big inertia is selected, moving distance is doubled; thus, pay attention.

* If the applicable maximum number of rotations (applicable maximum speed) is set to a value lower than the rated motor speed (rated speed), the applicable maximum number of rotations (applicable maximum speed) is applied to the formula above.

Caution

- When [P140] is [+ONLY/N] or [-ONLY/N]
 - ◆ In τ DISC/IM/SM motor

$$\text{Motor shaft rotation volume [Rotation]} = \frac{\text{P141 setting value} \times \text{Rated rotation speed} \times 0.4 \times 4}{120}$$

- ◆ In the case of τ linear/Servo Compass

$$\text{Motor operation volume [Setting unit]} = \frac{\text{P141 setting value} \times \text{Rated speed} \times 0.4 \times 4}{2} =$$

(Example 1) When [P141] is "0.30" and rated rotation speed is 3000 rpm

$$\text{Motor shaft rotation volume [Rotation]} = \frac{0.3 (\text{P141 setting value}) \times 3000 (\text{Rated rotation speed}) \times 0.4 \times 4}{120} = 12 [\text{Rotation}]$$

The motor rotates about 12 times in either forward or reverse direction.

* When big inertia is selected, rotation volume is doubled; thus, pay attention.

(Example 2) When [P141] is "0.30" with linear motor and rated speed is 1000 mm/sec

$$\text{Motor operation volume [Setting unit]} = \frac{0.3 (\text{P141 setting value}) \times 1000 (\text{Rated speed}) \times 0.4 \times 4}{2} = 240 [\text{mm}]$$

The motor operates for about 240 mm in either forward or reverse direction.

* When big inertia is selected, moving distance is doubled; thus, pay attention.

* If the applicable maximum number of rotations (applicable maximum speed) is set to a value lower than the rated motor speed (rated speed), the applicable maximum number of rotations (applicable maximum speed) is applied to the formula above.

● References

As references in τ DISC/IM/SM motor, examples when [P141] is "0.30 (Initial value)" are shown below.

Rated rotation speed	Setting of P140					
	BOTH/N	BOTH/H	+ ONLY/N	+ ONLY/H	— ONLY/N	— ONLY/H
2000	2 rotations in each direction of forward and reverse	4 rotations in each direction of forward and reverse	8 rotations in forward direction	16 rotations in forward direction	8 rotations in reverse direction	16 rotations in reverse direction
3000	3 rotations in each direction of forward and reverse	6 rotations in each direction of forward and reverse	12 rotations in forward direction	24 rotations in forward direction	12 rotations in reverse direction	24 rotations in reverse direction
4000	4 rotations in each direction of forward and reverse	8 rotations in each direction of forward and reverse	16 rotations in forward direction	32 rotations in forward direction	16 rotations in reverse direction	32 rotations in reverse direction

- (3) Auto-tuning error
Errors that may occur when executing auto-tuning function are as follows.

Table 9-19 Auto-tuning error No. list

Error No.	Contents
ERROR1	Measured data is "0". Try again after confirming that [P141] is not "0.00".
ERROR2	Speed loop integral time constant [P102] or [P112] deviated the range. Auto-tuning cannot be done. Manually set parameter.
ERROR3	Measured data is unusual. Confirm no play or backlash in a load machine.
ERROR4	[FOT*, ROT*], and [Alarm (servo errors or encoder errors)] caused interruption. Even error is caused by alarm, 7-segment LED at device front does not display the alarm contents. Confirm alarm contents with [status/diagnosis display] on LCD module and editing software, and remove causes, and then release alarm.

9-4-3 Tuning level adjustment function

This function is for adjusting the level (high/low) of gain based on the parameters set by auto-tuning. This function is executed in tuning level adjustment mode, and will be capable to adjust after auto-tuning function is executed.

⚠ Even after execution of auto-tuning function, when there is a change in load, execute auto-tuning function again.

- ITEM No. [3468] is for increasing or decreasing gain level, and suitable value should be set to servo control parameters in the table below.

In this case, adjust the gain level according to the response of machine.

Table 9-20 Tuning level adjustment parameters

No.	Parameter name	Remarks
P101	Speed loop gain	Set adequate value.
P102	Speed loop integral time constant	Set adequate value.
P103	Speed loop differential time constant	Set 0. (Usually, 0 is the adequate value)
P104	Speed loop proportional gain division ratio	Set 0. (Usually, 0 is the adequate value)
P105	Speed loop differential gain division ratio	Set 0. (Usually, 0 is the adequate value)
P106	Speed loop gain / Low-speed range	Setting value same as P101
P107	Speed loop integral time constant / Low-speed range	Setting value same as P102

- By ITEM No. [3467], increase or decrease the gain level for GSEL1 (GSEL signal ON/GSEL2 signal OFF), and set the proper value to the servo control parameters in the table below.
In this case, adjust the gain level according to the response of machine.

Table 9-21 Tuning level adjustment parameters (in GSEL signal ON/GSEL2 signal OFF)

No.	Parameter name	Remarks
P111	Speed loop gain at GSEL1	Set adequate value.
P112	Speed loop integral time constant at GSEL1	Set adequate value.
P113	Speed loop differential time constant at GSEL1	Set 0. (Usually, 0 is the adequate value)
P114	Speed loop proportional gain division ratio at GSEL1	Set 0. (Usually, 0 is the adequate value)
P115	Speed loop differential gain division ratio at GSEL1	Set 0. (Usually, 0 is the adequate value)

(Note)

Tuning level adjustment function of GSEL2 (GSEL signal OFF/GSEL2 signal ON) and GSEL3 (GSEL signal ON/GSEL2 signal ON) can be executed only from optional dedicated editing software (ver.2.00 or after). Please note that it cannot be executed from LCD module or SDI device.

Self-diagnosis

1) Tuning level adjustment function execution procedure

Operation when executing tuning level adjustment function is as follows. (Same as for ITEM "3467")

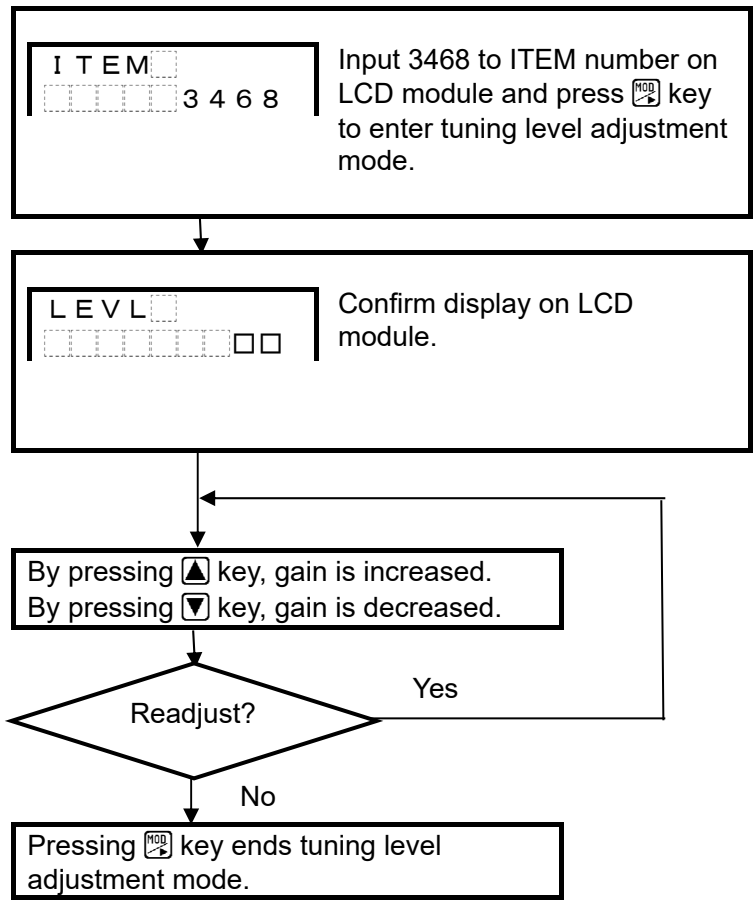
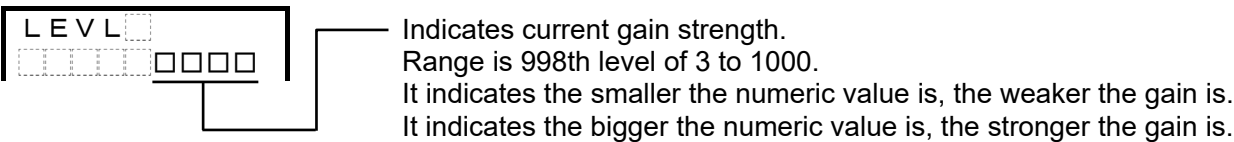


Figure 9-6 Tuning level adjustment function execution procedure

2) Display in tuning level adjustment mode



By pressing ▲ key, LEVL numeric value becomes big and gain becomes high.
By pressing ▼ key, LEVL numeric value becomes small and gain becomes low.

9-5 Forced jog mode

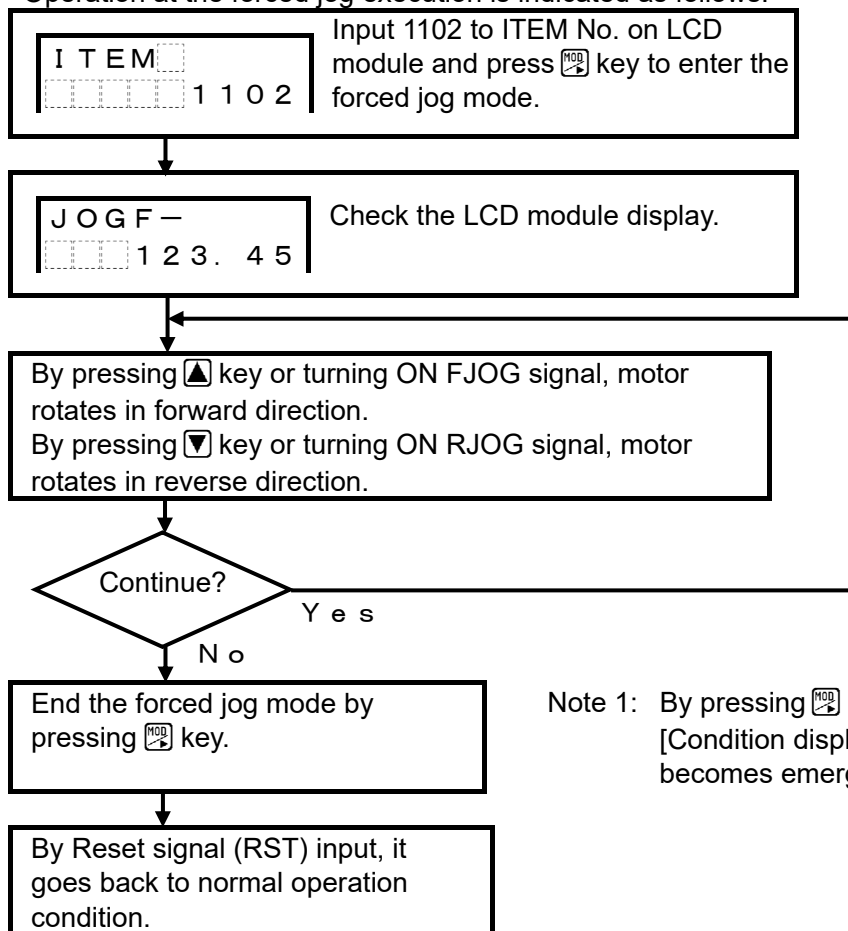
Forced jog mode is the motor jog motion mode for the recovery from the error at test run.

Operation speed of motor is [P400: Jog speed 1] setting value.

In the forced jog mode, the control input signals other than FJOG, RJOG, FOT*, ROT* will be ignored.

(1) Forced jog execution procedure

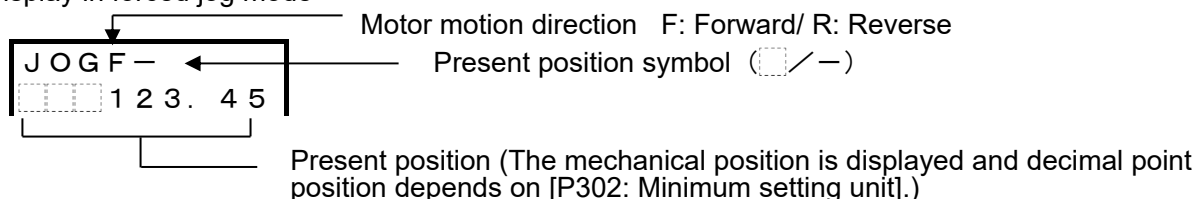
Operation at the forced jog execution is indicated as follows:



Note 1: By pressing key, the display becomes [Condition display mode], and the device becomes emergency stop condition.

Figure 9-7 Forced jog execution procedure

(2) Display in forced jog mode



Pressing / keys can rotate motor.

Motor rotates in forward direction by pressing key or turning on FJOG signal, and motor rotates in reverse direction by pressing key or turning ON RJOG signal.

Same display will appear while motor is rotating by FJOG or RJOG signal as well as by pressing / keys.



Caution

- To change the motion speed of motor, end the forced jog mode once, and change the value of [P400: Jog speed 1].
- If the motor enters the forced jog mode while the control input signal FJOG or RJOG is ON, the motor immediately starts rotating. Please be careful.

Chapter 10 Protective function

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10-1 Protective function and error processing

The device is equipped with various protective functions to protect device and motor from damages by unusual conditions, and error processing functions to alert erroneous operations.

Protective functions include [Alarm processing] and [Warning processing], while Error processing functions has [Error display].

1) Alarm processing

When an error is detected, motor stops (Instant stop or torque-free, depending on error contents), Alarm signal is output, and at the same time, alarm message is displayed.

2) Warning processing

If current use condition is highly likely to cause errors, an alert about errors is issued in advance. This alert outputs warning signal and displays warning message; however, motor does not stop.

3) Error display

Upon finding erroneous operation or input data error, error message is displayed.

Table 10-1 Error occurrence and processing

Contents of error	Processing contents in error occurrence (detection)		
	Motor operating conditions	Control output signal	LCD display
Alarm processing	Instant stop or torque-free	Alarm signal ON	Alarm message
Warning processing	Continue current operation	Warning signal ON	Warning message
Error display	Continue current operation	No changes	Error message

* About [LCD display]

When LCD module is installed or when optional SDI device is connected, alarm/warning/error message is displayed on [Data display block].

As for LCD module, refer to [11-1 Operation of LCD module].

"0"

" { "→" — "→" 2 "→" " "→" { "...

Display upper order	Status	Display lower order	Error contents
None	Normal	None	Alarm/warning not occurred, and RDY ON
0	RDY OFF	None	Alarm/warning not occurred, and RDY OFF
1	Servo error	0	IPM error
		2	Main power supply shortage voltage error
		3	Excessive voltage error
		4	Over speed error
		5	Overload error
		6	IPM overload error
		7	Regenerative resistor overload error
		8	AC-off detection error*1
		9	Radiator overheat error
		A	Servo control error
		b	Input power supply error
2	Motor error	0	Motor type not set
		1	Motor type incompatible
3	Encoder-related error 1	0	Encoder-related error
		1	At-power-ON motor shaft error
		2	Serial encoder count error
		3	Serial encoder/IPU communication error
		4	Linear sensor resolution error
		5	Encoder position detection signal error
		6	Serial number matching error
		7	Serial number not set (empty)
		8	τ DISC motor 1-rotation position detection speed error
		9	τ DISC absolute encoder light-receiving element error
		A	τ DISC absolute encoder light-emitting element error
		b	Magnetic pole detection error
F	Serial No. matching error		
4	NC error	0	Deviation over flow
		1	Deviation error
5	OT detection	0	Forward over travel
		1	Reverse over travel
		2	Forward direction software over travel
		3	Reverse direction software over travel

10-3

Table 10-3 7-segment display (2/3)

Display upper order	Status	Display lower order	Error contents
6	Automataic run error	0	Address setting error
		1	Positioning timeover
		2	Positioning data over flow
		3	No 1-rotation data setting
		4	No program end command setup
		5	Sub-routine call nesting over
		6	Sub-routine return invalid
		7	Jump address invalid
		8	Spin command invalid
		9	Division invalid
		A	Positioning amount error
		b	Invalid command
		c	Indirect data number invalid
		d	Successive control command invalid
7	Data sustain error	None	Backup data error
8	System error (Failure)	None	DSP error or RAM error
9	Sequence error	1	Remote sequence control IC defect
		2	Remote sequence control communication-OFF
		3	Remote sequence control receive timeout
A	Other errors	1	EEPROM (nonvolatile memory) writing error
		2	Rated speed command invalid 1
		3	Rated speed command invalid 2
		4	Servo control communication disconnection error
		5	Servo control communication error
b	Undefined	7	Rated speed command invalid 3
		None	
c	MECHATROLINK-III communication error*2	0	ASIC error
		1	System error
		2	Transmission cycle setting error
		3	Data size setting error
		4	Station address setting error
		5	Synchronous error
		6	Communication error
		7	Transmission cycle error
		8	FCS error
d	Undefined	9	Synchronization frame un-receiving
		None	

*2 Detected only when the optional MECHATROLINK-III is connected. For details, refer to the instruction manual, "VC II -C1 Type MECHATROLINK-III". (There is no explanation in this manual.)

Table 10-4 7-segment display (3/3)

Display upper order	Status	Display lower order	Error contents
E	Encoder-related error 2	0	Absolute encoder battery error
		1	Absolute encoder backup error
		2	Absolute encoder over flow error
		3	Absolute encoder count error
		5	Over speed* ³
			Communication error between encoder and IPU* ⁴
		6	Initialization error* ³
			Cable disconnection between encoder and IPU* ⁴
		7	Hardware error* ³
			Encoder backup error* ⁵
		8	ABS detection error* ³
			IPU backup error* ⁶
F	Warning	9	Transducer error* ³
		A	Signal strength error* ³
		0	Overload precaution
		1	Deviation abnormal warning
		2	Main power supply low voltage detection warning
		3	Zero return incomplete automatic startup warning
		4	Absolute encoder battery error warning
		5	Remote sequence control communication stand-by warning
		6	Remote sequence control SW change warning
		9	CMD warning* ⁷
		A	COMM warning* ⁷
		b	Signal strength warning* ³
			Encoder position detection parts deterioration warning* ⁴
		c	Thermal warning* ³

*³ Detected only when [L-ABS] is selected with P001: Encoder type selection.

*⁴ Detected only when [S-ABS3] or [S-MABS] is selected with P001: Encoder type selection.

*⁵ Detected only when [S-MABS] is selected with P001: Encoder type selection.

*⁶ Detected only when [S-ABS3], [S-MABS], or [S-ABS4] is selected with P001: Encoder type selection.

*⁷ Detected only when the optional MECHATROLINK-III is connected. For details, refer to the instruction manual, "VC II -C1 Type MECHATROLINK-III". (There is no explanation in this manual.)

10-3 Protective function list

10-3-1 Alarm list

(1) Servo error

Table 10-5 Servo error alarm list (1/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
IPM error  7-segment display 	Because of ground fault in motor, or short-circuit or ground fault in wiring U, V, W between the device and motor or in wiring B1, B2 between the device and regenerative resistor, excessive current flowed into transistor on main circuit. Or, cooling heat sink of power element is overheated. (In the device of 1.2kW or more) (Check item) 10-4 (1) IPM error 10-5-2 1) IPM error	Motor Torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Main power supply shortage voltage error  7-segment display 	The voltage of the main circuit DC bus is the specified value or less. (This alarm is detected in the device of main power supply integrated type.) (Check item) 10-4 (2) Control power supply/Main power supply shortage voltage error	Motor Torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Excessive voltage error  7-segment display 	The DC power supply voltage of the main circuit is the specified value or more due to one of the causes below. • The main power supply voltage is the specified value or more. • The regeneration processing capacity of the device is exceeded due to excessive load inertia, for example. • The ground potential rises due to a ground fault in the motor or excessive leak current. (Check item) 10-4 (3) Excessive voltage error 10-5-2 5) Excessive voltage error	Motor Torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Over speed error  7-segment display 	Number of motor rotations reached about 130% or more of rated speed*8. (Check item) 10-4 (6) Over speed error	Motor Torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input

*8 If P005 or P006 is other than 0, the speed is the applicable maximum speed.

Table 10-6 Servo error alarm list (2/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Overload error ALM. OVER LOAD 7-segment display 15	Due to overload or excess of permissible repetition frequency, built-in electronic thermal operated. Detection method is selected in [P144: Electronic-thermal detecting method selection]. (Check item) 10-4 (8) Overload error/IPM overload error 10-5-2 2) Overload error/IPM overload error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
IPM overload error ALM. IPM O. L. 7-segment display 16	The load became excessive for device power elements. The device sent 180% or higher current of its rated current for longer than regulation time while motor is running at low speed, or abnormal current was detected by the current FB detection for 500ms or more. (Check item) 10-4 (8) Overload error/IPM overload error 10-5-2 2) Overload error/IPM overload error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Regenerative resistor overload error ALM. RG. O. L. 7-segment display 17	Regenerative power generated in deceleration of load inertia exceeded permissible range of regenerative resistor power connected to the device. This error is detected based on [P158: Normal rated power of regeneration resistance]. (Check item) 10-5-2 3) Regenerative resistor overload error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
AC-off detection error ALM. AC DOWN 7-segment display 18	The AC power supply voltage is the specified value or less for at least 50ms. (Instantaneous stop occurred). ^{*9} * Provided, it is applicable when [ALM.ON: Alarm signal is output] is selected in [P714: ALM output selection at AC power cut]. As a rough guide, the specified value is 30V for a 100V device and 60V for a 200V device.	After stop in the method specified in [P713: Stopping method at AC power cut], torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input

^{*9} When 24VDC is used for control power supply, its voltage lower than about 18VDC (200V spec) or 12VDC (400V spec) is detected as a control voltage error.

Table 10-7 Servo error alarm list (3/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Radiator overheat error ALM. OVER HEAT 7-segment display 	The radiator temperature exceeds about 90°C. * Applied to devices with an output capacity of 22kW to 55kW. (Check item) 10-4 (8) Overload error/IPM overload error 10-5-2 2) Overload error/IPM overload error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Servo control error ALM. SRV CNTRL 7-segment display 	Motor operated reversely against torque that was output by device. If this error is detected in normal operation, adjust it in [P747: Servo control abnormality detection adjustment value].	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Input power supply error ALM. PHASE ERR 7-segment display 	- Main power supply (RL, SL, TL) and control power supply r, s, t are not matched in phase sequence. - Missing phase is found in power supply or there is such status. * Applicable to power supply regenerative devices	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Check if the power supply is wired normally. If an out-of-phase error or an open-phase error occurred, correct it.

(2) Motor error

Table 10-8 Motor error alarm list

Name Display	Contents	Operation at an alarm Output signal status	Release method
Motor type not set ALM. MOTR TYPE 1 7-segment display 	Setting of [P000: Motor type selection] is "000".	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Set motor type, and then power-on again.
Motor type incompatible ALM. MOTR TYPE 2 7-segment display 	Motor set in [P000: Motor type selection] and device is not matched in combination.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Set correct motor type, and then power-on again.

(3) Encoder-related error 1

Table 10-9 Encoder-related error 1 alarm list (1/4)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Encoder-related error A L M. E N C O D E R 7-segment display 	Alarm caused by: 1) Encoder error 2) Encoder cable disconnection, no connection, or unplugged connector 3) Encoder selection error in parameter (Check item) 10-4 (4) Encoder error 10-5-2 8) Encoder error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Check encoder, encoder cable, and parameter [P001], and then, 1) Power restart 2) Reset signal (RST) input when setting of [P001] is other than [INC3]
At-power-ON motor shaft error A L M. P W. O N E N C 7-segment display 	At power-on, motor shaft rotates or vibrates. If motor shaft rotates or vibrates at power-on, encoder cannot be initialized.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input when setting of [P001] is other than [INC2] or [INC3]
Serial encoder count error A L M. S E R. C O U N T 7-segment display 	Count error occurred on serial encoder. * Applicable when setting serial encoder (setting of [P001] is [S-INC] or [S-ABS])	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Serial encoder/IPU communication error A L M. S E R. C O M M. 7-segment display 	① Serial encoder and IPU error ② Encoder cable disconnection between this device and serial encoder/IPU ③ The encoder selection made by setting the related parameter is invalid. An error such as the ones listed above occurs. * Applicable when setting serial encoder (setting of [P001] is [S-INC], [S-ABS], or [L-ABS]) * Applicable when setting IPU (setting of [P001] is [S-INC2], [S-ABS2], [S-ABS3], [S-MABS], or [S-ABS4]) (Check item) * 10-4 (10) Serial encoder/IPU communication error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Check encoder cable and parameter [P001], and then, 1) Power restart 2) Reset signal (RST) input

Table 10-10 Encoder-related error 1 alarm list (2/4)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Linear sensor resolution error ALM. ☐ P 0 0 3 ☐ E R R. 7-segment display 3 4	1) When τ linear motor is used: "Distance between poles of τ linear motor [P058] $\div$ Linear sensor resolution [P003]" 2) When servo compass motor is used: "Sensor setting radius [P159] $\times$ Distance between poles of τ linear motor [P058] $\times$ Internal coefficient $\div$ Linear sensor resolution [P003]" The calculation result of 1) or 2) is beyond 32 bit. * Applicable when linear sensor is set (Setting of [P001] is [L-SEN] or [S-INC2])	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Reconsideration of linear sensor to use 2) Check of [P003] and power restart
Encoder position detection signal error ALM. ☐ S E R. A M P. 7-segment display 3 5	The position detection section of the encoder is abnormal. * Applicable when setting IPU (Setting of [P001] is [S-INC2], [S-ABS2], [S-ABS3], [S-MABS], or [S-ABS4]) (Check item) 10-4 (11) Encoder position detection signal error 10-5-2 19) Encoder position detection signal error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	After recovery of IPU, 1) Power restart 2) Motor replacement or repair at our factory is necessary
Serial number matching error ALM. ☐ S N O. U N M A T 7-segment display 3 6	Serial No. of device side and serial No. of IPU side are not matching when the device is connected to IPU and absolute position compensation function is effective. * Applied if all of the following conditions are met: • P001 is set to [S-INC2], [S-ABS2], [S-ABS3], or [S-MABS]. • P314 is set to "0" or "1". • The absolute position compensation function is effective. (Check item) 5-11 Serial number check at power-on	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Power restart
Serial number not set (empty) ALM. ☐ S N O. E M P T Y 7-segment display 3 7	Serial No. is not set in IPU side when the device is connected to IPU and absolute position compensation function is effective. * Applied if all of the following conditions are met: • P001 is set to [S-INC2], [S-ABS2], [S-ABS3], or [S-MABS]. • P314 is set to "0" or "1". • The absolute position compensation function is effective. (Check item) 5-11 Serial number check at power-on	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	After setting absolute position correction data, serial number, etc. to IPU side, restart the power supply.

Table 10-11 Encoder-related error 1 alarm list (3/4)

Name Display	Contents	Operation at an alarm Output signal status	Release method
τ DISC motor 1-rotation position detection speed error A L M. ☐ ☐ A B S. O. S. 7-segment display 3 8	Applicable when the setting of [P001] is [S-ABS2], [S-ABS3], or [S-MABS]. - When the power is turned on or when a serial encoder communication error is released, the motor rotates or vibrates at 1rpm or more. Applicable when the setting of [P001] is [S-ABS4]. - When the power is turned on or when a serial encoder communication error is released, the motor rotates or vibrates at 15rpm or more.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
τ DISC absolute encoder light-receiving element error A L M. ☐ ☐ A B S. I C 1 7-segment display 3 9	Light-receiving element of τ DISC absolute encoder is unusual. * Applicable when setting IPU (Setting of [P001] is [S-ABS2]) (Check item) 10-5-2 20) Absolute encoder photo acceptance unit error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Motor replacement or repair at our factory is necessary
τ DISC absolute encoder light-emitting element error A L M. ☐ ☐ A B S. I C 2 7-segment display 3 A	Light-emitting element of τ DISC absolute encoder is unusual. * Applicable when setting IPU (Setting of [P001] is [S-ABS2], [S-ABS3], or [S-MABS]) (Check item) 10-5-2 21) Absolute encoder light emitting element error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Motor replacement or repair at our factory is necessary
Magnetic pole detection error A L M. ☐ ☐ P O L E. E R R 7-segment display 3 b	- Automatic magnetic pole detection is not completed normally. - When using magnetic pole sensor, magnetic pole detection is not completed normally. - Selection in magnetic pole sensor type [P010] set through parameter is wrong (Check item) 10-4 (5) Magnetic pole detection error 10-5-2 9) Magnetic pole detection error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Check encoder, magnetic pole sensor, encoder cable, and parameter [P010], and then, 1) Power restart 2) Reset signal (RST) input

Table 10-12 Encoder-related error 1 alarm list (4/4)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Serial No. matching error S E R N O U N M A T C H E D 7-segment display 3 F	Serial No. of device side and serial No. of IPU side are not matching when the device is connected to IPU and absolute position compensation function is effective. Alarm will not be output. * Applied if all of the following conditions are met: • P001 is set to [S-INC2], [S-ABS2], [S-ABS3], or [S-MABS]. • P314 is set to "0" or "1". • The absolute position compensation function is effective. (Check item) 5-11 Serial number check at power-on	Motor torque-free Alarm OFF Warning OFF Servo Ready OFF Brake Release OFF	Power restart

(4) NC error

Table 10-13 NC error alarm list

Name Display	Contents	Operation at an alarm Output signal status	Release method
Deviation over flow A L M. ☐ ☐ O V E R F L O W 7-segment display 4 0	Position deviation exceeded setting value of [P207: Overflow detecting pulse]. (Check item) 10-5-2 10) Deviation over flow/Deviation error	Motor stops instantly, and after stop, becomes torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Reset signal (RST) input
Deviation error A L M. ☐ V A R I. O V E R 7-segment display 4 1	Position deviation exceeded setting value of [P208: Deviation error detecting pulse]. * Applicable when selecting [STOP: Alarm-stop] in [P209: Motion selection at deviation error] (Check item) 10-5-2 10) Deviation over flow/Deviation error	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹⁰ Brake Release ON	1) Power restart 2) Reset signal (RST) input

*¹⁰ Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

(5) OT detection

Table 10-14 OT detection alarm list

Name Display	Contents	Operation at an alarm Output signal status	Release method
Forward over travel A L M. + H A R D O T . 7-segment display 5 0	Forward Over Travel signal (FOT) is detected. (Check item) 10-5-2 12) Forward over travel/Reverse over travel	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹¹ Brake Release ON	Move the motor in reverse direction in jog operation and release forward over travel
Reverse over travel A L M. - H A R D O T . 7-segment display 5 1	Reverse Over Travel signal (ROT) is detected. (Check item) 10-5-2 12) Forward over travel/Reverse over travel	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹¹ Brake Release ON	Move the motor in forward direction in jog operation and release forward over travel
Forward direction software over travel A L M. + S O F T O T . 7-segment display 5 2	Current position exceeded the setting value of [P306: Forward software OT limit]. (Check item) 10-5-2 13) Forward software limit/reverse software limit	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹¹ Brake Release ON	Move the motor in reverse direction in jog operation till the operation possible range
Reverse direction software over travel A L M. - S O F T O T . 7-segment display 5 3	Current position exceeded the setting value of [P307: Reverse software OT limit]. (Check item) 10-5-2 13) Forward software limit/reverse software limit	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹¹ Brake Release ON	Move the motor in forward direction in jog operation till the operation possible range

*¹¹ Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

(6) Automatic run error

Table 10-15 Automatic run error alarm list (1/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Address setting error A L M. A D D R E R R. 7-segment display 6 0	An attempt was made to execute a command with specifying an address beyond the range of 0 to 279.	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹² Brake Release ON	Correct the address, then, 1) Power restart 2) Reset signal (RST) input
Positioning timeover A L M. T I M E O U T 7-segment display 6 1	Positioning operation is not completed when the time set in [P203: Positioning time over] has elapsed. (Check item) 10-5-2 11) Positioning timeover	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹² Break Release ON	1) Power restart 2) Reset signal (RST) input
Positioning data over flow A L M. D A T A O V E R 7-segment display 6 2	An attempt was made to execute simple successive positioning with specifying a successive operation distance beyond the range of 2147483647 to -2147483648.	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹² Break Release ON	Correct the successive operation distance within the range, then, 1) Power restart 2) Reset signal (RST) input
No 1-rotation data setting A L M. P 3 0 5 E R R. 7-segment display 6 3	An attempt was made to execute the index positioning or spin command in the status in which [P305: Index data range] is not set, "0".	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹² Break Release ON	Correct [P305: Index data range], then, 1) Power restart 2) Reset signal (RST) input
No program end command setup A L M. P E N D. E R R. 7-segment display 6 4	The address reached 280 since the PEND command was not set for the execution of a command not in group 0.	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹² Break Release ON	Correct the program, then, 1) Power restart 2) Reset signal (RST) input
Sub-routine call nesting over A L M. C A L L O V E R 7-segment display 6 5	An attempt is made to execute a subroutine call nine or more times without subroutine return.	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹² Break Release ON	Correct the program, then, 1) Power restart 2) Reset signal (RST) input

*¹² Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

Table 10-16 Automatic run error alarm list (2/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Sub-routine return invalid  7-segment display 	An attempt was made to execute sub-routine return without executing a sub-routine call.	Motor servo lock Alarm ON Warning OFF Servo Ready ON ^{*13} Break Release ON	Correct the program, then, 1) Power restart 2) Reset signal (RST) input
Jump address invalid  7-segment display 	An attempt was made to execute a command with specifying a jump destination or sub-routine call destination beyond the range of 0 to 279.	Motor servo lock Alarm ON Warning OFF Servo Ready ON ^{*13} Break Release ON	Correct the address, then, 1) Power restart 2) Reset signal (RST) input
Spin command invalid  7-segment display 	An attempt was made to execute the SPNT or SPNP command without executing the SPNS command. Alternatively, an attempt was made to execute a command other than SPNS, SPNT, or SPNP during spin operation. Alternatively, the SPNS or SPNT command was executed at address 279. The internal speed operation value exceeded 32 bits because the setting value of [P303, P304: Electronic gear ratio], [P305: Index data range] or [P310: Machine travel amount] was invalid.	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON ^{*13} Break Release ON	Correct the program and parameters, then, 1) Power restart 2) Reset signal (RST) input
Division invalid  7-segment display 	An attempt was made to execute division with divisor "0".	Motor servo lock Alarm ON Warning OFF Servo Ready ON ^{*13} Break Release ON	Correct the divisor, then, 1) Power restart 2) Reset signal (RST) input
Positioning amount error  7-segment display 	An attempt was made to execute the positioning command with a positioning amount exceeding the setting value of [P308: Forward positioning amount max. value] or [P309: Reverse positioning amount max. value]. (Check item) 10-5-2 15) Positioning amount error	Motor servo lock Alarm ON Warning OFF Servo Ready ON ^{*13} Break Release ON	Correct data, then, 1) Power restart 2) Reset signal (RST) input

^{*13} Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

Table 10-17 Automatic run error alarm list (3/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Invalid command A L M. ☐ C M N D. E R R. 7-segment display 6 b	An attempt was made to execute an unrecognizable command. (This alarm occurs when an invalid command was registered by communication.)	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹⁴ Break Release ON	Correct data, then, 1) Power restart 2) Reset signal (RST) input
Indirect data number invalid A L M. ☐ I X N O. E R R. 7-segment display 6 c	An attempt was made to execute a command with specifying indirect data using indirect data number beyond the range of 0 to 99.	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹⁴ Break Release ON	Correct data , then, 1) Power restart 2) Reset signal (RST) input
Successive control command invalid A L M. ☐ C O N T ☐ E R R. 7-segment display 6 d	During the execution of a successive control command, an attempt was made to execute other than a successive control command without completing the CEND command.	Motor stops instantly, and after stop, enters servo lock status Alarm ON Warning OFF Servo Ready ON* ¹⁴ Break Release ON	Correct data, then, 1) Power restart 2) Reset signal (RST) input

*¹⁴ Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

(7) Data sustain error

Table 10-18 Data sustain error alarm list

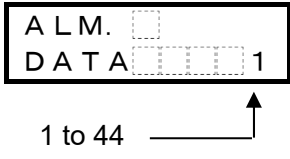
Name Display	Contents	Operation at an alarm Output signal status	Release method
Data sustain error 1 to 44  1 to 44 7-segment display	Sustained data was broken.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Reset data, then, 1) Power restart 2) Reset signal (RST) input However, DATA39, DATA43, and DATA44 error cannot be released. Contact us for service.
Display	Details		
DATA 1	Contents of parameter (Group 0/P000th level) were broken.		
DATA 2	Contents of parameter (Group 1/P100th level) were broken.		
DATA 3	Contents of parameter (Group 2/P200th level) were broken.		
DATA 4	Contents of parameter (Group 3/P300th level) were broken.		
DATA 5	Contents of parameter (Group 4/P400th level) were broken.		
DATA 6	Contents of parameter (Group 5/P500th level) were broken.		
DATA 7	Contents of parameter (Group 6/P600th level) were broken.		
DATA 8	Contents of parameter (Group 7/P700th level) were broken.		
DATA 9	Contents of command (address 000 to 009) were broken.		
DATA 10	Contents of command (address 010 to 019) were broken.		
DATA 11	Contents of command (address 020 to 029) were broken.		
DATA 12	Contents of command (address 030 to 039) were broken.		
DATA 13	Contents of command (address 040 to 049) were broken.		
DATA 14	Contents of command (address 050 to 059) were broken.		
DATA 15	Contents of command (address 060 to 069) were broken.		
DATA 16	Contents of command (address 070 to 079) were broken.		
DATA 17	Contents of command (address 080 to 089) were broken.		
DATA 18	Contents of command (address 090 to 099) were broken.		
DATA 19	Contents of command (address 100 to 109) were broken.		
DATA 20	Contents of command (address 110 to 119) were broken.		
DATA 21	Contents of command (address 120 to 129) were broken.		
DATA 22	Contents of command (address 130 to 139) were broken.		
DATA 23	Contents of command (address 140 to 149) were broken.		
DATA 24	Contents of command (address 150 to 159) were broken.		
DATA 25	Contents of command (address 160 to 169) were broken.		
DATA 26	Contents of command (address 170 to 179) were broken.		
DATA 27	Contents of command (address 180 to 189) were broken.		
DATA 28	Contents of command (address 190 to 199) were broken.		
DATA 29	Contents of command (address 200 to 209) were broken.		
DATA 30	Contents of command (address 210 to 219) were broken.		
DATA 31	Contents of command (address 220 to 229) were broken.		
DATA 32	Contents of command (address 230 to 239) were broken.		
DATA 33	Contents of command (address 240 to 249) were broken.		
DATA 34	Contents of command (address 250 to 259) were broken.		
DATA 35	Contents of command (address 260 to 269) were broken.		
DATA 36	Contents of command (address 270 to 279) were broken.		
DATA 37	Contents of indirect data (IX00 to IX49) were broken.		
DATA 39	Contents of DCCT offset data were broken.		
DATA 43	Contents of absolute position correction data were broken.		
DATA 44	Contents of device capacity and machine model information data were broken.		

