

## **Instruction Manual**

AC Servo driver
VPH Series
HB Type
TDISC

# **Preface**

Thank you for adopting the AC servo driver <VPH HB Type>. Before use, please read this manual carefully to fully exploit the performance of this device.

#### **Trademarks**

ENSIS® is a registered trademark of Mitutoyo Corporation.

Linear Scale® is a registered trademark of Mitutoyo Corporation.

BiSS® is a registered trademark of iC-Haus GmbH.

EnDat® is a registered trademark of HEIDENHAIN CORPORATION.

#### **Definition of terms**

In this instruction manual, the terms listed below are used unless otherwise specified.

Term	Description
This manual	VPH Series HB Type τDISC Instruction Manual
Device, this device	AC servo driver (VPH HB Type)
Motor	тDISC motor (ND-s Series, HD-s Series, DD-s Series)
VPH DES	VPH Data Editing Software (editing software dedicated to VPH)
P***	Parameter number ("***" is a 3-digit number.)
Controller	A generic term for any motion controller of Mitsubishi Electric Corporation
SSCNETIII	Motion network dedicated to SSCNETIII
SSCNETIII/H	Motion network dedicated to SSCNETIII/H
SSCNETIII(/H)	A generic term for SSCNETIII and SSCNETIII/H
Communication	Mode in which this device operates according to the commands issued from
mode	SSCNETIII(/H)
Maintenance mode	Mode in which this device operates alone

For details of the communication mode and the maintenance mode, refer to "1-3 Configuration of the run modes".

## Precautions in safety

Before installation, wiring, operation, maintenance and inspection, and error 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.

The following labels are used to indicate safety precautions in this manual.

Cautions 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.
<u></u> Caution	If mishandling is made, dangerous situation as medium or light injury could occur and damages on goods could be suspected.  However, since ACaution-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	<ul> <li>Never touch inside of this device and terminal blocks.</li> <li>Do not give damages, apply excessive force, and put any heavy articles on cables, and do not pinch any cable.</li> </ul>	Electric shock may occur.
Prohibition	Never touch rotating blocks of a running motor.	Injury may occur.
Compulsion	<ul> <li>Be sure to ground the earth terminal or earth cable of this device or the motor.</li> <li>Use the earth cable specified in this manual or a thicker cable than that, for the class-D grounding or better.</li> <li>Execute relocation, wiring, maintenance, and inspection a certain period of time (5 minutes for 3.3 kW or less and 10 minutes for 7 kW or more) after power-off. Start the job after the "CHARGE" LED is turned off. Never fail to shut off the control power, in addition to the main power.</li> </ul>	Electric shock may occur.

<u> </u>		
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.
<b>⊘</b> Prohibition	<ul> <li>The motor, this device, and peripheral equipment become hot. Do not touch them.</li> <li>When the power is supplied and for a while after the power is shut off, the radiator, motor, regenerative resistor, and other components of this device may be very hot. Do not touch them.</li> </ul>	Burn may occur.
Prohibition	Do not look directly at the light emitted from the CNSA (IN) and CNSB (OUT) connectors and the end of the SSCNETIII(/H) optical cable.	If the light gets in the eye, it may cause discomfort to the eye.
Prohibition	<ul> <li>Keep an electrically charged hand away at least 10 mm from the control axis selection switches (SW2/SW3).</li> </ul>	Injury or failure may occur.
Compulsion	Use the motor and this device in the specified combination.	Fire or failure may occur.
Compulsion	Never conduct the voltage withstanding test or the Mega test on this device.	Failure may occur.

# Storage

<u> </u>		
Prohibition	Do not store this device in a place of raining, water dripping, and harmful gas and liquid.	Failure may occur.
Compulsion	<ul> <li>Store this device under controlled temperature and humidity within the range specified in this manual in a place avoiding direct sunlight.</li> <li>Be sure to contact our sales representative when the storage period after purchase has passed more than three years.</li> </ul>	Failure may occur.

# Transportation

<u> </u>		
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

⚠Danger		
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	<ul> <li>Never block air-intake/exhaust windows and do not allow foreign substance to go in.</li> <li>Be sure to install this device to the specified directions.</li> <li>Attach this device to a metal or non-flammable object.</li> </ul>	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 or failure may occur.
Compulsion	Conduct proper attachment suitable for the output or weight of this unit.	Equipment may be damaged.

# Wiring

<u> </u>		
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.

<u> </u>		
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 with the length and treatment (shielding, twisting, etc.) specified in 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

<u> </u>		
<b>⊘</b> Prohibition	<ul> <li>Since excessive adjustment can make the operation unstable, avoid this situation.</li> <li>The brake of the brake-incorporated motor is for keeping the machine position. Do not use it for braking or to secure the safety of the machine.</li> </ul>	Injury or machine damage may occur.
<b>⊘</b> 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.
<b>⊘</b> 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 providing an emergency stop circuit having a built-in thermostat, for example. If the 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	<ul> <li>Install an emergency stop circuit externally, to stop operation instantly and shut off the power.</li> <li>For trial run, fix the motor, check this device and motor only for operation, and then attach them to the machine.</li> <li>When alarm happened, be sure to remove the cause after reset, and then restart.</li> </ul>	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 people even if it restarts.	Injury may occur.
Compulsion	Avoid turning ON/OFF repeatedly. It may cause the deterioration of main circuit element.	Failure may occur.

# Maintenance and inspection

<u> </u>		
Prohibition	Overhaul/repair shall be conducted only by us or personnel designated by us.	Failure may occur.
Compulsion	Be sure to use the device by strictly observing the permissible ambient temperature and humidity ranges.	Otherwise, errors and failures may occur.
Compulsion	<ul> <li>The device lifetime has a close relation with the temperature in use. Note that 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.</li> <li>The capacitance of the main circuit electrolytic capacitor inside the device decreases due to deterioration. To prevent secondary accidents due to failures, it is recommended to replace it earlier than arranged. For information on the standard replacement period, refer to "Chapter 7 Maintenance".</li> <li>The cooling effect of the built-in cooling fan motor of this device will decrease due to deterioration. To prevent secondary accidents due to failures, it is recommended to replace it earlier than arranged. For information on the standard replacement period, refer to "Chapter 7 Maintenance".</li> </ul>	Failure may occur.

#### **Precautions before installation (during transportation)**

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

Do not pile up devices and do not put any item on the cover.

#### **Cautions in storage**

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

#### Storage conditions of the device

Item		Description
	Temperature	-20 °C to +65 °C
Ambient	Humidity	90% or less (non-condensing)
condition	Storage location	Store in a clean place free from dust and dirt.  (Avoid a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, and oil.)
Vibration		Store in a place free from vibration.

#### **Precautions in transportation**

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

#### Transporting conditions of the device

Item		Description			
	Temperature	-20 °C to +65 °C			
Ambient	Humidity	90% or less (non-condensing)			
condition	Storage	Do not transport the products in a harmful atmosphere such as corrosive			
	location	gas, grinding fluid, metal powder, oil, etc.			
Vi	bration	Acceleration of 4.9 m/s <sup>2</sup> or less			

## 

Humidity conditions remarkably affect the life of the device.

Recommended storing or transporting condition is in humidity of 75% RH or less.

If the humidity exceeds 75% RH, contact our sales representative.

#### About this manual

This manual explains the installation, wiring, and use of the device and the motor, as well as maintenance and inspection, error diagnosis, countermeasures, and other matters. In order to use this device correctly, deeply understand the contents of this manual. When performing the installation, wiring, operation, maintenance and inspection, and other work, observe the conditions and procedures contained in this manual.

When using a customized device, read this manual and the specification document for the customized device.

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

For details of the SSCNETIII(/H) connection procedure and adjustment, refer to the separate instruction manuals.

#### [Related instruction manuals]

- TI-15080\* "VPH Series Option"
   Instruction manual describing the optional items of this device
- TI-15170\* "VPH Series Absolute Position Compensation"
  Instruction manual describing the absolute position compensation function
- TI-14701\* "VPH Series Servo Adjustment Manual"
   Instruction manual describing the motor servo adjustment procedure
- TI-14970\* "VPH Series STO Option"
   Instruction manual describing the STO optional function
- TI-15300\* "VPH Series HB Type Setting manual"
   Instruction manual describing the procedure for connecting to SSCNETIII(/H)

#### Warranty period

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

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

- a. Modification by parties other than us.
- b. Nonstandard operation contradictory to the rules and regulations stipulated in this manual.
- c. Natural and other disasters.
- d. Connection with another maker's unit which is not approved by us.

The warranty is limited to the repair of this device. It does not cover any damage caused by a fault of the delivered device, any lost opportunities on the customer's side, lost profits, secondary damage, or accidents.

Regardless of the warranty period, please inform our sales person whenever you find any failure or error.

#### **⚠** Caution

- Our products have been designed and manufactured as general-purpose products in the general
  industry. They have not been designed or manufactured in any equipment or systems that may involve
  human lives. If, therefore, they are put to any other use, we shall not assume any responsibility
  whatsoever. (Examples: Uses that are expected to have a significant influence on human lives and
  property, such as uses in nuclear energy, aerospace, and medical equipment and systems and
  passenger cars)
- 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.

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#### 1-1 Features of the device

This device supports motor control, and it carries out SSCNETIII(/H)-compliant controller command-based speed control, torque control, and positioning control. The device has features such as those listed below, and the single device can support several types of motors and encoders with parameter settings.

#### Features of the VPH HB Type

- **a.** In the SSCNETIII/H communication mode, high-performance systems can be supported by using full-duplex 150 Mbps (equivalent to 300 Mbps in a single direction) high-speed communication.
- **b.** Both SSCNETIII and SSCNETIII/H communication modes are supported. At the time of a communication connection to the controller, the device automatically switches between communication modes.
- **c.** By using an optical fiber cable, the influence of the noise entering from external equipment is reduced.
- **d.** For each operation, gain, filter, and acceleration/deceleration time settings can be made. It is possible to apply slow S-curve acceleration/deceleration in the jog mode and high-response acceleration/deceleration in the positioning mode without switching between them with an external signal or the like.
- **e.** Torque waveforms are controlled with quadric curve under 2-stage S-curve acceleration/ deceleration control.
- **f.** The positioning drive time is within 1 ms.
- **g.** Digital control through driftless, solution of adjustment mismatch, enhancement of manmachine interface, and other features pursue the reliability and user friendly operation.
- **h.** Adoption of IPM (IGBT) to the power switching block realizes the improvement of servo performance and noise reduction.
- i. With the full-scale software servo, control that fits the rigidity of the machine is possible, achieving linear/S-curve acceleration/deceleration, feed-forward, torque command filter, and at-stop and low-speed gain changeover.
- **j.** It is possible to connect to VPH DES using USB communication to display servo waveforms on an oscilloscope, display frequency response characteristics, and edit parameters.
- **k.** Using an absolute encoder eliminates the need for homing. The auto-tuning function makes servo adjustment easy.

## 1-2 System configuration

Figure 1-1 and Figure 1-2 show the peripheral system configuration of this device.

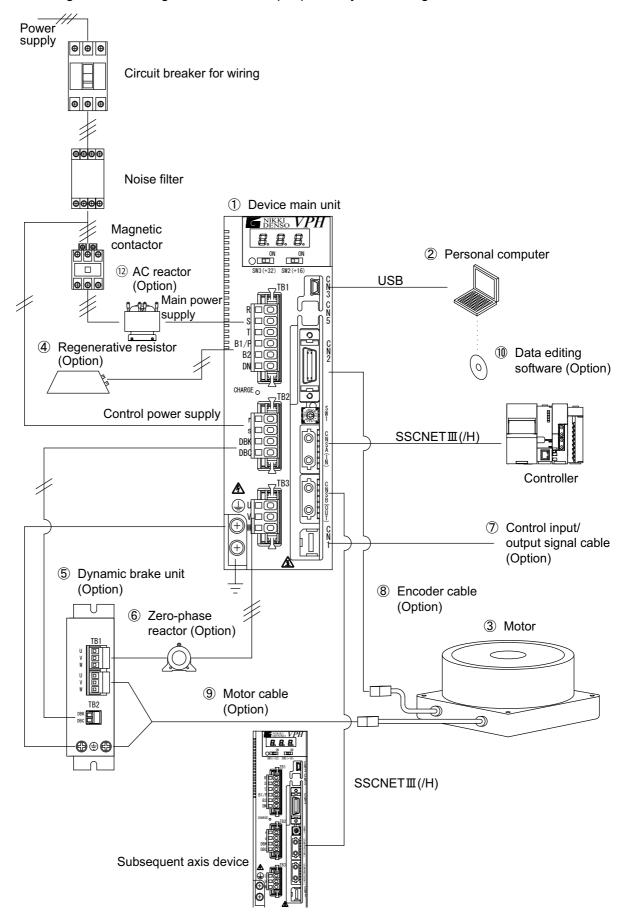


Figure 1-1 VPH HB Type system configuration for the 800 W class or less

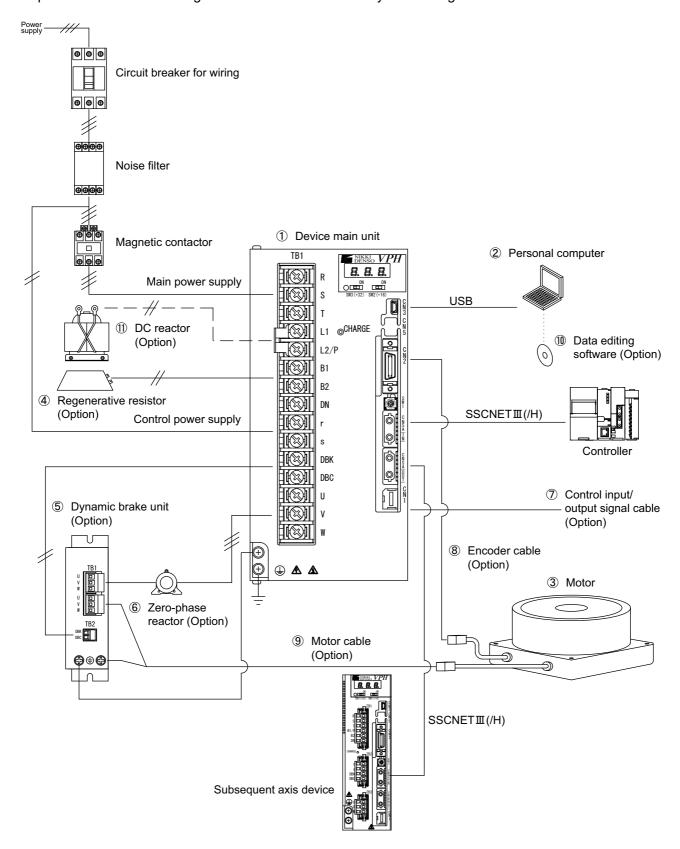


Figure 1-2 VPH HB Type system configuration for the 1.5 kW or more

#### Names of parts

1 Device main unit

This device controls the motor.

Using parameters, one device can cope with multiple kinds of motors and encoders.

#### 2 Personal computer

USB communication with editing software developed by us can perform below:

- Display of status data (such as operation speed and deviation).
- Control of the device control signal.
- Setting and backup of parameter and other settings.

Some machine models cannot be connected with a commercial PC; so, please consult us upon necessary.

#### 3 Motor

As standard, our motor is connected.

#### 4 Regenerative resistor (option)

The regenerative resistor is used to consume regenerative power generated by motor braking.

⑤ Dynamic brake unit (100 V and 200 V device option)

The dynamic brake unit can brake the coasting motor.

#### 6 Zero-phase reactor (option)

The zero-phase reactor is used to absorb noise produced by the main unit of the VPH Series and reduce the impact of noise on the device itself and peripheral equipment.

⑦ Control input/output signal cable (option)

The control input/output signal cable is connected to the control input/output connector (CN1) on the main unit of the VPH Series to input and output signals.

8 Encoder cable (option)

The encoder cable is used to connect the encoder feedback pulse input connector (CN2) on the main unit of the VPH Series to the encoder and the magnetic pole sensor.

Motor cable (option)

The motor cable is used to connect the motor power connector on the main unit of the VPH Series to the motor power cable.

1 Data editing software VPH DES (option)

Data editing software allows you to perform VPH Series operations including parameter editing, remote operation, checking of the operation status and signal status, and measurement of oscilloscope data from a PC.

① DC reactor (The option is for 1.5 kW or more.)

The DC reactor is used to make the waveform of the input current into a waveform close to that of a sine wave to suppress harmonic waves. It can be used for the 1.5 kW class or more.

(12) AC reactor (The option is for 800 W or less)

The AC reactor is used to make the waveform of the input current into a waveform close to that of a sine wave to suppress harmonic waves.

It can be used for the 800 kW class or less.

<sup>\*</sup> Set parameters and other items through USB communication with VPH DES.

#### 1-2-1 Data display LED panel

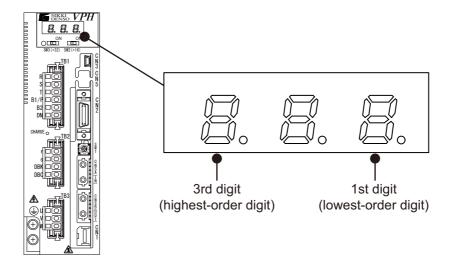


Figure 1-3 Appearance of the data display LED panel

On the data display LED panel, the numbers and characters listed below are displayed.

Table 1-1 Numbers and characters displayed on the data display LED panel

Data display LED panel	Number	Data display LED panel	Character	Data display LED panel	Character
0	0	R	Α	C	n(N)
1	1	Ь	b(B)	0	o(O)
2	2	Е	С	Р	Р
3	3	Ь	d(D)	9	q(Q)
4	4	Ε	E	۲	r(R)
5	5	F	F	Ł	t(T)
Б	6	Н	Н	ប	U
٦	7	h	h	u	u
8	8	٦	J	-	- (negative sign)
9	9	L	L		

Depending on the operation, the data display LED panel displays the following items.

Table 1-2 List of display items

LED panel display	Description	Mode
ЯЬ	Connection station detecting phase	Communication mode
ЯЬ □.	Network parameter setting phase	Communication mode
AC.	Initial communication 1st phase	Communication mode
Rd	Initial communication 2nd phase	Communication mode
RE	Initial communication 3rd phase	Communication mode
AF	Initial communication 4th phase	Communication mode
AH	Initial communication 5th phase	Communication mode
AA	Waiting for hot start	Communication mode
Ь**	Run time phase: Ready OFF/Servo OFF	Communication mode
[**	Runtime phase: Ready ON/Servo OFF	Communication mode
d**	Run time phase: Ready ON/Servo ON	Communication mode
AL.	An alarm occurs.	Communication mode
//L .	All alaith occurs.	Maintenance mode
FL.	Warning occurrence	Communication mode
PC –	Maintenance mode (communication operation mode)	Maintenance mode
PEd	Maintenance mode (self-diagnosis mode)	Maintenance mode
hit	Driver system error	Communication mode

<sup>\*\*:</sup> Axis number

#### 1-2-2 Setting a control axis number

#### ♠ Caution

Keep an electrically charged hand away at least 10 mm from the control axis selection switches (SW2/SW3).

Otherwise, the other parts may become faulty.

By combining the control axis selection switches (SW1/SW2/SW3), set a control axis number of this device between 1 and 64.

- Make sure that the control axis number set on the device is the same as that set on the controller.
- If different control axis numbers are set in a single communication system, the system does not operate normally.
- The control axis number that is set at power on is used. If an attempt is made to change it during device operation, [FL.93.5: SSCNETIII(/H) control axis number setting switch status change warning] is generated.

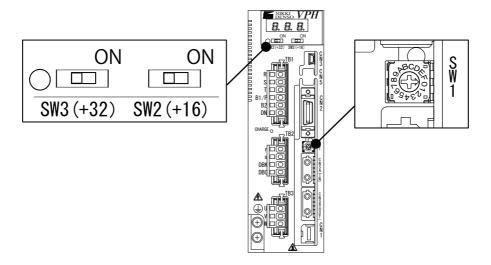


Figure 1-4 Control axis selection switches

Table 1-3 Control axis number correspondence table

Control axis	Control axis selection switches (SW2/SW3)							
selection	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3
switch	(+16)	(+32)	(+16)	(+32)	(+16)	(+32)	(+16)	(+32)
(SW1)	OFF	OFF	ON	OFF	OFF	ON	ON	ON
0	1st	axis	17th	axis	33rd	axis	49th axis	
1	2nd axis		18th	axis	34th axis		50th axis	
2	3rd axis		19th axis		35th axis		51st axis	
3	4th axis		20th	th axis 36th axis		axis	52nd axis	
4	5th axis		21st axis 3		37th	37th axis		axis
5	6th axis		6th axis 22nd axis 38th axis		axis	54th axis		
6	7th axis		6 7th axis 23rd axis		39th	axis	55th	axis
7	8th axis		24th axis		40th axis		56th axis	
8	9th axis		25th axis		41st axis		57th	axis
9	10th	axis	26th	axis	42nd	l axis	58th	axis

Chapter 1 Features and configuration of the device > 1-2 System configuration

Control axis		Control axis selection switches (SW2/SW3)							
selection	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	
switch	(+16)	(+32)	(+16)	(+32)	(+16)	(+32)	(+16)	(+32)	
(SW1)	OFF	OFF	ON	OFF	OFF	ON	ON	ON	
Α	11th	axis	27th	axis	43rd	axis	59th	axis	
В	12th	axis	28th	axis	44th	axis	60th	axis	
С	13th	axis	29th	axis	45th	axis	61st	axis	
D	14th axis		30th axis		46th axis		62nd axis		
E	15th axis		31st axis		47th axis		63rd axis		
F	16th	16th axis		l axis	48th	axis	64th	axis	

## 1-3 Configuration of the run modes

The following run modes are available by selecting each with the relevant external input signals.

Select the self-diagnosis mode using VPH DES.

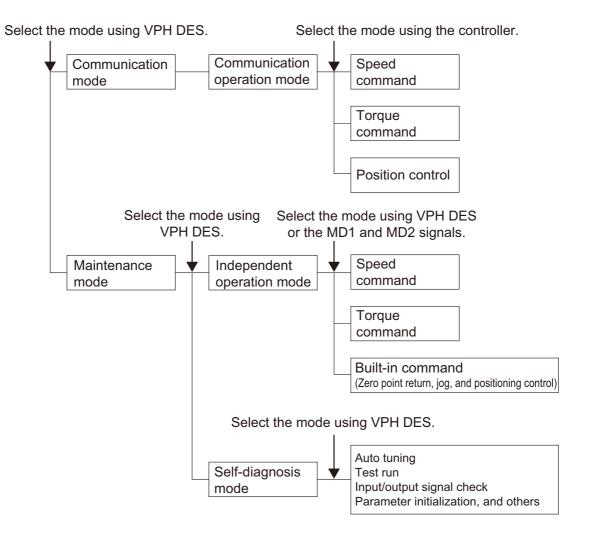


Figure 1-5 Mode configuration diagram

## 1-4 Mode switching

This device has the following modes.

Table 1-4 Description of modes

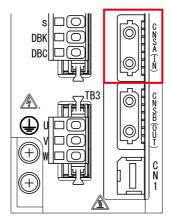
Mode	Description				
Communication	Mode in which this device operates according to the commands issued				
mode	from SSCNETIII(/H).				
	Mode in which this device operates alone.				
Maintenance mode	The motor can be operated according to the commands issued from				
Maintenance mode	internal speed control, torque control, built-in command control, and				
	others.				

When the power is turned on, this device is put in the communication mode.

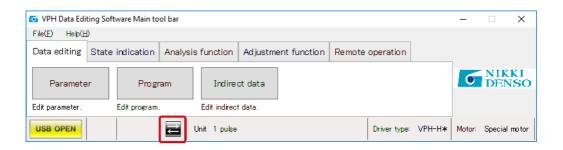
#### 1-4-1 Mode switching procedure

To switch between the communication and maintenance modes, use VPH DES. Switch between them with the following procedure.

- 1. Disconnect the network.
  - Disconnect the connector from CNSA to disconnect the network.

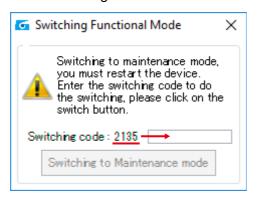


- 2. Switch to the maintenance mode.
  - Click the switching icon at the bottom of the <Main tool bar> window.

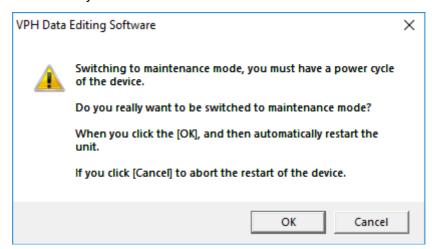


The <Switching Functional Mode> window starts.
 Enter the number displayed for Switching code in the right input field and press the Enter key.

Click "Switching to Maintenance mode".



- 3. Restart the device.
  - A dialog appears, which prompts you to turn the power off, then on again. If you see no problem with automatically restarting the system, click "OK". The device will be automatically restarted.



• Confirm that the icon at the bottom of the <Main tool bar> window changes.



- \* To switch from the maintenance mode to the communication mode, perform either of the following:
  - In the maintenance mode, perform steps 1 to 3 above.
  - Turn off the power to the device, then on again.

#### 1-4-2 Notes on mode switching

Mode switching is not possible in the cases below. Remove the cause, then retry.

Table 1-5 Conditions under which mode switching is impossible

Item	Description	Action
Network	The CNSA cable is connected, and the	Remove the cable from CNSA,
communication in	device is in the communication status.	and retry in the status in which
progress		the device is disconnected from
		the network.
Occurrence of an	One of the following communication-	Retry in the status in which the
alarm	related alarms occurs	alarm is released.
	AL.A0.5: CPU start error	For details of the alarms, refer
	AL.A0.6: CPU error	to "8-2 Error code
		specifications".

## 1-5 Restrictions

#### 1-5-1 Restrictions on functions

In the SSCNET  ${\rm I\hspace{-.1em}I\hspace{-.1em}I}$  (/H) communication mode, the following functions are unavailable from VPH DES developed by us:

- Remote operation function
- Frequency response function
- Self-diagnosis function
- Positioning test run function
- Device reset, restart, and switching to the maintenance mode when parameters are written

#### 1-5-2 Restrictions on parameter edit

To edit the parameters of this device, use VPH DES developed by us. This is not possible from Mitsubishi Electric Corporation software "MT Developer2", "MELSOFT GX Works2", or the like.

## 1-6 Startup procedure

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

#### 1. Product check at delivery

No damages during transportation? (Check packages for no breakages and product surface for no abnormalities)

- Correct products as you ordered?
   (Check the model, rated output, and so on, referring to "12-1-1 Model".)
- Accessories packaged? (Check the accessories, referring to "2-1 Incoming check".)

#### 2. Installation

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

#### 3. Wiring

- Wiring of the power supply block of the device main unit
   Connect the power supply of the device main unit, referring to "2-4 Power supply connection".
- Motor connection

Connect the motor and the device main unit, referring to "2-5 Motor connection".

Grounding

Be sure to ground to prevent electric shock and take noise protection measures, referring to "2-6 Grounding".

Connecting of the regenerative resistor
 When the regenerative resistor is supplied, refer to "2-7 Regenerative resistor connection".

· Control circuit wiring

Connect the control circuit to connect with the device main unit. Refer to "2-8 Control circuit wiring".

Noise protection

To prevent troubles due to noise, be sure to take noise prevention measures and treatments, referring to "2-9 Noise protection".

When carrying out each wiring task, refer to "3-1 External wiring diagram".

As for electric wire to use in wiring, adopt the one described in "2-10 Applicable electric wires".

As for cables for the control circuit, use our optional cables.

- 4. Before-run inspection and start-up of the device
  - Before-run inspection

Be sure to carry out every item described in "4-1-2 Before-run inspection".

• Start-up of the device

After completion of the inspection, carry out test run and adjustment, referring to "4-1 Run procedure".

#### 5. Run start

Check that the above procedure is completed, and start operation.

Chapter 1 Features and configuration of the device > 1-6 Startup procedure

# Chapter 2 Installation and wiring

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2-2	Installation environment		
2-3			
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		er supply circuit	
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## 2-1 Incoming check

At the time of product delivery, check below points.

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

If you find any shortages or damages, please contact our sales representative immediately. An accessory of this device differs depending on the model, as listed below.

Table 2-1 100 V device accessory list

Device model	Accessory	
Device model	Model	Quantity
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB1051*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 50 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB1101*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 100 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB1201*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 200 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1

Table 2-2 200 V device accessory list

	Accessory	
Device model	Model	Quantity
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB2101*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 100 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB2201*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 200 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB2401*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 400 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1
	Plug connector for main circuit block A [06JFAT-SBXGF-I]	1
NCR-HB2801*-A-***	Plug connector for main circuit block B [03JFAT-SBYGF-I]	1
Capacity: 800 W	Plug connector for the control block [04JFAT-SBXGF-I]	1
	Open tool [J-FAT-OT]	1
NCR-HB2152*-A-***	None	_
Capacity: 1.5 kW	Notic	
NCR-HB2222*-A-***	None	_
Capacity: 2.2 kW	Notic	
NCR-HB2332*-A-***	None	
Capacity: 3.3 kW	None	-
NCR-HB2702*-A-***	Plug connector for the control block [FKC 2,5/ 4-STF-5,08]	1
Capacity: 7 kW		1
NCR-HB2153*-A-***	Plug connector for the control block [FKC 2,5/ 4-STF-5,08]	1
Capacity: 15 kW		

Table 2-3 400 V device accessory list

Device model	Accessory	
Device model	Model	Quantity
NCR-HB3702*-A-***	Plug connector for the control block [231-704/037-000]	1
Capacity: 7 kW	Open tool [231-131]	1

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

#### 2-2 Installation environment

- **a.** For information about the ambient conditions of the device, refer to "12-1-2 General specifications".
- **b.** The device lifetime has a close relation with the temperature in use. 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.
- c. For the temperature inside the storage control panel, consider the surrounding temperature and the temperature increase due to a loss in this device and in the equipment inside the panel. Be sure to keep the surrounding temperature of the device within the permissible range. In general, the calorific value of this device due to loss is about 5% + 50 W of the connected motor capacity.
- **d.** 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.)
- **e.** If there are nearby heating elements and vibrating sources, prepare an appropriate construction against the influence.
- **f.** 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.
- g. If there is a noise generation source, reinforce the grounding treatment to avoid mixture of induction noises. Depending on the use conditions, a noise filter may be required. Take noise protection measures, referring to "2-9 Noise protection".

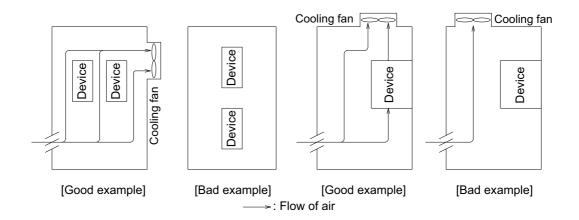


Figure 2-1 Alignment example for storing devices

#### **⚠** Caution

Be sure to use this device by strictly observing the permissible ambient temperature and humidity ranges. Using it outside the ranges may result in errors and failures.

## 2-3 Installation method

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

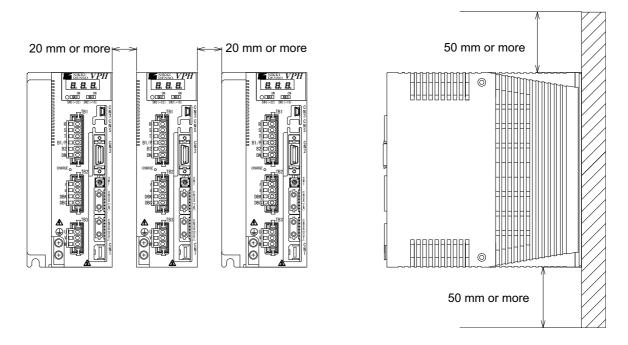


Figure 2-2 Installation and ventilation of the device

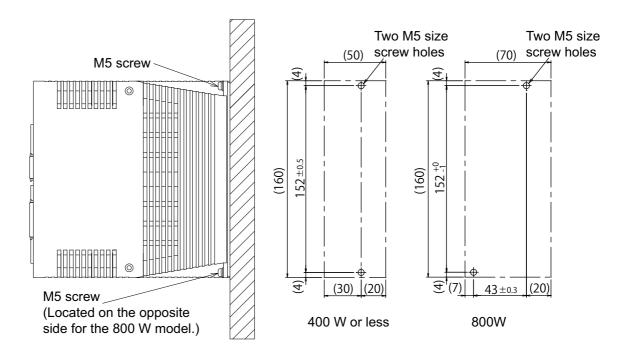


Figure 2-3 Device installation method (800 W or less)

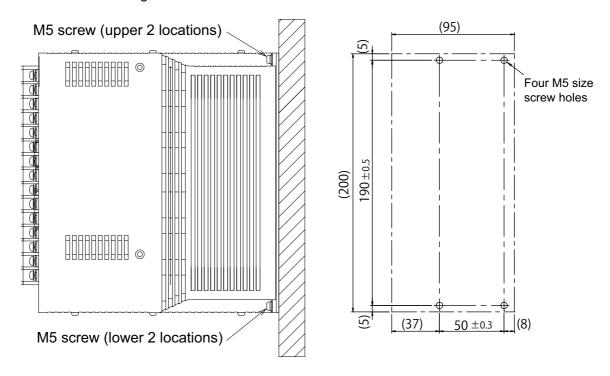


Figure 2-4 Device installation method (1.5 kW, 2.2 kW)

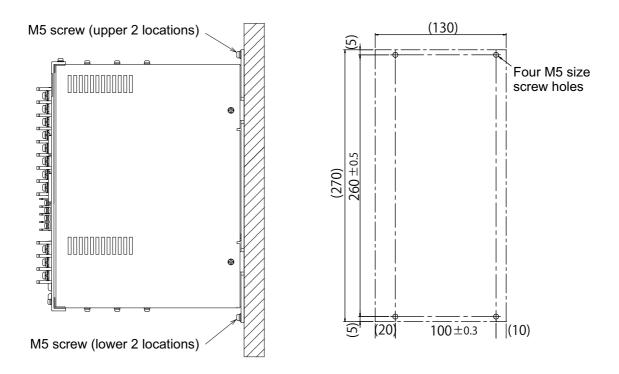


Figure 2-5 Device installation method (3.3 kW)

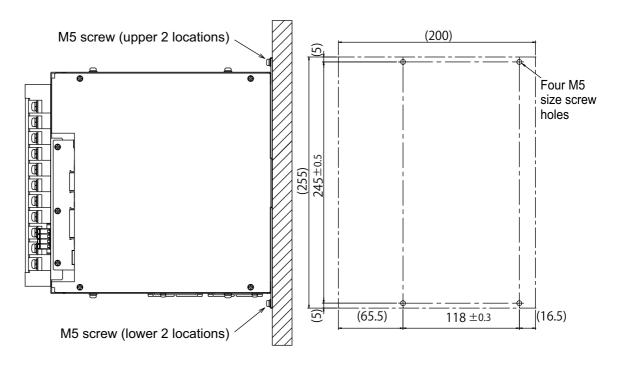


Figure 2-6 Device installation method (7 kW)

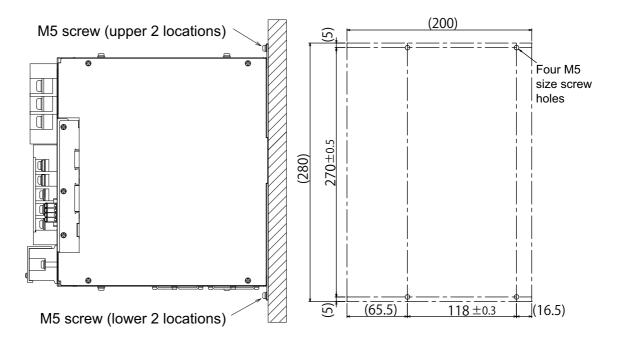


Figure 2-7 Device installation method (15 kW)

# 2-4 Power supply connection

#### 2-4-1 Power supply wiring

The rated voltages of this device are as listed below.

NCR-HB1051\*-A-\*\*\* to NCR-HB1201\*-A-\*\*\*

Main power supply: 100 to 120 VAC, 50/60 Hz, single-phase power supply Control power supply: 100 to 120 VAC, 50/60 Hz, single-phase power supply NCR-HB2101\*-A-\*\*\* to NCR-HB2801\*-A-\*\*\*

Main power supply: 200 to 240 VAC, 50/60 Hz, single-/3-phase power supply Control power supply: 200 to 240 VAC, 50/60 Hz, single-phase power supply NCR-HB2152\*-A-\*\*\* to NCR-HB2153\*-A-\*\*\*

Main power supply: 200 to 240 VAC, 50/60 Hz, 3-phase power supply Control power supply: 200 to 240 VAC, 50/60 Hz, single-phase power supply NCR-HB3702\*-A-\*\*\*

Main power supply: 380 to 480 VAC, 50/60 Hz, 3-phase power supply Control power supply: 380 to 480 VAC, 50/60 Hz, single-phase power supply

- **a.** For accident and fire prevention, install a circuit breaker for wiring 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.
- **b.** Because the main circuit of this device is of the capacitor input type, large inrush current flows at the time of power-on. Therefore, a voltage drop can be induced depending on the power capacity and the power supply impedance. Allow enough spare or ample room when choosing the power capacity and the electric wire.
- **c.** Be very careful not to connect the motor connecting terminal (U, V, W, E) of this device to the main power supply (R, S, T, E) erroneously.
- **d.** When the power supply capacity exceeds 500 KVA, connect a reactor to coordinate power supply.

(For the reactor, contact our sales representative.)

# ♠ Caution

Be very careful not to connect the motor connecting terminal (U, V, W, E) of this device to the main power supply (R, S, T, E) erroneously. Otherwise, the device may be damaged.

## 2-4-2 Power supply circuit

Representative power supply circuits are shown in Figure 2-8 to Figure 2-10.

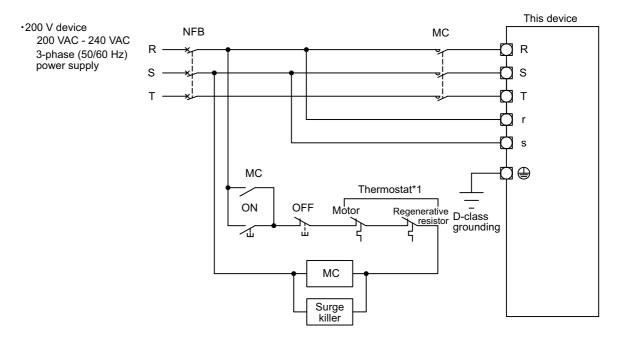


Figure 2-8 Typical power supply circuit for 3-phase power supply

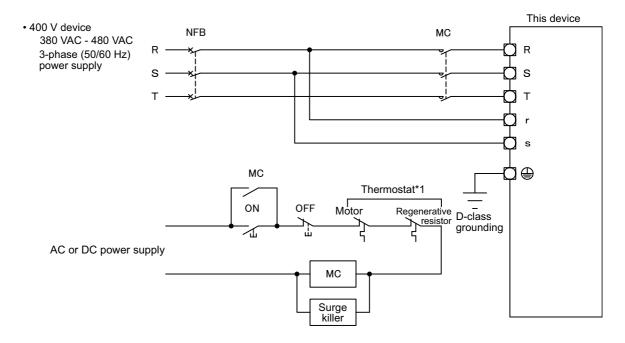


Figure 2-9 Typical power supply circuit for 3-phase power supply (400 V device)

\*1 Our standard motor is not attached with a thermostat.

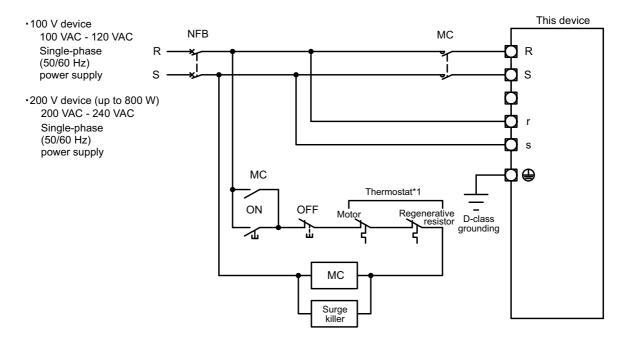


Figure 2-10 Typical power supply circuit for single-phase power supply

\*1 Our standard motor is not attached with a thermostat.

# **⚠** 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 circuit breaker for wiring, for power supply line protection and for fire and accident prevention.
- For information about the breaker capacity, refer to "12-1-5 Device electrical specification".
- 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 highpower equipment when possible.

#### 2-4-3 Power-on sequence

- **a.** 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.
- **b.** 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.

The figure below shows a timing chart. For information about brake output timing charts, refer to "Chapter 9 Parameters".

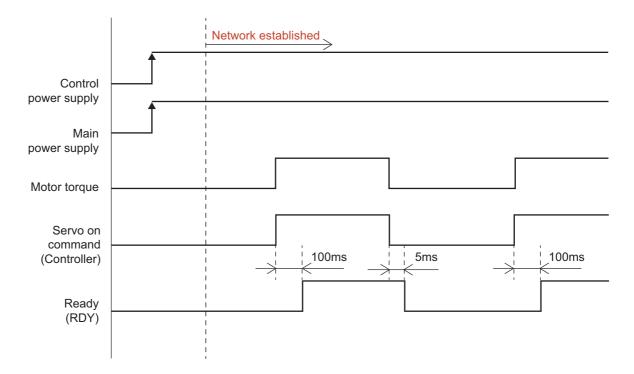


Figure 2-11 Timing chart

# 2-4-4 Selecting a circuit breaker for wiring and an earth leakage circuit breaker

- **a.** For short circuit protection in the event of device failure, select an appropriate breaker that has the rated breaking capacity suitable for the power capacity. For information about the breaker capacity per device, refer to "12-1-5 Device electrical specification".
- b. When using an earth leakage circuit breaker, because the inverter block of the device is PWM controlled, its output contains harmonic components. Due to the electrostatic capacitance against the ground in the electric line from the device to the motor and the floating capacitance between the winding wire and the iron core in the motor, leakage current is generated. Thus, an earth leakage circuit breaker of the inverter applicable type should be selected. A zero-phase reactor can be connected to the motor power supply line to suppress the leakage current.

# ♠ 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 error, 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.
- Make sure that the sequence control is such that it stops the command upon the alarm
  occurrence (output) due to the activation of the protective function. Make sure also that the
  sequence control is not such that when the power supply is restored after the occurrence
  of an electricity failure (or a sudden stop), commands (such as speed command voltage)
  are input so that the motor immediately runs.

# 2-5 Motor connection

#### 2-5-1 Motor wiring

- **a.** Connect correctly without fail in the phase sequence of the connecting terminal (U, V, W, and E) of the motor and connecting terminal (U, V, W, and E) of this device. (Connect U to U, V to V, and W to W respectively). Connection in the wrong phase sequence disables normal operation, the motor can vibrate, and the motor can also run regardless of the input command, which is very dangerous.
- **b.** On the motor-device wiring, do not connect a magnet switch or a circuit breaker for wiring.
- **c.** 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 burned out. Thus, pay attention to the timing, referring to "Figure 2-11" Timing chart".
- d. Kits containing a motor power supply cable and connectors are available as our options. In addition, shielded cables and zero-phase reactors are also available as noise protection measures.
- **e.** For devices with a rated output of 800 W or less and 7 kW or more, the supplied plug connector is used. For details of the wiring procedure, refer to "2-11-1 Wiring procedure".

# 2-6 Grounding

- a. Be sure to ground for electric shock prevention and noise protection measures.
- **b.** Use a wire for grounding which has a conductor cross-sectional area greater than or equal to that described in "2-10 Applicable electric wires".
- c. Connect grounding wire to grounding terminal (E) of the device.
- **d.** Use exclusive grounding. If common grounding is used, be sure to apply one-point grounding.
- e. Be sure to connect the motor grounding wire to the 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 and better than D-class grounding (grounding resistance 100  $\Omega$  or less).
- 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.

# 2-7 Regenerative resistor connection

- a. Use the regenerative resistor supplied as an option, unless otherwise specified.
- **b.** The regenerative resistor is used to consume excessive energy that the capacitor in the device cannot absorb, among regenerative energy generated by motor braking when load inertia (GD2) is large.
- **c.** Since heat is generated by regenerative energy, locate the regenerative resistor not to influence other equipment.
- d. The thermostat is supplied with a regenerative resistor. The contact of the thermostat operates (is opened) when the regenerative resistor gets overheated. Carry out wiring so that the main power supply is shut down when the contact operates. In the contact specifications of the thermostat, the contact current is 15 A at 100 VAC or 10 A at 200 VAC. When mounting the thermostat, refer to the figure below.
- **e.** The cable length between the regenerative resistor and device shall be up to 3 m or as short as possible. As the cable is longer, surge voltage generated by power element switching becomes higher, and the device could be damaged.

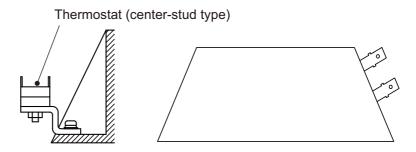


Figure 2-12 Mounting a thermostat on a cement resistor

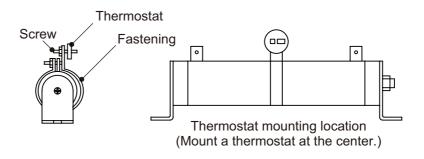


Figure 2-13 Mounting a thermostat on a vitreous enamel resistor

# 

If abnormally high current flows in a regenerative resistor, the resistor becomes hot in a short time and quite dangerous. Be sure to construct a circuit to shut down the main power supply using the contact of the thermostat.

# 2-8 Control circuit wiring

#### a. Encoder feedback pulse signal

- Using shielded twisted pair cable, be sure to connect the shield to the metal connector (FG) of connector CN2.
- For the purpose of movement of motor itself, keep the bending radius of motor as big as possible so as not to give stress.
- 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.

#### b. Control input and output signal

- When using relays and switches for control input/output signals, use an element for micro current.
- 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.
- Prepare the power supply +V (+12 V, 2.5 mA to +24 V, 5 mA/1 item) for control input signals by yourself.
- Keep the length of the cable within 3 m.

# 2-9 Noise protection

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.

Be sure to carry out the following countermeasures and preventive treatments.

- **a.** 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.
- **b.** If a 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 protection measures on the power supply line.
- **c.** 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.
- d. This 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.

# 2-10 Applicable electric wires

Use electric wires shown in Table 2-4 to Table 2-8. As for cables for control circuit, use optional items.

Table 2-4 Applicable electric wires

Control circuit	Terminal	Conditions
Encoder feed	A/A*,B/B*, Z/Z* (EP5,GND)	<ul> <li>90 deg phase contrast pulse encoder</li> <li>Shielded twisted pair cable of AWG24 (0.2 mm²)</li> <li>For EP5 and GND, AWG20 (0.5 mm²)*1</li> <li>Length: 20 m or less</li> </ul>
Back pulse input	SD/SD* (EP5,GND)	Serial encoder  • Shielded twisted pair cable of AWG24 (0.2 mm²)  • For EP5 and GND, AWG20 (0.5 mm²)*1  • Length: 30 m or less
Magnetic pole sensor input	HA/HA*, HB/HB*, HC/HC*, (EP5,GND)	<ul> <li>Shielded twisted pair cable of AWG24 (0.2 mm²)</li> <li>For EP5 and GND, AWG20 (0.5 mm²) or more*1</li> <li>Length: 30 m or less</li> </ul>
Other control input/output		<ul> <li>Shielded cable of AWG28 (0.08 mm²) to AWG24 (0.2 mm²)</li> <li>Length: 3 m or less</li> </ul>

Electric wire diameter on Table 2-4 is decided based on PVC shielded twisted pair cable under the following conditions.

PVC shielded twisted pair cable: Rated 300 V, 80  $^{\circ}$ C , maximum ambient temperature: 40  $^{\circ}$ C Wiring conditions: air wiring, single string

\*1 Wire diameter of EP5 and GND of the encoder feedback pulse input and the magnetic pole sensor differs depending on the encoder and the length of cable to combine. Thus, for details, contact our sales representative.

# 

- 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.

Table 2-5 Applicable electric wire 100 VAC specification

Unit: AWG (mm<sup>2</sup>)

Main circuit	Terminal	NCR- HB1051*- A-***	NCR- HB1101*- A-***	NCR- HB1201*- A-***	
Main power supply, grounding	R,S,E	14 (2)	14 (2)	14 (2)	
Control power supply	r,s	18 (0.75)	18 (0.75)	18 (0.75)	
Motor power supply	U,V,W	14 (2)	14 (2)	14 (2)	
Regenerative resistor	B1/P,B2	18 (0.75)	18 (0.75)	18 (0.75)	

Table 2-6 Applicable electric wire 200 VAC specification (800 W or less)

Unit: AWG (mm<sup>2</sup>)

Main circuit	Terminal	NCR- HB2101*- A-***	NCR- HB2201*- A-***	NCR- HB2401*- A-***	NCR- HB2801*- A-***	
Main power supply, grounding	R,S,T,E	14 (2)	14 (2)	14 (2)	14 (2)	
Control power supply	r,s	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	
Motor power supply	U,V,W	14 (2)	14 (2)	14 (2)	14 (2)	
Regenerative resistor	B1/P,B2	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	

Table 2-7 Applicable electric wire 200 VAC specification (1.5 kW or more)

Unit: AWG (mm<sup>2</sup>)

Main circuit	Terminal	NCR- HB2152*- A-***	NCR- HB2222*- A-***	NCR- HB2332*- A-***	NCR- HB2702*- A-***	NCR- HB2153*- A-***
Main power supply, grounding	R,S,T,E	14 (2)	12 (3.5)	10 (5.5)	6 (14)	6 (14)*
Control power supply	r,s	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)
Motor power supply	U,V,W	14 (2)	12 (3.5)	10 (5.5)	6 (14)	6 (14)*
Regenerative resistor	B1,B2	18 (0.75)	18 (0.75)	18 (0.75)	10 (5.5)	8 (8)

<sup>\* 4 (22)</sup> if UL-approved.

Table 2-8 Applicable electric wire 400 VAC specification (7 kW or more)

Unit: AWG (mm<sup>2</sup>)

Main circuit	Terminal	NCR- HB3702*- A-***		
Main power supply, grounding	R,S,T,E	10 (5.5)		
Control power supply	r,s	18 (0.75)		
Motor power supply	U,V,W	10 (5.5)		
Regenerative resistor	B1,B2	14 (2)		

- **a.** Electric wire diameter on Table 2-5 to Table 2-8 is decided based on vinyl insulation electric wire (KIV electric wire) for electric equipment under the following conditions.
  - KIV electric wire: Rated 600 V, 60°C, operating temperature: 40°C, wiring condition: air, 3-string (interval s = d) wiring
- **b.** 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.
- **c.** In the case of calculating the permissible current by changing operating temperature and wiring conditions to be used, the calculation should be performed by multiplying with the permissible current reduction coefficient and permissible current compensatory coefficient according to the objective temperature and conditions. Permissible current reduction coefficient (when cable permissible maximum temperature is 60  $^{\circ}\text{C}$ ) when operating temperature is higher than 30  $^{\circ}\text{C}$ .

Permissible current reduction coefficient =  $\sqrt{(60-\theta)/30}$ ( $\theta$  = Operating temperature  $\theta$  < 60)

Table 2-9 Permissible current compensatory coefficients when wiring plural cables in air

	ber of ings	1	2	3	6	4	6
Aligr	nment	<b>→</b>	•	S S	\$ 8 8 8	S S	\$ s
<u>a</u> a	s=d		0.85	0.80	0.70	0.70	0.60
Central interval	s=2d	1.00	0.95	0.95	0.90	0.90	0.90
2. ∪	s=3d		1.00	1.00	0.95	0.95	0.95

# 2-11 Wiring to power supply block

For devices with a rated output of 800 W or less and 7 kW or more, the supplied plug connector is used for wiring to the main power supply block and the control power supply block.

#### 2-11-1 Wiring procedure

- 1. Strip 9 to 10 mm of the coating of the application electric wire (8 to 9 mm for 400 V devices). For details of the size of the application electric wire, refer to "2-10 Applicable electric wires".
- **2.** Open the electric wire insertion block of the plug connector, using the supplied open tool (or a slotted screwdriver).
  - For insertion, disconnect the plug connector from the device, then start work.
- 3. With the electric wire insertion block still open, insert the electric wire. After insertion, remove the open tool to secure the electric wire. (Be sure to check that the electric wire is connected tightly.)
- **4.** Mount the plug connector to the device. (Check that wiring is conducted according to the signals printed on the device.)

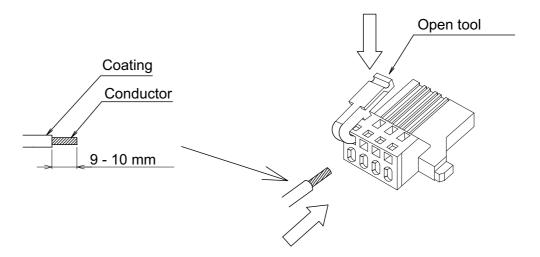


Figure 2-14 Plug connector wiring diagram (800 W or less)

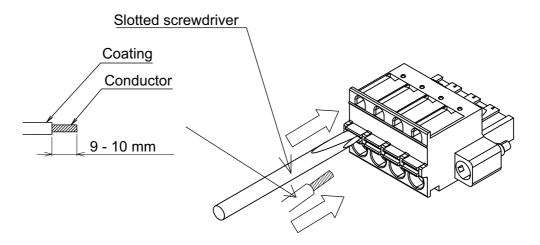


Figure 2-15 Plug connector wiring diagram (200 V and 7 kW, 15 kW)

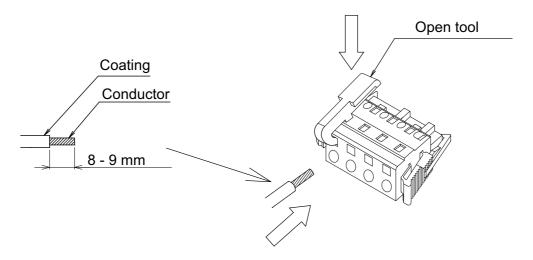


Figure 2-16 Plug connector wiring diagram (400 V and 7 kW)

# Chapter 3 Signal connection

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# 3-1 External wiring diagram

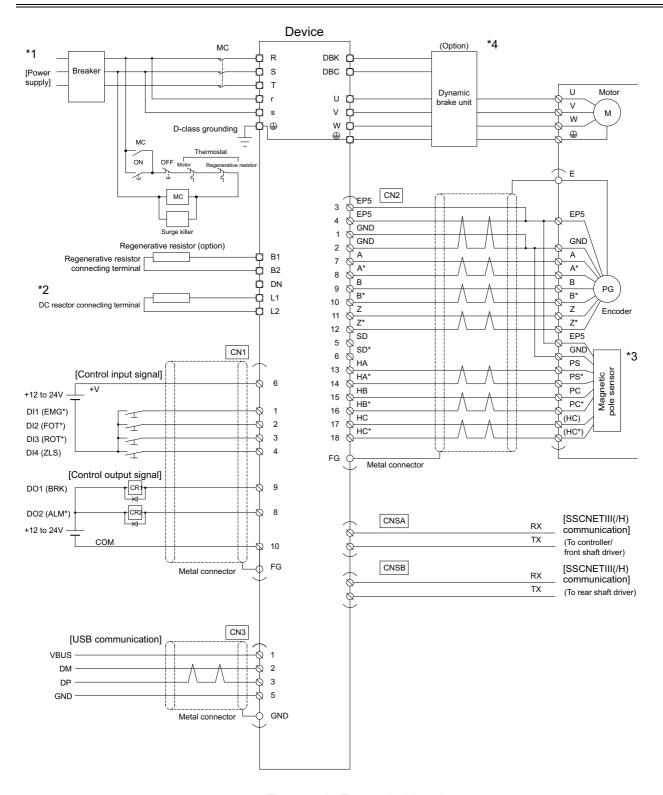


Figure 3-1 External wiring diagram

- \*1 For details of connecting the power supply, refer to "2-4-2 Power supply circuit".
- \*2 The DC reactor terminal is available to a model with an output capacity of at least 1.5 kW.
- \*3 Wiring is required when using the magnetic pole sensor.
- \*4 Can be used with 100 V and 200 V devices.

- Note 1: The statuses of the switches connected to control input signals show the OFF statuses of the individual input signals.
- Note 2: For information about the connection between motor and encoder, refer to the instruction manual of each motor.
- Note 3: A pin not mentioned in this wiring diagram is NC.
- Note 4: For a control input/output signal name, the value in parentheses is the initial value of the parameter.
- Note 5: When wishing to use a DC reactor with a device capacity of 1.5 kW to 3.3 kW, prepare it by yourself. Options are available for a device capacity of 1.5 kW or more. [Recommended specification (device capacity: 1.5 kW to 3.3 kW)] Rated current: 18 A or more

Inductance: 3 mH or less

(For details, contact our sales representative.)

- Note 6: When a serial encoder is used, make a connection, referring to "Figure 3-2" Serial encoder connecting diagram".
- Note 7: If the CNSA (IN) and CNSB (OUT) connectors are not connected, place caps on the connectors.
- Note 8: In the maintenance mode, all control input signals can be allocated.

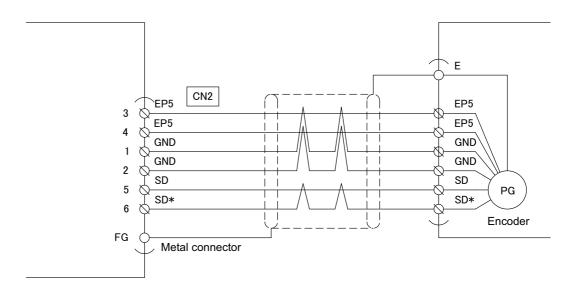


Figure 3-2 Serial encoder connecting diagram

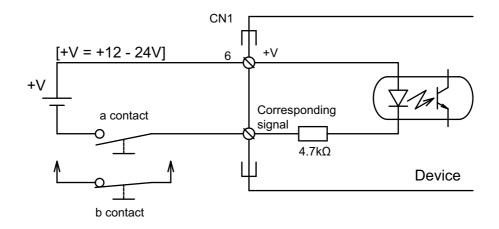
# 3-2 Input/output interface

The types and equivalent circuits of input/output signals are shown below.

# Circuit No. I-1: DI1 to 4 control input signals

Connector No. CN1

#### a. Equivalent circuit



#### b. Electrical specifications

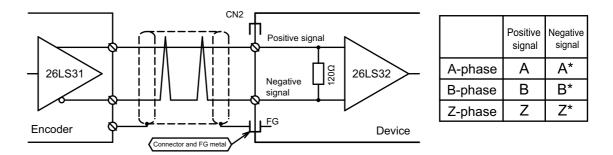
Item	Description		
Insulation method	Photo coupler insulation		
Operating voltage range	10.2 to 26.4 VDC		
Ripple ratio	Within 5%		
Poted input current	12 VDC: About 2.5 mA		
Rated input current	24 VDC: About 5.0 mA		
Input resistance	About 4.7 kΩ		
Input filter time constant	About 120 µs		

- As a contact element, use micro current on/off relay or open collector output transistor.
- This signal becomes valid after input for at least 1 ms.
- The type of each input signal is shown in "3-4-2 Control input and output signal list".

### Circuit No. I-2: A, A\*, B, B\*, Z, and Z\* encoder feedback pulse inputs

Connector No. CN2

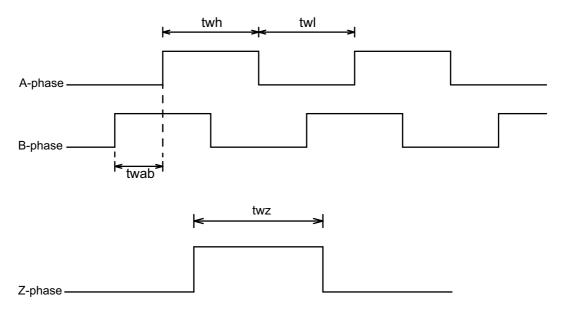
#### a. Equivalent circuit



• Be sure that encoder feedback pulse is line driver (26LS31 equivalent) output.

#### b. Electrical specifications

- When attaching encoder in the forward direction, let B-phase go ahead of A-phase in motor forward direction operation.
- Minimum input pulse width [twh twl] for A-phase and B-phase must be 80 ns or more.
- Minimum edge distance between A-phase and B-phase [twab] must be at least 40 ns.
- By changing [P066: Encoder input direction switching], the phase order can be switched.
- Minimum input pulse width [twz] of encoder marker signal (Z-phase) must be 500 ns or more.

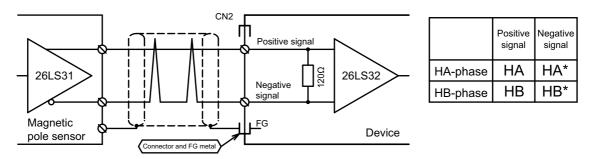


<sup>\*</sup> In case of positive logic

# Circuit No. I-3: HA, HA\*, HB, and HB\* magnetic pole sensors

Connector No. CN2

#### a. Equivalent circuit

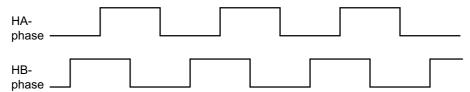


#### b. Electrical specifications

Item	Description		
Maximum input frequency	25 Mpps (4-multiplication)		
Input method	Line receiver		

• When attaching the magnetic pole sensor in the forward direction, let HB-phase go ahead of HA-phase in motor forward direction operation.

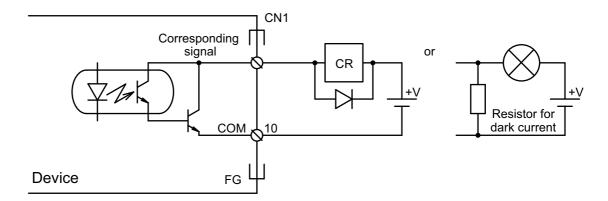
#### • 2-phase magnetic pole



## Circuit No. O-1: DO1 to 2 control output signals

Connector No. CN1

#### a. Equivalent circuit



- When connecting inductive load such as relay, be sure to insert diode in parallel to the load.
- In the case of lamp load, insert resistor for dark current and use the circuit within the rated current including inrush current.
- Since photo coupler (PS2733 equivalent) is used in the output circuit, please consider the switching time by receipt circuit.

#### b. Electrical specifications

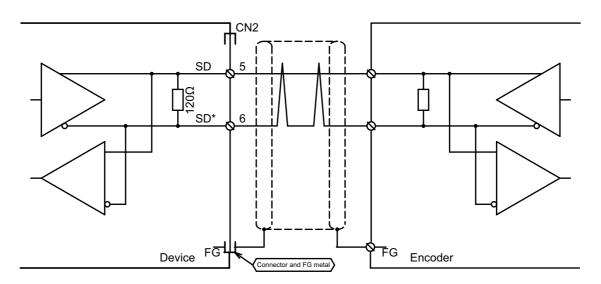
Item	Description
Insulation method	Photo coupler insulation
Maximum load voltage	30 VDC
Maximum load current	50 mA/1-point
Leak current	0.1 mA
Saturation voltage	1.0 V or less

- When conducted COM terminals, it becomes ON.
- When released COM terminals, it becomes OFF.
- The type of each output signal is shown in "3-4-2 Control input and output signal list".

## Circuit No. IO-1: SD and SD\* serial encoder data inputs/outputs

Connector No. CN2

#### a. Equivalent circuit



#### b. Electrical specifications

- When a serial encoder is connected, serial data is processed in the half-duplex mode.
- By changing [P066: Encoder input direction switching], the phase order can be switched.

#### Circuit No. IO-2: USB communication

Connector No. CN3

#### a. Electrical specifications

- This circuit is provided for communication with a PC.
- Communication is possible based on USB2.0 (FULL SPEED).

# 3-3 Connector pin alignment

## 3-3-1 Control input/output connector CN1

#### a. Connector specification

Connector to be used (receptacle): MUF-RS10DK-GKXR (J.S.T. Mfg.) or equivalent Applicable cable side connector (soldered plug): MUF-PK10K-X (J.S.T. Mfg.) or equivalent

#### b. Pin alignment

The figure below is the connector alignment of the main unit side viewed from the connecting block.

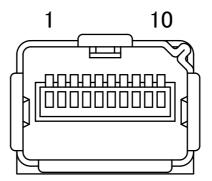


Table 3-1 Control input/output connector pin alignment

No.	Signal	Signal name	No.	Signal	Signal name
	code			code	
1	DI1	Control input signal 1 (ENG*)	6	+V	External power supply (+12 VDC
'	DIT	Control input signal 1 (E140 )	0	. V	to +24 VDC)
2	DI2	Control input signal 2 (FOT*)	7	NC	Not connected (reserved)
3	DI3	Control input signal 3 (ROT*)	8	DO2	Control output signal 2 (ALM*)
4	DI4	Control input signal 4 (ZLS)	9	DO1	Control output signal 1 (BRK)
5	NC	Not connected (reserved)	10	COM	External power supply common

<sup>\*</sup> For the control output signals DO1 to DO2 and the control input signals DI1 to DI4, the values in parentheses are initial setting values due to parameters.

An asterisk "\*" indicates a negative logic signal.

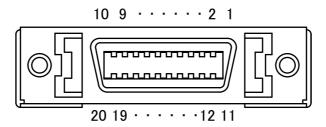
## 3-3-2 Encoder feedback pulse input connector CN2

#### a. Connector specification

Connector to be used (receptacle): 10220-52A2PL (3M) or equivalent Applicable cable side connector (soldered plug): 10120-3000PE (3M) or equivalent Applicable cable side connector (shell): 10320-52A0-008 (3M) or equivalent

#### b. Pin alignment

The figure below is the connector alignment of the main unit side viewed from the connecting block.



The figure below is the connector alignment of the cable side viewed from the soldering terminal side.

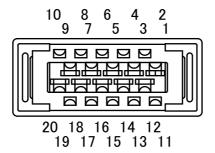


Table 3-2 Encoder feedback pulse input

No.	Signal code	Signal name	No.	Signal code	Signal name
1	GND	Internal control power supply common	11	Z	Encoder marker signal input (positive pole)
2	GND	Internal control power supply common	12	Z*	Encoder marker signal input (negative pole)
3	EP5	Encoder power supply (+5 V)	13	НА	Magnetic pole sensor input
4	EP5	Encoder power supply (+5 V)	14	HA*	Magnetic pole sensor input
5	SD	Communication data (positive pole)	15	НВ	Magnetic pole sensor input
6	SD*	Communication data (negative pole)	16	HB*	Magnetic pole sensor input
7	А	Encoder pulse A-phase input (positive pole)	17	НС	Magnetic pole sensor input
8	A*	Encoder pulse A-phase input (negative pole)	18	HC*	Magnetic pole sensor input
9	В	Encoder pulse B-phase input (positive pole)	19	NC	Not connected (reserved)
10	B*	Encoder pulse B-phase input (negative pole)	20	NC	Not connected (reserved)

## 3-3-3 USB communication connector CN3

a. Connector specification

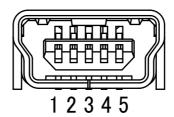
Connector to be used (receptacle): UX60SC-MB-5S8 (HIROSE) or equivalent

Applicable cable: Commercially available USB cable

(host: A plug ⇔ device: Mini B plug)

#### b. Pin alignment

The figure below is the connector alignment of the main unit side viewed from the connecting block.



<sup>\*</sup> We do not offer any USB cable as an option.

Table 3-3 USB communication

No.	Signal code	Signal name	No.	Signal code	Signal name
1	VBUS	USB power supply (+5 V)	4	NC	Not connected (reserved)
2	DM	Communication data (a pair with DP)	5	GND	Internal control power supply common
3	DP	Communication data (a pair with DM)			

### 3-3-4 SSCNET III (/H) cable connection connectors CNSA and CNSB

- By connecting the SSCNETIII(/H) optical cable to be connected to the controller or the servo amplifier\*1 for the front axis, to the CNSA (IN) connector, communication with the front axis is performed.
- By connecting the SSCNETIII(/H) optical cable to be connected to the servo amplifier\*1 for the rear axis, to the CNSB (OUT) connector, communication with the rear axis is performed.

  \*1 This device, Mitsubishi Electric Corporation product MR-J4/J3 amplifier, etc.

#### a. Connector specification

Applicable cable: Mitsubishi Electric Corporation product SSCNETIII(/H) standard cord for use in the panel \*2

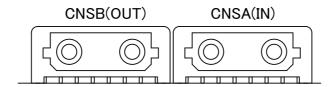
Mitsubishi Electric Corporation product SSCNETIII(/H) standard cable for use outside the panel \*2

Mitsubishi Electric Corporation product SSCNETIII(/H) long distance cable \*2

\*2 We do not offer any optical cable as an option. Purchase one from Mitsubishi Electric Corporation.

#### **b.** Pin alignment

The figure below is the main unit side connector as viewed from the connecting block.



## 3-3-5 Power supply terminal TB1

100 VAC specification: Use with 50 W, 100 W, and 200 W.

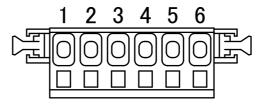
200 VAC specification: Use with 100 W, 200 W, 400 W, and 800 W.

a. Connector specification

Connector to be used (pin header): S06B-F32SK-GGXR (JST) or equivalent Applicable cable side connector (plug): 06JFAT-SBXGF-I (JST) or equivalent (supplied with the device main unit)

#### b. Pin alignment

The figure below is the alignment when the plug is viewed from the cable insertion block.



Connect the grounding to the grounding terminal on the device cabinet.

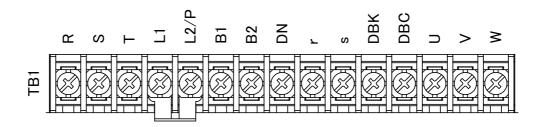
Table 3-4 Power supply terminal (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase (100 V/200 V)	4	B1/P	Regenerative resistor
2	S	Main power supply S-phase (100 V/200 V)	5	B2	Regenerative resistor
3	Т	Main power supply T-phase (200 V)	6	DN	Not used

200 VAC specification: Use with 1.5 kW and 2.2 kW.

#### a. Pin alignment

Terminal block to be used: Number of terminals - 15, screw size - M4



Connect the grounding to the grounding terminal on the device cabinet. When not using a DC reactor, do not remove the shorting bar between L1 and L2/P.

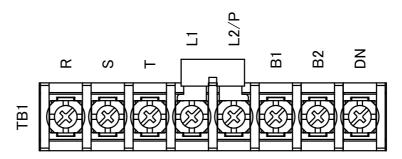
Table 3-5 Power supply terminal (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase	9	r	Control power supply R-phase
2	S	Main power supply S-phase	10	s	Control power supply S-phase
3	Т	Main power supply T-phase	11	DBK	Dynamic brake signal
4	L1	DC reactor	12	DBC	Dynamic brake signal common
5	L2/P	DC reactor	13	U	Motor power U-phase
6	B1	Regenerative resistor	14	V	Motor power V-phase
7	B2	Regenerative resistor	15	W	Motor power W-phase
8	DN	Not used			

200 VAC specification: Use with 3.3 kW.

#### a. Pin alignment

Terminal block to be used: Number of terminals - 8, screw size - M4



Connect the grounding to the grounding terminal on the device cabinet.

When not using a DC reactor, do not remove the shorting bar between L1 and L2/P.

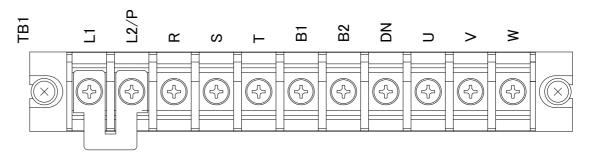
Table 3-6 Power supply terminal (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase	5	L2/P	DC reactor
2	S	Main power supply S-phase	6	B1	Regenerative resistor
3	Т	Main power supply T-phase	7	B2	Regenerative resistor
4	L1	DC reactor	8	DN	Not used

200 VAC specification: Use with 7 kW. 400 VAC specification: Use with 7 kW.

#### a. Pin alignment

Terminal block to be used: Number of terminals - 11, screw size - M5



Connect the grounding to the grounding terminal on the device cabinet. When not using a DC reactor, do not remove the shorting bar between L1 and L2/P.

Table 3-7 Power supply terminal (TB1)

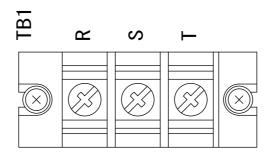
No.	Signal code	Signal name	No.	Signal code	Signal name
1	L1	DC reactor	7	B2	Regenerative resistor
2	L2/P	DC reactor	8	DN	Not used
3	R	Main power supply R-phase	9	U	Motor power U-phase
4	S	Main power supply S-phase	10	V	Motor power V-phase
5	Т	Main power supply T-phase	11	W	Motor power W-phase
6	B1	Regenerative resistor			

#### Chapter 3 Signal connection > 3-3 Connector pin alignment

200 VAC specification: Use with 15 kW.

#### a. Pin alignment

Terminal block to be used: Number of terminals - 3, screw size - M6



Connect the grounding to the grounding terminal on the device cabinet.

Table 3-8 Power supply terminal (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase	3	Т	Main power supply T-phase
2	S	Main power supply S-phase			

## 3-3-6 Power supply terminal TB2

100 VAC specification: Use with 50 W, 100 W, and 200 W.

200 VAC specification: Use with 100 W, 200 W, 400 W, and 800 W.

a. Connector specification

Connector to be used (pin header): S04B-F32SK-GGXR (JST) or equivalent Applicable cable side connector (plug): 04JFAT-SBXGF-I (JST) or equivalent (supplied with the device main unit)

#### b. Pin alignment

The figure below is the alignment when the plug is viewed from the cable insertion block.

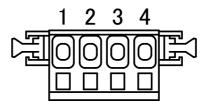


Table 3-9 Power supply terminal (TB2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	r	Control power supply R-phase (100 V/200 V)	3	DBK	Dynamic brake signal
2	s	Control power supply S-phase (100 V/200 V)	4	DBC	Dynamic brake signal common

200 VAC specification: Use with 3.3 kW.

#### a. Pin alignment

Terminal block to be used: Number of terminals - 4, screw size - M3

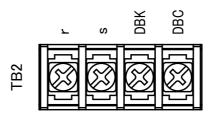


Table 3-10 Power supply terminal (TB2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	r	Control power supply R-phase	3	DBK	Dynamic brake signal
2	s	Control power supply S-phase	4	DBC	Dynamic brake signal common

#### Chapter 3 Signal connection > 3-3 Connector pin alignment

200 VAC specification: Use with 7 kW and 15 kW.

a. Connector specification

Connector to be used (pin header): MSTB 2,5/4-GF-5,08 (PHOENIX CONTACT) or

equivalent

Applicable cable side connector (plug): FKC 2,5/ 4-STF-5,08 (PHOENIX CONTACT) or

equivalent

(supplied with the device main unit)

#### **b.** Pin alignment

The figure below is the alignment when the plug is viewed from the cable insertion block.

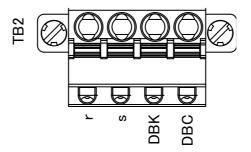


Table 3-11 Power supply terminal (TB2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	r	Control power supply R-phase	3	DBK	Dynamic brake signal
2	s	Control power supply S-phase	4	DBC	Dynamic brake signal common

400 VAC specification: Use with 7 kW.

#### a. Connector specification

Connector to be used (pin header): 231-934/001-000 (WAGO) or equivalent Applicable cable side connector (plug):231-704/037-000 (WAGO) or equivalent (supplied with the device main unit)

#### **b.** Pin alignment

The figure below is the alignment when the plug is viewed from the cable insertion block.

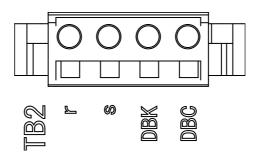


Table 3-12 Power supply terminal (TB2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	r	Control power supply R-phase (400 V)	3	DBK	Dynamic brake signal
2	s	Control power supply S-phase (400 V)	4	DBC	Dynamic brake signal common

### 3-3-7 Motor power supply terminal TB3

100 VAC specification: Use with 50 W, 100 W, and 200 W.

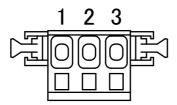
200 VAC specification: Use with 100 W, 200 W, 400 W, and 800 W.

a. Connector specification

Connector to be used (pin header): S03B-F32SK-GGYR (JST) or equivalent Applicable cable side connector (plug): 03JFAT-SBYGF-I (JST) or equivalent (supplied with the device main unit)

### b. Pin alignment

The figure below is the alignment when the plug is viewed from the cable insertion block.



Connect the grounding to the grounding terminal on the device cabinet.

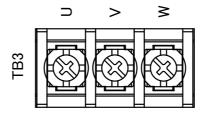
Table 3-13 Motor power supply terminal (TB3)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	U	Motor power U-phase	3	W	Motor power W-phase
2	V	Motor power V-phase			

200 VAC specification: Use with 3.3 kW.

### a. Pin alignment

Terminal block to be used: Number of terminals - 3, screw size - M4



Connect the grounding to the grounding terminal on the device cabinet.

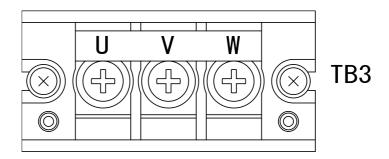
Table 3-14 Motor power supply terminal (TB3)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	U	Motor power U-phase	3	W	Motor power W-phase
2	V	Motor power V-phase			

200 VAC specification: Use with 15 kW.

### a. Pin alignment

Terminal block to be used: Number of terminals - 3, screw size - M6



Connect the grounding to the grounding terminal on the device cabinet.

Table 3-15 Motor power supply terminal (TB3)

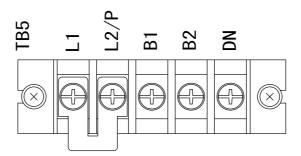
No.	Signal code	Signal name	No.	Signal code	Signal name
1	U	Motor power U-phase	3	W	Motor power W-phase
2	V	Motor power V-phase			

# 3-3-8 Power supply terminal TB5

200 VAC specification: Use with 15 kW.

### a. Pin alignment

Terminal block to be used: Number of terminals - 5, screw size - M5



When not using a DC reactor, do not remove the shorting bar between L1 and L2/P. Connect the grounding to the grounding terminal on the device cabinet.

Table 3-16 Motor power supply terminal (TB5)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	L1	DC reactor	4	B2	Regenerative resistor
2	L2/P	DC reactor	5	DN	Not used
3	B1	Regenerative resistor			

# 3-4 Control input and output signals

For the servo driver, any signals can be allocated to control input signals (DI1 to DI4) and control output signals (DO1 and DO2). Make the settings with parameters. By default, the following signals are allocated.

For the servo driver, emergency stop (EMG\*) and overtravel (FOT\*, ROT\*) are initialized. If you do not connect the control input signals, you cannot start operation unless you disable these signals with (P624, P623). If you disable the signals, pay sufficient attention to operation and make sure that you can stop operation safely in another way.

P620: Control input signal allocation 1

DI No.	Signal name	Signal code
DI1	Emergency stop	EMG*
DI2	Forward direction overtravel	FOT*
DI3	Reverse direction overtravel	ROT*
DI4	Zero point deceleration	ZLS

P622: Control output signal allocation 1

DO No.	Signal name	Signal code
DO1	Brake release	BRK
DO2	Alarm	ALM*

# 3-4-1 Signal allocation settings with VPH DES

From VPH DES, the Parameter edit screen opens.

A parameter is divided into DI No. and DO No. items. In the relevant location, set a signal.

<sup>\*</sup> The signal symbol "\*" indicates a negative logic setting.

### 3-4-2 Control input and output signal list

The names of control input and output signals and the run modes in which the signals are effective are given in the following list.

### **a.** Control input signal

The names of control input signals and the run modes in which the signals are effective are given in the following list.

\* The speed command, torque command, and built-in command functions are available in the maintenance mode.

Table 3-17 Control input signal list

### O: Effective, -: Ineffective

	Control input signal			_		Mainten	ance	mode	
Allocat	ion No.	Signal		Commu			Built-in con		nmand
Positive logic	Negative logic	code	Signal name		Speed	Torque	Jog	POS	HOME
1	51	RST	Reset	_	0	0	0	0	0
2	52	ARST	Alarm reset	0	0	0	0	0	0
3	53	EMG	Emergency stop	0	0	0	0	0	0
4	54	SON	Servo on	_	0	0	0	0	0
5	55	DR	Drive	_	0	0	0	0	0
6	56	CLR	Deviation clear	_	_	_	0	0	0
8	58	TL	Torque limit	0	0	0	0	0	0
9	59	FOT	Forward direction overtravel	0	0	0	0	0	0
10	60	ROT	Reverse direction overtravel	0	0	0	0	0	0
11	61	MD1	Mode select 1	_	0	0	0	0	0
12	62	MD2	Mode select 2	_	0	0	0	0	0
13	63	GSL1	Gain select 1	_	0	0	0	0	0
14	64	GSL2	Gain select 2	_	0	0	0	0	0
16	66	RVS	Command direction inversion	_	0	_	_	_	_
17	67	SS1	Command selection 1	_	0	0	0	0	0
18	68	SS2	Command selection 2	_	0	0	0	0	0
19	69	SS3	Command selection 3	_	0	0	0	0	0
20	70	SS4	Command selection 4	_	_	_	_	0	0
21	71	SS5	Command selection 5	_	_	_	_	0	0
22	72	SS6	Command selection 6	_	_	_	_	0	0
23	73	SS7	Command selection 7	_	_	_	_	0	0
24	74	SS8	Command selection 8	_	_	_	_	0	0
25	75	ZST	Positioning drive	_	_	_	_	0	0
26	76	ZLS	Zero point deceleration	0	_	_	_	_	0
27	77	ZMK	External zero point marker	_	_	_	_	_	0
28	78	TRG	External trigger	_	_	_	_	0	_
29	79	CMDZ	Command zero	_	0	0	0	0	0

Chapter 3 Signal connection > 3-4 Control input and output signals

	Control input signal					Maintena	ance r	node	
Allocat	ion No.	Signal		Commu nication	tion	Torque	Built-in command		
Positive logic	Negative logic	code	Signal name	mode			Jog	POS	HOME
30	80	ZCAN	Positioning cancel	_	_	_	_	0	0
31	81	FJOG	Forward direction jog	_	-	_	0		_
32	82	RJOG	Reverse direction jog	_	_	_	0	_	_
37	87	МТОН	Motor overheat	0	0	0	0	0	0

### **b.** Control output signal

The names of control output signals and the operation mode in which the signals are effective are given in the following list.

\* The speed command, torque command, and built-in command functions are available in the maintenance mode.

Table 3-18 Control output signal list

### O : Effective, -: Ineffective

Control output signal			Commu Maintenance mode						
Allocat	ion No.	Signal		nication			Built-	in con	nmand
Positive logic	Negative logic	code	Signal name	mode	Speed	Torque	Jog	POS	HOME
1	51	ALM	Alarm	0	0	0	0	0	0
2	52	WNG	Warning	0	0	0	0	0	0
3	53	RDY	Servo ready	0	0	0	0	0	0
4	54	SZ	Speed Zero	0	0	0	0	0	0
5	55	PE1	Position deviation range 1	0	_	0	0	0	0
6	56	PE2	Position deviation range 2	0	_	0	0	0	0
7	57	PN1	Positioning complete 1	0	_	0	_	0	0
8	58	PN2	Positioning complete 2	0	_	0	_	0	0
9	59	PZ1	Positioning complete response 1	_	_	_	_	0	0
10	60	PZ2	Positioning complete response 2	_	_	_	_	0	0
11	61	ZN	Command complete	_	_	_	_	0	0
12	62	ZZ	Command complete response	0	_	_	_	0	0
13	63	ZRDY	Command drive ready	0	_	_	_	0	0
14	64	PRF	Rough match	0	_	_	0	0	0
15	65	VCP	Speed attainment	0	0	_	0	0	0
17	67	BRK	Brake release	0	0	0	0	0	0
18	68	LIM	Limit in-Process	0	0	0	0	0	0
19	69	EMGO	Emergency stop	0	0	0	0	0	0
20	70	НСР	Zero point return complete	0	0	0	0	0	0
21	71	HLDZ	Command zero in- process	_	0	0	0	0	0
22	72	ОТО	Overtravel in-process	0	0	0	0	0	0
23	73	MTON	Motor electrification in- process	0	0	0	0	0	0
25	75	SMOD	Speed command mode in-process	0	0	_	_	_	_
26	76	TMOD	Torque command mode in-process	0	_	0	_	_	_
27	77	PMOD	Position control mode in- process	0	_	_	_	_	_
28	78	NMOD	Built-in command mode in-process	_	_	0	0	0	0

Chapter 3 Signal connection > 3-4 Control input and output signals

	Control output signal				N	/laintena	ince n	node	
Allocat	ion No.	Signal		Commu			Built-in command		
Positive logic	Negative logic	code	Signal name	mode	Speed		Jog	POS	HOME
33	83	OUT1	Common output 1	_	_	_	_	0	0
34	84	OUT2	Common output 2	_	_	_	_	0	0
35	85	OUT3	Common output 3	_	_	_	_	0	0
36	86	OUT4	Common output 4	_	_	_	_	0	0
37	87	OUT5	Common output 5	_	_	_	_	0	0
38	88	OUT6	Common output 6	_	_	_	_	0	0
39	89	OUT7	Common output 7	_	_	_	_	0	0
40	90	OUT8	Common output 8	_	_	_	_	0	0
49	99	OCEM	Marker output	0	0	0	0	0	0

<sup>\*</sup> Only positive logic OCEM output is effective. Even if it is set as negative logic with the parameter, it is output as positive logic.

### 3-4-3 Control input signals

### Reset [RST]

- a. Function
  - When this signal is switched ON, any detected alarm is reset and the alarm signal (ALM) is switched OFF.
  - While this signal is ON, the motor is in the power-off state and the brake release signal (BRK) and the servo ready signal (RDY) are not output. When this signal is switched OFF again, the servo driver returns to the normal operating status.
  - When this signal is switched ON, the emergency stop signal (EMGO) is released.

Be sure to remove the cause of an alarm before resetting the alarm.

- b. Related signals
  - [ALM: Alarm]
  - [RDY: Servo ready]
  - [BRK: Brake release]
  - [EMGO: Emergency stop]

### Alarm reset [ARST]

- a. Function
  - When this signal is switched ON, any detected alarm is reset and the alarm signal (ALM) is switched OFF.
  - When no alarm is detected and this signal is switched ON, no operation is performed.

### **△** Caution

Be sure to remove the cause of an alarm before resetting the alarm.

- b. Related signal
  - [ALM: Alarm]

# **Emergency stop [EMG] (initial allocation: DI1)**

a. Function

For details of this signal, refer to the explanation of P633 in "Chapter 9 Parameters".

- When this signal is switched ON, the emergency stop signal (EMGO) is switched ON and the motor stops according to the stop mode and deceleration time specified in [P633]. At this time, the servo ready signal (RDY) is switched OFF.
- For a torque command, the torque command becomes zero without braking stoppage.
- After the motor stops, when the time specified in [P633: Servo OFF delay time after EMG braking stoppage] has elapsed, the motor enters the power-off state.
- b. Related signals
  - [RDY: Servo ready]
  - [EMGO: Emergency stop]
- c. Related parameters
  - [P623: Control input signal condition setting 1(EMG)]
  - [P633: Stopping selection when EMG signal is ON, Deceleration time after EMG signal braking stoppage, Servo OFF delay time after EMG braking stoppage]

### Servo on [SON]

### a. Function

- When this signal is switched ON, the motor enters the power-on state.
- When this signal is switched OFF, the motor enters the power-off state.
- When this signal is OFF, the brake release signal (BRK) and the servo ready signal (RDY) are not output.

### b. Related signals

[RDY: Servo ready] [BRK: Brake release]

• [MTON: Motor electrification in-process]

### Drive [DR]

### a. Function

- When this signal is switched ON, the command in each mode can be accepted.
- When this signal is switched OFF during motor operation, each command becomes invalid and the motor stops in the relevant mode listed below.

Run mode	Stop mode
Speed command	Deceleration with the setting value of P405 or P409
Torque command	Torque drop with the setting of P439
Position control	Quick stop
Built-in command	Quick stop

### **b.** Related parameters

- [P405: Speed command deceleration standard time]
- [P409: Internal speed command deceleration standard time]
- [P439: Internal torque command Increase/Decrease change time]

# **Deviation clear [CLR]**

#### a. Function

- When this signal is switched ON, position deviation is cleared and the motor stops in the status in which the speed command is "0".
- When this signal is switched ON during motor operation, the motor stops quickly. The commands remaining when this signal is switched ON are discarded.

### **Torque limit [TL]**

- a. Function
  - When this signal is switched ON, the torque limit values specified in [P636: TL signal torque limit value +] and [P637: TL signal torque limit value -] become valid.
  - The lowest torque limit value specified in the following related parameters is used.
  - Torque limit is effective even to a sudden motor stop and a deceleration stop in the event of an alarm/warning.
- b. Related signal
  - [LIM: Limit in-Process]
- c. Related parameters
  - [P080: Max torque limit value +]
  - [P081: Max torque limit value -]
  - [P415 : Torque limit value]
  - [P523 : SEL Torque limit value]
  - [P636: TL signal torque limit value +]
  - [P637: TL signal torque limit value -]

### Forward direction overtravel [FOT] (initial allocation: DI2)

- a. Function
  - This signal indicates the travel limit (stroke end) in the forward direction.
  - When this signal is switched ON, the motor recognizes that the travel limit point is reached and stops after the deceleration time set in [P634].
  - For a torque command, the torque becomes zero without braking stoppage.
  - When this signal is ON, operation can be performed only in the reverse direction.
  - When this signal is OFF, the device recognizes that the current position is within the normal operation range and can perform normal operation.
  - During a reverse direction command, this signal is invalid.
- b. Related parameter
  - [P634: Deceleration time after OT signal braking stoppage]

# Reverse direction overtravel [ROT] (initial allocation: DI3)

- a. Function
  - This signal indicates the travel limit (stroke end) in the reverse direction.
  - When this signal is switched ON, the motor recognizes that the travel limit point is reached and stops after the deceleration time set in [P634].
  - For a torque command, the torque becomes zero without braking stoppage.
  - When this signal is ON, operation can be performed only in the forward direction.
  - When this signal is OFF, the device recognizes that the current position is within the normal operation range and can perform normal operation.
  - During a forward direction command, this signal is invalid.
- **b.** Related parameter
  - [P634: Deceleration time after OT signal braking stoppage]

### Mode select 1, 2 [MD1, MD2]

### a. Function

• When this signal is switched ON, the run mode in the maintenance mode is selected according to the combination of MD1 and MD2 as listed in the table below.

MD2	MD1	Run mode
OFF	OFF	Speed command
OFF	ON	Torque command
ON	OFF	Speed command
ON	ON	Built-in command

### **b.** Related parameter

• [P638: MD signal delay time]

# Gain select 1, 2 [GSL1, GSL2]

### a. Function

• When this signal is switched ON, a gain number is selected in the combination of GSL1 and GSL2 as shown in the table below.

GSL2	GSL1	Valid gain number
OFF	OFF	Gain number selected with SEL
OFF	ON	Gain No. 1
ON	OFF	Gain No. 2
ON	ON	Gain No. 3

# **Command direction inversion [RVS]**

### a. Function

• When this signal is switched ON, the command direction is inversed against the internal speed command.

# Command selection 1 - 8 [SS1 to SS8]

### a. Function

- These signals, SS1 to SS8, select a command in combination of them.
- SS4 to SS8 are valid only for built-in commands. When SS4 to SS8 are specified for other than a built-in command, they are ignored.

### b. Related parameter

- [P638: SS signal delay time]
- The signals SS4 to SS8 are invalid for speed commands, torque commands, and built-in command (jog).

# ● : ON Blank: OFF

5	SS3 - 1		Speed	Torque	Built-in
3	2	1	command	command	command (jog)
			Speed command 0 (P410 - P412)	Torque command 0 (P441 - P443)	Jog speed 0 (P573)
		•	Speed command 1 (P413 - P415)	Torque command 1 (P444 - P446)	Jog speed 1 (P574)
	•		Speed command 2 (P416 - P418)	Torque command 2 (P447 - P449)	Jog speed 2 (P575)
	•	•	Speed command 3 (P419 - P421)	Torque command 4 (P450 - P452)	Jog speed 3 (P576)
•			Speed command 4 (P422 - P424)	Torque command 4 (P453 - P455)	Jog speed 4 (P577)
•		•	Speed command 5 (P425 - P427)	Torque command 5 (P456 - P458)	Jog speed 5 (P578)
•	•		Speed command 6 (P428 - P430)	Torque command 6 (P459 - P461)	Jog speed 6 (P579)
•	•	•	Speed command 7 (P431 - P433)	Torque command 7 (P462 - P464)	Jog speed 7 (P580)

	SS8 - 1							Built-in command
8	7	6	5	4	3	2	1	(command)
								Address 0
							•	Address 1
						•		Address 2
						•	•	Address 3
					•			Address 4
					•		•	Address 5
					•	•		Address 6
					•	•	•	Address 7
				_				
	•	•	•	•	•		•	Address 253
•	•	•	•	•	•	•		Address 254
•	•	•	•	•	•	•	•	Address 255

### Positioning drive (ZST)

- a. Function
  - When this signal is switched ON, the command selected with command selection 1 to 8 (SS1 to SS8) is executed.
  - When this signal is ON, the positioning complete response signals (PZ1 and PZ2) are OFF.
- b. Related signal
  - [SS1 to SS8: Command selection 1 8]
- c. Related parameter
  - [P638: ZST signal delay time]

### Zero point deceleration [ZLS] (initial allocation: DI4)

- a. Function
  - When this signal is switched ON during zero point return operation, zero point deceleration starts.
  - When this signal is ON and zero point return operation starts, the device moves the motor in the direction opposite to the zero point return direction once, checks that this signal is OFF, and executes zero point return operation.
  - For details, refer to "Chapter 4 Run".
- **b.** Related parameter
  - [P582: Zero point return creep speed]

### **External zero point marker [ZMK]**

- a. Function
  - This signal is used as the external marker input during zero point return.
- **b.** Related parameter
  - [P581: Zero point marker selection for homing]

# **External trigger [TRG]**

- a. Function
  - When operation for which built-in command external trigger positioning is valid is executed, switching TRG ON starts external trigger positioning operation.
  - This signal can be input as a pulse signal for at least 200 µsec.

# **Command zero [CMDZ]**

### a. Function

• When this signal is switched ON, the command listed below becomes zero.

Run mode	Corresponding command
Speed command	Speed command
Torque command	Torque command
Built-in command	Speed command

 When this signal is switched ON during motor operation, the execution of the command is stopped and the motor performs deceleration stop. The deceleration time follows the parameter setting of each command. When this signal is switched OFF, motor operation restarts from the point in the command at which operation was stopped.

# **Positioning cancel [ZCAN]**

### a. Function

- When this signal is switched ON during motor operation, the motor performs deceleration stop according to the specified deceleration time.
- When this signal is switched ON during the execution of a command, the run is canceled and the operation is interrupted.
- The device is in the start waiting state with address assignment when the motor is being stopped and after it is stopped.

# Forward direction jog [FJOG]

### a. Function

- When this signal is ON for at least the time listed in the table below, jog operation is performed in the forward direction. When this signal is switched OFF, the execution of the command is stopped.
- When this signal is ON, switching the reverse direction jog signal (RJOG) ON stops the execution of the forward direction jog command.

ON state time	Jog operation
Minimum signal acceptance time     Minimum ON state time required for     recognizing the signal. For details of the     time, refer to "Circuit No. I-1: DI1 to 4     control input signals" of the explanation     of "3-2 Input/output interface".	One-shot jog     Travel in the distance of the minimum     setting unit
100 [ms] or more	Forward direction jog

### **b.** Related signal

• [RJOG: Reverse direction jog]

### **c.** Related parameters

• [P573 - P580: Jog speed 0 - 7]

### Reverse direction jog [RJOG]

### a. Function

- When this signal is ON for at least the time listed in the table below, jog operation is performed in the reverse direction. When this signal is switched OFF, the execution of the command is stopped.
- When this signal is ON, switching the forward direction jog signal (FJOG) ON stops the execution of the reverse direction jog command.

ON state time	Jog operation
Minimum signal acceptance time     Minimum ON state time required for     recognizing the signal. For details of the     time, refer to "Circuit No. I-1: DI1 to 4     control input signals" of the explanation     of "3-2 Input/output interface".	One-shot jog     Travel in the distance of the minimum     setting unit
100 [ms] or more	Reverse direction jog

b. Related signal

• [FJOG: Forward direction jog]

c. Related parameters

• [P573 - P580: Jog speed 0 - 7]

# **Motor overheat [MTOH]**

- a. Function
  - When this signal is switched ON, a motor overheat error occurs.
  - When this signal is switched OFF, the motor overheat error is released.
  - When this signal is ON, the motor overheat error is not released.
  - For details of this signal, refer to "6-5 Motor overheat detection function".
- b. Related signal
  - [ALM: Alarm]

### 3-4-4 Control output signals

### Alarm [ALM] (initial allocation: DO2)

- a. Function
  - When an alarm occurs, this signal is switched ON, and at the same time, the servo ready signal (RDY) is switched OFF. When the motor enters the power-off state, the brake release signal (BRK) is switched OFF.
  - If an alarm occurs, the motor executes brake stop or enters the power-off state.
  - When this signal is ON, the relevant alarm number is displayed on the data display LED panel.
  - For how to release the alarm, refer to "Chapter 8 Protective function".
- **b.** Switched OFF when
  - The power is turned off, then on again.
  - The reset signal (RST) is switched ON.
  - The alarm reset signal (ARST) is switched ON.
- c. Related signals
  - [RST: Reset]
  - [ARST: Alarm reset]

### Warning [WNG]

- a. Function
  - If continuing operation in the current status may cause the device to detect an error and stop, this signal is switched ON as warning.
  - When this signal is ON, run operation does not stop.
  - When there is no possibility that an error occurs, this signal is switched OFF.
  - When this signal is ON, the relevant warning number is displayed on the data display LED panel.
  - For how to release the warning, refer to "Chapter 8 Protective function".

# Servo ready [RDY]

- a. Function
  - When motor control is ready to operate, this signal is switched ON.
  - When an alarm occurs, this signal is switched OFF, and is switched ON again when the alarm is reset.
- b. Switched OFF when
  - An alarm occurs.
  - The reset signal (RST) is switched ON.
  - The servo on signal (SON) is switched OFF.
  - The motor enters the power-off state.

### **Speed Zero [SZ]**

- a. Function
  - This signal is ON when the motor speed is within the speed range specified in [P651: SZ signal speed range] and is OFF when the speed is not within the range.
- **b.** Related parameter
  - [P651: SZ signal speed range]

### Position deviation range 1, 2 [PE1, PE2]

- a. Function
  - This signal is ON when position deviation is within the range specified in [P653: PE1 signal deviation range] ([P655]).
  - If [P654: PE1 signal delay time] ([P656]) is set, this signal is ON after the elapse of the delay time from the time the deviation enters the deviation range.
- **b.** Switched OFF when
  - An alarm occurs.
  - The reset signal (RST) is switched ON.
  - The emergency stop signal (EMG) is switched ON.
  - The servo on signal (SON) is switched OFF.
  - The drive signal (DR) is OFF.
  - The deviation clear signal (CLR) is switched ON.
  - The run mode is other than the built-in command run mode.
  - The position deviation falls out of the range specified in [P653] ([P655]).
  - Before the elapse of the delay time of [P654] ([P656]) from the time the position deviation falls within the [P653]([P655]) setting range
- **c.** Related parameters
  - [P653: PE1 signal deviation range]
  - [P654: PE1 signal delay time]
  - [P655: PE2 signal deviation range]
  - [P656: PE2 signal delay time]

### Positioning complete 1, 2 [PN1, PN2]

### a. Function

- After the execution of a command is completed, this signal is switched ON when position deviation falls within the range specified in [P653: PE1 signal deviation range] ([P655]).
- If [P654: PE1 signal delay time] ([P656]) is set, this signal is ON after the elapse of the delay time from the time the deviation enters the deviation range.

### **b.** Switched OFF when

- An alarm occurs.
- The run mode is changed.
- The reset signal (RST) is switched ON.
- The emergency stop signal (EMG) is switched ON.
- The servo on signal (SON) is switched OFF.
- The drive signal (DR) is switched OFF.
- The deviation clear signal (CLR) is switched ON.
- The positioning cancel signal (ZCAN) is switched ON.
- A program is started.
- The run mode is other than the built-in command run mode.
- The position deviation falls out of the range specified in [P653] ([P655]).
- Before the elapse of the [P654] ([P656]) delay time from the time the position deviation falls within the [P653]([P655]) setting range

### **c.** Related parameters

- [P179: S-curve time 2]
- [P522: SEL S-curve time 1]
- [P653: PE1 signal deviation range]
- [P654: PE1 signal delay time]
- [P655: PE2 signal deviation range]
- [P656: PE2 signal delay time]
- [P823: S-curve time 1]

# Positioning complete response 1, 2 [PZ1, PZ2]

### a. Function

- This signal is used as a handshake to check that the device recognizes the positioning drive signal (ZST).
- This signal is switched ON when positioning is completed.

#### b. Switched OFF when

- Operation is performed not in the built-in command run mode.
- The positioning drive signal (ZST) is switched ON.

### Command complete [ZN]

- a. Function
  - This signal is switched ON when the execution of any of the POS/HOME/INDX commands is completed.
- b. Switched OFF when
  - An alarm occurs.
  - The run mode is changed.
  - The command is issued.
  - The reset signal (RST) is switched ON.
  - The emergency stop signal (EMG) is switched ON.
  - The servo on signal (SON) is switched OFF.
  - The deviation clear signal (CLR) is switched ON.
  - The positioning cancel signal (ZCAN) is switched ON.

### **Command complete response [ZZ]**

- a. Function
  - This signal is used as a handshake to check that the device recognizes the positioning drive signal (ZST).
  - This signal is switched ON when the execution of the relevant command is completed.
- **b.** Switched OFF when
  - Operation is performed not in the built-in command run mode.
  - The positioning drive signal (ZST) is switched ON.

### **Command drive ready [ZRDY]**

- a. Function
  - This signal is switched ON when command operation becomes ready.
  - After an alarm occurs and this signal is switched OFF, this signal is recovered when the alarm is reset.
- b. Switched OFF when
  - An alarm occurs.
  - The reset signal (RST) is switched ON.
  - The emergency stop signal (EMG) is switched ON.
  - The servo on signal (SON) is switched OFF.
  - The drive signal (DR) is switched OFF.
  - The deviation clear signal (CLR) is switched ON.
  - The positioning cancel signal (ZCAN) is switched ON.
  - The motor enters the power-off state.
  - Operation is performed not in the built-in command run mode.

# Rough match [PRF]

- a. Function
  - For a built-in command, after positioning operation starts, this signal is switched ON when the difference between the current position and target position falls within the range specified in [P657: PRF signal distance] or when positioning complete 1 signal (PN1) is switched ON.
  - If zero point return (HOME command) is executed with a built-in command, this signal is switched ON under the same conditions as those of the zero point return complete signal (HCP).
- b. Switched OFF when
  - An alarm occurs.
  - · Operation starts.
  - The run mode is changed.
  - The reset signal (RST) is switched ON.
  - The emergency stop signal (EMG) is switched ON.
  - The servo on signal (SON) is switched OFF.
  - The deviation clear signal (CLR) is switched ON.
  - The positioning cancel signal (ZCAN) is switched ON (built-in command mode).
- c. Related signals
  - [HCP: Zero point return complete]
  - [PN1: Positioning complete 1]
- d. Related parameter
  - [P657: PRF signal distance]

# Speed attainment [VCP]

- a. Function
  - This signal is switched ON when the difference between the specified speed and motor speed falls within the range specified in [P652: VCP signal speed deviation range].
- **b.** Related parameter
  - [P652: VCP signal speed deviation range]

# Brake release [BRK] (initial allocation: DO1)

- a. Function
  - This signal is ON when the brake is released.
  - For details of this signal, refer to "6-9 Brake function".
- b. Switched OFF when
  - An alarm occurs.
  - The motor is not electrified.
  - The emergency stop signal (EMG) is switched ON.
- c. Related parameters
  - [P658: Brake release delay time, Brake activation delay time]
  - [P659: Brake activation effective low speed range]
  - [P660: Brake enforced activation delay time]

### **Limit in-process [LIM]**

- a. Function
  - This signal is switched ON when the motor enters the torque limit area and OFF when the motor leaves the torque limit area.
  - For a torque command, this signal is valid in the speed limit value. This signal is switched ON when the motor enters the speed limit area.
- b. Related parameters
  - [P080: Max torque limit value +]
  - [P081: Max torque limit value -]
  - [P123 (9th 7th digits): Main power supply drop torque limit value]
  - [P415 : Torque limit value]
  - [P440: Speed limit value at torque command mode]
  - [P443 : TRQSEL Speed limit value]
  - [P523 : SEL Torque limit value]
  - [P636: TL signal torque limit value +]
  - [P637: TL signal torque limit value -]

### **Emergency stop in-process [EMGO]**

- a. Function
  - This signal is switched ON when the emergency stop signal (EMG) is switched ON.
  - When the emergency stop signal (EMG) is OFF, this signal is switched OFF by switching the reset signal (RST) ON, then OFF again.
- b. Related signals
  - [RST: Reset]
  - [EMG: Emergency stop]

# Zero point return complete [HCP]

- a. Function
  - This signal is switched ON when the device can recognize the absolute position.

When an absolute encoder is used and the value indicating Reflected is specified in [P170], this signal is switched ON at power-on.

When other than an absolute encoder is used, this signal is switched ON once zero point return is completed after power-on.

- **b.** Switched OFF when
  - Power ON
  - Zero point return is started.
  - An encoder alarm occurs.
  - One of [P161] and [P164] settings is changed and reflected.
- c. Related parameters
  - [P060: Encoder type]
  - [P161 (1st digit): Moving direction selection]
  - [P164: Mechanical movement]
  - [P170: Present position reflection selection after main power of ABS is ON]

# Command zero in-process [HLDZ]

- a. Function
  - This signal is switched ON when the command zero signal (CMDZ) is ON and the motor stops.
- b. Switched OFF when
  - The motor runs.
  - The command zero signal (CMDZ) is switched OFF.
- c. Related signal
  - [CMDZ: Command zero]

# **Overtravel in-process [OTO]**

- a. Function
  - This signal is switched ON when an overtravel state occurs.
  - This signal is switched OFF when the overtravel state is canceled.
  - This signal is invalid in the communication mode.
- b. Related signals
  - [FOT: Forward direction overtravel]
  - [ROT: Reverse direction overtravel]

### **Motor electrification in-process [MTON]**

- a. Function
  - This signal is switched ON when the servo on signal (SON) is switched ON and the motor enters the power-on state.
  - When the reset signal (RST) is switched ON in the motor power-on state, the motor is in the power-off state while the reset signal (RST) is ON. The motor enters the power-on state again when the reset signal (RST) is switched OFF.
- b. Switched OFF when
  - The reset signal (RST) is switched ON.
  - The servo on signal (SON) is switched OFF.
- c. Related parameters
  - [P633: Servo OFF delay time after EMG braking stoppage]
  - [P658: Brake activation delay time]

# Speed command mode in-process [SMOD]

- a. Function
  - This signal is ON in the speed command run mode.
- b. Related signal
  - [MD1,2: Mode select 1, 2]

# Torque command mode in-process [TMOD]

- a. Function
  - This signal is ON in the torque command run mode.
- b. Related signal
  - [MD1,2: Mode select 1, 2]

### Position control mode in-process [PMOD]

- a. Function
  - This signal is ON in the position control run mode.
- b. Related signal
  - [MD1,2: Mode select 1, 2]

### **Built-in command mode in-process [NMOD]**

- a. Function
  - This signal is ON in the built-in command run mode.
- b. Related signal
  - [MD1,2: Mode select 1, 2]

# Common output 1 - 8 [OUT1 to OUT8]

- a. Function
  - This signal is switched ON when a command for which common output data is valid is executed in the command run mode.
  - This signal is kept ON after the execution of the command is completed.
  - OUT8 to OUT1 are treated as binary data (8 bits) and correspond to bit 7 to 0, respectively.
    - Corresponding bit = 0: This signal is OFF.
    - Corresponding bit = 1: This signal is ON.
- **b.** Switched OFF when
  - An alarm occurs.
  - The run mode is changed.
  - Command at the start
  - The reset signal (RST) is switched ON.
  - The emergency stop signal (EMG) is switched ON.
  - The servo on signal (SON) is switched OFF.
  - The deviation clear signal (CLR) is switched ON.

# **Marker output [OCEM]**

- a. Function
  - This signal outputs the marker pulse corresponding to the motor encoder marker signal.
- **b.** Switched OFF when
  - No marker signal is output.
- c. Related parameters
  - [P060: Encoder type]
  - [P140 (3rd digit): Marker output width]
  - [P143: Marker output position]

Chapter 3 Signal connection > 3-4 Control input and output signals

# Chapter 4 Run

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# 4-1 Run procedure

This section describes the procedure for trial run with this device alone.

Before starting this operation, set the device to the maintenance mode using VPH DES. For details of how to switch to the maintenance mode and trial run, refer to the separate instruction manual "VPH Series Servo Adjustment Manual".

Operate this device in accordance with following procedure.

- 1. Be sure to conduct trial run.
- 2. When conducting trial run, be very careful not to cause accident. To avoid problems, first run this device in the no-load status. After confirming no fault, connect the device to the machine.
- **3.** If [P068: Magnetic pole sensor type] is "Auto magnetic pole sensing", at the power-on or after recovery from encoder errors, "auto magnetic pole detection operation" is executed at the first Servo On. Carefully perform this operation because the motor performs swing motion during the operation. The swing and motion in this operation depend on values in parameter [P380] to [P387] (magnetic pole detection operation related parameters). When this operation cannot be terminated normally, the motor stops due to error detection. The servo ready signal (RDY) is not output during this operation. The signal is output after normal termination.

<u> </u>				
Prohibition	<ul> <li>Do not touch terminal block of the device carelessly.</li> <li>Do not use the device leaving the cover of terminal block removed.</li> <li>Voltage also remains after the power is turned off. Confirm that the "CHARGE" LED on the device front panel goes off, then start work.</li> </ul>	Electric shock may occur.		
Prohibition	<ul> <li>After duly confirming safety, switch ON/OFF the power supply.</li> <li>Note that motor performs swing motion in the auto magnetic pole detection operation.</li> <li>In the case of machine that cannot carry out auto magnetic pole detection operation at the power-on with the motor (due to interference on works, etc.) use the "magnetic pole sensor".</li> </ul>	Injury or failure may occur.		

# 4-1-1 Power supply voltage check

Confirm that the power supply voltage for the device satisfies required specification. For information about the specification of the power supply voltage, refer to "12-1-5 Device electrical specification".

### 4-1-2 Before-run inspection

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

- **a.** Isn't there any miswiring? Specially, is the power not connected to motor connection terminal U, V, W?
- b. Isn't there any place in short-circuit status by cable chips, etc.?
- c. Isn't there any place where excessive stress is on wires?
- d. Isn't there any loose fit screw or terminal? Are connectors inserted tightly?
- e. Is power supply voltage correct?
- f. Isn't there any short-circuit or line-to-ground fault in external sequence circuit?
- g. Is grounding method correct? Is the grounding grade D-class or better?

<u> </u>				
Prohibition	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.

- Set motor data using VPH DES.
- Check the positive/negative logic setting for input signals (when used).