Table 10-19 System error alarm list

Name Display	Contents	Operation at an alarm Output signal status	Release method
CPU error ALM. ☐ ☐ CPU ☐ RAM ALM. ☐ ☐ EX ☐ RAM ALM. ☐ ☐ ☐ D PRAM ALM. ☐ ☐ DSP ☐ BOOT ALM. ☐ ☐ DSP ☐ BOOT 1 ALM. ☐ ☐ DSP ☐ PARA ALM. ☐ ☐ FPGA ☐ RST ALM. ☐ ☐ FPGA ☐ TIM ALM. ☐ ☐ FPGA ☐ CRC 7-segment display 	Device failure (Check item) 10-5-2 17) CPU error	Motor torque-free Alarm blinking Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Device replacement, or repair at our factory is necessary
CPU error 7-segment display Uncertainty	Due to errors in CPU or memory (ROM, RAM), watchdog timer has expired (Check item) 10-5-2 17) CPU error	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Device replacement, or repair at our factory is necessary

(9) Sequence error

Table 10-20 Sequence error alarm list

Name Display	Contents	Operation at an alarm Output signal status	Release method
Remote sequence control IC defect A L M. N E T I C E R 7-segment display 9 1	IC chip that controls remote sequence control communication is broken.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Repair at our factory
Remote sequence control communication-OFF A L M. N E T E R R. 7-segment display 9 2	Communication for remote sequence control became impossible. It also may occur when the power of controller which executes sequence control is OFF first.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Restart the power for entire system where sequence control is connected remotely
Remote sequence control receive timeout A L M. N E T O F F 7-segment display 9 3	Receiving timeout occurred because of errors in transmitting conditions of remote sequence control.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Remove causes, then, 1) Power restart 2) Reset signal (RST) input

Table 10-21 The other error alarm list (1/2)

Name Display	Contents	Operation at an alarm Output signal status	Release method
EEPROM (nonvolatile memory) writing error ALM. ☐ WR. EEPROM 7-segment display R 1	Data writing into device built-in EEPROM could not be done (Check item) 10-5-2 14) EEPROM writing error	Motor stops. After stopping, motor becomes torque free. Alarm ON Warning OFF Servo Ready ON* ¹⁵ Brake Release ON	1) Power restart 2) Reset signal (RST) input
Rated speed command invalid 1 ALM. ☐ STD. SPD. 1 7-segment display R 2	The speed in the motor rated speed* ¹⁶ according to the setting in [P303, P304: Electronic gear ratio] and [P310: Machine travel amount] exceeded 40M (setting unit/sec). Or, the frequency of the electric angle at the motor rated speed* ¹⁶ is 600Hz or more. (Check item) 10-4 (12) Rated speed command invalid (STD.SPD.1/STD.SPD.2)	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Correct [P303/P304: Electronic gear ratio] and [P310: Machine travel amount], then, 1) Power restart 2) Reset signal (RST) input * If the frequency of the electric angle at the motor rated speed* ¹⁶ is 600Hz or more, contact our sales representative.
Rated speed command invalid 2 ALM. ☐ STD. SPD. 2 7-segment display R 3	The speed in the motor rated speed* ¹⁶ according to the setting in [P303, P304: Electronic gear ratio] and [P310: Machine travel amount] became less than 100 (setting unit/sec). (Check item) 10-4 (12) Rated speed command invalid (STD.SPD.1/STD.SPD.2)		
Servo control communication disconnection error ALM. ☐ M. COMM. ER 7-segment display R 4	When servo control communication is being executed, disconnection (communication interruption) occurred. (Note) This alarm occurs when [ALM] is selected in [P523: Alarm stop selection at servo control communication stopped].	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Remove cause of disconnection, then, 1) Power restart 2) Reset signal (RST) input
Servo control communication error ALM. ☐ BCC. ERR 7-segment display R 5	When servo control communication is being executed, communication error (data error, etc.) occurred. (Note) This alarm occurs when [ALM] is selected in [P523: Alarm stop selection at servo control communication stopped].	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Remove cause of communication error, then, 1) Power restart 2) Reset signal (RST) input

*¹⁵ Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

*¹⁶ If P005 or P006 is other than 0, the speed is the applicable maximum speed.

Table 10-22 The other error alarm list (2/2)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Rated speed command invalid 3 A L M. STD. SPD. 3 7-segment display 	The motor rated speed* ¹⁷ exceeded 32768 (rpm) when considering [P058: Distance between linear motor pole opposite] as 1 revolution against [P006: Tau Linear motor applicable maximum speed] or [P007: Tau Linear motor rated speed].	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Change parameter, and then power-on again
Absolute encoder positioning error A L M. ABS. H. ERR 7-segment display 	[ABS HOME] zero point return operation is implemented with an encoder other than an absolute encoder.	Motor servo lock Alarm ON Warning OFF Servo Ready ON* ¹⁸ Break Release ON	Select a correct zero point return method, and 1) Power restart 2) Reset signal (RST) input

*¹⁷ If P005 or P006 is other than 0, the speed is the applicable maximum speed.

*¹⁸ Status where RDY1 is selected in [P716: RDY signal specification selection]. Other selection may change the status.

(11) Encoder-related error 2

Table 10-23 Encoder-related error 2 alarm list (1/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Absolute encoder battery error A L M. ☐ A B S. B A T T. 7-segment display 	Voltage of external battery for absolute encoder data backup became low. <Only one detection after power-on> * Applicable when absolute encoder is set (Setting of [P001] is [S-ABS] or [S-MABS])	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Replace external battery, then, 1) Power restart 2) Reset signal (RST) input
Absolute encoder backup error A L M. ☐ A B S. B A K U P. 7-segment display 	Multi-rotation data in backup on absolute encoder was lost. * Applicable when absolute encoder is set (Setting of [P001] is [S-ABS] or [S-MABS])	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Replace external battery, and execute initial setting operation of absolute encoder, and then restart power
Absolute encoder over flow error A L M. ☐ ☐ A B S. O V E R 7-segment display 	Applicable when absolute encoder is set (Setting of [P001] is [S-ABS]) - Rotating volume of absolute encoder reached ± 16383 rotations or more. Applicable when absolute encoder is set (Setting of [P001] is [S-MABS]) - The upper limit on the rotation amount of the absolute encoder is exceeded.	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Execute initial setting operation of absolute encoder, then restart power
Absolute encoder count error A L M. ☐ A B S. C O U N T 7-segment display 	Count error of absolute encoder occurred. * Applicable when absolute encoder is set (Setting of [P001] is [S-ABS])	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Execute initial setting operation of absolute encoder, then restart power

Table 10-24 Encoder-related error 2 alarm (when setting of [P001] is [L-ABS]) list (2/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Over speed A L M. ABS. O V S P D 7-segment display E 5	The maximum response speed of the linear scale is exceeded. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Review the operation conditions first and then 1) Power restart 2) Reset signal (RST) input
Initialization error A L M. ABS. I N I T. 7-segment display E 6	Initialization of the linear scale detection head is not completed normally. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Adjust the signal of the linear scale detection head first and then 1) Power restart 2) Reset signal (RST) input
Hardware error A L M. ABS. H A R D 7-segment display E 7	An error occurred in the hardware of the linear scale detection head. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Adjust the signal of the linear scale detection head first and then 1) Power restart 2) Reset signal (RST) input * If it frequently occurs, the sensor head must be replaced.
ABS detection error A L M. ABS. D T C T 7-segment display E 8	An error occurred in the absolute value data of the linear scale. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Adjust the signal of the linear scale detection head first and then 1) Power restart 2) Reset signal (RST) input
Transducer error A L M. ABS. T R A N. 7-segment display E 9	An error occurred in the internal signal balance of the linear scale detection head. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Adjust the signal of the linear scale detection head first and then 1) Power restart 2) Reset signal (RST) input
Signal strength error A L M. ABS. A M P. 7-segment display E A	The signal strength of the linear scale reduces to 15% or less. Or, it becomes 100%. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Adjust the signal of the linear scale detection head first and then 1) Power restart 2) Reset signal (RST) input

Table 10-25 Encoder-related error 2 alarm (when setting of [P001] is [S-ABS3], [S-MABS], or [S-ABS4]) list (3/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Communication error between encoder and IPU A L M. E N C I P U C O M 7-segment display E 5	An error occurred in the encoder and IPU communication circuit. * Applicable when the IPU is set (the setting of [P001] is [S- ABS3] or [S-MABS]). (Check item) 10-5-2 22) Communication error between encoder and IPU	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Repair at our factory.
Cable disconnection between encoder and IPU A L M. E N C. C A B L E 7-segment display E 6	Cable disconnection between encoder and IPU occurred, for example. * Applicable when the IPU is set (the setting of [P001] is [S- ABS3] or [S-MABS]). (Check item) 10-5-2 23) Cable disconnection between encoder and IPU	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	Check the cable first and then 1) Power restart
Encoder backup error A L M. E N C. B A K U P 7-segment display E 7	Encoder backup data is damaged. * Applicable when the IPU is set (the setting of [P001] is [S- MABS]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) Encoder unit and motor replacement or repair at our factor is necessary.
IPU backup error A L M. I P U B A K U P 7-segment display E 8	IPU backup data is damaged. * Applicable when the IPU is set (the setting of [P001] is [S- ABS3], [S-MABS], [S-ABS4]).	Motor torque-free Alarm ON Warning OFF Servo Ready OFF Brake Release OFF	1) Power restart 2) IPU replacement or repair at our factory is necessary.

10-3-2 Warning list

Table 10-26 Warning list (1/3)

Name Display	Contents	Operation at an alarm Output signal status	Release method
Overload precaution WNG. OVER. LOAD 7-segment display F 0	Continuation of operation under current operating conditions results in overload error.	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Remove cause of overload
Deviation abnormal warning WNG. VAR I. OVER 7-segment display F 1	Position deviation exceeded setting value in [P208: Deviation error detecting pulse]. * Applicable when [Operation continues] is selected in [P209: Motion selection at deviation error]	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Remove cause of deviation error occurrence (increased load, setting errors in gain or acceleration/ deceleration time, etc)
Main power supply low voltage detection warning WNG. UNDRVOLT 2 7-segment display F 2	The voltage of the main circuit DC bus is the specified value or less. For information about a rough guide for the specified value, refer to 10-4 Verification when protective function is activated. (This warning is detected in the device of main power supply separation type)	Motor torque-free Alarm OFF Warning ON Servo Ready OFF Brake Release OFF	Recover main power supply voltage to normal range
Zero return incomplete automatic startup warning WNG. HOME. ERR. 7-segment display F 3	Drive signal was ignored because automatic run was executed before completion of Zero return. * Detection is not made when no conditions are selected in [P409: Automatic run permission condition selection].	Auto-start signal is ignored. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Execute Zero return (If other than automatic mode is selected, the warning is turned off.)
Absolute encoder battery error warning WNG. ABS. BATT. 7-segment display F 4	Voltage of external battery for absolute encoder data backup became low. <Fulltime monitoring> * Applicable when absolute encoder is set. (Setting of [P001] is [S-ABS] or [S-MABS])	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Replace external battery
Remote sequence control communication stand-by warning WNG. NET NORDY 7-segment display F 5	Communication for remote sequence control is not started. It occurred when the device under remote sequence control was not operating.	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Power on the device to control through remote sequence
Remote sequence control SW change warning WNG. NET SW 7-segment display F 6	Setting status of station number SW or baud rate SW of the device for remote sequence control was changed after power-on.	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Return the station number SW or baud rate SW setting of the device for remote sequence control to original status at power-on

Table 10-27 Warning (when setting of [P001] is [L-ABS]) list (2/3)

Name	Contents	Operation at an alarm Output signal status	Release method
Display			
Signal strength warning  7-segment display F b	There is a large change in the signal strength of the linear scale. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	At any position on the scale, make the gap between detection head and scale constant, and make the signal strength at the detection head constant.
Thermal warning  7-segment display F c	The internal temperature of the linear scale detection head is 65°C or more. * Applicable when the ABS linear scale is set (the setting of [P001] is [L-ABS]).	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Cool the linear scale detection head.

Table 10-28 Warning (when setting of [P001] is [S-ABS3] or [S-MABS]) list (3/3)

Name	Contents	Operation at an alarm Output signal status	Release method
Display			
Encoder position detection parts deterioration warning  7-segment display F b	Deterioration of encoder position signal detection parts has progressed. * Applicable when the IPU is set (the setting of [P001] is [S-ABS3] or [S-MABS]). (Check item) 10-5-2 24) Encoder position detection parts deterioration warning	Continues current operation. Alarm OFF Warning ON Servo Ready ON Brake Release ON	Motor replacement or repair at our factory is necessary.

10-3-3 Error list

Table 10-29 Error list

Name Display	Contents	Operation at an alarm Output signal status	Release method
Data input range error 	Input parameter and data value deviated setting range.	In the editing mode, motor continues current operation, with no changes in output signal.	Release error with any key and reset correct data
Data setting value error 	The result of calculation using multiple related parameter values is beyond the setting range.	In the editing mode, motor continues current operation, with no changes in output signal.	Release error with any key and reset correct data

10-4 Verification when protective function is activated

Activation of protective function indicates some errors occurred.

Before releasing alarm, be sure to investigate cause of errors and remove the cause.

As for check and measures against cause of errors, refer to [10-5 Abnormal diagnosis and countermeasures], and take necessary measures.

(1) IPM error (IPM ERR.)

When IPM error occurred, it is considered that excessive current flowed to transistors on the device main circuit (power block). Thus, repeated alarm reset and occurrence of this error without completely removing cause of the error results in damage on the device.

Be sure to remove cause of errors, and then resume run.

In the case of this device that is more than 1.2kW, excessive heating error in the function for radiating heat generated by power elements also activates this protective function as one of this error.

Suspicious causes of error occurrence are as follows.

- Overload status continued, due to excess of rated load or excess of permissible repetition frequency.
- Surrounding temperature of the device rose.
- Radiator is clogged.
- Failure or lowered capacity in radiator cooling fan

Thus, in the occurrence of this error, check if surrounding temperature is within 0 to 55°C, if ventilation is located properly not to disturb radiation, if radiator is not clogged, and if fan runs normally, including other factors.

If overheat error occurred, remove cause of the error, and wait until the radiator temperature becomes low (allowing cool down time for about 30 minutes), and then resume run.

(2) Main power supply shortage voltage error (UNDER VOLTAGE)

When the voltage shortage error is happened due to low AC power supply voltage, low voltage due to the shortage in power capacity or sudden blackout (power failure for more than about 10ms) is suspected. If power failure continued after sudden blackout that activated protective function, protective circuit is reset because of no control power supply. Therefore, it is dangerous to design sequence to run motor that is activated by various input commands (speed command, pulse train command, etc.) due to recovery of power; thus, never assemble such sequence. Be sure to make external sequence to have each signal OFF and to stop command upon alarm occurrence (output) by protection function.

The following table lists the detection voltage values of the main circuit DC bus in the device.

Table 10-30 Value detected as an under voltage error^{*19}

Model	Detected voltage
NCR-*D**A1A-051* to NCR-*D**A1A-201*	90V
NCR-*D**A2A-101* to NCR-*D**A2A-203(153)*	180V
NCR-*D**A2B-303(223)* to NCR-*D**A2B-373(373)*	180V
NCR-*D**A3A-262* to NCR-*D**A3A-203(153)*	370V
NCR-*D**A3B-373(303)* to NCR-*D**A3B-553(373)*	350V

^{*19} () indicates the model No. of IM motor type.

(3) Excessive voltage error (OVER VOLTAGE)

- 1) When excessive voltage error occurred in the time of motor stop or deceleration, excessive regenerative energy due to big load inertia is suspected. In this case, make the following improvements:
 - Attach a regenerative resistor.
 - Increase the deceleration time.
 - Decrease the applicable operation speed.
- 2) This error may be caused because the ground potential rises due to a ground fault in the motor or excessive leak current, and the main power supply DC voltage exceeds the specified value. Make the following check and improvement:
 - Check if a ground fault occurred in the motor.
 - In the case of excessive leak current, insert a zero-phase reactor.
- 3) Check if the power supply voltage use is too high.

The following table lists the detection voltage values of the main power supply DC voltage in the device.

Table 10-31 Values detected as an over voltage error*²⁰

Model	Detected voltage
NCR-*D**A1A-051* to NCR-*D**A1A-201*	200V
NCR-*D**A2A-101* to NCR-*D**A2A-203(153)*	400V
NCR-*D**A2B-303(223)* to NCR-*D**A2B-373(373)*	425V
NCR-*D**A3A-262* to NCR-*D**A3A-203(153)*	800V
NCR-*D**A3B-373(303)* to NCR-*D**A3B-553(373)*	855V

(4) Encoder error (ENCODER)

When encoder error occurred, no connection or disconnection of encoder cable, unplugging of connector, noise on encoder signal, or setting error in parameter [P000 to P002: Encoder selection] can be suspected.

If encoder itself goes into malfunction, encoder error may not be detected.

In this case, overload error occurs in the time of motor run.

(5) Magnetic pole detection error (POLE.ERR)

It is considered that initial magnetic pole detection was not completed normally when magnetic pole sensor was used. Suspicious causes of error occurrence are as follows.

- Magnetic pole decision was not completed normally because operation speed was too fast.
- Magnetic pole sensor is defective.
- Noise on signal

Also, when magnetic pole detection is executed without magnetic pole sensor, it is suspected that automatic magnetic pole detection was not completed normally. Set correct value in P055 to P057 and P116 to P119. As for the method of adjustment, refer to [5-6 Automatic magnetic pole detection operation].

(6) Over speed error (OVER SPEED)

When over speed error occurred, excessive speed over-shoot at the time of motor start due to conditions such as big load inertia is suspected. In this case, adjust gain for speed loop and for position loop, or prolong acceleration time.

For the method of adjustment for each gain, refer to [5-5 Adjustment].

*²⁰ () indicates the model No. of IM motor type.

(7) Radiator overhear error (OVER HEAT)

If a radiator overhear error occurs, the temperature of the radiator in the device exceeds about 90°C.

Causes of increase in radiator temperature include:

- The ambient temperature of the device rises.
- The radiator is clogged.
- The radiator cooling fan is faulty or its capacity is lowered.

Thus, if this error occurs, check if the ambient temperature is within a range of 0 to 55°C, if the ventilation is such that the heat from the device can escape, if the radiator is free from clogging, and if the fan is operating normally, for example.

If this error occurs, remove the cause of the error, wait for the radiator temperature to drop (leave the device for a cooling time of about 30 minutes) and then resume operation.

(8) Overload error (OVER LOAD)

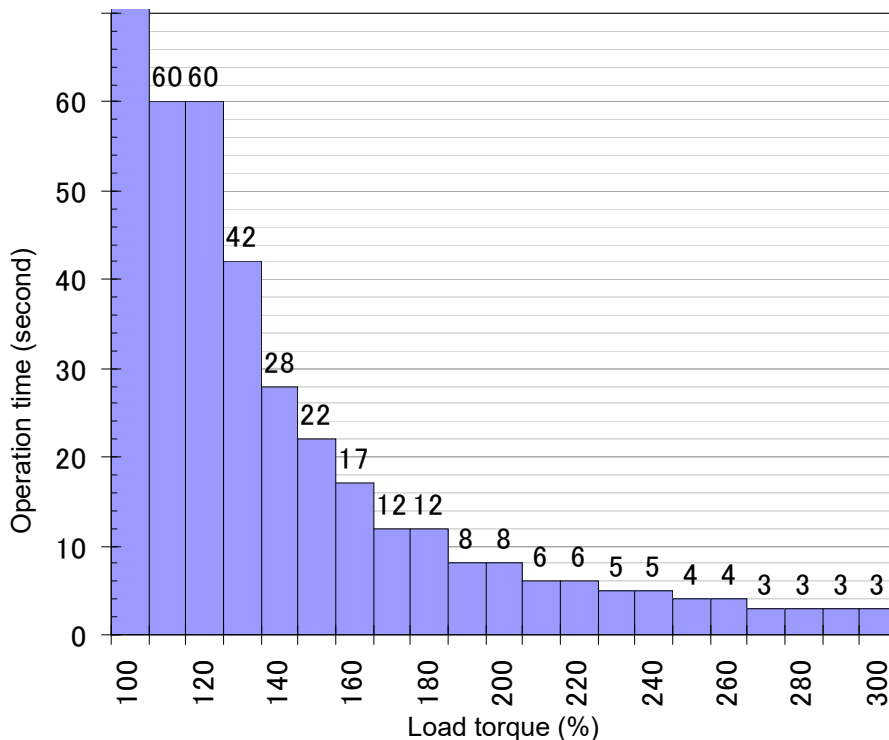
When this error occurred, it is considered built-in electronic thermal was activated due to overload or excess of permissible repetition frequency. If alarm reset and operation are repeated in a short period of time, temperature in device power element and in motor goes up abnormally, which leads to breakage. Be sure to remove cause of error, allow cool down time for about 30 minutes, and then resume run.

As for detection of overload error, built-in electronic thermal can be selected in parameter [P144] as shown below.

©STD: Detection method differs depending on applicable motor.

1) When using IM motor/SM motor

Error is detected by the relationship between the load considering the motor rated torque as 100% and the time.

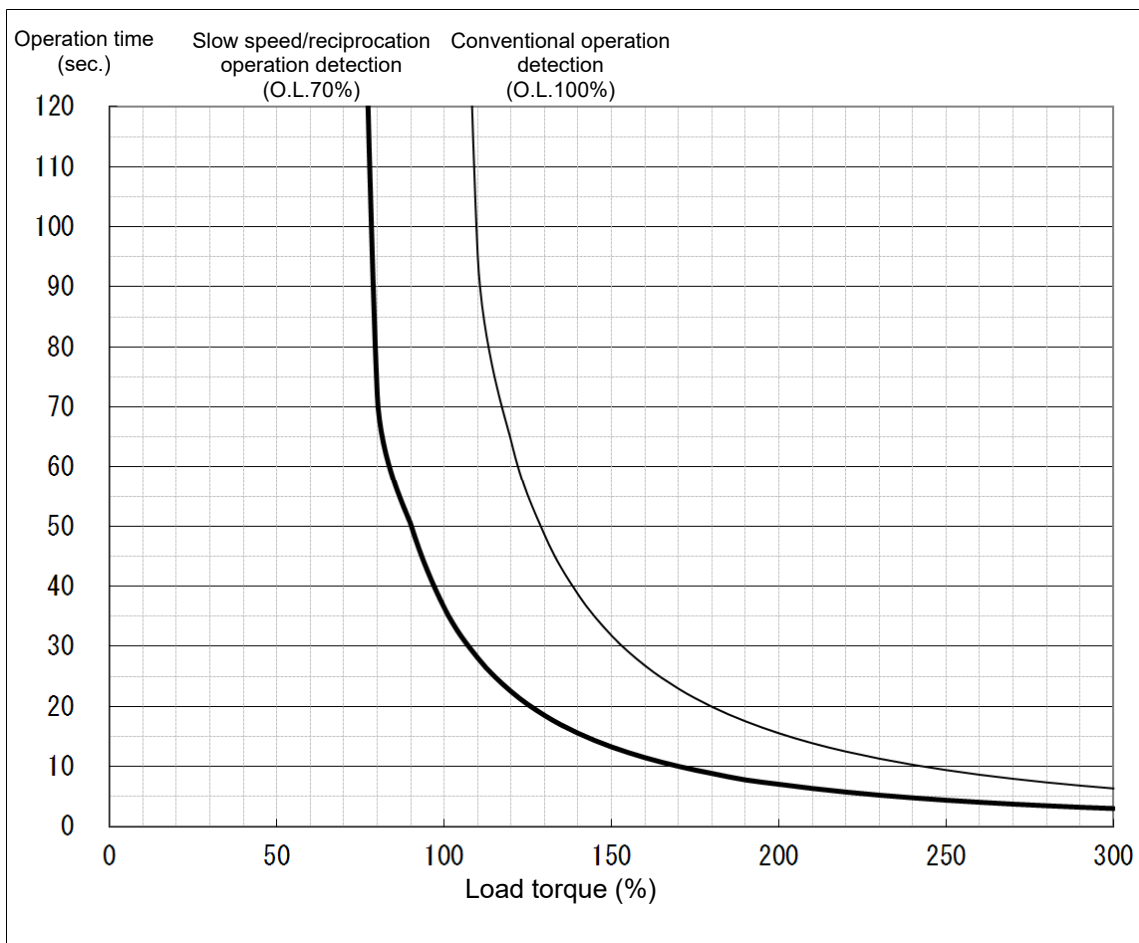


2) When using τ DISC motor/ τ linear motor/servo compass

In the conventional operation, error is detected at 100% or more of load actual value ([O.L. 100%]) providing rated torque of motor is 100%.

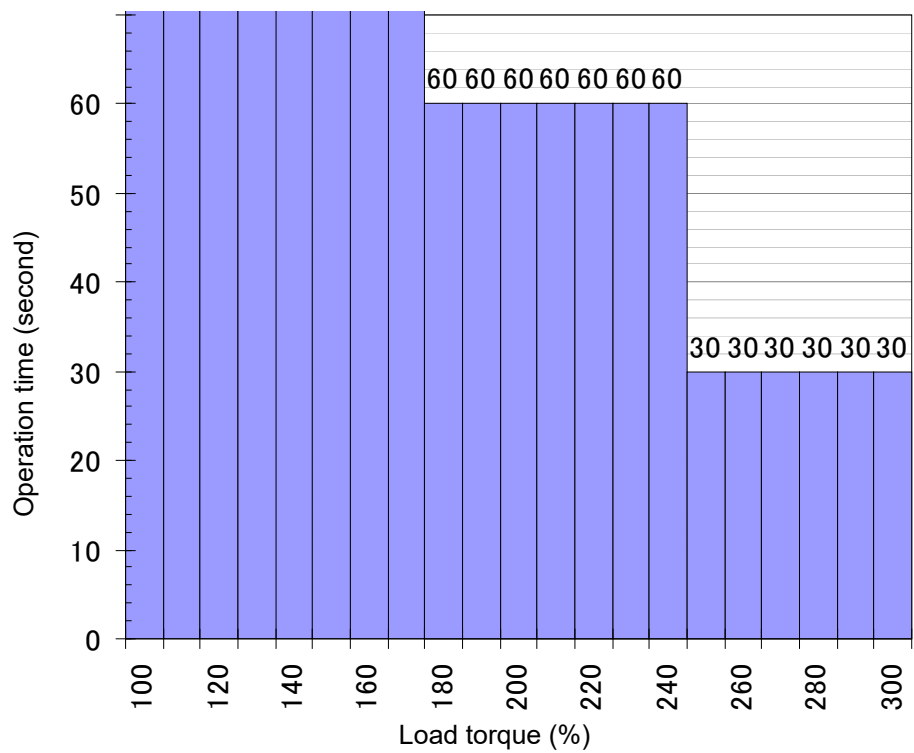
For use in the following situations, detect an error by changing "O.L." to 70% (setting it to 70% with the parameter P504. The initial value of P504: 70%) to prevent a 1 phase concentration thermal failure at one location of the coil unit:

- When executing slow speed run less than 24mm/sec (applicable only to τ linear motor)
- When executing slow speed run less than 0.8% of rated (applicable maximum) speed (applicable only to servo compass)
- When executing repeated positioning operation within pole-to-pole distance.



Protective function

©[BIG]: Error is detected by the relationship between the load considering the motor rated torque as 100% and the time.

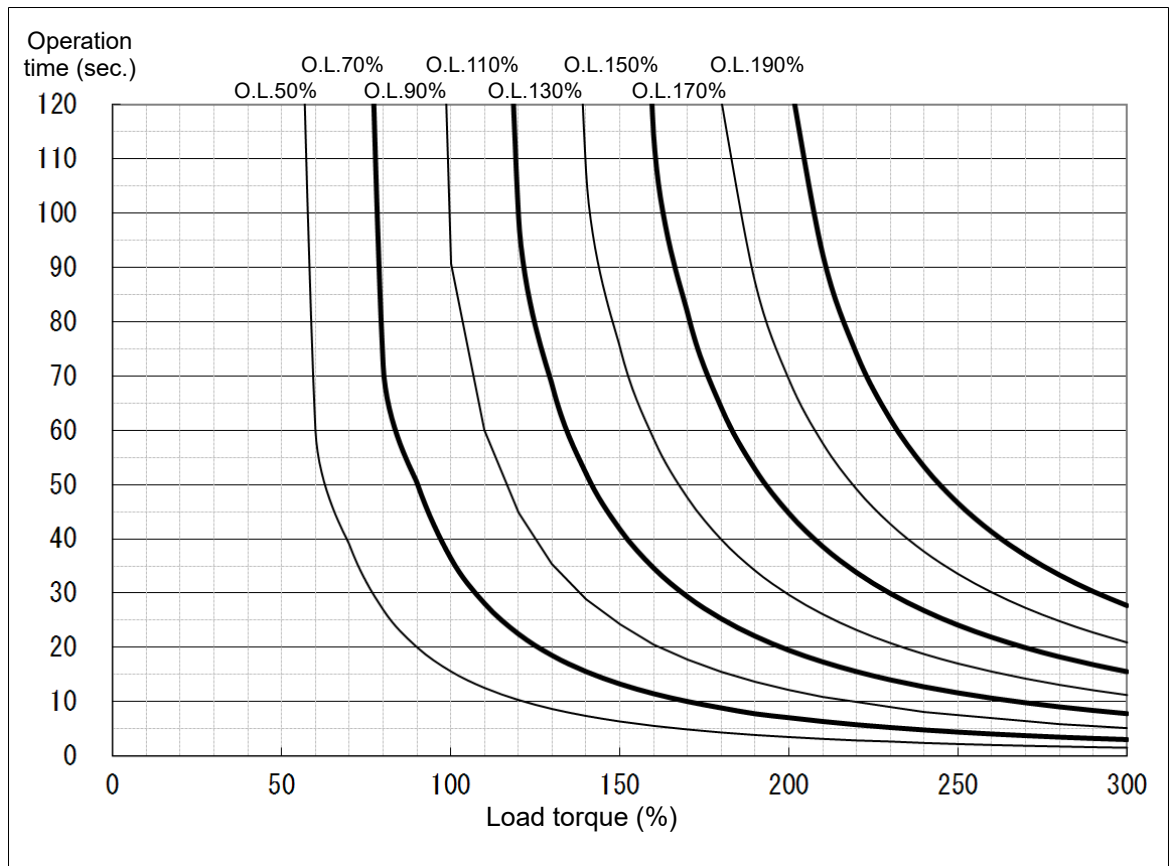


* When using BIG, the above electronic thermal may not be activated due to the device protection purpose.

⚠ For the device capacity of 30kW or less, the electronic thermal detection method of [STD] is used even if it is set at [BIG].

⚠ To use BIG, contact our sales representative.

©[O.L. XXX%]: Error is detected at load actual value XXX% or more providing rated torque of motor is 100%.



Protective function

(9) IPM overload error (IPM O.L.)

It is considered that the power element of device is overloaded.

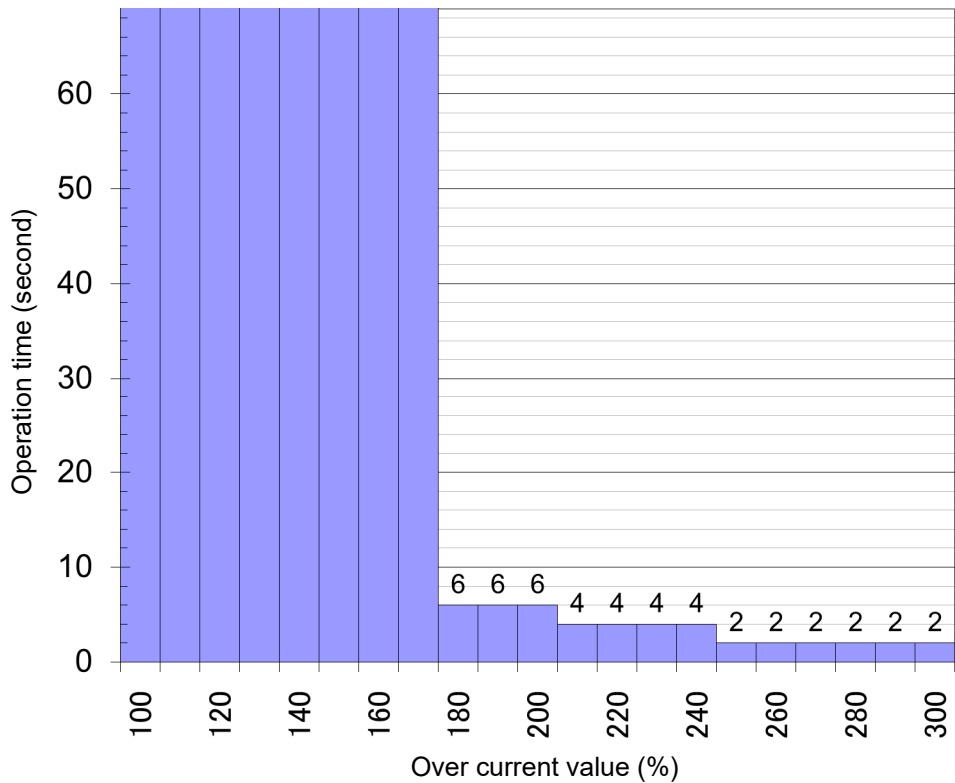
Suspicious causes of error are as follows:

- Sending the current of 180% or higher of the rated current value of device for longer than regulation time while motor is running at low speed.
- Abnormal current for 500ms or more is detected by the current FB detection.

If alarm reset and motion is repeatedly done in short period of time, power element of device and motor temperature will go up abnormally and it may cause the damage. After removing the cause of error, make sure to wait for about 30 minutes of cooling time before starting operation again.

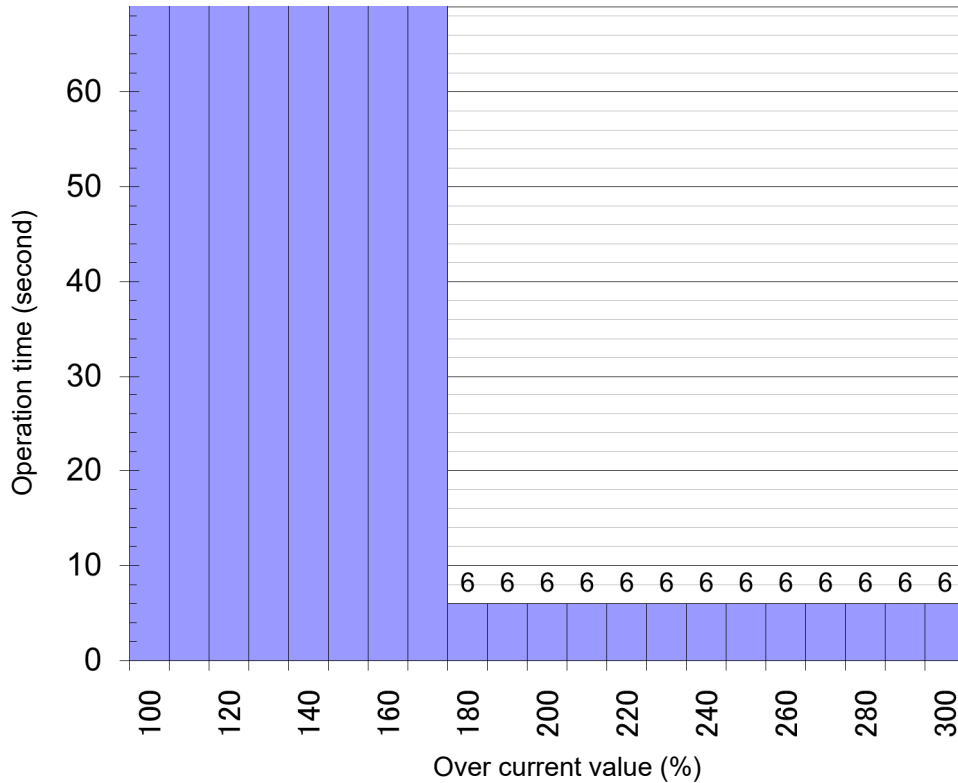
1) When using the device of 2.2kW or less

Error is detected by the relationship between the load considering the rated current value of device as 100% and the time.