# 4-1-3 Setting the motor run direction

In this manual, the motor run directions are defined as follows: Forward direction as CCW and reverse direction as CW. They indicate the rotation directions of the rotation axis as observed from the top of the motor.

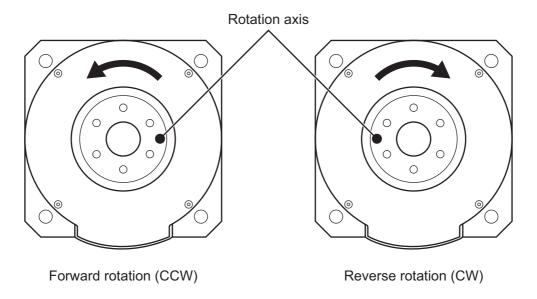


Figure 4-1 Run direction of the τDISC motor

Table 4-1	Each command	input and motor	rotation direction	(with the τDISC motor)
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Command input mode	Polarity	Motor rotation direction	
Speed command	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
Speed Command	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)
Torque command	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
Torque command	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)
Positioning operation	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
command	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)

Hereinafter in this document, "motor forward direction" means the motor move direction when the forward direction is specified in the input command, and "motor reverse direction" means the motor move direction when the reverse direction is specified in the input command.

To run the motor in the reverse direction with a positive voltage command or forward direction command, set parameter [P161: Moving direction selection] to "Reverse direction operation" in the standard connection state.

### 4-1-4 Adjustment

To adjust the device, use VPH DES.

For details of the adjustment method, refer to the separate instruction manual "VPH Series Servo Adjustment Manual".

### 4-1-5 Adjustment at shipment

- For information about standard factory settings (initial values), refer to "9-2 Parameter list".
- This 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.

# 4-2 Run modes

This device supports the following run modes.

A run mode is selected with the mode select 1 (MD1) signal and the mode select 2 (MD2) signal.

By combining signal ON/OFF states, the device is switched between run modes.

Table 4-2 Mode select table

O: Signal ON, -: Signal OFF

Run mode	Mode select signal 1 (MD1)	Mode select signal 2 (MD2)
Speed command	_	_
Torque command	0	_
Speed command	_	0
Built-in command	0	0

# 4-2-1 SEL setting

For each run mode, there are eight command numbers.

Table 4-3 Selecting a run mode

Run mode	SEL name	SEL number
Speed command mode	SPD SEL	0 - 7
Torque command mode	TRQ SEL	0 - 7
Built-in command mode	SEL	0 - 7

A SEL number is selected with the command selection 1 (SS1) signal, command selection 2 (SS2) signal, and command selection 3 (SS3) signal. By combining signal ON/OFF states, the device is switched between SEL numbers.

Table 4-4 Selecting a SEL number

SS3	SS2	SS1	SEL number
OFF	OFF	OFF	SEL number 0
OFF	OFF	ON	SEL number 1
OFF	ON	OFF	SEL number 2
OFF	ON	ON	SEL number 3
ON	OFF	OFF	SEL number 4
ON	OFF	ON	SEL number 5
ON	ON	OFF	SEL number 6
ON	ON	ON	SEL number 7

# Chapter 5 Maintenance mode

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# 5-1 Speed command mode

At speed command mode, speed control run is executed according to the internal speed command value that is set in a parameter. Eight speed command values, SPD SEL 0 to SPD SEL 7, can be set. Select a speed command specification with the "Speed command value spec selection" of each SEL number.

Table 5-1 Speed command spec-related parameters

No.	Name	Input range	
		0: Speed command/command number 0	
P410	SPD SEL 0 Speed command	setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 1	
P413	SPD SEL 1 Speed command	setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 2	
P416	SPD SEL 2 Speed command	setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 3	
P419	SPD SEL 3 Speed command	setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 4	
P422	SPD SEL 4 Speed command	setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 5	
P425	SPD SEL 5 Speed command	d setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 6	
P428	SPD SEL 6 Speed command	d setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	
		0: Speed command/command number 7	
P431	SPD SEL 7 Speed command	setting value	
[1st digit]	value spec selection	1: Analog speed command	
		2: Speed command/indirect data assignment	

If [Speed command value spec selection] is "Speed command value/command number setting value" or "Speed command vale/indirect data assignment", refer to "5-1-1 Internal speed command".

### 5-1-1 Internal speed command

Run is executed by controlling the speed according to the internal command value that is set in a parameter. The command can be executed by selecting "Speed command value/ command number setting value" or "Speed command vale/indirect data assignment" in the [Speed command value spec selection] of each SEL number.

- **a.** Internal speed command function
  - Set the motor operation speed to the speed command value parameter.
  - With a positive value, the motor performs forward direction operation.
  - The speed command values are SPD SEL 0 to SPD SEL 7. For the SEL number to use, set a command value.
  - If "Reverse direction operation" is selected for [P161: Moving direction selection], the motor performs reverse direction operation with the positive value command.
  - Indirect data assignment is possible by setting [Speed command value spec selection] to "Speed command vale/indirect data assignment" and setting a minus value (-99 to -1).
- **b.** Internal speed command-related parameters

Table 5-2 Internal speed command-related parameters

No.	Name	Input range
P411	SPD SEL 0 Speed command value	-300000000 to 300000000 [P161 unit/s]
P414	SPD SEL 1 Speed command value	-300000000 to 300000000 [P161 unit/s]
P417	SPD SEL 2 Speed command value	-300000000 to 300000000 [P161 unit/s]
P420	SPD SEL 3 Speed command value	-300000000 to 300000000 [P161 unit/s]
P423	SPD SEL 4 Speed command value	-300000000 to 300000000 [P161 unit/s]
P426	SPD SEL 5 Speed command value	-300000000 to 300000000 [P161 unit/s]
P429	SPD SEL 6 Speed command value	-300000000 to 300000000 [P161 unit/s]
P432	SPD SEL 7 Speed command value	-300000000 to 300000000 [P161 unit/s]

### c. Internal speed command-related time chart

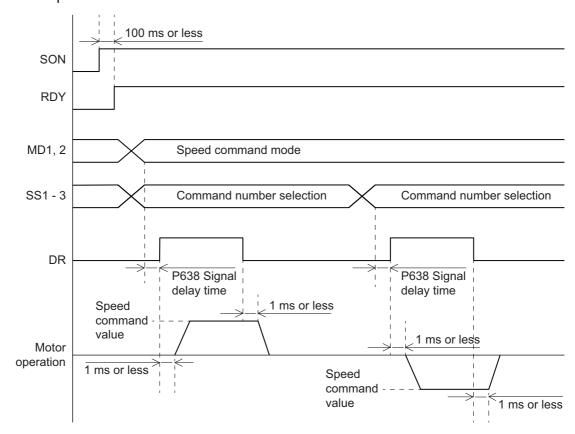


Figure 5-1 Internal speed command time chart

### 5-1-2 Acceleration/deceleration at speed command mode

Acceleration/deceleration is controlled according to the value that is set in a parameter. Acceleration/deceleration is decided by combining the standard speed and the time required to reach the standard speed.

- a. Acceleration/deceleration function at speed command mode
  - Set an acceleration value to the acceleration standard speed and the acceleration time and a deceleration value to the deceleration standard speed and the deceleration time.
  - For acceleration, if the time required to reach the acceleration standard speed from the motor stop status is set to the acceleration time, acceleration is performed proportionally.
  - For deceleration, if the time required to reach the motor stop status from the deceleration standard speed is set to the deceleration time, deceleration is performed proportionally.
  - If the acceleration standard speed and the deceleration standard speed is set to "0", the maximum speed of the motor is assumed to be the standard speed.

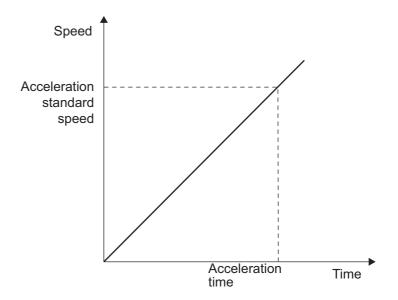


Figure 5-2 Acceleration standard speed in relation to acceleration time at speed command mode

### b. Acceleration/deceleration setting-related parameters

Table 5-3 Acceleration/deceleration setting-related parameters

No.	Name	Input range
P404	Speed command acceleration standard time	0 to 300000000 [P161 unit/s]
P405	Speed command deceleration standard time	0 to 300000000 [P161 unit/s]
P408	Internal speed command acceleration standard time	0.0 to 99999.9 [ms]
P409	Internal speed command deceleration standard time	0.0 to 99999.9 [ms]

## 5-1-3 Torque limit at speed command mode

The torque limit value at speed command mode follows the internal command that is set in a parameter.

- a. Torque limit with the internal command
  - The torque limit values are SPD SEL 0 to SPD SEL 7. The torque limit value of the SEL number used during operation is effective.
  - The torque limit value is a setting value common to the forward direction and the reverse direction.
  - Indirect data assignment is possible by setting a minus value (-9.9 to -0.1).
- **b.** Torque limit-related parameters

Table 5-4 Internal torque limit-related parameters

No.	Name	Input range	
P412	SPD SEL 0 Torque limit value	-9.9 to 799.9 [%]	
P415	SPD SEL 1 Torque limit value	-9.9 to 799.9 [%]	
P418	SPD SEL 2 Torque limit value -9.9 to 799.9 [%]		
P421	SPD SEL 3 Torque limit value -9.9 to 799.9 [%]		
P424	SPD SEL 4 Torque limit value -9.9 to 799.9 [%]		
P427	SPD SEL 5 Torque limit value	-9.9 to 799.9 [%]	
P430	SPD SEL 6 Torque limit value -9.9 to 799.9 [%]		
P433	SPD SEL 7 Torque limit value	-9.9 to 799.9 [%]	

# 5-2 Torque command mode

At torque command mode, torque control run is executed according to the internal torque command value that is set in a parameter. Up to eight torque command values, TRQ SEL 0 to TRQ SEL 7, can be set. Select a speed command specification with the "Torque command value spec selection" of each SEL number.

Table 5-5 Torque command-related parameters

No.	Name	Input range
		0: Torque command/command number 0
P441	TRQ SEL 0 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 1
P444	TRQ SEL 1 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 2
P447	TRQ SEL 2 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 3
P450	TRQ SEL 3 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 4
P453	TRQ SEL 4 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 5
P456	TRQ SEL 5 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 6
P459	TRQ SEL 6 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment
		0: Torque command/command number 7
P462	TRQ SEL 7 Torque command	setting value
[1st digit]	value spec selection	1: Analog torque command
		2: Torque command/indirect data assignment

<sup>•</sup> If [Torque command value spec selection] is "Torque command value/command number setting value" or "Torque command value/indirect data assignment", refer to "5-2-1 Internal torque command".

## 5-2-1 Internal torque command

Run is executed by controlling the torque according to the command value that is set in a parameter. The command can be executed by selecting "Torque command value/command number setting value" or "Torque command value/indirect data assignment" in the [Torque command value spec selection] of each SEL number.

- **a.** Internal torque command function
  - Set the torque value of the motor to the torque command value parameter.
  - With a positive value, the motor performs forward direction operation.
  - The torque command values are TRQ SEL 0 to TRQ SEL 7. For the SEL number to use, set a command value.
  - If "Reverse direction operation" is selected for [P161: Moving direction selection], the motor performs reverse direction operation with the positive value command.
  - Indirect data assignment is possible by setting [Torque command value spec selection] to "Torque command vale/indirect data assignment" and setting a minus value (-9.9 to -0.1).
- **b.** Internal torque command-related parameters

Table 5-6 Internal torque command-related parameters

No.	Name	Input range	
P442	TRQ SEL 0 Torque command value	-799.9 to 799.9 [%]	
P445	TRQ SEL 1 Torque command value	-799.9 to 799.9 [%]	
P448	TRQ SEL 2 Torque command value	-799.9 to 799.9 [%]	
P451	TRQ SEL 3 Torque command value	-799.9 to 799.9 [%]	
P454	TRQ SEL 4 Torque command value	-799.9 to 799.9 [%]	
P457	TRQ SEL 5 Torque command value	-799.9 to 799.9 [%]	
P460	TRQ SEL 6 Torque command value	-799.9 to 799.9 [%]	
P463	TRQ SEL 7 Torque command value	-799.9 to 799.9 [%]	

#### c. Internal torque command time chart

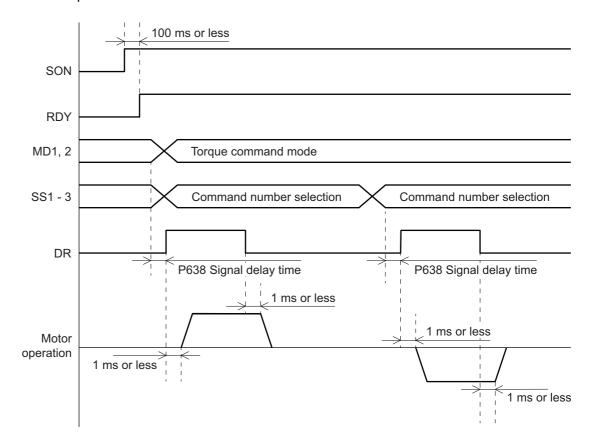


Figure 5-3 Internal torque command time chart

# 5-2-2 Torque command Increase/Decrease change time

The torque increase/decrease time is controlled according to the values that are set in parameters.

- a. Torque command increase/decrease time function at torque command mode
  - For torque increase, if the time required to reach the rated torque from the torque zero state is set, the torque increases proportionally.

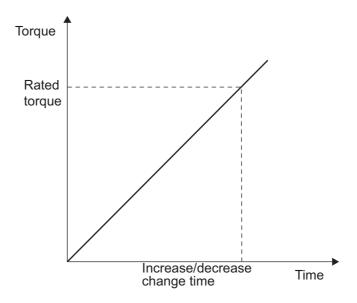


Figure 5-4 Torque command increase/decrease change in relation to rated torque

**b.** Torque command increase/decrease change time-related parameters

Table 5-7 Torque increase/decrease change time-related parameters

No.	Name	Input range
P439	Internal torque command Increase/Decrease change time	0.0 to 9999.9 [ms]

# 5-2-3 Speed limit at torque command mode

The speed limit at torque command mode follows the internal command that is set in a parameter.

- a. Speed limit with the internal command
  - The speed limit values are TRQ SEL 0 to TRQ SEL 7. The speed limit value of the SEL number used during operation is effective.
  - It is a setting value common to the forward direction and the reverse direction.
  - Indirect data assignment is possible by setting a minus value (-99 to -1).
- **b.** Speed limit-related parameters

Table 5-8 Speed limit-related parameters

No.	Name	Input range
P440	Speed limit value at torque command mode	0 to 300000000 [P161 unit/s]
P443	TRQ SEL 0 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P446	TRQ SEL 1 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P449	TRQ SEL 2 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P452	TRQ SEL 3 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P455	TRQ SEL 4 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P458	TRQ SEL 5 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P461	TRQ SEL 6 Speed limit value	-990000000 to 300000000 [P161 unit/s]
P464	TRQ SEL 7 Speed limit value	-990000000 to 300000000 [P161 unit/s]

# 5-3 Built-in command

At built-inr command mode, program operation is executed with jog operation or commands. As per the built-in command specifications, up to eight SELs, SEL0 to SEL7, can be set.

# 5-3-1 Program operation

Run is executed according to the commands that are set in a program. There are command addresses 0 to 255, and up to 256 addresses can be set. For details of programs, refer to "5-4 Program".

## 5-3-2 Jog operation

Run is executed by controlling the speed according to the command value that is set in a parameter.

#### a. Jog operation function

- Set the motor operation speed to the jog speed parameter.
- There are jog speeds from 0 to 7. For the number to use, set a command value.
- With a positive value, the motor performs forward direction operation.
- If "Reverse direction operation" is selected for [P161: Moving direction selection], it is possible to cause the motor to perform reverse direction operation with a positive value command.
- The acceleration/deceleration and other specs follow the setting of SEL0.

#### **b.** Jog operation-related parameters

Table 5-9 Jog operation-related parameters

No.	Name	Input range
P573	Jog speed 0	-990000000 to 300000000 [P161 unit/s]
P574	Jog speed 1	-990000000 to 300000000 [P161 unit/s]
P575	Jog speed 2	-990000000 to 300000000 [P161 unit/s]
P576	Jog speed 3	-990000000 to 300000000 [P161 unit/s]
P577	Jog speed 4	-990000000 to 300000000 [P161 unit/s]
P578	Jog speed 5	-990000000 to 300000000 [P161 unit/s]
P579	Jog speed 6	-990000000 to 300000000 [P161 unit/s]
P580	Jog speed 7	-990000000 to 300000000 [P161 unit/s]

#### **c.** Jog operation time chart

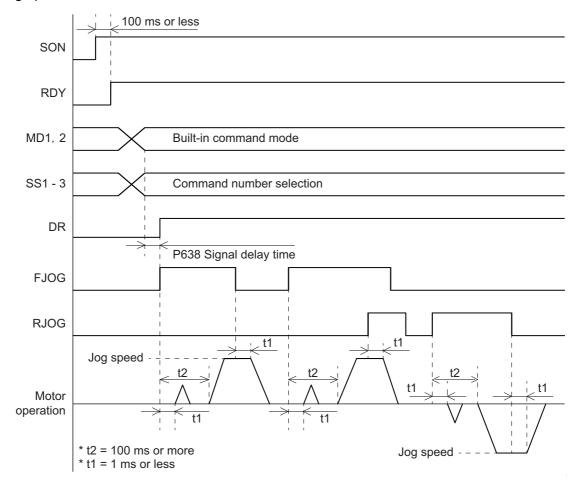


Figure 5-5 Jog operation time chart

#### 5-3-3 Acceleration/deceleration at built-in command mode

Acceleration/deceleration is controlled according to the value that is set in a parameter. Acceleration/deceleration is decided by combining the standard speed and the time required to reach the standard speed.

- a. Acceleration/deceleration function at built-in command mode
  - Set an acceleration value to the acceleration standard speed and the acceleration time and a deceleration value to the deceleration standard speed and the deceleration time.
  - For acceleration, if the time required to reach the acceleration standard speed from the motor stop status is set to the acceleration time, acceleration is performed proportionally.
  - For deceleration, if the time required to reach the motor stop status from the deceleration standard speed is set to the deceleration time, deceleration is performed proportionally.
  - If the acceleration standard speed and the deceleration standard speed is set to "0", the maximum speed of the motor is assumed to be the standard speed.

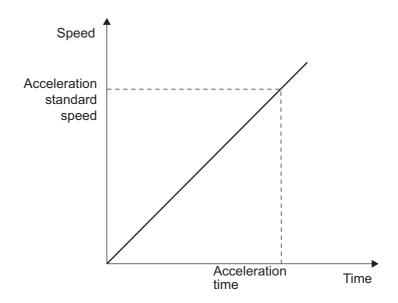


Figure 5-6 Acceleration standard speed in relation to acceleration time at built-in command mode

#### b. Acceleration/deceleration setting-related parameters

Table 5-10 Acceleration/deceleration setting-related parameters

No.	Name	Input range
P518	SEL0 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P519	SEL0 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P520	SEL0 Acceleration time	-9.9 to 99999.9 [ms]
P521	SEL0 Deceleration time	-9.9 to 99999.9 [ms]
P525	SEL1 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P526	SEL1 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P527	SEL1 Acceleration time	-9.9 to 99999.9 [ms]
P528	SEL1 Deceleration time	-9.9 to 99999.9 [ms]

No.	Name	Input range
P532	SEL2 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P533	SEL2 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P534	SEL2 Acceleration time	-9.9 to 99999.9 [ms]
P535	SEL2 Deceleration time	-9.9 to 99999.9 [ms]
P539	SEL3 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P540	SEL3 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P541	SEL3 Acceleration time	-9.9 to 99999.9 [ms]
P542	SEL3 Deceleration time	-9.9 to 99999.9 [ms]
P546	SEL4 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P547	SEL4 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P548	SEL4 Acceleration time	-9.9 to 99999.9 [ms]
P549	SEL4 Deceleration time	-9.9 to 99999.9 [ms]
P553	SEL5 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P554	SEL5 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P555	SEL5 Acceleration time	-9.9 to 99999.9 [ms]
P556	SEL5 Deceleration time	-9.9 to 99999.9 [ms]
P560	SEL6 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P561	SEL6 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P562	SEL6 Acceleration time	-9.9 to 99999.9 [ms]
P563	SEL6 Deceleration time	-9.9 to 99999.9 [ms]
P567	SEL7 Acceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P568	SEL7 Deceleration standard speed	-990000000 to 300000000 [P161 unit/s]
P569	SEL7 Acceleration time	-9.9 to 99999.9 [ms]
P570	SEL7 Deceleration time	-9.9 to 99999.9 [ms]

#### 5-3-4 S-curve acceleration/deceleration at built-in command mode

By setting S-curve acceleration/deceleration, you can reduce the impact at the start and end of acceleration/deceleration. There are two S-curve acceleration/deceleration settings. The value resulting from synthesizing the first and second settings is the S-curve acceleration/deceleration.

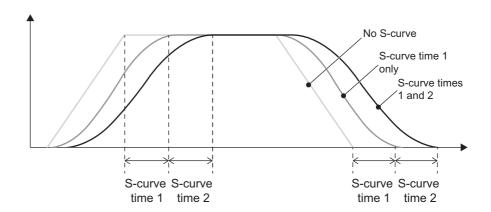


Figure 5-7 S-curve acceleration/deceleration operation example

#### a. S-curve acceleration/deceleration-related parameters

They are parameters for setting S-curve acceleration/deceleration time. Set the first ones for the individual SELs individually. The second ones are common settings.

No.	Name	Input range
P179	S-curve time 2	0.0 to 1000.0 [ms]
P522	SEL 0 S-curve time 1	0.0 to 1000.0 [ms]
P529	SEL 1 S-curve time 1	0.0 to 1000.0 [ms]
P536	SEL 2 S-curve time 1	0.0 to 1000.0 [ms]
P543	SEL 3 S-curve time 1	0.0 to 1000.0 [ms]
P550	SEL 4 S-curve time 1	0.0 to 1000.0 [ms]
P557	SEL 5 S-curve time 1	0.0 to 1000.0 [ms]
P564	SEL 6 S-curve time 1	0.0 to 1000.0 [ms]
P571	SEL 7 S-curve time 1	0.0 to 1000.0 [ms]

Table 5-11 S-curve acceleration/deceleration-related parameters

# 5-3-5 Torque limit at built-in command mode

The torque limit value at built-in command mode follows the internal command that is set in a parameter.

- a. Torque limit with the internal command
  - The torque limit values at built-in command mode are SEL 0 to SEL 7. The torque limit value of the SEL number used during operation is effective.
  - It is a setting value common to the forward direction and the reverse direction.
  - Indirect data assignment is possible by setting a negative value (-9.9 to -0.1).

Table 5-12 Internal torque limit-related parameters

No.	Name	Input range
P523	SEL 0 Torque limit value	-9.9 to 799.9 [%]
P530	SEL 1 Torque limit value	-9.9 to 799.9 [%]
P537	SEL 2 Torque limit value	-9.9 to 799.9 [%]
P544	SEL 3 Torque limit value	-9.9 to 799.9 [%]
P551	SEL 4 Torque limit value	-9.9 to 799.9 [%]
P558	SEL 5 Torque limit value	-9.9 to 799.9 [%]
P565	SEL 6 Torque limit value	-9.9 to 799.9 [%]
P572	SEL 7 Torque limit value	-9.9 to 799.9 [%]

# 5-4 Program

Positioning operation and zero point return are executed with a program.

# 5-4-1 Command list

This section outlines the commands supported by this device.

Table 5-13 Command list

Title	Command name	Function
NOP	No operation command [No OPeration]	Performs no operation.
POS	Positioning [POSitioning]	Performs positioning operation.
HOME	Zero point return [HOME positioning]	Performs zero point return operation.
INDX	Index positioning [INDeX positioning]	Performs rotator positioning operation.

### 5-4-2 Positioning

If the POS command is executed in program run, positioning operation is started.

Positioning operation is executed by specifying an address where the POS command is set and switching the positioning start signal (ZST) ON. Upon the completion of the operation, the command complete signal (ZN) is switched ON.

Even in the overtravel state, operation can be performed in the release direction.

By setting [P516: Positioning approval selection when homing is not completed], it is possible to disable the execution of positioning operation before the completion of zero point return.

#### a. Positioning operation input data

Data name	Data function	Input range	Unit
DOS.	Positioning position and	-2147483648 to 2147483647	P161 unit
POS	direction	IX00 to IX99	Piorunii

Set a positioning amount. If a value outside the range is set, [AL432: Positioning command incorrect] occurs.

Data name	Data function	Input range	Unit
E	Desitioning anod	0 to 300000000	P161 unit/s
	Positioning speed	IX00 to IX99	F 101 utilit/S

Set a positioning speed. If "0" is set, the motor does not operate with the command being under execution. To disable the command, switch the positioning cancel signal (ZCAN) ON. For indirect data assignment, if a value outside the range is set in indirect data, the positioning speed is set to "0".

Data name	Data function	Input range	Unit
TRG	External trigger position	0 to 2147483647 IX00 to IX99	P161 unit

Set the moving amount from the time the external trigger signal (TRG) is switched ON. The positioning direction follows the positioning position and direction (POS). If "0" is set, external trigger positioning is ineffective.

Data name	Data function	Input range	Unit
OUT	Common output	00000000 to 11111111 IX00 to IX99	Binary

Set a common output. A common output is possible at the start of operation.

Data name	Data function	Input range	Unit
A/I	Absolute position/relative position	ABSOLUTE/INCREMENT	None

Select a positioning amount type.

ABSOLUTE

Set the target position and direction in reference to position data. (Absolute position)

#### INCREMENT

Set the moving amount and direction from the current position of the motor. (Relative position)

When the maximum value is set for the positioning position, infinite length feed is performed.

Data name	Data function	Input range	Unit
UPDN	SEL selection	SEL 0 to 7	None

Select the SEL number used for positioning operation.

The following setting values follow the selected SEL number.

Acceleration/deceleration time, S-curve acceleration/deceleration time, torque limit value, Gain No., and PN signal selection

#### b. Positioning operation time chart

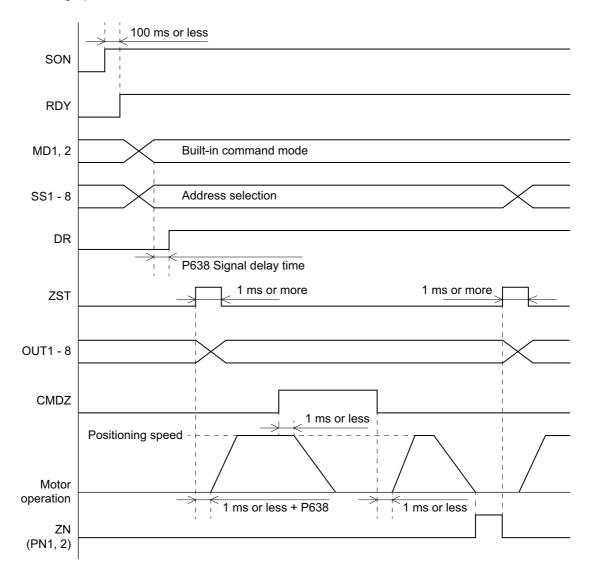


Figure 5-8 POS command time chart

### 5-4-3 Zero point return

When the HOME command in program run is executed, zero point return operation is started. By specifying an address in which the HOME command is set and switching the positioning start signal (ZST) ON, zero point return operation is executed. Upon completion of operation, the command complete signal (ZN) is switched ON.

Even in the overtravel state, operation can be performed in the release direction. For an ABS encoder, the zero point marker position is [P143: Marker output position].

The following methods of zero point return are available.

TYPE	Zero point return method	Description
STD.HOME	Standard zero point return	Detects the marker after zero point deceleration, and sets the zero point.
LS LESS	LS less zero point return	Detects the marker without using zero point deceleration, and sets the zero point.
STOP HOME	On-the-spot zero point return	Sets the current position of the motor as the zero point without operation.
ОТ НОМЕ	OT return zero point return	Detects the marker after zero point deceleration, and sets the zero point.  The direction is reversed when OT is detected before zero point deceleration.
OT LSLESS	OT return LS less Zero point return	Detects the marker without using zero point deceleration, and sets the zero point.  The direction is reversed when OT is detected.
SET ABS	ABS encoder Current position auto setting	Sets the relationship between the encoder position and mechanical position when an absolute encoder is connected. SET ABS can be executed even in the servo off status.

#### a. Zero point return operation input data

Data name	Data function	Input range	Unit
DIR	Zero point return direction	FORWARD/REVERSE	None

Select a zero point return direction.

- FORWARD : Operation is performed in the forward direction.
- REVERSE : Operation is performed in the reverse direction.
- \* For STOP HOME and SET ABS, zero point return direction is not used.

Data name	Data function	Input range	Unit
F	Zero point return speed	0 to 300000000	P161 unit/s

Set a zero point return speed. If "0" is set, the motor does not operate with the command being under execution. To disable the command, switch the positioning cancel signal (ZCAN) ON.

<sup>\*</sup> For STOP HOME and SET ABS, the zero point return speed is not used.

Data name	Data function	Input range	Unit
OUT	Common output	00000000 to 11111111 IX00 to IX99	Binary

Set a common output. A common output is possible at the start of operation.

Data name	Data function	Input range	Unit
TYPE	Zero point return method	STD HOME/LS LESS/ STOP HOME/OT HOME/ SET ABS/OUT POS/ OT LS LESS	None

Select a zero point return method.

Data name	Data function	Input range	Unit
UPDN	SEL selection	SEL 0 to 7	None

Select the SEL number used for zero point return operation.

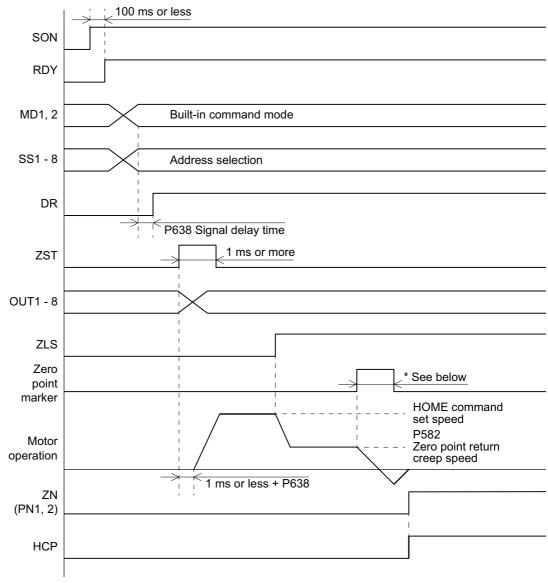
The following setting values follow the selected SEL number.

Acceleration/deceleration time, S-curve acceleration/deceleration time, torque limit value, Gain No., and PN signal selection

#### **b.**Zero point return operation time chart

• STD HOME

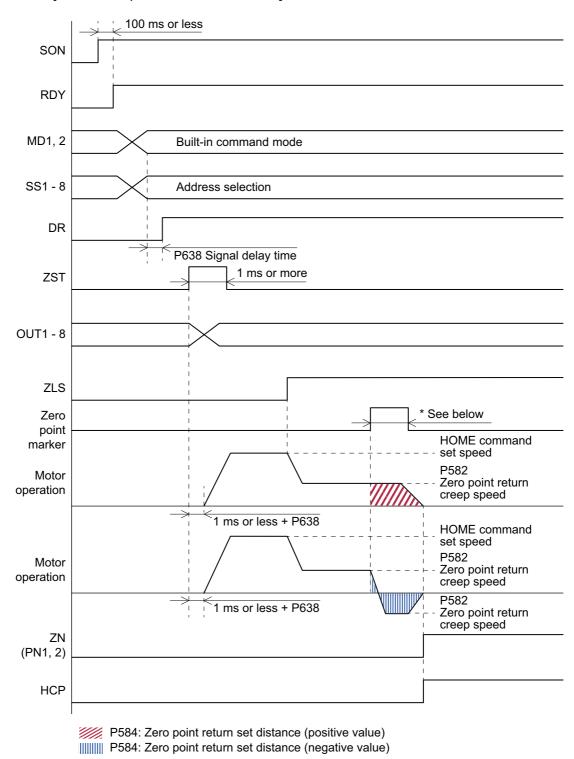
Detects the marker after zero point deceleration, and sets the zero point.



<sup>\*</sup> Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-9 STD HOME time chart ①

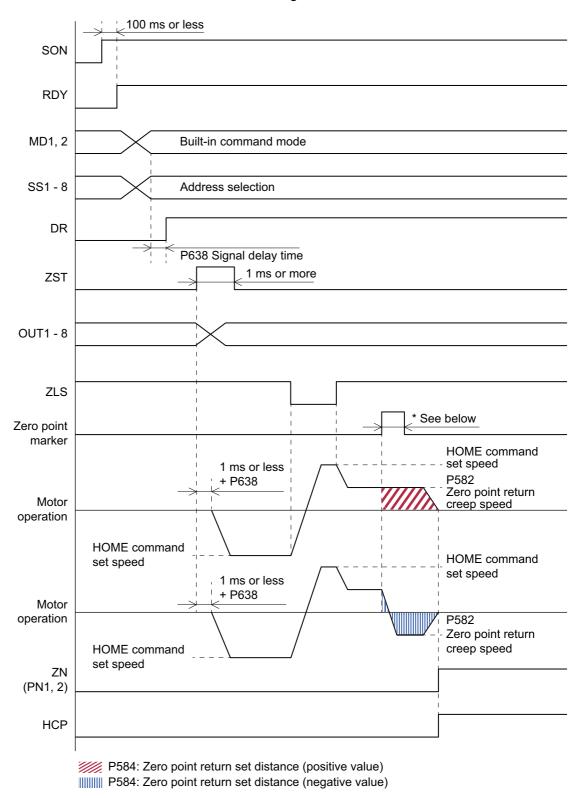
When [P584: Zero point return set distance] is set



<sup>\*</sup> Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-10 STD HOME time chart ②

If the command is executed when the ZLS signal is in the ON state

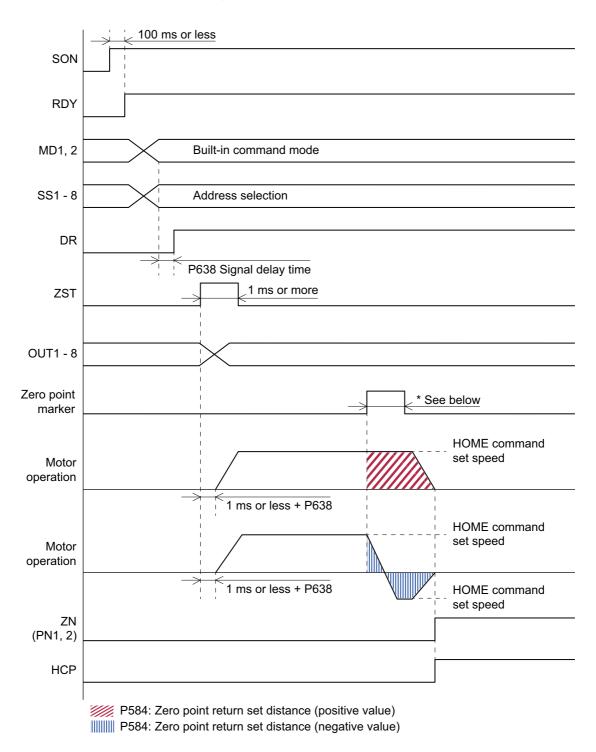


<sup>\*</sup> Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-11 STD HOME time chart ③

#### • LS LESS

Detects the marker without using zero point deceleration, and sets the zero point.



\* Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-12 LS LESS time chart

#### STOP HOME

Sets the current position of the motor as the zero point without operation.

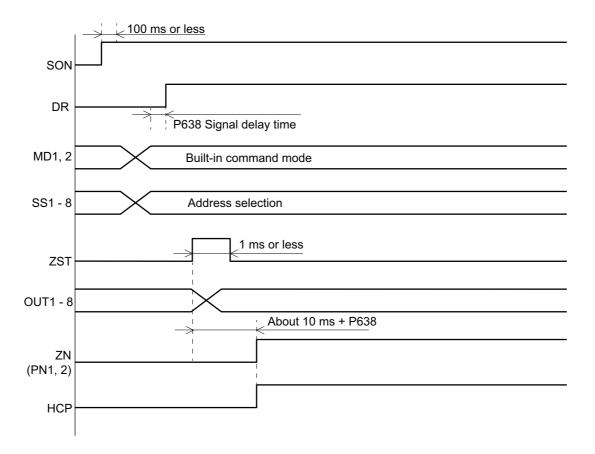
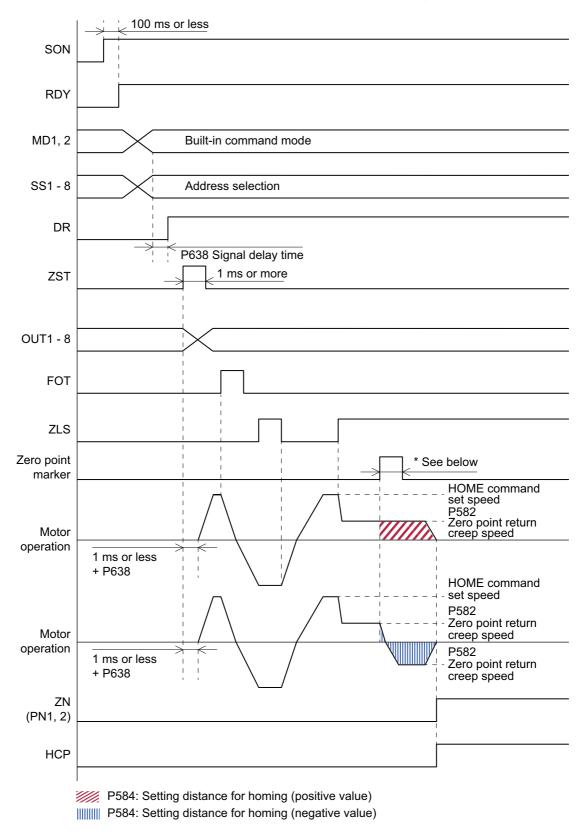


Figure 5-13 STOP HOME time chart

#### • OT HOME

Detects the marker after zero point deceleration, and sets the zero point.

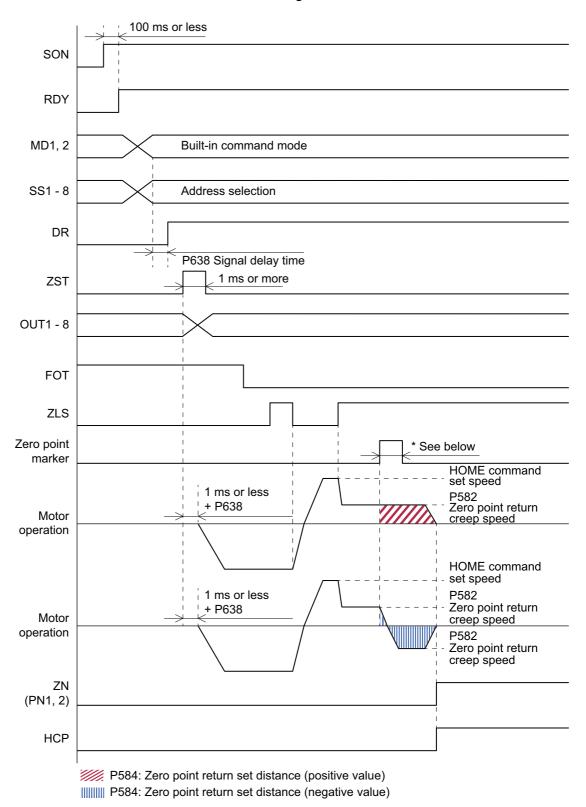
If ZLS is detected beyond FOT, the device stops after decelerating to the creep speed.



\* Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-14 OT HOME time chart ①

If the command is executed when the FOT signal is in the ON state

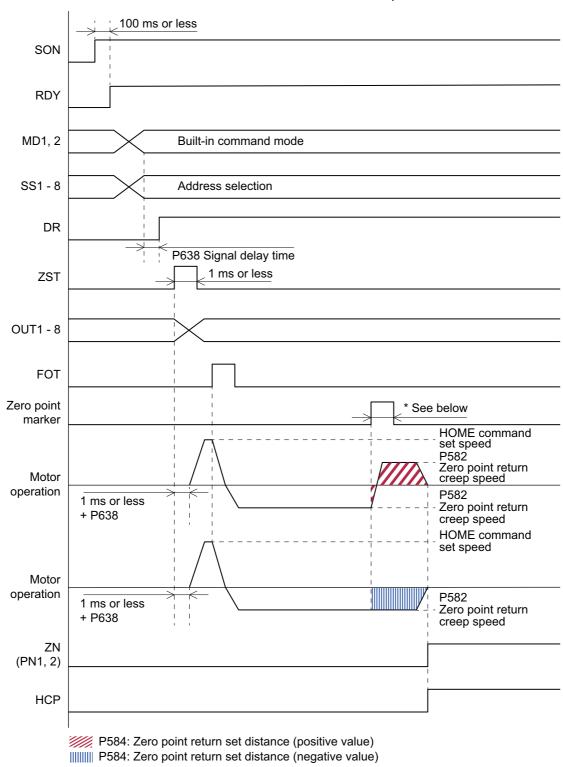


<sup>\*</sup> Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-15 OT HOME time chart ②

#### • OT LS LESS

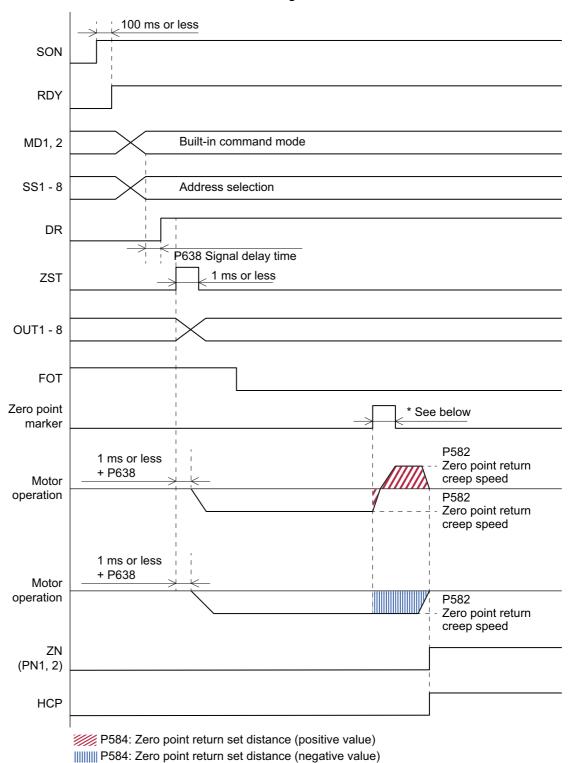
Reverses the direction, detects the marker, and sets the zero point when OT is detected.



\* Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-16 OT LS LESS time chart ①

If the command is executed when the FOT signal is in the ON state



<sup>\*</sup> Select the zero point marker to use from [P581 (1st digit): Zero point marker selection for homing].

Figure 5-17 OT LS LESS time chart ②

#### • SET ABS

When SET ABS is executed, the value of the encoder position (C024) is set in [P168: ABS standard data].

SET ABS can be executed even in the servo off status.

For details of the setting method, refer to "6-4 Adjustment of the mechanical position of the ABS encoder".

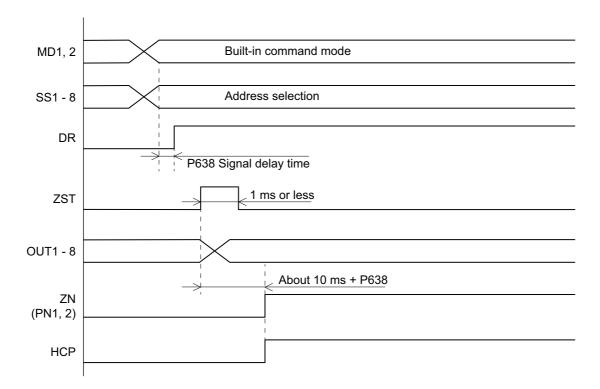


Figure 5-18 SET ABS time chart

### 5-4-4 Index positioning

When the INDX command is executed in program run, index positioning operation is started. Index positioning operation is executed by specifying an address where the INDX command is set and switching the positioning start signal (ZST) ON. Upon the completion of the operation, the command complete signal (ZN) is switched ON.

By setting [P516: Positioning approval selection when homing is not completed], it is possible to disable the execution of positioning operation before the completion of zero point return.

To execute the INDX command, set the following parameters:

P165: Rotation position range

- Set a value other than "0".
- P166: Rotation position range sign switching position Set "0".

To use the HOME command with the ABS encoder, change P170 (Present position reflection selection after main power of ABS is ON) to "No reflection" before use.

#### a. Index positioning operation input data

Data name	Data function	Input range	Unit
POS	Desitioning position	0 to 2147483647	P161 unit
103	Positioning position	IX00 to IX99	P 101 unii

Set a positioning amount. If a value outside the range is set, [AL.DE.3: 1 rotation short cut positioning position setting error] occurs. For indirect data assignment, If a value outside the range is set in indirect data, [AL.DE.2: Positioning command incorrect] occurs.

Data name	Data function	Input range	Unit
F	Positioning speed	0 to 300000000 IX00 to IX99	P161 unit/s

Set a positioning speed. If "0" is set, the motor does not operate with the command being under execution. To disable the command, switch the positioning cancel signal (ZCAN) ON. For indirect data assignment, if a value outside the range is set in indirect data, the positioning speed is set to "0".

Data name	Data function	Input range	Unit
OUT	Common output	00000000 to 11111111	Dinant
OUT		IX00 to IX99	Binary

Set a common output. A common output is possible at the start of operation.

Data name	Data function	Input range	Unit
DIR	Positioning direction	SHORT/FORWARD/REVERSE	None

Select a positioning amount type.

• SHORT: Operation is performed in the direction in which the positioning travel distance is shorter.

• FORWARD: Operation is performed in the forward direction.

• REVERSE: Operation is performed in the reverse direction.

Data name	Data function	Input range	Unit
UPDN	SEL selection	SEL 0 to 7	None

Select the SEL number used for positioning operation.

The following setting values follow the selected SEL number.

Acceleration/deceleration time, S-curve acceleration/deceleration time, torque limit value, Gain No., and PN signal selection

#### **b.** Index positioning operation time chart

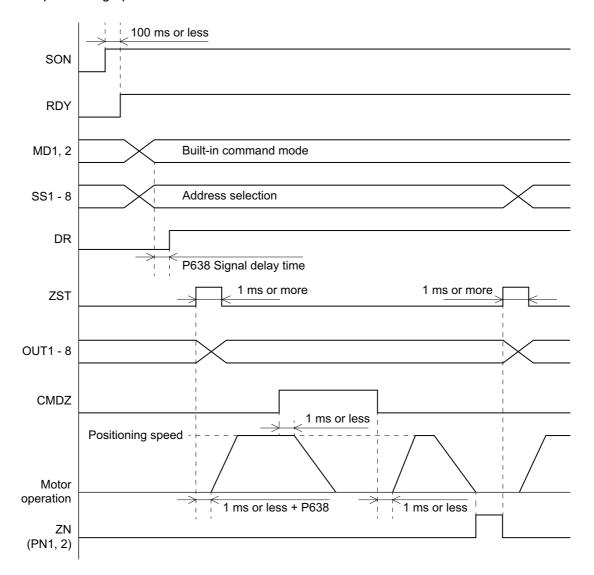


Figure 5-19 INDX command time chart

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# 6-1 Switching between the normal speed gain and the low speed gain

There are gain adjustment parameters for the gain during normal operation and the gain during low speed operation. The timing for switching between the normal gain and the low speed gain can be set with a parameter.

For information about the adjustment method, refer to the "VPH Series Servo Adjustment Manual".

# 6-1-1 Gain switching-related parameters

Table 6-1 Gain switching -related parameters

No.	Name	Input range [unit]
P210	Gain No. 0 Low speed gain switching speed	0.000 to 99999.999 [rpm]
P211	Gain No. 0 Low speed gain switching deviation pulse	0 to 99999999 [FB pulse]
	Gain No. 0	
	Normal speed → Low speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 0	
P212	Low speed → Normal speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 0 Low speed gain switching spec 1 selection	Speed and deviation pulse interlocking     Speed and deviation pulse separate 1     Speed and deviation pulse
		separate 2
	Gain No. 0 Low speed gain switching spec 2 selection	<ul><li>0: During command input, switching is ineffective.</li><li>1: Switching is effective regardless of the command.</li></ul>
	Gain No. 1 Low speed gain switching delay time	0.0 to 999.9 [ms]
P213	Gain No. 1 Low speed gain holding time after switching	0.0 to 9999.9 [ms]
P240	Gain No. 1 Low speed gain switching speed	0.000 to 99999.999 [rpm]
P241	Gain No. 1 Low speed gain switching deviation pulse	0 to 99999999 [FB pulse]

No.	Name	Input range [unit]
P242	Gain No. 1 Normal speed → Low speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 1 Low speed → Normal speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 1 Low speed gain switching spec 1 selection	Speed and deviation pulse interlocking     Speed and deviation pulse separate 1     Speed and deviation pulse separate 2
	Gain No. 1 Low speed gain switching spec 2 selection	<ul><li>0: During command input, switching is ineffective.</li><li>1: Switching is effective regardless of the command.</li></ul>
	Gain No. 2 Low speed gain switching delay time	0.0 to 999.9 [ms]
P243	Gain No. 2 Low speed gain holding time after switching	0.0 to 9999.9 [ms]
P270	Gain No. 2 Low speed gain switching speed	0.000 to 99999.999 [rpm]
P271	Gain No. 2 Low speed gain switching deviation pulse	0 to 99999999 [FB pulse]
	Gain No. 2 Normal speed → Low speed gain switching filter time constant	0.0 to 99.9 [ms]
P272	Gain No. 2 Low speed → Normal speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 2 Low speed gain switching spec 1 selection	Speed and deviation pulse interlocking     Speed and deviation pulse separate 1     Speed and deviation pulse separate 2
	Gain No. 2 Low speed gain switching spec 2 selection	<ul><li>0: During command input, switching is ineffective.</li><li>1: Switching is effective regardless of the command.</li></ul>
P273	Gain No. 3 Low speed gain switching delay time	0.0 to 999.9 [ms]
	Gain No. 3 Low speed gain holding time after switching	0.0 to 9999.9 [ms]
P300	Gain No. 3 Low speed gain switching speed	0.000 to 99999.999 [rpm]
P301	Gain No. 3 Low speed gain switching deviation pulse	0 to 99999999 [FB pulse]

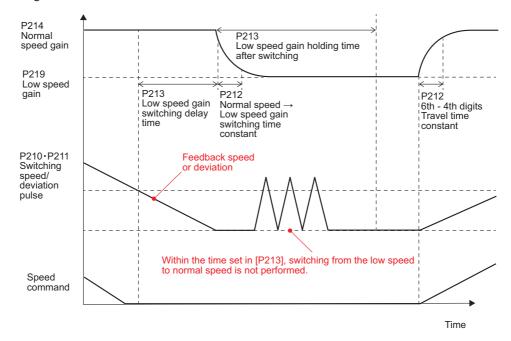
No.	Name	Input range [unit]
P302	Gain No. 3  Normal speed → Low speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 3 Low speed → Normal speed gain switching filter time constant	0.0 to 99.9 [ms]
	Gain No. 3 Low speed gain switching spec 1 selection	Speed and deviation pulse interlocking     Speed and deviation pulse separate 1     Speed and deviation pulse separate 2
	Gain No. 3 Low speed gain switching spec 2 selection	During command input,     switching is ineffective.     Switching is effective     regardless of the command.
P303	Gain No. 3 Low speed gain switching delay time	0.0 to 999.9 [ms]
	Gain No. 3 Low speed gain holding time after switching	0.0 to 9999.9 [ms]

# 6-1-2 Gain switching operation

The timing for gain switching can be set with a parameter. In the following example, the gain No. is 0.

[Switching between the normal speed gain and the low speed gain]

P212: Low speed gain switching spec 1 selection = 0 Speed and deviation pulse interlocking P212: Low speed gain switching spec 2 selection = 0 During command input, low speed gain switching ineffective.



# 6-2 Auto magnetic pole detection operation

The functions for detecting the magnetic pole position of the motor in the device include auto magnetic pole detection operation. This operation is effective if [P068: Magnetic pole sensor type] is "Auto magnetic pole sensing", and is executed in the following operations:

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

# 6-2-1 Auto magnetic pole detection-related parameters

No. Input range [unit] Name P380 Magnetic pole detection torque limit value 0 to 799 [%] P381 0 to 9999 Magnetic pole detection gain 1 P382 Magnetic pole detection integration time constant 0.1 to 999.9 [ms] P383 Magnetic pole detection gain 2 0 to 9999 [s-1] P384 0.0 to 30.0 [deg] Magnetic pole detection complete range Magnetic pole detection filter order selection 0: Primary, 1: Secondary P385 Magnetic pole detection filter frequency 0 to 9999 [Hz] Landing torque 0 to 799 [%] P386 Landing torque holding time 0.00 to 99.99 [s] Magnetic pole detection torque minimum value 0 to 799 [%] P387 Magnetic pole detection torque attenuation pattern 0: Soft damping,

1: Rapid damping

Table 6-2 Auto magnetic pole detection operation-related parameters

# 6-2-2 Auto magnetic pole detection operation

selection

a. Auto magnetic pole detection operation pattern The operation pattern in auto magnetic pole detection is as shown below. In actual operation, the following pattern is repeated two or three times. When this operation terminates normally, the servo ready signal (RDY) is output.

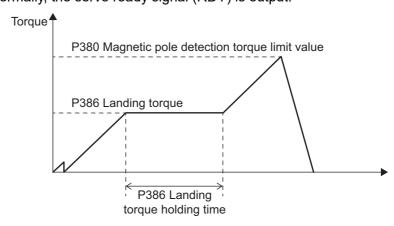
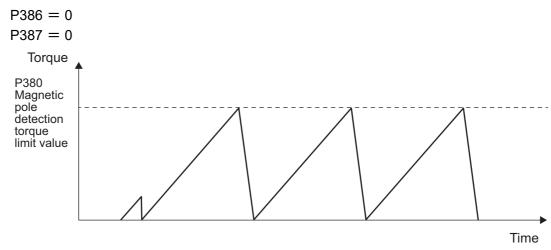


Figure 6-1 Single pattern operation of auto magnetic pole detection

- \* The time required for auto magnetic pole detection operation is four seconds plus the time set in [P386: Landing torque holding time].
- \* When the [P386] setting is "0", the slope of output torque is linear until it reaches the [P380] setting from the "0" status. The time required to reach the [P380] setting from the "0" status is 500 ms

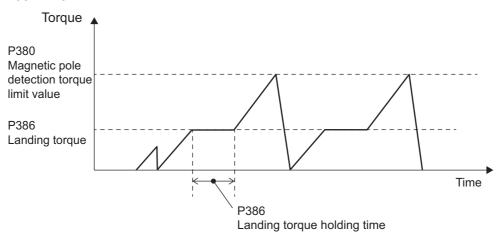
- **b.** Auto magnetic pole detection operation pattern examples
  - Depending on the load inertia, the proper values of the auto magnetic pole detection-related parameters differ. Set them referring to the following setting examples as rough guides.
  - Example 1: If the load inertia is equal to or less than several tens of times the motor inertia A non-zero value is set in P380.



• Example 2: If the load inertia is equal to or greater than several tens of times the motor inertia

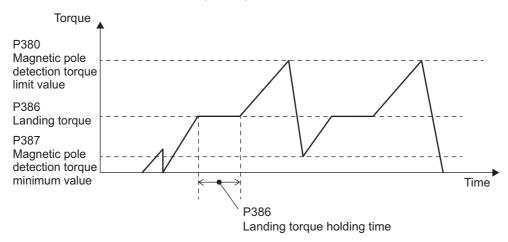
A non-zero value is set in P380 and P386.

$$P387 = 0$$



• Example 3: If the load inertia is equal to or greater than several tens of times the motor inertia, and the load is slightly unbalanced

A non-zero value is set in P380, P386, and P387.



# 6-2-3 Auto magnetic pole-related error

If this operation cannot terminate normally, "AL.D4.3 Auto magnetic pole detection error" occurs and the servo off status is assumed. Followings are possible causes.

- The gain adjustment of the auto magnetic pole is not an appropriate value. Adjust the gain, referring to "6-2-4 Auto magnetic pole adjustment".
- Detection fails due to the influence of the mechanical system.
   Due to conditions of the mechanical system, such as large load inertia, low rigidity, and imbalanced load, automatic magnetic pole detection may fail. Take measures such as adjusting the gain. Also, check that there is no play in the mechanical system. If the error is not removed, you may need to review the mechanical system.

# 6-2-4 Auto magnetic pole adjustment

If the auto magnetic pole operation is not completed normally due to, for example, the occurrence of an error, adjust the gain.

- a. P380: Magnetic pole detection torque limit value
  - Set the torque limit value according to the motor to use.
  - The larger the setting value, the larger the torque output by the motor and the quicker the response.
  - If the setting value is decreased too much, the response becomes slow, making it difficult to achieve magnetic pole detection.
- b. P381: Magnetic pole detection gain 1
  - The larger the value, the quicker the response.
  - If the setting value is increased too much, vibration occurs.
  - If the setting value is decreased too much, the response becomes slow, making it difficult to achieve magnetic pole detection.
- c. P382: Magnetic pole detection integration time constant
  - The smaller the setting value, the quicker the response.
  - If the setting value is decreased too much, vibration (chatter vibration) occurs.
  - If the setting value is increased too much, the response becomes slow, making it difficult to achieve magnetic pole detection.
- d. P383: Magnetic pole detection gain 2
  - The larger the value, the quicker the response.
  - If the setting value is increased too much, over-shoot, under-shoot, or vibration occurs.
  - If the setting value is decreased too much, the response becomes slow, making it difficult to achieve magnetic pole detection.
- e. P385: Magnetic pole detection filter frequency
  - If machine resonance occurs, enter a filter for the torque command to fix it.
  - The larger the value, the quicker the response.
  - If the setting value is decreased too much, the response becomes slow, making it difficult to achieve magnetic pole detection.
- f. P386: Landing torque
  - Set the landing torque value 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, this makes it difficult to achieve magnetic pole detection.
- g. P386: Landing torque holding time
  - Set the landing torque holding time according to the torque limit value at magnetic pole detection.
  - The larger the setting value, the more stable the magnetic pole detection operation in the landing torque, but the longer the magnetic pole detection time.

# **⚠** Caution

- In the case of machine that cannot carry out "auto magnetic pole detection operation (swing motion of the motor)" at the power-on (due to interference between works, etc.), use the "magnetic pole sensor".
- Note that motor performs swing motion in the auto magnetic pole detection operation.

# 6-3 Vibration control filter

This device is equipped with the 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.

## 6-3-1 Vibration control filter-related parameters

Table 6-3 Vibration control filter-related parameters

No.	Name	Input range [unit]
P340	Vibration control filter ineffective speed range *	0.00 to 99999.999 [rpm]
	Vibration control filter center frequency *	0 to 4999 [Hz]
P341	Vibration control filter band width ratio *	0 to 100 [%]
	Vibration control filter depth	0 to 99 [-dB]

<sup>\*</sup> If either P340 or P341 is "0", the vibration control filter is ineffective.

## 6-3-2 Vibration control filter operation pattern

Operation with the vibration control filter being set is as follows.

- \* Filter values can be set only in manual manner.
- \* Filter values can be determined based on the torque, speed, and deviation waveform.

[Example] P341: Vibration control filter center frequency 100 [Hz], Vibration control filter band width ratio 20 [%]

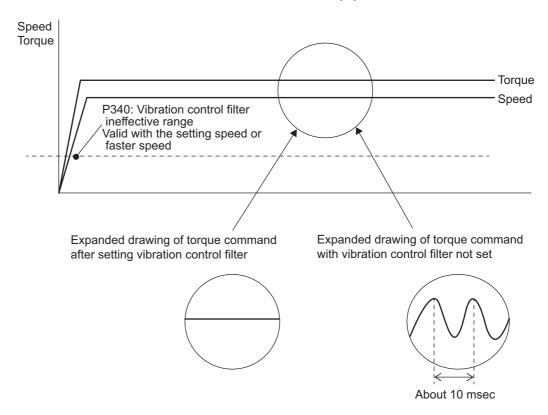


Figure 6-2 Vibration control filter setting example in the case of 100 [Hz] vibration

When effective, this function can influence the acceleration/deceleration operation of the motor. Set a correct value in [P340] according to the details of the operation.

# 6-4 Adjustment of the mechanical position of the ABS encoder

# 6-4-1 ABS encoder position setting

If using the ABS encoder, you can change the display of the current position (C020) at will. Two setting methods are available, manual setting method in which you change parameters directly and automatic setting method with commands. For information about the automatic setting method, refer to "6-4-2 ABS encoder position setting using a command".

- Encoder setting Start VPH DES, and set the connected encoder.
- 2. Mechanical position setting
  - ABS standard data setting
     Set [P168: ABS standard data].
     From the status display of VPH DES, check the value displayed for the encoder position
     (C024), and set the position you want to be standard data in [P168: ABS standard data].
  - ABS standard mechanical position
     Set [P169: ABS standard mechanical position]. For the position that is set in [P168], set the value displayed for the current position (C020) in [P169: ABS standard mechanical position].
- \* If changing [P161 (1st digit): Moving direction selection] after the completion of the setting, follow "3) Mechanical position setting" again.
- \* If zero point return is executed after the completion of the above setting, the setting becomes ineffective.

To make effective the mechanical position setting with [P168] and [P169], turn the power off, then on again.

#### [Example 1]

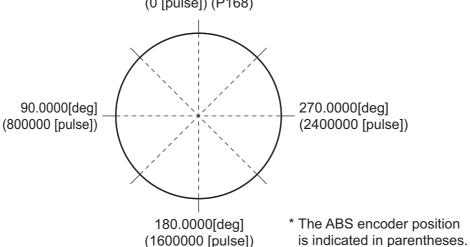
P061: Number of encoder pulses of rotary type motor = 3200000 [ppr]

P161: Position unit selection = deg
P161: Position decimal point unit selection = 0.0001

P165: Rotation position range = 360.0000 [deg]

P168: ABS standard data = 0 [pulse]
P169: ABS standard mechanical position = 0.0000 [deg]

0.0000[deg] (P169) (0 [pulse]) (P168)



#### [Example 2]

P061: Number of encoder pulses of rotary type motor = 3200000 [ppr]

P161: Position unit selection = deg
P161: Position decimal point unit selection = 0.0001

P165: Rotation position range = 360.0000 [deg]
P168: ABS standard data = 800000 [pulse]
P169: ABS standard mechanical position = 180.0000 [deg]

90.0000[deg] (0 [pulse])

180.0000[deg] (P169)
(800000 [pulse]) (P168)

270.0000[deg] (2400000 [pulse])

\* The ABS encoder position is indicated in parentheses.

## 6-4-2 ABS encoder position setting using a command

By executing the HOME command at any position, adjust the mechanical position.

#### 1. Command selection

Select HOME, and set TYPE [zero point return method] to "SET ABS".

#### 2. Movement to the standard position

Using jog operation, etc., move the motor to the standard position of the machine system.

#### 3. ABS standard mechanical position setting

At the position of "2. Movement to the standard position", set the value you want displayed as the current position in [P169: ABS standard mechanical position].

#### 4. Command execution

Execute the HOME command, SET ABS.

The value of the current encoder position (C024) of the motor is automatically set in [P168: ABS standard data]. The value of [P169: ABS standard mechanical position] is displayed as the current position (C020).

#### [Example]

If you want to set the position of the encoder position 1600000 [pulse] as the current position 0 [deg]

Set [P169: ABS standard mechanical position] to "0", and execute SET ABS at the position of the encoder position 1600000 [pulse].

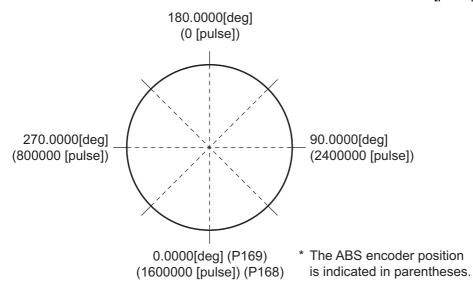
P061: Number of encoder pulses of rotary type motor = 3200000 [ppr]

P161: Position unit selection = deg
P161: Position decimal point unit selection = 0.0001

P165: Rotation position range = 360.0000 [deg] P169: ABS standard mechanical position = 0.0000 [deg]

[P168] is automatically set after the execution of SET ABS.

P168: ABS standard data = 1600000 [pulse]



# 6-5 Motor overheat detection function

Using parameters, set the "AL.C0.0 Motor overheat error" and "FL.F0.7 Motor overheat warning" specifications.

## 6-5-1 Motor overheat detection-related parameters

Table 6-4 Motor overheat detection-related parameters

No.	Name	Input range [unit]
P129		0: Warning
	Motor overheat detection spec selection	1: No warning
		2: Warning only
	Motor overheat detection time	0 to 999 [s]

### 6-5-2 Motor overheat detection

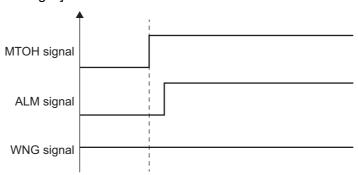
Motor overheat detection examples are shown below.

a. If the detection time is "0"

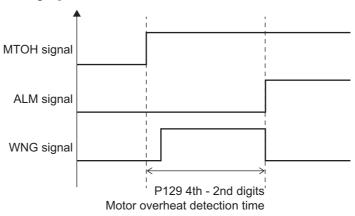
With the MTOH signal being ON, [AL.116: Motor overheat error] occurs.

• P129[1st digit]: No warning

• P129[4th - 2nd digits]: 0



- b. If the detection specification is "Warning" and the detection time is "1 to 999"
  With the MTOH signal being ON, [FL.907: Motor overheat warning] occurs, and after the period during which the MTOH signal is continuously ON reaches the set time, [AL.116: Motor overheat error] occurs.
  - P129[1st digit]: Warning
  - P129[4th 2nd digits]: 1 to 999



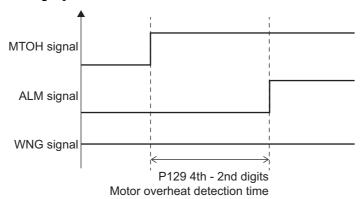
c. If the detection specification is "No warning"and the detection time is "1 to 999"
After the period during which the MTOH signal is continuously ON reaches the set time,

[AL.116: Motor overheat error] occurs.

[FL.907: Motor overheat warning] does not occur.

• P129[1st digit]: No warning

• P129[4th - 2nd digits]: 1 to 999



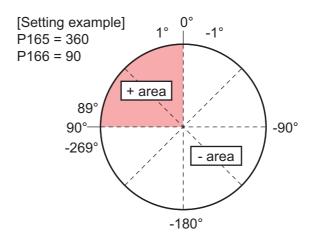
# 6-6 Rotation position range setting

Relation between the rotation position range and the sign switching position

• If P165 is a positive value (1 to 2147483647)

At power ON, the present position is acquired according to the [P165] and [P166] settings.

Subsequently, the present position is rounded within the [P165] range.



- If P165 is a negative value (-2147483648 to -1)
  At power ON, the present position is acquired according to the [P165] and [P166] settings.
  Subsequently, rounding within the range is not performed.
- \* Effective if [P170] is set to "0: Reflected" when the ABS encoder is connected.

  If a negative value is set under other conditions, the present position is rounded within the [P165] range.

# 6-7 Software overtravel detection function

Using parameters, set overtravel detection.

## 6-7-1 Software overtravel-related parameters

The operation in this operation depends on the values of the software overtravel-related parameters.

Table 6-5 Software overtravel-related parameters

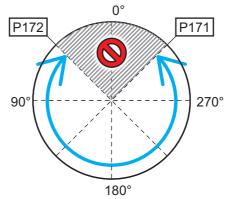
No.	Name	Input range [unit]
P171	Forward direction software OT limit	-2147483648 to 2147483647 [P161 unit]
P172	Reverse direction software OT limit	-2147483648 to 2147483647 [P161 unit]
P585	Position data standard point	-2147483648 to 2147483647 [P161 unit]

# 6-7-2 Software overtravel setting examples

Examples of the motor operation range due to the soft OT limit are shown below.

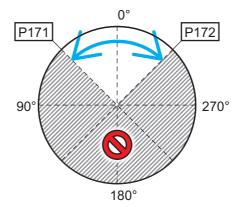
• If a rotation position range is set

[Setting example] P161 = 0.001deg P162, P163 = 1/1 P164 = 360.000 <u>P165 = 360.000</u> <u>P166 = 0.000</u> P171 = 315.000 P172 = 45.000

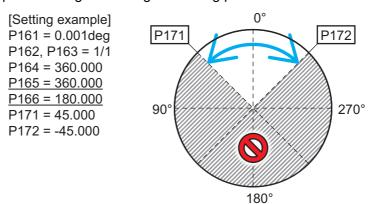


• If the rotation position range and the sign switching position are ineffective

[Setting example] P161 = 0.001deg P162, P163 = 1/1 P164 = 360.000 <u>P165 = 0.000</u> <u>P166 = 0.000</u> P171 = 45.000 P172 = -45.000



• If a rotation position range and a sign switching position are set



\* If the rotation position range is set, software overtravel may not be detected normally. Thus, in this case, use this function for an auxiliary use of overtravel detection with a sensor (such as a limit switch).

# 6-8 Notch filter

Using parameters, set a notch filter.

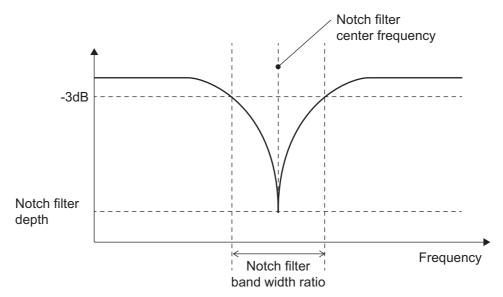
# 6-8-1 Notch filter-related parameters

Table 6-6 Notch filter-related parameters

No.	Name	Input range [unit]
	Gain No. 0 Notch filter center frequency	0 to 9999 [Hz]
P236	Gain No. 0 Notch filter band width ratio	0 to 200[%]
	Gain No. 0 Notch filter depth	0 to 99[-dB]
	Gain No. 1 Notch filter center frequency	0 to 9999 [Hz]
P266	Gain No. 1 Notch filter band width ratio	0 to 200[%]
	Gain No. 1 Notch filter depth	0 to 99[-dB]
	Gain No. 2 Notch filter center frequency	0 to 9999 [Hz]
P296	Gain No. 2 Notch filter band width ratio	0 to 200[%]
	Gain No. 2 Notch filter depth	0 to 99[-dB]
	Gain No. 3 Notch filter center frequency	0 to 9999 [Hz]
P326	Gain No. 3 Notch filter band width ratio	0 to 200[%]
	Gain No. 3 Notch filter depth	0 to 99[-dB]
	Notch filter center frequency 1	0 to 9999 [Hz]
P331	Notch filter band width ratio 1	0 to 200[%]
	Notch filter depth 1	0 to 99[-dB]
	Notch filter center frequency 2	0 to 9999 [Hz]
P332	Notch filter band width ratio 2	0 to 200[%]
	Notch filter depth 2	0 to 99[-dB]
	Notch filter center frequency 3	0 to 9999 [Hz]
P333	Notch filter band width ratio 3	0 to 200[%]
	Notch filter depth 3	0 to 99[-dB]
	Notch filter center frequency 4	0 to 9999 [Hz]
P334	Notch filter band width ratio 4	0 to 200[%]
	Notch filter depth 4	0 to 99[-dB]

# 6-8-2 Notch filter function

The relation of the notch filter function is shown below.



# 6-9 Brake function

This section explains the brake release and brake activation function of this device.

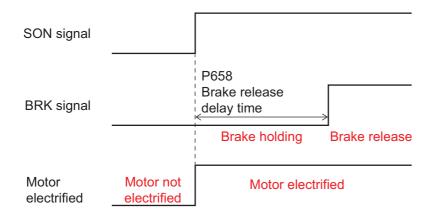
## 6-9-1 Brake function-related parameters

Table 6-7 Brake function-related parameters

No.	Name	Input range [unit]
P121	Main power OFF error detection spec selection	0: Servo OFF after braking stop 1: Servo OFF
	Stopping selection when EMG signal is ON	0: Servo OFF after braking stop 1: Servo OFF
P633	Deceleration time after EMG signal braking stoppage	0.00 to 99.99 [s]
	Servo OFF delay time after EMG signal braking stoppage	0.00 to 9.99 [s]
P651	SZ signal speed range	0 to 300000000 [P161 unit/s]
P658	Brake release delay time	0.000 to 9.999 [s]
P036	Brake activation delay time	0.000 to 9.999 [s]
P659	Brake activation effective low speed range	0 to 300000000 [P161 unit/s]
P660	Brake enforced activation delay time	0.000 to 9.999 [s]

# 6-9-2 Brake release delay time

As soon as the servo on signal (SON) is turned ON, the motor electrified status is assumed. After the elapse of the time that is set in [P658 (4th - 1st digits)], the brake release signal (BRK) turns ON.



## 6-9-3 Brake activation delay time

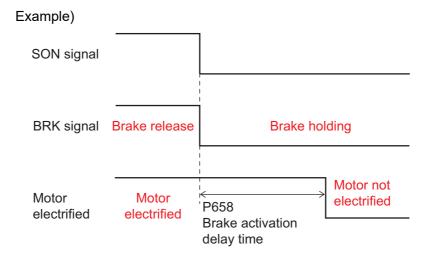
The brake release signal (BRK) output timing differs between when the motor is stopped and when it is operating.

To judge whether the motor is stopped, use the speed zero signal (SZ). Adjust the [P651] setting so that the speed zero signal (SZ) becomes stable when the brake release signal (BRK) is operated.

- a. When the motor is stopped (if the SZ signal is ON)
  - 1 If the servo on signal (SON) is OFF (if it is held OFF for a time longer than the [P658 (8th 5th digits)] setting)

After the servo on signal (SON) is turned OFF, the brake release signal (BRK) is turned OFF, and after the elapse of the time that is set in [P658 (8th - 5th digits)], the servo off status is assumed.

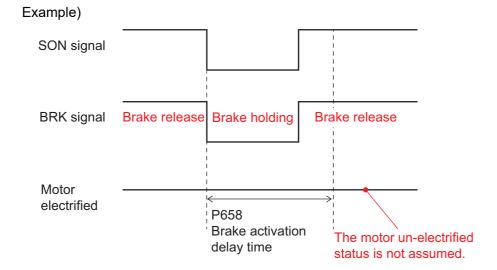
(The brake release signal (BRK) is turned OFF in the servo on status, thereby preventing the vertical shafts from dropping.)



② If the servo on signal (SON) is OFF (if it is held OFF for a time shorter than the [P658 (8th - 5th digits)] setting)

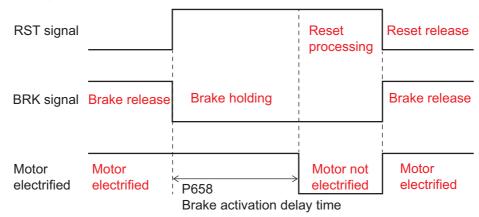
If the interval of switching the servo on signal (SON) from OFF to ON is shorter than the time that is set in [P658 (8th - 5th digits)], the brake release signal (BRK) is turned OFF as soon as the servo on signal (SON) is turned OFF, and the brake release signal (BRK) is turned ON as soon as the servo on signal (SON) is turned ON.

In this case, the motor un-electrified status is not assumed because the [P658 (8th - 5th digits)] time has not elapsed.



③ If the reset signal (RST) is turned ON (if it is held ON for a time longer than the [P658 (8th - 5th digits)] setting)
After the reset signal (RST) is turned ON, the brake release signal (BRK) is turned OFF, and after the elapse of [P658 (8th - 5th digits)], a reset (servo off status) occurs.
With the reset signal (RST) being turned OFF, the brake release signal (BRK) and the motor electrification in-process signal (MTON) are turned ON (servo on status) again.
\* The operation starts with the SON signal being ON (servo on status).



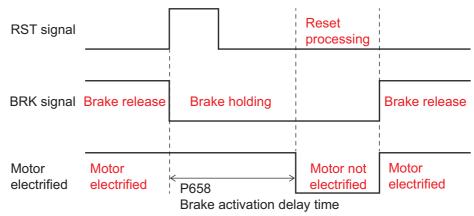


④ If the reset signal (RST) is turned ON (if it is held ON for a time shorter than the [P658 (8th - 5th digits)] setting)

After the reset signal (RST) is turned ON, the brake release signal (BRK) is turned OFF, and because the reset signal (RST) is turned OFF before the [P658 (8th - 5th digits)] setting, the servo off status is assumed in internal reset processing time only.

\* The operation starts with the SON signal being ON (servo on status).

### Example)



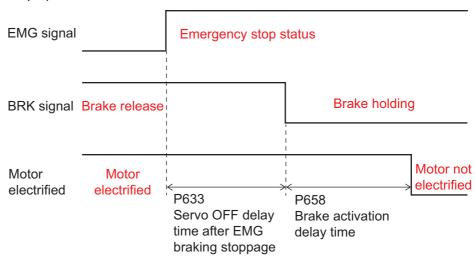
After the elapse of the time that is set in [P658 (8th - 5th digits)] from an ON edge of the reset signal (RST), reset processing is performed.

During reset processing, the servo off status (MTON signal OFF) is assumed.

⑤ If the emergency stop signal (EMG) is turned ON After the emergency stop signal (EMG) is turned ON, the brake release signal (BRK) is turned OFF, and after the elapse of [P658 (8th - 5th digits)], the emergency stop status is assumed.

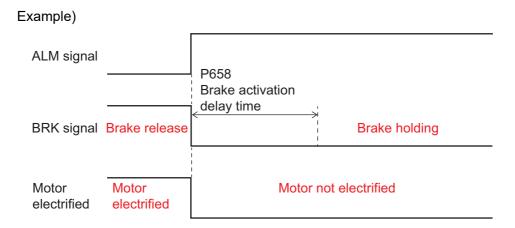
(The BRK signal is turned OFF in the servo on status, thereby preventing the vertical shafts from dropping.)

#### Example)



⑥ When a torque free alarm and a warning occurs If a torque free alarm or a warning occurs, the brake holding status is assumed and the motor is un-electrified at the time of its occurrence.

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.



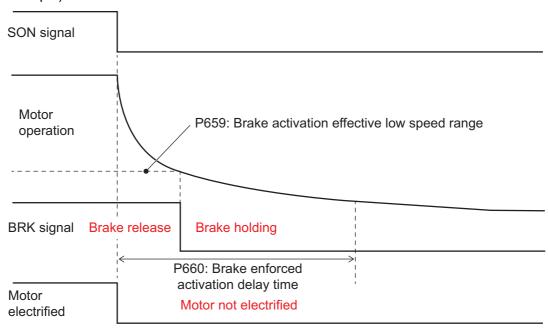
#### **b.** When the motor is operating (if the SZ signal is OFF)

During motor operation, the brake release signal (BRK) is turned OFF when either [P659] or [P660] meets the condition.

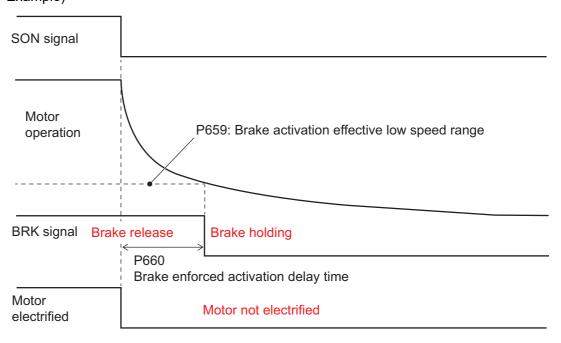
\* During motor operation, there is no time at which braking holding is performed in the servo on status.

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 [P659] meets the condition first Example)



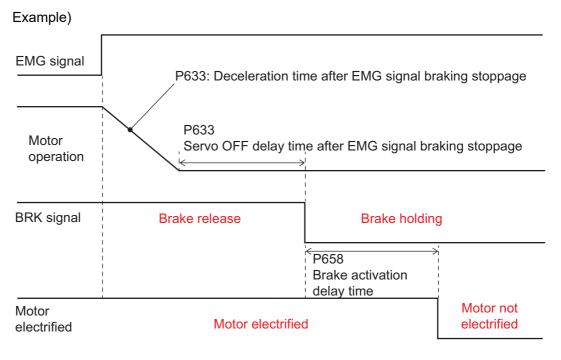
② If [P660] meets the condition first Example)



- ③ If the emergency stop signal (EMG) is turned ON during motor operation
  - \* This operation is effective if [P633 (1st digit)] is set to "Braking stop".

After the emergency stop signal (EMG) is turned OFF, the motor performs braking stoppage with [P633 (5th - 2nd digits)], and after the elapse of the time that is set in [P633 (8th - 6th digits)], the brake release signal (BRK) is turned OFF and the brake holding status is assumed. After the elapse of the time that is set in [P658 (8th - 5th digits)], the servo off status is assumed.

(The BRK signal is turned OFF in the servo on status, thereby preventing the vertical shafts from dropping.)



\* In the case of coasting to stop ([P633 (1st digit)] = Servo OFF), the motor operates as described in ① or ② above.

Power discontinuity
 To prevent dropping during power discontinuity, operation is possible by setting [P121 (1st digit)] to 0 (Braking).

### Example) AC AC disconnection detection power supply Motor operation P658 Brake activation delay time BRK Brake holding Brake release signal Motor not Motor Motor electrified electrified electrified

\* Depending on the status of the device, the motor un-electrified status may be assumed before the elapse of the [P658 (8th - 5th digits)] time.

### 6-10-1 Index data setting method

a. Range in which indirect data can be assigned with a parameter To assign indirect data with a parameter, set a minus value. The setting range is "-1" to "-89", and it corresponds to the indirect data "IX01" to "IX89". In parameter setting, "0" is handled as a numeric value, so "IX00" cannot be specified.

#### b. Indirect data assignment method

The assignment method differs depending on whether [P161: Position decimal point unit selection] is applied to the parameter unit.

- If using indirect data for a parameter to which [P161: Position decimal point unit selection] is applied
  - Set the indirect data number in the integer digits. For details on "parameter to which [P161: Position decimal point unit selection] is applied", refer to "9-2 Parameter list". Those parameters for which "P161" is contained in the Unit column are such parameters. Example) To specify IX15 for [P411: SPDSEL0 Speed command value], with [P161] being set to 0.01, set "-15.00".
- If using indirect data for a parameter to which [P161: Position decimal point unit selection] is not applied
   Set the indirect data number in the lower two digits, regardless of the decimal point.
  - Example) To specify IX15 for [P412: SPDSEL0 Torque limit value], set "-1.5".
- c. Notes on assigning indirect data
  - Do not assign an indirect data number outside the assignment range.
  - To set a value in indirect data, do not set a value beyond the parameter setting range.

#### 6-10-2 Indirect data list

The type of indirect data depends on the number.

Table 6-8 Indirect data number list

Indirect data No.	Indirect data name	Type	Function
IX00	Indirect data 00		Indirect data also sustained after power off.
to	to	Holding	Can be rewritten up to 1 billion times.
IX49	Indirect data 49		Can be rewritten up to 1 billion times.
IX50	Indirect data 50		Arbitrary indirect data not sustained after
to	to	0 cleared	power off.
IX89	Indirect data 89		Cleared to "0" at power on.
IX90	Indirect data 90		
to	to		Reserved
IX99	Indirect data 99		

# 6-10-3 List of parameters corresponding to indirect data

Table 6-9 Speed command-related parameters

No.	Name	Input rango	P161
INO.	Name	Input range	application
P411	SPD SEL 0 Speed command value	-990000000 to -100000000	0
P412	SPD SEL 0 Torque limit value	-9.9 to 799.9	
P414	SPD SEL 1 Speed command value	-990000000 to -100000000	0
P415	SPD SEL 1 Torque limit value	-9.9 to 799.9	
P417	SPD SEL 2 Speed command value	-990000000 to -100000000	0
P418	SPD SEL 2 Torque limit value	-9.9 to 799.9	
P420	SPD SEL 3 Speed command value	-990000000 to -100000000	0
P421	SPD SEL 3 Torque limit value	-9.9 to 799.9	
P423	SPD SEL 4 Speed command value	-990000000 to -100000000	0
P424	SPD SEL 4 Torque limit value	-9.9 to 799.9	
P426	SPD SEL 5 Speed command value	-990000000 to -100000000	0
P427	SPD SEL 5 Torque limit value	-9.9 to 799.9	
P429	SPD SEL 6 Speed command value	-990000000 to -100000000	0
P430	SPD SEL 6 Torque limit value	-9.9 to 799.9	
P432	SPD SEL 7 Speed command value	-990000000 to -100000000	0
P433	SPD SEL 7 Torque limit value	-9.9 to 799.9	

Table 6-10 Torque command-related parameters

No.	Name	Input rango	P161
INO.	name	Input range	application
P442	TRQ SEL 0 Torque command value	-9.9 to -0.1	0
P443	TRQ SEL 0 Speed limit value	-990000000 to 300000000	
P445	TRQ SEL 1 Torque command value	-9.9 to -0.1	0
P446	TRQ SEL 1 Speed limit value	-990000000 to 300000000	
P448	TRQ SEL 2 Torque command value	-9.9 to -0.1	0
P449	TRQ SEL 2 Speed limit value	-990000000 to 300000000	
P451	TRQ SEL 3 Torque command value	-9.9 to -0.1	0
P452	TRQ SEL 3 Speed limit value	-990000000 to 300000000	
P454	TRQ SEL 4 Torque command value	-9.9 to -0.1	0
P455	TRQ SEL 4 Speed limit value	-990000000 to 300000000	
P457	TRQ SEL 5 Torque command value	-9.9 to -0.1	0
P458	TRQ SEL 5 Speed limit value	-990000000 to 300000000	
P460	TRQ SEL 6 Torque command value	-9.9 to -0.1	0
P461	TRQ SEL 6 Speed limit value	-990000000 to 300000000	
P463	TRQ SEL 7 Torque command value	-9.9 to -0.1	0
P464	TRQ SEL 7 Speed limit value	-990000000 to 300000000	

Table 6-11 Built-in command-related parameters

N-	Nama	lanut nanna	P161
No.	Name	Input range	application
P518	SEL 0 Acceleration standard speed	-9900000000 to -100000000	0
P519	SEL 0 Deceleration standard speed	-9900000000 to -100000000	0
P520	SEL 0 Acceleration time	-9.9 to -0.1	
P521	SEL 0 Deceleration time	-9.9 to -0.1	
P522	SEL 0 S-curve time 1	-9.9 to -0.1	
P523	SEL 0 Torque limit value	-9.9 to -0.1	
P525	SEL 1 Acceleration standard speed	-9900000000 to -100000000	0
P526	SEL 1 Deceleration standard speed	-9900000000 to -100000000	0
P527	SEL 1 Acceleration time	-9.9 to -0.1	
P528	SEL 1 Deceleration time	-9.9 to -0.1	
P529	SEL 1 S-curve time 1	-9.9 to -0.1	
P530	SEL 1 Torque limit value	-9.9 to -0.1	
P532	SEL 2 Acceleration standard speed	-9900000000 to -100000000	0
P533	SEL 2 Deceleration standard speed	-9900000000 to -100000000	0
P534	SEL 2 Acceleration time	-9.9 to -0.1	
P535	SEL 2 Deceleration time	-9.9 to -0.1	
P536	SEL 2 S-curve time 1	-9.9 to -0.1	
P537	SEL 2 Torque limit value	-9.9 to -0.1	
P539	SEL 3 Acceleration standard speed	-9900000000 to -100000000	0
P540	SEL 3 Deceleration standard speed	-9900000000 to -100000000	0
P541	SEL 3 Acceleration time	-9.9 to -0.1	
P542	SEL 3 Deceleration time	-9.9 to -0.1	
P543	SEL 3 S-curve time 1	-9.9 to -0.1	
P544	SEL 3 Torque limit value	-9.9 to -0.1	
P546	SEL 4 Acceleration standard speed	-9900000000 to -100000000	0
P547	SEL 4 Deceleration standard speed	-9900000000 to -100000000	0
P548	SEL 4 Acceleration time	-9.9 to -0.1	
P549	SEL 4 Deceleration time	-9.9 to -0.1	
P550	SEL 4 S-curve time 1	-9.9 to -0.1	
P551	SEL 4 Torque limit value	-9.9 to -0.1	
P553	SEL 5 Acceleration standard speed	-9900000000 to -100000000	0
P554	SEL 5 Deceleration standard speed	-9900000000 to -100000000	0
P555	SEL 5 Acceleration time	-9.9 to -0.1	
P556	SEL 5 Deceleration time	-9.9 to -0.1	
P557	SEL 5 S-curve time 1	-9.9 to -0.1	
P558	SEL 5 Torque limit value	-9.9 to -0.1	
P560	SEL 6 Acceleration standard speed	-9900000000 to -100000000	0
P561	SEL 6 Deceleration standard speed	-9900000000 to -100000000	0
P562	SEL 6 Acceleration time	-9.9 to -0.1	
P563	SEL 6 Deceleration time	-9.9 to -0.1	
P564	SEL 6 S-curve time 1	-9.9 to -0.1	
P565	SEL 6 Torque limit value	-9.9 to -0.1	

No.	Name	Input range	P161 application
P567	SEL 7 Acceleration standard speed	-9900000000 to -100000000	0
P568	SEL 7 Deceleration standard speed	-9900000000 to -100000000	0
P569	SEL 7 Acceleration time	-9.9 to -0.1	
P570	SEL 7 Deceleration time	-9.9 to -0.1	
P571	SEL 7 S-curve time 1	-9.9 to -0.1	
P572	SEL 7 Torque limit value	-9.9 to -0.1	

Table 6-12 Jog operation-related parameters

No.	Name	Input range	P161 application
P573	Jog speed 0	-99 to -1	
P574	Jog speed 1	-99 to -1	
P575	Jog speed 2	-99 to -1	
P576	Jog speed 3	-99 to -1	
P577	Jog speed 4	-99 to -1	
P578	Jog speed 5	-99 to -1	
P579	Jog speed 6	-99 to -1	
P580	Jog speed 7	-99 to -1	

Table 6-13 Self-diagnosis- and input and output-related parameters

No.	Name	Input range	P161 application
P636	TL signal torque limit value +	-9.9 to -0.1	
P637	TL signal torque limit value -	-9.9 to -0.1	

# 6-11 Torque limit function when the power supply voltage drops (compatible with the SEMI F47 standard)

This is a function that limits the torque when the DC voltage inside the device drops due to a temporary drop in the power supply voltage, thereby avoiding a main power supply undervoltage error.

# **∕** Caution

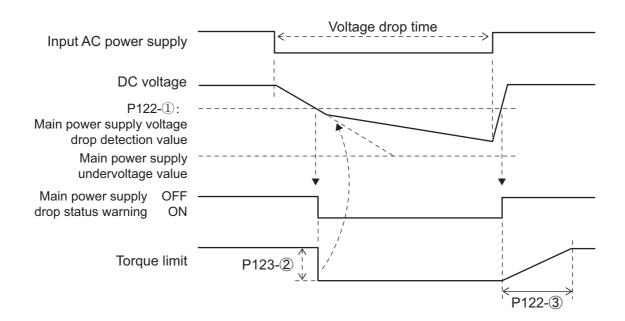
- It supports only the voltage drop level and the duration time required by the SEMI F47 standard
- The input main power supply must be a 3-phase power supply. It does not support a single-phase power supply.
- This function does not support all load conditions or operating conditions. If the load is too large, a main power supply undervoltage error may occur. Be sure to perform an operation check with an actual machine, and set the [P124] parameter, if necessary.
- During torque limit and during return, motor speed or torque fluctuations may occur.
- If, during acceleration for positioning operation, for example, position deviation exorbitance occurs, adjust the position deviation exorbitance detection pulse settings ([P175], [P176], [P177], and [P178]).
- Do not limit the torque below the held torque.
- In the initial status, this function is disabled. To enable it, set [P122] and [P123].
- When an external dynamic brake is used, this function cannot be used.

# 6-11-1 Parameters related to the torque limit when the power supply voltage drops

Table 6-14 Parameters related to the torque limit when the power supply voltage drops

No.		ltem	Setting value	Initial value	Unit	Remarks
	1	Main power supply voltage drop detection value	80	0	%	To enable this function, set 80.
P122	2	Reserved	_	_	_	This parameter is reserved.
	3	Main power supply torque drop limit Fluctuation changing time	0 to 999	50	ms	Change time for 100% motor rated torque
	1	Reserved	_	_	_	
P123	2	Main power supply drop toque limit value	0 to 300	100	%	The lowest of other torque limit values is given priority.

# 6-11-2 Torque limit function when the power supply voltage drops (compatible with the SEMI F47 standard)



# Chapter 7 Maintenance

7-1	Inspe	ction	.7-2
	7-1-1	Daily inspection items	7-2
	7-1-2	Periodic inspection items	7-2
7-2	Suga	estions for parts replacement	7-3

# 7-1 Inspection

The device and the motor are 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 the main circuit capacitor. Wait for a certain period of time (5 minutes for 3.3 kW or less and 10 minutes for 7 kW or more) after power shutdown (the "CHARGE" LED on the front of the device goes off), then start work.
- Never apply insulation test to the device with the mega tester.
  - <The device will be damaged.>
  - When measuring insulation of the motor, completely disconnect wiring (U, V, W) between the motor and device, and then carry it out.

## 7-1-1 Daily inspection items

Carry out the following daily inspections.

- a. If motor runs normally.
- **b.** If no unusual factors are found in the environment of the installed place (power supply, temperature, humidity, dusts, etc.).
- c. If no malfunctions are found in the cooling system.
- d. If no loosening is found on the terminals and connectors.
- e. If there are no unusual sounds and vibrations.
- f. If no excessive heating and discoloration are found.
- g. If no error is found in the regenerative resistor and other components.

# 7-1-2 Periodic inspection items

Carry out the following periodic inspections at the interval of designated operating time or at the fixed interval (for such as a half year or one year).

- **a.** If no loosening is found at the block connected with load, no slack in belts, no play in the shaft key, no unusual sound in the motor bearing.
- **b.** If no unusual factors are found in the environment of the installed place (power supply, temperature, humidity, dusts, etc.).
- c. If no malfunctions are found in the cooling system.
- **d.** If no loosening is found on the terminals and connectors.
- e. If there are no unusual sounds and vibrations.
- f. If no excessive heating and discoloration are found.
- g. If there are no foreign substances and dusts inside the device.
- h. If there are no scratches and wear on cables.
- i. If no error is found in the regenerative resistor and other components.
- **j.** Inspection on the radiator fan of the control panel, cleaning of the air filter, and inspection or replacement of relays, etc.

# 7-2 Suggestions for parts replacement

Suggestions for parts replacement are as follows.

Table 7-1 Parts replacement guide 1

Part name	Replacement guide	Use conditions		
Smoothing capacitor	10 years	Ameliant town and the Amelian and		
Cooling fan	2 or 3 years	Ambient temperature: Annual average		
Fuse	10 years	temperature 30 °C  • Loading rate: 80% or less		
Internal device	10 years	Working rate: 20 hours or less/day		
memory	10 years	rremang rate. 20 means of loos, adj		

<sup>\*</sup> For the smoothing capacitor or fuse, it may be necessary to replace the board containing it with a new one depending on the use condition.

For other parts that have lifetime, the suggestive interval of parts replacement is indicated in the following table.

Table 7-2 Parts replacement guide 2

Part name	Replacement guide	Use conditions
Relays	10 years	Power-on: 10 times/day

<sup>\*</sup> For a relay, it may be necessary to replace the board containing it with a new one depending on the use condition.

# **∴** 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 the operating temperature can shorten the equipment lifetime by half.

Chapter 7 Maintenance > 7-2 Suggestions for parts replacement

# Chapter 8 Protective function

8-1	Error	code list	8-2
	8-1-1	Alarm list	8-2
		Warning list	
		code specifications	
		Alarm specifications	
		Warning specifications	

# 8-1 Error code list

When an error occurs, the relevant error code is displayed on the data display LED panel on the device front panel.

For details of the data display LED panel, refer to "Chapter 10 Status display".

The following tables list error codes.

### 8-1-1 Alarm list

#### a. Driver system-related error

Table 8-1 Driver system-related error

Error code		Description of error
hLt	Driver system error	

#### **b.** Error related to SSCNETIII(/H)

Table 8-2 Error related to SSCNETIII(/H)

Error code	Description of error
AL.33.0	SSCNETIII(/H) ASIC error
AL.34.0	SSCNETIII(/H) reception error 1
AL.35.0	SSCNETIII(/H) command frequency error
AL.36.0	SSCNETIII(/H) reception error 2
AL.37.0	SSCNETIII(/H) mechanical travel amount setting error

#### c. Error related to device hardware

Table 8-3 Error related to device hardware

Error code	Description of error
AL.A0.1	RAM error
AL.A0.2	FRAM write error
AL.A0.3	Driver error
AL.A0.4	Main power supply voltage detection element error
AL.A0.5	CPU start error
AL.A0.6	CPU error
AL.A1.0	Maker data sustain error
AL.A1.1	Parameter sustain error
AL.A1.2	Command data sustain error
AL.A1.3	Indirect data sustain error
AL.A1.5	Absolute position compensation data sustain error
AL.A2.0	Error in matching of firmware and manufacturer data

#### d. Servo-related error

Table 8-4 Servo-related error

Error code	Description of error
AL.B0.0	Power element error
AL.B1.0	Main power supply discontinuity error
AL.B2.0	Main power supply undervoltage error
AL.B3.0	Main power supply excessive voltage error
AL.B4.0	Over speed error
AL.B5.0	Motor overload error
AL.B6.0	Driver overload error
AL.B7.0	Regenerative resistor overload error
AL.B8.0	Control power supply momentary stop error
AL.B9.0	Regenerative overcurrent error
AL.BA.0	Servo control error
AL.BC.0	Motor power cable disconnection error
AL.BD.0	Overcurrent error
AL.BF.0	Driver overheat error
AL.C0.0	Motor overheat error
AL.C1.0	Main power supply open-phase error
AL.C2.0	Control power supply discontinuity detected error
AL.C3.0	Motor power cable disconnection error 2
AL.C4.0	Control power supply error

## e. Error related to parameter setting

Table 8-5 Error related to parameter setting

Error code	Description of error
AL.D0.0	Motor unselection
AL.D0.1	Motor selection incorrect 1 (invalid device output capacity combination)
AL.D0.2	Motor selection incorrect 2 (invalid device power voltage combination)
AL.D0.3	Motor selection incorrect 3 (invalid device single-phase power supply combination)
AL.D0.4	Motor selection incorrect 4 (invalid device specification or revision combination)
AL.D0.5	Motor selection incorrect 5 (invalid motor type combination)
AL.D0.8	Carrier frequency setting error
AL.D0.9	Inverter output frequency error
AL.D1.0	Maximum speed command higher limit incorrect
AL.D1.1	Maximum speed command lower limit incorrect
AL.D1.3	1 rotation position range incorrect
AL.D1.6	Motor information incorrect error
AL.D1.7	Motor combination mismatch error 1
AL.D1.8	Motor combination mismatch error 2
AL.D1.9	Motor combination mismatch error 3

## f. Encoder-related error

Table 8-6 Encoder-related error

Error code	Description of error
AL.D4.1	Magnetic pole signal pattern error
AL.D4.2	Error in matching of magnetic pole signal and encoder resolution
AL.D4.3	Auto magnetic pole detection error
AL.D4.4	Encoder signal disconnection error
AL.D4.5	Encoder velocity error
AL.D4.7	Absolute position compensation data unregistered
AL.D4.8	Absolute position compensation data collation error
AL.D4.9	Absolute position compensation data none error
AL.D5.0	IPU communication error
AL.D5.2	Communication error between encoder IPU
AL.D5.3	Cable disconnection error between encoder IPU
AL.D5.4	Encoder position detection signal error
AL.D5.5	1 rotation position detection speed error
AL.D5.6	Photo acceptance unit error
AL.D5.7	Light emitting element error
AL.D5.8	IPU backup error
AL.D5.9	Absolute position compensation encoder pulse number error
AL.D6.0	Magnetic pole signal disconnection error
AL.D6.1	Encoder identification error
AL.D6.2	Unregistered encoder selection error
AL.D6.5	Encoder communication timeout
AL.D6.6	Absolute position compensation data IPU registration error
AL.DA.0	Encoder data sustain error 1
AL.DA.1	Encoder data sustain error 2
AL.DA.2	Encoder position detection signal error 1
AL.DA.3	Encoder position detection signal error 2
AL.DA.4	Encoder communication timeout/Re-introduction-of-unit power release
AL.DA.5	Encoder communication error/Re-introduction-of-unit power release
AL.DA.6	Encoder position mismatch error
AL.DA.7	Encoder shipment data error

### g.NC-related error

Table 8-7 NC-related error

Error code	Description of error
AL.DB.0	Forward direction overtravel / Automatic release
AL.DB.1	Reverse direction overtravel / Automatic release
AL.DB.2	Forward direction software overtravel / Automatic release
AL.DB.3	Reverse direction software overtravel / Automatic release
AL.DB.4	Forward direction overtravel / Reset release
AL.DB.5	Reverse direction overtravel / Reset release
AL.DB.6	Forward direction software overtravel / Reset release

Error code	Description of error
AL.DB.7	Reverse direction software overtravel / Reset release
AL.DB.8	Forward direction positioning amount over
AL.DB.9	Reverse direction positioning amount over
AL.DC.0	Address setting error
AL.DD.0	Position deviation excess 1 (maximum position deviation over)
AL.DD.1	Position deviation excess 2 (theoretical position deviation over)
AL.DD.2	Position deviation excess 3 (servo-on position deviation over)
AL.DD.4	Main power supply voltage is lowered by the excessive deviation
AL.DE.1	1 rotation data un-setup error
AL.DE.2	Positioning command incorrect
AL.DE.3	1 rotation short cut positioning position setting error
AL.DE.4	Indirect data number incorrect
AL.DE.5	Zero point position setting run error

#### **h.** Error related to communication network

Table 8-8 Error related to communication network

Error code	Description of error
AL.DF.5	USB communication disconnected error

### i. STO-related error

Table 8-9 STO-related error

Error code	Description of error
AL.E4.0	Safety input timing error
AL.E4.1	Safety input error during operation

# 8-1-2 Warning list

Table 8-10 Warning

Warning code	Description of warning
FL.E6.0	Driver input emergency stop
FL.E7.0	Controller input emergency stop
FL.F0.0	Motor overload notice
FL.F0.2	Main power supply undervoltage detection warning
FL.F0.3	Zero point return uncompleted automatic start warning
FL.F0.6	Main power supply voltage is lowered
FL.F0.7	Motor overheat warning
FL.F0.8	Driver overheat warning
FL.F1.2	Encoder position detection parts deterioration warning
FL.F2.0	Forward direction overtravel
FL.F2.1	Reverse direction overtravel
FL.F2.2	Forward direction software overtravel
FL.F2.3	Reverse direction software overtravel
FL.F3.4	Mode switching status change warning
FL.F3.5	SSCNETIII(/H) control axis number setting switch status change
	warning

# 8-2 Error code specifications

The following table describes each item in the tables listing details of each error code.

#### **Error code Error item**

Indicates the error name corresponding to the error code. (Example) Main power supply voltage detection element error

#### a. Description

Describes the nature of the error.

(Example) An error occurs in the voltage detection element and the main power supply voltage cannot be read normally.

#### b. Causes and measures

Indicates the cause(s) of the error and measure(s).

#### c. Operation at an error

Indicates the operation of the device (motor) when the error occurs.

(Example) Servo OFF

#### d. Release method

Indicates the method for releasing the error status.

(Example) Turn the power off, then on again.

#### e. Related display

Indicates the status display on the device that is related to the error.

(Example) -

When there is no status display related to the error, "-" is indicated.

#### f. Related parameter

Indicates the parameter related to the error.

(Example) -

When there is no status display related to the error, "-" is indicated.

#### g. Output signal status

Indicates the status of each typical output signal.

(Example) ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## 8-2-1 Alarm specifications

# ♠ Caution

If repair or replacement is necessary due to a failure in the device or a part, contact our sales representative.

# **hLT Driver system error**

a. Description

The control circuit does not operate normally.

- \* This alarm is not recorded in the alarm history.
- b. Causes and measures
  - The control power supply suffered from voltage fluctuations beyond the permissible voltage fluctuation range.

Check that the voltage of the control power supply does not exceed the permissible voltage fluctuation range.

- The device is faulty.
   Turn the power off, then on again. If the error still occurs, repair is necessary.
- c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: - /WNG: - /RDY: - /ZRDY: - /BRK: -

# AL.33.0 SSCNETIII(/H) ASIC error

a. Description

An error occurred in the electronic part controlling SSCNETIII(/H) communication.

- b. Causes and measures
  - The electronic part is faulty.
     Turn the power off, then on again. If the error still occurs, repair is necessary.
- c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

-

g. Output signal status

# AL.34.0 SSCNETIII(/H) reception error 1

a. Description

In SSCNETIII(/H) communication, consecutive communication errors occurred for about 3.5 ms.

- b. Causes and measures
  - Wiring error

Check that the optical cable is not broken or does not have a contact failure but is connected correctly, etc.

Incorrect insertion of the connector
 Check that the connector is inserted.

c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.35.0 SSCNETIII(/H) command frequency error

a. Description

The frequency of the position command received from the controller exceeds 1.05 times the motor rated speed.

- b. Causes and measures
  - Command setting error

    Check the operation program that sets the position command.
- c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

**f.** Related parameter

\_

g. Output signal status

## AL.36.0 SSCNETIII(/H) reception error 2

a. Description

In SSCNETIII(/H) communication, consecutive communication errors occurred for about 70 ms

- b. Causes and measures
  - Wiring error

Check that the optical cable is not broken or does not have a contact failure but is connected correctly, etc.

Incorrect insertion of the connector
 Check that the connector is inserted.

c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.37.0 SSCNETIII(/H) mechanical travel amount setting error

a. Description

A value other than a power of 2 is set in [P164: Mechanical movement].

- b. Causes and measures
  - Parameter setting error

Set a power of 2 in [P164: Mechanical movement].

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

P164: Mechanical movement

g. Output signal status

## AL.A0.1 RAM error

a. Description

The RAM (memory) in the device cannot be read or written normally.

- \* This alarm is not recorded in the alarm history.
- b. Causes and measures
  - The device is faulty.
     Turn the power off, then on again. If the error still occurs, repair is necessary.
- c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

\_

**f.** Related parameter

\_

g. Output signal status

ALM: - /WNG: - /RDY: - /ZRDY: - /BRK: -

## AL.A0.2 FRAM write error

a. Description

Data cannot be written in the FRAM in the device.

- \* This alarm is not recorded in the alarm history.
- b. Causes and measures
  - The device is faulty.

Turn the power off, then on again. If the error still occurs, repair is necessary.

c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.A0.3 Driver error

a. Description

A DSP peripheral device does not operate normally.

- b. Causes and measures
  - The device is faulty.

Turn the power off, then on again. If the error still occurs, repair is necessary.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.A0.4 Main power supply voltage detection element error

a. Description

An error occurs in the voltage detection element and the main power supply voltage cannot be read normally.

- b. Causes and measures
  - The voltage detection element is faulty.

    Turn the power off, then on again. If the error still occurs, repair is necessary.
- c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.A0.5 CPU start error

a. Description

An error occurred at the start of the CPU and the CPU could not be operated normally.

- b. Causes and measures
  - The device is faulty.

    Turn the power off, then on again. If the error still occurs, repair is necessary.
- c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.A0.6 CPU error

a. Description

An error occurred in the CPU and communication processing does not operate.

- b. Causes and measures
  - The device is faulty.

    Turn the power off, then on again. If the error still occurs, repair is necessary.
- c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Turn the power off, then on again.

e. Related display

f. Related parameter

\_

g. Output signal status

## AL.A1.0 Maker data sustain error

a. Description

An error occurred in the stored factory-set maker data.

- b. Causes and measures
  - The maker data is damaged.

Repair is necessary.

c. Operation at an error

Servo OFF

d. Release method

Repair is necessary.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.A1.1 Parameter sustain error

a. Description

An error occurred in the stored parameter data.

- b. Causes and measures
  - Parameter data is damaged.

From VPH DES self-diagnosis, execute [H000: data initialization] to clear the data. Then, set parameter and command data and indirect data again.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.A1.2 Command data sustain error

a. Description

The stored command data is corrupted.

- b. Causes and measures
  - The stored command data is damaged.

From VPH DES self-diagnosis, execute [H000: data initialization] to clear the data. Then, set parameter and command data and indirect data again.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.A1.3 Indirect data sustain error

a. Description

The stored indirect data (IX00 to IX49) is corrupted.

- b. Causes and measures
  - The stored indirect data is damaged.

From VPH DES self-diagnosis, execute [H000: data initialization] to clear the data. Then, set parameter and command data and indirect data again.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

# AL.A1.5 Absolute position compensation data sustain error

a. Description

The stored absolute position compensation data is corrupted.

- b. Causes and measures
  - The stored ABS position compensation data is damaged.
     From VPH DES self-diagnosis, execute [H000: ABS position compensation data initialization] to clear the data. Then, register the ABS position compensation data in the device using the VPH ABS position compensation data transfer program (VPH APE).
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.A2.0 Error in matching of firmware and manufacturer data

a. Description

Software controlling the device is inconsistent with the data used by the software.

- b. Causes and measures
  - The matching of firmware and data is wrong.
     Repair is necessary.
- c. Operation at an error

Servo OFF

d. Release method

Repair is necessary.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.B0.0 Power element error

## a. Description

Excessive current flowed in the device power element.

Or, the cooling heat sink of the device power element got overheated.

#### b. Causes and measures

When this error occurred, excessive current may have flowed in the device power element. If this error frequently occurs, the device may be damaged. Be sure to remove the cause of the error, then restart the device.

When the device power element is overheated, remove the cause of the error, cool it for a while (about 30 minutes), waiting for the temperature of the radiator to fall, and then restart the device.

- Incorrect wiring of the zero-phase reactor
   Check that the zero-phase reactor is wound with a motor power cable (U/V/W phases) in the same direction and with the same number of turns.
- A short-circuit occurs in the motor power cable.

Check that there are no short-circuits.

- The overload status continued due to excess of permissible repetition frequency.

  Take measures such as reducing the load inertia and increasing the acceleration time.

  Also, check and adjust the gain, as well as the play in the mechanical system.
- The ambient temperature of the device rises.

  Check the installation environment, and improve cooling and ventilation.
- An error occurred in the radiator.

Some devices have a function to radiate the heat generated from the power element. A possible cause is that an error occurred in the radiation function, causing overheat. Check the radiator to see if it is clogged. If the cooling fan of the radiator is faulty, repair or replace it.

c. Operation at an error

Servo OFF

#### **d.** Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

**f.** Related parameter

\_

## g. Output signal status

# AL.B1.0 Main power supply discontinuity error

## a. Description

- During the main power-off status, servo on continues for more than the time set in [P121 (4th 2nd digits): Main power OFF error detection time].
- During the servo on status, the main power-off status continues for more than the time set in [P121 (4th 2nd digits): Main power OFF error detection time].

#### b. Causes and measures

The main power supply is shut off.
 Check the power supply used.

• Wiring error

Check, for example, that the electric wire diameter is thick enough and that the screws of the power supply terminals are tight.

## c. Operation at an error

The motor stops with the setting of [P121(1st digit): Main power OFF error detection spec selection] and enters the servo off status.