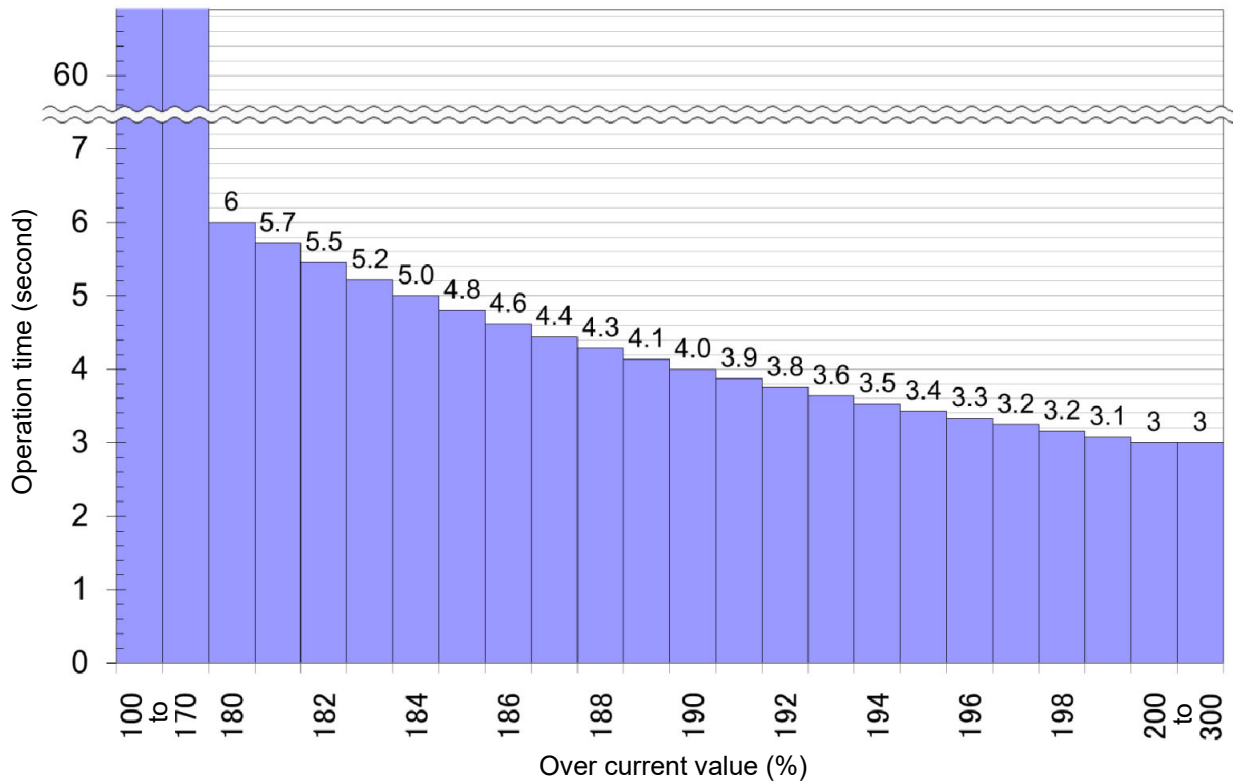
- 2) When using the device of 3kW or more and 20kW or less

Error is detected by the relationship between the load considering the rated current value of device as 100% and the time.



- 3) When using the device of 30kW or more

Error is detected by the relationship between the load considering the rated current value of device as 100% and the time.



(10) Serial encoder/IPU communication error (SER. COMM.)

Disconnection in communication line with serial encoder and IPU, unplugging of connector, and noises can be suspected.

Check wiring environment.

If this error occurred when transceiving absolute position correction data, user data, and IPU parameter, lifetime of FLASH inside IPU or ERASE error is suspected, adding to noises.

In this case, contact our sales representative.

(11) Encoder position detection signal error (SER. AMP.)

When this error occurred, it is considered that proper control could not be executed due to inadequate sensor attachment or sensor failure.

Contact our sales representative.

(12) Rated speed command invalid (STD.SPD.1/STD.SPD.2)

This alarm may be caused because the value calculated from the parameter setting value meets either of the conditions ① and ② below.

- ① The rated speed or the applicable maximum speed is out of the 100 to 40M [setting unit/sec] range.

Change the parameter settings so that the calculated value falls within the range.

- 1) The calculation formula for a rotation system motor is as follows:

$$\text{When the machine travel amount is "0": Speed} = R \times P005[\text{rps}] \times \frac{P303}{P304}$$

$$\text{When the machine travel amount is other than "0": Speed} = P005[\text{rps}] \times \frac{P303 \times P310}{P304}$$

R: Number of encoder pulses per rotation (4-time multiplication)

P005: IM/SM/Tau DISC motor applicable maximum number of rotations (rated speed when "0" is set)

P310: Machine travel amount [Example] 360.00 ⇒ 36000 (decimal point ignored.)

- 2) The calculation formula for a linear system motor is as follows:

$$\text{When P302 is 1: Speed} = P006(P007)[\text{mm/sec}] \times 1000 \div P003[\mu\text{m}]^{*21}$$

$$\text{When P302 is not 1: Speed} = P006(P007)[\text{mm/sec}] \times 1000 \div P302[\mu\text{m}]$$

When the value of P006 is "0", the value of P007 is used.

- ② The frequency of the electric angle at the rated speed or applicable maximum speed is 600Hz or more.

Contact our sales representative.

*21 When our IPU is connected, P003 = 0.01953125.

10-5 Abnormal diagnosis and countermeasures

When error occurred, execute following inspection and abnormal diagnosis to find the cause, and then take necessary measures. If failure or damage on parts or device is found, and if following error is not applicable, promptly contact our sales representative.

The responsible worker should switch ON/OFF the power.

Even if the power is OFF, residual voltage may be left at the main circuit. Make sure to wait for five minutes or more after power-off or make sure to check that the [CHARGE] LED is not lit for the driver with [CHARGE] LED before operating again.

Also, when touching inside the device, pay attention to breakage due to static electricity.

Never apply insulation test with mega tester, since it can break the device.

When measuring insulation of motor, completely disconnect wiring (U, V, W) between motor and device, and then carry it out.

10-5-1 Check and verification items

When error occurred, inspect and confirm following points.

When there are device and motor of the same model, replace and operate them, and then make sure if error is caused by device failure, motor failure, or external factor.

<Check and verification items>

- (1) How is the status of alarm display?
- (2) Are there any defects found in visual inspection?
- (3) Is there repeatability of failure or is the error found in particular operation?
- (4) How frequently does it occur?
- (5) How long has it been used so far?
- (6) Is power voltage is normal or does it largely fluctuate depending on time?
- (7) Was there a sudden blackout?
- (8) Is temperature of motor and device or their surrounding temperature normal?
- (9) Is there something unusual in the environment of motor and device? (Water, oil, iron dust, paper dust, corrosive gas, etc.)
- (10) When does error occur; in motor acceleration or deceleration, or in constant speed run?
- (11) Does error occur when load fluctuates? (when load becomes big or small)
- (12) Is there a change with operation directions of motor?
- (13) Are there any errors in no load run?



Caution

- When IPM error or overload error occurred, operating the device and motor by repeating reset can cause device breakage and burnout in motor. Thus, be sure to remove cause of errors before re-start.

10-5-2 Inspection points and measures at alarm occurrence

When error occurred, check error contents with alarm display, and carry out necessary remedies.
 Be sure to carry out alarm release, after removing cause of errors.
 If error occurrence is repeated, it may damage the device.

Table 10-32 Inspection points and measures at alarm occurrence (1/6)

Error contents	Cause	Measures
1) IPM error • Excessive current flowed to power elements on main circuit, due to ground fault of motor, short-circuit of wiring (U, V, W) between device and motor, or ground fault and wrong wiring. • Excessive current flowed to main circuit power elements because supply voltage of AC power deviated from specification range. • In the case of this device of 1.2kW or more, error occurred in function that radiates heat on main circuit power elements, and thus, it made overheat status.	• Ground fault of motor	• Motor replacement
	• Ground fault or short-circuit in wiring (U,V,W) between device and motor	• Wiring correction
	• Ground fault or short-circuit in wiring (B1,B2) between device and regenerative resistor	• Wiring correction
	• Fluctuation in electric current due to motor unstable operation or vibration	• Adjustment in stability (gain adjustment, improvements in backlash on mechanical system)
	• Power supply voltage deviated specification range or fluctuates largely.	• Supply adequate power supply.
	• Erroneous run due to noise	• Removing noise source or taking noise prevention measures
	• Surrounding temperature is high or air ventilation is bad.	• Decrease surrounding temperature or improve air ventilation or cool-down system.
	• Clogging of radiator	• Cleaning of radiators, by such as air blow
2) Overload error/IPM overload error • Due to overload or excess of permissible repetition frequency, built-in electronic thermal was operated. • Wrong value is set to [P000 to P011]; the value is not correct for actual motor being connected	• 0 or a value higher than 1000 is set in [P120].	• Review the setting value of [P120].
	• Too much load	• Lighten the load.
	• Too many operation of motor start/stop	• Decrease frequency in use of motor start/stop.
	• Wrong wiring in wiring (U,V,W) between device and motor	• Wiring correction
	• Encoder feedback signal is affected by noise.	• Removing noise source or taking noise prevention measures
	• Runaway or vibration due to a failure in the encoder	• Encoder replacement
	• Mechanical lock due to brakes, etc.	• Release brake. • Fix the machine if found malfunction or defect.
	• Fluctuation in electric current due to motor unstable operation or vibration	• Adjustment in stability (gain adjustment, improvement on backlash in mechanical system, play in connecting block, poor rigidity, etc)
	• Surrounding temperature is high or air ventilation is bad.	• Decrease surrounding temperature. • Improve air ventilation or cool-down system.
	• Wrong setting in [P000 to P011]	• Set correct value to [P000 to P011].

Table 10-33 Inspection points and measures at alarm occurrence (2/6)

Error contents	Cause	Measures
3) Regenerative resistor overload error - Due to excessive load inertia, regenerative power became more than permissible power of regenerative resistor. - Wrong value is set to [P158]; the value is not for actual regenerative resistor being connected.	Excessive regenerative energy due to excessive load inertia	- Use regenerative resistor with more power. - Make load inertia smaller. - Decrease applicable number of rotations or prolong deceleration time.
	Wrong setting in [P158]	Set correct value to [P158].
4) Low voltage error Power supply voltage or control power supply voltage is lowered. For information about the specified value of the main circuit DC voltage, refer to [10-4 (2) Main power supply shortage voltage error (UNDER VOLTAGE)].	- Power block fuse was blown out. - Power supply voltage is low. (lack in capacity also included) - Sudden blackout for longer than 10ms was found. - Wiring diameter for power supply is small. - Screws on power supply terminal are loosened.	- Supply with correct power supply, and recheck power supply system, capacity, electric wire diameter. - If the above check and treatment did not solve errors, blowout of protective fuse is suspected. Contact our sales representative.
	Erroneous run due to noise	Removing noise source or taking noise prevention measures
5) Excessive voltage error - The regeneration processing capacity during motor stop and during deceleration is exceeded due to excessive load inertia, for example, and the DC power supply voltage of the main circuit exceeds the specified value. - The ground potential rises, and the DC power supply voltage of the main circuit exceeds the specified value. For information about the specified value of the main circuit DC voltage, refer to [10-4 (3) Excessive voltage error (OVER VOLTAGE)].	Power supply voltage is high.	Supply with correct power supply.
	Excessive regenerative energy due to excessive load inertia	- Attach regenerative resistor. - Make load inertia smaller. - Decrease applicable number of rotations or prolong deceleration time.
	Erroneous run due to noise	Removing noise source or taking noise prevention measures
	Runaway or vibration due to a failure in the encoder	Encoder replacement
	Ground fault in the motor or excessive leak current	- Check if a ground fault occurred in the motor. - In the case of excessive leak current, insert a zero-phase reactor.
6) Over speed error Motor rotation speed*²² became 130% or more of rated rotation speed.	- Wrong wiring in wiring (U,V,W) between device and motor - Wrong wiring in encoder feedback signal line	Wiring correction
	Encoder failure	Encoder replacement
	Excessive load inertia, or big over-shoot due to gain setting error	- Make load inertia smaller or prolong acceleration time. - Adjustment in stability (gain adjustment, improvement on backlash in mechanical system, play in connecting block, poor rigidity, etc.)
	Encoder feedback signal is affected by noise.	Removing noise source or taking noise prevention measures

*²² If P005 or P006 is other than 0, the speed is the applicable maximum speed.

Table 10-34 Inspection points and measures at alarm occurrence (3/6)

Error contents	Cause	Measures
7) Radiator overheat error • The radiator temperature exceeds about 90°C.	• The ambient temperature is high, or the ventilation is bad.	• Lower the ambient temperature. • Improve the draft cooling.
	• The fan is stopped.	• Replacement at our factory
	• The radiator is clogged.	• Clean the radiator with air blow, for example.
8) Encoder error • Encoder error, no connection or disconnection of encoder cable, unplugging of connector, noise on encoder signal, or setting error in parameter occurred.	• Encoder cable disconnection, no connection, or wrong wiring	• Wiring correction
	• Connector plugging error	• Plug connector firmly.
	• Encoder failure	• Encoder replacement
9) Magnetic pole detection error • Automatic magnetic pole detection is not completed normally. • Magnetic pole detection is not completed normally, in the use of magnetic pole sensor.	• Setting error in encoder select setting parameters	• Correctly set data in [P000 to P004].
	• Magnetic pole sensor is defective.	• Magnetic pole sensor replacement
	• Setting error in magnetic pole sensor type select parameters	• Correctly set data in [P010] and [P011].
	• Operation speed till the decision of magnetic pole is too fast.	• Operate it at adequate speed not causing error.
	• Magnetic pole sensor cable disconnection, no connection, or wrong wiring	• Wiring correction
10) Deviation over flow/ Deviation error • Position deviation exceeded setting value of [P207: Overflow detecting pulse]. • Position deviation exceeded setting value of [P208: Deviation error detecting pulse].	• Inadequate setting in automatic magnetic pole detection operation parameters	• Set adequate value to [P055 to P057] and to [P116 to P119].
	• Too much load	• Lighten the load.
	• Excessive load inertia, or big over-shoot due to gain setting error	• Make load inertia smaller or prolong acceleration time. • Adjustment in stability (gain adjustment, improvement on backlash in mechanical system, play in connecting block, poor rigidity, etc.)
	• Wrong wiring in wiring (U,V,W) between device and motor • Wrong wiring in encoder feedback signal line	• Wiring correction
	• Encoder failure	• Encoder replacement
	• Encoder feedback signal or command pulse are affected by noise.	• Removing noise source or taking noise prevention measures
	• Mechanical lock due to brakes, etc.	• Release the brake. Fix the machine if found malfunction or defect.
11) Positioning timeover • Positioning is not completed when the time set in [P203: Positioning time over] has elapsed.	• Parameter setting error	• Check related parameter and reset correct value.
	• Too much load	• Lighten the load.
	• Scratch in the machine system	• Remove the machine system failure.
	• Too low gain setting	• Increase gain setting.
	• Parameter setting error	• Check related parameter and reset correct value.

Table 10-35 Inspection points and measures at alarm occurrence (4/6)

Error contents	Cause	Measures
12) Forward over travel/ Reverse over travel • Detected forward over travel • Detected reverse over travel	• Control signal cable poor contact, disconnection, no connection, or wrong wiring	• Wiring correction
	• Connector plugging error	• Plug connector firmly.
	• Positioning data setting error	• Reset correct value.
	• External sequence failure	• External sequence correction
13) Forward software limit/ reverse software limit • Current position exceeded setting value of [P306: Forward software OT limit]. • Current position exceeded setting value of [P307: Reverse software OT limit].	• Positioning data setting error	• Reset correct value.
14) EEPROM write error • Data could not written into nonvolatile memory (EEPROM).	• Due to noise, data could not written into nonvolatile memory (EEPROM).	• Removing noise source or taking noise prevention measures
	• Device failure	• Device replacement
15) Positioning amount error • For positioning command, positioning amount exceeded [P308: Forward positioning amount max. value] or [P309: Reverse positioning amount max. value].	• Positioning data setting error	• Reset correct value.
	• Parameter setting error	• Check related parameter and reset correct value.
	• Erroneous run due to noise	• Removing noise source or taking noise prevention measures
16) Servo control error • Motor rotated reversely against torque output by the device.	• Wrong wiring in wiring (U,V,W) between device and motor • Wrong wiring in encoder feedback signal line	• Wiring correction
	• Encoder failure • Encoder related parameter setting error	• Encoder replacement • Correctly set data to [P001 to P004, P059].
	• Motor related parameter setting error	• Correctly set data to [P000, P020, P058].
	• Magnetic pole sensor failure • Setting error in magnetic pole sensor related parameters (in the use of magnetic pole sensor)	• Magnetic pole sensor replacement • Correctly set data to [P010 and P011] and [P050 to P053].
	• Inadequate setting in automatic magnetic pole detection operation parameters (When automatic magnetic pole detection is valid)	• Adjust [P055 to P057] and [P116 to P119] to adequate value.
	• Motor unstable operation or unusual vibration	• Adjustment in stability (gain adjustment, improvement on backlash in mechanical system)
	• External force was applied to motor, which made motor run. (Example of external force) Strain by overload and tension	• Loosen the detection level of servo control error in [P747].

Table 10-36 Inspection points and measures at alarm occurrence (5/6)

Error contents	Cause	Measures
17) CPU error • Due to errors in CPU or memory, watchdog timer has expired.	• Erroneous run due to noise	• Removing noise source or taking noise prevention measures
	• Device failure	• Device replacement
18) Data sustain error • Error occurred in data content.	• Due to noise, data was broken.	• Removing noise source or taking noise prevention measures
19) Encoder position detection signal error • An error occurred in the position detection section of the encoder.	• Failure in the position detection section of the encoder	• Replacement of the motor • Repair at our factory
	• Signal error due to the deterioration of the position detection part of the encoder.	
	• Signal error due to a change in the encoder scale mounting position motor due to the overloading/uneven loading of the motor	• Modify the load conditions to the regular ones.
	• Failure in the position detection section of the IPU	• Replacement of the IPU
20) Absolute encoder photo acceptance unit error • An error occurred in the photo acceptance unit of the absolute encoder for τ DISC.	• Failure in the position detection section of the encoder	• Replacement of the motor • Repair at our factory
	• Signal error due to the deterioration of the position detection part of the encoder	
	• Signal error due to a change in the encoder scale mounting position motor due to the overloading/uneven loading of the motor	• Modify the load conditions to the regular ones.
	• Cable between encoder and IPU disconnected or not connected	• Check the cable connection. • Replacement of the motor • Repair at our factory
	• IPU failure	• Replacement of the IPU • Replacement of the motor • Repair at our factory
	• Failure in the data communication section of the encoder	• Replacement of the motor • Repair at our factory
21) Absolute encoder light emitting element error • An error occurred in the light emitting element of the absolute encoder for τ DISC.	• Failure in the position detection section of the encoder	• Replacement of the motor • Repair at our factory
	• Signal error due to the deterioration of the position detection part of the encoder	
	• Signal error due to a change in the encoder scale mounting position motor due to the overloading/uneven loading of the motor	• Modify the load conditions to the regular ones.
22) Communication error between encoder and IPU • An error occurred in the encoder and IPU communication circuit.	• Failure in the IPU communication circuit	• Replacement of the IPU
	• Failure in the encoder communication circuit	• Replacement of the motor
	• Superimposition of noise on the cable between encoder and IPU	• Remove the noise source, and take noise protection measures.
	• Cable disconnection between encoder and IPU	• Correct the wiring.

Table 10-37 Inspection points and measures at alarm occurrence (6/6)

Error contents	Cause	Measures
23) Cable disconnection between encoder and IPU • The cable between encoder and IPU is disconnected.	▪ Loose connector between encoder and IPU or cable not connected	▪ Insert the connector firmly.
	▪ Cable disconnection between encoder and IPU	▪ Correct the wiring.
24) Encoder position detection parts deterioration warning • Deterioration of the positional signal detection parts of the encoder has progressed.	▪ Signal strength reduction due to the deterioration of the position detection part of the encoder	▪ Replacement of the motor ▪ Repair at our factory
	▪ Signal strength reduction due to a change in the encoder scale mounting position motor due to the overloading/uneven loading of the motor	▪ Modify the load conditions to the regular ones.



Caution

- When IPM error or overload error occurred, operating the device and motor by repeating reset can cause device breakage and burn-out in motor. Thus, be sure to remove cause of errors before re-start.

Chapter 11 Setting and display

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11-1 Operation of LCD module

11-1-1 Function of each part of LCD module

Various parameters and data can be set through key input on [device front LCD module for machine model of 1.2kW or more] or on [optional SDI device for machine model of 0.8kW or less].

Parameters deeply relate to machine system and to system operation; thus, set them paying due attention.

(1) External view of LCD module

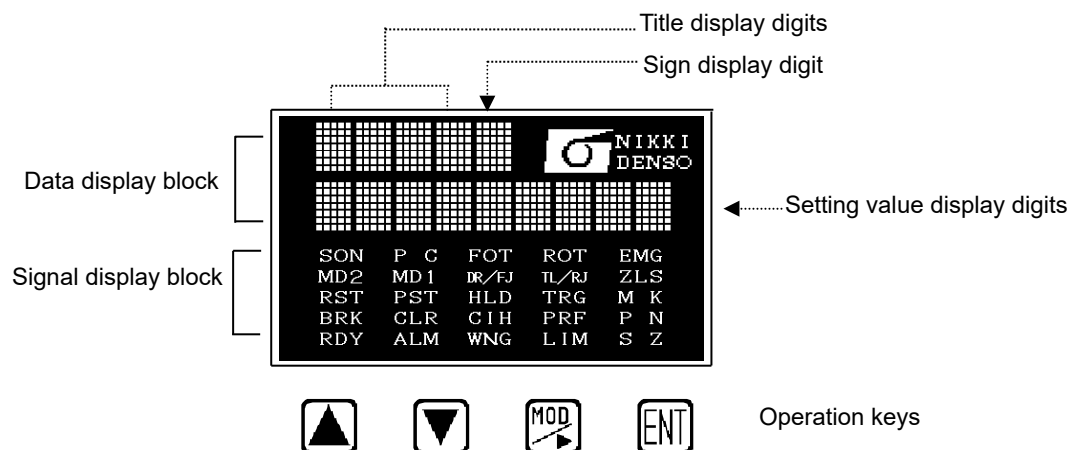


Figure 11-1 External view of LCD module

(2) Display contents on each display block

Table 11-1 Display contents on each display block

Display block		Display contents
Data display block	Title display digits	It displays title (name, number) of object item or it displays message (ALM. /WNG./ERR.) when protective function is activated.
	Sign display digit	It displays content of data code of object item. display: indicates direct data of plus. [—] display: indicates direct data of minus. [*] display: indicates indirect data assignment. [✓] display : indicates setting data invalid.
	Setting value display digits	It displays data (setting value/status/diagnosis result/alarm name, etc.) of object item.
Signal display block		It displays status of input/output signals. If signal is input or output, corresponding character lights up.

(3) Function of each operation key

Table 11-2 Function of each operation key

Key	Function	
	When item selected	Display of next item
	When data set	Numeric digit (0 to 9) increment, sign (□, −, *, /) change For menu data display, it displays next menu
	When item selected	Display of previous item
	When data set	Numeric digit (0 to 9) decrement, sign (□, −, *, /) change For menu data display, it displays previous menu
	When item selected	It displays heading item of next object mode
	When data set	Selection of data setting digits
	At power-on	Cancellation of alarm history record
	When item selected	Transition to data setting status of object item
	When data set	It determines display data (full digits) as new data
	At power-on	Initialization of all memory data * Refer to caution below
	When data set	Compulsory termination of data setting (No data change; it sustains previous data)

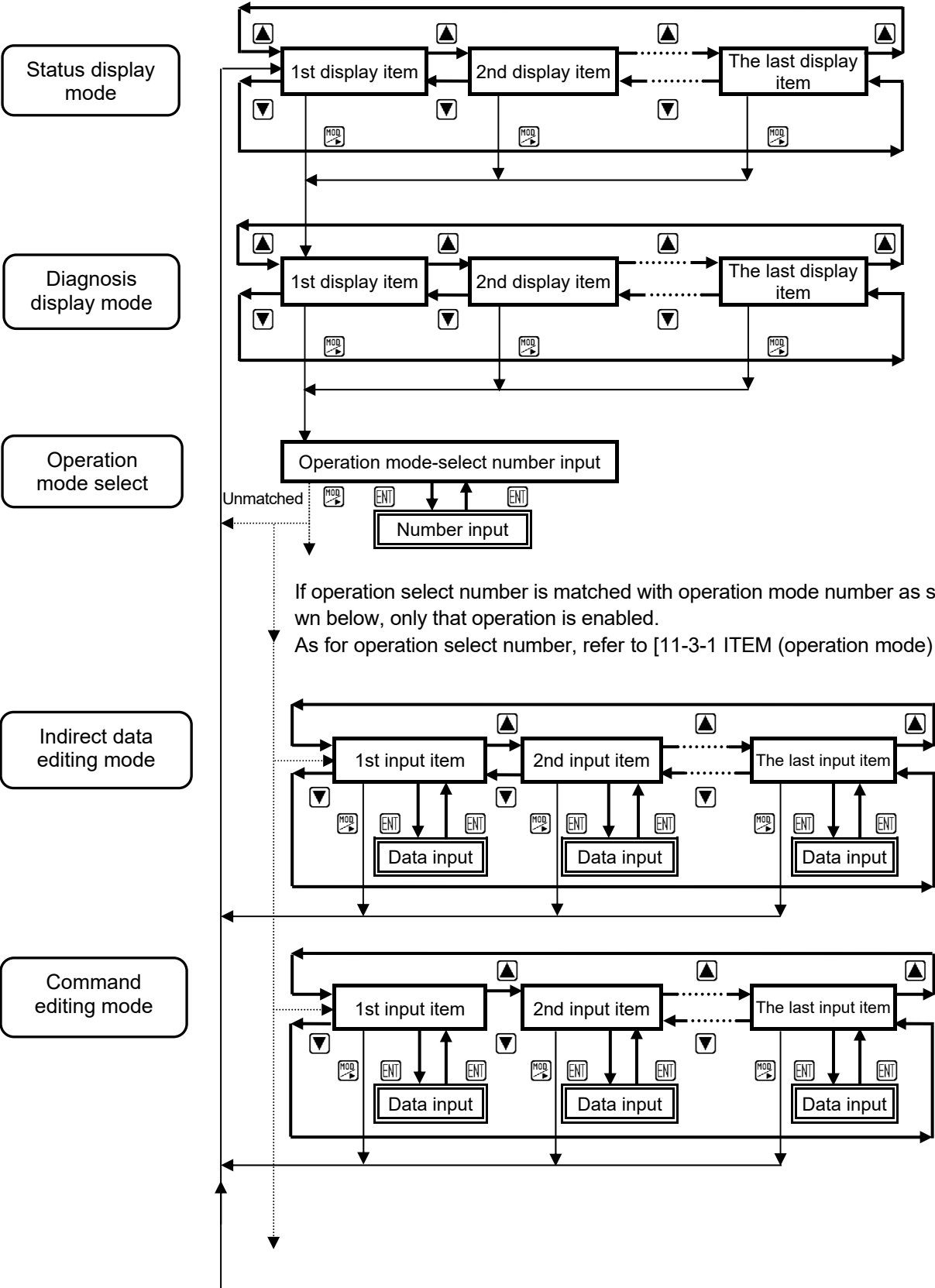
**Caution**

If power is turned on while pressing  key and  key simultaneously, all memory data (parameters, etc.) are initialized. The figure below indicates data display block of LCD module for that occasion.



Before initialization, it is recommendable to duplicate and keep data.
Optional data editing software can back up data with PC.

Display & key operation and data setting flow chart is as follows.



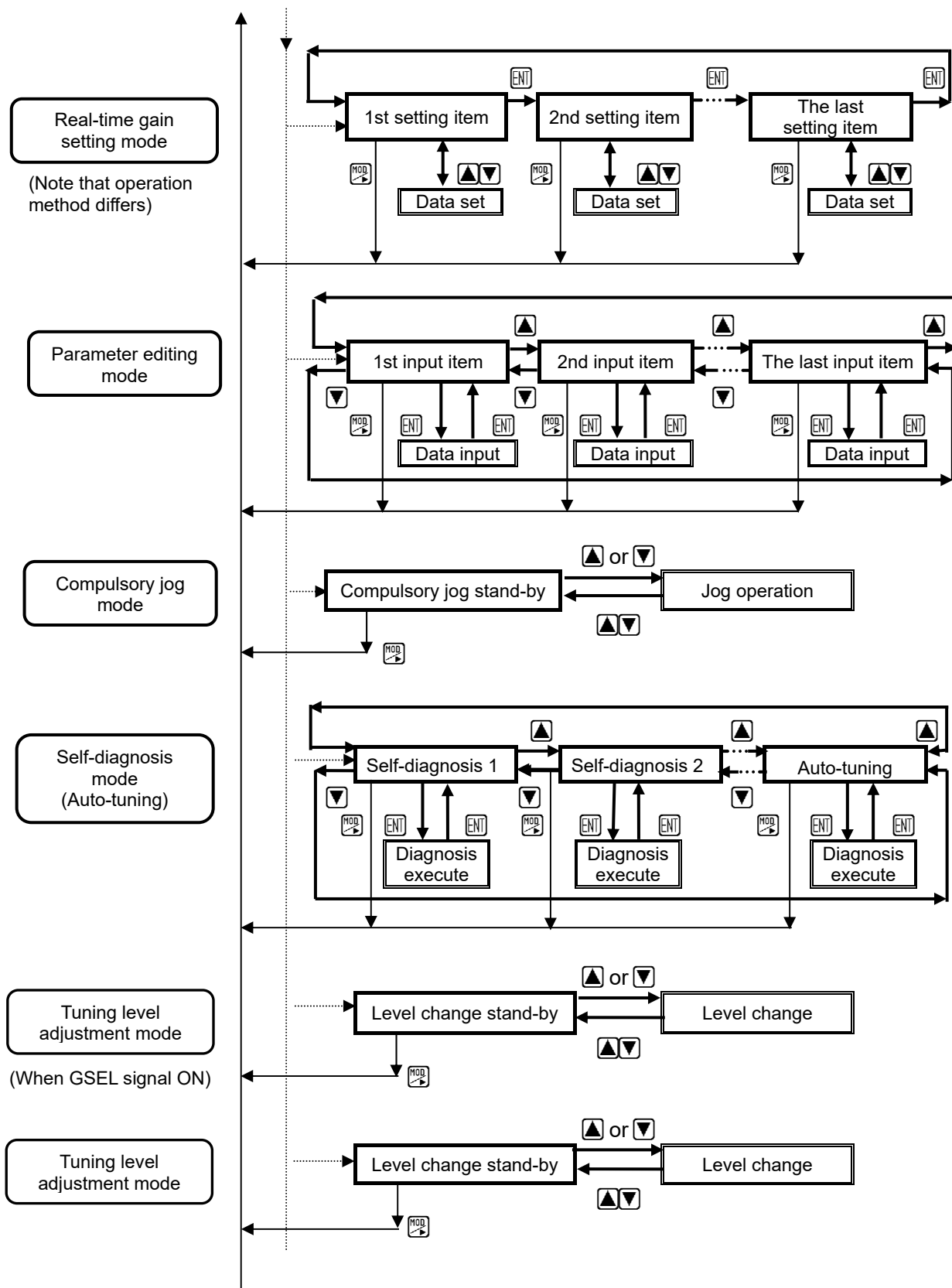


Figure 11-2 Display & key operation flow chart

11-2-1 Initial status display

- During device initialization after power-on, <POWER ON!> is displayed.
- At the delivery of device, various parameters and each data are set in initial value.
- Driving the motor without setting applicable motor is impossible. Thus, before setting each data, such various parameters as [P000: Motor type selection] should be set depending on use conditions.
- To prompt parameter check and resetting, at the first power-on, motor no select alarm <ALM.MOTRTYPE1> is displayed.
In this case, Alarm signal is also output simultaneously.
- Initial status display is cleared with key input of either ///ENT .
After clearance, contents can be checked with alarm history record.

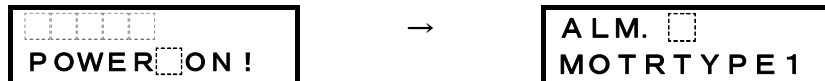


Figure 11-3 Initial status display

Display example

Displaying motor torque

Actual torque is displayed in status display (ST10).

- (1) Display mode is changed with  in the sequence of: Status display (ST00) → Diagnosis display (TYPE) → Operation select (ITEM) → Status display (ST00) → .
◎ Select status display mode (ST00).
- (2) Display item is changed with   in the sequence of: (ST00) → (ST01) →
◎ Select display item (ST10).
- (3) Selected (ST10) data indicates motor torque in operation.

Checking alarm status

In the alarm occurrence, alarm content is displayed on diagnosis display (ALM0).

- (1) Display mode changes with  in the sequence of: Status display (ST00) → Diagnosis display (TYPE) → Operation select (ITEM) → Status display (ST00) → .
◎ Select diagnosis display mode (TYPE).
- (2) Display item changes with   in the sequence of: (TYPE) → (MODE) →
◎ Select display item (ALM0).
- (3) Selected (ALM0) data displays alarm content activated.

11-2-2 Status display mode

Title display digits display status No. (S T × ×), setting value display digits display status data, and sign display digit displays sign.

Table 11-3 Status display mode display contents (1/3)

Display order	Display example	Unit	Display contents
1	ST00— 100.00	%	Motor actual operation speed is displayed in % against rated speed or applicable maximum speed. In forward direction: , in reverse direction: — Display range: -120.00 to 120.00
2	ST01— 10000.000	*1	Current position is displayed. Depending on the setting value of [P502: LCD current position display selection], this display shows the items listed below. • Absolute position • Mechanical position • Relative position • ABS encoder data • Encoder feedback data Display range: -99999999 to 99999999*2
3	ST02— 00010000	pulse	Position deviation pulse is displayed. In + deviation: , in - deviation: — Display range: -99999999 to 99999999
4	ST03— 100.00	%	External speed command input value is displayed in % against rated speed or applicable maximum speed. Forward direction command: , reverse direction command: — Display range: -999.99 to 999.99
5	ST04— 100.0	%	External torque command input value is displayed in % against rated torque. Forward direction command: , reverse direction command: — Display range: -300.0 to 300.0
6	ST05— 000100.00	kpps	Input frequency of pulse train command is displayed. Forward direction command: , reverse direction command: — Display range: -999999.99 to 999999.99
7	ST06— 10000000	pulse	Accumulated number of input pulses of pulse train command is displayed. Forward direction command: , reverse direction command: — Display range: -99999999 to 99999999
8	ST07 100.0	%	Forward direction external torque limit command input value is displayed in % against rated torque. Display range: 0.0 to 300.0
9	ST08 100.0	%	Reverse direction external torque limit command input value is displayed in % against rated torque Display range: 0.0 to 300.0

- In this mode, if key is pressed once, it sustains display data for one second, if key is pressed and held down, it sustains display data.

*1 The unit can be [mm], [°], or [in (inch)] according to setting in [P301].

*2 Position of decimal point depends on setting in [P302].

Table 11-4 Status display mode display contents (2/3)

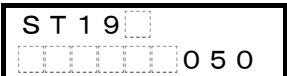
Display order	Display example	Unit	Display contents
10		%	Thermal trip rate is displayed in %. This display depends on setting value in [P144: Electronic-thermal detecting method selection] and is as follows: ▪ [STD/BIG] displays overload rate at where it becomes overload error or IPM overload error. ▪ [O.L. XXX%] displays overload rate at where it becomes IPM overload error. Display range: 0 to 100 Display of 100 (100%) triggers overload alarm.
11		%	Actual torque command is displayed in % against rated torque. Display range: 0.0 to 799.9
12		%	Peak torque command is displayed in % against rated torque. (It becomes 000 with RST signal.) Display range: 0.0 to 799.9
13		rpm	Actual rotation speed of rotating object is displayed. In forward direction rotation: , in reverse direction rotation: — Display range: -99999 to 99999
14		*3	Actual operation speed of machine is displayed. In forward direction: , in reverse direction: — Display range: -99999999 to 99999999*4
15		rpm	Actual operation speed of motor is displayed in rpm. In forward direction: , in reverse direction: — Display range: -99999 to 99999
16		%	Load ratio (effective value) of motor is displayed. 100%-display in motor rated load If [O.L. XXX%] is set in [P144: Electronic-thermal detecting method selection], it becomes overload error at XXX%. Display range: 0 to 300
17		%	Load ratio of regenerative resistor is displayed. This display depends on setting value in [P158: Normal rated power of regeneration resistance] and is as follows: Note, however, that continuous regeneration operation is not supported. For continuous regeneration operation, ignore this display. ▪ Other than 0: 100%-display at regenerative resistor rated power ▪ 0: 100%-display at the full of regenerative power accumulated inside the device. If this display indicates 50% or more, excessive voltage error may occur; thus, attach regenerative resistor. Display range: 0 to 999

- In this mode, if key is pressed once, it sustains display data for one second, if key is pressed and held down, it sustains display data.

*3 The unit can be [mm/sec], [°/sec], [in (inch)/sec], or [pulse/sec] according to setting in [P301].

*4 Position of decimal point depends on setting in [P302].

Table 11-5 Status display mode display contents (3/3)

Display order	Display example	Unit	Display contents
18		%	Maximum value of servo control error occurrence ratio is displayed in %. 100% or more triggers servo control error. This error ratio can be adjusted in [P747: Servo control abnormality detection adjustment value]. This error ratio is zero cleared in the following cases: ▪ When RST signal is turned ON after servo control error occurrence ▪ When P747 setting value is changed Display range: 0 to 999
19		%	The load factor (effective value) of the U-phase current feedback is displayed. 100% is displayed when the U-phase current value is the maximum current of the device. Display range: 0 to 100
20		%	The load factor (effective value) of the V-phase current feedback is displayed. 100% is displayed when the V-phase current value is the maximum current of the device. Display range: 0 to 100
21		%	The load factor (effective value) of the W-phase current feedback is displayed. 100% is displayed when the W-phase current value is the maximum current of the device. Display range: 0 to 100

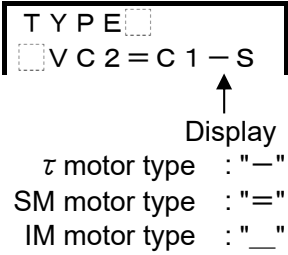
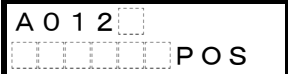
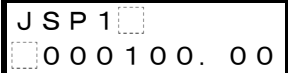
- In this mode, if  key is pressed once, it sustains display data for one second, if  key is pressed and held down, it sustains display data.

Setting and display

11-2-3 Diagnosis display mode

Data display block displays message and data.