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

\_

## f. Related parameter

P121[1st digit]: Main power OFF error detection spec selection P121[4th - 2nd digits]: Main power OFF error detection time

## g. Output signal status

# AL.B2.0 Main power supply undervoltage error

#### a. Description

The DC voltage of the main power supply is lower than the specified value in the servo on status.

When the setting of [P124 (1st digit): Main power supply undervoltage error spec selection] is "1: Anomaly detection among the servo ON 1" or "2: Anomaly detection among the servo ON 2", this error may occur.

The following table lists the DC voltage values of the main power supply in the device with which this error occurs.

Table 8-11 Main power supply undervoltage error detection value

Input power supply specification	Voltage detected as an error	
100 VAC	90 V or less	
200 VAC	177 V or less	
400 VAC	350 V or less	

# **⚠** Caution

After an instantaneous power failure occurs and the protective function is activated, if the power failure status continues, no control power is supplied and the protective circuit is reset. After that, when the power is recovered, various commands (including the speed command and pulse train command) are input. If the motor runs immediately after power recovery in a sequence, it is dangerous. Do not design such a sequence. Design an external sequence in which each signal is switched OFF and the execution of each command is stopped when the protective function is activated and an alarm occurs (is output).

## b. Causes and measures

- A voltage drop occurred due to an insufficient power supply capacity. Check the power supply used.
- An instantaneous power failure (power failure for at least about 10 ms) occurred. Check the power supply used.
- Servo-on operation is performed immediately after power-on.

  After power-on, wait for some time, then execute servo-on operation.
- In a device of 1.5 kW or greater, the shorting bar between "L1 and L2/P" of the power supply terminals is removed.

Install the shorting bar between "L1 and L2/P".

• A fuse blowout occurred in the power section.

#### c. Operation at an error

Servo OFF

## d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

C016: Main power supply DC voltage

## **f.** Related parameter

P124[1st digit]: Main power supply undervoltage error spec selection
P124[5th - 2nd digits]: Detection allowed time for main power supply undervoltage error

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.B3.0 Main power supply excessive voltage error

## a. Description

The main power supply DC voltage exceeds the specified value.

The following table lists the detection voltage values of the main power supply DC voltage in the device with which this error occurs.

Table 8-12 Main power supply excessive voltage error detection value

Input power supply specification	Voltage detected as an error	
100 VAC	210 V or more	
200 VAC	410 V or more	
400 VAC	855 V or more	

#### b. Causes and measures

- The power supply voltage is high.
   Check the power supply used.
- The regeneration processing capacity is exceeded due to excessive load inertia.

  Make improvements such as attaching a regenerative resistor, reducing the load inertia, increasing the deceleration time, and reducing the operation speed.
- The ground current rises due to a ground fault in the motor or excessive leak current.
   Check if a ground fault occurred in the motor. For excessive leak current, make improvements such as inserting a zero-phase reactor.
- Runaway or vibration occurred due to a failure in the encoder.
   Repair or replace the encoder.
- c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

## g. Output signal status

# AL.B4.0 Over speed error

## a. Description

The motor operation speed reaches the value set in [P127(4th - 2nd digits): Over speed error detection speed].

#### b. Causes and measures

- Incorrect wiring of motor power cable (U/V/W) or encoder feedback signal cable Check the wiring and correct it.
- The overshoot becomes large due to conditions such as large load inertia.
   Take measures such as reducing the load inertia and increasing the acceleration time.
   Also, check and adjust the gain, as well as the play in the mechanical system.
- The encoder feedback signal is influenced by noises.
   Remove the noise source, and take noise protection measures.
- c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

## f. Related parameter

P127[4th - 2nd digits]: Over speed error detection speed

## g. Output signal status

## AL.B5.0 Motor overload error

## a. Description

The motor torque actual value exceeds the motor electronic thermal detection actual value. For the motor electronic thermal detection actual value, a detection value is set by assuming that the motor rated torque is 100%. To prevent thermal failures that may occur due to the concentration of current to a single phase of the motor, switching is performed during 1 phase concentration. During 1 phase concentration, an error is detected with a value equal to 70% of the motor electronic thermal detection actual value. For the switching during 1 phase concentration, a switching range with the 1 electric angle motor rotation of the motor assumed to be 1 rev, is set, as well as a switching speed with the 1 electric angle rotation of the motor assumed to be 1 rps. If either becomes equal to or less than the setting value, the 1 phase concentration status is assumed.

The following table lists the ordinary detection values with which this error occurs.

Motor	Detection	1 phase	1 phase
	actual value	concentration range	concentration speed
тDISC	110%	0.3 rev or less	0.3 rps or less

Table 8-13 Motor overload error detection value

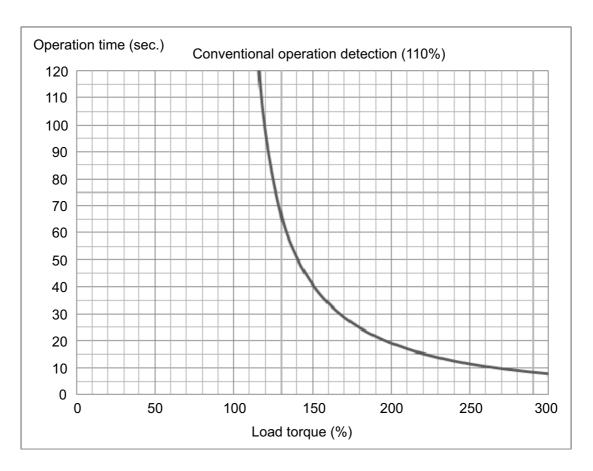


Figure 8-1 Load torque in relation to detection time

#### **b.** Causes and measures

After removing the cause of the overload, wait for the cooling time (about 30 minutes). 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.

Excessive load

Take measures such as reducing the load.

The frequency of starting and stopping the motor is high.
 Reduce the starting and stopping frequency, and operate it in the range in which it is not overloaded.

• Current vibration due to the vibration or instable operation of the motor Check and adjust the gain, as well as the play in the mechanical system.

Incorrect wiring of motor power cable (U/V/W)
 Check the wiring and correct it.

• Mechanical lock due to the brake, etc.

Check the brake and the mechanical configuration, and remove the cause of the lock.

• The ambient temperature is high, or the ventilation is bad.

Check the installation environment, and improve cooling and ventilation.

Runaway or vibration occurred due to a failure in the encoder.
 Repair or replace the encoder.

#### c. Operation at an error

The motor stops as selected in [P126(1st digit): Overload abnormal motion selection] and enters the servo off status.

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- \* The load ratio is sustained even after the power is turned OFF. For this reason, if the power is turned OFF immediately after an overload error is detected, an overload error may occur shortly after the power is turned on again.

## e. Related display

C012: Thermal trip rate of motor

#### **f.** Related parameter

P083[3rd - 1st digits]: Motor electronic thermal detected actual value
P084[3rd - 1st digits]: Motor 1 phase concentration electronic thermal detection ratio
P126[1st digit]: Overload abnormal motion selection

## g. Output signal status

## AL.B6.0 Driver overload error

## a. Description

The load became excessive for the device power element.

Current 180% or higher than the device rated current flows for at least the specified time while the motor is running at low speed.

After removing the cause of the overload, wait for the cooling time (about 30 minutes). 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.

#### b. Causes and measures

Excessive load

Take measures such as reducing the load.

- The frequency of starting and stopping the motor is high.
   Reduce the starting and stopping frequency, and operate it in the range in which it is not overloaded.
- Current vibration due to the vibration or instable operation of the motor Check and adjust the gain, as well as the play in the mechanical system.
- Incorrect wiring of motor power cable (U/V/W)
   Check the wiring and correct it.
- Mechanical lock due to the brake, etc.

Check the brake and the mechanical configuration, and remove the cause of the lock.

The ambient temperature is high, or the ventilation is bad.
 Check the installation environment, and improve cooling and ventilation.

#### c. Operation at an error

The motor stops as selected in [P126(1st digit): Overload abnormal motion selection] and enters the servo off status.

## d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- \* The load ratio is sustained even after the power is turned OFF. For this reason, if the power is turned OFF immediately after an overload error is detected, an overload error may occur shortly after the power is turned on again.

## e. Related display

C014: Thermal trip ratio of driver

## **f.** Related parameter

P126[1st digit]: Overload abnormal motion selection

## g. Output signal status

## AL.B7.0 Regenerative resistor overload error

## a. Description

Regenerative power generated in deceleration of load inertia exceeded the permissible power range of the regenerative resistor connected to the device.

#### b. Causes and measures

- The regeneration processing capacity is exceeded due to excessive load inertia.
   Make improvements such as replacing the regenerative resistor to one with a larger power, reducing the load inertia, increasing the deceleration time, and reducing the operation speed.
- Parameter setting error
   Check the regenerative resistor used, and set it for the parameter.

#### c. Operation at an error

The motor stops as selected in [P126(1st digit): Overload abnormal motion selection] and enters the servo off status.

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- \* The load ratio is sustained even after the power is turned OFF. For this reason, if the power is turned OFF immediately after an overload error is detected, an overload error may occur shortly after the power is turned on again.

## e. Related display

C018: Load ratio of regenerative resistor

## f. Related parameter

P086[3rd - 1st digits]: Regenerative resistor overload detection ratio P126[1st digit]: Overload abnormal motion selection

## g. Output signal status

# AL.B8.0 Control power supply momentary stop error

a. Description

The voltage of the control power supply is lower than the specified value for at least 50ms.

- b. Causes and measures
  - Wiring error

Check, for example, that the electric wire diameter is thick enough and that the screws of the power supply terminals are tight.

c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status.

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

-

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# **AL.B9.0 Regenerative overcurrent error**

a. Description

Current higher than the specified value flowed in the transistor in the regenerative circuit.

- b. Causes and measures
  - The regeneration processing capacity is exceeded due to excessive load inertia.
     Make improvements such as replacing the regenerative resistor to one with a large resistance value, reducing the load inertia, increasing the deceleration time, and reducing the operation speed.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.BA.0 Servo control error

## a. Description

The motor rotated in a direction opposite to that expected for the torque output by the device.

#### b. Causes and measures

• The wiring has an error.

Check the wiring of the motor power cable (U/V/W) and the encoder feedback signal cable.

- Current vibration due to the vibration or instable operation of the motor Check and adjust the gain, as well as the play in the mechanical system.
- Parameter setting error

Check the encoder-related parameters (such as motor type and resolution).

• The motor is operated with external force.

This error may occur if external force (such as load or tension) is applied to the motor, causing the motor to operate. The detection is relaxed by adjusting [P120: Servo control error detection dead band torque].

## c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

C017: Peak servo control error ratio

## **f.** Related parameter

P120: Servo control error detection dead band torque

## g. Output signal status

# AL.BC.0 Motor power cable disconnection error

\* Can occur only for devices with the following input voltage specifications and output capacities:

100 V - 200 W or less, 200 V - 3.3 kW or less

a. Description

A problem occurred in the motor power cable.

Or, the current detection sensor for motor power does not operate normally.

- b. Causes and measures
  - Wiring error

Check that the motor power cable (U/V/W) is not broken but connected and wired correctly, etc.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

## **AL.BD.0 Overcurrent error**

## a. Description

Abnormal current was detected by the current FB detection for at least 50 ms.

- b. Causes and measures
  - Excessive load

Take measures such as reducing the load.

• The frequency of starting and stopping the motor is high.

Reduce the starting and stopping frequency, and operate it in the range in which it is not overloaded.

- Current vibration due to the vibration or instable operation of the motor Check and adjust the gain, as well as the play in the mechanical system.
- Incorrect wiring of motor power cable (U/V/W)

Check the wiring and correct it.

• Mechanical lock due to the brake, etc.

Check the brake and the mechanical configuration, and remove the cause of the lock.

• The ambient temperature is high, or the ventilation is bad.

Check the installation environment, and improve cooling and ventilation.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

-

**f.** Related parameter

\_

g. Output signal status

## AL.BF.0 Driver overheat error

\* Can occur only for devices with the following input voltage specifications and output capacities:

200 V - 3.3 kW or less, 400 V - 75 kW

a. Description

The device temperature exceeds the allowable range.

- b. Causes and measures
  - The ambient temperature of the device rises.

Place it so that the heat can escape, considering the ventilation characteristics and the ambient temperature.

• The cooling fan is clogged.

Clean the fan with air blow, etc. to remove clogging.

• The cooling fan is faulty.

Repair or replace it.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.C0.0 Motor overheat error

## a. Description

The motor overheat (MTOH) signal is detected.

Or, in the motor(\*) equipped with a temperature sensor, motor overheat is detected.

Remove the cause of the error, then wait for the cooling time (about 30 minutes).

\* Our standard motor is not attached with a temperature sensor.

#### b. Causes and measures

 Insufficient cooling of the motor
 Install the motor on a surface having a sufficient radiation area so that the motor comes into contact with the entire surface with no floating.

Motor setting error

A motor parameter selected in the device may be inconsistent with the installed motor. Check the motor settings.

## c. Operation at an error

The motor stops with the setting of [P126(1st digit): Overload abnormal motion selection] and enters the servo off status.

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

C102: Internal control input signal 2

## **f.** Related parameter

P126[1st digit]: Overload abnormal motion selection P129[1st digit]: Motor overheat detection spec selection P129[4th - 2nd digits]: Motor overheat detection time

P620: Control input signal allocation 1 P621: Control input signal allocation 2

P627: Control input signal condition setting 5

## g. Output signal status

## AL.C1.0 Main power supply open-phase error

a. Description

When a 3-phase power supply is specified in the motor specification, a problem occurred for at least one phase.

- b. Causes and measures
  - Wiring error

When a 3-phase power supply is specified, a problem including disconnection, no connection, or wrong wiring occurred for at least one phase. Check the wiring.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.C2.0 Control power supply discontinuity detected error

a. Description

The control power supply detection circuit is damaged.

- b. Causes and measures
  - Wiring error

Check, for example, that the electric wire diameter is thick enough and that the screws of the power supply terminals are tight.

c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Turn the power off, then on again.

e. Related display

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f. Related parameter

\_

g. Output signal status

# AL.C3.0 Motor power cable disconnection error 2

## a. Description

An error occurred in the motor power cable.

Or, the current detection sensor for motor power does not operate normally.

This error occurs after the elapse of the time that is set in [P045: Motor power cable disconnection detection time].

#### b. Causes and measures

Wiring error

Check that the motor power cable (U/V/W) is not broken but connected and wired correctly, etc.

• Parameter setting error

Check, for example, that the detection time that is set in [P045: Motor power cable disconnection detection time] is not too early.

## c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

\_

## **f.** Related parameter

P045: Motor power cable disconnection detection time

## g. Output signal status

## **AL.C4.0 Control power supply error**

- \* Occurs only when no encoder is selected or S-iABS is selected.
- a. Description

At power ON, the voltage of the control power supply is lower than the specified value for at least 100 ms.

- **b.** Causes and measures
  - Wiring error

Check, for example, that the electric wire diameter is thick enough and that the screws of the power supply terminals are tight.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## **AL.D0.0 Motor unselection**

a. Description

The motor parameter is not set.

- **b.** Causes and measures
  - Parameter not set

From the VPH DES "Driver/Motor selection" window, set the motor.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

# AL.D0.1 Motor selection incorrect 1 (invalid device output capacity combination)

a. Description

The device output capacity is not consistent with the motor specification.

- b. Causes and measures
  - Wrong motor selected

Check the motor selection from the VPH DES "Driver/Motor selection" window.

• Check of the device to connect

Check if the device to use matches the motor combination to connect.

· Wrong parameter file

When sending a saved parameter file, check if the file is correct.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

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f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D0.2 Motor selection incorrect 2 (invalid device power voltage combination)

a. Description

The device power voltage is not consistent with the motor specification.

- b. Causes and measures
  - Wrong motor selected

Check the motor selection from the VPH DES "Driver/Motor selection" window.

• Check of the device to connect

Check if the device to use matches the motor combination to connect.

Wrong parameter file

When sending a saved parameter file, check if the file is correct.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

# AL.D0.3 Motor selection incorrect 3 (invalid device single-phase power supply combination)

a. Description

The device power supply type is not consistent with the motor specification.

- b. Causes and measures
  - · Wrong motor selected

Check the motor selection from the VPH DES "Driver/Motor selection" window.

• Check of the device to connect

Check if the device to use matches the motor combination to connect.

· Wrong parameter file

When sending a saved parameter file, check if the file is correct.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D0.4 Motor selection incorrect 4 (invalid device specification or revision combination)

a. Description

The device specification is not consistent with the motor specification.

- b. Causes and measures
  - Wrong motor selected

Check the motor selection from the VPH DES "Driver/Motor selection" window.

• Check of the device to connect

Check if the device to use matches the motor combination to connect.

Wrong parameter file

When sending a saved parameter file, check if the file is correct.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

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f. Related parameter

\_

g. Output signal status

# AL.D0.5 Motor selection incorrect 5 (invalid motor type combination)

a. Description

Motor type error

- b. Causes and measures
  - Wrong motor selected

Check the motor selection from the VPH DES "Driver/Motor selection" window.

· Check of the device to connect

Check if the device to use matches the motor combination to connect.

· Wrong parameter file

When sending a saved parameter file, check if the file is correct.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# **AL.D0.8 Carrier frequency setting error**

a. Description

A carrier frequency not supported by the device is set.

- b. Causes and measures
  - Parameter setting error
     Check if an unsupported value is set in [P100: Carrier frequency setting]. If the appropriate value is unknown, set "0".
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

P100: Carrier frequency setting

g. Output signal status

# AL.D0.9 Inverter output frequency error

a. Description

An attempt was made to use a motor of which the maximum electric angle frequency (inverter output frequency) is 600Hz or higher.

- b. Causes and measures
  - The maximum electric frequency is high.
     In [P082: Motor max speed special setting], set a value lower than "72000/[P016: Number of motor poles]".
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

P016: Number of motor poles

P082: Motor max speed special setting

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D1.0 Maximum speed command higher limit incorrect

a. Description

The speed that is set in the motor maximum speed mode exceeds 2G (P161 setting unit/sec).

- b. Causes and measures
  - The motor maximum speed is high.

It is considered that the maximum speed calculated by the setting of [P164: Mechanical movement] is out of the range of 100 to 2G [setting unit/sec]. Change the parameter settings so that the calculated value falls within the range.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

-

f. Related parameter

P164: Mechanical movement

g. Output signal status

# AL.D1.1 Maximum speed command lower limit incorrect

a. Description

The speed that is set in the motor maximum speed mode does not reach 100 (P161 setting unit/sec).

- b. Causes and measures
  - The motor maximum speed is low.

It is considered that the maximum speed calculated by the setting of [P164: Mechanical movement] is out of the range of 100 to 2G [setting unit/sec]. Change the parameter settings so that the calculated value falls within the range.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

**f.** Related parameter

P164: Mechanical movement

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D1.3 1 rotation position range incorrect

a. Description

The setting of the 1 rotation position range is incorrect.

- b. Causes and measures
  - Parameter setting error

The relation between the settings of [P165: Rotation position range] and [P166: Rotation position range sign switching position] may be contradictory. Check the parameter settings.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and execute one of the following operations:

- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

P165: Rotation position range

P166: Rotation position range sign switching position

g. Output signal status

## **AL.D1.6 Motor information incorrect error**

- \* Occurs only when no encoder is selected or S-iABS is selected.
- a. Description

The motor information in the encoder is not appropriate data.

- **b.** Causes and measures
  - The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair is necessary.

c. Operation at an error

Servo OFF

d. Release method

Turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.D1.7 Motor combination mismatch error 1

- \* Occurs only when no encoder is selected or S-iABS is selected.
- a. Description

The input power supply specification or the output capacity of the device does not match the connected motor.

- b. Causes and measures
  - Check of the device to connect
     Check that the device to use matches the motor combination to connect.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.D1.8 Motor combination mismatch error 2

- \* Occurs only when S-iABS is selected.
- a. Description

S-iABS is selected for the encoder type, but a non-S-iABS motor is connected.

- b. Causes and measures
  - Motor type setting

Check the motor to connect, and set the type of the motor to connect, with VPH DES.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

P060: Encoder type

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.D1.9 Motor combination mismatch error 3

- \* Occurs only when S-ABS2, S-ABS4, or S-MABS is selected.
- a. Description

An item other than S-iABS is selected for the encoder type, but an S-iABS is connected.

- **b.** Causes and measures
  - · Motor type setting

Check the motor to connect, and set the type of the motor to connect, with VPH DES.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

## AL.D4.1 Magnetic pole signal pattern error

## a. Description

When the magnetic pole sensor was used, the signal from the magnetic pole sensor could not be read normally.

When the magnetic pole sensor itself is faulty, a magnetic sensor error may not be detected. In this case, an error including an overload error occurs while the motor is running.

## b. Causes and measures

• It was not possible to determine the magnetic pole because the operating speed was too high.

Reduce the operating speed.

A problem occurred with the encoder cable connection.

Check that the encoder cable is not broken or loose but is connected correctly, etc.

Incorrect wiring

Check the wiring of the motor power cable (U/V/W) and the encoder feedback signal cable.

• The magnetic pole signal is influenced by noises.

Remove the noise source, and take noise protection measures.

• Parameter setting error

Check the magnetic pole sensor and encoder used, and set parameters.

• The magnetic pole sensor is faulty.

Repair or replace the magnetic pole sensor.

## c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

## **f.** Related parameter

P068: Magnetic pole sensor type

## g. Output signal status

# AL.D4.2 Error in matching of magnetic pole signal and encoder resolution

## a. Description

When the magnetic pole sensor was used, the motor electric angle rotated one turn before the magnetic pole signal pattern went through one cycle.

When the magnetic pole sensor itself is faulty, a magnetic sensor error may not be detected. In this case, an error including an overload error occurs while the motor is running.

#### b. Causes and measures

• It was not possible to determine the magnetic pole because the operating speed was too high.

Reduce the operating speed.

• A problem occurred with the encoder cable connection.

Check that the encoder cable is not broken or loose but is connected correctly, etc.

Incorrect wiring

Check the wiring of the motor power cable (U/V/W) and the encoder feedback signal cable.

• The magnetic pole signal is influenced by noises.

Remove the noise source, and take noise protection measures.

• Parameter setting error

Check the magnetic pole sensor and encoder used, and set parameters.

• The magnetic pole sensor is faulty.

Repair or replace the magnetic pole sensor.

#### c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and turn the power off, then on again.

## e. Related display

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## f. Related parameter

P016: Number of motor poles

P017: Distance between motor pole opposite

P061: Number of encoder pulses of rotary type motor

P062: Scale resolution

P063: Scale pitch distance

P064: Number of pulse per scale pitch

P068: Magnetic pole sensor type

#### g. Output signal status

# AL.D4.3 Auto magnetic pole detection error

#### a. Description

In the automatic magnetic pole detection mode, automatic magnetic pole detection operation was not completed normally.

#### b. Causes and measures

- A problem occurred with the encoder cable connection.
   Check that the encoder cable is not broken or loose but is connected correctly, etc.
- Incorrect wiring
   Check the wiring of the motor power cable (U/V/W) and the encoder feedback signal
- · Parameter setting error

Set [P068: Magnetic pole sensor type] to "0: Auto magnetic pole". Check the encoder used and set the parameter.

• The gain adjustment of the auto magnetic pole is not an appropriate value. For details, refer to "6-2-3 Auto magnetic pole-related error".

• Detection fails due to the influence of the mechanical system. For details, refer to "6-2-3 Auto magnetic pole-related error".

#### c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

#### e. Related display

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## **f.** Related parameter

P060: Encoder type

P068: Magnetic pole sensor type

P380: Magnetic pole detection torque limit value

P381: Magnetic pole detection gain 1

P382: Magnetic pole detection integration time constant

P383: Magnetic pole detection gain 2

P384: Magnetic pole detection complete range

P385[1st digit]: Magnetic pole detection filter order selection

P385[5th - 2nd digits]: Magnetic pole detection filter frequency

P386[3rd - 1st digits]: Landing torque

P386[7th - 4th digits]: Landing torque holding time

P387[3rd - 1st digits]: Magnetic pole detection torque minimum value

P387[4th digit]: Magnetic pole detection torque attenuation pattern selection

#### g. Output signal status

# **AL.D4.4 Encoder signal disconnection error**

#### a. Description

An error occurred in the encoder cable.

Or, in the encoder type "C-SEN2", the encoder frequency exceeds 24Mpps.

When the encoder itself is faulty, an encoder error may not be detected. In this case, an error including an overload error occurs while the motor is running.

#### b. Causes and measures

- A problem occurred with the encoder cable connection.
   Check that the encoder cable is not broken or loose but is connected correctly, etc.
- Parameter setting error
   Check if the encoder used is set in [P060: Encoder type]. If it is not set, set the encoder from the VPH DES "Driver/Motor selection" window.
- Not recognized due to a failure in the encoder.
   Repair or replace the encoder.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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**f.** Related parameter

P060: Encoder type

g. Output signal status

# AL.D4.5 Encoder speed error

a. Description

The maximum feedback signal speed exceeds the speed that the device can detect. For the specification of the feedback signal, refer to "12-1-3 Functional specifications".

- b. Causes and measures
  - The maximum speed is high.

Set [P082: Motor max speed special setting] within the maximum speed specification of the motor and feedback signal.

- Serial method: 41.9Gpps
- 90 deg phase difference method: 163Mpps

This maximum speed does not guarantee operation of the device.

For the specification of the feedback signal, refer to "12-1-3 Functional specifications".

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

P082: Motor max speed special setting

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D4.7 Absolute position compensation data unregistered

a. Description

Although ABS position compensation is set effective, no ABS position compensation data is registered in the device.

- b. Causes and measures
  - No ABS position compensation data is registered.
     Use the VPH ABS position compensation data transfer program (VPH APE) to register ABS position compensation data in the device.
  - ABS position compensation is set effective although it is not used.
     If not using ABS position compensation, set [P104: Absolute position compensation action entry] to "0: Absolute position compensation function ineffective".
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

L021: Whether ABS position compensation data is valid or invalid

f. Related parameter

P104: Absolute position compensation action entry

g. Output signal status

# AL.D4.8 Absolute position compensation data collation error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

The absolute position compensation data registered in the device is inconsistent with the data registered in the IPU.

- b. Causes and measures
  - The ABS position compensation data is inconsistent.
     Input the RST signal or turn the power off, then on again. The ABS position compensation data registered in the IPU is automatically in the device.
- **c.** Operation at an error

Servo OFF

d. Release method

Execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

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f. Related parameter

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g. Output signal status

# AL.D4.9 Absolute position compensation data none error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

No ABS position compensation data is registered in the IPU. ABS position compensation data for another model is registered.

- **b.** Causes and measures
  - No ABS position compensation data is registered in the device.
     Use the VPH ABS position compensation data transfer program (VPH APE) to register ABS position compensation data in the device.
  - ABS position compensation data is registered in the device, but is not transferred to the IPLI

From VPH DES, execute [d015: Transfer the absolute position compensation data to IPU] to transfer the data from the device to the IPU.

- No ABS position compensation data is possessed.
   Contact our sales representative.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

L021: Whether ABS position compensation data is valid or invalid

**f.** Related parameter

\_

g. Output signal status

## AL.D5.0 IPU communication error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

An error occurred in communication between device and IPU.

- b. Causes and measures
  - A problem occurred with the cable connection. Check that the cable between device and IPU is not broken or loose but is connected correctly, etc.
  - Parameter setting error Check if the encoder used is set in [P060: Encoder type]. If it is not set, set the encoder from the VPH DES "Driver/Motor selection" window.
  - A problem occurred in the power supply (when an external power supply is used). If the encoder power is supplied from the outside, adjust the external power supply voltage to an appropriate value.
- c. Operation at an error Servo OFF
- d. Release method Remove the cause and turn the power off, then on again.
- e. Related display
- **f.** Related parameter
- g. Output signal status ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

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# AL.D5.2 Communication error between encoder IPU

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

An error occurred in the communication circuit between the encoder and IPU.

- **b.** Causes and measures
  - A problem occurred with the encoder cable connection.
     Check that the encoder cable is not broken or loose but is connected correctly, etc.
  - Communication between encoder and IPU is influenced by noises. Remove the noise source, and take noise protection measures.
  - Data cannot be transmitted or received due to a failure in the IPU.
     If this error occurs when ABS position compensation data, user data, or IPU parameters are transmitted or received, another possible cause is a failure in the IPU. Repair or replace it.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

# AL.D5.3 Cable disconnection between encoder IPU

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

An error occurred in the cable between encoder and IPU.

- b. Causes and measures
  - A problem occurred with the encoder cable connection.

    Check that the encoder cable is not broken or loose but is connected correctly, etc.
  - Communication between encoder and IPU is influenced by noises. Remove the noise source, and take noise protection measures.
  - Data cannot be transmitted or received due to a failure in the IPU.
     If this error occurs when ABS position compensation data, user data, or IPU parameters are transmitted or received, another possible cause is a failure in the IPU. Repair or replace it.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

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g. Output signal status

# AL.D5.4 Encoder position detection signal error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

The encoder cannot read the positional signal detection waveform normally.

- b. Causes and measures
  - Incorrect mounting of the encoder position detection section

    When the encoder is mounted additionally, the sensor may be mounted incorrectly. Check
    the mounting status.

Repair or replace the sensor or the IPU in the following cases:

- Failure in the encoder position detection section
- A signal error occurred due to the deterioration of the encoder position detection section.
- Failure in the IPU detection parts
- The encoder scale mounting position is changed due to the overloading or uneven loading of the motor.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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**f.** Related parameter

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g. Output signal status

# AL.D5.5 1 rotation position detection speed error

\* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).

## a. Description

When an ABS encoder is used and the power is turned on or when a serial encoder communication error is released, the motor rotates or vibrates, making it impossible to detect the position normally.

Usually, the error is detected at the following speed.

For S-ABS2 and S-ABS3: 1rpm or more

For S-ABS4: 15rpm or more

With a combination of motor and encoder, the above speeds may be changed with a parameter.

#### b. Causes and measures

• The position cannot be detected due to vibration.

It is considered that when an ABS encoder is used and the power is turned on or when a serial encoder communication error is released, the motor rotates or vibrates, making it impossible to detect the position normally. Usually, the error is detected at the following speed.

For S-ABS2 and S-ABS3: 1rpm or moreFor S-ABS4: 15rpm or more

With a combination of motor and encoder, the above speeds may be changed with a parameter.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

P071[2nd & 1st digits]: 1 rotation position detection speed error detection speed

P089[2nd & 1st digits]: 1 rotation position detection speed error detection speed special setting

g. Output signal status

# AL.D5.6 Photo acceptance unit error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

An error occurred in a component in the ABS encoder.

- b. Causes and measures
  - A signal error occurred due to a failure in or the deterioration of the encoder position detection section.

Repair or replace the motor.

- Failure in the IPU detection parts Repair or replace the IPU.
- A problem occurred with the connection of the cable between encoder and IPU.
   Check that the cable is not broken or loose but is connected correctly, etc. If the error still occurs, repair or replace it.
- The encoder scale mounting position is changed due to the overloading or uneven loading of the motor.

Review the load conditions.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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**f.** Related parameter

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g. Output signal status

# AL.D5.7 Light emitting element error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

An error occurred in a component in the ABS encoder.

- b. Causes and measures
  - A signal error occurred due to a failure in or the deterioration of the encoder position detection section.

Repair or replace the motor.

• The encoder scale mounting position is changed due to the overloading or uneven loading of the motor.

Review the load conditions.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D5.8 IPU backup error

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

IPU backup data is damaged.

Magnetic encoder backup data is damaged.

- b. Causes and measures
  - Failure or deterioration

A possible cause is a failure in the IPU. Repair or replace it.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

**f.** Related parameter

\_

g. Output signal status

# AL.D5.9 Absolute position compensation encoder pulse number error

a. Description

The number of encoder pulses set in the device is not the same as the number set in ABS position compensation data.

- b. Causes and measures
  - ABS position compensation data setting error
     Use the VPH ABS position compensation data transfer program (VPH APE) to register
     ABS position compensation data in the device.
  - Parameter setting error
     Check if the number of encoder pulses of the encoder used is set in [P061: Encoder pulse of rotary type motor]. If it is not set, set the encoder resolution from the VPH DES "Driver/ Motor selection" window.
- **c.** Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

# AL.D6.0 Magnetic pole signal disconnection error

#### a. Description

When the magnetic pole sensor was used, the signal from the magnetic pole sensor could not be read normally.

When the magnetic pole sensor itself is faulty, this error may not be detected. In this case, an error including an overload error occurs while the motor is running.

#### b. Causes and measures

• It was not possible to determine the magnetic pole because the operating speed was too high.

Reduce the operating speed.

• A problem occurred with the encoder cable connection.

Check that the encoder cable is not broken or loose but is connected correctly, etc.

Incorrect wiring

Check the wiring of the motor power cable (U/V/W) and the encoder feedback signal cable.

• The magnetic pole signal is influenced by noises.

Remove the noise source, and take noise protection measures.

• Parameter setting error

Check the magnetic pole sensor and encoder used, and set parameters.

• The magnetic pole sensor is faulty.

Repair or replace the magnetic pole sensor.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

P068: Magnetic pole sensor type

g. Output signal status

## AL.D6.1 Encoder identification error

a. Description

If an "ENSIS" or "EnDat" encoder is connected, encoder information cannot be referred to due to a communication error during initialization at power ON.

- b. Causes and measures
  - A problem occurred with the encoder cable connection.
     Check that the encoder cable is not broken or loose but is connected correctly, etc.
  - An encoder not compliant with the device is connected.
     Connect an encoder that is compliant with the device.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.D6.2 Unregistered encoder selection error

a. Description

An attempt is made to select and start an encoder not compliant with the device.

- **b.** Causes and measures
  - Parameter setting error

Check if the encoder used is set in [P060: Encoder type]. If it is not set, set the encoder from the VPH DES "Driver/Motor selection" window.

An encoder not compliant with the device is connected.
 Connect an encoder that is compliant with the device.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

P060: Encoder type

g. Output signal status

# **AL.D6.5 Encoder communication timeout**

a. Description

Reception of data from the encoder could not be checked, causing a timeout.

- b. Causes and measures
  - Parameter setting error

Check if the encoder used is set in [P060: Encoder type]. If it is not set, set the encoder from the VPH DES "Device and motor selection" window.

• A problem occurred with the encoder cable connection.

Check that the encoder cable is not broken or loose but is connected correctly, etc.

• The encoder is faulty.

Repair or replace the encoder.

Encoder communication is affected by noise.
 Remove the noise source, and take noise protection measures.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

(If the error still occurs, replacement or repair is necessary.)

e. Related display

\_

f. Related parameter

P060: Encoder type

g. Output signal status

# AL.D6.6 Absolute position compensation data IPU registration error

a. Description

The ABS position compensation data written in the IPU is not consistent with the data of the write source.

The ABS position compensation data was not written normally due to the influence of noises, etc.

- b. Causes and measures
  - ABS position compensation data error
     Use the VPH ABS position compensation data transfer program (VPH APE) to register
     ABS position compensation data in the device.
  - The cable is influenced by noises.
     Remove the noise source, and take noise protection measures. Then, use the VPH ABS position compensation data transfer program (VPH APE) to register ABS position compensation data in the device.
- c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

**f.** Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.DA.0 Encoder data sustain error 1

- \* Occurs only when S-iABS is selected.
- a. Description

Shipment adjustment data 1 in the encoder is damaged.

- b. Causes and measures
  - The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

## AL.DA.1 Encoder data sustain error 2

- \* Occurs only when S-iABS is selected.
- a. Description

Shipment adjustment data 2 in the encoder is damaged.

- b. Causes and measures
  - The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.DA.2 Encoder position detection signal error 1

- \* Occurs only when S-iABS is selected.
- a. Description

The rough position detection signal of the encoder cannot be read normally.

- b. Causes and measures
  - The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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**f.** Related parameter

\_

g. Output signal status

# AL.DA.3 Encoder position detection signal error 2

- \* Occurs only when S-iABS is selected.
- a. Description

The precise position detection signal of the encoder cannot be read normally.

- b. Causes and measures
  - The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.DA.4 Encoder communication timeout/Re-introduction-of-unit power release

- \* Occurs only when S-iABS is selected.
- a. Description

There is no response from the encoder.

- b. Causes and measures
  - A problem occurred with the encoder cable connection.

Check that the encoder cable is not broken or loose but is connected correctly, etc.

· Parameter setting error

Check the motor to connect, and set the type of the motor to connect, with VPH DES.

The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

# AL.DA.5 Encoder communication error /Re-introduction-of-unit power release

- \* Occurs only when S-iABS is selected.
- a. Description

An error occurred in communication between device and encoder.

- b. Causes and measures
  - A problem occurred in encoder cable connection.

Check that the encoder cable is not broken or loose but is connected correctly, etc.

• The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

f. Related parameter

-

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# **AL.DA.6 Encoder position mismatch error**

- \* Occurs only when S-iABS is selected.
- a. Description

The rough position of the encoder does not match the precise position.

- b. Causes and measures
  - · The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

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**f.** Related parameter

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g. Output signal status

# AL.DA.7 Encoder shipment data error

- \* Occurs only when S-iABS is selected.
- a. Description

The shipment data in the encoder contained an error.

- **b.** Causes and measures
  - The encoder is faulty.

Turn the power off, then on again. If the error still occurs, encoder repair or replacement is necessary.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause and turn the power off, then on again.

e. Related display

\_

**f.** Related parameter

\_

g. Output signal status

# AL.DB.0 Forward direction overtravel / Automatic release

#### a. Description

The forward direction overtravel signal (FOT) was detected.

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute reverse direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P634(5th - 2nd digits): Deceleration time after OT signal braking stoppage] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

\_

#### f. Related parameter

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

P634[8th - 6th digits]: OT condition holding time

#### g. Output signal status

## AL.DB.1 Reverse direction overtravel / Automatic release

#### a. Description

The reverse direction overtravel signal (ROT) was detected.

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute forward direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P634(5th - 2nd digits): Deceleration time after OT signal braking stoppage] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

\_

#### **f.** Related parameter

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

P634[8th - 6th digits]: OT condition holding time

#### g. Output signal status

# AL.DB.2 Forward direction software overtravel / Automatic release

#### a. Description

The status display [C020: Current position] is beyond the setting of [P171].

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute reverse direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

Parameter setting error

Check if the setting of [P171: Forward direction software OT limit] is appropriate.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P635(5th - 2nd digits): Soft OT braking stoppage deceleration time] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

C020: Current position

#### **f.** Related parameter

P171: Forward direction software OT limit

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P635[5th - 2nd digits]: Soft OT signal braking stoppage deceleration time

P635[8th - 6th digits]: Soft OT condition holding time

#### g. Output signal status

# AL.DB.3 Reverse direction software overtravel / Automatic release

#### a. Description

The status display [C020: Current position] is beyond the setting of [P172].

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute forward or reverse direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

· Parameter setting error

Check if the setting of [P172: Reverse direction software OT limit] is appropriate.

· Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P635(5th - 2nd digits): Soft OT braking stoppage deceleration time] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

C020: Current position

#### f. Related parameter

P172: Reverse direction software OT limit

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P635[5th - 2nd digits]: Soft OT signal braking stoppage deceleration time

P635[8th - 6th digits]: Soft OT condition holding time

#### g. Output signal status

# AL.DB.4 Forward direction overtravel / Reset release

#### a. Description

The forward direction overtravel signal (FOT) was detected.

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute reverse direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P634(5th - 2nd digits): Deceleration time after OT signal braking stoppage] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Execute one of the following operations, then move the motor to the operation range.

- Input the ARST signal.
- Input the RST signal.

#### e. Related display

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#### f. Related parameter

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3, P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

P634[8th - 6th digits]: OT condition holding time

#### g. Output signal status

## AL.DB.5 Reverse direction overtravel / Reset release

#### a. Description

The reverse direction overtravel signal (ROT) was detected.

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute forward direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P634(5th - 2nd digits): Deceleration time after OT signal braking stoppage] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Execute one of the following operations, then move the motor to the operation range.

- Input the ARST signal.
- Input the RST signal.

#### e. Related display

\_

#### f. Related parameter

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

P634[8th - 6th digits]: OT condition holding time

#### g. Output signal status

# AL.DB.6 Forward direction software overtravel / Reset release

## a. Description

The status display [C020: Current position] is beyond the setting of [P171].

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute reverse direction operation to move the motor in the operation range.

• Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

· Parameter setting error

Check if the setting of [P171: Forward direction software OT limit] is appropriate.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P635(5th - 2nd digits): Soft OT braking stoppage deceleration time] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Execute one of the following operations, then move the motor to the operation range.

- Input the ARST signal.
- Input the RST signal.

## e. Related display

C020: Current position

## **f.** Related parameter

P171: Forward direction software OT limit

P410[3rd digit]: SPDSEL0 Overtravel spec selection

 $P413[3rd\ digit]:\ SPDSEL1,\ P416[3rd\ digit]:\ SPDSEL2,\ P419[3rd\ digit]:\ SPDSEL3,$ 

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P635[5th - 2nd digits]: Soft OT signal braking stoppage deceleration time

P635[8th - 6th digits]: Soft OT condition holding time

#### g. Output signal status

## AL.DB.7 Reverse direction software overtravel / Reset release

#### a. Description

The status display [C020: Current position] is beyond the setting of [P172].

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute forward direction operation to move the motor in the operation range.

• Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

· Parameter setting error

Check if the setting of [P172: Reverse direction software OT limit] is appropriate.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

### c. Operation at an error

The motor stops after the time of [P635(5th - 2nd digits): Soft OT braking stoppage deceleration time] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Execute one of the following operations, then move the motor to the operation range.

- Input the ARST signal.
- Input the RST signal.

## e. Related display

C020: Current position

#### f. Related parameter

P172: Reverse direction software OT limit

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P635[5th - 2nd digits]: Soft OT signal braking stoppage deceleration time

P635[8th - 6th digits]: Soft OT condition holding time

#### g. Output signal status

# AL.DB.8 Forward direction positioning amount over

## a. Description

An attempt was made to execute the positioning command with a positioning quantity greater than the value set in [P173].

#### b. Causes and measures

- Parameter setting error
   Check if the setting of [P173: Max travel amount for forward direction positioning] is appropriate.
- Positioning amount setting error
   Check if the positioning amount of the command is appropriate.

#### c. Operation at an error

Servo lock

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

\_

#### **f.** Related parameter

P173: Max travel amount for forward direction positioning

## g. Output signal status

# AL.DB.9 Reverse direction positioning amount over

## a. Description

An attempt was made to execute the positioning command with a positioning amount greater than the value set in [P174].

## b. Causes and measures

- Parameter setting error
   Check if the setting of [P174: Max travel amount for reverse direction positioning] is appropriate.
- Positioning amount setting error
   Check if the positioning amount of the command is appropriate.

#### c. Operation at an error

Servo lock

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

# e. Related display

\_

## **f.** Related parameter

P174: Max travel amount for reverse direction positioning

## g. Output signal status

# AL.DC.0 Address setting error

a. Description

An attempt was made to specify a command address other than 0 to 255 and execute a command.

- b. Causes and measures
  - Address setting error
     Check if the command of the command address is appropriate.
- **c.** Operation at an error

Servo lock

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

-

g. Output signal status

# AL.DD.0 Position deviation excess 1 (maximum position deviation over)

## a. Description

The position deviation exceeds the value set in [P176].

#### b. Causes and measures

- The overshoot becomes large due to conditions such as large load inertia.
   Take measures such as reducing the load inertia and increasing the acceleration time.
   Also, check and adjust the gain, as well as the play in the mechanical system.
- Runaway or vibration occurred due to a failure in the encoder.
   Repair or replace the encoder.
- The encoder feedback signal or the command pulse is influenced by noises. Remove the noise source, and take noise protection measures.
- Mechanical lock due to the brake, etc.
   Check the brake and the mechanical configuration, and remove the cause of the lock.
- Incorrect setting of parameters Check the related parameters.

#### c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

\_

### f. Related parameter

P176: Position deviation exorbitance detection pulse Max value

#### g. Output signal status

# AL.DD.1 Position deviation excess 2 (theoretical position deviation over)

#### a. Description

The position deviation exceeds the amount based on the value set in [P178].

#### b. Causes and measures

- The overshoot becomes large due to conditions such as large load inertia.

  Take measures such as reducing the load inertia and increasing the acceleration time.

  Also, check and adjust the gain, as well as the play in the mechanical system.
- Runaway or vibration occurred due to a failure in the encoder. Repair or replace the encoder.
- The encoder feedback signal or the command pulse is influenced by noises. Remove the noise source, and take noise protection measures.
- Mechanical lock due to the brake, etc.
   Check the brake and the mechanical configuration, and remove the cause of the lock.
- Incorrect setting of parameters
   Check the related parameters.

## c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

\_

## f. Related parameter

P177: Position deviation exorbitance detection pulse Min value

P178: Position deviation exorbitance detection ratio

## g. Output signal status

# AL.DD.2 Position deviation excess 3 (servo-on position deviation over)

#### a. Description

When the position deviation exceeded the value set in [P175], servo-on operation was performed.

#### b. Causes and measures

- The overshoot becomes large due to conditions such as large load inertia.

  Take measures such as reducing the load inertia and increasing the acceleration time.

  Also, check and adjust the gain, as well as the play in the mechanical system.
- Runaway or vibration occurred due to a failure in the encoder.
   Repair or replace the encoder.
- The encoder feedback signal or the command pulse is influenced by noises. Remove the noise source, and take noise protection measures.
- Mechanical lock due to the brake, etc.
   Check the brake and the mechanical configuration, and remove the cause of the lock.
- Incorrect setting of parameters Check the related parameters.

#### c. Operation at an error

Servo OFF

#### d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

#### f. Related parameter

P175: Position deviation exorbitance detection pulse at Servo OFF → Servo ON

#### g. Output signal status

# AL.DD.4 Main power supply voltage is lowered by the excessive deviation

a. Description

When the DC voltage of the main power supply is lower than the specified value, the amount of commands accumulated due to the speed limit set in [P123] exceeds 2.1 billion.

b. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

c. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- d. Related display

\_

e. Related parameter

\_

f. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

# AL.DE.1 1 rotation data un-setup error

a. Description

An attempt was made to execute an INDX command when [P165] was not set.

- b. Causes and measures
  - Parameter setting error
     Set a value other than "0" in [P165: Rotation position range].
- c. Operation at an error

Servo lock

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

**f.** Related parameter

P165: Rotation position range

g. Output signal status

ALM: O /WNG: ● /RDY: Follows [P650]./ZRDY: ● /BRK: ●

## **AL.DE.2 Positioning command incorrect**

a. Description

A value outside the range is set in the positioning command.

- b. Causes and measures
  - Positioning command setting error
     Check if the positioning command value of the command is appropriate.
- c. Operation at an error

Servo lock

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: Follows [P650]./ZRDY: ● /BRK: ●

## AL.DE.3 1 rotation short cut positioning position setting error

#### a. Description

A value greater than that set in [P165] is specified as the positioning position in the INDX command.

Or, an attempt was made to execute the INDX command when sign switching was enabled according to the setting in [P166].

#### b. Causes and measures

- Positioning command value setting error
   Check if the positioning command value of the INDX command is appropriate.
- Parameter setting error
   Check if the setting of [P165: Rotation position range] or [P166: Rotation position range sign switching position] is appropriate.
- c. Operation at an error

Servo lock

#### d. Release method

Correct the command setting or set 0 in [P166] and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

#### e. Related display

\_

#### f. Related parameter

P165: Rotation position range

P166: Rotation position range sign switching position

#### g. Output signal status

ALM: O /WNG: ● /RDY: Follows [P650]./ZRDY: ● /BRK: ●

## AL.DE.4 Indirect data number incorrect

a. Description

An attempt was made to specify an indirect data number other than IX00 to IX99 and execute a command.

- b. Causes and measures
  - Indirect data specification error
     Check if the specification of the indirect data number is appropriate.
- c. Operation at an error

Servo lock

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

-

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: Follows [P650]./ZRDY: ● /BRK: ●

## AL.DE.5 Zero point position setting run error

a. Description

When other than the ABS encoder was used, the HOME command, SET ABS, was executed.

- b. Causes and measures
  - Command specification error
     The HOME command, SET ABS, is effective only when the ABS encoder is used.
- c. Operation at an error

Servo lock

d. Release method

Execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

P060: Encoder type

g. Output signal status

ALM: O /WNG: ● /RDY: Follows [P650]./ZRDY: ● /BRK: ●

## AL.DF.5 USB communication disconnected error

a. Description

USB communication was disconnected during VPH DES test run.

- b. Causes and measures
  - Wiring error

Check that the USB cable is not broken or does not have a contact failure but is connected correctly, etc.

Incorrect insertion of the connector
 Check that the connector is inserted.

c. Operation at an error

The motor immediately stops, and after having stopped, enters the servo off status

d. Release method

Remove the cause and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.E4.0 Safety input timing error

a. Description

Ten or more seconds elapse after either of the safety input signal 1 (SF1\*) and safety input signal 2 (SF2\*) is turned OFF, but the other signal does not turn OFF.

- b. Causes and measures
  - Wiring error

Check that safety input signal 1 (SF1\*) and safety input signal 2 (SF2\*) are not broken or do not have a contact failure but are connected correctly, etc.

c. Operation at an error

Servo OFF

d. Release method

Remove the cause, turn OFF either safety input signal 1 (SF1\*) or safety input signal 2 (SF2\*), and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## AL.E4.1 Safety input error during operation

a. Description

In the case where the motor was operating and the speed zero signal (SZ) was OFF, either safety input signal 1 (SF1\*) or safety input signal 2 (SF2\*) turned OFF.

- b. Causes and measures
  - During motor operation, an error occurred in safety input.

    This STO function is assumed to be used when the motor is stopped.
- c. Operation at an error

Servo OFF

d. Release method

Check that the speed zero signal (SZ) is ON, turn OFF safety input signal 1 (SF1\*) and safety input signal 2 (SF2\*), and execute one of the following operations:

- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

**f.** Related parameter

-

g. Output signal status

ALM: O /WNG: ● /RDY: ● /ZRDY: ● /BRK: ●

## 8-2-2 Warning specifications

## FL.E6.0 Driver input emergency stop

#### a. Description

The emergency stop signal (EMG), a control input signal, was input.

- b. Causes and measures
  - The emergency stop signal (EMG) was input.
     Check that restarting the operation does not present any problems and turn OFF the emergency stop signal (EMG).
- c. Operation at an error

The motor stops as selected in [P633] and enters the servo off status.

d. Release method

[In communication mode]

Automatically released by releasing the emergency stop signal (EMG).

[In maintenance mode]

Release the emergency stop signal (EMG) and execute one of the following operations:

- Input the RST signal.
- Turn the power off, then on again.
- e. Related display

\_

**f.** Related parameter

P633[1st digit]: Stopping selection when EMG signal is ON

P633[5th - 2nd digits]: Deceleration time after EMG signal braking stoppage

P633[8th - 6th digits]: Servo OFF delay time after EMG braking stoppage

g. Output signal status

## FL.E7.0 Controller input emergency stop

a. Description

In communication, the emergency stop signal (EMG) was input.

- b. Causes and measures
  - The emergency stop signal (EMG) was input.
     Check that restarting the operation does not present any problems and turn OFF the emergency stop signal (EMG).
- c. Operation at an error

The motor stops as selected in [P633] and enters the servo off status.

d. Release method

[In communication mode]

Automatically released by releasing the emergency stop signal (EMG).

e. Related display

\_

**f.** Related parameter

P633[1st digit]: Stopping selection when EMG signal is ON

P633[5th - 2nd digits]: Deceleration time after EMG signal braking stoppage

P633[8th - 6th digits]: Servo OFF delay time after EMG braking stoppage

g. Output signal status

## FL.F0.0 Motor overload notice

#### a. Description

The load factor rises, and the status display [C012: Thermal trip rate of motor] reaches 90%. If the load factor keeps rising and [C012: Thermal trip rate of motor] reaches 100%, [AL.B5.0: Motor overload error] will occur.

#### b. Causes and measures

Excessive load

Take measures such as reducing the load.

• The frequency of starting and stopping the motor is high.

Reduce the starting and stopping frequency, and operate it in the range in which it is not overloaded.

• Current vibration due to the vibration or instable operation of the motor

Check and adjust the gain, as well as the play in the mechanical system.

Incorrect wiring of motor power cable (U/V/W)

Check the wiring and correct it.

• Mechanical lock due to the brake, etc.

Check the brake and the mechanical configuration, and remove the cause of the lock.

• The ambient temperature is high, or the ventilation is bad.

Check the installation environment, and improve cooling and ventilation.

• Runaway or vibration occurred due to a failure in the encoder.

Repair or replace the encoder.

#### c. Operation at an error

Continue current operation

#### d. Release method

Automatic release at the point when the thermal trip rate of motor becomes less than 90%

#### e. Related display

C012: Thermal trip rate of motor

#### **f.** Related parameter

P083[3rd - 1st digits]: Motor electronic thermal detected actual value

P084[3rd - 1st digits]: Motor 1 phase concentration electronic thermal detection ratio

#### g. Output signal status

## FL.F0.2 Main power supply undervoltage detection warning

#### a. Description

The status display [C016: Main power supply DC voltage value] is lower than the specified value in the servo on status.

When the setting of [P124(1st digit): Main power supply undervoltage error spec selection] is "0" or "1", this warning is effective.

#### b. Causes and measures

- A voltage drop occurred due to an insufficient power supply capacity.
   Check the power supply used.
- An instantaneous power failure (power failure for at least about 10 ms) occurred.
   Check the power supply used.
- Servo-on operation is performed immediately after power-on.

  After power-on, wait for some time, then execute servo-on operation.
- In a device of 1.5 kW or greater, the shorting bar between "L1 and L2/P" of the power supply terminals is removed.

Install the shorting bar between "L1 and L2/P".

• A fuse blowout occurred in the power section.

#### c. Operation at an error

Continue current operation

#### d. Release method

Remove the cause and recover the main power supply voltage to the normal range.

#### e. Related display

C016: Main power supply DC voltage value

#### **f.** Related parameter

P124[1st digit]: Main power supply undervoltage error spec selection

P124[5th - 2nd digits]: Detection allowed time for main power supply undervoltage error

#### g. Output signal status

## FL.F0.3 Zero point return uncompleted automatic start warning

#### a. Description

When [P516] was set to the value indicating positioning not allowed, an attempt was made to start a positioning command (POS/INDX) before zero point return was completed.

#### b. Causes and measures

- Zero point return is uncompleted.
   Complete zero point return and execute the positioning command.
- The setting of the parameter is Positioning not allowed.
   If [P516: Positioning approval selection when homing is not completed] is set to other than Positioning not allowed, the positioning command can be executed even in the status where zero point return is uncompleted.

#### c. Operation at an error

The positioning drive signal is ignored.

#### d. Release method

Remove the cause and execute one of the following operations:

- Zero point return
- Jog operation
- Change the run mode.
- Input the ARST signal.
- Input the RST signal.
- Turn the power off, then on again.

## e. Related display

\_

#### f. Related parameter

P516: Positioning approval selection when homing is not completed

## g. Output signal status

## FL.F0.6 Main power supply voltage is lowered

#### a. Description

The main power supply voltage is lower than the value set in [P122].

#### b. Causes and measures

- The power supply voltage low (or the capacity is insufficient).
   Check the power supply used.
- A fuse blowout occurred in the power section.
- Wiring error

Check, for example, that the electric wire diameter is thick enough and that the screws of the power supply terminals are tight.

- Servo-on operation is performed immediately after power-on.
- Incorrect setting of parameters
   Check the value of [P122(2nd & 1st digits): Main power supply voltage drop detection value].
- An instantaneous power failure for at least about 10 ms occurred. After an instantaneous power failure occurs and the protective function is activated, if the power failure status continues, no control power is supplied and the protective circuit is reset. After that, when the power is recovered, various commands (including the speed command and pulse train command) are input. If the motor runs immediately after power recovery in a sequence, it is dangerous. Do not design such a sequence. Design an external sequence in which each signal is switched OFF and the execution of each command is stopped when the protective function is activated and an alarm occurs (is output).

#### c. Operation at an error

Continue current operation

#### d. Release method

Automatic release by removing the cause and recovering the main power supply voltage to the normal range.

e. Related display

\_

#### f. Related parameter

P122[2nd & 1st digits]: Main power supply voltage drop detection value

g. Output signal status

## FL.F0.7 Motor overheat warning

#### a. Description

The motor overheat (MTOH) signal is detected.

Or, in the motor equipped with a temperature sensor, motor overheat is detected.

When the setting of [P129(1st digit): Motor overheat detection spec selection] is "0:

Warning", this warning is effective.

#### b. Causes and measures

- Insufficient cooling of the motor
   Install the motor on a surface having a sufficient radiation area so that the motor comes into contact with the entire surface with no floating.
- Motor setting error

A motor parameter selected in the device may be inconsistent with the installed motor. Check motor settings.

c. Operation at an error

Continue current operation

d. Release method

Cool the motor until the motor overheat signal is switched OFF.

e. Related display

\_

#### **f.** Related parameter

P129[1st digit]: Motor overheat detection spec selection P129[4th - 2nd digits]: Motor overheat detection time

g. Output signal status

## FL.F0.8 Driver overheat warning

- \* At this point, there are no models that support this error.
- a. Description

The device temperature exceeds the allowable range.

- b. Causes and measures
  - The ambient temperature of the device rises.

Place it so that the heat can escape, considering the ventilation characteristics and the ambient temperature.

• The cooling fan is clogged.

Clean the fan with air blow, etc. to remove clogging.

• The cooling fan is faulty.

Repair or replace it.

c. Operation at an error

Continue current operation

d. Release method

Cool the device until the warning is released.

e. Related display

\_

f. Related parameter

\_

g. Output signal status

ALM: ● /WNG: O /RDY: - /ZRDY: - /BRK: -

## FL.F1.2 Encoder position detection parts deterioration warning

- \* The error occurs only when the IPU exists (S-ABS2, S-ABS3, S-ABS4).
- a. Description

Deterioration of the positional signal detection parts of the encoder has progressed.

- b. Causes and measures
  - A signal error occurred due to the deterioration of the encoder position detection section. Repair or replace the motor.
- c. Operation at an error

Continue current operation

d. Release method

Motor replacement or repair is necessary.

e. Related display

\_

f. Related parameter

-

g. Output signal status

## FL.F2.0 Forward direction overtravel

#### a. Description

The forward direction overtravel signal (FOT) was detected.

#### b. Causes and measures

The overtravel detection spot is reached.

Using jog operation, etc., execute reverse direction operation to move the motor in the operation range.

• Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P634(5th - 2nd digits): Deceleration time after OT signal braking stoppage] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

e. Related display

\_

#### f. Related parameter

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7)

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7)

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

P634[8th - 6th digits]: OT condition holding time

#### g. Output signal status

## FL.F2.1 Reverse direction overtravel

#### a. Description

The reverse direction overtravel signal (ROT) was detected.

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute forward direction operation to move the motor in the operation range.

• Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P634(5th - 2nd digits): Deceleration time after OT signal braking stoppage] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

\_

#### **f.** Related parameter

```
P410[3rd digit]: SPDSEL0 Overtravel spec selection
```

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7)

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7)

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

P634[8th - 6th digits]: OT condition holding time

#### g. Output signal status

## FL.F2.2 Forward direction software overtravel

#### a. Description

The status display [C020: Current position] is beyond the setting of [P171].

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute reverse direction operation to move the motor in the operation range.

• Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P635(5th - 2nd digits): Soft OT braking stoppage deceleration time] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

C020: Current position

#### **f.** Related parameter

P171: Forward direction software OT limit

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7)

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7)

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P635[5th - 2nd digits]: Soft OT signal braking stoppage deceleration time

P635[8th - 6th digits]: Soft OT condition holding time

#### **g.** Output signal status

## FL.F2.3 Reverse direction software overtravel

#### a. Description

The status display [C020: Current position] is beyond the setting of [P172: Reverse direction software OT limit].

#### b. Causes and measures

• The overtravel detection spot is reached.

Using jog operation, etc., execute forward direction operation to move the motor in the operation range.

· Incorrect setting of the positioning command

Check if the travel distance with the positioning command exceeds the overtravel detection spot.

• Incorrect external sequence

Check the external sequence and use the motor in the operation range.

• Wiring or connector insertion error

Check that the control signal cable is not broken or does not have a contact failure but is connected correctly, etc.

#### c. Operation at an error

The motor stops after the time of [P635(5th - 2nd digits): Soft OT braking stoppage deceleration time] and enters the servo lock status.

For a torque command, the torque becomes zero without deceleration stop.

#### d. Release method

Automatic release by moving the motor to the operation range

#### e. Related display

C020: Current position

#### f. Related parameter

P172: Reverse direction software OT limit

P410[3rd digit]: SPDSEL0 Overtravel spec selection

P413[3rd digit]: SPDSEL1, P416[3rd digit]: SPDSEL2, P419[3rd digit]: SPDSEL3,

P422[3rd digit]: SPDSEL4, P425[3rd digit]: SPDSEL5, P428[3rd digit]: SPDSEL6,

P431[3rd digit]: SPDSEL7)

P441[3rd digit]: TRQSEL0 Overtravel spec selection

P444[3rd digit]: TRQSEL1, P447[3rd digit]: TRQSEL2, P450[3rd digit]: TRQSEL3,

P453[3rd digit]: TRQSEL4, P456[3rd digit]: TRQSEL5, P459[3rd digit]: TRQSEL6,

P462[3rd digit]: TRQSEL7)

P517[3rd digit]: SEL0 Overtravel spec selection

P524[3rd digit]: SEL1, P531[3rd digit]: SEL2, P538[3rd digit]: SEL3,

P545[3rd digit]: SEL4, P552[3rd digit]: SEL5, P559[3rd digit]: SEL6,

P566[3rd digit]: SEL7

P635[5th - 2nd digits]: Soft OT signal braking stoppage deceleration time

P635[8th - 6th digits]: Soft OT condition holding time

#### g. Output signal status

## FL.F3.4 Mode switching status change warning

a. Description

The mode switch is operated during device operation.

- b. Causes and measures
  - The mode switch is operated during device operation It cannot be changed during operation. Return the mode switch to the setting it had when the device started. To change it, make sure that the device is not in operation.
- c. Operation at an error

Continue current operation

d. Release method

Return the mode switch setting to that at the start of the device.

e. Related display

\_

**f.** Related parameter

\_

g. Output signal status

ALM: ● /WNG: O /RDY: - /ZRDY: - /BRK: -

# FL.F3.5 SSCNETIII(/H) control axis number setting switch status change warning

a. Description

The axis number setting switch is operated during device operation.

- b. Causes and measures
  - An attempt was made to change the axis number during device operation.
     It cannot be changed during operation. Return the axis number setting switch to the setting it had when the device started. To change it, make sure that the device is not in operation.
- c. Operation at an error

Continue current operation

d. Release method

Return the axis number setting switch to the setting it had when the device started.

e. Related display

\_

f. Related parameter

-

g. Output signal status

Chapter 8 Protective function > 8-2 Error code specifications

# Chapter 9 Parameters

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# 9-1 Parameter group list

They are grouped according to parameter number.

\* The numerical value following the P in "Parameter range" is a parameter number.

Parameter		Parameter group name						
group	Parameter range	Classification in the parameter group						
0	Motor- and encode	r-related parameters						
	P000 -	Motor parameters						
	P060 -	Encoder and magnetic pole parameters						
	P080 -	Motor characteristic change parameters						
	* P000 - P079 ca selection" of VP	n be automatically set with the "control device and motor PH DES.						
1	Device- and machi	ne specification-related parameters						
	P100 -	Device specification parameters						
	P120 -	Error specification parameters						
	P140 -	Pulse output parameters						
	P150 -	Reserved						
	P160 -	Unit and coordinate parameters						
2, 3	Servo adjustment-r	related parameters						
	P200 -	Gain-related parameters						
	P210 -	Gain No. 0 parameters						
	P240 -	Gain No. 1 parameters						
	P270 -	Gain No. 2 parameters						
	P300 -	Gain No. 3 parameters						
	P330 -	Common filter parameters						
	P380 -	Automatic magnetic pole detection adjustment parameters						
4, 5	Command-related	•						
7, 0	P400 -	Speed command parameters						
	P434 -	Torque command parameters						
	P515 -	Built-in command parameters						
	P573 -	Jog and zero point return command parameters						
6		d input and output-related parameters						
O	P600 -	Front panel- and self-diagnosis-related parameters						
	P620 -	Input and output signal parameters						
7	Communication-rel	1 2 1						
1	Communication-rei	USB communication, general-purpose communication,						
	P700 -	and field net parameters						
8	Network-related pa	rameters						
	P800 -	Network parameters						
9	Dedicated & specia	al specification-related parameters						
	P900 -	Special spec parameters						

## 9-2 Parameter list

## 9-2-1 Parameter list configuration

Each of the items in the parameter list is described below.

#### a. No.

Shows the number of the parameter.

#### b. Target digit

If a single parameter No. has multiple functions, shows the target digit(s).

#### c. Parameter name

Shows the name of the parameter.

#### d. Activating timing

Shows the timing with which the setting becomes effective if the parameter is changed.

- I: Real-time
- R: Reset or power ON
- P: Power ON
- E: When the command is executed or the power is turned off, then on again In the communication mode, the reset function is not available. Thus, after changing any parameter to be reflected after a reset, turn the power off, then on again.
- \* If a parameter to be reflected in real-time is changed during motor operation, vibration, sudden starting, sudden stopping, and so on may occur. Confirm safety before changing it.

#### e. Edit type

Shows the type of parameter edit method.

- Blank:Editing with numeric value input
- r: Editing with numeric value input or real-time editing
- S: Editing enabled only if [P000] is set to "19999 (special motor)"
  - \* For a parameter of this type, set the value presented from the manufacturer.
- H: Display enabled only if [P000] is set to "19999 (special motor)"
  - \* Editing is always disabled.

#### f. Level

Shows whether the motor can be operated with the initial value.

- F: Can be run with the initial value.
- S: Setting required.

#### g. Effective run mode

Shows the run mode in which the parameter is effective.

- Communication: At communication mode
- Maintenance: At maintenance mode

## 9-2-2 Motor- and encoder-related parameters (group 0)

Run mode O: Effective, -: Ineffective

	Target		Activating	Edit		Run m	node
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P000		Motor Identification code	Р		F	0	0
P006		Driver combination rated output	Р	Н	F	0	0
P007		Driver combination power voltage	Р	Н	F	0	0
P008	1	Driver combination main power supply single phase / 3 phase	Р	S	F	0	0
	2	Driver combination main power supply AC /DC power source	Р	S	F	0	0
P009	3 - 1	Driver combination revision	Р	S	F	0	0
	7 - 4	Driver combination special spec code	Р	S	F	0	0
P010	1	Motor type identification	Р	S	F	0	0
	2	Main power supply type for the driver to match with motor	Р	S	F	0	0
P011		Motor rated output	Р	S	F	0	0
P012		Motor rated current	Р	S	F	0	0
P013		Motor momentary max current	Р	S	F	0	0
P014		Motor rated speed	Р	Н	F	0	0
P015		Motor torque/thrust constant	Р	S	F	0	0
P016		Number of motor poles	Р	S	F	0	0
P017		Distance between motor pole opposite	Р	S	F	0	0
P018		Motor phase resistance	Р	S	F	0	0
P019		Motor phase inductance (Lq)	Р	S	F	0	0
P020		Motor phase inductance (Ld)	Р	S	F	0	0
P021		Current cut off frequency	Р	S	F	0	0
P028	3 - 1	Phase control division ratio	Р	S	F	0	0
PU20	6 - 4	Phase control integrated limit value	Р	S	F	0	0
P029		Rotor inertia	Ĺ	S	F	0	0
P030	3 - 1	Motor electronic thermal detection actual value	I	S	F	0	0
	7 - 4	Motor electronic thermal detection time	I	S	F	0	0
P031	3 - 1	Motor 1 phase concentration electronic thermal detection ratio	I	S	F	0	0
	5 - 4	Motor 1 phase concentration electronic thermal detection motion range	I	S	F	0	0
	7 - 6	Motor 1 phase concentration electronic thermal detection low speed range	I	S	F	0	0
P032	3 - 1	Dead time compensation factor	Р	S	F	0	0
	6 - 4	Dead time compensation low current control range	Р	S	F	0	0

No.	Target	Parameter name	Activating	Edit	Level	Run m	ode
INO.	digit	raiailletei liaille	timing	type	Level	Communication	Maintenance
P033		Dead time compensation invalid speed	Р	S	F	0	0
P034	3 - 1	Current command variation limit value	Р	S	F	0	0
	6 - 4	Voltage output limit value	Р	S	F	0	0
	9 - 7	Current loop integral stop voltage	Р	S	F	0	0
P035	3 - 1	Induced electromotive force compensation rate	Р	S	F	0	0
P036	3 - 1	Incoherence compensation ratio	Р	S	F	0	0
P037	3 - 1	Torque electric angle position phase correction angle	Р	S	F	0	0
	6 - 4	Torque electric angle position phase correction start speed	Р	S	F	0	0
	9 - 7	Torque electric angle position phase correction complete speed	Р	S	F	0	0
P038	3 - 1	Speed electric angle phase correction angle	Р	S	F	0	0
	6 - 4	Speed electric angle phase correction starting speed	Р	S	F	0	0
	9 - 7	Speed electric angle phase correction complete speed	Р	S	F	0	0
P039	3 - 1	d axis current ratio	Р	S	F	0	0
	6 - 4	d axis current start speed	Р	S	F	0	0
	9 - 7	d axis current complete speed	Р	S	F	0	0
P040	3 - 1	1st torque correction value	Р	S	F	0	0
	6 - 4	1st torque correction value start speed	Р	S	F	0	0
	9 - 7	1st torque correction value complete speed	Р	S	F	0	0
P041	3 - 1	2nd torque correction value	Р	S	F	0	0
	6 - 4	2nd torque correction value start speed	Р	S	F	0	0
	9 - 7	2nd torque correction value complete speed	Р	S	F	0	0
P042	3 - 1	Torque correction ratio for 6th harmonic	_	S	F	0	0
	6 - 4	Torque correction shift electric angle for 6th harmonic	I	S	F	0	0
P043	3 - 1	Reserved					
	6 - 4	PWM drive circuit fully charged waiting time	Р	S	F	0	0
	8 - 7	PWM drive circuit charging time	Р	S	F	0	0
P044	1	Field weakening control selection	Р	S	F	0	0
	4 - 2	Field weakening start speed	Р	S	F	0	0
	7 - 5	d-axis max current	Р	S	F	0	0
P045	2 - 1	Motor power cable disconnection detection time	Р	S	F	0	0

	Target		Activating	Edit		Run m	ode
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P046		Motor NT characteristic max speed	Р	S	F	0	0
P047	3 - 1	Motor NT characteristic max speed at rated current	Р	S	F	0	0
	6 - 4	Motor NT characteristic max speed at momentary max current	Р	S	F	0	0
P048	3 - 1	Rated current decay start speed	Р	S	F	0	0
	6 - 4	Instantaneous max current decay start speed	Р	S	F	0	0
P060		Encoder type	Р	Η	S	0	0
P061		Number of encoder pulses of rotary type motor	Р	Н	S	0	0
P062		Scale resolution	Р	S	F	0	0
P063		Scale pitch distance	Р	S	F	0	0
P064		Number of pulses per scale pitch	Р	S	F	0	0
P066		Encoder input direction switching	Р	S	F	0	0
P067		Max speed of motor	Р	Н	F	0	0
P068		Magnetic pole sensor type	Р	S	S	0	0
P069		Magnetic pole position offset	Р	S	F	0	0
P070		Encoder wire breakage detection filter selection	Р	S	F	0	0
P071	2 - 1	1 rotation position detection speed error detection speed	Р	S	F	0	0
	3	Feedback smooth	Р	S	F	0	0
P072	1	Manufacturer exclusive use	Р	S	F	0	0
	3 - 2	Manufacturer exclusive use	Р	S	F	0	0
P080		Max torque limit value +	I		F	0	0
P081		Max torque limit value -	I		F	0	0
P082		Motor max speed special setting	Р		F	0	0
P083	3 - 1	Motor electronic thermal detection actual value	I		F	0	0
	7 - 4	Motor electronic thermal time constant	I		F	0	0
P084	3 - 1	Motor 1 phase concentration electronic thermal detection ratio	I		F	0	0
	5 - 4	Motor 1 phase concentration electronic thermal detection motion range	I		F	0	0
	7 - 6	Motor 1 phase concentration electronic thermal detection low speed range	I		F	0	0
P085	3 - 1	Regenerative resistor	I		F	0	0
	9 - 4	Regenerative resistor capacity	I		F	0	0
P086	3 - 1	Regenerative resistor overload detection ratio	I		F	0	0
	9 - 4	Regenerative resistor load time constant	I		F	0	0

No.	Target	Parameter name	Activating	Edit	Level	Run mode	
NO.	digit	r arameter name	timing	type		Communication	Maintenance
P087		Magnetic pole position offset special setting	Р		F	0	0
P088	1	ABS encoder data use range selection	Р		F	0	0
	2	ABS encoder overflow error detection selection	Р		F	0	0
P089	2 - 1	1 rotation position detection speed error detection speed special setting	Р		F	0	0
	3	Feedback smooth special setting	Р		F	0	0
P090	1	Manufacturer exclusive use	Р		F	0	0
P091	2 - 1	Encoder power supply OFF retention extension time	Р		F	0	0
1 091	4 - 3	Encoder power supply ON communication waiting time	Р		F	0	0

# 9-2-3 Device- and machine specification-related parameters (group 1)

Run mode O: Effective, -: Ineffective

No.	Target	Parameter name	Activating	Edit	Level	Run mode	
INO.	digit	Farameter name	timing	type	Level	Communication	Maintenance
P100		Carrier frequency setting	Р		F	0	0
P103	1	Dynamic brake spec selection	I		F	0	0
	3 - 2	Servo On delay time after dynamic brake is off	I		F	0	0
P104		Absolute position compensation action entry	Р		F	0	0
P120		Servo control error detection dead band torque	I		F	0	0
P121	1	Main power OFF error detection spec selection	I		F	0	0
	4 - 2	Main power OFF error detection time	I		F	0	0
P122	2 - 1	Main power supply voltage drop detection value	I		F	0	0
	6 - 3	Reserved					
	9 - 7	Main power supply torque drop limit Fluctuation changing time	I		F	0	0
P123	6 - 1	Reserved					
	9 - 7	Main power supply drop toque limit value	I		F	0	0
P124	1	Main power supply undervoltage error spec selection	I		F	0	0
	5 - 2	Detection allowed time for main power supply undervoltage error	I		F	0	0

	Target	5 .	Activating	Edit		Run m	node
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P126	1	Overload abnormal motion selection	I		F	0	0
	4 - 2	Overload abnormal deceleration torque limit value	I		F	0	0
P127	1	Over speed error spec selection	I		F	0	0
	4 - 2	Over speed error detection speed	I		F	0	0
P129	1	Motor overheat detection spec selection	I		F	0	0
	4 - 2	Motor overheat detection time	I		F	0	0
P140	2 - 1	Reserved					
	3	Marker output width	I		F	0	0
P143		Marker output position	I		F	0	0
P160	1	Inertia and viscous friction range selection	I		F	0	0
P161	1	Moving direction selection	R		F	0	0
	2	Position unit selection	R		F	_	_
	3	Position decimal point unit selection	R		F	_	_
P164		Mechanical movement	R		F	0	0
P165		Rotation position range	R		F	0	0
P166		Rotation position range sign switching position	R		F	0	0
P167	5 - 1	ABS multi turn limit	I		F	0	0
P168		ABS standard data	E		F	0	0
P169		ABS standard mechanical position	Е		F	0	0
P170	1	Present position reflection selection after main power of ABS is ON	Р		F	0	0
P171		Forward direction software OT limit	I		F	_	0
P172		Reverse direction software OT limit	I		F	_	0
P173		Max travel amount for forward direction positioning	I		F	_	0
P174		Max travel amount for reverse direction positioning	I		F	_	0
P175		Position deviation exorbitance detection pulse at Servo OFF → Servo ON	I		F	0	0
P176		Position deviation exorbitance detection pulse Max value	I		F	0	0
P177		Position deviation exorbitance detection pulse Min value	I		F	0	0
P178		Position deviation exorbitance detection ratio	I		F	0	0
P179		S-curve time 2	R		F	0	0

# 9-2-4 Servo adjustment-related parameters (groups 2 and 3)

Run mode  $\,\,$  O : Effective,  $\,-$  : Ineffective

No.	Target	Parameter name	Activating	Edit	Lovel	Run mode		
INO.	digit	Parameter name	timing	type	Level	Communication	Maintenance	
P200	3 - 1	Speed detection filter time constant for gain switching	I		F	0	0	
	6 - 4	Position deviation detection filter time constant for gain switching	I		F	0	0	
P210		Gain No. 0 Low speed gain switching speed	I		F	0	0	
P211		Gain No. 0 Low speed gain switching deviation pulse	I		F	0	0	
P212	3 - 1	Gain No. 0 Normal speed → Low speed gain switching filter time constant	I		F	0	0	
	6 - 4	Gain No. 0 Low speed → Normal speed gain switching filter time constant	I		F	0	0	
	7	Gain No. 0 Low speed gain switching spec 1 selection	I		F	0	0	
	8	Gain No. 0 Low speed gain switching spec 2 selection	I		F	0	0	
P213	4 - 1	Gain No. 0 Low speed gain switching delay time	I		F	0	0	
	9 - 5	Gain No. 0 Low speed gain holding time after switching	I		F	0	0	
P214		Gain No. 0 Speed loop proportional gain	I	r	F	0	0	
P215		Gain No. 0 Speed loop integral time constant	I	r	F	0	0	
P216		Gain No. 0 Speed loop derivative time constant	I	r	F	0	0	
P217		Gain No. 0 Speed loop proportional gain distribution factor	I	r	F	0	0	
P218		Gain No. 0 Speed loop derivative gain distribution factor	I	r	F	0	0	
P219		Gain No. 0 Low speed loop proportional gain	I	r	F	0	0	
P220		Gain No. 0 Low speed loop integral time constant	I	r	F	0	0	
P221		Gain No. 0 Low speed loop derivative time constant	I	r	F	0	0	
P222		Gain No. 0 Low speed loop proportional gain distribution factor	I	r	F	0	0	
P223		Gain No. 0 Low speed loop derivative gain distribution factor	I	r	F	0	0	
P224		Gain No. 0 Speed loop integral torque limit value	I	r	F	0	0	

NI.	Target	Developer	Activating	Edit	Lavel	Run mode		
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance	
P225		Gain No. 0 Position loop gain	I	r	F	0	0	
P226		Gain No. 0 Low speed position loop gain	I	r	F	0	0	
P227	4 - 1	Gain No. 0 Position loop derivative time constant	I		F	0	0	
	8 - 5	Gain No. 0 Low speed position loop derivative time constant	I		F	0	0	
P228	4 - 1	Reserved						
	6 - 5	Gain No. 0 Positioning command delay time	I		F	0	0	
P229	4 - 1	Gain No. 0 Speed feed forward ratio	I		F	0	0	
	8 - 5	Gain No. 0 Speed feed forward shift ratio	I		F	0	0	
P230		Gain No. 0 speed feed forward filter time constant	I		F	0	0	
P231		Gain No. 0 Inertia	I		F	0	0	
P232		Gain No. 0 Viscous friction	I		F	0	0	
P233	4 - 1	Gain No. 0 Inertia feed forward ratio	I		F	0	0	
	8 - 5	Gain No. 0 Viscous friction feed forward ratio	I		F	0	0	
P234		Gain No. 0 Torque feed forward filter time constant	I		F	0	0	
P235	3 - 1	Gain No. 0 Filter derivative coefficient while stopping	I		F	0	0	
	6 - 4	Gain No. 0 Filter time constant while stopping	I		F	0	0	
P236	4 - 1	Gain No. 0 Notch filter center frequency	I		F	0	0	
	7 - 5	Gain No. 0 Notch filter band width ratio	I		F	0	0	
	9 - 8	Gain No. 0 Notch filter depth	I		F	0	0	
P240		Gain No. 1 Low speed gain switching speed	I		F	0	0	
P241		Gain No. 1 Low speed gain switching deviation pulse	I		F	0	0	
P242	3 - 1	Gain No. 1 Normal speed → Low speed gain switching filter time constant	I		F	0	0	
	6 - 4	Gain No. 1 Low speed → Normal speed gain switching filter time constant	I		F	0	0	
	7	Gain No. 1 Low speed gain switching spec 1 selection	I		F	0	0	
	8	Gain No. 1 Low speed gain switching spec 2 selection	I		F	0	0	

No.	Target	Parameter name	Activating	Edit	Level	Run m	node
140.	digit		timing	type	Level	Communication	Maintenance
P243	4 - 1	Gain No. 1 Low speed gain switching delay time	I		F	0	0
	9 - 5	Gain No. 1 Low speed gain holding time after switching	I		F	0	0
P244		Gain No. 1 Speed loop proportional gain	I	r	F	0	0
P245		Gain No. 1 Speed loop integral time constant	I	r	F	0	0
P246		Gain No. 1 Speed loop derivative time constant	I	r	F	0	0
P247		Gain No. 1 Speed loop proportional gain distribution factor	I	r	F	0	0
P248		Gain No. 1 Speed loop derivative gain distribution factor	I	r	F	0	0
P249		Gain No. 1 Low speed loop proportional gain	I	r	F	0	0
P250		Gain No. 1 Low speed loop integral time constant	I	r	F	0	0
P251		Gain No. 1 Low speed loop derivative time constant	I	r	F	0	0
P252		Gain No. 1 Low speed loop proportional gain distribution factor	I	r	F	0	0
P253		Gain No. 1 Low speed loop derivative gain distribution factor	I	r	F	0	0
P254		Gain No. 1 Speed loop integral torque limit value	I	r	F	0	0
P255		Gain No. 1 Position loop gain	I	r	F	0	0
P256		Gain No. 1 Low speed position loop gain	I	r	F	0	0
P257	4 - 1	Gain No. 1 Position loop derivative time constant	I		F	0	0
	8 - 5	Gain No. 1 Low speed position loop derivative time constant	I		F	0	0
P258	4 - 1	Reserved					
	6 - 5	Gain No. 1 Positioning command delay time	I		F	0	0
P259	4 - 1	Gain No. 1 Speed feed forward ratio	I		F	0	0
	8 - 5	Gain No. 1 speed feed forward shift ratio	I		F	0	0
P260		Gain No. 1 Speed feed forward filter time constant	I		F	0	0
P261		Gain No. 1 Inertia	I		F	0	0
P262		Gain No. 1 Viscous friction	I		F	0	0
P263	4 - 1	Gain No. 1 Inertia feed forward ratio	I		F	0	0
	8 - 5	Gain No. 1 Viscous friction feed forward ratio	I		F	0	0

No.	Target digit	Parameter name	Activating timing	Edit type	Level	Run m	
P264		Gain No. 1 Torque feed forward filter time constant	ı		F	0	0
P265	3 - 1	Gain No. 1 Filter derivative coefficient while stopping	I		F	0	0
	6 - 4	Gain No. 1 Filter time constant while stopping	I		F	0	0
P266	4 - 1	Gain No. 1 Notch filter center frequency	I		F	0	0
	7 - 5	Gain No. 1 Notch filter band width ratio	I		F	0	0
	9 - 8	Gain No. 1 Notch filter depth	ļ		F	0	0
P270		Gain No. 2 Low speed gain switching speed	I		F	0	0
P271		Gain No. 2 Low speed gain switching deviation pulse	I		F	0	0
P272	3 - 1	Gain No. 2 Normal speed → Low speed gain switching filter time constant	I		F	0	0
	6 - 4	Gain No. 2 Low speed → Normal speed gain switching filter time constant	I		F	0	0
	7	Gain No. 2 Low speed gain switching spec 1 selection	I		F	0	0
	8	Gain No. 2 Low speed gain switching spec 2 selection	I		F	0	0
P273	4 - 1	Gain No. 2 Low speed gain switching delay time	I		F	0	0
	9 - 5	Gain No. 2 Low speed gain holding time after switching	I		F	0	0
P274		Gain No. 2 Speed loop proportional gain	I	r	F	0	0
P275		Gain No. 2 Speed loop integral time constant	I	r	F	0	0
P276		Gain No. 2 Speed loop derivative time constant	I	r	F	0	0
P277		Gain No. 2 Speed loop proportional gain distribution factor	1	r	F	0	0
P278		Gain No. 2 Speed loop derivative gain distribution factor	I	r	F	0	0
P279		Gain No. 2 Low speed loop proportional gain	I	r	F	0	0
P280		Gain No. 2 Low speed loop integral time constant	I	r	F	0	0
P281		Gain No. 2 Low speed loop derivative time constant	I	r	F	0	0
P282		Gain No. 2 Low speed loop proportional gain distribution factor	I	r	F	0	0

No.	Target digit	Darameter name	Activating	Edit	Lovel	Run mode	
NO.		Parameter name	timing	type	Level	Communication	Maintenance
P283		Gain No. 2 Low speed loop derivative gain distribution factor	I	r	F	0	0
P284		Gain No. 2 Speed loop integral torque limit value	I	r	F	0	0
P285		Gain No. 2 Position loop gain	I	r	F	0	0
P286		Gain No. 2 Low speed position loop gain	I	r	F	0	0
P287	4 - 1	Gain No. 2 Position loop derivative time constant	I		F	0	0
	8 - 5	Gain No. 2 Low speed position loop derivative time constant	I		F	0	0
P288	4 - 1	Reserved					
	6 - 5	Gain No. 2 Positioning command delay time	I		F	0	0
P289	4 - 1	Gain No. 2 Speed feed forward ratio	I		F	0	0
	8 - 5	Gain No. 2 Speed feed forward filter time constant	I		F	0	0
P290		Gain No. 2 Speed feed forward filter time constant	I		F	0	0
P291		Gain No. 2 Inertia	I		F	0	0
P292		Gain No. 2 Viscous friction	I		F	0	0
P293	4 - 1	Gain No. 2 Inertia feed forward ratio	I		F	0	0
	8 - 5	Gain No. 2 Viscous friction feed forward ratio	I		F	0	0
P294		Gain No. 2 Torque feed forward filter time constant	I		F	0	0
P295	3 - 1	Gain No. 2 Filter derivative coefficient while stopping	I		F	0	0
	6 - 4	Gain No. 2 Filter time constant while stopping	I		F	0	0
P296	4 - 1	Gain No. 2 Notch filter center frequency	I		F	0	0
	7 - 5	Gain No. 2 Notch filter band width ratio	I		F	0	0
	9 - 8	Gain No. 2 Notch filter depth	I		F	0	0
P300		Gain No. 3 Low speed gain switching speed	I		F	0	0
P301		Gain No. 3 Low speed gain switching deviation pulse	I		F	0	0

No.	Target	Parameter name	Activating	Edit	Level	Run mode	
INO.	digit	Parameter name	timing type	Level	Communication	Maintenance	
P302	3 - 1	Gain No. 3 Normal speed → Low speed gain switching filter time constant	I		F	0	0
	6 - 4	Gain No. 3 Low speed → Normal speed gain switching filter time constant	I		F	0	0
	7	Gain No. 3 Low speed gain switching spec 1 selection	I		F	0	0
	8	Gain No. 3 Low speed gain switching spec 2 selection	I		F	0	0
P303	4 - 1	Gain No. 3 Low speed gain switching delay time	I		F	0	0
	9 - 5	Gain No. 3 Low speed gain holding time after switching	I		F	0	0
P304		Gain No. 3 Speed loop proportional gain	I	r	F	0	0
P305		Gain No. 3 Speed loop integral time constant	I	r	F	0	0
P306		Gain No. 3 Speed loop derivative time constant	I	r	F	0	0
P307		Gain No. 3 Speed loop proportional gain distribution factor	I	r	F	0	0
P308		Gain No. 3 Speed loop derivative gain distribution factor	I	r	F	0	0
P309		Gain No. 3 Low speed loop proportional gain	I	r	F	0	0
P310		Gain No. 3 Low speed loop integral time constant	I	r	F	0	0
P311		Gain No. 3 Low speed loop derivative time constant	I	r	F	0	0
P312		Gain No. 3 Low speed loop proportional gain distribution factor	I	r	F	0	0
P313		Gain No. 3 Low speed loop derivative gain distribution factor	I	r	F	0	0
P314		Gain No. 3 Speed loop integral torque limit value	I	r	F	0	0
P315		Gain No. 3 Position loop gain	I	r	F	0	0
P316		Gain No. 3 Low speed position loop gain	I	r	F	0	0
P317	4 - 1	Gain No. 3 Position loop derivative time constant	I		F	0	0
	8 - 5	Gain No. 3 Low speed position loop derivative time constant	I		F	0	0
P318	4 - 1 6 - 5	Reserved Gain No. 3 Positioning command delay time	I		F	0	0

	Target digit	Parameter name	Activating Ed	Edit		Run mode		
No.			timing	type	Level	Communication	Maintenance	
P319	4 - 1	Gain No. 3 Speed feed forward ratio	I		F	0	0	
	8 - 5	Gain No. 3 Speed feed forward shift ratio	I		F	0	0	
P320		Gain No. 3 Speed feed forward filter time constant	I		F	0	0	
P321		Gain No. 3 Inertia	I		F	0	0	
P322		Gain No. 3 Viscous friction	I		F	0	0	
P323	4 - 1	Gain No. 3 Inertia feed forward ratio	I		F	0	0	
	8 - 5	Gain No. 3 Viscous friction feed forward ratio	I		F	0	0	
P324		Gain No. 3 Torque feed forward filter time constant	I		F	0	0	
P325	3 - 1	Gain No. 3 Filter derivative coefficient while stopping	I		F	0	0	
	6 - 4	Gain No. 3 Filter time constant while stopping	I		F	0	0	
P326	4 - 1	Gain No. 3 Notch filter center frequency	I		F	0	0	
	7 - 5	Gain No. 3 Notch filter band width ratio	I		F	0	0	
	9 - 8	Gain No. 3 Notch filter depth	I		F	0	0	
P330	1	Torque command filter order selection	I		F	0	0	
	5 - 2	Torque command filter frequency	I		F	0	0	
P331	4 - 1	Notch filter center frequency 1	I		F	0	0	
	7 - 5	Notch filter band width ratio 1	I		F	0	0	
	9 - 8	Notch filter depth 1	I		F	0	0	
P332	4 - 1	Notch filter center frequency 2	I		F	0	0	
	7 - 5	Notch filter band width ratio 2	I		F	0	0	
	9 - 8	Notch filter depth 2	I		F	0	0	
P333	4 - 1	Notch filter center frequency 3	I		F	0	0	
	7 - 5	Notch filter band width ratio 3	I		F	0	0	
	9 - 8	Notch filter depth 3	I		F	0	0	
P334	4 - 1	Notch filter center frequency 4	I		F	0	0	
	7 - 5	Notch filter band width ratio 4	I		F	0	0	
	9 - 8	Notch filter depth 4	I		F	0	0	
P340		Vibration control filter ineffective speed range	I		F	0	0	
P341	4 - 1	Vibration control filter center frequency	I		F	0	0	
	7 - 5	Vibration control filter band width ratio	I		F	0	0	
	9 - 8	Vibration control filter depth	I		F	0	0	
P342	1	Feedback filter order selection	I		F	0	0	
	5 - 2	Feedback filter frequency	I		F	0	0	
P348	3 - 1	Vibration control model gain	I		F	0	0	
	6 - 4	Vibration control damping gain	I		F	0	0	

No.	Target digit	Parameter name	Activating	Edit	Level	Run mode	
INO.			timing	type	Levei	Communication	Maintenance
P349	1	Vibration control order selection	I		F	0	0
	5 - 2	Vibration control lower limit frequency	I		F	0	0
	9 - 6	Vibration control higher limit frequency	I		F	0	0
P380		Magnetic pole detection torque limit value	I		F	0	0
P381		Magnetic pole detection gain 1	I		F	0	0
P382		Magnetic pole detection integration time constant	I		F	0	0
P383		Magnetic pole detection gain 2	I		F	0	0
P384		Magnetic pole detection complete range	I		F	0	0
P385	1	Magnetic pole detection filter order selection	I		F	0	0
	5 - 2	Magnetic pole detection filter frequency	I		F	0	0
P386	3 - 1	Landing torque	I		F	0	0
	7 - 4	Landing torque holding time	I		F	0	0
P387	3 - 1	Magnetic pole detection torque minimum value (second and subsequent sessions)	I		F	0	0
	4	Magnetic pole detection torque attenuation pattern selection	I		F	0	0

# 9-2-5 Command-related parameters (groups 4 and 5)

Run mode O: Effective, -: Ineffective

No.	Target digit	Parameter name	Activating	Edit	Level	Run mode	
			timing	type	Level	Communication	Maintenance
P404		Speed command acceleration standard time	I		F	_	0
P405		Speed command deceleration standard time	I		F	_	0
P408		Internal speed command acceleration standard time	I		F	_	0
P409		Internal speed command deceleration standard time	I		F	_	0
P410	1	SPD SEL 0 Speed command value spec selection	I		F	_	0
	2	SPD SEL 0 Gain No. selection	I		F	_	0
	3	SPD SEL 0 Overtravel spec selection	I		F	_	0
P411		SPD SEL 0 Speed command value	I		F	_	0
P412		SPD SEL 0 Torque limit value	I		F	_	0

	Target digit	Parameter name	Activating	Edit	Level	Run mode	
No.			timing	type		Communication	
D440	4	SPD SEL 1 Speed command value					_
P413	1	spec selection	I		F	_	0
	2	SPD SEL 1 Gain No. selection	I		F	_	0
	3	SPD SEL 1 Overtravel spec selection	I		F	_	0
P414		SPD SEL 1 Speed command value	I		F	_	0
P415		SPD SEL 1 Torque limit value	I		F	_	0
P416	1	SPD SEL 2 Speed command value	ı		F	_	0
1 410	'	spec selection	•		'	_	U
	2	SPD SEL 2 Gain No. selection	I		F	_	0
	3	SPD SEL 2 Overtravel spec selection	I		F	_	0
P417		SPD SEL 2 Speed command value	I		F	_	0
P418		SPD SEL 2 Torque limit value	I		F	_	0
P419	1	SPD SEL 3 Speed command value	ı		F	_	0
		spec selection	'		•		0
	2	SPD SEL 3 Gain No. selection	I		F	_	0
	3	SPD SEL 3 Overtravel spec selection	I		F	_	0
P420		SPD SEL 3 Speed command value	I		F	_	0
P421		SPD SEL 3 Torque limit value	I		F	_	0
P422	1	SPD SEL 4 Speed command value	ı		F	_	0
'	•	spec selection	•				0
	2	SPD SEL 4 Gain No. selection	I		F	_	0
	3	SPD SEL 4 Overtravel spec selection	I		F	_	0
P423		SPD SEL 4 Speed command value	I		F	_	0
P424		SPD SEL 4 Torque limit value	I		F	_	0
P425	1	SPD SEL 5 Speed command value			F	_	0
1 120		spec selection			•		O
	2	SPD SEL 5 Gain No. selection	I		F	_	0
	3	SPD SEL 5 Overtravel spec selection	I		F	_	0
P426		SPD SEL 5 Speed command value	I		F	_	0
P427		SPD SEL 5 Torque limit value	I		F	_	0
P428	1	SPD SEL 6 Speed command value	ı		F	_	0
1 120		spec selection			•		0
	2	SPD SEL 6 Gain No. selection	I		F	_	0
	3	SPD SEL 6 Overtravel spec selection	I		F	_	0
P429		SPD SEL 6 Speed command value	I		F	_	0
P430		SPD SEL 6 Torque limit value	I		F	_	0
P431	1	SPD SEL 7 Speed command value	I		F	_	0
		spec selection	-				0
	2	SPD SEL 7 Gain No. selection	I		F	_	0
	3	SPD SEL 7 Overtravel spec selection	I		F	_	0
P432		SPD SEL 7 Speed command value	I		F	_	0
P433		SPD SEL 7 Torque limit value	I		F	_	0
P439		Internal torque command Increase/ Decrease change time	I		F	_	0
P440		Speed limit value at torque command mode	I		F	_	0

	Target		Activating	Edit		Run m	node
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P441	1	TRQ SEL 0 Torque command value	ı		F		0
1 441	'	spec selection				_	O
	2	TRQ SEL 0 Gain No. selection	l		F	_	0
	3	TRQ SEL 0 Overtravel spec selection	I		F	_	0
P442		TRQ SEL 0 Torque command value	I		F	_	0
P443		TRQ SEL 0 Speed limit value	I		F	_	0
P444	1	TRQ SEL 1 Torque command value	ı		F	_	0
1 444	!	spec selection			Į.	_	O
	2	TRQ SEL 1 Gain No. selection	l		F	_	0
	3	TRQ SEL 1 Overtravel spec selection	I		F	_	0
P445		TRQ SEL 1 Torque command value	I		F	_	0
P446		TRQ SEL 1 Speed limit value	I		F	_	0
P447	1	TRQ SEL 2 Torque command value	ı		F		0
	'	spec selection	'		_	0	
	2	TRQ SEL 2 Gain No. selection	I		F	_	0
	3	TRQ SEL 2 Overtravel spec selection	I		F	_	0
P448		TRQ SEL 2 Torque command value	I		F	_	0
P449		TRQ SEL 2 Speed limit value	I		F	_	0
P450	1	TRQ SEL 3 Torque command value	I F –		0		
P430		spec selection			Г	_	0
	2	TRQ SEL 3 Gain No. selection	I		F	_	0
	3	TRQ SEL 3 Overtravel spec selection	I		F	_	0
P451		TRQ SEL 3 Torque command value	I		F	_	0
P452		TRQ SEL 3 Speed limit value	I		F	_	0
DAES	4	TRQ SEL 4 Torque command value	ı		F		0
P453	1	spec selection			Г	_	0
	2	TRQ SEL 4 Gain No. selection	I		F	_	0
	3	TRQ SEL 4 Overtravel spec selection	I		F	_	0
P454		TRQ SEL 4 Torque command value	I		F	_	0
P455		TRQ SEL 4 Speed limit value	I		F	_	0
P456	4	TRQ SEL 5 Torque command value	ı		F		0
P456	1	spec selection	l		Г	_	0
	2	TRQ SEL 5 Gain No. selection	I		F	_	0
	3	TRQ SEL 5 Overtravel spec selection	I		F	_	0
P457		TRQ SEL 5 Torque command value	I		F	_	0
P458		TRQ SEL 5 Speed limit value	I		F	_	0
P459	1	TRQ SEL 6 Torque command value	ı		F		0
F459	1	spec selection			Г	_	0
	2	TRQ SEL 6 Gain No. selection	I		F	_	0
	3	TRQ SEL 6 Overtravel spec selection	I		F	_	0
P460		TRQ SEL 6 Torque command value	I		F	_	0
P461		TRQ SEL 6 Speed limit value	Į		F	_	0
P462	1	TRQ SEL 7 Torque command value	ı		F		^
F 40Z	Ľ	spec selection	<b>'</b>		F		0
	2	TRQ SEL 7 Gain No. selection	I		F		0
3		TRQ SEL 7 Overtravel spec selection	I		F	_	0

No	Target	Doromotor name	Activating	Edit	Lovel	Run m	node
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P463		TRQ SEL 7 Torque command value	I		F	_	0
P464		TRQ SEL 7 Speed limit value	I		F	_	0
P516	1	Positioning approval selection when homing is not completed	I		F	_	0
P517	1	SEL 0 Homing complete signal selection	I		F	_	0
	2	SEL 0 Gain No. selection	I		F	_	0
	3	SEL 0 Overtravel spec selection	I		F	_	0
P518		SEL 0 Acceleration standard speed	I		F	_	0
P519		SEL 0 Deceleration standard speed	I		F	_	0
P520		SEL 0 Acceleration time	I		F	_	0
P521		SEL 0 Deceleration time	I		F	_	0
P522		SEL 0 S-curve time 1	I		F	_	0
P523		SEL 0 Torque limit value	I		F	_	0
P524	1	SEL 1 Homing complete signal selection	I		F	_	0
	2	SEL 1 Gain No. selection	I		F	_	0
	3	SEL 1 Overtravel spec selection	I		F	_	0
P525		SEL 1 Acceleration standard speed	I		F	_	0
P526		SEL 1 Deceleration standard speed	I		F	_	0
P527		SEL 1 Acceleration time	I		F	_	0
P528		SEL 1 Deceleration time	I		F	_	0
P529		SEL 1 S-curve time 1	I		F	_	0
P530		SEL 1 Torque limit value	I		F	_	0
P531	1	SEL 2 Homing complete signal selection	I		F	_	0
	2	SEL 2 Gain No. selection	I		F	_	0
	3	SEL 2 Overtravel spec selection	I		F	_	0
P532		SEL 2 Acceleration standard speed	I		F	_	0
P533		SEL 2 Deceleration standard speed	I		F	_	0
P534		SEL 2 Acceleration time	I		F	_	0
P535		SEL 2 Deceleration time	I		F	_	0
P536		SEL 2 S-curve time 1	I		F	_	0
P537		SEL 2 Torque limit value	I		F	_	0
P538	1	SEL 3 Homing complete signal selection	I		F	_	0
	2	SEL 3 Gain No. selection	ı		F	_	0
	3	SEL 3 Overtravel spec selection	I		F	_	0
P539		SEL 3 Acceleration standard speed	I		F	_	0
P540		SEL 3 Deceleration standard speed	I		F	_	0
P541		SEL 3 Acceleration time	I	F –		0	
P542		SEL 3 Deceleration time	I	F _		0	
P543		SEL 3 S-curve time 1	I			0	
P544		SEL 3 Torque limit value	I		F	_	0

	Target		Activating	Edit		Run mode	
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
DE 45		SEL 4 Homing complete signal	1		F		
P545	1	selection	I		F	_	0
	2	SEL 4 Gain No. selection	I		F	_	0
	3	SEL 4 Overtravel spec selection	I		F	_	0
P546		SEL 4 Acceleration standard speed	I		F	_	0
P547		SEL 4 Deceleration standard speed	I		F	_	0
P548		SEL 4 Acceleration time	l		F	_	0
P549 P550		SEL 4 Deceleration time SEL 4 S-curve time 1	I		F F	_	0
P551		SEL 4 Torque limit value	!		F	_	0
F 33 1		SEL 5 Homing complete signal	'		Г	_	0
P552	1	selection	I		F	_	0
	2	SEL 5 Gain No. selection	I		F	_	0
	3	SEL 5 Overtravel spec selection	I		F	_	0
P553		SEL 5 Acceleration standard speed	I		F	_	0
P554		SEL 5 Deceleration standard speed	<u> </u>		F	_	0
P555 P556		SEL 5 Acceleration time	1		F F	_	0
P556		SEL 5 Deceleration time SEL 5 S-curve time 1	1		F	_	0
P558		SEL 5 Torque limit value	'		F	_	0
		SEL 6 Homing complete signal				_	0
P559	1	selection	I		F	_	0
	2	SEL 6 Gain No. selection	I		F	_	0
	3	SEL 6 Overtravel spec selection	I		F	_	0
P560		SEL 6 Acceleration standard speed	I		F	_	0
P561		SEL 6 Deceleration standard speed	I		F	_	0
P562		SEL 6 Acceleration time	l ·		F	_	0
P563		SEL 6 Deceleration time	<u> </u>		F	_	0
P564		SEL 6 S-curve time 1	1		F F	_	0
P565		SEL 6 Torque limit value SEL 7 Homing complete signal	I		F	_	0
P566	1	selection	I		F	_	0
	2	SEL 7 Gain No. selection	I		F	_	0
	3	SEL 7 Overtravel spec selection	I		F	_	0
P567		SEL 7 Acceleration standard speed	I		F	_	0
P568		SEL 7 Deceleration standard speed	I		F	_	0
P569		SEL 7 Acceleration time	<u> </u>		F	_	0
P570		SEL 7 Deceleration time	I		F	_	0
P571 P572		SEL 7 S-curve time 1 SEL 7 Torque limit value	I I		F F	_	0
P572		Jog speed 0	1		F	_	0
P573		Jog speed 1	1		F	_	0
P575		Jog speed 2	'		F	_	0
P576		Jog speed 3	ı		F	_	0
P577		Jog speed 4	·		F	_	0
		5 5600 .	•		•		)

No.	Target	Parameter name	Activating	Edit	Level	Run m	ode
INO.	digit	raiailletei liaille	timing	type	Level	Communication	Maintenance
P578		Jog speed 5	I		F	_	0
P579		Jog speed 6	I		F	_	0
P580		Jog speed 7	I		F	_	0
P581	1	Zero point marker selection for homing	Е		F	_	0
	2	Homing acceleration/deceleration control in reverse direction	I		F	_	0
	3	Zero point return set distance operation selection	I		F	_	0
P582		Zero point return creep speed	I		F	_	0
P583		Zero point position constant	I		F	_	0
P584		Zero point return set distance	I		F	_	0
P585		Position data standard point	I		F	_	0
P586		OT deceleration time at OT HOME	I		F	_	0

# 9-2-6 Self-diagnosis- and input and output-related parameters (group 6)

Run mode O: Effective, -: Ineffective

Nia	Target	Devementor marrie	Activating	Edit	Lavel	Run m	node
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P600	3 - 1	Status display C000 display item selection	I		F	_	0
	4	Reserved					
	5	Status display C000 display multiplier factor selection	I		F	_	0
	6	STO operation status indication selection	I		F	_	0
P601	1	Auto tuning moving direction	I		F	_	0
	4 - 2	Auto tuning test operation ratio	I		F	_	0
	7 - 5	Max torque at auto tuning	I		F	_	0
	8	Auto tuning inertia multiplying selection	I		F	_	0
P604	1	Test run starting position assignment	I		F	_	0
	2	Test run traveling direction	I		F	_	0
	3	Test run SEL selection	I		F	_	0
	9 - 4	Test run stopping time	I		F	_	0
P605		Test run starting position	I		F	_	0
P606		Test run positioning amount	I		F	_	0
P607		Test run positioning speed	1		F	_	0
P608		Test run starting position movement speed	I		F	_	0

	Target	_	Activating	Edit		Run mode	
No.	digit	Parameter name	timing	type	Level	Communication	
P620	2 - 1	Control input signal allocation 1(DI1)	I		F	_	0
	4 - 3	Control input signal allocation 1(DI2)	I		F	_	0
	6 - 5	Control input signal allocation 1(DI3)	I		F	_	0
	8 - 7	Control input signal allocation 1(DI4)	I		F	_	0
P622	2 - 1	Control output signal allocation 1(DO1)	I		F	0	0
	4 - 3	Control output signal allocation 1(DO2)	I		F	0	0
	6 - 5	Reserved					
	8 - 7	Reserved					
P623	1	Control input signal condition setting 1(RST)	I		F	0	0
	2	Control input signal condition setting 1(ARST)	I		F	0	0
	3	Control input signal condition setting 1(EMG)	I		F	0	0
	4	Control input signal condition setting 1(SON)	I		F	0	0
	5	Control input signal condition setting 1(DR)	I		F	0	0
	6	Control input signal condition setting 1(CLR)	I		F	0	0
	7	Control input signal condition setting 1(Reserved)					
	8	Control input signal condition setting 1(TL)	I		F	0	0
P624	1	Control input signal condition setting 2(FOT)	I		F	0	0
	2	Control input signal condition setting 2(ROT)	I		F	0	0
	3	Control input signal condition setting 2(MD1)	I		F	0	0
	4	Control input signal condition setting 2(MD2)	I		F	0	0
	5	Control input signal condition setting 2(GSL1)	I		F	0	0
	6	Control input signal condition setting 2(GSL2)	I		F	0	0
	7	Control input signal condition setting 2(Reserved)					
	8	Control input signal condition setting 2(RVS)	I		F	0	0

NI.	Target	Developer	Activating	Edit	Level	Run m	ode
No.	digit	Parameter name	timing	type	Level	Communication	Maintenance
P625	1	Control input signal condition setting 3(SS1)	I		F	0	0
	2	Control input signal condition setting 3(SS2)	I		F	0	0
	3	Control input signal condition setting 3(SS3)	I		F	0	0
	4	Control input signal condition setting 3(SS4)	I		F	0	0
	5	Control input signal condition setting 3(SS5)	I		F	0	0
	6	Control input signal condition setting 3(SS6)	I		F	0	0
	7	Control input signal condition setting 3(SS7)	I		F	0	0
	8	Control input signal condition setting 3(SS8)	I		F	0	0
P626	1	Control input signal condition setting 4(ZST)	I		F	0	0
	2	Control input signal condition setting 4(ZLS)	I		F	0	0
	3	Control input signal condition setting 4(ZMK)	I		F	0	0
	4	Control input signal condition setting 4(TRG)	I		F	0	0
	5	Control input signal condition setting 4(CMDZ)	I		F	0	0
	6	Control input signal condition setting 4(ZCAN)	I		F	0	0
	7	Control input signal condition setting 4(FJOG)	I		F	0	0
	8	Control input signal condition setting 4(RJOG)	I		F	0	0
P627	1	Control input signal condition setting 5(Reserved)					
	2	Control input signal condition setting 5(Reserved)					
	3	Control input signal condition setting 5(Reserved)					
	4	Control input signal condition setting 5(Reserved)					
	5	Control input signal condition setting 5(MTOH)	I		F	0	0
	6	Control input signal condition setting 5(Reserved)					
	7	Control input signal condition setting 5(Reserved)					
	8	Control input signal condition setting 5(Reserved)					

	Target	Activating Edit ,			Run m	node	
No.	digit	Parameter name	timing	type	Level	Communication	
	3	Deviation clear selection when SON	3	71		Communication	Mantenance
P631	1	signal is OFF	I		F	0	0
DCCC	4	Stopping selection when EMG signal			_		
P633	1	is ON	I		F	0	0
	5 - 2	Deceleration time after EMG signal	ı		F	0	0
		braking stoppage	·		•	0	)
	8 - 6	Servo OFF delay time after EMG	I		F	0	0
		signal braking stoppage				<u> </u>	
P634	1	Reserved					
	5 - 2	Deceleration time after OT signal	I		F	_	0
		braking stoppage					
	8 - 6	OT condition holding time	I		F	_	0
P635	1	Reserved					
	5 - 2	Soft OT braking stoppage	1		F	_	0
		deceleration time					
	8 - 6	Soft OT condition holding time	l		F	_	0
P636		TL signal torque limit value +	I		F	_	0
P637		TL signal torque limit value -	I		F	_	0
P638	3 - 1	MD signal delay time	I		F	0	0
	6 - 4	SS signal delay time	I		F	0	0
	9 - 7	ZST signal delay time	I		F	0	0
P650	1	RDY signal specifications Selection of OT ALM signal is ON	R		F	_	0
	2	RDY signal specifications Selection of motor electrification ALM signal other than OT is ON	R		F	0	0
P651		SZ signal speed range	I		F	0	0
P652		VCP signal speed deviation range	I		F	0	0
P653		PE1 signal deviation range	I		F	0	0
P654		PE1 signal delay time	I		F	0	0
P655		PE2 signal deviation range	I		F	0	0
P656		PE2 signal delay time	I		F	0	0
P657		PRF signal distance	I		F	0	0
P658	4 - 1	Brake release delay time	I		F	0	0
	8 - 5	Brake activation delay time	I		F	0	0
P659		Brake activation effective low speed	1		F		_
F 009		range	ı		Г	0	0
P660		Brake enforced activation delay time	I		F	0	0

# 9-2-7 Network-related parameters (group 8)

Run mode O: Effective, -: Ineffective

Nativating Edit , , Run n						mode	
No.	digit	Parameter name	timing	type	Level	Communication	
	9	Marker transit selection at		-71		Communication	Mantenance
P800	1	communication mode	Р		F	0	_
D004	4	NET SEL number selection at gain			_		
P801	1	switching command OFF	ı		F	0	_
	2	NET SEL number selection at gain	ı		F	0	
	_	switching command ON	' '		O	_	
P802	1	VCII communication mode selection	Р		F	0	_
		for the connection test	_			- C	
P803	1	Select load factor unit for monitoring	Р		F	0	_
P820	1	NET SEL 0 Gain No. selection	l		F	0	_
P823		NET SEL 0 S-curve time 1	I		F	0	_
P824	4 - 1	NET SEL 0 Delay compensation	I		F	0	_
	8 - 5	NET SEL 0 Lead compensation	I		F	0	_
P825		NET SEL 0 Torque limit value +	I		F	0	_
P826		NET SEL 0 Torque limit value -	I		F	0	_
P830	1	NET SEL 1 Gain No. selection	I		F	0	_
P833		NET SEL 1 S-curve time 1	I		F	0	_
P834	4 - 1	NET SEL 1 Delay compensation	I	F		0	_
	8 - 5	NET SEL 1 Lead compensation	I	I F		0	_
P835		NET SEL 1 Torque limit value +	I	F		0	_
P836		NET SEL 1 Torque limit value -	I		F	0	_
P840	1	NET SEL 2 Gain No. selection	I		F	0	_
P843		NET SEL 2 S-curve time 1	I		F	0	_
P844	4 - 1	NET SEL 2 Delay compensation	I		F	0	_
	8 - 5	NET SEL 2 Lead compensation	I		F	0	_
P845		NET SEL 2 Torque limit value +	I		F	0	_
P846		NET SEL 2 Torque limit value -	I		F	0	_
P850	1	NET SEL 3 Gain No. selection	I		F	0	_
P853		NET SEL 3 S-curve time 1	I		F	0	_
P854	4 - 1	NET SEL 3 Delay compensation	I		F	0	_
	8 - 5	NET SEL 3 Lead compensation	I		F	0	_
P855		NET SEL 3 Torque limit value +	I		F	0	_
P856		NET SEL 3 Torque limit value -	I		F	0	_
P860	1	NET SEL 4 Gain No. selection	I	I F		0	_
P863		NET SEL 4 S-curve time 1	I			0	_
P864	4 - 1	NET SEL 4 Delay compensation	I	1 1		0	_
	8 - 5	NET SEL 4 Lead compensation	I	1		0	_
P865		NET SEL 4 Torque limit value +	I	1		0	_
P866		NET SEL 4 Torque limit value -	I	1		0	_
P870	1	NET SEL 5 Gain No. selection	I	I F		0	_
P873		NET SEL 5 S-curve time 1	I		F	0	_

## Chapter 9 Parameters > 9-2 Parameter list

No.	Target	Parameter name	Activating	Edit	Level	Run m	node
INO.	digit	r arameter name	timing	type	Level	Communication	Maintenance
P874	4 - 1	NET SEL 5 Delay compensation	I		F	0	_
	8 - 5	NET SEL 5 Lead compensation	I		F	0	_
P875		NET SEL 5 Torque limit value +	I		F	0	_
P876		NET SEL 5 Torque limit value -	I		F	0	_
P880	1	NET SEL 6 Gain No. selection	I		F	0	_
P883		NET SEL 6 S-curve time 1	I		F	0	_
P884	4 - 1	NET SEL 6 Delay compensation	I		F	0	_
	8 - 5	NET SEL 6 Lead compensation	I		F	0	_
P885		NET SEL 6 Torque limit value +	I		F	0	_
P886		NET SEL 6 Torque limit value -	I		F	0	_
P890	1	NET SEL 7 Gain No. selection	I		F	0	_
P893		NET SEL 7 S-curve time 1	I		F	0	_
P894	4 - 1	NET SEL 7 Delay compensation	I		F	0	_
	8 - 5	NET SEL 7 Lead compensation	I		F	0	_
P895		NET SEL 7 Torque limit value +	I		F	0	_
P896		NET SEL 7 Torque limit value -	I		F	0	_

# 9-3 Parameter specification

The initial values of parameters are set so that the motor operates without any load (trial run). To operate by connecting to the machine system, adjust the operation speed, gain, and so on according to the load status.