Table 11-6 Diagnosis display mode display contents (1/5)

Display order	Display example	Unit	Display contents
1		—	Device type is displayed. TYPE [] [] Absolute position correction status []: Absolute position correction invalid +: Absolute position correction valid, data nil *: Absolute position correction valid, data exist VC2=C1-Δ Δ: Applicable motor type L: τ linear motor S: SM motor I: IM motor R: τ DISC motor Display example: SM motor selected * In the case of device for power supply regeneration, "S" is displayed instead of C in C1.
2		—	Run mode is displayed. JOG : Manual run mode ORG : Zero return run mode AUTO : Automatic run mode PULSE : Pulse train run mode
3		—	Start of automatic run or command being executed and its address are displayed. Display example: Command POS, Address 012
4		*5	Jog speed selected by Jog speed select signal is displayed. Display range: 0 to 99999999*6
5		%	Input status of speed override signal is displayed in % as override ratio. Display range: 0 to 150

*5 The unit can be [mm/sec], [°/sec], [in (inch)/sec], or [pulse/sec] according to setting in [P301].

*6 Position of decimal point depends on setting in [P302].

Table 11-7 Diagnosis display mode display contents (2/5)

Display order	Display example	Unit	Display contents																								
6	STIN 00000000 DI1 DI2 DI3 DI4 DI5 DI6 DI7 DI8	—	Basic external input signal status set with P737 and P738 is displayed. * Correspondence between input signal set with "OO" in two digits and display position is as follows: At signal ON: 1, at signal OFF: 0 <table><tr><td>DI1</td><td>: P 7 3 7</td><td>(× × × × × × × ×)</td></tr><tr><td>DI2</td><td>: P 7 3 7</td><td>(× × × × × × × ×)</td></tr><tr><td>DI3</td><td>: P 7 3 7</td><td>(× × × × × × × ×)</td></tr><tr><td>DI4</td><td>: P 7 3 7</td><td>(× × × × × × × ×)</td></tr><tr><td>DI5</td><td>: P 7 3 8</td><td>(× × × × × × × ×)</td></tr><tr><td>DI6</td><td>: P 7 3 8</td><td>(× × × × × × × ×)</td></tr><tr><td>DI7</td><td>: P 7 3 8</td><td>(× × × × × × × ×)</td></tr><tr><td>DI8</td><td>: P 7 3 8</td><td>(× × × × × × × ×)</td></tr></table>	DI1	: P 7 3 7	(× × × × × × × ×)	DI2	: P 7 3 7	(× × × × × × × ×)	DI3	: P 7 3 7	(× × × × × × × ×)	DI4	: P 7 3 7	(× × × × × × × ×)	DI5	: P 7 3 8	(× × × × × × × ×)	DI6	: P 7 3 8	(× × × × × × × ×)	DI7	: P 7 3 8	(× × × × × × × ×)	DI8	: P 7 3 8	(× × × × × × × ×)
DI1	: P 7 3 7	(× × × × × × × ×)																									
DI2	: P 7 3 7	(× × × × × × × ×)																									
DI3	: P 7 3 7	(× × × × × × × ×)																									
DI4	: P 7 3 7	(× × × × × × × ×)																									
DI5	: P 7 3 8	(× × × × × × × ×)																									
DI6	: P 7 3 8	(× × × × × × × ×)																									
DI7	: P 7 3 8	(× × × × × × × ×)																									
DI8	: P 7 3 8	(× × × × × × × ×)																									
7	EIN1 00000000 EI1 EI2 EI3 EI4 EI5 EI6 EI7 EI8	—	Extended external input signal status is displayed.*7 At signal ON: 1, at signal OFF: 0 <table><tr><td>EI1</td><td>: R S T</td></tr><tr><td>EI2</td><td>: E M G</td></tr><tr><td>EI3</td><td>: S O N</td></tr><tr><td>EI4</td><td>: P S T</td></tr><tr><td>EI5</td><td>: H L D</td></tr><tr><td>EI6</td><td>: C L R</td></tr><tr><td>EI7</td><td>: F O T</td></tr><tr><td>EI8</td><td>: R O T</td></tr></table>	EI1	: R S T	EI2	: E M G	EI3	: S O N	EI4	: P S T	EI5	: H L D	EI6	: C L R	EI7	: F O T	EI8	: R O T								
EI1	: R S T																										
EI2	: E M G																										
EI3	: S O N																										
EI4	: P S T																										
EI5	: H L D																										
EI6	: C L R																										
EI7	: F O T																										
EI8	: R O T																										
8	EIN2 00000000 EI9 EI10 EI11 EI12 EI13 EI14 EI15 EI16	—	Extended external input signal status set with P739 and P740 is displayed.*7 * Correspondence between input signal set with "OO" in two digits and display position is as follows: At signal ON: 1, at signal OFF: 0 <table><tr><td>EI9</td><td>: P 7 3 9</td><td>(× × × × × × × ×)</td></tr><tr><td>EI10</td><td>: P 7 3 9</td><td>(× × × × × × × ×)</td></tr><tr><td>EI11</td><td>: P 7 3 9</td><td>(× × × × × × × ×)</td></tr><tr><td>EI12</td><td>: P 7 3 9</td><td>(× × × × × × × ×)</td></tr><tr><td>EI13</td><td>: P 7 4 0</td><td>(× × × × × × × ×)</td></tr><tr><td>EI14</td><td>: P 7 4 0</td><td>(× × × × × × × ×)</td></tr><tr><td>EI15</td><td>: P 7 4 0</td><td>(× × × × × × × ×)</td></tr><tr><td>EI16</td><td>: P 7 4 0</td><td>(× × × × × × × ×)</td></tr></table>	EI9	: P 7 3 9	(× × × × × × × ×)	EI10	: P 7 3 9	(× × × × × × × ×)	EI11	: P 7 3 9	(× × × × × × × ×)	EI12	: P 7 3 9	(× × × × × × × ×)	EI13	: P 7 4 0	(× × × × × × × ×)	EI14	: P 7 4 0	(× × × × × × × ×)	EI15	: P 7 4 0	(× × × × × × × ×)	EI16	: P 7 4 0	(× × × × × × × ×)
EI9	: P 7 3 9	(× × × × × × × ×)																									
EI10	: P 7 3 9	(× × × × × × × ×)																									
EI11	: P 7 3 9	(× × × × × × × ×)																									
EI12	: P 7 3 9	(× × × × × × × ×)																									
EI13	: P 7 4 0	(× × × × × × × ×)																									
EI14	: P 7 4 0	(× × × × × × × ×)																									
EI15	: P 7 4 0	(× × × × × × × ×)																									
EI16	: P 7 4 0	(× × × × × × × ×)																									

*7 This diagnosis display mode is displayed when optional control input/output extension board is connected.

Table 11-8 Diagnosis display mode display contents (3/5)

Display order	Display example	Unit	Display contents
9		—	Extended external input signal status is displayed.*⁸ * In EI17-EI20, correspondence between input signal set with "OO" in two digits and display position is as follows: At signal ON: 1, at signal OFF: 0 EI17 : P 7 4 1 (× × × × × × ○ ○) EI18 : P 7 4 1 (× × × × ○ ○ × ×) EI19 : P 7 4 1 (× × ○ ○ × × × ×) EI20 : P 7 4 1 (○ ○ × × × × × ×) EI21 : C I H EI22 : Z L S EI23 : T R G EI24 : Unused
10		—	Extended external input signal status is displayed.*⁸ At signal ON: 1, at signal OFF: 0 EI25 : M D 1 EI26 : M D 2 EI27 : P C EI28 : F J O G EI29 : R J O G EI30 : Unused EI31 : Unused EI32 : Unused
11		—	Basic external output signal status set with P742 is displayed. * Correspondence between output signal set with "OO" in two digits and display position is as follows: At signal ON: 1, at signal OFF: 0 DO1 : P 7 4 2 (× × × × × × ○ ○) DO2 : P 7 4 2 (× × × × ○ ○ × ×) DO3 : P 7 4 2 (× × ○ ○ × × × ×) DO4 : P 7 4 2 (○ ○ × × × × × ×)
12		—	Extended external output signal status set with P743 and P744 is displayed. * Correspondence between output signal set with "OO" in two digits and display position is as follows: At signal ON: 1, at signal OFF: 0 EO1 : P 7 4 3 (× × × × × × ○ ○) EO2 : P 7 4 3 (× × × × ○ ○ × ×) EO3 : P 7 4 3 (× × ○ ○ × × × ×) EO4 : P 7 4 3 (○ ○ × × × × × ×) EO5 : P 7 4 4 (× × × × × × ○ ○) EO6 : P 7 4 4 (× × × × ○ ○ × ×) EO7 : P 7 4 4 (× × ○ ○ × × × ×) EO8 : P 7 4 4 (○ ○ × × × × × ×)

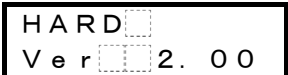
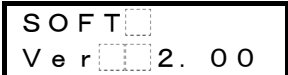
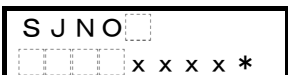
*⁸ This diagnosis display mode is displayed when optional control input/output extension board is connected.

Table 11-9 Diagnosis display mode display contents (4/5)

Display order	Display example	Unit	Display contents
13		—	Latest alarm content is displayed.*⁹ Display example: IPM error
14		—	Previous (1-time before) alarm content is displayed.*⁹ Display example: Linear sensor/encoder error
15		—	Previous (2-time before) alarm content is displayed.*⁹ Display example: Overload error
16		—	Previous (3-time before) alarm content is displayed.*⁹ Display example: Excessive voltage error
17		—	Previous (4-time before) alarm content is displayed.*⁹ Display example: Over speed error
18		—	Latest warning content is displayed. Display example: Overload precaution
19		—	Device capacity is displayed in the form of [$** \times 10$]. Display example: $401 = 40 \times 10^1 = 400W$ └ Exponent portion of exponentiation of 10 └ Significant figures
20		—	Machine model information is displayed. 1st digit: Input voltage specification 0: 100VAC specification 1: 200VAC specification 2: 400VAC specification 2nd digit: Power specification 0: Main power supply separation type 1: Main power supply integrated type 3rd digit: Control specification 0: τ motor specification 1: SM motor specification 2: IM motor specification Display example: τ motor specification/main power supply separation type/200VAC

*⁹ Alarm history record of ALM1 to 4 is not renewed, even if the identical alarm occurred of which content is being displayed in the latest alarm history record ALM0.

Table 11-10 Diagnosis display mode display contents (5/5)

Display order	Display example	Unit	Display contents
21		—	Hardware version is displayed. Display example: Hardware version 2.00 Maximum display: 9.99
22		—	Software version is displayed. Display example: Software version 2.00 Maximum display: 9.99
23		—	Device system software number is displayed. Display example: x x x x : ROM number * : ROM version* * After the uppercase character "Z", use lowercase characters, starting with "a".

11-3 Operation mode

11-3-1 ITEM (operation mode) list

Selectable ITEM (operation mode) is shown in Table 11-11.

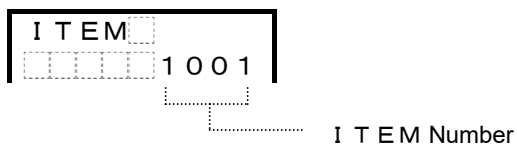
Table 11-11 ITEM (operation mode) list

ITEM select number	Operation mode		
1 0 0 1	Indirect data editing mode (IX00 to IX99)		
1 0 0 2	Command editing mode		
1 1 0 2	Compulsory jog mode		
1 1 0 3	Self-diagnosis mode		
2 0 0 0	Group 0	Motor, encoder parameter	Parameter editing mode
2 1 0 0	Group 1	Driver adjustment parameter	
2 2 0 0	Group 2	NC adjustment parameter	
2 3 0 0	Group 3	Position adjustment parameter	
2 4 0 0	Group 4	Run operation parameter	
2 5 0 0	Group 5	Display, edit, communication parameter	
2 6 0 0	Group 6	Pulse train input parameter	
2 7 0 0	Group 7	Input/output signals parameter	
3 0 0 1	Real-time gain setting 1 (Speed loop gain adjustment)		Real-time gain setting mode*10
3 0 0 2	Real-time gain setting 2 (Speed loop gain adjustment, in slow speed range)		
3 0 0 3	Real-time gain setting 3 (Speed loop gain adjustment, in GSEL signal ON/ GSEL2 signal OFF)		
3 0 0 4	Real-time gain setting 4 (Position loop gain adjustment)		
3 4 6 7	Auto-tuning level adjustment mode (In GSEL signal ON/GSEL2 signal OFF)		
3 4 6 8	Auto-tuning level adjustment mode		

*¹⁰ Auto-tuning level adjustment function for GSEL2 (GSEL signal OFF/GSEL2 signal ON) and GSEL3 (GSEL signal ON/GSEL2 signal ON) is not available, and the real-time gain setting of GSEL2 and GSEL3 can be done only by using dedicated editing software (option).

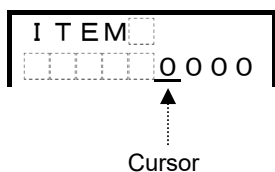
Setting and display

1) Display example



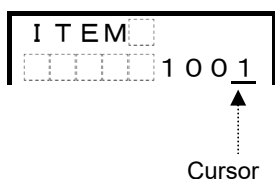
2) Setting

▪ ITEM number input 1



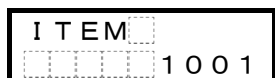
- By pressing key, cursor appears, and input is enabled.
- By pressing key or key, the numeric value or sign at the cursor is changed.
- By pressing key, cursor moves.
- To cancel input data, press keys simultaneously.

▪ ITEM number input 2



- With the above operation, ITEM number 1001 (for example) is input.

▪ ITEM number setting



- By pressing key, cursor disappears, and ITEM number is set.

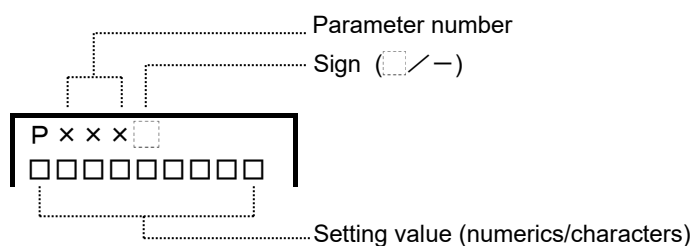
11-3-2 Parameter setting

(1) Parameter structure

Table 11-12 Parameter structure

Group number	Parameter No.	Group name
0	P 0 × ×	Motor, encoder parameter
1	P 1 × ×	Driver adjustment parameter
2	P 2 × ×	NC adjustment parameter
3	P 3 × ×	Position adjustment parameter
4	P 4 × ×	Run operation parameter
5	P 5 × ×	Display, edit, communication parameter
6	P 6 × ×	Pulse train input parameter
7	P 7 × ×	Input/output signals parameter

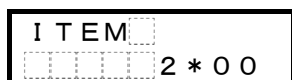
(2) Display



(3) Setting method

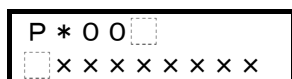
Parameter editing (numeric value input or menu select) procedure is as follows.

1) ITEM number selection



- Set ITEM number [2 * 0 0].
* is a group number. (Refer to Table 11-12).
- After setting, by pressing  key, the display is switched to 2).

2) Parameter selection

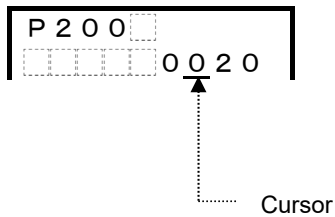


- Select parameter to be edited.
By pressing  key, parameter number becomes greater.
By pressing  key, parameter number becomes smaller.
- In this case, current set data is displayed.

Setting and display

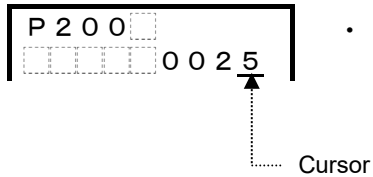
<When set via numeric value data input>

3) Data input 1



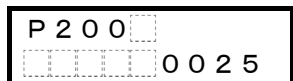
- By pressing key, cursor appears, and input is enabled.
- By pressing key or key, the numeric value or sign at the cursor is changed.
- By pressing key, cursor moves.
- To cancel input data, press keys simultaneously.

4) Data input 2



- With the above operation, input the data to be set.

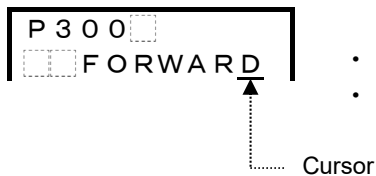
5) Data memory



- By pressing key, cursor disappears, and setting data is memorized.

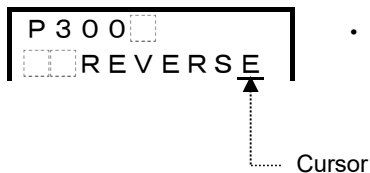
<When set via menu selection>

3) Data selection 1



- By pressing key, cursor appears, and selection is enabled.
- By pressing key or key, menu item is changed.
- To cancel selected data, press keys simultaneously.

4) Data selection 2



- With the above operation, select the data to be set.

5) Data memory



- By pressing key, cursor disappears, and setting data is memorized.

11-3-3 Command setting

(1) Common setting items

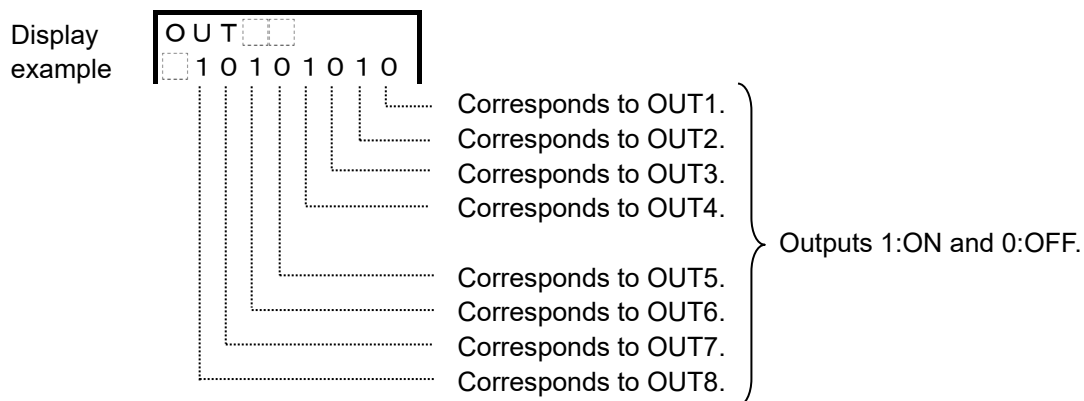
1) Acceleration/deceleration time selection

Set the acceleration and deceleration times using parameters and select one of the combinations listed below.

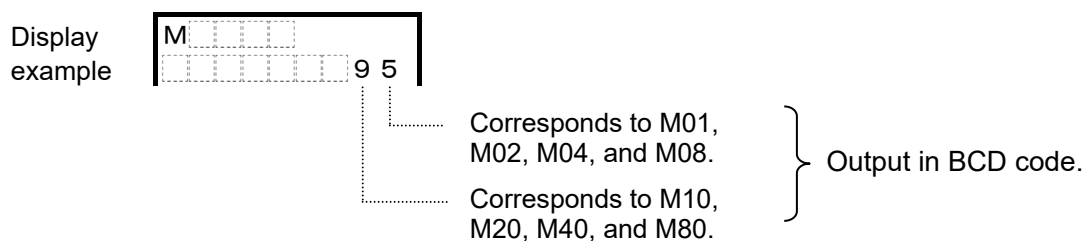
Table 11-13 Combinations of acceleration and deceleration times

Acceleration/deceleration time selection	Acceleration/deceleration time setting (parameter)
SEL.1	The acceleration time depends on [P211: Acceleration time 1]. The deceleration time depends on [P214: Deceleration time 1].
SEL.2	The acceleration time depends on [P212: Acceleration time 2]. The deceleration time depends on [P215: Deceleration time 2].
SEL.3	The acceleration time depends on [P213: Acceleration time 3]. The deceleration time depends on [P216: Deceleration time 3].

2) Common output



3) M output

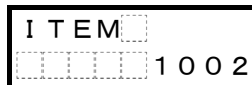


Setting and display

(2) Setting method

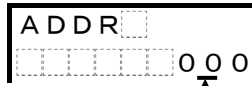
Command editing procedure is as follows.

1) ITEM number selection



- Set ITEM number [1 0 0 2].
- After setting by pressing  key, the display is switched to 2).

2) Address input 1



- By pressing  key, cursor appears, and input is enabled.
- By pressing  or  key, the numeric value at the cursor is changed.
- By pressing  key, cursor moves.
- To cancel input data, press   keys simultaneously.

Cursor

3) Address input 2



- With the above operation, address to be edited is input.

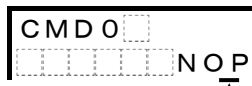
Cursor

4) Address setting



- By pressing  key, cursor disappears, and address to be edited is set .
- After setting address, by pressing  key, the display is switched to 5).

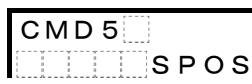
5) Command selection



- By pressing  key, cursor appears, and input is enabled.
- By pressing  key, select command group.
- By pressing  or  key, select command to be edited.

Cursor

6) Command setting



- By pressing  key, cursor disappears, and command to be edited is determined.
- After setting command, by pressing  or  key, the display is switched to 7).

7) Editing of each setting item of selected command

Each setting item editing (numeric value input or menu selection) procedure is the same as parameter editing procedure.

11-3-4 Real-time gain setting

(1) Function

Real-time gain setting is to adjust each gain of the device with exclusive mode in real-time, confirming operating conditions of motor.

In the parameter editing mode, gain is reflected in the actual operation by pressing **ENT** key. On the contrary, in the real-time gain setting mode, each key press on **▲** key or **▼** key just changes gain in increments of ± 1 , which is reflected in the actual operation promptly.

(2) Setting method

Parameters that can be used to set real-time gain are shown in Table 11-14.

Table 11-14 Real-time gain setting parameters

I T E M	Parameter No.	Parameter name	Initial value
3 0 0 1	P 1 0 1	Speed loop gain	0 0 2 5
	P 1 0 2	Speed loop integral time constant	2 0 . 0 0 [ms]
	P 1 0 3	Speed loop differential time constant	0 0 0 0 [μ s]
	P 1 0 4	Speed loop proportional gain division ratio	0 0 0 . 0 [%]
	P 1 0 5	Speed loop differential gain division ratio	0 0 0 . 0 [%]
3 0 0 2	P 1 0 6	Speed loop gain/Low-speed range	0 0 2 5
	P 1 0 7	Speed loop integral time constant/Low-speed range	2 0 . 0 0 [ms]
	P 1 0 8	Speed loop differential time constant/Low-speed range	0 0 0 0 [μ s]
	P 1 0 9	Speed loop proportional gain division ratio/Low-speed range	0 0 0 . 0 [%]
	P 1 1 0	Speed loop differential gain division ratio/Low-speed range	0 0 0 . 0 [%]
3 0 0 3	P 1 1 1	Speed loop gain at GSEL1	0 0 2 5
	P 1 1 2	Speed loop integral time constant at GSEL1	2 0 . 0 0 [ms]
	P 1 1 3	Speed loop differential time constant at GSEL1	0 0 0 0 [μ s]
	P 1 1 4	Speed loop proportional gain division ratio at GSEL1	0 0 0 . 0 [%]
	P 1 1 5	Speed loop differential gain division ratio at GSEL1	0 0 0 . 0 [%]
	P 2 2 6	Position loop gain at GSEL1	0 0 0 0 [1/S]
	P 2 2 7	Servo lock gain at GSEL1	0 0 0 0 [1/S]
3 0 0 4	P 2 0 0	Position loop gain	0 0 2 0 [1/S]
	P 2 0 1	Servo lock gain	0 0 2 0 [1/S]

1) I T E M **ENT** → 3001 (Selection of real-time gain setting mode) → **ENT** → **MOD**

2) P * * * **ENT** (Selection of setting parameter)

"*" mark indicates parameter No. (Refer to Table 11-14).

3) Data setting (gain adjustment) on selected parameter:

Each press on **▲** key executes addition of +1.

Each press on **▼** key executes subtraction of -1.

4) By pressing **MOD** key, this mode is ended. (In this time, display goes to [status display mode].)

5) Display example



* Display uses a lower-case letter "p" at the head of parameter No., so as to distinguish it from identical item in parameter editing mode.

⚠ Caution

- Value during gain setting is reflected in the actual operation promptly, however, it is not written to backup memory. Writing of setting data is made when **ENT** key or **MOD** key is pressed.
- Real-time gain setting of GSEL2 (GSEL signal OFF/GSEL2 signal ON) and GSEL3 (GSEL signal ON/GSEL2 signal ON) can only be set by dedicated editing software (option).

Chapter 12 Data

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12-1 Specification

12-1-1 Model

Model of NCR-CD*1 series is as follows.

Table 12-1 Model display

NCR —

C	D	A	1	A1	A	—	201	B	
(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)

Number	Item	Display	Contents
		NCR	AC servo controller series
(1)	Product middle classification	D	Driver
		C	Controller
(2)	Type name	D	VC II Series
(3)	Machine model type	A	τ linear/ τ DISC motor
		B	SM motor
		C	IM motor
(4)	Function type	0	Driver
		1	Controller
		6	Free curving control
(5)	Input power specification	A1	100VAC system
		A2	200VAC system
		A3	400VAC system
(6)	Design order	A, B, ...	Starting from A
(7)	Output capacity	(Example) 201	$20\ 1 = 20 \times 10^1 = 200W$ Exponent portion of exponentiation of 10 Significant figures
(8)	Type in each motor	None	IM/SM motor
		B	τ linear NLA-A/B/M/N type τ DISC motor D/ND series
		C	τ linear NLA-S type
		D	τ linear NVA/NLD series τ DISC motor HD/ND-C series
		J	τ DISC motor ND-s/HD-s/DD-s series τ iD roll iD series *1
(9)	Special specification	None	Standard specification
		T**, S**, S***	Special specification

(Note) As for device that is equipped with options, refer to 12-6 Device built-in option.

- When using dynamic brake, dynamic brake unit (option) is necessary. For information about the specifications and the connection method, refer to the Dynamic Brake Unit Instruction Manual.
- Note that connecting dynamic brake unit to IM motor gives no influence; its connection has no meaning.
- When this device should conform to UL standard, file an application with a model of NCR-(1) to (7).

*1 For the iD Series, the type in each motor may change depending on the use conditions for the customer and other factors.
Contact our sales representative.

12-1-2 General specification

Table 12-2 General specification

Item		Contents
External view		Refer to [12-2-1 Main unit outline drawing].
Ambient condition	Temperature	Operating temperature: 0 to 55°C 0 to 50°C (When conforming to UL standard) Storing temperature -20 to 60°C*2
	Humidity	85% or less, no condensing*2
	Sea level	1000m or less
	Setting location	Do not install in harmful atmosphere such as corrosive gas, grinding oil, metal dust, oil, etc.
Cooling method		Natural air cooling (801 or less), Forced air cooling (122 or more)
Installation method		Panel installation type
Vibration resistance		0.5G (10-50Hz)
Shock resistance		5G
Noise resistance		FT/B : ±2000V (frequency 5/100kHz, cycle 300ms), 1 minute Radiation noise : ±1000V (50ns, 10cm), 1 minute Electro-static noise : ±10kV (between grounding and case)

*2 Temperature and humidity greatly affect the lifetime; thus, refrain from the use under high-temperature and high-humidity conditions.

Table 12-3 Functional specifications (1/2)

Item	Contents and specifications	
Number of control shafts	1 shaft	
Maximum speed	20Mpps(25Mpps)* ³ However, it is frequency of 4 times of encoder pulse.	
Control	Position (Position control data/pulse train)	
Control method	Position control	Automatic run (positioning operation) Pulse train run
Command input style	Automatic run	1) Internal stored data 280 points (address assignment by control signal is 0 to 255) 2) Serial communication 3) USB communication
	Pulse train command	1) 90° phase difference pulse 2) Directional pulse 3) Directional signal + feed pulse <Line driver or open collector output (option) compatible. However, line driver method is recommendable, due to noise resistance.> <Maximum input is 5Mpps (6.25Mpps)* ³ > <GND is common for line receiver input; thus, pay attention to noise.> 4) Servo control communication
	Analog input	1) Dedicated commands (SPD/CSPD) enable analog speed command input. 2) Dedicated commands (TRQ/CTRQ) enable analog torque command input. * Input resolution: 14 bits
Major functions	Zero return run, manual (jog) run, pulse train run, serial communication run, program run (positioning, simple continuous positioning, external trigger positioning, four arithmetic/logical operations, timer, unconditional/conditional jump, sub-routine, spinner control, successive control), self-diagnosis, torque limit, backlash correction, feed/forward ratio setting, electronic gear ratio setting, electronic thermal, inertia feed/forward addition ratio	
Acceleration/ deceleration pattern	Linear accel-decel, S-letter accel-decel	
Auto-tuning function	Parameter setting can cope with cases even in relatively big inertia ratio.	
Gain select function	1) With combination of GSEL signal, 4-type gain select is enabled. 2) Position loop gain also corresponds to gain select.	
Input signals	[8 basic input signals (Initial value)] Servo On (SON(*)), Reset (RST), Mode Select (MD1, MD2), Automatic start (PST), Forward Direction Jog (FJOG), Reverse Direction Jog (RJOG), Zero Point Deceleration (ZLS) <Following signals are used in remote control or allocated according to input signal allocation.> Emergency Stop (EMG*), Proportional Control (PC), Address Assignment (PS1-PS8), Hold (HLD), Speed Override (OR1-4), Deviation Clear (CLR), Command Pulse Input Prohibition (CIH (*)), External trigger (TRG), Forward Over Travel (FOT*), Reverse Over Travel (ROT*), M complete (MFIN), Block stop (BSTP), Program cancel (PCAN), Gain Select (GSEL), Gain Select 2 (GSEL2), Compulsory Brake ON (BRON), Torque Limit (TL), External automatic start prohibit (EPIH), Jog speed select (JOSP), Command Direction Select (SSD)	

*³  The spec in () corresponds to the device of HARD VER.2.00 or later.

Table 12-4 Functional specifications (2/2)

Item	Contents and specifications
Output signals	[4 basic output signals (Initial value)] Servo Ready (RDY), Alarm (ALM(*)), Warning (WNG(*)), Positioning Complete (PN) <Following signals can be allocated with remote control or output signal allocation.> Torque Limit In-Process (LIM), Speed Zero (SZ), Brake Release (BRK), Rough match (PRF), Program end (PEND), Automatic run ready (PRDY), Manual run mode In-Process (MMOD), Automatic run mode In-Process (AMOD), Zero return run mode In-Process (HMOD), Pulse train run mode In-Process (PMOD), M strobe (MSTB), Soft Limit Switch (SLSA, SLSB), Common output (OUT1-8), M output (M01-M80), Encoder marker (OCEM), Positioning Complete B (PNB), Zero point return complete (HCMP)
Encoder pulse output	90° phase difference pulse train output (Division output possible: maximum output frequency of 2 signals (A-phase and B-phase) is 20Mpps with 4-multiplication)
Operation/display function	Device front LCD module or optional SDI device can display input of each data and various statuses.
Filter	Notch filter, torque command filter, disturbance correction filter, active vibration control filter
Monitor function	1) Control signal status is displayed on signal display block of device front LCD module or optional SDI device. 2) Various operating conditions, setting status (data), and error detection content history record are displayed on data display block of device front LCD module or optional SDI device. 3) Analog monitor: 2 items (It can monitor 2 items that are selected with parameter from various operation statuses.) 4) Various monitoring is enabled with USB compatible dedicated editing software.
Data sustain function	Following data is sustained in nonvolatile memory: Parameter, command, indirect data (part), alarm history record (History record of up to last five occasions is sustained. However, event that is identical to the latest alarm is not registered.) (Up to 10,000 times of rewriting is possible to nonvolatile memory.)
Protective function	IPM error, excessive voltage, low voltage, excessive speed, overload (electronic thermal), regenerative resistor overload, deviation over flow, communication error, data error, CPU error, encoder error, automatic magnetic pole detection error, absolute encoder error, etc.
Communication function	Serial communication (RS-422A) enables various data transceiving. By USB 1.1/2.0 standard compliance (Full speed), the device can communicate with dedicated editing software. * Before ending a USB connection, implement "Safely Remove Hardware".
Options	SDI device, editing software, device net interface, CC-LINK interface, MECHATROLINK-III interface, control input/output extension unit 1, control input/output extension unit 2, cable, regenerative resistor, etc.

Data

12-1-4 Device electrical specification

(1) 100V-device

Table 12-5 100V-device electrical specifications

Item		Contents		
Machine type (Model)		NCR-*D**A1*		
		-051	-101	-201
Main power supply	Input voltage	100 to 115VAC, 50/60Hz Single-phase		
	Permissible voltage fluctuation	90 to 121VAC, 50/60Hz		
	Input rated current [Arms]	1.5* ⁴	3.0* ⁴	6.0* ⁴
	Rated capacity [KVA]	0.15	0.3	0.6
	Inrush current [A]* ⁵	32.0[10ms]		
Control power supply	Input voltage	100 to 115VAC, 50/60Hz Single-phase		
	Permissible voltage fluctuation	90 to 121VAC, 50/60Hz		
	Input rated current [Arms]	0.20* ⁴	0.20* ⁴	0.20* ⁴
	Power consumption [W]	13	13	13
	Inrush current [A]* ⁵	13.0[2ms]		
Output capacity [W]		50	100	200
Drive method		3-phase sine wave PWM		
Continuous output current [Arms]		1.1	2.0	3.4
Instant output current [Arms]		3.3	6.0	9.9
Control method		Semiclosed loop with encoder (linear sensor) feedback		
Brake method		Regenerative brake: regenerative resistor externally installed		
Carrier frequency	τ motor type	25kHz		
	IM/SM motor type (parameter select)	7.5kHz/10kHz/15kHz/20kHz		
Speed control range		1:5000* ⁶		
Maximum speed frequency		20Mpps (25Mpps)* ⁷ However, it is frequency of 4 times of encoder pulse.		
Weight	[kg]* ⁸	1.0	1.0	1.4
Safety standard	UL	○	○	○
	CE	○	○	○
Shape		Refer to [12-2 Outline].		
Accessory				
Applicable motor		Refer to [12-5 Applicable motor list].		

*⁴ This value is just a rough indication.*⁵ Value at the rated voltage of 115VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide. For a circuit breaker for wiring, select a product that has the breaking capacity ensuring protective coordination.*⁶ At the speed of 1/5000 of rated rotating speed, smooth motor rotation may be disturbed. Speed control range is based on term where motor does not stop with 100% load.*⁷ ⚠ The spec in () corresponds to the device of HARD VER.2.00 or later.*⁸ Weight without options

(2) 200V-device

Table 12-6 200V-device electrical specifications (1/2)

Item		Contents						
Machine type (Model)		NCR-*D**A2						
		-101	-201	-401	-801	-152 (-122)* ⁹	-222	-402
Main power supply	Input voltage	200 to 230VAC, 50/60Hz 3-phase						
	Permissible voltage fluctuation	180 to 242VAC, 50/60Hz						
	Input rated current [Arms]	0.9* ¹⁰	1.7* ¹⁰	3.2* ¹⁰	5.2* ¹⁰	12.2* ¹⁰	15.9* ¹⁰	25.0* ¹⁰
	Rated capacity [KVA]	0.3	0.6	1.1	1.8	3.0	4.7	7.8
	Inrush current [A]* ¹¹	64.0 [4ms]				18.0 [30ms]		165.0 [6ms]
Control power supply	Input voltage	200 to 230VAC, 50/60Hz Single-phase						
	Permissible voltage fluctuation	180 to 242VAC, 50/60Hz						
	Input rated current [Arms]	0.1* ¹⁰	0.1* ¹⁰	0.1* ¹⁰	0.1* ¹⁰	0.17* ¹⁰	0.17* ¹⁰	0.22* ¹⁰
	Power consumption [W]	13	13	13	13	22	22	24
	Inrush current [A]* ¹¹	25.0 [2ms]				52.0 [2ms]		34.0 [2ms]
Output capacity [W]		100	200	400	800	1.5k (1.2k)* ¹²	2.2k	4.0k
Drive method		3-phase sine wave PWM						
Continuous output current [Arms]		1.1	2.0	3.4	5 (6.8)* ¹³	10.0	16.0	24.0 (27.0)* ¹⁴
Instant output current [Arms]		3.3	6.0	9.9	17.0	30.0	48.0	78.0
Control method		Semiclosed loop with encoder (linear sensor) feedback						
Brake method		Regenerative brake: regenerative resistor externally installed						
Carrier frequency	τ motor type	25kHz				16kHz		10kHz
	IM/SM motor type (parameter select)	7.5kHz/10kHz/15kHz/20kHz				7.5kHz/10kHz/15kHz		7.5kHz/10kHz
Speed control range		1:5000* ¹⁵						
Maximum speed frequency		20Mpps (25Mpps)* ¹⁶ However, it is frequency of 4 times of encoder pulse.						
Weight [kg]* ¹⁷		1.0	1.0	1.4	2.4	4.0	4.0	6.0
Safety standard	UL	○	○	○	○	-	-	○
	CE	○	○	○	○	○	○	○
Shape		Refer to [12-2 Outline].						
Accessory		Regenerative resistor (400W or less as option) Refer to [12-3 Regenerative resistor outline and combination].						
Applicable motor		Refer to [12-5 Applicable motor list].						

*⁹ () indicates the model No. of IM type motor.

*¹⁰ This value is just a rough indication.

*¹¹ Value at the rated voltage of 230VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide. For a circuit breaker for wiring, select a product that has the breaking capacity ensuring protective coordination.

*¹² () indicates device capacity of IM type motor.

*¹³ When UL standard is not applied, rated current is 6.8A.

*¹⁴ If it does not conform to the UL standard due to design class B, the rated current is "27.0A".

*¹⁵ At the speed of 1/5000 of rated rotating speed, smooth motor rotation may be disturbed. Speed control range is based on term where motor does not stop with 100% load.

*¹⁶ ⚠ The spec in () corresponds to the device of HARD VER.2.00 or later.