#### 9-3-1 Parameter setting method

Values to input in the parameter editing window of VPH DES are of the types below.

a. Parameter setting (supported by all parameters)

An input value will directly become a setting.

[Example] If wishing to set 360 in [P411: SPDSEL0 Speed command value]

In the parameter editing window, set "360" in the P411 setting column.

**b.** Indirect data number assigned value (supported by some parameters only)

An input value will become the assigned value of the indirect data number. Set the value for the specified indirect data number.

[Example] If wishing to use indirect data IX01 to set 360 in [P411: SPDSEL0 Speed command value]

In the parameter editing window, set "-1" in the P411 setting column (specify an indirect data number as a negative value), and in the indirect data editing window, set "360" in the IX01 setting column.

#### 9-3-2 Definition of terms

The following terms, as used in this chapter, are defined as below.

Maximum speed

Usually, the rated speed in the motor specification. If a value other than "0" is set in [P082: Motor max speed special setting], the setting of [P082] is assumed to be the maximum speed.

When the special parameter is specified, the priority of settings is [P082] > [P067] > [P014]. If a value lower than the maximum speed in the specification is set in [P440: Speed limit value at torque command mode] or the speed limit value to be set for each command, it is clamped to the minimum speed that is set.

Peak torque

Usually, the peak torque value in the motor specification.

If a value lower than the peak torque value in the specification is set in [P080 (P081): Max torque limit value + (-)] or for the torque limit value to be set for each command run, the parameter value is assumed to be the peak torque value.

When the special parameter is specified, the smallest of the settings of [P013], [P080 (P081)], and the torque limit value for each command run is assumed to be the peak torque.

# 9-4 Parameter details

The following provides the details of each parameter. Each item in the parameter descriptions is as described below.

#### a. Setting item

Activating timing

Timing with which the setting becomes effective if the parameter is changed.

• Setting range

Range of values that can be set.

• Initial value

Value that is set before shipment.

#### **b.** Function

Describes the function of the parameter.

#### c. Setting selection

Describes each choice if the parameter is to be set by selecting a choice.

If the parameter is to be set by entering a value, this item does not appear or the next item, "d.Reference", is moved up.

#### d. Reference

Describes the references related to the parameter, if any.

#### 9-4-1 Motor- and encoder-related parameters (group 0)

#### P000: Motor Identification code

a. Setting item

Activating timing: Power ON

Setting range: -2147483648 to 2147483647

Initial value: 0

**b.** Function

Set the identification code of the motor used.

If a motor identification code has been registered, it will automatically be set when you select the motor from VPH DES.

\* Set the value presented from the manufacturer.

c. Setting selection

0: Motor unregistered

19999: [P006] to [P071] can be input individually with VPH DES.

## P006: Driver combination rated output

a. Setting item

Activating timing: Power ON

Setting unit: kW

Setting range: 0.000 to 9999.999

Initial value: 0.000

b. Function

Set the rated output of the servo driver used.

\* Set the value presented from the manufacturer.

## P007: Driver combination power voltage

a. Setting item

Activating timing: Power ON

Setting unit: V

Setting range: 0 to 9999

Initial value: 0

**b.** Function

Set the power supply voltage of the servo driver used.

# P008[1st digit]: Driver combination main power supply single phase / 3 phase

#### a. Setting item

Activating timing: Power ON

Setting range: 0 to 3

Initial value: 0

#### **b.** Function

Select the main power supply type of the servo driver used.

- \* Set the value presented from the manufacturer.
- c. Setting selection
  - 0: No selection
  - 1: Single phase
  - 2: 3 phase
  - 3: 3 phase power supply regeneration

# P008[2nd digit]: Driver combination main power supply AC /DC power source

#### a. Setting item

Activating timing: Power ON

Setting range: 0 to 2

Initial value: 0

#### b. Function

Select the power supply support of the servo driver used.

- \* Set the value presented from the manufacturer.
- c. Setting selection
  - 0: No selection
  - 1: AC power supply
  - 2: DC power supply

# P009[3rd - 1st digits]: Driver combination revision

#### a. Setting item

Activating timing: Power ON Setting range: 000 to 999

Initial value: 0

#### b. Function

Set the revision of the servo driver used.

### P009[7th - 4th digits]: Driver combination special spec code

a. Setting item

Activating timing: Power ON Setting range: 0000 to 9999

Initial value: 0

b. Function

Set the specification code to use if combining with a special motor and a special device.

\* Set the value presented from the manufacturer.

### P010[1st digit]: Motor type identification

a. Setting item

Activating timing: Power ON

Setting range: 0 to 5

Initial value: 0

**b.** Function

Select the type of motor used.

- \* Set the value presented from the manufacturer.
- c. Setting selection
  - 0: No selection
  - 1: TDISC
  - 2: tlinear
  - 3: Reserved
  - 4: Reserved
  - 5: Reserved

# P010[2nd digit]: Main power supply type for the driver to match with motor

a. Setting item

Activating timing: Power ON

Setting range: 0 to 4

Initial value: 0

b. Function

Select the main power supply type of the servo driver supporting the motor used.

- c. Setting selection
  - 0: No selection
  - 1: Common type
  - 2: Single phase only
  - 3: 3 phase only
  - 4: Power regeneration only

#### P011: Motor rated output

a. Setting item

Activating timing: Power ON

Setting unit: kW

Setting range: 0.001 to 9999.999

Initial value: 0.001

**b.** Function

Set the rated output of the motor used.

\* Set the value presented from the manufacturer.

#### P012: Motor rated current

a. Setting item

Activating timing: Power ON

Setting unit: A

Setting range: 0.000 to 99999.999

Initial value: 0.000

b. Function

Set the rated current of the motor used.

\* Set the value presented from the manufacturer.

## P013: Motor momentary max current

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 100 to 799

Initial value: 100

**b**. Function

Set the momental maximum current ratio of the motor used.

\* Set the value presented from the manufacturer.

# P014: Motor rated speed

a. Setting item

Activating timing: Power ON

Setting unit: rpm

Setting range: 0.001 to 99999.999

Initial value: 0.001

**b.** Function

Set the rated speed of the motor used.

If [P067] or [P082] is not set, this setting will be the Maximum speed.

### P015: Motor torque/thrust constant

a. Setting item

Activating timing: Power ON

Setting unit: N•m/A

Setting range: 0.0001 to 99999.9999

Initial value: 0.0001

**b.** Function

Set the torque constant or force constant of the motor used.

\* Set the value presented from the manufacturer.

## P016: Number of motor poles

a. Setting item

Activating timing: Power ON

Setting unit: Poles

Setting range: 2 to 10000

Initial value: 2

b. Function

Set the number of poles of the motor used.

\* Set the value presented from the manufacturer.

## P017: Distance between motor pole opposite

a. Setting item

Activating timing: Power ON

Setting unit: mm

Setting range: 0.001 to 999.999

Initial value: 0.001

b. Function

Set the distance between motor pole opposites of the motor used.

\* Set the value presented from the manufacturer.

# P018: Motor phase resistance

a. Setting item

Activating timing: Power ON

Setting unit:  $m\Omega$ 

Setting range: 0.001 to 99999.999

Initial value: 0.001

b. Function

Set the phase resistance value of the motor used.

## P019: Motor phase inductance (Lq)

a. Setting item

Activating timing: Power ON

Setting unit: mH

Setting range: 0.001 to 999.999

Initial value: 0.001

**b.** Function

Set the motor phase inductance (Lq).

\* Set the value presented from the manufacturer.

# P020: Motor phase inductance (Ld)

a. Setting item

Activating timing: Power ON

Setting unit: mH

Setting range: 0.001 to 999.999

Initial value: 0.001

**b.** Function

Set the motor phase inductance (Ld).

\* Set the value presented from the manufacturer.

# P021: Current cut off frequency

a. Setting item

Activating timing: Power ON

Setting unit: Hz

Setting range: 1 to 5000

Initial value: 1000

b. Function

Set the current cut off frequency.

\* Set the value presented from the manufacturer.

# P028[3rd - 1st digits]: Phase control division ratio

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 100

Initial value: 0

b. Function

Set the phase control division ratio.

## P028[6th - 4th digits]: Phase control integrated limit value

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

**b.** Function

Set the phase control integrated limit value.

\* Set the value presented from the manufacturer.

#### P029: Rotor inertia

a. Setting item

Activating timing: Real-time

Setting unit: kg•m<sup>2</sup>

Setting range: 0.0000000 to 99.9999999

Initial value: 0.0000000

**b.** Function

Set the rotor inertia.

\* Set the value presented from the manufacturer.

## P030[3rd - 1st digits]: Motor electronic thermal detection actual value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799

Initial value: 110

b. Function

Set the load factor at which to detect [AL.B5.0: Motor overload error].

\* Set the value presented from the manufacturer.

# P030[7th - 4th digits]: Motor electronic thermal detection time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0 to 9999

Initial value: 53

**b.** Function

Set the motor thermal time constant.

# P031[3rd - 1st digits]: Motor 1 phase concentration electronic thermal detection ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 70

#### b. Function

Set the load factor at which to detect [AL.B5.0: Motor overload error] during motor 1 phase concentration.

\* Set the value presented from the manufacturer.

# P031[5th & 4th digits]: Motor 1 phase concentration electronic thermal detection motion range

a. Setting item

Activating timing: Real-time

Setting unit: rev

Setting range: 0 to 9.9

Initial value: 1.0

#### b. Function

Set the operation range in which to detect a motor 1 phase concentration state.

\* Set the value presented from the manufacturer.

# P031[7th & 6th digits]: Motor 1 phase concentration electronic thermal detection low speed range

a. Setting item

Activating timing: Real-time

Setting unit: rps

Setting range: 0 to 9.9

Initial value: 1.0

#### b. Function

Set the speed at which to defect a low speed state.

\* Set the value presented from the manufacturer.

# P032[3rd - 1st digits]: Dead time compensation factor

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 200

Initial value: 50

#### b. Function

Set the dead time compensation factor.

### P032[6th - 4th digits]: Dead time compensation low current control range

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0.0 to 99.9

Initial value: 0.5

**b.** Function

Set the dead time compensation low current limit range.

\* Set the value presented from the manufacturer.

### P033: Dead time compensation invalid speed

a. Setting item

Activating timing: Power ON

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 0.000

b. Function

Set the speed at which the dead time compensation is to become invalid.

\* Set the value presented from the manufacturer.

## P034[3rd - 1st digits]: Current command variation limit value

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 799

Initial value: 100

b. Function

Set the current command variation limiter ratio.

\* Set the value presented from the manufacturer.

# P034[6th - 4th digits]: Voltage output limit value

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 799

Initial value: 0

b. Function

Set the voltage output limit value.

## P034[9th - 7th digits]: Current loop integral stop voltage

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 799

Initial value: 0

**b.** Function

Set the current loop integral stop voltage.

\* Set the value presented from the manufacturer.

## P035[3rd - 1st digits]: Induced electromotive force compensation rate

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 100

Initial value: 0

b. Function

Set the induced electromotive force compensation rate.

\* Set the value presented from the manufacturer.

### P036[3rd - 1st digits]: Incoherence compensation ratio

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 100

Initial value: 0

b. Function

Set the incoherence compensation ratio.

\* Set the value presented from the manufacturer.

# P037[3rd - 1st digits]: Torque electric angle position phase correction angle

a. Setting item

Activating timing: Power ON

Setting unit: deg

Setting range: 0.0 to 90.0

Initial value: 0.0

b. Function

Set the electric angle phase correction angle during rated torque output.

# P037[6th - 4th digits]: Torque electric angle position phase correction start speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to start torque electric angle phase correction.

\* Set the value presented from the manufacturer.

# P037[9th - 7th digits]: Torque electric angle position phase correction complete speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to complete torque electric angle phase correction.

\* Set the value presented from the manufacturer.

## P038[3rd - 1st digits]: Speed electric angle phase correction angle

a. Setting item

Activating timing: Power ON

Setting unit: deg

Setting range: 0.0 to 90.0

Initial value: 0.0

**b.** Function

Set the speed electric angle phase correction angle.

\* Set the value presented from the manufacturer.

# P038[6th - 4th digits]: Speed electric angle phase correction starting speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

**b.** Function

Set the speed at which to start speed electric angle phase correction.

# P038[9th - 7th digits]: Speed electric angle phase correction complete speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to complete speed electric angle phase correction.

\* Set the value presented from the manufacturer.

## P039[3rd - 1st digits]: d axis current ratio

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0.0 to 99.0 (field weakening)

Initial value: 0.0

b. Function

Set the d axis current value.

\* Set the value presented from the manufacturer.

### P039[6th - 4th digits]: d axis current start speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to start the d axis current.

\* Set the value presented from the manufacturer.

# P039[9th - 7th digits]: d axis current complete speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to complete the d axis current.

### P040[3rd - 1st digits]: 1st torque correction value

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0.0 to 99.0

Initial value: 0.0

**b.** Function

Set the 1st torque correction value.

\* Set the value presented from the manufacturer.

### P040[6th - 4th digits]: 1st torque correction value start speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to start the 1st torque correction value.

\* Set the value presented from the manufacturer.

## P040[9th - 7th digits]: 1st torque correction value complete speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

b. Function

Set the speed at which to complete the 1st torque correction.

\* Set the value presented from the manufacturer.

# P041[3rd - 1st digits]: 2nd torque correction value

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0.0 to 99.0

Initial value: 0.0

b. Function

Set the 2nd torque correction value.

### P041[6th - 4th digits]: 2nd torque correction value start speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

**b.** Function

Set the speed at which to start the 2nd torque correction value.

\* Set the value presented from the manufacturer.

## P041[9th - 7th digits]: 2nd torque correction value complete speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

**b.** Function

Set the speed at which to complete the 2nd torque correction.

\* Set the value presented from the manufacturer.

# P042[3rd - 1st digits]: Torque correction ratio for 6th harmonic

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.00 to 9.99

Initial value: 0.00

b. Function

Set the 6th harmonic torque correction ratio.

\* Set the value presented from the manufacturer.

# P042[6th - 4th digits]: Torque correction shift electric angle for 6th harmonic

a. Setting item

Activating timing: Real-time

Setting unit: deg

Setting range: 0 to 359

Initial value: 0

**b.** Function

Set the 6th harmonic torque correction shift electric angle.

## P043[3rd - 1st digits]: Reserved

- a. Setting item
- b. Function

Reserved area. Set the initial value.

### P043[6th - 4th digits]: PWM drive circuit fully charged waiting time

a. Setting item

Activating timing: Power ON

Setting unit: ms

Setting range: 0 to 999

Initial value: 0

b. Function

Set the waiting time after the PWM drive circuit has fully been charged.

Usually, set "0".

\* Set the value presented from the manufacturer.

## P043[8th - 7th digit]: PWM drive circuit charging time

a. Setting item

Activating timing: Power ON

Setting unit: ms

Setting range: 0.0 to 9.9

Initial value: 0.0

**b.** Function

Set the PWM drive circuit charging time.

Usually, set "0".

\* Set the value presented from the manufacturer.

# P044[1st digit]: Field weakening control selection

a. Setting item

Activating timing: Power ON

Setting range: 0 to 2

Initial value: 0

b. Function

Select field weakening control.

- \* Set the value presented from the manufacturer.
- c. Setting selection
  - 0: INVALID
  - 1: Theoretical value
  - 2: P044 (4th 2nd digits)

Use the setting of the field weakening start speed.

## P044[4th - 2nd digits]: Field weakening start speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

**b.** Function

Set the speed (base speed) at which to start field weakening.

Set it with the ratio of P014 Motor rated speed.

If "0" is set, "100%" is assumed.

\* Set the value presented from the manufacturer.

#### P044[7th - 5th digits]: d-axis max current

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 799

Initial value: 0

b. Function

Set the maximum current for the d axis.

Set it with the ratio of P012 Motor rated current.

If "0" is set, "100%" is assumed.

\* Set the value presented from the manufacturer.

# P045[2nd & 1st digits]: Motor power cable disconnection detection time

a. Setting item

Activating timing: Power ON

Setting unit: sec

Setting range: 0.0 to 9.9

Initial value: 0

b. Function

Set the time at which to detect [AL.C3.0: Motor power cable disconnection error 2].

If 0 is set, 2.0 sec is assumed.

If 9.9 is set, error detection is ineffective.

### P046: Motor NT characteristic max speed

a. Setting item

Activating timing: Power ON

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 0.000

**b.** Function

Set the motor NT characteristic maximum speed. Usually, set the initial value. If [P067: Max speed of motor] or [P082: Motor max speed special setting] is set, it has priority.

\* Set the value presented from the manufacturer.

## P047[3rd - 1st digits]: Rated current at motor NT characteristic max speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 100

Initial value: 0

b. Function

Set the current corresponding to the rated torque at [P046: Motor NT characteristic max speed].

Set it with the ratio of [P012: Motor rated current] to the motor rated current.

Usually, set the initial value.

\* Set the value presented from the manufacturer.

# P047[6th - 4th digits]: Momentary max current at motor NT characteristic max speed

a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

**b.** Function

Set the current corresponding to the momentary max current at [P046: Motor NT characteristic max speed].

Set it with the ratio of [P012: Motor rated current] to the motor rated current. Usually, set the initial value.

## P048[3rd - 1st digits]: Rated current decay start speed

#### a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

#### b. Function

Set the speed at which the motor NT characteristic rated torque decays.

Set it with the ratio to [P014: Motor rated speed].

Usually, set the initial value.

\* Set the value presented from the manufacturer.

### P048[6th - 4th digits]: Instantaneous max current decay start speed

#### a. Setting item

Activating timing: Power ON

Setting unit: %

Setting range: 0 to 999

Initial value: 0

#### **b.** Function

Set the speed at which the maximum torque decays in the motor NT characteristic peak running range.

Set it with the ratio of [P014: Motor rated speed] to the motor rated speed.

Usually, set the initial value.

## P060: Encoder type

#### a. Setting item

Activating timing: Power ON

Setting range: Refer to the encoder selection table.

Initial value: 0

#### b. Function

Select the type of encoder used.

\* Set the value presented from the manufacturer.

#### c. Setting selection

Setting	VPH DES	Encoder type
value	P060 item	Encoder type
0	No selection	Encoder not selected
1	INC1	Reserved
2	INC2	Reserved
3	INC3	Reserved
4	L-SEN	тlinear 90 deg phase difference pulse
5	S-INC	NA80 serial incremental
6	S-ABS	NA80 serial absolute
7	C-SEN1	Reserved
8	C-SEN2	τDISC motor, with marker
9	S-INC2	Reserved
10	S-ABS2	Serial absolute 2
11	L-LESS	Tlinear scaleless sensor
12	ENSIS	Mitutoyo ABS linear scale
13	S-ABS3	Serial absolute 3
14	S-MABS	Multi turn serial absolute
15	L-BiSS	Linear BiSS encoder
16	R-BiSS	Rotary BiSS encoder
17	EnDat	HEIDENHAIN ABS encoder
18	S-ABS4	Serial absolute 4
19	S-iABS	Motor identification support serial absolute

# P061: Number of encoder pulses of rotary type motor

#### a. Setting item

Activating timing: Power ON Setting unit: Mppr (resolution)

Setting range: 0.000000 to 2147.483647

Initial value: 0.000000

#### **b.** Function

Set the number of encoder pulses per rotation of the rotary system motor.

#### P062: Scale resolution

a. Setting item

Activating timing: Power ON

Setting unit: µm

Setting range: 0.00000 to 999.99999

Initial value: 0.00000

**b.** Function

Set the scale resolution of the linear sensor to be used.

- For a rotary motor, this parameter is ineffective.
- \* Set the value presented from the manufacturer.

#### P063: Scale pitch distance

a. Setting item

Activating timing: Power ON

Setting unit: µm

Setting range: 0.00000 to 999.99999

Initial value: 0.00000

b. Function

Set the scale pitch distance of the linear sensor to be used.

The scale resolution is determined with the combination with [P064], with the formula below.

Scale resolution = [P063]/[P064]

\* Set the value presented from the manufacturer.

## P064: Number of pulse per scale pitch

a. Setting item

Activating timing: Power ON

Setting unit: Pulse

Setting range: 0 to 100000

Initial value: 0

b. Function

Set the number of pulses per scale pitch.

The scale resolution is determined with the combination with [P063].

## P066: Encoder input direction switching

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the encoder input direction.

\* Set the value presented from the manufacturer.

c. Setting selection

0: Non-reverse

1: Reversal

## P067: Max speed of motor

a. Setting item

Activating timing: Power ON

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 0.000

**b.** Function

Set the Maximum speed for the combination of the motor used and the encoder.

If [P082] is set, it has priority.

## P068: Magnetic pole sensor type

a. Setting item

Activating timing: Power ON

Setting range: 0 to 13

Initial value: 0

b. Function

Select the magnetic pole sensor type.

\* Set the value presented from the manufacturer.

- c. Setting selection
  - 0: Auto magnetic pole sensing
  - 1: 2 phase (HA, HB signals)
  - 2: 3 phase (HA, HB, HC signals)
  - 3: 2 phase (serial communication signal)
  - 4: 3 phase (serial communication signal)
  - 5: IPU-MABS
  - 6: IPU-ABS
  - 7: ENSIS
  - 8: BiSS
  - 9: NA80 Type
  - 10: NA70 Type
  - 11: EnDat
  - 12: iABS
  - 13: IPU-ABSex

## P069: Magnetic pole position offset

a. Setting item

Activating timing: Power ON

Setting unit: mm

Setting range: 0.000 to 999.999

Initial value: 0.000

**b.** Function

Set the magnetic pole position offset.

If a value is set in [P087], this setting is ineffective.

### P070: Encoder wire breakage detection filter selection

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the encoder wire breakage detection filter.

- \* Set the value presented from the manufacturer.
- c. Setting selection

0: 100 ns

1: 6.4 µs

# P071 [2nd & 1st digits]: 1 rotation position detection speed error detection speed

a. Setting item

Activating timing: Power ON

Setting unit: rpm Setting range: 0 to 99

Initial value: 0

b. Function

Set the speed at which a 1 rotation position detection speed error occurs.

This parameter is effective to encoder types S-ABS2, S-ABS3, and S-ABS4.

If "0" is set, the detection speed is "1 rpm".

\* Set the value presented from the manufacturer.

# P071 [3rd digit]: Feedback smooth

a. Setting item

Activating timing: Power ON

Setting range: 0 to 5

Initial value: 0

b. Function

Set the smoothing degree of the encoder feedback.

This parameter is effective to encoder types S-ABS2, S-ABS3, and S-ABS4.

The larger the setting, the larger the smoothing degree.

\* Set the value presented from the manufacturer.

# P072[1st digit]: Manufacturer exclusive use

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

b. Function

Manufacturer exclusive use parameter. Unless otherwise specified by the manufacturer, set the initial value.

## P072[3rd & 2nd digits]: Manufacturer exclusive use

a. Setting item

Activating timing: Power ON

Setting range: 0 to 20

Initial value: 0

**b.** Function

Manufacturer exclusive use parameter. Unless otherwise specified by the manufacturer, set

the initial value.

#### P080: Max torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 799.9

Initial value: 300.0

b. Function

Set the forward direction motor output torque limit value.

If the setting exceeds the Peak torque of the motor, the output torque is clamped to the Peak

torque.

If "0" is set, no forward direction torque is generated.

#### P081: Max torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 799.9

Initial value: 300.0

b. Function

Set the reverse direction motor output torque limit value.

For a setting that exceeds the Peak torque of the motor, the output torque is clamped to the

Peak torque.

If "0" is set, no reverse direction torque is generated.

# P082: Motor max speed special setting

a. Setting item

Activating timing: Power ON

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 0.000

b. Function

Set the Maximum speed of the motor used.

This setting has priority over [P067].

If "0" is set, the setting of [P067] is effective.

### P083 [3rd - 1st digits]: Motor electronic thermal detected actual value

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

#### b. Function

Set the load factor at which to detect [AL.B5.0: Motor overload error].

The setting is the ratio to the motor rated current value, which is assumed "100%".

If a value greater than the rated current of the servo driver is set, this setting will be the rated current value of the servo driver.

If "0" is set, the motor electronic thermal detected actual value (appropriate value when an ordinary motor is used) of [P030 (3rd - 1st digits)] is automatically set.

Usually, set the initial value.

#### [Electronic thermal settings]

For electric thermal, the parameters to be effective differ depending on the setting value of [P083(3rd - 1st digits): Motor electronic thermal detection actual value]. If [P083(3rd - 1st digits)] is "0", the electronic thermal settings of [P030] and [P031] are effective. If [P083(3rd - 1st digits)] is other than "0", the electronic thermal settings of [P083] and [P084] are effective.

Parameter name	Setting of the 3rd	o 1st digits of P083
Farameter name	If "0"	If other than "0"
Motor electronic thermal detection actual	3rd - 1st digits of	3rd - 1st digits of
value	P030	P083
Motor electronic thermal detection time	7th - 4th digits of	7th - 4th digits of
INDION ELECTIONIC THERMAL DETECTION TIME	P030	P083
Motor 1 phase concentration electronic	3rd - 1st digits of	3rd - 1st digits of
thermal detection ratio	P031	P084
Motor 1 phase concentration electronic	5th & 4th digits of	5th & 4th digits of
thermal detection motion range	P031	P084
Motor 1 phase concentration electronic	7th & 6th digits of	7th & 6th digits of
thermal detection low speed range	P031	P084

# P083 [7th - 4th digits]: Motor electronic thermal time constant

#### a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0 to 9999

Initial value: 0

#### b. Function

Set the motor thermal time constant.

If [P083 (3rd - 1st digits)] is "0", this function is ineffective.

# P084[3rd - 1st digits]: Motor 1 phase concentration electronic thermal detection ratio

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

#### b. Function

Set the load factor at which to detect [AL.B5.0: Motor overload error] during motor 1 phase concentration.

When the motor goes below the detection operation range or the detection low speed range, the detection ratio switches from [P083 (3rd - 1st digits)] to this setting.

If "0" is set, the detection ratio is "1".

If [P083 (3rd - 1st digits)] is "0", this function is ineffective.

# P084[5th & 4th digits]: Motor 1 phase concentration electronic thermal detection motion range

#### a. Setting item

Activating timing: Real-time

Setting unit: rev

Setting range: 0.0 to 9.9

Initial value: 0.0

#### b. Function

Set the operation range in which to detect motor 1 phase concentration.

This setting is the value assumed if the one turn of the electric angle is assumed to be "1.0rev".

If "0" is set, detection is not performed.

If [P083 (3rd - 1st digits)] is "0", this function is ineffective.

# P084[7th & 6th digits]: Motor 1 phase concentration electronic thermal detection low speed

#### a. Setting item

Activating timing: Real-time

Setting unit: rps

Setting range: 0.0 to 9.9

Initial value: 0.0

#### b. Function

Set the speed at which to defect a low speed state.

This setting is the value assumed if the one turn of the electric angle is assumed to be "1.0 rps".

If "0" is set, detection is not performed.

If [P083 (3rd - 1st digits)] is "0", this function is ineffective.

## P085 [3rd - 1st digits]: Regenerative resistor

a. Setting item

Activating timing: Real-time

Setting unit: Ω

Setting range: 0 to 999

Initial value: 0

b. Function

Set the regenerative resistor value if a regenerative resistor is connected.

## P085[9th - 4th digits]: Regenerative resistor capacity

a. Setting item

Activating timing: Real-time

Setting unit: kW

Setting range: 0.000 to 999.999

Initial value: 0.000

b. Function

Set the regenerative resistor capacity if a regenerative resistor is connected.

## P086 [3rd - 1st digits]: Regenerative resistor overload detection ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 100

Initial value: 15

**b.** Function

Set the overload detection ratio if a regenerative resistor is connected.

If using the 400 W type regenerative resistors (options) "NCR-XAE3A2A" and "NCR-

XAF3A2A", set 10%. Otherwise, set the initial value.

# P086 [7th - 4th digits]: Regenerative resistor load time constant

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0 to 9999

Initial value: 300

b. Function

Set the load time constant if a regenerative resistor is connected.

Usually, set the initial value.

## P087: Magnetic pole position offset special setting

a. Setting item

Activating timing: Power ON

Setting unit: FB pulse

Setting range: 0 to 999999999

Initial value: 0

#### b. Function

Set the following magnetic position offsets.

- . ENSIS, BiSS, and EnDat encoders
- 2-phase magnetic sensor
- 3-phase magnetic sensor

When using an encoder, make the setting with one of [d020: Auto magnetic pole detection magnetic offset setting], [d021: DC energization magnetic offset setting], and [d022: On-the-spot magnetic offset setting] in the self-diagnosis mode.

If "0" is set, the setting of [P069] is effective.

c. Reference

For details of self-diagnosis, refer to "Chapter 11 Self-diagnosis".

## P088[1st digit]: ABS encoder data use range selection

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

b. Function

Set the ABS encoder data use range.

This function is effective only when a BiSS encoder is used.

c. Setting selection

0: 0 to 2147483647

1: -2147483648 to 2147483647

# P088[2nd digit]: ABS encoder overflow error detection selection

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

b. Function

Select the error detection motion when the ABS encoder overflows.

c. Setting selection

0: Detection

1: No detection

# P089 [2nd & 1st digits]: 1 rotation position detection speed error detection speed special setting

a. Setting item

Activating timing: Power ON

Setting unit: rpm
Setting range: 0 to 99

Initial value: 0

b. Function

Set the speed at which a 1 rotation position detection speed error occurs.

This parameter is effective to encoder types S-ABS2, S-ABS3, and S-ABS4.

This setting has priority over [P071].

If "0" is set, the setting of [P071] is effective.

## P089[3rd digit]: Feedback smooth special setting

a. Setting item

Activating timing: Power ON

Setting range: 0 to 5

Initial value: 0

b. Function

Set the smoothing degree of the encoder feedback.

This parameter is effective to encoder types S-ABS2, S-ABS3, and S-ABS4.

The larger the setting, the larger the smoothing degree.

This setting has priority over [P071].

If "0" is set, the setting of [P071] is effective.

# P090[1st digit]: Manufacturer exclusive use

a. Setting item

Activating timing: Power ON

Setting range: 0 to 9

Initial value: 0

b. Function

Manufacturer exclusive use parameter. Unless otherwise specified by the manufacturer, set the initial value.

# P091[2nd & 1st digits]: Encoder Power supply OFF retention extension time

a. Setting item

Activating timing: Power ON

Setting unit: s

Setting range: 0 to 99

Initial value: 0

**b.** Function

Set the time for which to retain the OFF state of the encoder power supply, in addition to the normal encoder power supply OFF retention time, at restart with a software reset.

# P091[4th & 3rd digits]: Encoder power supply ON communication waiting time

### a. Setting item

Activating timing: Power ON

Setting unit: s

Setting range: 0.0 to 9.9

Initial value: 0.0

#### b. Function

Set the waiting time from turning ON the encoder power supply until starting the first communication that is applied at power on.

The actual waiting time is equal to the normal waiting time plus this setting.

This parameter is effective only to the BiSS encoder.

## 9-4-2 Device- and machine specification-related parameters (group 1)

## P100: Carrier frequency setting

a. Setting item

Activating timing: Power ON

Setting unit: kHz Setting range: 0 to 20

Initial value: 0

b. Function

Select the PWM carrier frequency.

To use this parameter in the communication mode, set "0".

If a value other than "0" is set, communication may not be connectable.

If a carrier frequency not supported by the servo driver is set, [AL.D0.8: Carrier frequency setting error] occurs.

c. Setting selection

0: Device standard frequency

## P103 [1st digit]: Dynamic brake spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the dynamic brake specification.

- c. Setting selection
  - 0: INVALID (not connected)

Dynamic brake operation is not performed.

1: DMB ON (dynamic brake operation)

Normal dynamic brake operation is performed.

2: DMB OFF (operation with the SON signal disabled)

DMB operation by turning off the external input SON signal is not performed.

If the status changes from SON to servo off due to an alarm and so on, operation is performed.

# P103[3rd & 2nd digits]: Servo On delay time after dynamic brake is off

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 10

Initial value: 10

b. Function

Set the time after which to enable servo on again after the status of motor operation stop with the dynamic brake is confirmed.

## P104: Absolute position compensation action entry

a. Setting item

Activating timing: Power ON

Setting range: 0 to 3

Initial value: 0

b. Function

Specify the operation of the absolute position compensation function.

- c. Setting selection
  - 0: Absolute position compensation function ineffective
  - 1: Standard absolute position compensation effective
  - 2: Absolute position compensation after homing
  - 3: With the start of standard absolute position compensation, resetting (present position acquisition) is implemented per marker.

## P120: Servo control error detection dead band torque

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799 to 799

Initial value: 0

b. Function

Set the dead band torque value for relaxing the detection of [AL.BA.0: Servo control error]. If the error is detected despite normal operation, make a setting so that the value of [C017: Peak servo control error ratio] is around 50.0%.

If a negative value is set, the value is displayed as [C017: Peak servo control error ratio], but the error is not detected.

# P121[1st digit]: Main power OFF error detection spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the operation to perform when a main power OFF error is detected.

- c. Setting selection
  - 0: Servo OFF after braking stop
  - 1: Servo OFF (if there is a dynamic brake, stop with the dynamic brake)

## P121[4th - 2nd digits]: Main power OFF error detection time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 999

Initial value: 50

#### b. Function

If the main power OFF status continues for the time that is set, error detection is performed. If "0" is set, error detection is ineffective.

## P122[2nd & 1st digits]: Main power supply voltage drop detection value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 99

Initial value: 0

#### b. Function

Set the voltage value at which a main power supply drop is detected.

The setting is the ratio to the main power supply standard voltage of the servo driver, which is assumed "100%".

c. Reference

For details, refer to "6-11 Torque limit function when the power supply voltage drops (compatible with the SEMI F47 standard)".

# P122[6th - 3rd digits]: Reserved

- a. Setting item
- b. Function

Reserved area. Set the initial value.

# P122[9th - 7th digits]: Main power supply torque drop limit Fluctuation changing time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 999

Initial value: 50

#### b. Function

Set the torque limit changing ratio at the occurrence of a main power supply drop and at recovery.

This setting is the time required to reach the rated torque from the torque of zero.

#### c. Reference

For details, refer to "6-11 Torque limit function when the power supply voltage drops (compatible with the SEMI F47 standard)".

## P123[6th - 1st digits]: Reserved

- a. Setting item
- b. Function

Reserved area. Set the initial value.

## P123[9th - 7th digits]: Main power supply drop torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 300

Initial value: 100

b. Function

Set the main power supply drop torque limit value.

The setting is the ratio to the rated torque, which is assumed "100%".

c. Reference

For details, refer to "6-11 Torque limit function when the power supply voltage drops (compatible with the SEMI F47 standard)".

## P124[1st digit]: Main power supply undervoltage error spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 2

b. Function

Select the error detection specification at a main power supply undervoltage.

- c. Setting selection
  - 0: Abnormal detection invalid (constant warning detection)
  - 1: Anomaly detection among the servo ON 1

If a main power supply undervoltage status occurs when the servo is ON, this results in a main power supply undervoltage error.

If a main power supply undervoltage status occurs when the servo is OFF, this results in a main power supply undervoltage detection warning.

[P124 (5th - 2nd digits)] is effective.

2: Anomaly detection among the servo ON 2

If a main power supply undervoltage status occurs when the servo is ON, this results in a main power supply undervoltage error.

If a main power supply undervoltage status occurs when the servo is OFF, neither error nor warning occurs.

[P124 (5th - 2nd digits)] is effective.

# P124[5th - 2nd digits]: Detection allowed time for main power supply undervoltage error

#### a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 9999

Initial value: 0

#### b. Function

Set the detection allowed time when a main power supply undervoltage error occurs.

When a main power supply undervoltage error occurs at servo ON, the error is not detected within the time set for this parameter.

In the main power supply undervoltage state, the motor enters the un-electrified status and the MTON signal is OFF.

This setting is effective when [P124 (1st digit)] is either "1: Anomaly detection among the servo ON 1" or "2: Anomaly detection among the servo ON 2".

If "0" is set, the following applies.

- [P124 (1st digit)] is "Anomaly detection among the servo ON 1" → Main power supply undervoltage detection warning
- [P124 (1st digit)] is "Anomaly detection among the servo ON 2 " → No error or warning occurs.

## P126[1st digit]: Overload abnormal motion selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

#### b. Function

Select the motor operation to perform when an overload error and a motor overheat error are detected.

- c. Setting selection
  - 0: Servo OFF after braking stop
  - 1: Servo OFF (if there is a dynamic brake, stop with the dynamic brake)

# P126[4th - 2nd digits]: Overload abnormal deceleration torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799

Initial value: 0

#### b. Function

Set the torque limit value after an overload error is detected.

If "0" is set, the torque limit value is "35%".

When an overload error occurs, the torque is also limited with the thermal detected/ detection actual value [%] of [P030] and [P083].

## P127[1st digit]: Over speed error spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the specification when an over speed error is detected.

- c. Setting selection
  - 0: Re-magnetic pole detection invalid after release Zero point return complete signal (HCP) condition not changed
  - 1: Re-magnetic pole detection valid after release Zero point return complete signal (HCP) OFF

## P127[4th - 2nd digits]: Over speed error detection speed

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

b. Function

Set the speed at which to detect an over speed error.

The setting is the ratio to the motor maximum speed, which is assumed "100%".

If "0" is set, the speed is "130%".

# P129[1st digit]: Motor overheat detection spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

**b.** Function

Select the detection specification of [AL.C0.0: Motor overheat error] and [FL.F0.7: Motor overheat warning].

- c. Setting selection
  - 0: Warning
  - 1: No warning
  - 2: Warning only

## P129[4th - 2nd digits]: Motor overheat detection time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0 to 999

Initial value: 0

b. Function

Set the time at which to detect [AL.C0.0: Motor overheat error].

After the elapse of this setting from the time the MTOH signal turns ON, [AL.C0.0: Motor overheat error] occurs.

## P140[2nd & 1st digits]: Reserved

a. Setting item

b. Function

Reserved area. Set the initial value.

# P140[3rd digit]: Marker output width

a. Setting item

Activating timing: Real-time

Setting range: 0 to 5

Initial value: 0

b. Function

Select the marker output width.

c. Setting selection

The width is as given below, depending on [P060] encoder type.

Setting	[P060] marker input	[P060] serial
0	Through output	50 μs
1	50 μs	50 μs
2	100 μs	100 μs
3	500 μs	500 μs
4	1 ms	1 ms
5	2 ms	2 ms

## P143: Marker output position

a. Setting item

Activating timing: Real-time Setting unit: FB position

Setting range: -2147483648 to 2147483647

Initial value: 0

#### **b.** Function

Set the encoder marker output position. (Effective only for the ABS encoder.)

The setting range of the 1-rotation ABS encoder is 0 to (1-rotation resolution of the encoder - 1).

The marker output occurs when [C024: Encoder position] matches this setting.

To perform zero point return with a built-in command, set the same value as that of [P168:

ABS standard data].

# P160[1st digit]: Inertia and viscous friction range selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 6

Initial value: 4

b. Function

Select the minimum setting unit of inertia and viscous friction data.

c. Setting selection

0:1

1: 0.1

2: 0.01

3: 0.001

4: 0.0001

5: 0.00001

6: 0.000001

# P161[1st digit]: Moving direction selection

a. Setting item

Activating timing: Reset or power ON

Setting range: 0 to 1

Initial value: 0

b. Function

Select the operating direction of the motor for commands.

c. Setting selection

0: Forward direction operation

1: Reverse direction operation

## P161[2nd digit]: Position unit selection

### a. Setting item

Activating timing: Reset or power ON

Setting range: 0 to 7

Initial value: 6

#### b. Function

Select the basic unit of positioning data and other settings.

All position and speed settings are made in this unit.

This setting is fixed to the initial value.

### c. Setting selection

- 0: Reserved
- 1: Reserved
- 2: Reserved
- 3: Reserved
- 4: Reserved
- 5: Reserved
- 6: pulse
- 7: Reserved

## P161[3rd digit]: Position decimal point unit selection

#### a. Setting item

Activating timing: Reset or power ON

Setting range: 0 to 7

Initial value: 0

#### b. Function

Select the minimum setting unit of positioning data.

This setting decides the decimal point position of position data and speed data, which is reflected in the display of the data.

This setting is fixed to the initial value.

#### c. Setting selection

- 0: 1
- 1: Reserved
- 2: Reserved
- 3: Reserved
- 4: Reserved
- 5: Reserved
- 6: Reserved
- 7: Reserved

### P164: Mechanical movement

a. Setting item

Activating timing: Reset or power ON

Setting unit: P161 setting unit Setting range: 0 to 2147483647

Initial value: 0

b. Function

Set the load travel volume per rotation of the drive shaft (load shaft) of the machine system.

If "0" is set, the encoder resolution is "4194304".

## P165: Rotation position range

a. Setting item

Activating timing: Reset or power ON

Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

b. Function

Set the one rotation data range to the rotating machine.

With this, the absolute position (ABS) data range is the range from 0 to ([this setting] -1).

If "0" is set, the index positioning command (INDX) cannot be used.

If "0" is set and an attempt is made to execute the INDX command, an error will occur.

If the HOME command (except with SET ABS and OUT POS) is executed under either of the following conditions, this function is disabled.

- The ABS encoder is connected.
- The setting of [P170] is "0: Reflected".

If a negative value is set, the position is rounded only at power ON.

c. Reference

6-6 Rotation position range setting

# P166: Rotation position range sign switching position

a. Setting item

Activating timing: Reset or power ON

Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

b. Function

Set the sign switching position within motor 1 rotation range.

With any of the following settings or operations, this function is disabled.

- This setting is "0".
- A value equal to or greater than the [P165] setting is set.
- The rotation position range is ineffective.
- \* If using the INDX command, set "0".

## P167[5th - 1st digits]: ABS multi turn limit

a. Setting item

Activating timing: Real-time Setting unit: Rotation speed Setting range: 0 to 32767

Initial value: 0

**b.** Function

At present, this function is disabled. Set the initial value.

### P168: ABS standard data

a. Setting item

Activating timing: Command execution or power re-input

Setting unit: FB pulse

Setting range: -2147483648 to 2147483647

Initial value: 0

**b.** Function

Set the ABS data at the machine standard position. (Effective only for the ABS encoder.)

This is effective if "0" is set in [P170].

## P169: ABS standard mechanical position

a. Setting item

Activating timing: Command execution or power re-input

Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

b. Function

Set the machine position for the machine standard position. (Effective only for the ABS

encoder.)

This is effective if "0" is set in [P170].

# P170[1st digit]: Present position reflection selection after main power of ABS is ON

#### a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

#### b. Function

Select the specification of the present position at power ON. (Effective only for the ABS encoder.)

#### c. Setting selection

#### 0: Reflected

Set the present position based on the ABS encoder position at power ON.

#### 1: No reflection

The present position at power ON is "0". Execute the HOME command to match the machine zero point.

#### P171: Forward direction software OT limit

#### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

#### b. Function

Set the forward direction travel limit as the distance from [P585].

This is always effective after the power supply is turned on and homing is completed.

If "0" is set as [P170] for the ABS encoder, this takes effect as soon as the power supply is turned on.

If "0" is set for this parameter, OT limit detection is not performed.

#### **△**Caution

After turning on the power supply, be sure to perform homing. (The ABS encoder is excluded.)

[P585] is set upon completion of homing, so before the completion of homing, soft OT limit detection is not performed.

The software OT limit is detected at the feedback position. If [P165: Rotation position range] is set, the software OT limit may not be detected.

#### c. Reference

"6-7 Software overtravel detection function"

#### P172: Reverse direction software OT limit

#### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

#### **b.** Function

Set the reverse direction travel limit as the distance from [P585].

This is always effective after the power supply is turned on and homing is completed.

If "0" is set as [P170] for the ABS encoder, this takes effect as soon as the power supply is turned on.

If "0" is set for this parameter, OT limit detection is not performed.

#### **△** Caution

After turning on the power supply, be sure to perform homing. (The ABS encoder is excluded.)

[P585] is set upon completion of homing, so before the completion of homing, soft OT limit detection is not performed.

The software OT limit is detected at the feedback position. If [P165: Rotation position range] is set, the software OT limit may not be detected.

#### c. Reference

"6-7 Software overtravel detection function"

## P173: Max travel amount for forward direction positioning

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit Setting range: 0 to 2147483647

Initial value: 0

#### **b.** Function

Set the maximum forward direction positioning quantity as an incremental quantity.

(The decimal point position depends on [P161 (3rd digit)].)

If the positioning quantity of the executed command is larger than this setting, the command is terminated with an alarm.

If "0" is set, the forward direction positioning quantity is not checked.

## P174: Max travel amount for reverse direction positioning

#### a. Setting item

Activating timing: Real-time
Setting unit: P161 setting unit
Setting range: -2147483648 to 0

Initial value: 0

#### **b.** Function

Set the maximum reverse direction positioning quantity as an incremental quantity.

(The decimal point position depends on [P161 (3rd digit)].)

If the positioning quantity of the executed command is larger than this setting, the command is terminated with an alarm.

If "0" is set, the reverse direction positioning quantity is not checked.

# P175: Position deviation exorbitance detection pulse at Servo OFF → Servo ON

#### a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 999999999

Initial value: 1000

#### b. Function

If the position deviation at a change from servo OFF to servo ON is equal to or greater than this setting, [AL.DD.2: Position deviation excess 3] is detected.

If deviation clear is made ineffective with [P631], the position deviation is accumulated during servo OFF, so that if the position deviation at the time the servo is turned ON exceeds this setting, error detection is performed.

# P176: Position deviation exorbitance detection pulse Max value

#### a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 999999999

Initial value: 1000000

#### b. Function

Set the maximum value at which to perform error detection.

If the deviation pulse is equal to or greater than this setting, [AL.DD.0: Position deviation excess 1] is detected

## P177: Position deviation exorbitance detection pulse Min value

#### a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 999999999

Initial value: 300000

#### b. Function

Set the minimum value at which to perform error detection.

If the deviation pulse is equal to or less than this setting, error detection is not performed.

This setting is effective when [P178] is effective.

### P178: Position deviation exorbitance detection ratio

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 999

Initial value: 150

#### b. Function

Set the detection ratio, with the theoretical deviation value when the motor tracks the speed (referred to simply as the "theoretical deviation value") being assumed "100%".

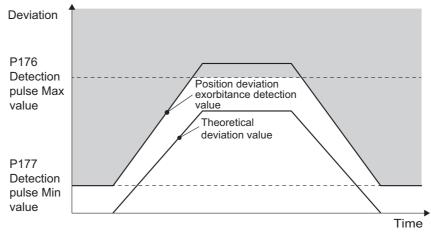
If the position deviation pulse exceeds the detection ratio, [AL.DD.1: Position deviation excess 2] is detected

If "0" is set, error detection is ineffective.

[Position deviation pulse detection relation]

Set the deviation allowance for the theoretical deviation value, using [P178: Position deviation exorbitance detection ratio].

Position deviation exorbitance detection value = Theoretical deviation value x P178 + P177



### P179: S-curve time 2

### a. Setting item

Activating timing: Reset or power ON

Setting unit: ms

Setting range: 0 to 1000.0

Initial value: 3.0

#### b. Function

Set the acceleration/deceleration curve of the motor in each operation of the command/jog, with time if the curve is assumed to be an "S-curve".

For [P522, P529, P536, P543, P550, P557, P564, P571], an S-curve is further applied to S-curve time 1 to which an S-curve has been applied.

If "0" is set, this function is ineffective.

## 9-4-3 Servo adjustment-related parameters (groups 2 and 3)

# P200[3rd - 1st digits]: Speed detection filter time constant for gain switching

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.0

b. Function

Set the time constant for the speed for gain switching.

# P200[6th - 4th digits]: Position deviation detection filter time constant for gain switching

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.0

b. Function

Set the time constant for the position deviation for gain switching.

# P210: Gain No. 0 Low speed gain switching speed

a. Setting item

Activating timing: Real-time

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 1.000

**b.** Function

Set the speed at which to switch between the normal speed gain and the low speed gain.

When the operation speed is equal to or less than this speed, the gain is switched to the low speed gain.

If "0" is set, switching to the low speed gain is ineffective.

## P211: Gain No. 0 Low speed gain switching deviation pulse

#### a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 99999999

Initial value: 10

#### **b.** Function

Set the deviation pulse at which to switch between the normal speed gain and the low speed gain.

When the deviation pulse goes below this deviation range, the gain is switched to the low speed gain.

If "0" is set, switching to the low speed gain is ineffective.

# P212[3rd - 1st digits]: Gain No. 0 Normal speed → Low speed gain switching filter time constant

#### a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 5.0

#### b. Function

Set the time constant when the gain is switched from the normal speed gain to the low speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P212[6th - 4th digits]: Gain No. 0 Low speed → Normal speed gain switching filter time constant

### a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.0

#### b. Function

Set the time constant when the gain is switched from the low speed gain to the normal speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

## P212[7th digit]: Gain No. 0 Low speed gain switching spec 1 selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

#### b. Function

Set the low speed gain switching specification.

- c. Setting selection
  - 0: Speed and deviation pulse interlocking

The speed loop gain and the position loop gain are switched when both the switching speed range and the switching deviation range match.

1: Speed and deviation pulse separate 1

For the speed loop, the gain is switched when the switching speed range matches. For the position loop, the gain is switched when the switching deviation range matches.

2: Speed and deviation pulse separate 2

For the position loop, the gain is switched when the switching deviation range matches. For the speed loop, the gain is switched when the position loop is in a low speed gain status and the switching speed range matches.

## P212[8th digit]: Gain No. 0 Low speed gain switching spec 2 selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Set the low speed gain switching specification.

- c. Setting selection
  - 0: During command input, low speed gain switching is ineffective.

    In position command mode, switching during the position command is ineffective.

    In speed command mode, switching during the speed command is ineffective.
  - 1: Low speed gain switching is effective regardless of command input.

## P213[4th - 1st digits]: Gain No. 0 Low speed gain switching delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 999.9

Initial value: 10.0

b. Function

Set the delay time when the gain switches from the normal speed gain to the low speed gain.

The gain switches to the low speed gain after the elapse of this time after the low speed gain switching condition is met.

# P213[9th - 5th digits]: Gain No. 0 Low speed gain holding time after switching

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 0.0

b. Function

Within this time after switching to the low speed gain, the low speed gain status is held even if the normal speed gain switching condition is met.

If, however, "0" is set in [P212: Low speed gain switching spec 2 selection], and command input is performed, the normal speed gain is assumed by canceling the low speed gain holding time after switching.

## P214: Gain No. 0 Speed loop proportional gain

a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

**b.** Function

Set the speed loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

## P215: Gain No. 0 Speed loop integral time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the time constant of speed loop integral compensation.

The smaller the setting, the faster the response, but if it is too small, vibration will occur.

If "0" is set, integral compensation is ineffective.

## P216: Gain No. 0 Speed loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

b. Function

Set the time constant of speed loop derivative compensation.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

## P217: Gain No. 0 Speed loop proportional gain distribution factor

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the proportional compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

## P218: Gain No. 0 Speed loop derivative gain distribution factor

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

This is effective if a positive value is set in [P216: Speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

# P219: Gain No. 0 Low speed loop proportional gain

#### a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

#### **b.** Function

Set the speed loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

## P220: Gain No. 0 Low speed loop integral time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the time constant of speed loop integral compensation in the low speed gain range. The smaller the setting, the faster the response, but if it is too small, vibration will occur. If "0" is set, integral compensation is ineffective.

## P221: Gain No. 0 Low speed loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

b. Function

Set the time constant of speed loop derivative compensation in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P222: Gain No. 0 Low speed loop proportional gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

b. Function

Set the proportional compensation gain distribution factor o of the two-degree-of freedom PID speed control system in the low speed gain range.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

## P223: Gain No. 0 Low speed loop derivative gain distribution factor

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the derivative compensation gain distribution factor of the two-degree-of freedom PID speed control system in the low speed gain range.

This is effective if a positive value is set in [P221: Low speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

## P224: Gain No. 0 Speed loop integral torque limit value

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799 (0 means no limit.)