*¹⁷ Weight without options

Table 12-7 200V-device electrical specifications (2/2)

Item		Contents						
Machine type (Model)		NCR-*D**A2*						
		-752 (-552) *18	-113 (-752) *18	-153 (-113) *18	-203 (-153) *18	-303 (-223) *18	-353 (-303) *18	-373 (-373) *18
Main power supply	Input voltage	200 to 230VAC, 50/60Hz 3-phase						
	Permissible voltage fluctuation	180 to 242VAC, 50/60Hz				170 to 253VAC, 50/60Hz		
	Input rated current [Arms]	35.0*19	50.0*19	72.2*19	86.6*19	156.0*19	185.0*19	192.0*19
	Rated capacity [KVA]	15.0	20.0	25.0	30.0	54.0	64.0	66.5
	Inrush current [A]*20	85.0 [18ms]	85.0 [22ms]	100.0 [27ms]	150.0 [38ms]	182.0 [42ms]	182.0 [42ms]	182.0 [50ms]
Control power supply	Input voltage	24VDC*21						
	Permissible voltage fluctuation	20.4 to 27.6VDC						
	Input rated current [Arms]	1.5*19	1.5*19	1.5*19	2.4*19	3.0*19	3.0*19	5.0*19
	Power consumption [W]	36	36	36	56	70	70	120
Output capacity [W]		7.5k (5.5k) *22	11.0k (7.5k) *22	15.0k (11.0k) *22	20.0k (15.0k) *22	30.0k (22.0k) *22	35.0k (30.0k) *22	37.0k (37.0k) *22
Drive method		3-phase sine wave PWM						
Continuous output current [Arms]		41.8	47.7	62.6	87.3	120.0	164.0	180.0
Instant output current [Arms]		83.6	95.4	125.2	174.6	240.0	328.0	360.0
Control method		Semiclosed loop with encoder (linear sensor) feedback						
Brake method		Regenerative brake: regenerative resistor externally installed						
Carrier frequency	τ motor type	10kHz				7.5kHz		
	IM/SM motor type (parameter select)	75kHz/10kHz						
Speed control range		1:5000*23						
Maximum speed frequency		20Mpps (25Mpps)*24 However, it is frequency of 4 times of encoder pulse.						
Weight [kg]*25		7.4	7.7	10.0	18.5	42.0	42.0	48.2
Safety standard	UL	-	-	-	-	-	-	-
	CE	○	○	-	-	-	-	-
Shape		Refer to [12-2 Outline].						
Accessory		Regenerative resistor (400W or less as option) Refer to [12-3 Regenerative resistor outline and combination].						
Applicable motor		Refer to [12-5 Applicable motor list].						

*18 () indicates the model No. of IM type motor.

*19 This value is just a rough indication.

*20 Value at the rated voltage of 230VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide. For a circuit breaker for wiring, select a product that has the breaking capacity ensuring protective coordination.

*21 Depending on the use conditions, over current protection may be activated for the 24VDC power supply due to inrush current. Thus, a power supply whose capacity is at least twice the rated capacity is recommended.

*22 () indicates device capacity of IM type motor.

*23 At the speed of 1/5000 of rated rotating speed, smooth motor rotation may be disturbed. Speed control range is based on term where motor does not stop with 100% load.

*24 ⚠ The spec in () corresponds to the device of HARD VER.2.00 or later.

*25 Weight without options

(3) 400V-device

Table 12-8 400V-device electrical specifications (1/2)

Item		Contents						
Machine type (Model)		NCR-*D**A3*						
		-262	-402	-752 (-552) *26	-113 (-752) *26	-153 (-113) *26	-203 (-153) *26	
Main power supply	Input voltage	400 to 460VAC, 50/60Hz 3-phase						
	Permissible voltage fluctuation	360 to 484VAC, 50/60Hz						
	Input rated current [Arms]	7.5*27	11.5*27	22.0*27	29.0*27	36.5*27	43.5*27	
	Rated capacity [KVA]	5.2	7.8	15	20	25	30	
	Inrush current [A]*28	65.0 [4ms]	56.0 [8ms]	45.0 [17ms]	56.0 [17ms]	56.0 [22ms]	87.0 [31ms]	
Control power supply	Input voltage	24VDC*29						
	Permissible voltage fluctuation	20.4 to 27.6VDC						
	Input rated current [Arms]	0.83*27	1.0*27	1.5*27	1.5*27	1.5*27	2.4*27	
	Power consumption [W]	20	24	36	36	36	56	
Output capacity [W]		2.6k	4.0k	7.5k (5.5k) *30	11.0k (7.5k) *30	15.0k (11.0k) *30	20.0k (15.0k) *30	
Drive method		3-phase sine wave PWM						
Continuous output current [Arms]		8.0	15.0	20.9	23.4	31.3	43.7	
Instant output current [Arms]		24.0	45.0	41.8	46.8	62.6	87.4	
Control method		Semiclosed loop with encoder (linear sensor) feedback						
Brake method		Regenerative brake: regenerative resistor externally installed						
Carrier frequency	τ motor type	10kHz						
	IM/SM motor type (parameter select)	7.5kHz/10kHz						
Speed control range		1:5000*31						
Maximum speed frequency		25Mpps However, it is frequency of 4 times of encoder pulse.						
Weight [kg]*32		4.0	6.0	7.4	7.7	10.0	18.5	
Safety standard	UL	-	-	-	-	-	-	
	CE	-	-	-	-	-	-	
Shape		Refer to [12-2 Outline].						
Accessory		Regenerative resistor Refer to [12-3 Regenerative resistor outline and combination].						
Applicable motor		Refer to [12-5 Applicable motor list].						

*26 () indicates the model No. of IM type motor.

*27 This value is just a rough indication.

*28 Value at the rated voltage of 460VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide. For a circuit breaker for wiring, select a product that has the breaking capacity ensuring protective coordination.

*29 Depending on the use conditions, over current protection may be activated for the 24VDC power supply due to inrush current. Thus, a power supply whose capacity is at least twice the rated capacity is recommended.

*30 () indicates device capacity of IM type motor.

*31 At the speed of 1/5000 of rated rotating speed, smooth motor rotation may be disturbed. Speed control range is based on term where motor does not stop with 100% load.

*32 Weight without options

Table 12-9 400V-device electrical specifications (2/2)

Item		Contents						
Machine type (Model)		NCR-*D**A3*						
		-373 (-303) *33	-553 (-373) *1833					
Main power supply	Input voltage	1) 380VAC 50/60Hz, 3-phase 2) 400 to 440VAC, 50/60Hz, 3-phase 3) 460 to 480VAC, 50/60Hz, 3-phase 3-phase						
	Permissible voltage fluctuation	1) 323 to 418VAC, 50/60Hz 2) 340 to 484VAC, 50/60Hz 3) 391 to 500VAC, 50/60Hz						
	Input rated current [Arms]	101.0*34	150.0*34					
	Rated capacity [KVA]	66.5	99.0					
	Inrush current [A]*35	95.0 [50ms]	145.0 [50ms]					
Control power supply	Input voltage	24VDC*36						
	Permissible voltage fluctuation	20.4 to 27.6VDC						
	Input rated current [Arms]	5.0*34	5.0*34					
	Power consumption [W]	120	120					
Output capacity [W]		37.0k (30.0k) *37	55.0k (37.0k) *37					
Drive method		3-phase sine wave PWM						
Continuous output current [Arms]		90.0	135.0					
Instant output current [Arms]		180.0	270.0					
Control method		Semiclosed loop with encoder (linear sensor) feedback						
Brake method		Regenerative brake: regenerative resistor externally installed						
Carrier frequency	τ motor type	7.5kHz						
	IM/SM motor type (parameter select)	75kHz/10kHz						
Speed control range		1:5000*38						
Maximum speed frequency		20Mpps (25Mpps)*39 However, it is frequency of 4 times of encoder pulse.						
Weight	[kg]*40	47.0	53.7					
Safety standard	UL	-	-					
	CE	-	-					
Shape		Refer to [12-2 Outline].						
Accessory		Regenerative resistor Refer to [12-3 Regenerative resistor outline and combination].						
Applicable motor		Refer to [12-5 Applicable motor list].						

*33 () indicates the model No. of IM type motor.

*34 This value is just a rough indication.

*35 Value at the rated voltage of 480VAC. The value in brackets ([]) indicates the time constant for inrush current. For the time after which inrush current is eliminated, use 3 times the value in brackets ([]) as a rough guide. For a circuit breaker for wiring, select a product that has the breaking capacity ensuring protective coordination.

*36 Depending on the use conditions, over current protection may be activated for the 24VDC power supply due to inrush current. Thus, a power supply whose capacity is at least twice the rated capacity is recommended.

*37 () indicates device capacity of IM type motor.

*38 At the speed of 1/5000 of rated rotating speed, smooth motor rotation may be disturbed. Speed control range is based on term where motor does not stop with 100% load.

*39 ⚠ The spec in () corresponds to the device of HARD VER.2.00 or later.

*40 Weight without options

12-2 Outline

12-2-1 Main unit outline drawing and names of parts

[Device supporting 100V]: NCR-D**A1A-051/101

[Device supporting 200V]: NCR-D**A2A-101/201

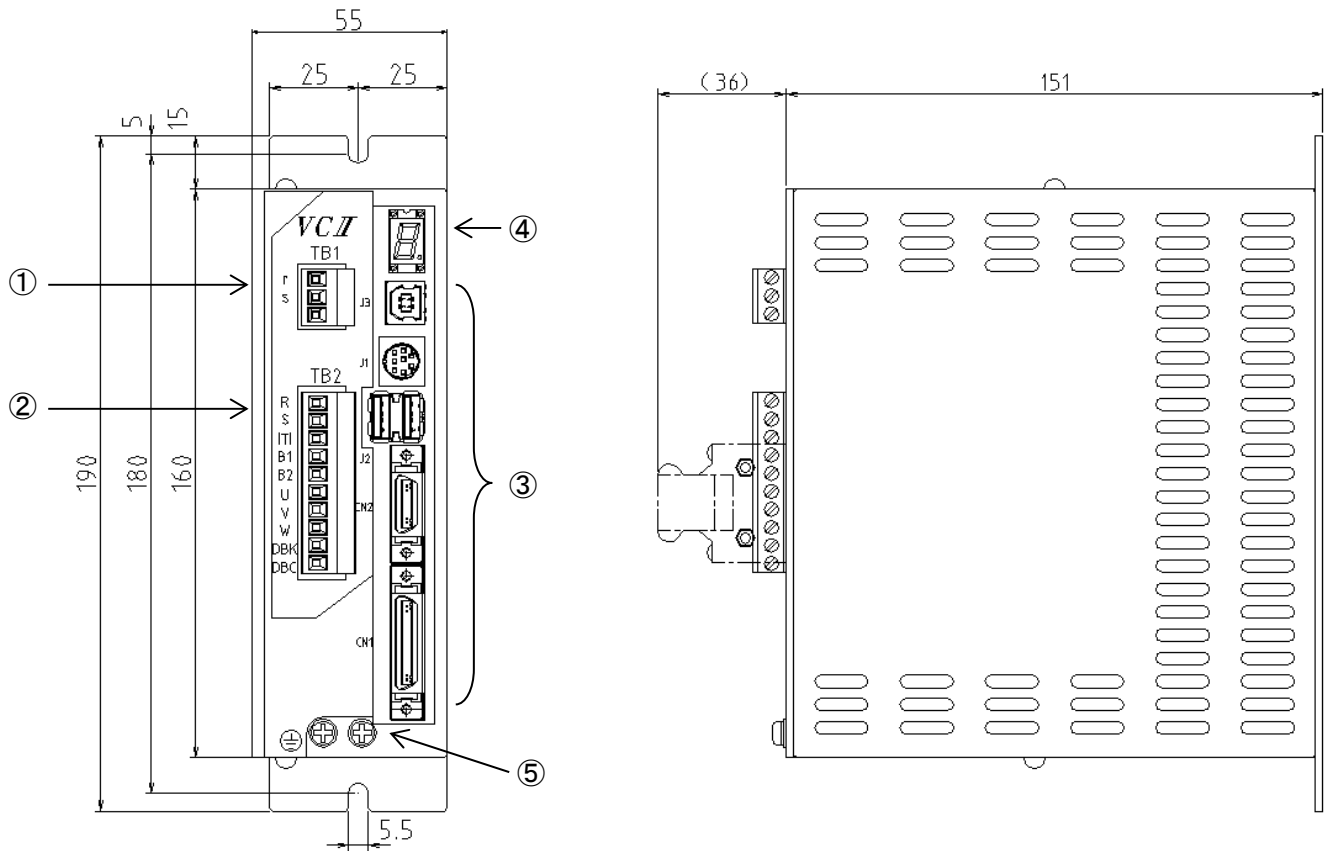


Figure 12-1 Main unit outline drawing

Table 12-10 Name of each part

Number	Name	Function
①	TB1	Control power supply connection terminal (r,s)
②	TB2	- AC input power supply terminal (R,S,T) - Motor connection terminal (U,V,W) - Regenerative resistor connection terminal (B1,B2) - Dynamic brake activation signal (DBK,DBC)
③	CN1	Control input/output signal connector
	CN2	- Encoder feedback pulse input connector - Input the encoder feedback pulse signal from encoder installed to the motor.
	J1	- Serial communication connector - It connects to the external devices or optional units for serial communication.
	J2	- Servo control communication connector - It connects to the other VC II series products and is used for synchronous operation.
	J3	USB communication connector
④	7-segment LED	- Motion status display LED - Displays the code according to the motion status.
⑤	E	- Fixing screws for power and motor grounding cables - Size M4

Data

[Device supporting 100V]: NCR-*D**A1A-201

[Device supporting 200V]: NCR-*D**A2A-401

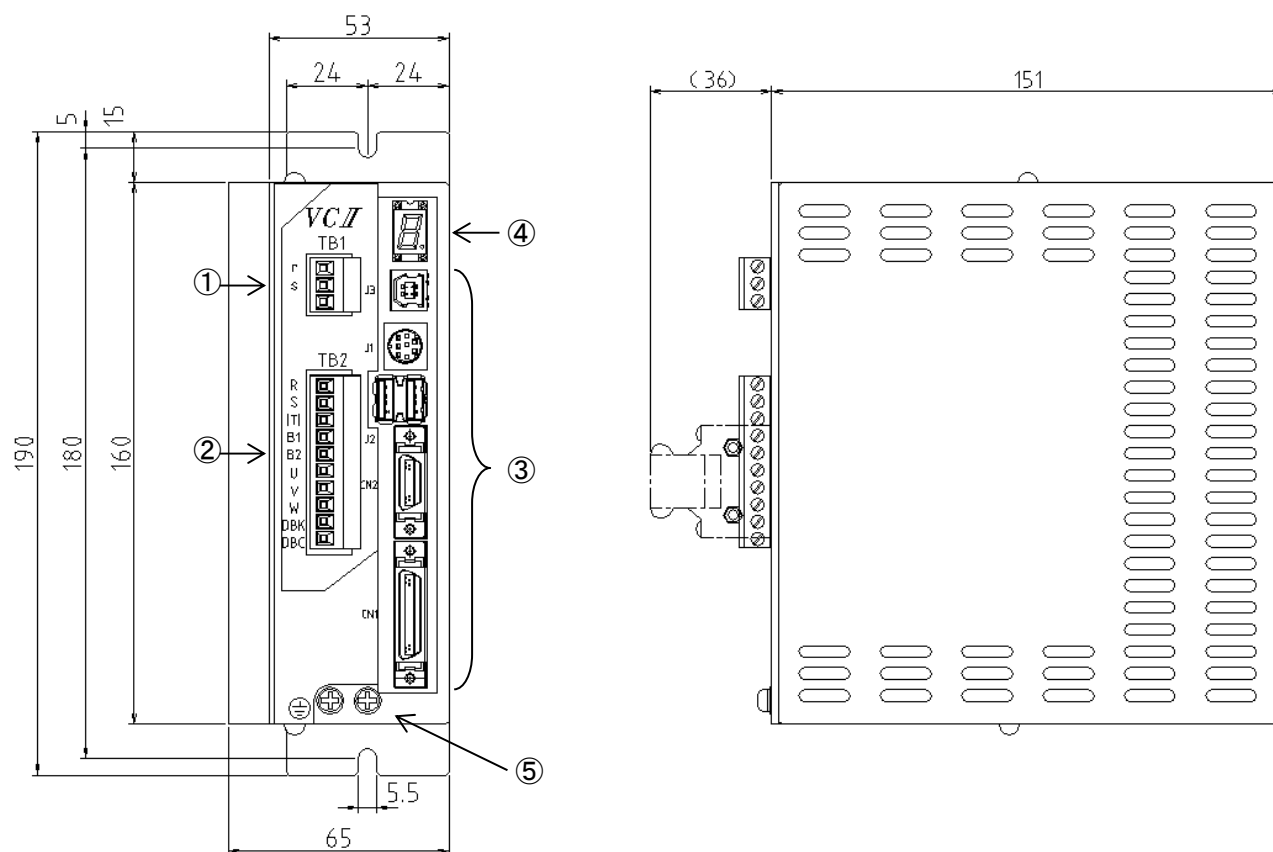


Figure 12-2 Main unit outline drawing

Table 12-11 Name of each part

Number	Name	Function
①	TB1	Control power supply connection terminal (r,s)
②	TB2	- AC input power supply terminal (R,S,T) - Motor connection terminal (U,V,W) - Regenerative resistor connection terminal (B1,B2) - Dynamic brake activation signal (DBK,DBC)
③	CN1	Control input/output signal connector
	CN2	- Encoder feedback pulse input connector - Input the encoder feedback pulse signal from encoder installed to the motor.
	J1	- Serial communication connector - It connects to the external devices or optional units for serial communication.
	J2	- Servo control communication connector - It connects to the other VC II series products and is used for synchronous operation.
	J3	USB communication connector
④	7-segment LED	- Motion status display LED - Displays the code according to the motion status.
⑤	E	- Fixing screws for power and motor grounding cables - Size M4

[Device supporting 200V]: NCR-*D**A2A-801

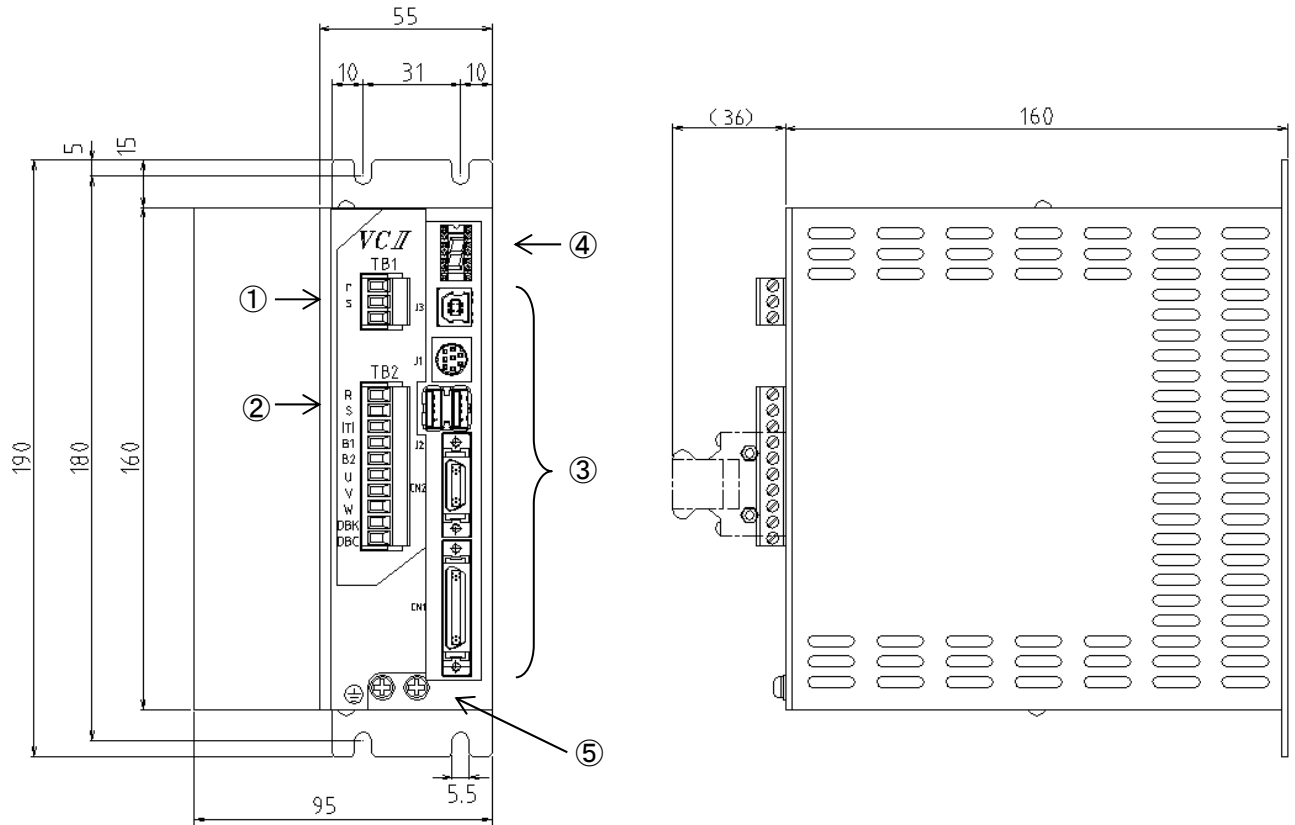


Figure 12-3 Main unit outline drawing

Table 12-12 Name of each part

Number	Name	Function	
①	TB1	• Control power supply connection terminal (r,s)	
②	TB2	• AC input power supply terminal (R,S,T) • Motor connection terminal (U,V,W) • Regenerative resistor connection terminal (B1,B2) • Dynamic brake activation signal (DBK,DBC)	
③	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector - Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector - It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector - It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
④	7-segment LED	• Motion status display LED - Displays the code according to the motion status.	
⑤	E	• Fixing screws for power and motor grounding cables	• Size M4

Data

[Device supporting 200V]: NCR-*D**A2A-152(122)/222

() is a model of IM motor.

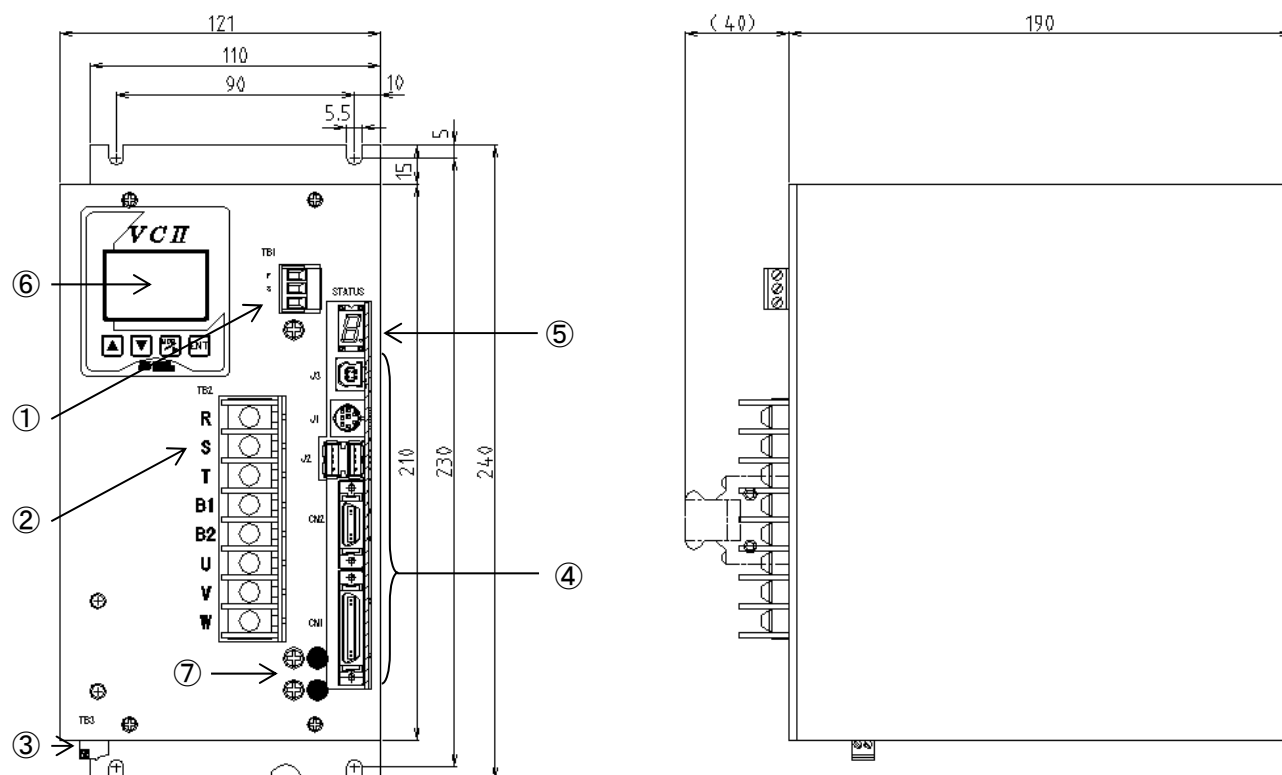


Figure 12-4 Main unit outline drawing

Table 12-13 Name of each part

Number	Name	Function	
①	TB1	• Control power supply connection terminal (r,s)	
②	TB2	• AC input power supply terminal block (R,S,T)	• Size M4
		• Motor connection terminal block (U,V,W)	• Size M4
		• Regenerative resistor connection terminal (B1,B2)	• Size M4
③	TB3	• Dynamic brake activation signal connector (DBK,DBC)	
④	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑤	7-segment LED	• Motion status display LED Displays the code according to the motion status.	
⑥	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑦	E	• Fixing screws for power and motor grounding cables	• Size M4

[Device supporting 400V]: NCR-*D**A3A-262

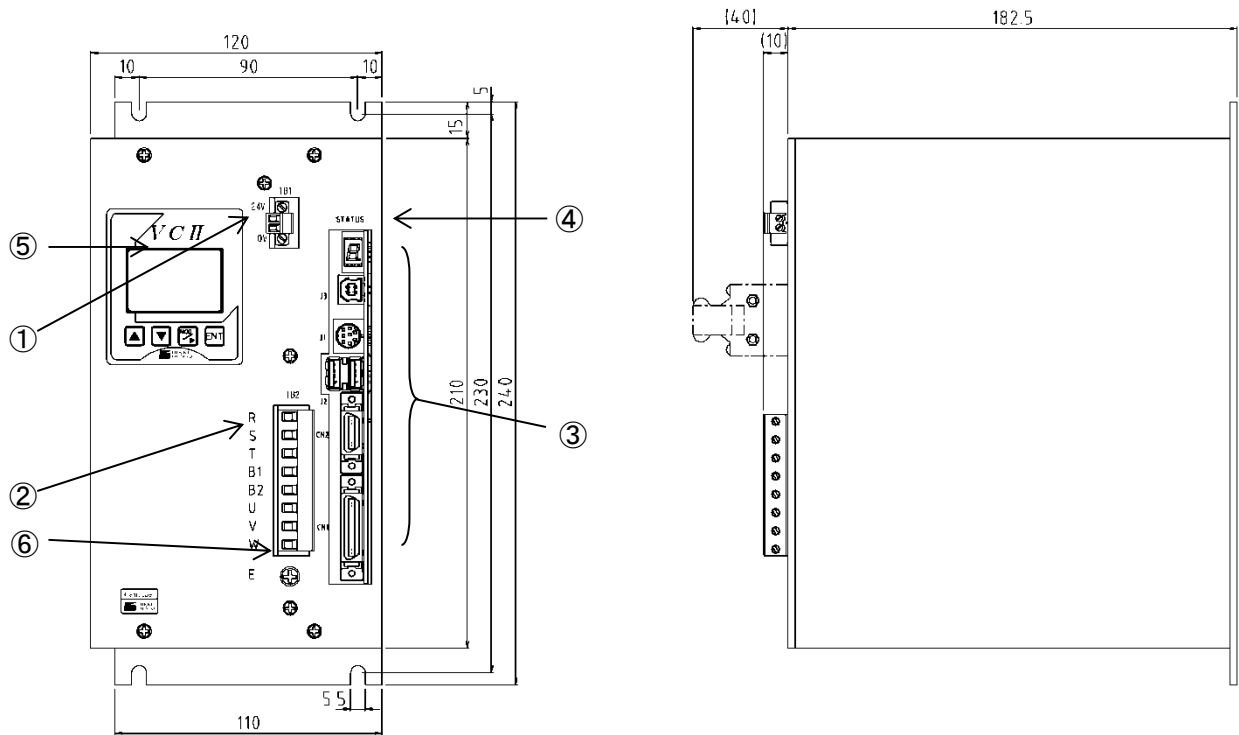


Figure 12-5 Main unit outline drawing

Table 12-14 Name of each part

Number	Name	Function	
①	TB1	• Control power supply connection terminal (24V,0V)	
②	TB2	• AC input power supply terminal block (R,S,T)	
		• Motor connection terminal block (U,V,W)	
		• Regenerative resistor connection terminal (B1,B2)	
③	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
④	7-segment LED	• Motion status display LED Displays the code according to the motion status.	
⑤	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑥	E	• Fixing screws for power and motor grounding cables	• Size M4

Data

[Device supporting 200V]: NCR-*D**A2A-402

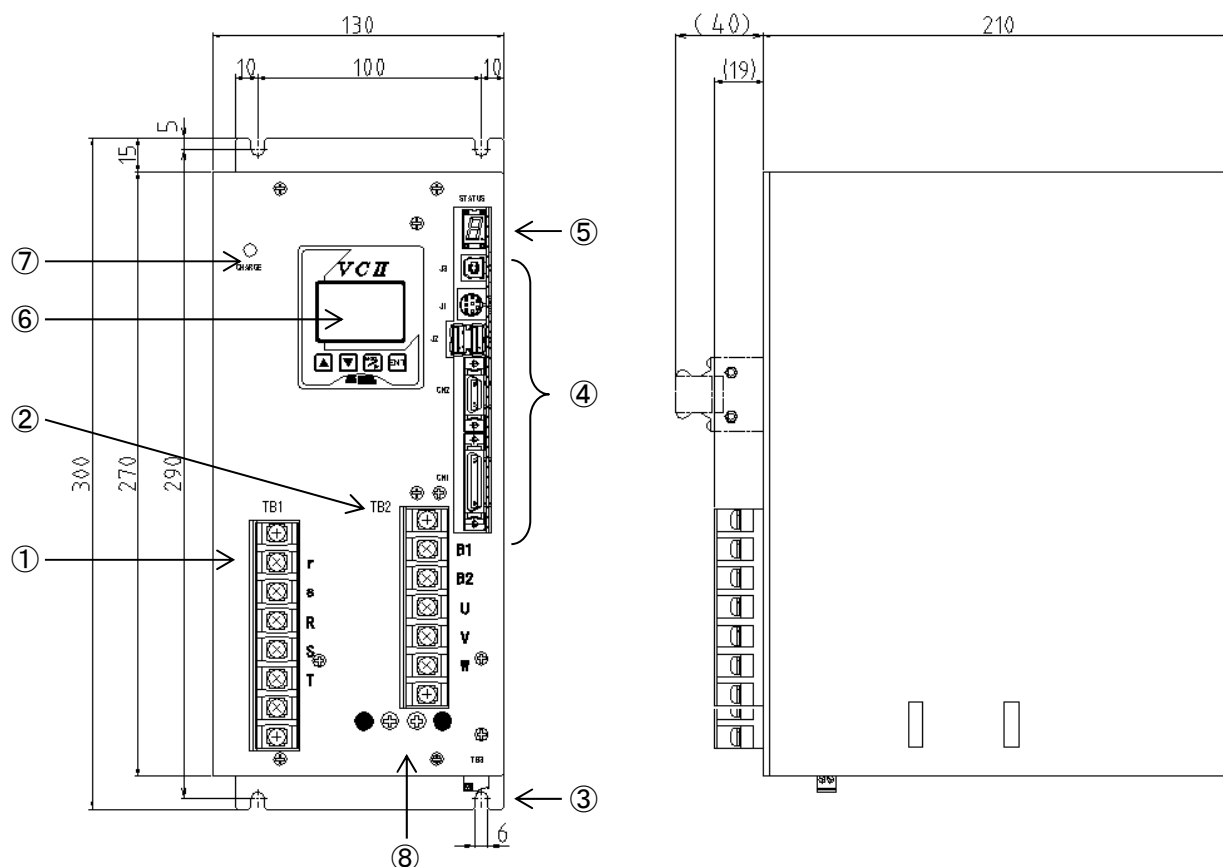


Figure 12-6 Main unit outline drawing

Table 12-15 Name of each part

Number	Name	Function	
①	TB1	• Control power source connection terminal block (r,s)	• Size M4
		• AC input power source terminal block (R,S,T)	• Size M4
②	TB2	• Motor connection terminal block (U,V,W)	• Size M4
		• Regenerative resistor connection terminal block (B1,B2)	• Size M4
③	TB3	• Dynamic brake activation signal connector (DBK,DBC)	
④	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑤	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑥	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑦	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device.	
⑧	E	• Fixing screws for power and motor grounding cables	• Size M4

[Device supporting 200V]: NCR-*D**A2B-402

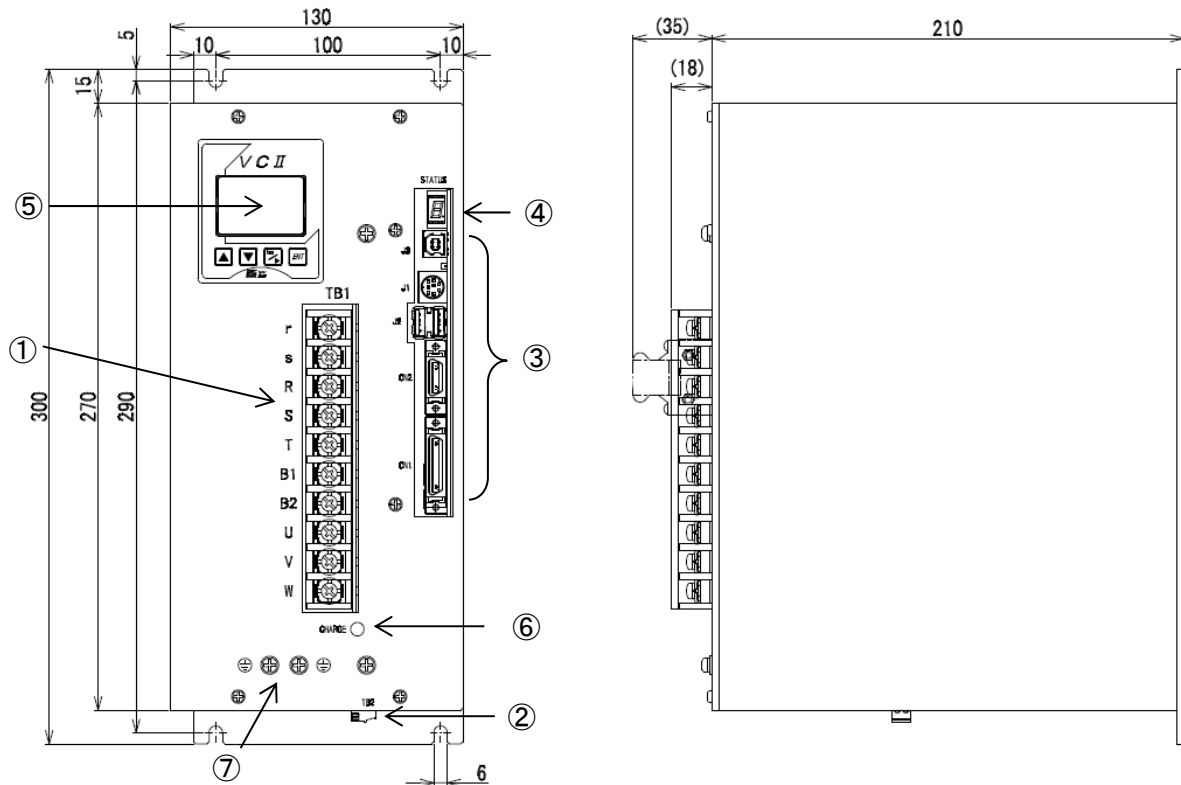


Figure 12-7 Main unit outline drawing

Table 12-16 Name of each part

Number	Name	Function	
①	TB1	• Control power source connection terminal block (r,s)	• Size M4
		• AC input power source terminal block (R,S,T)	• Size M4
		• Motor connection terminal block (U,V,W)	• Size M4
		• Regenerative resistor connection terminal block (B1,B2)	• Size M4
②	TB2	• Dynamic brake activation signal connector (DBK,DBC)	
③	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
④	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑤	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑥	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device.	
⑦	E	• Fixing screws for power and motor grounding cables	• Size M4

[Device supporting 400V]: NCR-*D**A3A-402

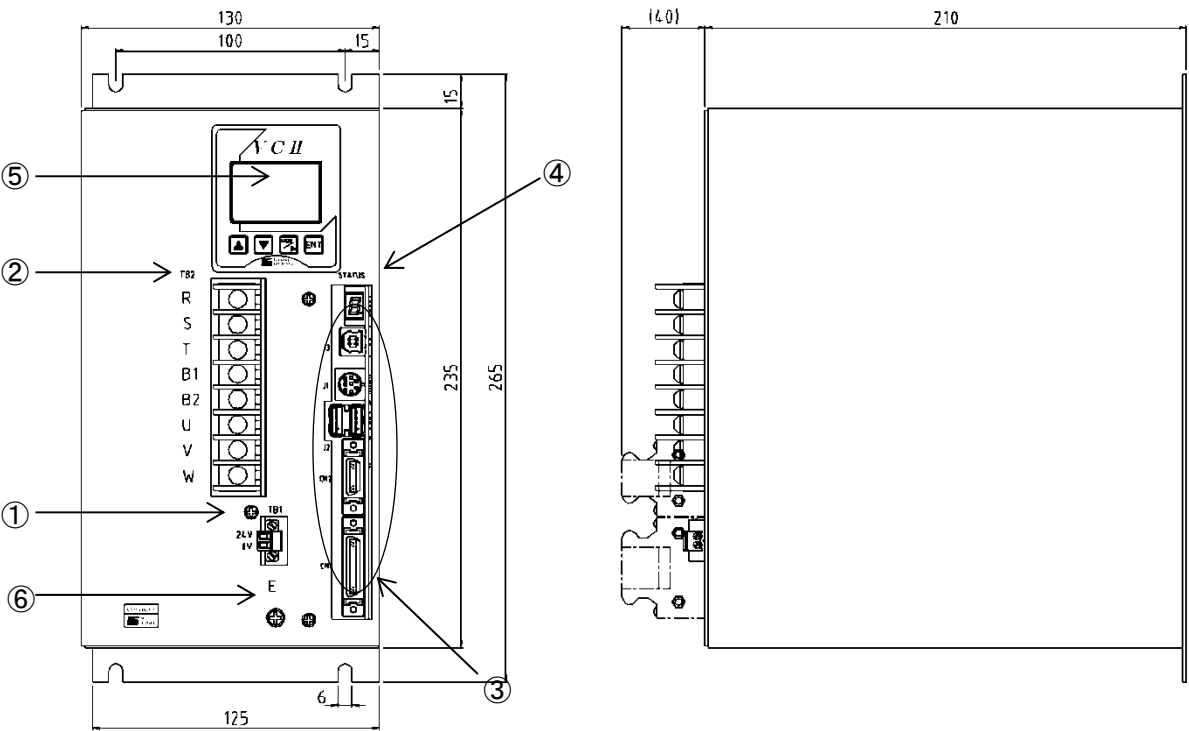


Figure 12-8 Main unit outline drawing

Table 12-17 Name of each part

Number	Name	Function	
①	TB1	Control power source connection terminal block (24V,0V)	
		• AC input power source terminal block (R,S,T)	• Size M4
②	TB2	• Motor connection terminal block (U,V,W)	• Size M4
		• Regenerative resistor connection terminal block (B1,B2)	• Size M4
③	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
④	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑤	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑥	E	• Fixing screws for power and motor grounding cables	• Size M4

[Device supporting 200V]: NCR-*D**A2A-752(552)/113(752)/153(113)

[Device supporting 400V]: NCR-*D**A3A-752(552)/113(752)/153(113)

() is a model No. of IM type motor.

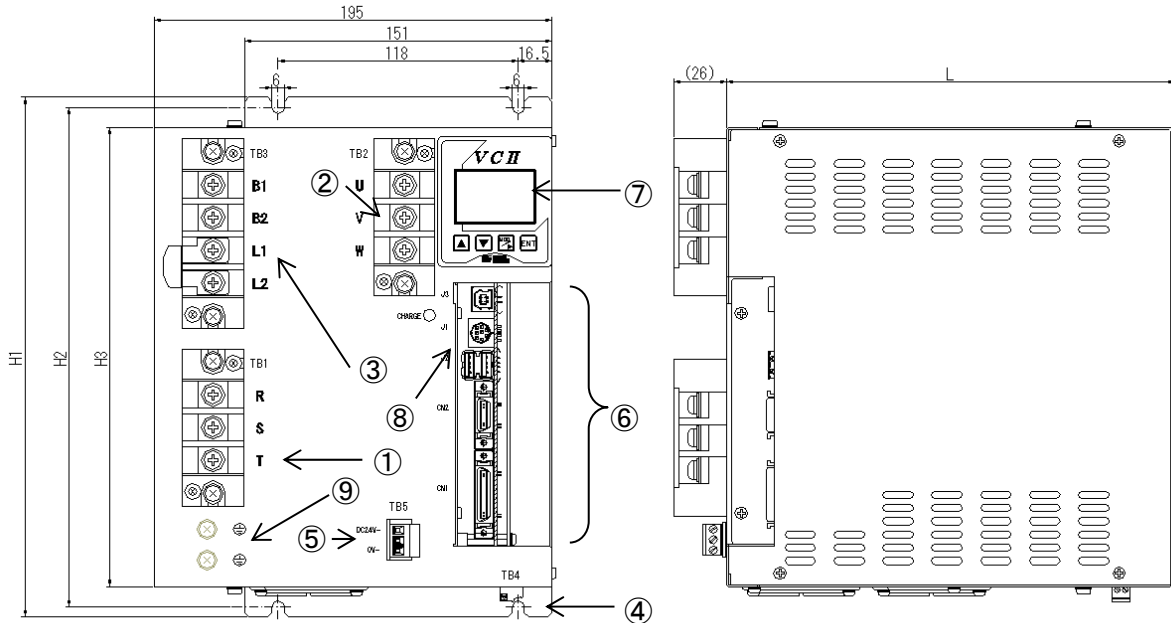


Figure 12-9 Main unit outline drawing

Device model	L	H 1	H 2	H 3
NCR-*D*-752(552)	220	255	245	225
NCR-*D*-113(752)	230	280	270	250
NCR-*D*-153(113)	230	280	270	250

(Note)

The device supporting 400V is not provided with a dynamic brake drive signal connector.

Table 12-18 Name of each part

Number	Name	Function	
①	TB1	• AC input power source terminal block (R,S,T)	• Size M5
②	TB2	• Motor connection terminal block (U,V,W)	• Size M5
③	TB3	• Regenerative resistor connection terminal block (B1,B2)	• Size M5
		• DC reactor connection terminal block (L1,L2)	• Size M5
④	TB4	• Dynamic brake activation signal connector (DBK,DBC)	
⑤	TB5	• Control power supply connection terminal (24V,0V)	
⑥	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑦	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑧	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device.	
⑨	E	• Fixing screws for power and motor grounding cables	• Size M5

Data

[Device supporting 200V]: NCR-*D**A2A-203(153)

[Device supporting 400V]: NCR-*D**A3A-203(153)

() is a model No. of IM type motor.

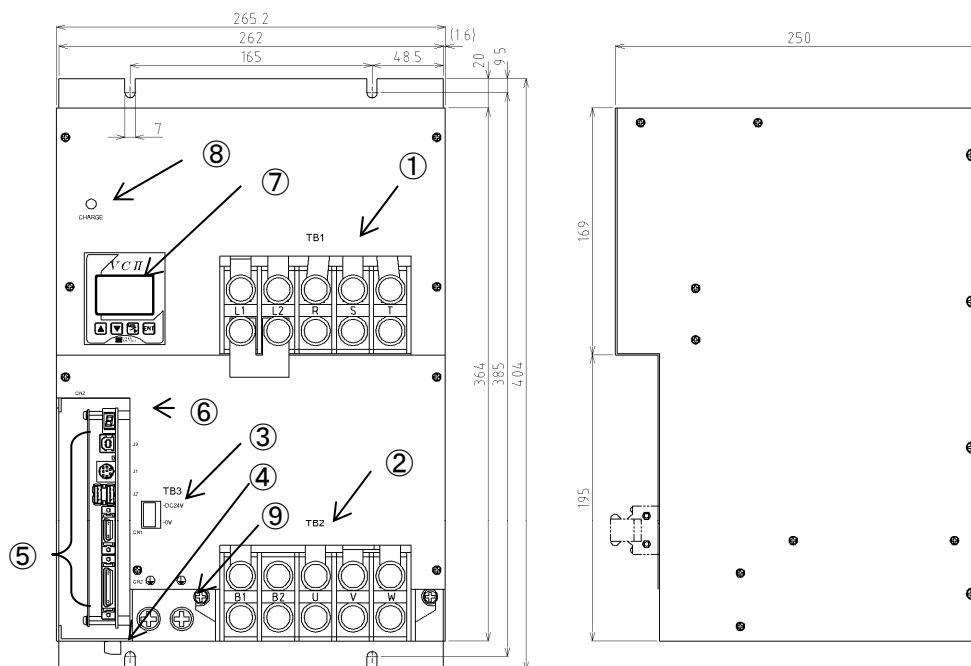


Figure 12-10 Main unit outline drawing

(Note)

The device supporting 400V is not provided with a dynamic brake drive signal connector.

Table 12-19 Name of each part

Number	Name	Function	
①	TB1	• AC input power source terminal (R,S,T)	• Size M8
		• DC reactor connection terminal block (L1,L2)	• Size M8
②	TB2	• Motor connection terminal (U,V,W)	• Size M8
		• Regenerative resistor connection terminal (B1,B2)	• Size M8
③	TB3	• Control power supply connection terminal (24V,0V)	
④	TB4	• Dynamic brake activation signal connector (DBK,DBC)	
⑤	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑥	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑦	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑧	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device. • ⚠ It is available for the device of HARD VER. 2.00 or later.	
⑨	E	• Fixing screws for power and motor grounding cables	• Size M6

[Device supporting 200V]: NCR-*D**A2B-303(223)/353(303)
 () is a model No. of IM type motor.

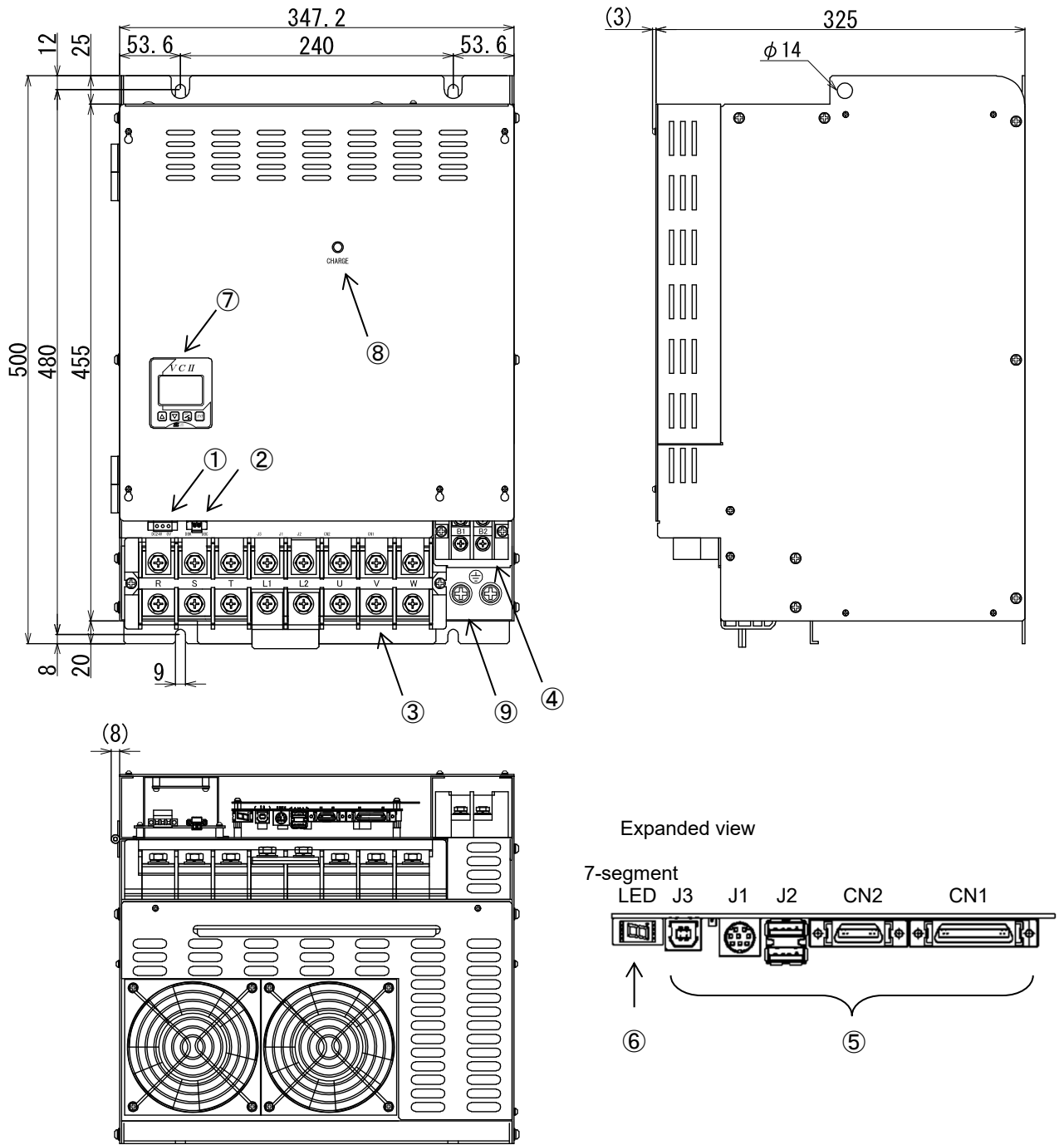


Figure 12-11 Main unit outline drawing

Table 12-20 Name of each part

Number	Name	Function	
①	CN3	• Control power supply connection terminal (24V,0V)	
②	CN4	• Dynamic brake activation signal connector (DBK,DBC)	
③	TB3	• AC input power source terminal (R,S,T)	• Size M8
		• DC reactor connection terminal block (L1,L2)* ⁴¹	• Size M8
④	TB4	• Motor connection terminal (U,V,W)	• Size M8
		• Regenerative resistor connection terminal (B1,B2)	• Size M6
⑤	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑥	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑦	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑧	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device. • ⚠ It is available for the device of HARD VER. 2.00 or later.	
⑨	E	• Fixing screws for power and motor grounding cables	• Size M8

*⁴¹ When using an optional DC reactor, remove the shorting bar before wiring.

[Device supporting 200V]: NCR-*D**A2B-373(373)
 () is a model No. of IM type motor.

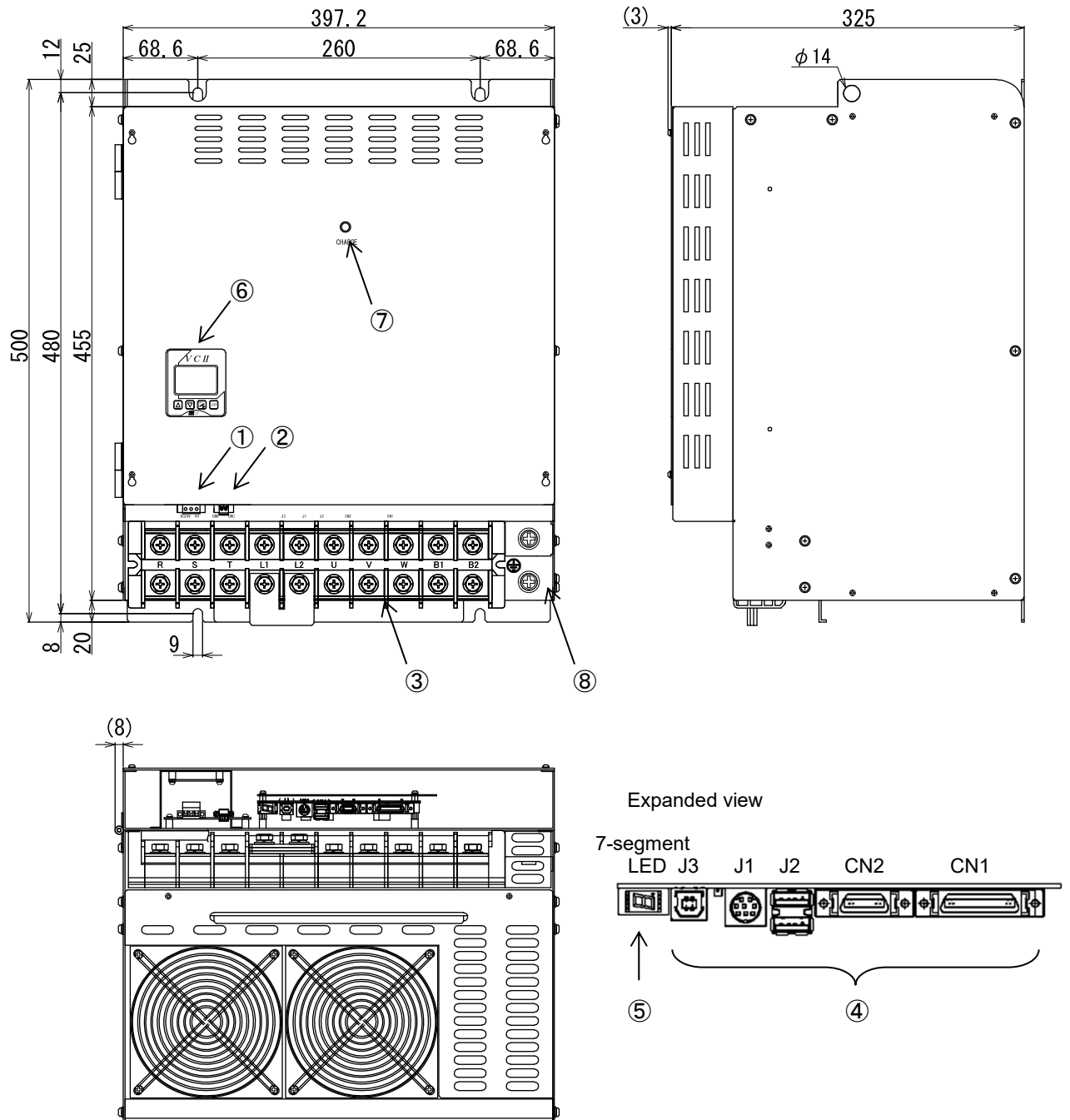


Table 12-21 Name of each part

Number	Name	Function	
①	CN3	• Control power supply connection terminal (24V,0V)	
②	CN4	• Dynamic brake activation signal connector (DBK,DBC)	
③	TB3	• AC input power source terminal (R,S,T)	• Size M8
		• DC reactor connection terminal block (L1,L2)*42	• Size M8
		• Motor connection terminal (U,V,W)	• Size M8
④	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑤	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑥	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑦	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device. • ⚠ It is available for the device of HARD VER. 2.00 or later.	
⑧	E	• Fixing screws for power and motor grounding cables	• Size M8

*42 When using an optional DC reactor, remove the shorting bar before wiring.

[Device supporting 400V]: NCR-*D**A3B-373(303)
() is a model No. of IM type motor.

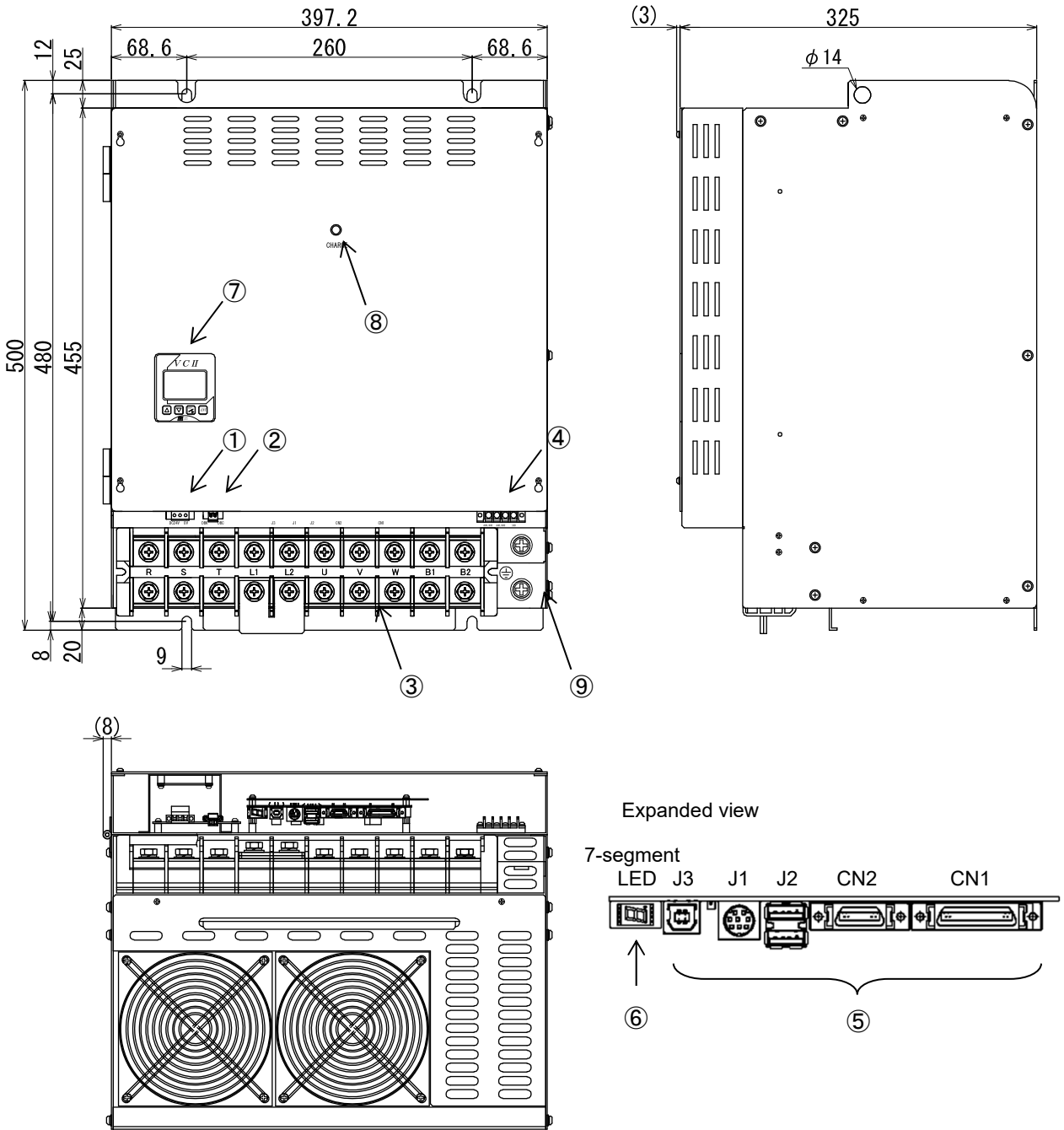


Table 12-22 Name of each part

Number	Name	Function	
①	CN3	• Control power supply connection terminal (24V,0V)	
②	CN4	• Dynamic brake activation signal connector (DBK,DBC)	
③	TB3	• AC input power source terminal (R,S,T)	• Size M8
		• DC reactor connection terminal block (L1,L2)* ⁴³	• Size M8
		• Motor connection terminal (U,V,W)	• Size M8
④	TB4	• Input voltage switching terminal	• Size M3
⑤	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑥	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑦	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑧	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device. • ⚠ It is available for the device of HARD VER. 2.00 or later.	
⑨	E	• Fixing screws for power and motor grounding cables	• Size M8

*⁴³ When using an optional DC reactor, remove the shorting bar before wiring.

[Device supporting 400V]: NCR-*D**A3B-553(373)
 () is a model No. of IM type motor.

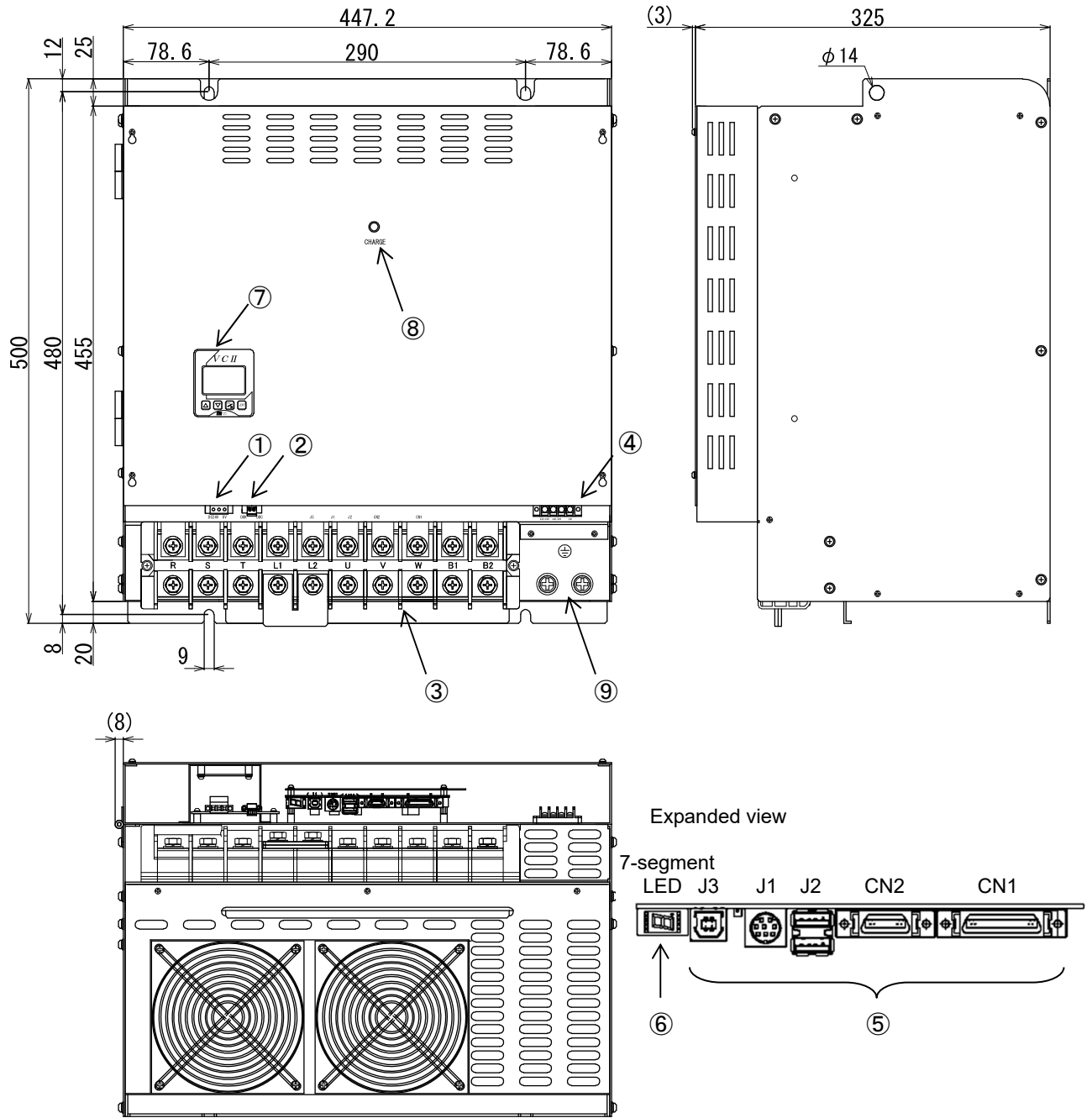


Table 12-23 Name of each part

Number	Name	Function	
①	CN3	• Control power supply connection terminal (24V,0V)	
②	CN4	• Dynamic brake activation signal connector (DBK,DBC)	
③	TB3	• AC input power source terminal (R,S,T)	• Size M8
		• DC reactor connection terminal block (L1,L2)* ⁴⁴	• Size M8
		• Motor connection terminal (U,V,W)	• Size M8
④	TB4	• Input voltage switching terminal	• Size M3
⑤	CN1	• Control input/output signal connector	
	CN2	• Encoder feedback pulse input connector Input the encoder feedback pulse signal from encoder installed to the motor.	
	J1	• Serial communication connector It connects to the external devices or optional units for serial communication.	
	J2	• Servo control communication connector It connects to the other VC II series products and is used for synchronous operation.	
	J3	• USB communication connector	
⑥	7-segment LED	• Motion status display LED Display the code according to the motion status.	
⑦	LCD module	• Module in which LCD display and key switches are integrated For data and parameter input, for various monitoring and alarm check	
⑧	CHARGE LED	• It lights when high voltage is charged in the main circuit condenser in the device. • ⚠ It is available for the device of HARD VER. 2.00 or later.	
⑨	E	• Fixing screws for power and motor grounding cables	• Size M8

*⁴⁴ When using an optional DC reactor, remove the shorting bar before wiring.

12-3 Regenerative resistor outline and combination

12-3-1 Regenerative resistor combination

If the resistor consists of multiple ones, connect them in parallel before use.

The number of thermostats attached is 1.

(1) 100V-device

Table 12-24 Attached regenerative resistor list (100VAC-device)

Device model	Attached regenerative resistor type
NCR-*D**A1A-051 Capacity: 0.05kW	Not attached; if necessary, contact our sales representative.
NCR-*D**A1A-101 Capacity: 0.1kW	Not attached; if necessary, contact our sales representative.
NCR-*D**A1A-201 Capacity: 0.2kW	Not attached; if necessary, contact our sales representative.

(2) 200V-device

Table 12-25 Attached regenerative resistor list (200VAC-device) (1/2)

Device model	Attached regenerative resistor type
NCR-*D**A2A-101 Capacity: 0.1kW	Not attached; if necessary, contact our sales representative.
NCR-*D**A2A-201 Capacity: 0.2kW	Not attached; if necessary, contact our sales representative.
NCR-*D**A2A-401 Capacity: 0.4kW	Not attached; if necessary, contact our sales representative.
NCR-*D**A2A-801 Capacity: 0.8kW	• CAN60UT 82ΩJ 60W, 82Ω 1 piece • Cement resistor outline 1 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc.
NCR-*D**A2A-152(122)* ⁴⁵ Capacity: 1.5kW(1.2kW)	• CAN200UT 24ΩJ 200W, 24Ω 1 piece • Cement resistor outline 2 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc.
NCR-*D**A2A-222 Capacity: 2.2kW	• CAN200UT 24ΩJ 200W, 24Ω 1 piece • Cement resistor outline 2 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc.
NCR-*D**A2A-402 Capacity: 4.0kW	• CAN400UR 20ΩJ 400W, 20Ω 1 piece • Cement resistor outline 3 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc.
NCR-*D**A2A-752(552)* ⁴⁵ Capacity: 7.5kW(5.5kW)	• RGH300G(OS)30ΩJ 300W, 30Ω 3 pieces (Connect them in parallel before use. Total: 900W, combined resistance value: 10.0Ω) • Vitreous enamel resistor outline 4 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.

*⁴⁵ () indicates the model No. of IM motor type or device capacity.

Table 12-26 Attached regenerative resistor list (200VAC-device) (2/2)

Device model	Attached regenerative resistor type
NCR-*D**A2A-113(752)* ⁴⁶ Capacity: 11.0kW(7.5kW)	• RGH500G(OS)22ΩJ 500W, 22Ω 3 pieces (Connect them in parallel before use. Total: 1.5kW, combined resistance value: 7.3Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A2A-153(113)* ⁴⁶ Capacity: 15.0kW(11.0kW)	• RGH500G(OS)22ΩJ 500W, 22Ω 4 pieces (Connect them in parallel before use. Total: 2.0kW, combined resistance value: 5.5Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A2A-203(153)* ⁴⁶ Capacity: 20.0kW(15.0kW)	• RGH500G(OS)22ΩJ 500W, 22Ω 6 pieces (Connect them in parallel before use. Total: 3.0kW, combined resistance value: 3.7Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A2B-303(223)* ⁴⁶ Capacity: 30.0kW(22.0kW)	• RGH500G(OS)22ΩJ 500W, 22Ω 8 pieces (Connect them in parallel before use. Total: 4.0kW, combined resistance value: 2.75Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A2B-353(303)* ⁴⁶ Capacity: 35.0kW(30.0kW)	• RGH500G(OS)22ΩJ 500W, 22Ω 8 pieces (Connect them in parallel before use. Total: 4.0kW, combined resistance value: 2.75Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A2B-373(373)* ⁴⁶ Capacity: 37.0kW(37.0kW)	• RGH500G(OS)22ΩJ 500W, 22Ω 10 pieces (Connect them in parallel before use. Total: 5.0kW, combined resistance value: 2.2Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.

*⁴⁶ () indicates the model No. of IM motor type or device capacity.

(3) 400V-device

Table 12-27 Attached regenerative resistor list (400VAC-device) (1/2)

Device model	Attached regenerative resistor type
NCR-*D**A3A-262 Capacity: 2.6kW	• CAN200UT 100ΩJ 200W, 100Ω 1 piece • Cement resistor outline 2 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc.
NCR-*D**A3A-402 Capacity: 4.0kW	• CAN400UR 51ΩJ 400W, 51Ω 1 piece • Cement resistor outline 3 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc.
NCR-*D**A3A-752(552)* ⁴⁷ Capacity: 7.5kW(5.5kW)	• RGH300G(OS)120ΩJ 300W, 120Ω 3 pieces (Connect them in parallel before use. Total: 900W, combined resistance value: 40.0Ω) • Vitreous enamel resistor outline 4 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A3A-113(752)* ⁴⁷ Capacity: 11.0kW(7.5kW)	• RGH500G(OS)82ΩJ 500W, 82Ω 3 pieces (Connect them in parallel before use. Total: 1.5kW, combined resistance value: 27.3Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A3A-153(113)* ⁴⁷ Capacity: 15.0kW(11.0kW)	• RGH500G(OS)82ΩJ 500W, 82Ω 4 pieces (Connect them in parallel before use. Total: 2.0kW, combined resistance value: 20.5Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A3A-203(153)* ⁴⁷ Capacity: 20.0kW(15.0kW)	• RGH500G(OS)82ΩJ 500W, 82Ω 6 pieces (Connect them in parallel before use. Total: 3.0kW, combined resistance value: 13.6Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.

⁴⁷ () indicates the model No. of IM motor type or device capacity.

Table 12-28 Attached regenerative resistor list (400VAC-device) (2/2)

Device model	Attached regenerative resistor type
NCR-*D**A3B-373(303)* ⁴⁸ Capacity: 37.0kW(30.0kW)	• RGH500G(OS)82ΩJ 500W, 82Ω 10 pieces (Connect them in parallel before use. Total: 5.0kW, combined resistance value: 8.2Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.
NCR-*D**A3B-553(373)* ⁴⁸ Capacity: 55.0kW(37.0kW)	• RGH500G(OS)82ΩJ 500W, 82Ω 12 pieces (Connect them in parallel before use. Total: 6.0kW, combined resistance value: 6.8Ω) • Vitreous enamel resistor outline 5 • Thermostat - 1 pc. • Thermostat mounting plate - 1 pc. • M4 nut - 2 pcs. • M4 screw - 1 pc.

*⁴⁸ () indicates the model No. of IM motor type or device capacity.

12-3-2 Regenerative resistor outline

The regenerative resistor outline and dimensions, as well as the thermostat mounting position and mounting method, are indicated below.

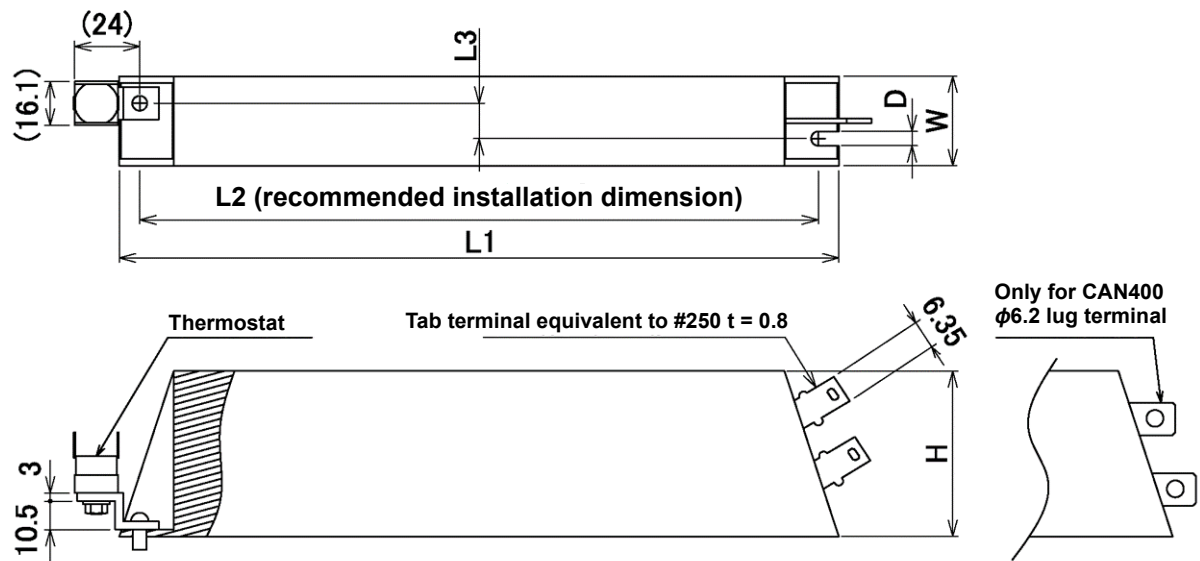


Figure 12-15 Cement resistor outline drawing

Table 12-29 Cement resistor outline dimensions

Model	Rating	L 1	L 2	W	H	L 3	D	Outline
CAN60	60W	115 ± 2.0	100 ± 1.0	21 ± 0.5	40 ± 0.8	5	4.3 ± 0.3	Outline 1
CAN200	200W	215 ± 2.0	200 ± 1.0	26 ± 0.5	50 ± 0.8	8	5.3 ± 0.3	Outline 2
CAN400	400W	265 ± 2.0	250 ± 1.0	33 ± 0.5	61 ± 0.8	13	5.3 ± 0.3	Outline 3

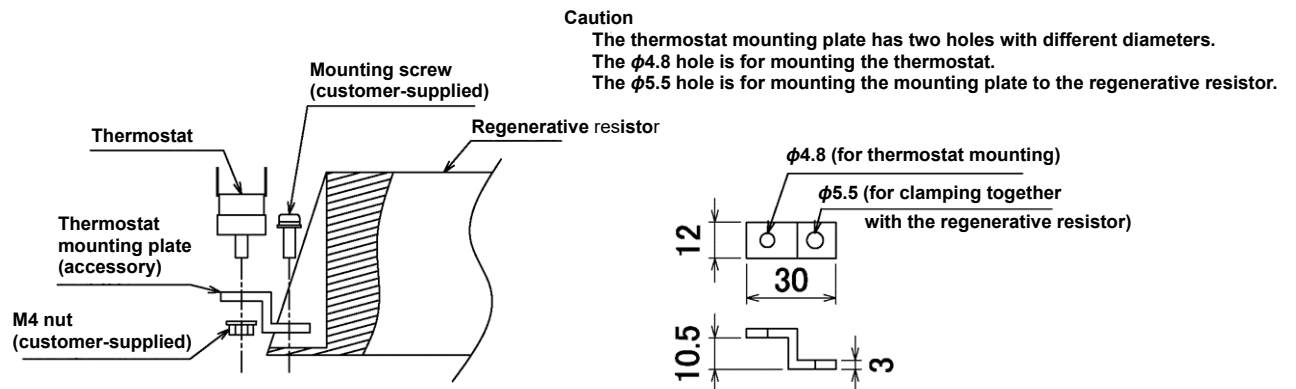


Figure 12-16 Cement resistor thermostat mounting diagram

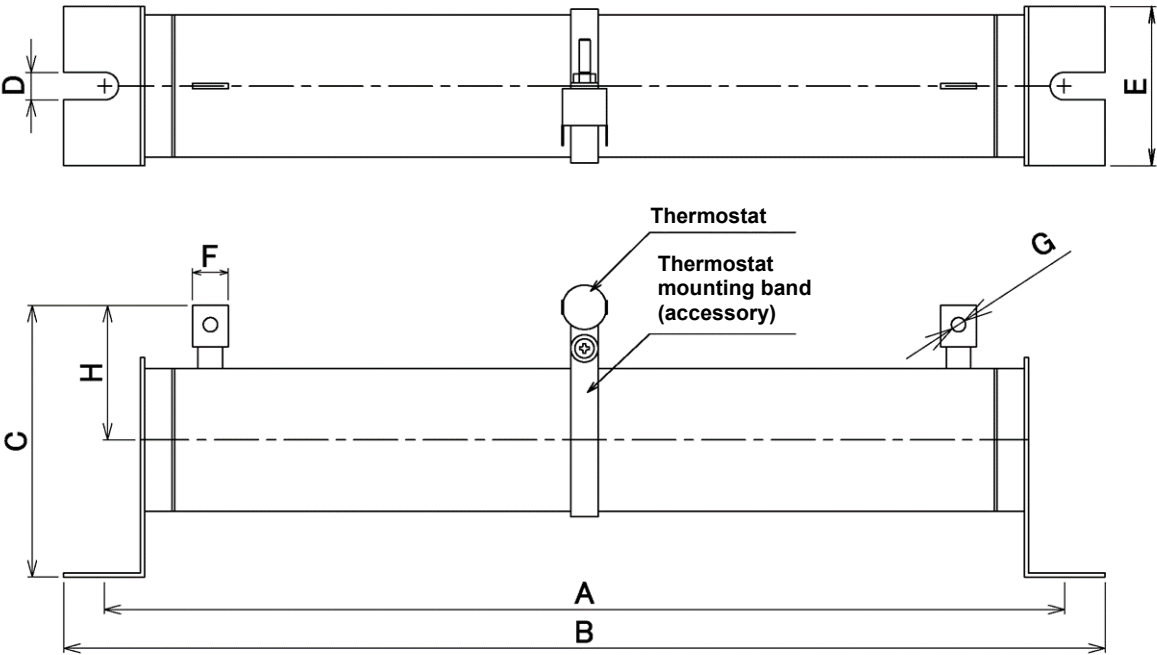


Figure 12-17 Vitreous enamel resistor outline

Table 12-30 Vitreous enamel resistor outline dimensions

Model	Rating	A	B	C	D	E	F	G	H	Outline
RGH300	300W	304 ±3.0	334 ±3.0	84 ±4.0	10 ±0.5	40 ±0.5	13 ±0.5	6.0 ±0.5	44 ±3.0	Outline 4
RGH500	500W	350 ±3.0	380 ±3.0	99 ±5.0	10 ±0.5	58 ±0.5	13 ±0.5	6.0 ±0.5	49 ±3.0	Outline 5

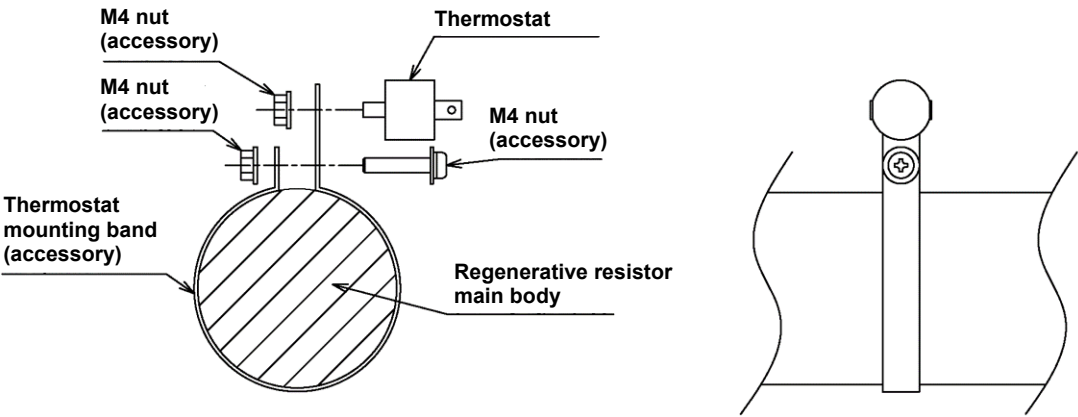


Figure 12-18 Enamel resistor thermostat mounting diagram

The following is the electric specifications of the thermostat to be mounted to the regenerative resistor.

Table 12-31 Specifications of the thermostat

	Cement resistor thermostat	Enamel resistor thermostat
Model	1NT01L-0857L90-10	03EN A130 (S cap mounting bracket/#187 upright)
Operating temperature	90±3°C	130±4°C
Return temperature	80±4°C	115±4°C
Operation method	Contact B (normally closed)	Contact B (normally closed)
Contact rating	120VAC: 0.1 to 17A	120VAC: 1 to 15A
	240VAC: 0.1 to 17A	240VAC: 1 to 10A
Connecting terminal	Equivalent to #187, t = 0.5 (tab terminal)	Equivalent to #187, t = 0.5 (tab terminal)
Allowable tightening torque for the M4 nut	2.8N · m or less	1.0N · m or less

* The contract rating applies only to an AC circuit. The thermostat cannot be used in a DC circuit. If used in a DC circuit, the thermostat may not operate.

* The tightening torque for the M4 nut must not exceed the allowable tightening torque. If the allowable tightening torque is exceeded, the thermostat may be damaged.

12-4 Motor cooling blower electric specification

(1) 200VAC-device motor cooling blower

Table 12-32 200VAC-device motor cooling blower electric specification

Motor model	Input power supply						Power supply Number of poles
	200V/50Hz		200V/60Hz		220V/60Hz		
	Power consumption (W)	Rated current (A)	Power consumption (W)	Rated current (A)	Power consumption (W)	Rated current (A)	
NA100-110F/-10	23	0.14	24	0.13	28	0.14	3φ 2P
NA100-180F/-10	37	0.22	54	0.29	56	0.28	
NA100-270F/-10	37	0.22	54	0.29	56	0.28	
NA100-370F/-10	37	0.22	54	0.29	56	0.28	
NA100-550F/-10, -550AF	47	0.27	68	0.36	70	0.35	
NA100-750F/-10, -750AF	110	0.55	163	0.75	167	0.75	
NA100-1100F/-10, -1100AF	110	0.55	163	0.75	167	0.75	
NA20-1500/-10	620	2.0	650	2.0	700	2.0	
NA20-1800	620	2.0	650	2.0	700	2.0	
NA20-2200/-10	620	2.0	650	2.0	700	2.0	
NA20-2700/-10	620	2.0	650	2.0	700	2.0	
NA20-3700/-10	620	2.0	650	2.0	700	2.0	
NA720-153, -223	47	0.27	68	0.36	70	0.35	

(2) 400VAC-device motor cooling blower

Table 12-33 400VAC-device motor cooling blower electric specification

Motor model	Input power supply				Power supply Number of poles
	400V/50Hz		400V/60Hz		
	Power consumption (W)	Rated current (A)	Power consumption (W)	Rated current (A)	
NA20-2200-10HA	620	1.0	650	1.0	3ϕ 2P
NA20-2700-10HA/20HA	620	1.0	650	1.0	
NA20-3700-10HA	620	1.0	650	1.0	
NA20-5500-10HA	1500	3.3	1500	3.0	3ϕ 4P
NA20-1500-20HA	620	1.0	650	1.0	3ϕ 2P
NA20-1800-20HA	620	1.0	650	1.0	

12-5 Applicable motor list

12-5-1 Applicable motor list for τ motor type

(1) τ linear motor

When using 90° phase difference pulse encoder, set the value of P001 to L-SEN.

In case of using our interpolator unit (IPU), set the value of P001 to S-INC2.

Table 12-34 Select list of parameters applicable to τ linear motors (1/2)

Device capacity	Motor select		Applicable motor						
	P000	P001			P006	P007		P010	P011
	Setting value		Motor type	Rated thrust	Applicable maximum speed	Rated speed	Peak thrust	Magnetic pole sensor	
				[N]	[mm/s]	[mm/s]	[%]	Type	Offset [mm]
NCR-*DA1A1*-051 Capacity: 0.05kW Input voltage: 100V	001	L-SEN or S-INC2	NLA-7SL	7	3000.00	3000.00	300	1	28.50
	021	L-SEN or S-INC2	NLA-25AL	25	3000.00	3000.00	300	1	22.50
NCR-*DA1A1*-101 Capacity: 0.1kW Input voltage: 100V	002	L-SEN or S-INC2	NLA-13SL	13	3000.00	3000.00	300	1	28.50
	022	L-SEN or S-INC2	NLA-50AL	50	3000.00	3000.00	300	1	28.50
NCR-*DA1A1*-201 Capacity: 0.2kW Input voltage: 100V	023	L-SEN or S-INC2	NLA-100AL	100	3000.00	3000.00	290	1	28.50
NCR-*DA1A2*-101 Capacity: 0.1kW Input voltage: 200V	024	L-SEN or S-INC2	NLA-50AM	50	3000.00	3000.00	300	1	28.50
	061	L-SEN or S-INC2	NVA-AMA	23	3500.00	3000.00	300	2	0.00
	066	L-SEN or S-INC2	NVA-AMJ	13.8	3000.00	3000.00	300	0	0.00
	071	L-SEN or S-INC2	NVA-BMA	50	3500.00	3000.00	300	2	0.00
	091	L-SEN or S-INC2	NVA-DMA	30	3500.00	3000.00	300	2	0.00
NCR-*DA1A2*-201 Capacity: 0.2kW Input voltage: 200V	025	L-SEN or S-INC2	NLA-100AM	100	3000.00	3000.00	300	1	28.50
	041	L-SEN or S-INC2	NLA-100BM	100	3000.00	3000.00	300	1	28.50
	051	L-SEN or S-INC2	NLD-AM10	50	3000.00	3000.00	300	2	0.00
	062	L-SEN or S-INC2	NVA-AMB	45	3500.00	3000.00	300	2	0.00
	072	L-SEN or S-INC2	NVA-BMB	100	3500.00	3000.00	300	2	0.00
	092	L-SEN or S-INC2	NVA-DMB	60	3500.00	3000.00	300	2	0.00
NCR-*DA1A2*-401 Capacity: 0.4kW Input voltage: 200V	026	L-SEN or S-INC2	NLA-150AM	150	3000.00	3000.00	300	1	28.50
	042	L-SEN or S-INC2	NLA-200BM	200	3000.00	3000.00	290	1	28.50
	052	L-SEN or S-INC2	NLD-AM20	95	3000.00	3000.00	290	2	0.00
	063	L-SEN or S-INC2	NVA-AMC	68	3500.00	3000.00	300	2	0.00
	064	L-SEN or S-INC2	NVA-AMD	90	3500.00	3000.00	290	2	0.00
	073	L-SEN or S-INC2	NVA-BMC	150	3500.00	3000.00	300	2	0.00
	093	L-SEN or S-INC2	NVA-DMC	90	3500.00	3000.00	300	2	0.00
	101	L-SEN or S-INC2	NLA-250MM	250	2500.00	2500.00	290	2	0.00

(Note 1)

Applicable maximum speed indicates speed when using 1.0 μ m or 5.0 μ m sensor.

When using a sensor other than those above, use it with sensor feedback pulse of 25Mpps or less.

(Note 2)

When not using magnetic pole sensor, set magnetic pole sensor type to 0 (P010=0).

(Note 3)

For information about the settings of P010 and P011 if setting P001 to L-ABS, refer to " τ linear Servo Motor Options".

Table 12-35 Select list of parameters applicable to τ linear motors (2/2)

Device capacity	Motor select		Applicable motor						
	P000	P001			P006	P007		P010	P011
	Setting value		Motor type	Rated thrust	Applicable maximum speed	Rated speed	Peak thrust	Magnetic pole sensor	
				[N]	[mm/s]	[mm/s]	[%]	Type	Offset
NCR-*DA1A2*-801 Capacity: 0.8kW Input voltage: 200V	043 *49	L-SEN or S-INC2	NLA-300BM	300	3000.00	3000.00	280	1	28.50
	053 *49	L-SEN or S-INC2	NLD-AM30	150	3000.00	3000.00	300	2	0.00
	054 *49	L-SEN or S-INC2	NLD-AM40	200	3000.00	3000.00	250	2	0.00
	065 *49	L-SEN or S-INC2	NVA-AME	135	3500.00	3000.00	300	2	0.00
	074	L-SEN or S-INC2	NVA-BMD*50	200	3500.00	3000.00	300	2	0.00
	075 *49	L-SEN or S-INC2	NVA-BME*50	300	3500.00	3000.00	300	2	0.00
	076 *51	L-SEN or S-INC2	NVA-BMD*52	200	3500.00	3000.00	300	2	0.00
	077 *51	L-SEN or S-INC2	NVA-BME*52	300	3500.00	3000.00	300	2	0.00
	081 *53	L-SEN or S-INC2	NLD-FL30	320	3500.00	3000.00	300	2	0.00
	082 *53	L-SEN or S-INC2	NLD-FL40*49	480	3500.00	3000.00	250	2	0.00
	094	L-SEN or S-INC2	NVA-DMD	120	3500.00	3000.00	300	2	0.00
	095 *49	L-SEN or S-INC2	NVA-DME	180	3500.00	3000.00	280	2	0.00
	102 *49	L-SEN or S-INC2	NLA-500MM	500	2500.00	2500.00	250	2	0.00
	121 *49	L-SEN or S-INC2	NLA-500NM	500	3000.00	3000.00	250	2	0.00
NCR-*DA1A2*-152 Capacity: 1.5kW Input voltage: 200V	011	L-SEN or S-INC2	NVA-BLF	540	3000.00	3000.00	300	2	0.00
	083 *53	L-SEN or S-INC2	NLD-FL40	480	3500.00	3000.00	300	2	0.00
	084 *53	L-SEN or S-INC2	NLD-FL60	640	3500.00	3000.00	300	2	0.00
NCR-*DA1A2*-222 Capacity: 2.2kW Input voltage: 200V	012	L-SEN or S-INC2	NVA-BLG	720	3000.00	3000.00	300	2	0.00
	013	L-SEN or S-INC2	NVA-BLH	900	3000.00	3000.00	300	2	0.00
	085 *53	L-SEN or S-INC2	NLD-FL70	800	3500.00	3000.00	300	2	0.00
	086 *53	L-SEN or S-INC2	NLD-FL85	1000	3500.00	3000.00	300	2	0.00
	103	L-SEN or S-INC2	NLA-750MM	750	2500.00	2500.00	300	2	0.00
	122	L-SEN or S-INC2	NLA-1000NM	1000	3000.00	3000.00	300	2	0.00
NCR-*DA1A2*-402 Capacity: 4.0kW Input voltage: 200V	123	L-SEN or S-INC2	NLA-1500NM	1500	3000.00	3000.00	300	2	0.00

*49 When the servo driver should conform to UL standard, combination is impossible due to limit in rated current.

*50 For P000 in the "Motor select" column, set it for combination with the magnet base MBV-BM*00B (design class B or earlier).

*51 Supported by devices with SOFT VER 2.10 or later.

*52 For P000 in the "Motor select" column, set it for combination with the magnet base MBV-BM*00C (design class C or earlier).

*53 Supported by devices with SOFT VER 2.30 or later.

(2) Servo compass motor

When using 90° phase difference pulse encoder, set the value of P001 to L-SEN.

In case of using our interpolator unit (IPU), set the value of P001 to S-INC2.

Table 12-36 Select list of parameters applicable to servo compass motors

Device capacity	Motor select		Applicable motor						
	P000	P001			P006	P007		P010	P011
	Setting value		Motor type	Rated thrust	Applicable maximum speed	Rated speed	Peak thrust	Magnetic pole sensor	
				[N]	[deg/s]	[deg/s]	[%]	Type	Offset
NCR-*DA1A2*-401 Capacity: 0.4kW Input voltage: 200V	005 *54	L-SEN or S-INC2	NVA-CMC850	150	208.35	208.35	300	2	0.00
	008 *54	L-SEN or S-INC2	NLD-CN53C	120	965.66	965.66	300	2	0.00
	031	L-SEN or S-INC2	(NVA-CMC850)	150	208.35	208.35	300	2	0.00
	034	L-SEN or S-INC2	(NLD-CN53C)	120	965.66	965.66	300	2	0.00
	035 *54	L-SEN or S-INC2	(NVA-CMC850)	150	208.35	208.35	300	2	0.00
	038 *54	L-SEN or S-INC2	(NLD-CN53C)	120	965.66	965.66	300	2	0.00
NCR-*DA1A2*-801 Capacity: 0.8kW Input voltage: 200V	006 *54*55	L-SEN or S-INC2	NVA-CME850	300	208.35	208.35	300	2	0.00
	007 *54*55	L-SEN or S-INC2	NVA-CME1550	300	112.71	112.71	300	2	0.00
	032 *54*55	L-SEN or S-INC2	(NVA-CME850)	300	208.35	208.35	300	2	0.00
	033 *54*55	L-SEN or S-INC2	(NVA-CME1550)	300	112.71	112.71	300	2	0.00
	036 *54*55	L-SEN or S-INC2	(NVA-CME850)	300	208.35	208.35	300	2	0.00
	037 *54*55	L-SEN or S-INC2	(NVA-CME1550)	300	112.71	112.71	300	2	0.00

Note) The applicable maximum speed and the rated speed can be determined as below.

◎When P001 = L-SEN: The lower one of the values determined as below.

$$= 3000[\text{mm/s}] \div (\text{Installation radius (P159)}[\text{mm}] \times 2\pi) \times 360[\text{deg}]$$

$$= 25[\text{Mbps}] \div (\text{Installation radius (P159)}[\text{mm}] \times 2\pi \div \text{Sensor resolution (P003)}[\mu\text{m}]) \times 360[\text{deg}]$$

[Example] If the installation radius (P159) = 825[mm] and the sensor resolution (P003) = 0.5[μm]

From the calculation results below, 208.35[deg/s].

$$= 3000[\text{mm/s}] \div (825[\text{mm}] \times 2\pi) \times 360[\text{deg}] = 208.35[\text{deg/s}]$$

$$= 25[\text{Mbps}] \div (825[\text{mm}] \times 2\pi \div 0.5[\mu\text{m}]) \times 360[\text{deg}] = 868.12[\text{deg/s}]$$

◎When P001 = S-INC2:

$$= 1600[\text{mm/s}] \div (\text{Installation radius (P159)}[\text{mm}] \times 2\pi) \times 360[\text{deg}]$$

[Example] If the installation radius (P159) = 825[mm]

From the calculation results below, 111.12[deg/s].

$$= 1600[\text{mm/s}] \div (825[\text{mm}] \times 2\pi) \times 360[\text{deg}] = 111.12[\text{deg/s}]$$

*54 From the setting value of P000, the setting units of P146 (mass/inertia) and P147 (viscous friction) are as below.

- If P000 = "031 to 034", mass (10^{-4}kg) and viscous friction ($10^{-4}\text{N} \cdot \text{m/s}$).
- If the number is not any of the above, inertia ($10^{-4}\text{kg} \cdot \text{m}^2$) and viscous friction ($10^{-4}\text{N} \cdot \text{m/rad/s}$).
- If P000 = "031 to 038", the motor has an old-style combination number. To newly adopt such a motor, use it with P000 = "005 to 008" (supported by devices with SOFT VER 2.50 or later).

*55 When the servo driver should conform to UL standard, combination is impossible due to limit in rated current.

Data

(3) τ DISC motor

(Note 1) About magnetic pole sensor

When using special τ DISC servo motor that is not listed here due to special specification, contact our sales representative, and set magnetic pole sensor type (P010) and magnetic pole sensor offset (P011).

Table 12-37 Select list of parameters applicable to τ DISC motors (1/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset
NCR-*DA1A1*-101 Capacity: 0.1kW Input voltage: 100V	211	C-SEN2	NMR-CAEIA2*-071 ^{*56}	2.4	3	180	300	2	0.00
	212	C-SEN2	NMR-CAEIA2*-071 ^{*56}	2.4	5	300	300	2	0.00
		S-INC2	NMR-CAEGA2*-071					2	
		S-ABS2	NMR-CAEHA2*-071					0	
	263 ^{*57}	^{*58}	NMR-FADBA2*-061	2.0	5	300	300	0 ^{*59}	0.00
	281	^{*58}	NMR-NAMBA2*-071	2.4	5	300	300	0 ^{*59}	0.00
	283 ^{*60}	C-SEN2	NMR-SAEIA1*-101A	3.0	5	300	250	2	0.00
		S-ABS2	NMR-SAEJA1*-101A NMR-SAEJA1*-101A-UC					0	
NCR-*DA1A1*-201 Capacity: 0.2kW Input voltage: 100V	207 ^{*57}	^{*58}	NMR-FDDBA2*-201 NMR-FSDBA2*-201	7.5	5	300 ^{*61}	300	2 ^{*59}	0.00
	213	C-SEN2	NMR-CAUIA2*-151 ^{*56}	4.8	3	180	290	2	0.00
	214	C-SEN2	NMR-CAUIA2*-151 ^{*56}	4.8	5	300	290	2	0.00
		S-INC2	NMR-CAUGA2*-151					2	
		S-ABS2	NMR-CAUHA2*-151					0	
	215	C-SEN2	NMR-CREIA2*-151 ^{*56}	4.8	3	180	300	2	0.00
	216	C-SEN2	NMR-CREIA2*-151 ^{*56}	4.8	5	300	300	2	0.00
		S-INC2	NMR-CREGA2*-151					2	
		S-ABS2	NMR-CREHA2*-151					0	
	264 ^{*57}	^{*58}	NMR-FAEBA2*-121 NMR-FPEBA2*-121	4.0	5	300	300	0 ^{*59}	0.00
	285 ^{*60}	C-SEN2	NMR-SAUJA1*-181A	5.9	5	300	250	2	0.00
		S-ABS2	NMR-SAUJA1*-181A NMR-SAUJA1*-181A-UC					0	
	288 ^{*60}	C-SEN2	NMR-SAEIA1*-101A	3.4	5	300	250	2	0.00
		S-ABS2	NMR-SAEJA1*-101A NMR-SAEJA1*-101A-UC					0	
	321	S-INC2	NMR-NDMGA2*-201	9.0	5	300	300	2	0.00
NCR-*DA1A2*-201 Capacity: 0.2kW Input voltage: 200V	231	C-SEN2	NMR-CAEIA2*-071 ^{*56}	2.4	3	180	300	2	0.00
	232	C-SEN2	NMR-CAEIA2*-071 ^{*56}	2.4	5	300	300	2	0.00
		S-INC2	NMR-CAEGA2*-071					2	
		S-ABS2	NMR-CAEHA2*-071					0	
	261	^{*58}	NMR-FADBA2*-061 NMR-FPDBA2*-061 NMR-FADBA2*-061-UC NMR-FBDBA2*-061-UC NMR-FPDBA2*-061-UC	2.0	5	300	300	2	0.00

^{*56} Select a motor type (P000) with rated speed of 3[rps] for the motor of 1,280,000 encoder pulses and a motor type (P000) with rated speed of 5[rps] for the motor of 640,000 encoder pulses.

^{*57} When using the device with this motor number, "Decreased rating" is applied. For details, contact our sales representative.

^{*58} For encoder type (P001) setting, please refer to Table 12-44 τ DISC encoder model.

^{*59} If the setting of the encoder type (P001) is [S-ABS2] or [S-ABS3], set "0".

^{*60} Supported by devices with SOFT VER 2.42 or later.

^{*61} The applicable maximum number of rotations differs depending on the encoder resolution. Contact our sales representative.

Table 12-38 Select list of parameters applicable to τ DISC motors (2/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset [mm]
NCR-*DA1A2*-201	282	*62	NMR-NAMBA2*-071	2.4	5	300	300	0*63	0.00
Capacity: 0.2kW Input voltage: 200V	284 *64	C-SEN2	NMR-SAEIA2*-131A	4.2	5	300	250	2	0.00
		S-ABS2	NMR-SAEJA2*-131A NMR-SAEJA2*-131A-UC					0	
NCR-*DA1A2*-401	201	C-SEN2	NMR-FDDB	7.5	5	300	300	1	0.00
Capacity: 0.4kW Input voltage: 200V	205	*62	NMR-FDDBA2*-201 NMR-FSDBA2*-201	7.5	5	300*65	300	2*63	0.00
	221	C-SEN2	NMR-FEDB	20.7	3	180	290	1	0.00
	223	*62	NMR-FEDBA2*-401 NMR-FTDBA2*-401	20.7	3	180*65	290	2*63	0.00
	233	C-SEN2	NMR-CAUIA2*-151*66	4.8	3	180	290	2	0.00
	234	C-SEN2	NMR-CAUIA2*-151*66	4.8	5	300	290	2	0.00
		S-INC2	NMR-CAUGA2*-151					2	
		S-ABS2	NMR-CAUHA2*-151					0	
	235	C-SEN2	NMR-CREIA2*-151*66	4.8	3	180	300	2	0.00
	236	C-SEN2	NMR-CREIA2*-151*66	4.8	5	300	300	2	0.00
		S-INC2	NMR-CREGA2*-151					2	
		S-ABS2	NMR-CREHA2*-151					0	
	262	*62	NMR-FAEBA2*-121 NMR-FPEBA2*-121	4.0	5	300	300	0*63	0.00
	286 *67	C-SEN2	NMR-SAUJA2*-221A	7.1	5	300	246*68 (250)	2	0.00
		S-ABS2	NMR-SAUJA2*-221A NMR-SAUJA2*-221A-UC					0	
	287 *69	C-SEN2	NMR-SAUJA2*-551A	5.9	15	900	240	2	0.00
	314 *67	C-SEN2	NMR-SREIA2*-301A	9.6	5	300	229*68 (250)	2	0.00
			NMR-SCEIA2*-301A						
		S-ABS2	NMR-SREJA2*-301A NMR-SCEJA2*-301A					0	
	322 *70	C-SEN2	NMR-CSMIA2*-281	9.0	5	300	300	2	0.00
		S-INC2	NMR-NDMGA2*-201 NMR-NDMGA2*-281-CE NMR-CSMGA2*-281					2	
		S-ABS2	NMR-CSMHA2*-281					0	
	331 *71	S-INC2	NMR-NEMGA2*-401	21.5	3	180	300	2	0.00
		S-ABS2	NMR-NEMHA2*-401					0	
	333	S-INC2	NMR-NEMGA2*-501-CE	19.5	3	180	290	2	0.00
		S-ABS2	NMR-NEMHA2*-501-CE					0	

*62 For encoder type (P001) setting, please refer to Table 12-44 τ DISC encoder model.

*63 If the setting of the encoder type (P001) is [S-ABS2] or [S-ABS3], set "0".

*64 Supported by devices with SOFT VER 2.40 or later.

*65 The applicable maximum number of rotations differs depending on the encoder resolution. Contact our sales representative.

*66 Select a motor type (P000) with rated speed of 3[rps] for the motor of 1,280,000 encoder pulses and a motor type (P000) with rated speed of 5[rps] for the motor of 640,000 encoder pulses.

*67 Supported by devices with SOFT VER 2.40 or later.

*68 The upper value indicated without parentheses is the instantaneous maximum torque of the motor. The lower value indicated with parentheses is the torque command value (ST10) on the display.

*69 Supported by devices with SOFT VER 2.42 or later.

*70 Supported by devices with SOFT VER 2.10 or later.

*71 When using the device with this motor number, "Decreased rating" is applied. For details, contact our sales representative.

Table 12-39 Select list of parameters applicable to τ DISC motors (3/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset
									[mm]
NCR-*DA1A2*-401 Capacity: 0.4kW Input voltage: 200V	351	*72	NMR-NPEBA2*-201	7.0	5	300	290	0	0.00
	394 *73	C-SEN2	DD16-251L04ANN	10.0	4	240	230	2	0.00
		S-ABS2	DD16-251L04CNN DD16-251F04CNN					0	
NCR-*DA1A2*-801 Capacity: 0.8kW Input voltage: 200V	203	*72	NMR-FDFB	22.5	5	300	300	1*74	0.00
	206	*72	NMR-FDFBA2*-701 NMR-FSFBA2*-701 NMR-FDFBA2*701-UC NMR-FSFBA2*-701-UC	22.5	5	300*75	300	2*74	0.00
	237	C-SEN2	NMR-CRFIA2*-311*76	9.6	3	180	300	2	0.00
	238	C-SEN2	NMR-CRFIA2*-311*76	9.6	5	300	300	2	0.00
		S-INC2	NMR-CRFGA2*-311					2	
		S-ABS2	NMR-CRFHA2*-311					0	
	241 *77	*72	NMR-FFDB	67	2	120*75	200	1*74	0.00
	243 *77	*72	NMR-FFDBA2*-801 NMR-FUDBA2*-801	67	2	120*75	200	2*74	0.00
	251 *78	C-SEN2	NMR-CSEIA2*-561	18	5	300	300	2	0.00
		S-INC2	NMR-CSEGA2*-561					2	
		S-ABS2	NMR-CSEHA2*-561					0	
	252 *78	C-SEN2	NMR-CTFIA2*-841	45	3	180	250	2	0.00
		S-INC2	NMR-CTFGA2*-841					2	
		S-ABS2	NMR-CTFHA2*-841					0	
	289 *79	C-SEN2	NMR-SAUIA2*-551A	8.0	15	900	240	2	0.00
	311 *77	*72	NMR-FCHBA2*-661 NMR-FRHBA2*-661	21	5	300	280	0*74	0.00
	315 *79	C-SEN2	NMR-SREIA2*-661A	9.6	11	660	230	2	0.00
	316 *80	C-SEN2	NMR-SRFIA2*-471A	15	5	300	247*81 (250)	2	0.00
		S-ABS2	NMR-SRFJA2*-471A					0	
	318 *79	C-SEN2	NMR-FRHIA2*-102 NMR-FCHIA2*-102	27.0	6	360	250	0	0.00

*72 For encoder type (P001) setting, please refer to Table 12-44 τ DISC encoder model.

*73 Supported by devices with SOFT VER 2.51 or later.

*74 If the setting of the encoder type (P001) is [S-ABS2] or [S-ABS3], set "0".

*75 The applicable maximum number of rotations differs depending on the encoder resolution. Contact our sales representative.

*76 Select a motor type (P000) with rated speed of 3[rps] for the motor of 1,280,000 encoder pulses and a motor type (P000) with rated speed of 5[rps] for the motor of 640,000 encoder pulses.

*77 When the servo driver should conform to UL standard, combination is impossible due to limit in rated current.

*78 Supported by devices with SOFT VER 2.10 or later.

*79 Supported by devices with SOFT VER 2.42 or later.

*80 Supported by devices with SOFT VER 2.40 or later.

*81 The upper value indicated without parentheses is the instantaneous maximum torque of the motor. The lower value indicated with parentheses is the torque command value (ST10) on the display.

Table 12-40 Select list of parameters applicable to τ DISC motors (4/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset
NCR-*DA1A2*-801 Capacity: 0.8kW Input voltage: 200V	323 *82	C-SEN2	NMR-SSMIA2*-531A	17	5	300	235	2	0.00
			NMR-SDMIA2*-531A						
		S-ABS2	NMR-SSMJA2*-531A					0	
			NMR-SDMJA2*-531A						
	324 *82	C-SEN2	NMR-SSEIA2*-941A	30	5	300	250	2	0.00
		S-ABS2	NMR-SSEJA2*-941A					0	
	332 *83	C-SEN2	NMR-CTEIA2*-501	27	3	180	300	2	0.00
		S-INC2	NMR-NEMGA2*-401					2	
			NMR-CTEGA2*-501						
		S-ABS2	NMR-NEMHA2*-401					0	
	334	S-INC2	NMR-NEMGA2*-501-CE	24.5	3	180	300	2	0.00
		S-ABS2	NMR-NEMHA2*-501-CE					0	
	335 *82	C-SEN2	NMR-STEIA2*-791A	42	3	180	240	2	0.00
			NMR-SEMIA2*-791A						
		S-ABS2	NMR-SEMJA2*-791A					0	
			NMR-STEJA2*-791A						
	341 *83,84	C-SEN2	NMR-CUEIA2*-951	76	2	120	250	2	0.00
		S-INC2	NMR-NFMGA2*-801						
			NMR-NFMGA2*-951-CE					2	
		S-ABS2	NMR-CUEGA2*-951					0	
	349 *85	S-ABS2	NMR-NFMHA2*-801	16.0	5	300	235*86 (236)		0.00
			NMR-NFMHA2*-951-CE					0	
	391 *87	C-SEN2	NMR-SDMJA2*-501-UC	42.0	2	120	238	2	0.00
		S-ABS2	NMR-SSMJA2*-501-UC					0	
	395 *88	C-SEN2	DD25-521L02ANN	27.0	4	240	232	2	0.00
		S-ABS2	DD25-521L02CNN					0	
		C-SEN2	DD16-681L04ANN					2	0.00
		S-ABS2	DD16-681L04CNN					0	

*82 Supported by devices with SOFT VER 2.40 or later.

*83 Supported by devices with SOFT VER 2.10 or later.

*84 When the servo driver should conform to UL standard, combination is impossible due to limit in rated current.

*85 Supported by devices with SOFT VER 2.61 or later.

*86 The upper value indicated without parentheses is the instantaneous maximum torque of the motor.
The lower value indicated with parentheses is the torque command value (ST10) on the display.

*87 Supported by devices with SOFT VER 2.50 or later.

*88 Supported by devices with SOFT VER 2.51 or later.

Table 12-41 Select list of parameters applicable to τ DISC motors (5/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset
NCR-*DA1A2*-152 Capacity: 1.5kW Input voltage: 200V	222	*89	NMR-FEFB	62	3	180	300	1*90	0.00
	224	*89	NMR-FEFBA2*-122 NMR-FTFBA2*-122 NMR-FEFBA2*-122-UC NMR-FTFBA2*-122-UC	62	3	180*91	300	2*90	0.00
	254	*89	NMR-CUGHA2*-162	76	3.34	200	250	0*90	0.00
	265 *92	C-SEN2	NMR-FAHIA2*-152A	14.4	16	960	220	2	0.00
	312	*89	NMR-FCIBA2*-751 NMR-FRIBA2*-751	24	5	300	280	0*90	0.00
	313	*89	NMR-FRHBA2*-112	24	7.5	450	263	0*90	0.00
	327 (317) *93,94	C-SEN2	NMR-SRFIA2*-102A	15.0	11	660	240	2	0.00
	329 (319) *93,94	C-SEN2	NMR-FRIIA2*-122	36.0	5.5	330	278	0	0.00
	320 *95	*89	NMR-FRHBA2*-112*G	27.5	7.5	450	229	0	0.00
	337 (336) *93, 94	C-SEN2	NMR-STFIA2*-152A	80	3	180	240	2	0.00
		S-ABS2	NMR-STFJA2*-152A					0	
	350 *96	C-SEN2	NMR-STFIA2*-142-UC	75.5	3	180	237*97 (238)	2	0.00
		S-ABS2	NMR-STFJA2*-142-UC					0	
	352 (392) *93, 94	C-SEN2	DD25-102L02ANN	80.0	2	120	238	2	0.00
		S-ABS2	DD25-102L02CNN					0	
	353 (393) *93, 94	C-SEN2	DD25-152L02ANN	120.0	2	120	250	2	0.00
		S-ABS2	DD25-152L02CNN					0	
	361	S-INC2	NMR-NSFGA2*-701 NMR-NSFGA2*-851-CE	27	5	300	300	2	0.00
	371 *98	S-INC2	NMR-NTFGA2*-122	67	3	180	300	2	0.00
		S-ABS2	NMR-NTFHA2*-122					0	
	373	S-INC2	NMR-NTFGA2*-142-CE	64	3	180	300	2	0.00
		S-ABS2	NMR-NTFHA2*-142-CE					0	

*89 For encoder type (P001) setting, please refer to Table 12-44 τ DISC encoder model.

*90 If the setting of the encoder type (P001) is [S-ABS2] or [S-ABS3], set "0".

*91 The applicable maximum number of rotations differs depending on the encoder resolution. Contact our sales representative.

*92 Supported by devices with SOFT VER 2.42 or later.

*93 Supported by devices with SOFT VER 2.54 or later.

*94 If using the number indicated with parentheses, continue to use it.

*95 Supported by devices with SOFT VER 2.50 or later.

*96 Supported by devices with SOFT VER 2.61 or later.

*97 The upper value indicated without parentheses is the instantaneous maximum torque of the motor.

The lower value indicated with parentheses is the torque command value (ST10) on the display.

*98 When using the device with this motor number, "Decreased rating" is applied. For details, contact our sales representative.

Table 12-42 Select list of parameters applicable to τ DISC motors (6/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset
NCR-*DA1A2*-222 Capacity: 2.2kW Input voltage: 200V	208	*99	NMR-FSNBA2*-202	53	6	360	290	2*100	0.00
	242	*99	NMR-FFFB	200	2	120*101	200	1*100	0.00
	244	*99	NMR-FFFBA2*-252 NMR-FUFBA2*-252	200	2	120*101	200	2*100	0.00
	253 *102	C-SEN2	NMR-CUFIA2*-192	152	2	120	250	2	0.00
		S-INC2	NMR-CUFGA2*-192					2	
		S-ABS2	NMR-CUFHA2*-192					0	
	255	*99	NMR-CUGHA2*-152	250	1	60	240	0*100	0.00
	256	*99	NMR-CUGHA2*-272	215	2	120	280	0*100	0.00
	303	*99	NMR-FFFBA2*-252-UC NMR-FUFBA2*-252-UC	200	2	120	200	2	0.00
	328 (326) *103,104	C-SEN2	NMR-FSJIA2*-252A	68.0	6	360	210	2	0.00
	346 (343) *103,104	C-SEN2	NMR-SUEIA2*-182A	150	2	120	200*105 (220)	2	0.00
			NMR-SFEIA2*-182A						
		S-ABS2	NMR-SUEJA2*-182A					0	
			NMR-SFEJA2*-182A						
	372	S-INC2	NMR-NTFGA2*-122	82	3	180	300	2	0.00
		S-ABS2	NMR-NTFHA2*-122					0	
	374	S-INC2	NMR-NTFGA2*-142-CE	75	3	180	300	2	0.00
		S-ABS2	NMR-NTFHA2*-142-CE					0	
	381	S-INC2	NMR-NUFGA2*-252	215	2	120	280	2	0.00
		S-ABS2	NMR-NUFHA2*-252					0	
		S-INC2	NMR-NUFGA2*-272-CE					2	
		S-ABS2	NMR-NUFHA2*-272-CE					0	

*99 For encoder type (P001) setting, please refer to Table 12-44 τ DISC encoder model.

*100 If the setting of the encoder type (P001) is [S-ABS2] or [S-ABS3], set "0".

*101 The applicable maximum number of rotations differs depending on the encoder resolution. Contact our sales representative.

*102 Supported by devices with SOFT VER 2.10 or later.

*103 Supported by devices with SOFT VER 2.54 or later.

*104 If using the number indicated with parentheses, continue to use it.

*105 The upper value indicated without parentheses is the instantaneous maximum torque of the motor. The lower value indicated with parentheses is the torque command value (ST10) on the display.

Table 12-43 Select list of parameters applicable to τ DISC motors (7/7)

Device capacity	Motor select		Applicable motor						
	P000	P001				P005		P010	P011
	Setting value		Motor type	Rated torque	Rated speed	Applicable maximum speed	Peak output	Magnetic pole sensor	
				[N·m]	[rps]	[rpm]	[%]	Type	Offset
NCR-*DA1A2*-402 Capacity: 4.0kW Input voltage: 200V	271	*106	NMR-FVGBA2*-322	500	1	60	200	2*107	0.00
	291	*106	NMR-FTJBA2*-302	115	4.16	250	300	2*107	0.00
	301	*106	NMR-FUIBA2*-212	500	0.67	40	200	2*107	0.00
	347 (344) *108,109	C-SEN2	NMR-SUFIA2*-322A	260	2	120	250	2	0.00
		S-ABS2	NMR-SUFJA2*-322A NMR-SUFJA2*-322A-UC					0	
	356 (396) *108,109	S-ABS2	DD40-322L02CNN	260	2	120	250	0	0.00
NCR-*DA1A2*-752 Capacity: 7.5kW Input voltage: 200V	302	*106	NMR-FUIBA2*-472 NMR-NUIHA2*-472	500	1.5	90	200	2*107	0.00
	348 (345) *108,109	C-SEN2	NMR-SUHIA2*-622A	500	2	120	200	2	0.00
		S-ABS2	NMR-SUHJA2*-622A					0	
	355 *110	S-ABS2	DD40-472L01CNN	750	1	60	227*111 (253)	0	0.00
	399 *108	S-ABS2	DD40-622L02CNN	500	2	120	200*111 (212)	0	0.00
NCR-*DA1A2*-113 Capacity: 11.0kW Input voltage: 200V	257	*106	NMR-CUGHA2*-652	250	4.17	250	228	0*107	0.00
	272	*106	NMR-FVIBA2*-672	1000	1	60	200	2*107	0.00
	273	*106	NMR-FVKBA2*-872	1500	1	60	200	2*107	0.00
	342	*106	NMR-NUIGA2*-862	450	3	180	200	2*107	0.00
		106	NMR-NUIHA2-862					0*107	
	357 (397) *108,109	S-ABS2	DD40-622L02CNN	500	2	120	250*111 (280)	0	0.00
	359 *112	S-ABS2	DD63-842L01HNN	1350	1	60	185*111 (200)	0	0.00
		S-ABS3	DD63-842L01CNN						
NCR-*DA1A2*-153 Capacity: 15.0kW Input voltage: 200V	358 (398) *108,109	S-ABS2	DD40-702L01CNN	750	1.5	90	233*111 (260)	0	0.00
	360 *112	S-ABS2	DD63-123L01HNN	2000	1	60	185*111 (200)	0	0.00
		S-ABS3	DD63-123L01CNN						
NCR-*DA1A2*-203 Capacity: 20.0kW Input voltage: 200V	274	*106	NMR-FGPHA2*-133	3000	0.67	40	193	0*107	0.00

*106 For encoder type (P001) setting, please refer to Table 12-44 τ DISC encoder model.

*107 If the setting of the encoder type (P001) is [S-ABS2] or [S-ABS3], set "0".

*108 Supported by devices with SOFT VER 2.54 or later.

*109 If using the number indicated with parentheses, continue to use it.

*110 Supported by devices with SOFT VER 2.61 or later.

*111 The upper value indicated without parentheses is the instantaneous maximum torque of the motor.
The lower value indicated with parentheses is the torque command value (ST10) on the display.

*112 Supported by devices with SOFT VER 2.57 or later.

Table 12-44 τ DISC encoder model

Encoder model	P001: Encoder type
NSR-RA****	C-SEN2
NSR-RB****	C-SEN2
NSR-RC****	C-SEN2
NSR-RD****	C-SEN2
NSR-RE****	C-SEN2
NSR-RF****	C-SEN2
NSR-RG****	S-INC2
NSR-RH****	S-INC2
NSR-RJ****	C-SEN2
NSR-RK****	C-SEN2
NSR-RL****	S-INC2* ¹¹³
NSR-RP****	S-ABS2* ¹¹⁴
NSR-RQ****	S-INC2
NSR-RR****	S-INC2
NSR-RS****	C-SEN2
NSR-RV****	S-ABS2* ¹¹⁴
NSR-RPSNAPAAA**	S-ABS3* ¹¹⁴
NSR-NAC***	S-ABS4* ¹¹⁴

C-SEN2 ... τ DISC motor, with marker

S-INC2 ... Serial incremental 2 (IPU)

S-ABS2 ... Serial absolute 2 (IPU)

S-ABS3 ... Serial absolute 3 (IPU)

S-ABS4 ... Serial absolute 4 (IPU)

*¹¹³ In case of using our IPU

*¹¹⁴ To use it as an absolute encoder, set [1] in P412.

Data

12-5-2 Applicable motor list for SM motor type

(Note 1)

In NA80/NA820/NA830 motor, only "ABS/INC compatible" encoder (encoder type "D" product in motor model) is usable.

Table 12-45 Select list of parameters applicable to SM motors (1/3)

Device capacity	P000	P001	Applicable motor			
	Setting value		Motor type	Rated output	Rated rotation speed	Peak output
				[kW]	[rpm]	[%]
NCR-*DB1A1*-051 Capacity: 0.05kW Input voltage: 100V	701	INC3	NA70-05*Z	0.05	3000	300
	704	S-INC or S-ABS	NA80-05*DZ	0.05	3000	300
		INC3	NA80-05*AZ			
NCR-*DB1A1*-101 Capacity: 0.1kW Input voltage: 100V	702	INC3	NA70-10*Z	0.1	3000	300
	705	S-INC or S-ABS	NA80-10*DZ	0.1	3000	300
		INC3	NA80-10*AZ			
NCR-*DB1A1*-201 Capacity: 0.2kW Input voltage: 100V	703	INC3	NA70-20*L	0.2	3000	300
	706	S-INC or S-ABS	NA80-20*DL	0.2	3000	300
		INC3	NA80-20*AL			
NCR-*DB1A2*-101 Capacity: 0.1kW Input voltage: 200V						
NCR-*DB1A2*-201 Capacity: 0.2kW Input voltage: 200V	601	INC3	NA70-10*Z	0.1	3000	300
	602	INC3	NA70-20*M	0.2	3000	300
	603	S-INC or S-ABS	NA80-10*DZ	0.1	3000	300
		INC3	NA80-10*AZ			
	604	S-INC or S-ABS	NA80-20*DM	0.2	3000	300
		INC3	NA80-20*AM			
NCR-*DB1A2*-401 Capacity: 0.4kW Input voltage: 200V	611	INC3	NA70-40*M	0.4	3000	300
	614	S-INC or S-ABS	NA80-40*DM	0.4	3000	300
		INC3	NA80-40*AM			
		INC3				
NCR-*DB1A2*-801 Capacity: 0.8kW Input voltage: 200V	612	INC3	NA70-60*M	0.6	3000	300
	613	INC3	NA70-80*M	0.8	3000	300
	615	S-INC or S-ABS	NA80-75*DM	0.75	3000	300
		INC3	NA80-75*AM			
	616	S-INC or S-ABS	NA80-60*DM	0.6	3000	300
		INC3	NA80-60*AM			

Table 12-46 Select list of parameters applicable to SM motors (2/3)

Device capacity	P000	P001	Applicable motor			
	Setting value		Motor type	Rated output	Rated rotation speed	Peak output
				[kW]	[rpm]	[%]
NCR-*DB1A2*-152 Capacity: 1.5kW Input voltage: 200V	621	INC3	NA720-122	1.2	2000	300
	622	S-INC or S-ABS	NA830-162*DM	1.6	3000	300
		INC3	NA830-162*AM			
NCR-*DB1A2*-222 Capacity: 2.2kW Input voltage: 200V	631	INC3	NA720-122	1.2	2000	300
	632	S-INC or S-ABS	NA830-162*DM	1.6	3000	300
		INC3	NA830-162*AM			
	641	INC3	NA720-182	1.8	2000	299
	642	INC3	NA720-242	2.4	2000	300
NCR-*DB1A2*-402 Capacity: 4.0kW Input voltage: 200V	651	INC3	NA720-242	2.4	2000	300
	652	INC3	NA720-402	4.0	2000	250
	653	S-INC or S-ABS	NA830-332*DM	3.3	3000	300
		INC3	NA830-332*AM			
	654	S-INC or S-ABS	NA820-402*DM	4.0	2000	250
		INC3	NA820-402*AM			
NCR-*DB1A2*-752 Capacity: 7.5kW Input voltage: 200V	664	S-INC or S-ABS	NA820-602*DM	6.0	2000	250
		INC3	NA820-602*AM			
	665	S-INC or S-ABS	NA820-752*DM	7.5	2000	200
		INC3	NA820-752*AM			
NCR-*DB1A2*-113 Capacity: 11.0kW Input voltage: 200V	672	S-INC or S-ABS	NA820-113*DM	11.0	2000	200
		INC3	NA820-113*AM			
NCR-*DB1A2*-153 Capacity: 15.0kW Input voltage: 200V	682	S-INC or S-ABS	NA820-153*DM	15.0	2000	200
		INC3	NA820-153*AM			
	683	S-INC or S-ABS	NA815-113*DM	11.0	1500	230
		INC3	NA815-113*AM			
NCR-*DB1A2*-203 Capacity: 20.0kW Input voltage: 200V	694	S-INC or S-ABS	NA815-203*DM	20.0	1500	200
		INC3	NA815-203*AM			
NCR-*DB1A2*-303 Capacity: 30.0kW Input voltage: 200V	695 (692) *115,116	S-INC or S-ABS	NA815-293*DM	29.0	1500	200
		INC3	NA815-293*AM			
NCR-*DB1A2*-373 Capacity: 37.0kW Input voltage: 200V	693	S-INC or S-ABS	NA815-373*DM	37.0	1500	200
		INC3	NA815-373*AM			

*115 Supported by devices with SOFT VER 2.61 or later.

*116 If using the number indicated with parentheses, continue to use it.

Table 12-47 Select list of parameters applicable to SM motors (3/3)

Device capacity	P000	P001	Applicable motor			
	Setting value		Motor type	Rated output	Rated rotation speed	Peak output
				[kW]	[rpm]	[%]
NCR-*DB1A3*-262 Capacity: 2.6kW Input voltage: 400V	742	INC3	NA820-162*AH	1.6	2000	300
	743	INC3	NA820-222*AH	2.2	2000	300
	744	INC3	NA820-262*AH	2.6	2000	300
	746	S-INC or S-ABS	NA830-162*DH	1.6	3000	300
		INC3	NA830-162*AH			
NCR-*DB1A3*-402 Capacity: 4.0kW Input voltage: 400V	751	S-INC or S-ABS	NA820-402*DH	4.0	2000	250
		INC3	NA820-402*AH			
	752	S-INC or S-ABS	NA830-332*DH	3.3	3000	300
		INC3	NA830-332*AH			
NCR-*DB1A3*-752 Capacity: 7.5kW Input voltage: 400V	761	S-INC or S-ABS	NA820-752*DH	7.5	2000	200
		INC3	NA820-752*AH			
	762	S-INC or S-ABS	NA820-602*DH	6.0	2000	250
		INC3	NA820-602*AH			
NCR-*DB1A3*-113 Capacity: 11.0kW Input voltage: 400V	771	S-INC or S-ABS	NA820-113*DH	11.0	2000	200
		INC3	NA820-113*AH			
NCR-*DB1A3*-153 Capacity: 15.0kW Input voltage: 400V	781	S-INC or S-ABS	NA820-153*DH	15.0	2000	200
		INC3	NA820-153*AH			
NCR-*DB1A3*-203 Capacity: 20.0kW Input voltage: 400V	782	S-INC or S-ABS	NA815-203*DH	20.0	1500	200
		INC3	NA815-203*AH			
NCR-*DB1A3*-373 Capacity: 37.0kW Input voltage: 400V	721	S-INC or S-ABS	NA815-373*DH	37.0	1500	200
		INC3	NA815-373*AH			
	723	S-INC or S-ABS	NA815-293*DH	29.0	1500	200
		INC3	NA815-293*AH			
NCR-*DB1A3*-553 Capacity: 55.0kW Input voltage: 400V	722	S-INC or S-ABS	NA815-553*DH	55.0	1500	200
		INC3	NA815-553*AH			

12-5-3 Applicable motor list for IM motor type

Table 12-48 Select list of parameters applicable to IM motors (1/2)

Device capacity	P000	P001	Applicable motor			
	Setting value		Motor type	Rated output	Rated rotation speed	Peak output
				[kW]	[rpm]	[%]
NCR-*DC1A2*-201 Capacity: 0.2kW Input voltage: 200V	401	INC1* ¹¹⁷	NA30-13F-15	0.2	1500	300
NCR-*DC1A2*-401 Capacity: 0.4kW Input voltage: 200V	411	INC1* ¹¹⁷	NA30-25F-15	0.4	1500	300
NCR-*DC1A2*-801 Capacity: 0.8kW Input voltage: 200V	412	INC1* ¹¹⁷	NA100-20F	0.6	3000	300
	413* ¹¹⁸	INC1* ¹¹⁷	NA100-40F	0.8	2000	300
	414* ¹¹⁸	INC1* ¹¹⁷	NA100-75F-10	0.8	1000	300
	415* ¹¹⁸	INC1* ¹¹⁷	NA30-50F-15	0.8	1500	300
NCR-*DC1A2*-122 Capacity: 1.2kW Input voltage: 200V						
NCR-*DC1A2*-222 Capacity: 2.2kW Input voltage: 200V	431	INC1* ¹¹⁷	NA100-110F-10	1.2	1000	200
	441	INC1* ¹¹⁷	NA100-180F-10	1.9	1000	300
	442	INC1* ¹¹⁷	NA30-110F-15	1.6	1500	300
	443	INC1* ¹¹⁷	NA100-75F	1.5	2000	300
	451	INC1* ¹¹⁷	NA100-110F	2.2	2000	300
NCR-*DC1A2*-402 Capacity: 4.0kW Input voltage: 200V	452	INC1* ¹¹⁷	NA100-270F-10	2.8	1000	300
	461	INC1* ¹¹⁷	NA30-180F-15	2.8	1500	300
	462	INC1* ¹¹⁷	NA100-180F	3.7	2000	200
	464	INC1* ¹¹⁷	NA100-370F-10	3.7	1000	200
NCR-*DC1A2*-552 Capacity: 5.5kW Input voltage: 200V	465	INC1* ¹¹⁷	NA100-550F-10	5.5	1000	200
	467	INC1* ¹¹⁷	NA100-180F	3.7	2000	300
	468	INC1* ¹¹⁷	NA100-370F-10	3.7	1000	300
	469	INC1* ¹¹⁷	NA100-270F	5.5	2000	200
NCR-*DC1A2*-752 Capacity: 7.5kW Input voltage: 200V	463	INC1* ¹¹⁷	NA100-370AF	7.5	2000	200
	466	INC1* ¹¹⁷	NA100-750F-10	7.5	1000	200
NCR-*DC1A2*-113 Capacity: 11.0kW Input voltage: 200V	471	INC1* ¹¹⁷	NA100-270F	5.5	2000	300
	472	INC1* ¹¹⁷	NA100-550F-10	5.5	1000	300
	473	INC1* ¹¹⁷	NA100-750F-10	7.5	1000	290
	474	INC1* ¹¹⁷	NA100-550AF	11.0	2000	200
	475	INC1* ¹¹⁷	NA100-1100F-10	11.0	1000	200
NCR-*DC1A2*-153 Capacity: 15.0kW Input voltage: 200V	481	INC1* ¹¹⁷	NA100-370F	7.5	2000	300
	482	INC1* ¹¹⁷	NA100-750AF	15.0	2000	200
	483	INC1* ¹¹⁷	NA20-1500-10	15.0	1000	200
	484	INC1* ¹¹⁷	NA100-550F	11.0	2000	300

*¹¹⁷ The standard encoder is an INC1 encoder. In addition, S-INC and S-ABS encoders can also be selected.

*¹¹⁸ When the servo driver should be conformed to UL standard, combination is impossible due to limit in rated current.

Table 12-49 Select list of parameters applicable to IM motors (2/2)

Device capacity	P000	P001	Applicable motor			
	Setting value		Motor type	Rated output	Rated rotation speed	Peak output
				[kW]	[rpm]	[%]
NCR-*DC1A2*-223 Capacity: 22.0kW Input voltage: 200V	491	INC1* ¹¹⁹	NA100-1100AF	22.0	2000	200
	492	INC1* ¹¹⁹	NA20-2200-10	22.0	1000	200
	493	INC1* ¹¹⁹	NA100-750F	15.0	2000	290
NCR-*DC1A2*-303 Capacity: 30.0kW Input voltage: 200V	495	INC1* ¹¹⁹	NA100-1100F	22.0	2000	300
	497	INC1* ¹¹⁹	NA20-2700-10	30.0	1000	200
	496	INC1* ¹¹⁹	NA20-1500	30.0	2000	200
NCR-*DC1A2*-373 Capacity: 37.0kW Input voltage: 200V	501	INC1* ¹¹⁹	NA100-1100F	22.0	2000	300
	503	INC1* ¹¹⁹	NA20-2700-10	30.0	1000	200
	504	INC1* ¹¹⁹	NA20-1800	37.0	2000	200
	505	INC1* ¹¹⁹	NA20-3700-10	37.0	1000	190
	502	INC1* ¹¹⁹	NA20-1500	30.0	2000	200
NCR-*DC1A3*-303 Capacity: 30.0kW Input voltage: 400V	591	INC1* ¹¹⁹	NA100-1100F-20H	22.0	2000	300
	592	INC1* ¹¹⁹	NA20-2200-10HA	22.0	1000	200
	593	INC1* ¹¹⁹	NA100-750F-20H	15.0	2000	300
	594	INC1* ¹¹⁹	NA20-1500-20HA	30.0	2000	200
	595	INC1* ¹¹⁹	NA20-2700-10HA	30.0	1000	200
NCR-*DC1A3*-373 Capacity: 37.0kW Input voltage: 400V	551	INC1* ¹¹⁹	NA20-1800-20HA	37.0	2000	200
	552	INC1* ¹¹⁹	NA20-3700-10HA	37.0	1000	200

*¹¹⁹ The standard encoder is an INC1 encoder. In addition, S-INC and S-ABS encoders can also be selected.

12-6 Device built-in option

12-6-1 Device built-in option list

Table 12-50 Device built-in option list (1/2)

Number	Option	Product model	Product code
1	Control input/output extension unit 1	NCR-XAA2D1A-201/401	226-3871
		NCR-XAA2D1A-801	226-3861
		NCR-XAA2D1B-152/222	226-3952
		NCR-XAA2D1B-302/402	226-3962
		NCR-XAA2D1A-153	253-9521
		NCR-XAA2D1A-203	254-4641
		NCR-XAA2D1A-262	253-9401
		NCR-XAA2D1A-402	253-9411
	Control input/output extension unit 2	NCR-XAA3D1A-201/401	226-3900
		NCR-XAA3D1A-801	226-3890
		NCR-XAA3D1B-152/222	253-9841
		NCR-XAA3D1B-302/402	254-8920
		NCR-XAA3D1A-203	254-4650
		NCR-XAA3D1A-262	253-9430
		NCR-XAA3D1A-402	253-9440
	Control input/output extension unit 3	NCR-XAAAD1A-201/401	255-2630
		NCR-XAAAD1A-801	255-2640
		NCR-XAAAD1A-152/222	255-2650
		NCR-XAAAD1A-302/402	255-2660
		NCR-XAAAD1A-153	255-2670
		NCR-XAAAD1A-203	255-2680
		NCR-XAAAD1A-262	255-2690
		NCR-XAAAD1A-402	255-2700
	CC-Link I/F unit	NCR-XAB7D1A-201/401	253-8541
		NCR-XAB7D1A-801	253-8531
		NCR-XAB7D1B-152/222	253-8822
		NCR-XAB7D1A-402	253-8841
		NCR-XAB7D1A-153	253-9501
		NCR-XAB7D1A-203	254-4580
		NCR-XAB7D1A-262	253-9371
		NCR-XAB7D1A-402	253-9381
	Device Net I/F unit	NCR-XAB6D1A-201/401	253-7951
		NCR-XAB6D1A-801	253-7941
		NCR-XAB6D1B-152/222	253-8093
		NCR-XAB6D1A-302/402	253-8101
		NCR-XAB6D1A-153	253-9511
		NCR-XAB6D1A-203	254-4630
		NCR-XAB6D1A-262	253-9461
		NCR-XAB6D1A-402	253-9471
	MECHATROLINK-III I/F unit	NCR-XABPD1A-201/401	255-1610
		NCR-XABPD1A-801	255-1620
		NCR-XABPD1A-152/222	255-1630
		NCR-XABPD1A-402	255-1640
		NCR-XABPD1A-153	255-1650
		NCR-XABPD1A-203	255-1660
		NCR-XABPD1A-262	255-2970
		NCR-XABPD1A-402	255-2980

Table 12-51 Device built-in option list (2/2)

Number	Option	Product model	Product code
2	Pulse train command open collector receive	NCR-XAD2D0A	254-7500
3	Responsivity 1 option	NCR-XAB3D0A	254-7510
4	Absolute position compensation function valid	NCR-XABID1	254-3780
	Absolute position compensation function valid (Correction data incorporated)	NCR-XABJD1	254-3930

* Number 1 to 4 is a group number relating to overlap installation.

Overlap installation of options with the same group number is impossible; thus, pay attention.

(Example) Device that has control input/output extension unit 2 installed

- As it has control input/output extension unit 2 of number 1 installed, it is impossible to install [Control input/output extension unit 1], [Control input/output extension unit 3], [CC-Link I/F unit], [Device Net I/F unit], and [MECHATROKINK-Ⅲ I/F unit] of the same number.

Thus, select an option from among number 2, number 3, and number 4 groups.

12-6-2 Name plate for options

1) When there is any device built-in option

As shown in figure below, name plate having a mark "✓" at the head of option model is labeled at the right side panel.

OPTION
NO OPTION
NCR-XAD2D0A
NCR-XAD3D0A
NCR-XABID1
NCR-XABJD1
NCR-XAA2D1A-201/401
NCR-XAA3D1A-201/401
NCR-XAB6D1A-201/401
✓ NCR-XAB7D1A-201/401
NCR-XABLD1A-201/401
NCR-XABPD1A-201/401
NCR-XAAAD1A-201/401

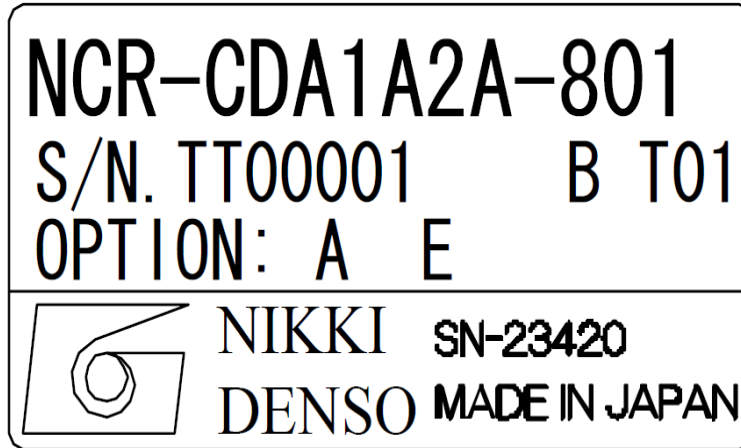
2) When there is no device built-in option

As shown in figure below, name plate having a mark "✓" at the head of [NO OPTION] is labeled at the right side panel.

OPTION
✓ NO OPTION
NCR-XAD2D0A
NCR-XAD3D0A
NCR-XABID1
NCR-XABJD1
NCR-XAA2D1A-201/401
NCR-XAA3D1A-201/401
NCR-XAB6D1A-201/401
NCR-XAB7D1A-201/401
NCR-XABLD1A-201/401
NCR-XABPD1A-201/401
NCR-XAAAD1A-201/401

3) Marking on name plate

On the name plate attached to the device front panel, installed options are indicated with code.



(Example) NCR-CDA1A2A-801B-T01 (when plural options are installed)
Figure 12-19 Serial name plate

Options are indicated at the portion of [OPTION] in the above figure in alphabetical letters, and their meanings are as follows.

Table 12-52 Device built-in option corresponding table

Classification number	Built-in option number	Model
N/A	None	
A	Control input/output extension unit 1	NCR-XAA2D1A-201/401
		NCR-XAA2D1A-801
		NCR-XAA2D1B-152/222
		NCR-XAA2D1B-302/402
		NCR-XAA2D1A-153
		NCR-XAA2D1A-203
		NCR-XAA2D1A-262
		NCR-XAA2D1A-402
B	Control input/output extension unit 2	NCR-XAA3D1A-201-401
		NCR-XAA3D1A-801
		NCR-XAA3D1B-152/222
		NCR-XAA3D1B-302/402
		NCR-XAA3D1A-203
		NCR-XAA3D1A-262
		NCR-XAA3D1A-402
C	CC-Link I/F unit	NCR-XAB7D1A-201/401
		NCR-XAB7D1A-801
		NCR-XAB7D1B-152/222
		NCR-XAB7D1A-402
		NCR-XAB7D1A-153
		NCR-XAB7D1A-203
		NCR-XAB7D1A-262
		NCR-XAB7D1A-402
D	Device Net I/F unit	NCR-XAB6D1A-201/401
		NCR-XAB6D1A-801
		NCR-XAB6D1B-152/222
		NCR-XAB6D1A-302/402
		NCR-XAB6D1A-153
		NCR-XAB6D1A-203
		NCR-XAB6D1A-262
		NCR-XAB6D1A-402
E	Pulse train command open collector receive	
F	Responsivity 1 option	
G	Absolute position compensation function valid	
H	Absolute position compensation function valid (Correction data incorporated)	

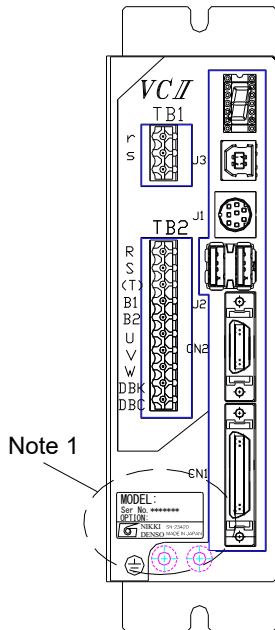
Classification number	Built-in option number	Model
J	SSCNETⅢ I/F unit	NCR-XABLD1A-201/401
		NCR-XABLD1A-801
		NCR-XABLD1A-152/222
		NCR-XABLD1A-402
		NCR-XABLD1A-153
		NCR-XABLD1A-203
		NCR-XABLD1A-262
K	MECHATROLINK-Ⅲ I/F unit	NCR-XABPD1A-201/401
		NCR-XABPD1A-801
		NCR-XABPD1A-152/222
		NCR-XABPD1A-402
		NCR-XABPD1A-153
		NCR-XABPD1A-203
		NCR-XABPD1A-262
L	Control input/output extension unit 3	NCR-XAAPD1A-201/401
		NCR-XAAPD1A-801
		NCR-XAAPD1A-152/222
		NCR-XAAPD1A-302/402
		NCR-XAAPD1A-153
		NCR-XAAPD1A-203
		NCR-XAAPD1A-262
		NCR-XAAPD1A-402

Data

12-6-3 Place for name plate for options

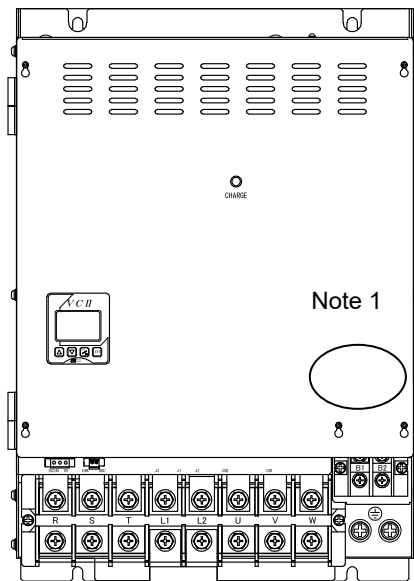
Name plate is placed near by [Note 1] in the front panel of the device, as shown in figure.

0 is an image in the NCR-*D**A1A-051 to NCR-*D**A1A-201* models.



NCR-*D**A1A-051 to NCR-*D**A1A-201*
 NCR-*D**A2A-101 to NCR-*D**A2A-401*
 NCR-*D**A2A-801*
 NCR-*D**A2A-152(122) to NCR-*D**A2A-222*
 NCR-*D**A2A-402*
 NCR-*D**A2A-752(552) to NCR-*D**A2A-153(113)*
 NCR-*D**A2A-203(153)*
 NCR-*D**A3A-262*
 NCR-*D**A3A-402*
 NCR-*D**A3A-752(552) to NCR-*D**A3A-153(113)*
 NCR-*D**A3A-203(153)*

Figure 12-20 Place for name plate for options 1*¹²⁰



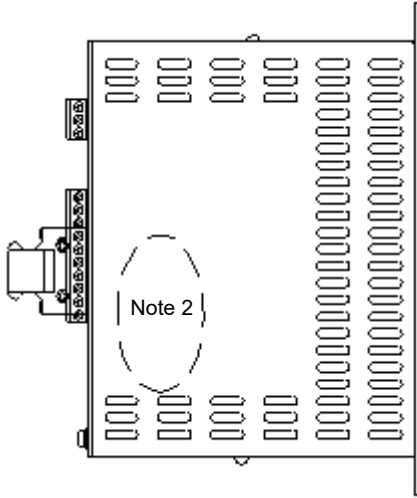
NCR-*D**A2B-303(223) to NCR-*D**A2B-373(373)*
 NCR-*D**A3B-373(303) to NCR-*D**A3B-553(373)*

Figure 12-21 Place for name plate for options 2*¹²⁰

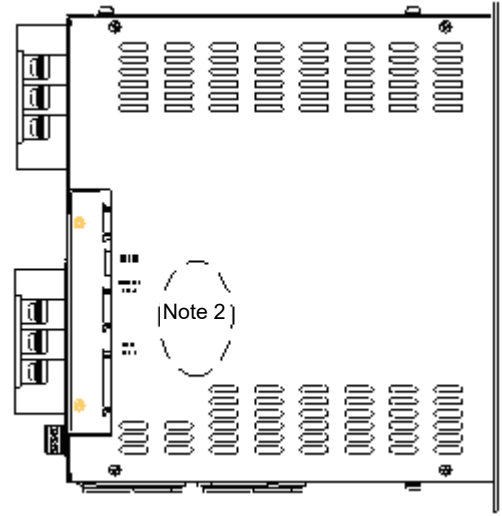
*¹²⁰ The model No. of IM type motors are mentioned in ().

Model name plate of options is attached to the device right side panel as shown in figure, in the potion of [Note 2].

NCR-*D**A2A-401*



NCR-*D**A2A-113*



NCR-*D**A2A-203*

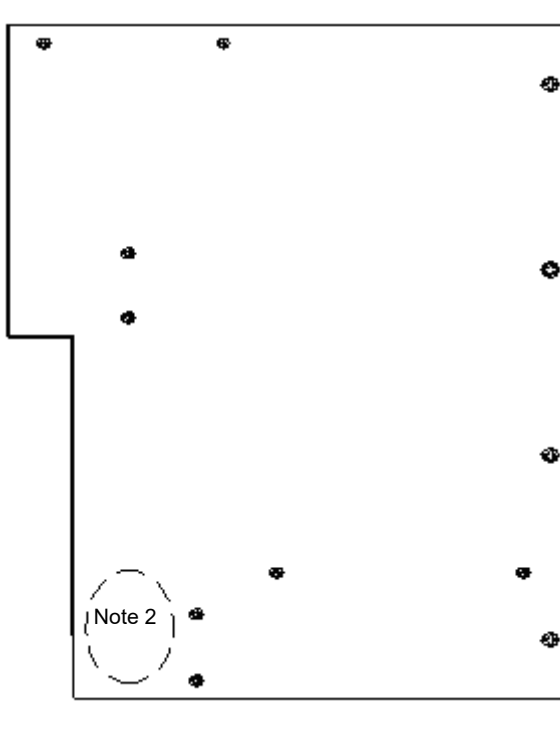


Figure 12-22 Place for name plate for options 3

The device and the motor is maintenance-free; however, in order to prevent breakdown by the change in the use conditions, periodically inspect them.



Caution

- The responsible worker should switch ON/OFF the power.
- Even when power supply is shut down, high voltage is charged in capacitor on main circuit. Thus, start working allowing five minutes or more after power-off (after LED is turned off, in the case of machine that is equipped with [CHARGE] LED on the device front panel).
- Never apply insulation test to the device with mega tester.
<The device will be damaged.>
When measuring insulation of motor, completely disconnect wiring (U, V, W) between motor and device, and then carry it out.

12-7-1 Daily inspection

Carry out daily inspection to check the following points.

<Inspection items>

- (1) If motor runs normally.
- (2) If no unusual factors are found in the environment of the installed place (power supply, temperature, humidity, dusts, etc).
- (3) If no malfunctions are found in cooling system.
- (4) If no loosening is found on terminals and connectors.
- (5) If there are no unusual sounds and vibrations.
- (6) If no excessive heating and discoloration are found.
- (7) If no defects are found in regenerative resistors, etc.

12-7-2 Periodic inspection

Carry out following periodic inspection at the interval of designated operating time or at the fixed interval (for such as a half year or one year).

<Inspection items>

- (1) If no loosening is found at the block connected with load, no slack in belts, no play in shaft key, no unusual sound in motor bearing.
- (2) If no unusual factors are found in the environment of the installed place (power supply, temperature, humidity, dusts, etc).
- (3) If no malfunctions are found in cooling system.
- (4) If no loosening is found on terminals and connectors.
- (5) If there are no unusual sounds and vibrations.
- (6) If no excessive heating and discoloration are found.
- (7) If there are no foreign substances and dusts inside the device.
- (8) If there are no scratches and wear on cables.
- (9) If no defects are found in regenerative resistors, etc.
- (10) Inspection on radiator fan of control panel, cleaning of air filter, and inspection or replacement of relays, etc.

12-7-3 Other inspections

(1) Gear

Motor having gear needs supply and drain of oil at the gear block.

Carry out oil replacement at every 3,000 hours.

Lubricant has important functional role, thus, use specified lubrication oil only.

(Never use machine oil, engine oil, etc.)

In no exclusive lubricant name is indicated, consult our sales representative.

In the oil lubrication method, pay attention not to leak oil or mix different types of oil during supply and drain of oil.

Supply oil up to the level indicated.

Check gear assembling bolt for loosening.

(2) Oil seal

Carry out oil seal replacement at every 5,000 hours.

Oil seal is not attached to the standard motor. When necessary, specify "With oil seal" separately.

(3) Motor bearing

Motor bearing is the exclusive bearing for motor only.

Lifetime of bearing is for about 20,000 hours, though it depends on use conditions.

Lifetime of motor cooling blower is also same.

(4) Device

Approximate replacement interval of each part of the device is indicated only as a guide.

Parts used in the device are electronic components, and some of them have lifetime.

Data

12-7-4 Suggestions for parts replacement

Suggestions for parts replacement are as follows.

Table 12-53 Parts replacement guide 1

Part name	Standard replacement year	Replacement method, etc.
Smoothing capacitor and other aluminum electrolytic capacitor (assembled on PCB)	5 years	Replacement with new PCB (check and decide)
Breaker, relay, etc.	-	Check and decide
Cooling fan	2 or 3 years	Replacement with new one
Fuse	10 years	Replacement with new one

Use conditions

- Surrounding temperature: annual mean temperature 30°C
- Loading rate: 80% or less
- Working rate: 20 hours or less/day

(Note): It is in conformity with "Recommendation of general inverter periodic inspection" by The Japan Electrical Manufacturers' Association.

The above standard replacement year is for reference only.

For other parts that have lifetime, suggestive interval of parts replacement is indicated in the following table.

Table 12-54 Parts replacement guide 2

Part name	Standard replacement year	Replacement method, etc.	Conditions
LCD and SDI device	7 years	Replacement with new one	25±10°C, 65%RH or less
EEPROM	10 years	Replacement with new PCB (check and decide)	Number of changes in parameter, indirect data, or command, etc.: 3 times/day
Lithium battery NCR-XBC4A	5 years	Replacement with new one	Replace it after the number of years on the left regardless of the use conditions.
Lithium battery NCR-XBG9A	10 years	Replacement with new one	Replace it after the number of years on the left regardless of the use conditions.



Caution

Temperature and humidity conditions greatly affect lifetime. Thus, avoid the use under a high temperature and high humidity condition. Generally, it is said that 10°C increase in operating temperature can shorten the equipment lifetime by half.