Initial value: 0

#### b. Function

Set the output torque limit value of speed loop integral compensation.

For a setting that exceeds the Peak torque of the motor, the output torque is clamped to the Peak torque.

If "0" is set, the torque is limited with the torque limit value during operation.

# P225: Gain No. 0 Position loop gain

#### a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### **b.** Function

Set the position loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the following applies.

- Position loop control is not performed, but operation is performed with the speed command of [P229 Speed feed forward].
- Position deviation is fixed to "0".

## P226: Gain No. 0 Low speed position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the position loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, normal positioning operation cannot be performed.

## P227[4th - 1st digits]: Gain No. 0 Position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the derivative compensation time constant of the position loop.

The larger the setting, the faster the response, but if the setting is too large, vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

# P227[8th - 5th digits]: Gain No. 0 Low speed position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the position loop derivative time constant in the low speed gain range.

# P228[4th - 1st digits]: Reserved

a. Setting item

b. Function

Reserved area. Set the initial value.

## P228[6th & 5th digits]: Gain No. 0 Positioning command delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 1.0

Initial value: 0.0

**b.** Function

Set the delay time after which to output the position command.

## P229[4th - 1st digits]: Gain No. 0 Speed feed forward ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 120.0

Initial value: 80.0

b. Function

Set the speed feed forward ratio.

The larger the setting, the higher the compliance, but over-shoot is likely to occur.

If this occurs, reduce the setting a little to allow for a slight deviation, thereby stabilizing operation.

If "0" is set, feed forward control is ineffective.

## P229[8th - 5th digits]: Gain No. 0 Speed feed forward shift ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 100.0

Initial value: 0.0

b. Function

Reduce the feed forward speed.

If the sign of the feed forward speed in the formula below changes, the feed forward speed is "0".

Feed forward speed

= Speed based on P229 speed feed forward ratio - (Use maximum speed x Setting [%])

## P230: Gain No. 0 Speed feed forward filter time constant

#### a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

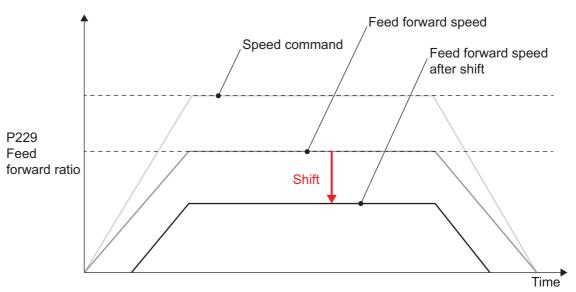
Initial value: 0.2

#### b. Function

Set the low pass filter time constant for the speed feed forward command.

- Positive value: The larger the setting, the smoother the speed feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the speed feed forward command.

### [Relation between speed feed forward parameters]



#### P231: Gain No. 0 Inertia

#### a. Setting item

Activating timing: Real-time Setting unit: P160 range kg•m<sup>2</sup> Setting range: 0 to 999999999

Initial value: 0

#### b. Function

Set the inertia of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

### P232: Gain No. 0 Viscous friction

#### a. Setting item

Activating timing: Real-time

Setting unit: P160 range N•m/(rad/s) Setting range: 0 to 999999999

Initial value: 0

## **b.** Function

Set the viscous friction of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

## P233[4th - 1st digits]: Gain No. 0 Inertia feed forward ratio

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P231: Inertia].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If the load inertia fluctuates, usually set "0".

If the load inertia does not fluctuate, set "100%" after servo adjustment.

If "0" is set, this feed forward control is not performed.

# P233[8th - 5th digits]: Gain No. 0 Viscous friction feed forward ratio

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P232: Viscous friction].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If "0" is set, this feed forward control is not performed.

## P234: Gain No. 0 Torque feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.1

#### b. Function

Set the low pass filter time constant for the torque feed forward command.

This torque feed forward command is the torque command output for load inertia and load viscous friction. Depending on the sign of the setting, the specification differs.

- Positive value: The larger the setting, the smoother the torque feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the torque feed forward command.

# P235[3rd - 1st digits]: Gain No. 0 Filter derivative coefficient while stopping

a. Setting item

Activating timing: Real-time Setting range: 0.0 to 99.9

Initial value: 1.0

b. Function

Set the derivative coefficient for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and the friction is large, so the vibration while stopping cannot be suppressed even if the stopped filter time constant is adjusted, the vibration can be suppressed by setting in the range of 1.0 to 20.0.
- If there is hardly any friction and some sound is heard while stopping, decrease the setting.

# P235[6th - 4th digits]: Gain No. 0 Filter time constant while stopping

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.2

b. Function

Set the filter time constant for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and vibration occurs while stopping, the vibration can be suppressed by setting in the range of 0.3 to 9.0.
- If the load inertia is small and the static friction of the motor is large, set in the range of 0.0 to 0.3.

## P236[4th - 1st digits]: Gain No. 0 Notch filter center frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

**b.** Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

## P236[7th - 5th digits]: Gain No. 0 Notch filter band width ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

**b.** Function

Set the band width of notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\%(0.20) = 200 \text{ Hz}$ 

# P236[9th & 8th digits]: Gain No. 0 Notch filter depth

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

## P240: Gain No. 1 Low speed gain switching speed

### a. Setting item

Activating timing: Real-time

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 1.000

#### b. Function

Set the speed at which to switch between the normal speed gain and the low speed gain.

When the operation speed is equal to or less than this speed, the gain is switched to the low

speed gain.

If "0" is set, switching to the low speed gain is ineffective.

## P241: Gain No. 1 Low speed gain switching deviation pulse

#### a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 99999999

Initial value: 10

#### **b.** Function

Set the deviation pulse at which to switch between the normal speed gain and the low speed gain.

When the deviation pulse goes below this deviation range, the gain is switched to the low speed gain.

If "0" is set, switching to the low speed gain is ineffective.

# P242[3rd - 1st digits]: Gain No. 1 Normal speed → Low speed gain switching filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 5.0

#### b. Function

Set the time constant when the gain is switched from the normal speed gain to the low speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P242[6th - 4th digits]: Gain No. 1 Low speed → Normal speed gain switching filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.0

### b. Function

Set the time constant when the gain is switched from the low speed gain to the normal speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P242[7th digit]: Gain No. 1 Low speed gain switching spec 1 selection

## a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

#### b. Function

Set the low speed gain switching specification.

## c. Setting selection

0: Speed and deviation pulse interlocking

The speed loop gain and the position loop gain are switched when both the switching speed range and the switching deviation range match.

1: Speed and deviation pulse separate 1

For the speed loop, the gain is switched when the switching speed range matches. For the position loop, the gain is switched when the switching deviation range matches.

2: Speed and deviation pulse separate 2

For the position loop, the gain is switched when the switching deviation range matches. For the speed loop, the gain is switched when the position loop is in a low speed gain status and the switching speed range matches.

# P242[8th digit]: Gain No. 1 Low speed gain switching spec 2 selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Set the low speed gain switching specification.

- c. Setting selection
  - 0: During command input, low speed gain switching is ineffective. In position command mode, switching during the position command is ineffective. In speed command mode, switching during the speed command is ineffective.
  - 1: Low speed gain switching is effective regardless of command input.

# P243[4th - 1st digits]: Gain No. 1 Low speed gain switching delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 999.9

Initial value: 10.0

b. Function

Set the delay time when the gain switches from the normal speed gain to the low speed gain.

The gain switches to the low speed gain after the elapse of this time after the low speed gain switching condition is met.

# P243[9th - 5 digits]: Gain No. 1 Low speed gain holding time after switching

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 0.0

#### b. Function

Within this time after switching to the low speed gain, the low speed gain status is held even if the normal speed gain switching condition is met.

If, however, "0" is set in [P242: Low speed gain switching spec 2 selection], and command input is performed, the normal speed gain is assumed by canceling the low speed gain holding time after switching.

## P244: Gain No. 1 Speed loop proportional gain

## a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

#### **b.** Function

Set the speed loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

# P245: Gain No. 1 Speed loop integral time constant

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### b. Function

Set the time constant of speed loop integral compensation.

The smaller the setting, the faster the response, but if it is too small, vibration will occur.

If "0" is set, integral compensation is ineffective.

## P246: Gain No. 1 Speed loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

b. Function

Set the time constant of speed loop derivative compensation.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P247: Gain No. 1 Speed loop proportional gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

**b.** Function

Set the proportional compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

# P248: Gain No. 1 Speed loop derivative gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

b. Function

Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

This is effective if a positive value is set in [P246: Speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

## P249: Gain No. 1 Low speed loop proportional gain

## a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

#### **b.** Function

Set the speed loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

## P250: Gain No. 1 Low speed loop integral time constant

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### b. Function

Set the time constant of speed loop integral compensation in the low speed gain range. The smaller the setting, the faster the response, but if it is too small, vibration will occur. If "0" is set, integral compensation is ineffective.

## P251: Gain No. 1 Low speed loop derivative time constant

## a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

## b. Function

Set the time constant of speed loop derivative compensation in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P252: Gain No. 1 Low speed loop proportional gain distribution factor

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### b. Function

Set the proportional compensation gain distribution factor o of the two-degree-of freedom PID speed control system in the low speed gain range.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

# P253: Gain No. 1 Low speed loop derivative gain distribution factor

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the derivative compensation gain distribution factor of the two-degree-of freedom PID speed control system in the low speed gain range.

This is effective if a positive value is set in [P251: Low speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

# P254: Gain No. 1 Speed loop integral torque limit value

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799 (0 means no limit.)

Initial value: 0

### b. Function

Set the output torque limit value of speed loop integral compensation.

For a setting that exceeds the Peak torque of the motor, the output torque is clamped to the Peak torque.

If "0" is set, the torque is limited with the torque limit value during operation.

## P255: Gain No. 1 Position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### b. Function

Set the position loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the following applies.

- Position loop control is not performed, but operation is performed with the speed command of [P259 Speed feed forward].
- Position deviation is fixed to "0".

## P256: Gain No. 1 Low speed position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the position loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, normal positioning operation cannot be performed.

# P257[4th - 1st digits]: Gain No. 1 Position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

#### b. Function

Set the derivative compensation time constant of the position loop.

The larger the setting, the faster the response, but if the setting is too large, vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

# P257[8th - 5th digits]: Gain No. 1 Low speed position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

**b.** Function

Set the position loop derivative time constant in the low speed gain range.

# P258[4th - 1st digits]: Reserved

- a. Setting item
- **b.** Function

Reserved area. Set the initial value.

# P258[6th & 5th digits]: Gain No. 1 Positioning command delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 1.0

Initial value: 0.0

b. Function

Set the delay time after which to output the position command.

# P259[4th - 1st digits]: Gain No. 1 Speed feed forward ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 120.0

Initial value: 80.0

**b.** Function

Set the speed feed forward ratio.

The larger the setting, the higher the compliance, but over-shoot is likely to occur.

If this occurs, reduce the setting a little to allow for a slight deviation, thereby stabilizing operation.

If "0" is set, feed forward control is ineffective.

# P259[8th - 5th digits]: Gain No. 1 Speed feed forward shift ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 100.0

Initial value: 0.0

#### **b.** Function

Reduce the feed forward speed.

If the sign of the feed forward speed in the formula below changes, the feed forward speed is "0".

Feed forward speed

= Speed based on P259 speed feed forward ratio - (Use maximum speed x Setting [%])

## P260: Gain No. 1 Speed feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.2

#### **b**. Function

Set the low pass filter time constant for the speed feed forward command.

- Positive value: The larger the setting, the smoother the speed feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the speed feed forward command.

## P261: Gain No. 1 Inertia

a. Setting item

Activating timing: Real-time Setting unit: P160 range kg•m<sup>2</sup> Setting range: 0 to 999999999

Initial value: 0

### b. Function

Set the inertia of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

## P262: Gain No. 1 Viscous friction

## a. Setting item

Activating timing: Real-time

Setting unit: P160 range N•m/(rad/s)

Setting range: 0 to 999999999

Initial value: 0

#### **b.** Function

Set the viscous friction of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

# P263[4th - 1st digits]: Gain No. 1 Inertia feed forward ratio

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P261: Inertia].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If the load inertia fluctuates, usually set "0".

If the load inertia does not fluctuate, set "100%" after servo adjustment.

If "0" is set, this feed forward control is not performed.

# P263[8th - 5th digits]: Gain No. 1 Viscous friction feed forward ratio

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### **b**. Function

Set the feed forward ratio for [P262: Viscous friction].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If "0" is set, this feed forward control is not performed.

## P264: Gain No. 1 Torque feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.1

#### **b.** Function

Set the low pass filter time constant for the torque feed forward command.

This torque feed forward command is the torque command output for load inertia and load viscous friction. Depending on the sign of the setting, the specification differs.

- Positive value: The larger the setting, the smoother the torque feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the torque feed forward command.

# P265[3rd - 1st digits]: Gain No. 1 Filter derivative coefficient while stopping

a. Setting item

Activating timing: Real-time Setting range: 0.0 to 99.9

Initial value: 1.0

#### b. Function

Set the derivative coefficient for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and the friction is large, so the vibration while stopping cannot be suppressed even if the stopped filter time constant is adjusted, the vibration can be suppressed by setting in the range of 1.0 to 20.0.
- If there is hardly any friction and some sound is heard while stopping, decrease the setting.

# P265[6th - 4th digits]: Gain No. 1 Filter time constant while stopping

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.2

#### b. Function

Set the filter time constant for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and vibration occurs while stopping, the vibration can be suppressed by setting in the range of 0.3 to 9.0.
- If the load inertia is small and the static friction of the motor is large, set in the range of 0.0 to 0.3.

# P266[4th - 1st digits]: Gain No. 1 Notch filter center frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

# P266[7th - 5th digits]: Gain No. 1 Notch filter band width ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

**b.** Function

Set the band width of notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\% (0.20) = 200 \text{ Hz}$ 

# P266[9th & 8th digits]: Gain No. 1 Notch filter depth

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

## P270: Gain No. 2 Low speed gain switching speed

## a. Setting item

Activating timing: Real-time

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 1.000

#### **b.** Function

Set the speed at which to switch between the normal speed gain and the low speed gain. When the operation speed is equal to or less than this speed, the gain is switched to the low

speed gain.

If "0" is set, switching to the low speed gain is ineffective.

# P271: Gain No. 2 Low speed gain switching deviation pulse

## a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 99999999

Initial value: 10

#### b. Function

Set the deviation pulse at which to switch between the normal speed gain and the low speed gain.

When the deviation pulse goes below this deviation range, the gain is switched to the low speed gain.

If "0" is set, switching to the low speed gain is ineffective.

# P272[3rd - 1st digits]: Gain No. 2 Normal speed → Low speed gain switching filter time constant

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 5.0

#### b. Function

Set the time constant when the gain is switched from the normal speed gain to the low speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P272[6th - 4th digits]: Gain No. 2 Low speed → Normal speed gain switching filter time constant

#### a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.0

### b. Function

Set the time constant when the gain is switched from the low speed gain to the normal speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P272[7th digit]: Gain No. 2 Low speed gain switching spec 1 selection

## a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

#### b. Function

Set the low speed gain switching specification.

## c. Setting selection

0: Speed and deviation pulse interlocking

The speed loop gain and the position loop gain are switched when both the switching speed range and the switching deviation range match.

1: Speed and deviation pulse separate 1

For the speed loop, the gain is switched when the switching speed range matches.

For the position loop, the gain is switched when the switching deviation range matches.

2: Speed and deviation pulse separate 2

For the position loop, the gain is switched when the switching deviation range matches. For the speed loop, the gain is switched when the position loop is in a low speed gain status and the switching speed range matches.

# P272[8th digit]: Gain No. 2 Low speed gain switching spec 2 selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

## b. Function

Set the low speed gain switching specification.

### c. Setting selection

0: During command input, low speed gain switching is ineffective. In position command mode, switching during the position command is ineffective. In speed command mode, switching during the speed command is ineffective.

1: Low speed gain switching is effective regardless of command input.

# P273[4th - 1st digits]: Gain No. 2 Low speed gain switching delay time

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 999.9

Initial value: 10.0

## b. Function

Set the delay time when the gain switches from the normal speed gain to the low speed gain.

The gain switches to the low speed gain after the elapse of this time after the low speed gain switching condition is met.

# P273[9th - 5th digits]: Gain No. 2 Low speed gain holding time after switching

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 0.0

#### b. Function

Within this time after switching to the low speed gain, the low speed gain status is held even if the normal speed gain switching condition is met.

If, however, "0" is set in [P272: Low speed gain switching spec 2 selection], and command input is performed, the normal speed gain is assumed by canceling the low speed gain holding time after switching.

# P274: Gain No. 2 Speed loop proportional gain

## a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

#### b. Function

Set the speed loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

# P275: Gain No. 2 Speed loop integral time constant

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### **b.** Function

Set the time constant of speed loop integral compensation.

The smaller the setting, the faster the response, but if it is too small, vibration will occur.

If "0" is set, integral compensation is ineffective.

## P276: Gain No. 2 Speed loop derivative time constant

## a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

#### b. Function

Set the time constant of speed loop derivative compensation.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P277: Gain No. 2 Speed loop proportional gain distribution factor

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### b. Function

Set the proportional compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

# P278: Gain No. 2 Speed loop derivative gain distribution factor

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

## b. Function

Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

This is effective if a positive value is set in [P276: Speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

## P279: Gain No. 2 Low speed loop proportional gain

a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

b. Function

Set the speed loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

# P280: Gain No. 2 Low speed loop integral time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the time constant of speed loop integral compensation in the low speed gain range.

The smaller the setting, the faster the response, but if it is too small, vibration will occur.

If "0" is set, integral compensation is ineffective.

# P281: Gain No. 2 Low speed loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

b. Function

Set the time constant of speed loop derivative compensation in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P282: Gain No. 2 Low speed loop proportional gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the proportional compensation gain distribution factor o of the two-degree-of freedom PID speed control system in the low speed gain range.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

# P283: Gain No. 2 Low speed loop derivative gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the derivative compensation gain distribution factor of the two-degree-of freedom PID speed control system in the low speed gain range.

This is effective if a positive value is set in [P281: Low speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

# P284: Gain No. 2 Speed loop integral torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799 (0 means no limit.)

Initial value: 0

### b. Function

Set the output torque limit value of speed loop integral compensation.

For a setting that exceeds the Peak torque of the motor, the output torque is clamped to the Peak torque.

If "0" is set, the torque is limited with the torque limit value during operation.

# P285: Gain No. 2 Position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the position loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the following applies.

- Position loop control is not performed, but operation is performed with the speed command of [P289 Speed feed forward].
- Position deviation is fixed to "0".

## P286: Gain No. 2 Low speed position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

**b.** Function

Set the position loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, normal positioning operation cannot be performed.

# P287[4th - 1st digits]: Gain No. 2 Position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

**b.** Function

Set the derivative compensation time constant of the position loop.

The larger the setting, the faster the response, but if the setting is too large, vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

# P287[8th - 5th digits]: Gain No. 2 Low speed position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the position loop derivative time constant in the low speed gain range.

## P288[4th - 1st digits]: Reserved

- a. Setting item
- **b.** Function

Reserved area. Set the initial value.

# P288[6th & 5th digits]: Gain No. 2 Positioning command delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 1.0

Initial value: 0.0

**b.** Function

Set the delay time after which to output the position command.

# P289[4th - 1st digits]: Gain No. 2 Speed feed forward ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 120.0

Initial value: 80.0

b. Function

Set the speed feed forward ratio.

The larger the setting, the higher the compliance, but over-shoot is likely to occur.

If this occurs, reduce the setting a little to allow for a slight deviation, thereby stabilizing operation.

If "0" is set, feed forward control is ineffective.

# P289[8th - 5th digits]: Gain No. 2 Speed feed forward shift ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 100.0

Initial value: 0.0

b. Function

Reduce the feed forward speed.

If the sign of the feed forward speed in the formula below changes, the feed forward speed is "0".

Feed forward speed

= Speed based on P289 speed feed forward ratio - (Use maximum speed x Setting [%])

# P290: Gain No. 2 Speed feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.2

b. Function

Set the low pass filter time constant for the speed feed forward command.

- Positive value: The larger the setting, the smoother the speed feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the speed feed forward command.

## P291: Gain No. 2 Inertia

a. Setting item

Activating timing: Real-time Setting unit: P160 range kg•m<sup>2</sup> Setting range: 0 to 999999999

Initial value: 0

b. Function

Set the inertia of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

## P292: Gain No. 2 Viscous friction

## a. Setting item

Activating timing: Real-time

Setting unit: P160 range N•m/(rad/s) Setting range: 0 to 999999999

Initial value: 0

#### b. Function

Set the viscous friction of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

# P293[4th - 1st digits]: Gain No. 2 Inertia feed forward ratio

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P291: Inertia].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If the load inertia fluctuates, usually set "0".

If the load inertia does not fluctuate, set "100%" after servo adjustment.

If "0" is set, this feed forward control is not performed.

# P293[8th - 5th digits]: Gain No. 2 Viscous friction feed forward ratio

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P292: Viscous friction].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If "0" is set, this feed forward control is not performed.

# P294: Gain No. 2 Torque feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.1

#### b. Function

Set the low pass filter time constant for the torque feed forward command.

This torque feed forward command is the torque command output for load inertia and load viscous friction. Depending on the sign of the setting, the specification differs.

- Positive value: The larger the setting, the smoother the torque feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the torque feed forward command.

# P295[3rd - 1st digits]: Gain No. 2 Filter derivative coefficient while stopping

a. Setting item

Activating timing: Real-time Setting range: 0.0 to 99.9

Initial value: 1.0

#### **b.** Function

Set the derivative coefficient for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and the friction is large, so the vibration while stopping cannot be suppressed even if the stopped filter time constant is adjusted, the vibration can be suppressed by setting in the range of 1.0 to 20.0.
- If there is hardly any friction and some sound is heard while stopping, decrease the setting.

# P295[6th - 4th digits]: Gain No. 2 Filter time constant while stopping

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.2

#### **b.** Function

Set the filter time constant for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and vibration occurs while stopping, the vibration can be suppressed by setting in the range of 0.3 to 9.0.
- If the load inertia is small and the static friction of the motor is large, set in the range of 0.0 to 0.3.

# P296[4th - 1st digits]: Gain No. 2 Notch filter center frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

#### **b.** Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

# P296[7th - 5th digits]: Gain No. 2 Notch filter band width ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

**b.** Function

Set the band width of notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\%(0.20) = 200 \text{ Hz}$ 

# P296[9th & 8th digits]: Gain No. 2 Notch filter depth

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

**b.** Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

# P300: Gain No. 3 Low speed gain switching speed

## a. Setting item

Activating timing: Real-time

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 1.000

#### b. Function

Set the speed at which to switch between the normal speed gain and the low speed gain.

When the operation speed is equal to or less than this speed, the gain is switched to the low speed gain.

If "0" is set, switching to the low speed gain is ineffective.

# P301: Gain No. 3 Low speed gain switching deviation pulse

## a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 99999999

Initial value: 10

#### **b.** Function

Set the deviation pulse at which to switch between the normal speed gain and the low speed gain.

When the deviation pulse goes below this deviation range, the gain is switched to the low speed gain.

If "0" is set, switching to the low speed gain is ineffective.

# P302[3rd - 1st digits]: Gain No. 3 Normal speed → Low speed gain switching filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 5.0

#### b. Function

Set the time constant when the gain is switched from the normal speed gain to the low speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P302[6th - 4th digits]: Gain No. 3 Low speed → Normal speed gain switching filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.0

### b. Function

Set the time constant when the gain is switched from the low speed gain to the normal speed gain.

• This setting is effective to the following parameters.

Speed loop proportional gain

Speed loop integral time constant

Speed loop derivative time constant

Speed loop proportional gain distribution factor

Speed loop derivative gain distribution factor

Position loop gain

Position loop derivative time constant

- For parameters other than the above, switching is performed without a filter time constant.
- For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.

# P302[7th digit]: Gain No. 3 Low speed gain switching spec 1 selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the low speed gain switching specification.

- c. Setting selection
  - 0: Speed and deviation pulse interlocking

The speed loop gain and the position loop gain are switched when both the switching speed range and the switching deviation range match.

1: Speed and deviation pulse separate 1

For the speed loop, the gain is switched when the switching speed range matches. For the position loop, the gain is switched when the switching deviation range matches.

2: Speed and deviation pulse separate 2

For the position loop, the gain is switched when the switching deviation range matches. For the speed loop, the gain is switched when the position loop is in a low speed gain status and the switching speed range matches.

# P302[8th digit]: Gain No. 3 Low speed gain switching spec 2 selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1 Initial value: 0

**b.** Function

Set the low speed gain switching specification.

- c. Setting selection
  - 0: During command input, low speed gain switching is ineffective.

    In position command mode, switching during the position command is ineffective.

    In speed command mode, switching during the speed command is ineffective.
  - 1: Low speed gain switching is effective regardless of command input.

# P303[4th - 1st digits]: Gain No. 3 Low speed gain switching delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 999.9

Initial value: 10.0

**b.** Function

Set the delay time when the gain switches from the normal speed gain to the low speed gain.

The gain switches to the low speed gain after the elapse of this time after the low speed gain switching condition is met.

# P303[9th - 5th digits]: Gain No. 3 Low speed gain holding time after switching

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 0.0

#### b. Function

Within this time after switching to the low speed gain, the low speed gain status is held even if the normal speed gain switching condition is met.

If, however, "0" is set in [P302: Low speed gain switching spec 2 selection], and command input is performed, the normal speed gain is assumed by canceling the low speed gain holding time after switching.

# P304: Gain No. 3 Speed loop proportional gain

## a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

## **b.** Function

Set the speed loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

# P305: Gain No. 3 Speed loop integral time constant

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### b. Function

Set the time constant of speed loop integral compensation.

The smaller the setting, the faster the response, but if it is too small, vibration will occur.

If "0" is set, integral compensation is ineffective.

## P306: Gain No. 3 Speed loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

b. Function

Set the time constant of speed loop derivative compensation.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P307: Gain No. 3 Speed loop proportional gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

**b.** Function

Set the proportional compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

# P308: Gain No. 3 Speed loop derivative gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

b. Function

Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system.

This is effective if a positive value is set in [P306: Speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

## P309: Gain No. 3 Low speed loop proportional gain

## a. Setting item

Activating timing: Real-time Setting range: 0 to 99999

Initial value: 25

#### **b.** Function

Set the speed loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the motor is in the torque 0 status.

## P310: Gain No. 3 Low speed loop integral time constant

## a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### b. Function

Set the time constant of speed loop integral compensation in the low speed gain range. The smaller the setting, the faster the response, but if it is too small, vibration will occur. If "0" is set, integral compensation is ineffective.

## P311: Gain No. 3 Low speed loop derivative time constant

## a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: -999 to 999

Initial value: 0

## b. Function

Set the time constant of speed loop derivative compensation in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

If a negative value is set, the time constant will be a first-order delay time constant.

# P312: Gain No. 3 Low speed loop proportional gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### b. Function

Set the proportional compensation gain distribution factor o of the two-degree-of freedom PID speed control system in the low speed gain range.

The larger the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too large, it will cause over-shoot.

# P313: Gain No. 3 Low speed loop derivative gain distribution factor

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -100.0 to 100.0

Initial value: 0.0

#### **b.** Function

Set the derivative compensation gain distribution factor of the two-degree-of freedom PID speed control system in the low speed gain range.

This is effective if a positive value is set in [P311: Low speed loop derivative time constant]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning.

If it is too small, it will cause over-shoot.

# P314: Gain No. 3 Speed loop integral torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799 (0 means no limit.)

Initial value: 0

### b. Function

Set the output torque limit value of speed loop integral compensation.

For a setting that exceeds the Peak torque of the motor, the output torque is clamped to the Peak torque.

If "0" is set, the torque is limited with the torque limit value during operation.

# P315: Gain No. 3 Position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

#### b. Function

Set the position loop gain.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the following applies.

- Position loop control is not performed, but operation is performed with the speed command of [P319 Speed feed forward].
- Position deviation is fixed to "0".

## P316: Gain No. 3 Low speed position loop gain

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0.0 to 9999.9

Initial value: 20.0

b. Function

Set the position loop gain in the low speed gain range.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, normal positioning operation cannot be performed.

# P317[4th - 1st digits]: Gain No. 3 Position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

#### b. Function

Set the derivative compensation time constant of the position loop.

The larger the setting, the faster the response, but if the setting is too large, vibration is likely to occur.

If "0" is set, derivative compensation is not performed.

# P317[8th - 5th digits]: Gain No. 3 Low speed position loop derivative time constant

a. Setting item

Activating timing: Real-time

Setting unit: µs

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the position loop derivative time constant in the low speed gain range.

# P318[4th - 1st digits]: Reserved

- a. Setting item
- **b.** Function

Reserved area. Set the initial value.

# P318[6th & 5th digits]: Gain No. 3 Positioning command delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 1.0

Initial value: 0.0

**b.** Function

Set the delay time after which to output the position command.

# P319[4th - 1st digits]: Gain No. 3 Speed feed forward ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 120.0

Initial value: 80.0

b. Function

Set the speed feed forward ratio.

The larger the setting, the higher the compliance, but over-shoot is likely to occur.

If this occurs, reduce the setting a little to allow for a slight deviation, thereby stabilizing operation.

If "0" is set, feed forward control is ineffective.

# P319[8th - 5th digits]: Gain No. 3 Speed feed forward shift ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 100.0

Initial value: 0.0

#### **b.** Function

Reduce the feed forward speed.

If the sign of the feed forward speed in the formula below changes, the feed forward speed is "0".

Feed forward speed

= Speed based on P319 speed feed forward ratio - (Use maximum speed x Setting [%])

## P320: Gain No. 3 Speed feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.2

#### **b**. Function

Set the low pass filter time constant for the speed feed forward command.

- Positive value: The larger the setting, the smoother the speed feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the speed feed forward command.

## P321: Gain No. 3 Inertia

a. Setting item

Activating timing: Real-time
Setting unit: P160 range kg•m²
Setting range: 0 to 999999999

Initial value: 0

### b. Function

Set the inertia of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

## P322: Gain No. 3 Viscous friction

## a. Setting item

Activating timing: Real-time

Setting unit: P160 range N•m/(rad/s)

Setting range: 0 to 999999999

Initial value: 0

#### b. Function

Set the viscous friction of the control system.

With [P160: Inertia and viscous friction range selection], a range can be set.

Usually, it is set with auto tuning.

# P323[4th - 1st digits]: Gain No. 3 Inertia feed forward ratio

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P321: Inertia].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If the load inertia fluctuates, usually set "0".

If the load inertia does not fluctuate, set "100%" after servo adjustment.

If "0" is set, this feed forward control is not performed.

# P323[8th - 5th digits]: Gain No. 3 Viscous friction feed forward ratio

## a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0.0 to 200.0

Initial value: 0.0

#### b. Function

Set the feed forward ratio for [P322: Viscous friction].

If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system.

If "0" is set, this feed forward control is not performed.

### P324: Gain No. 3 Torque feed forward filter time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -100.0 to 100.0

Initial value: 0.1

#### **b.** Function

Set the low pass filter time constant for the torque feed forward command.

This torque feed forward command is the torque command output for load inertia and load viscous friction. Depending on the sign of the setting, the specification differs.

- Positive value: The larger the setting, the smoother the torque feed forward command, but over-shoot is more likely to occur.
- Negative value: It will be the derivative control time constant for the torque feed forward command.

# P325[3rd - 1st digits]: Gain No. 3 Filter derivative coefficient while stopping

a. Setting item

Activating timing: Real-time Setting range: 0.0 to 99.9

Initial value: 1.0

#### b. Function

Set the derivative coefficient for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and the friction is large, so the vibration while stopping cannot be suppressed even if the stopped filter time constant is adjusted, the vibration can be suppressed by setting in the range of 1.0 to 20.0.
- If there is hardly any friction and some sound is heard while stopping, decrease the setting.

# P325[6th - 4th digits]: Gain No. 3 Filter time constant while stopping

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99.9

Initial value: 0.2

### b. Function

Set the filter time constant for vibration while stopping.

Depending on the condition, make an adjustment as described below.

- If the load inertia is large and vibration occurs while stopping, the vibration can be suppressed by setting in the range of 0.3 to 9.0.
- If the load inertia is small and the static friction of the motor is large, set in the range of 0.0 to 0.3.

### P326[4th - 1st digits]: Gain No. 3 Notch filter center frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

### P326[7th - 5th digits]: Gain No. 3 Notch filter band width ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

**b.** Function

Set the band width of notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\% (0.20) = 200 \text{ Hz}$ 

# P326[9th & 8th digits]: Gain No. 3 Notch filter depth

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

### P330[1st digit]: Torque command filter order selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the torque command filter order.

c. Setting selection

0: Primary

1: Secondary

### P330[5th - 2nd digits]: Torque command filter frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

**b.** Function

Set the filter (low pass) frequency of the torque command.

If resonance occurs depending on the combination with the machine system, insert a torque command filter to fix it.

If "0" is set, the filter is ineffective.

# P331[4th - 1st digits]: Notch filter center frequency 1

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

**b.** Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

### P331[7th - 5th digits]: Notch filter band width ratio 1

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

b. Function

Set the band width of the notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\% (0.20) = 200 \text{ Hz}$ 

### P331[9th & 8th digits]: Notch filter depth 1

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

# P332[4th - 1st digits]: Notch filter center frequency 2

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

### P332[7th - 5th digits]: Notch filter band width ratio 2

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

**b.** Function

Set the band width of the notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\% (0.20) = 200 \text{ Hz}$ 

### P332[9th & 8th digits]: Notch filter depth 2

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

# P333[4th - 1st digits]: Notch filter center frequency 3

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth. If "0" is set, the filter is ineffective.

### P333[7th - 5th digits]: Notch filter band width ratio 3

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

b. Function

Set the band width of the notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\% (0.20) = 200 \text{ Hz}$ 

### P333[9th & 8th digits]: Notch filter depth 3

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

# P334[4th - 1st digits]: Notch filter center frequency 4

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the center frequency of the notch filter.

If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency, notch filter band width, and notch filter depth.

If "0" is set, the filter is ineffective.

### P334[7th - 5th digits]: Notch filter band width ratio 4

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

**b.** Function

Set the band width of the notch filter.

Set it with a ratio to the notch filter center frequency.

If "0" is set, the filter is ineffective.

Example) Center frequency x This setting = Band width

 $1000 \text{ Hz} \times 20\% (0.20) = 200 \text{ Hz}$ 

# P334[9th & 8th digits]: Notch filter depth 4

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the notch filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

# P340: Vibration control filter ineffective speed range

a. Setting item

Activating timing: Real-time

Setting unit: rpm

Setting range: 0.000 to 99999.999

Initial value: 0.000

b. Function

Set the ineffective speed range of the vibration control filter.

If the speed is equal to or less than this setting, the vibration control filter is ineffective.

If "0" is set, the vibration control filter is ineffective.

### P341[4th - 1st digits]: Vibration control filter center frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the center frequency of the vibration control filter.

If the rigidity is low depending on the combination with the machine system, and low-frequency vibration occurs, set the resonance frequency to prevent the resonance.

If "0" is set, the filter is ineffective.

### P341[7th - 5th digits]: Vibration control filter band width ratio

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 200

Initial value: 0

b. Function

Set the band width of the vibration control filter.

### P341[9th & 8th digits]: Vibration control filter depth

a. Setting item

Activating timing: Real-time

Setting unit: -dB

Setting range: 0 to 99

Initial value: 0

b. Function

Set the depth of the vibration control filter.

If "0" is set, the notch depth is "-  $\infty$  ".

Usually, set the initial value.

The maximum depth is limited by the operation accuracy of the servo driver.

# P342[1st digit]: Feedback filter order selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the order of the speed feedback filter.

c. Setting selection

0: Primary

1: Secondary

### P342[5th - 2nd digits]: Feedback filter frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 1000

b. Function

Set the speed feedback filter frequency.

### P348[3rd - 1st digits]: Vibration control model gain

a. Setting item

Activating timing: Real-time Setting range: 0 to 300

Initial value: 0

b. Function

Set the vibration control model gain.

To perform vibration control, usually set "100".

If the setting is "0", vibration control is ineffective.

### P348[6th - 4th digits]: Vibration control damping gain

a. Setting item

Activating timing: Real-time Setting range: 0 to 100

Initial value: 0

b. Function

Set the vibration control gain for vibration control.

If the setting is small, the vibration control force is weak. If the setting is large, the vibration control force is strong.

If the setting is too large, the servo response performance worsens.

If the setting is "0", vibration control is ineffective.

c. Vibration control setting

This function can suppress vibration at about 5 to 100 Hz.

- Conditions for performing vibration control
  - [P100: Carrier frequency setting] is 18 kHz to 11 kHz or 9 kHz or less.
  - [P348 (3rd 1st digits): Vibration control model gain] is other than "0".
  - [P348 (6th 4th digits): Vibration control damping gain] is other than "0".
  - The inertia of the gain number to operate is other than "0".
- Notes on performing vibration control
  - Set [P349: Vibration control lower limit frequency] and [P349: Vibration control higher limit frequency].
  - The viscous friction to set must be about ten times the inertia.

### P349[1st digit]: Vibration control order selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the order of the characteristics of the frequency range from the lower limit frequency to the upper limit frequency in which to suppress vibration with vibration control. Usually, set "0: Secondary".

c. Setting selection

0: 2nd

1: 4th

### P349[5th - 2nd digits]: Vibration control lower limit frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the lower limit frequency at which to suppress vibration with vibration control.

Vibration is suppressed at the frequency equal to or greater than this setting.

If either the lower limit frequency or the upper limit frequency is "0", vibration is suppressed with vibration control in the entire frequency range.

# P349[9th - 6th digits]: Vibration control higher limit frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 0

b. Function

Set the upper limit frequency at which to suppress vibration with vibration control.

If either the lower limit frequency or the upper limit frequency is "0", vibration is suppressed with vibration control in the entire frequency range.

### P380: Magnetic pole detection torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799

Initial value: 200

b. Function

Set the torque limit value during automatic magnetic pole detection.

The same limit value is used for both forward direction and reverse direction.

### P381: Magnetic pole detection gain 1

a. Setting item

Activating timing: Real-time Setting range: 0 to 9999

Initial value: 80

b. Function

Set the proportional compensation gain during automatic magnetic pole detection.

The larger the setting, the faster the response, but vibration may occur depending on the rigidity of the machine system.

If "0" is set, automatic magnetic pole detection does not operate normally.

### P382: Magnetic pole detection integration time constant

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.1 to 9999.9

Initial value: 200.0

b. Function

Set the integral compensation time constant during automatic magnetic pole detection.

The smaller the setting, the faster the response, but vibration is likely to occur.

# P383: Magnetic pole detection gain 2

a. Setting item

Activating timing: Real-time

Setting unit: s<sup>-1</sup>

Setting range: 0 to 9999

Initial value: 20

b. Function

Set the position loop gain during automatic magnetic pole detection.

The larger the setting, the faster the response, but vibration is likely to occur.

If "0" is set, the position loop is open, so that automatic magnetic pole detection cannot be performed.

### P384: Magnetic pole detection complete range

a. Setting item

Activating timing: Real-time

Setting unit: deg

Setting range: 0.0 to 30.0

Initial value: 5.0

b. Function

Set the automatic magnetic pole detection completion range.

The wider the range, the easier the completion of automatic magnetic pole detection, but the larger the magnetic pole position error.

If the range is made narrow, it may not be possible to complete automatic magnetic pole detection.

### P385[1st digit]: Magnetic pole detection filter order selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the automatic magnetic pole detection filter order.

c. Setting selection

0: Primary

1: Secondary

# P385[5th - 2nd digits]: Magnetic pole detection filter frequency

a. Setting item

Activating timing: Real-time

Setting unit: Hz

Setting range: 0 to 9999

Initial value: 2000

b. Function

Set the filter during automatic magnetic pole detection.

If resonance occurs depending on the combination with the machine system, insert a low pass filter to fix it.

If "0" is set, the filter is ineffective.

### P386[3rd - 1st digits]: Landing torque

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799

Initial value: 0

b. Function

Set the landing torque during automatic magnetic pole detection.

If "0" is set, the landing torque is ineffective.

### P386[7th - 4th digits]: Landing torque holding time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 99.99

Initial value: 0.00

b. Function

Set the landing torque holding time during automatic magnetic pole detection.

If "0" is set, the landing torque is ineffective.

### P387[3rd - 1st digits]: Magnetic pole detection torque minimum value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 799

Initial value: 0

b. Function

Set the minimum value of automatic magnetic pole detection torque for the second and subsequent sessions.

# P387[4th digit]: Magnetic pole detection torque attenuation pattern selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the pattern during automatic magnetic pole detection torque attenuation.

c. Setting selection

0: Soft damping

1: Rapid damping

### 9-4-4 Command-related parameters (groups 4 and 5)

### P404: Speed command acceleration standard time

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 0

b. Function

Set the standard speed in speed command acceleration.

If "0" is set, the maximum speed is set.

### P405: Speed command deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 0

b. Function

Set the standard speed in speed command deceleration.

If "0" is set, the maximum speed is set.

### P408: Internal speed command acceleration standard time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99999.9

Initial value: 500.0

b. Function

Set the acceleration time for the internal speed command.

This setting is the time required to reach the speed that is set in [P404] from the motor stop status.

### P409: Internal speed command deceleration standard time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99999.9

Initial value: 500.0

b. Function

Set the deceleration time for the internal speed command.

This setting is the time required to reach the speed that is set in [P405] from the motor stop status.

### P410[1st digit]: SPD SEL 0 Speed command spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 0
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P410[2nd digit]: SPD SEL 0 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P410[3rd digit]: SPD SEL 0 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P411: SPD SEL 0 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P410 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P412: SPD SEL 0 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P413[1st digit]: SPD SEL 1 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 1
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P413[2nd digit]: SPD SEL 1 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P413[3rd digit]: SPD SEL 1 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P414: SPD SEL 1 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P413 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P415: SPD SEL 1 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P416[1st digit]: SPD SEL 2 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 2
  - 1: Reserved
  - 2: Speed command value/indirect data assignment

Speed data stored with the specified indirect data number

# P416[2nd digit]: SPD SEL 2 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P416[3rd digit]: SPD SEL 2 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P417: SPD SEL 2 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P416 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P418: SPD SEL 2 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P419[1st digit]: SPD SEL 3 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 3
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P419[2nd digit]: SPD SEL 3 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P419[3rd digit]: SPD SEL 3 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P420: SPD SEL 3 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P419 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P421: SPD SEL 3 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P422[1st digit]: SPD SEL 4 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 4
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P422[2nd digit]: SPD SEL 4 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P422[3rd digit]: SPD SEL 4 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P423: SPD SEL 4 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P422 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P424: SPD SEL 4 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P425[1st digit]: SPD SEL 5 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 5
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P425[2nd digit]: SPD SEL 5 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P425[3rd digit]: SPD SEL 5 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P426: SPD SEL 5 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P425 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P427: SPD SEL 5 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P428[1st digit]: SPD SEL 6 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 6
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P428[2nd digit]: SPD SEL 6 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P428[3rd digit]: SPD SEL 6 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P429: SPD SEL 6 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P428 (1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P430: SPD SEL 6 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P431[1st digit]: SPD SEL 7 Speed command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the speed command value specification in speed command mode.

- c. Setting selection
  - 0: Speed command value/Setting value of command number 7
  - 1: Reserved
  - 2: Speed command value/indirect data assignment Speed data stored with the specified indirect data number

# P431[2nd digit]: SPD SEL 7 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P431[3rd digit]: SPD SEL 7 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in speed command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

Switch OFF the overtravel direction command, and switch ON the reset signal (RST).

The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P432: SPD SEL 7 Speed command value

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -300000000 to 300000000

Indirect data number: -990000000 to -100000000

Initial value: 0

#### b. Function

Set the internal speed command value.

For indirect data assignment, the following applies.

- For [P431(1st digit)], set "2: Speed command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the speed command will be "0".
- Set the indirect data number in the integer digits.

### P433: SPD SEL 7 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### **b.** Function

Set the motor output torque limit value in speed command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

If "0" is set, no torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P439: Internal torque command Increase/Decrease change time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 9999.9

Initial value: 0.0

**b.** Function

Set the increase/decrease change time of the internal torque command.

This setting is the time required to reach the rated torque.

# P440: Speed limit value at torque command mode

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode.

If "0" is set, the limit is imposed with 120% of the maximum speed.

### P441[1st digit]: TRQ SEL 0 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 0
  - 1: Reserved
  - 2: Torque command value/indirect data assignment
    Torque value stored with the specified indirect data number

# P441[2nd digit]: TRQ SEL 0 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

### P441[3rd digit]: TRQ SEL 0 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

### P442: TRQ SEL 0 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P441 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P443: TRQ SEL 0 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P444[1st digit]: TRQ SEL 1 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 1
  - 1: Reserved
  - 2: Torque command value/indirect data assignment
    Torque value stored with the specified indirect data number

# P444[2nd digit]: TRQ SEL 1 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in torque command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

### P444[3rd digit]: TRQ SEL 1 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P445: TRQ SEL 1 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P444 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P446: TRQ SEL 1 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P447[1st digit]: TRQ SEL 2 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 2
  - 1: Reserved
  - 2: Torque command value/indirect data assignment
    Torque value stored with the specified indirect data number

# P447[2nd digit]: TRQ SEL 2 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

# P447[3rd digit]: TRQ SEL 2 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

# 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P448: TRQ SEL 2 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P447 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P449: TRQ SEL 2 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P450[1st digit]: TRQ SEL 3 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 3
  - 1: Reserved
  - 2: Torque command value/indirect data assignment
    Torque value stored with the specified indirect data number

# P450[2nd digit]: TRQ SEL 3 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in torque command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P450[3rd digit]: TRQ SEL 3 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

# 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P451: TRQ SEL 3 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P450 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P452: TRQ SEL 3 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the internal torque command value and the command direction in torque command mode.

If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P453[1st digit]: TRQ SEL 4 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 4
  - 1: Reserved
  - 2: Torque command value/indirect data assignment

Torque value stored with the specified indirect data number

# P453[2nd digit]: TRQ SEL 4 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

Select the gain number in torque command mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

# P453[3rd digit]: TRQ SEL 4 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P454: TRQ SEL 4 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P453 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P455: TRQ SEL 4 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P456[1st digit]: TRQ SEL 5 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 5
  - 1: Reserved
  - 2: Torque command value/indirect data assignment
    Torque value stored with the specified indirect data number

# P456[2nd digit]: TRQ SEL 5 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in torque command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P456[3rd digit]: TRQ SEL 5 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

# 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P457: TRQ SEL 5 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P456 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point. Example) To specify the indirect data IX15, set "-1.5".

# P458: TRQ SEL 5 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P459[1st digit]: TRQ SEL 6 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 6
  - 1: Reserved
  - 2: Torque command value/indirect data assignment Torque value stored with the specified indirect data number

# P459[2nd digit]: TRQ SEL 6 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in torque command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P459[3rd digit]: TRQ SEL 6 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

### c. Setting selection

# 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P460: TRQ SEL 6 Torque command value

# a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P459 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P461: TRQ SEL 6 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P462[1st digit]: TRQ SEL 7 Torque command value spec selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the torque command value specification in torque command mode.

- c. Setting selection
  - 0: Torque command value/Setting value of command number 7
  - 1: Reserved
  - 2: Torque command value/indirect data assignment
    Torque value stored with the specified indirect data number

# P462[2nd digit]: TRQ SEL 7 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in torque command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P462[3rd digit]: TRQ SEL 7 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in torque command mode.

#### c. Setting selection

# 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is not possible. Switch OFF the overtravel direction command, and switch ON the reset signal (RST). The overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

# 2: Warning

With the overtravel ON, the overtravel warning occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the torque becomes zero. In this state, movement in the overtravel release direction is possible. Switch OFF the overtravel direction command, and release overtravel by switching ON the reset signal (RST).

At this time, the alarm display is released even in the overtravel state.

# P463: TRQ SEL 7 Torque command value

### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -799.9 to 799.9 Indirect data number: -9.9 to -0.1

Initial value: 0.0

#### b. Function

Set the internal torque command value and the command direction in torque command mode.

For indirect data assignment, the following applies.

- For [P462 (1st digit)], set "2: Torque command value/indirect data assignment".
- To specify indirect data, set a negative value.
- If a value outside the indirect data number range, the torque command will be "0".
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P464: TRQ SEL 7 Speed limit value

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the motor operation speed limit value in torque command mode. If "0" is set, the limit is imposed with 120% of the maximum speed.

c. Setting selection

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

d.

# P516[1st digit]: Positioning approval selection when homing is not completed

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the positioning approval specification when homing is not completed.

- c. Setting selection
  - 0: INC positioning permitted
  - 1: ABS/INC positioning permitted
  - 2: Positioning not allowed

# P517[1st digit]: SEL 0 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

# P517[2nd digit]: SEL 0 Gain No. selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

#### b. Function

Select the gain number in built-in command mode.

### c. Setting selection

- 0: Gain No. 0
- 1: Gain No. 1
- 2: Gain No. 2
- 3: Gain No. 3

# P517[3rd digit]: SEL 0 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P518: SEL 0 Acceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### b. Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P519: SEL 0 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P520: SEL 0 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P521: SEL 0 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P522: SEL 0 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

#### **b.** Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P523: SEL 0 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P524[1st digit]: SEL 1 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

# P524[2nd digit]: SEL 1 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

Select the gain number in built-in command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P524[3rd digit]: SEL 1 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P525: SEL 1 Acceleration standard speed

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

### b. Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P526: SEL 1 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P527: SEL 1 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P528: SEL 1 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P529: SEL 1 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

#### **b.** Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P530: SEL 1 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P531[1st digit]: SEL 2 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

# P531[2nd digit]: SEL 2 Gain No. selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

#### b. Function

Select the gain number in built-in command mode.

### c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P531[3rd digit]: SEL 2 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P532: SEL 2 Acceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### **b.** Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P533: SEL 2 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P534: SEL 2 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

### b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

### P535: SEL 2 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P536: SEL 2 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P537: SEL 2 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P538[1st digit]: SEL 3 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

# P538[2nd digit]: SEL 3 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in built-in command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P538[3rd digit]: SEL 3 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops.

In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P539: SEL 3 Acceleration standard speed

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

### b. Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P540: SEL 3 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### **b.** Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P541: SEL 3 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P542: SEL 3 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

### b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P543: SEL 3 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P544: SEL 3 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P545[1st digit]: SEL 4 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

# P545[2nd digit]: SEL 4 Gain No. selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

#### b. Function

Select the gain number in built-in command mode.

### c. Setting selection

- 0: Gain No. 0
- 1: Gain No. 1
- 2: Gain No. 2
- 3: Gain No. 3

# P545[3rd digit]: SEL 4 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P546: SEL 4 Acceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P547: SEL 4 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P548: SEL 4 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P549: SEL 4 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P550: SEL 4 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P551: SEL 4 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

# P552[1st digit]: SEL 5 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

# P552[2nd digit]: SEL 5 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

Select the gain number in built-in command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P552[3rd digit]: SEL 5 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P553: SEL 5 Acceleration standard speed

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

### b. Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P554: SEL 5 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P555: SEL 5 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P556: SEL 5 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

### b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

### P557: SEL 5 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

### b. Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P558: SEL 5 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P559[1st digit]: SEL 6 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

#### **b.** Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1 1: PN2

# P559[2nd digit]: SEL 6 Gain No. selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

#### b. Function

Select the gain number in built-in command mode.

### c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

# P559[3rd digit]: SEL 6 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

#### c. Setting selection

### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P560: SEL 6 Acceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### **b.** Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

# P561: SEL 6 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P562: SEL 6 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

### b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

### P563: SEL 6 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P564: SEL 6 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P565: SEL 6 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

### P566[1st digit]: SEL 7 Homing complete signal selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

**b.** Function

Select the positioning completion signal in built-in command mode.

c. Setting selection

0: PN1

1: PN2

### P566[2nd digit]: SEL 7 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

**b.** Function

Select the gain number in built-in command mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

### P566[3rd digit]: SEL 7 Overtravel spec selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

#### b. Function

Select the overtravel specification in built-in command mode.

For the software overtravel state, however, the specification is fixed to "reset release alarm".

#### c. Setting selection

#### 0: Auto release alarm

With the overtravel ON, the overtravel auto release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel auto release alarm is released.

#### 1: Reset release alarm 1

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is not possible.

With the reset ON, the overtravel auto release alarm is displayed, and movement in the overtravel release direction is possible.

#### 2: Warning

With the overtravel ON, the overtravel warning occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With the overtravel OFF, the overtravel warning is released.

#### 3: Reset release alarm 2

With the overtravel ON, the overtravel reset release alarm occurs, and the motor stops. In this state, movement in the overtravel release direction is possible.

With a reset, the overtravel reset release alarm display is released.

At this time, the alarm display is released even in the overtravel state.

# P567: SEL 7 Acceleration standard speed

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

### b. Function

Set the acceleration standard speed in built-in command mode.

If "0" is set, the acceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

### P568: SEL 7 Deceleration standard speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 0

#### b. Function

Set the deceleration standard speed in built-in command mode.

If "0" is set, the deceleration standard speed is the maximum speed.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P569: SEL 7 Acceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the acceleration time in built-in command mode.

This setting is the time required to reach the acceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P570: SEL 7 Deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 99999.9

Initial value: 500.0

#### b. Function

Set the deceleration time in built-in command mode.

This setting is the time required to reach the deceleration standard speed from the motor stop status.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P571: SEL 7 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in built-in command mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P572: SEL 7 Torque limit value

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

**b.** Function

Set the torque limit value in built-in command mode.

If a value exceeding the Peak torque of the motor is set, the output torque is clamped to the Peak torque.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P573: Jog speed 0

a. Setting item

Activating timing: Real-time

Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

### P574: Jog speed 1

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P575: Jog speed 2

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

### P576: Jog speed 3

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P577: Jog speed 4

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

### P578: Jog speed 5

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P579: Jog speed 6

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

### P580: Jog speed 7

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s

Setting range: -990000000 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

b. Function

Set the speed for jog operation.

The acceleration/deceleration time and so on follow the setting value of SEL0.

To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the integer digits.

Example) To specify the indirect data IX15 when [P161 (3rd digit)] is set to "2: 0.01", set "-15.00".

### P581[1st digit]: Zero point marker selection for homing

a. Setting item

Activating timing: Command execution or power re-input

Setting range: 0 to 1

Initial value: 0

b. Function

Select the signal to use as a zero point marker.

- c. Setting selection
  - 0: Feedback marker
  - 1: External marker

# P581[2nd digit]: Homing acceleration/deceleration control in reverse direction

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the specification of homing acceleration/deceleration in reverse direction.

- c. Setting selection
  - 0: Acc./Dec. (SEL acceleration/deceleration setting)
  - 1: Quick Acc./Dec.

### P581[3rd digit]: Zero point return set distance operation selection

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

#### b. Function

Select the operation direction for [P584: Zero point return set distance].

#### c. Setting selection

#### 0: Coordinate direction

When a positive value is set, operation is performed in the forward direction. When a negative value is set, operation is performed in the reverse direction.

#### 1: Operation direction

When a positive value is set, operation is performed in the zero point return operation

When a negative value is set, operation is performed in the opposite direction of zero point return operation.

### P582: Zero point return creep speed

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 1 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the creep operation speed after zero point deceleration detection in zero point return operation.

Usually, set a value equal to or less than 1/100 of the motor rated speed.

### P583: Zero point position constant

#### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit Setting range: 0 to 2147483647

Initial value: 0

#### b. Function

Set the distance after which to start marker signal detection after zero point deceleration detection in zero point return operation. Set a value equal to or greater than the distance enabling deceleration from the zero point return speed to the homing creep speed.

#### **△** Caution

If the zero point return speed is high, sudden deceleration and sudden stopping may occur if this setting is small.

Set a value sufficient for deceleration to the creep speed.

### P584: Zero point return set distance

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

#### b. Function

Set the +? travel distance from the marker signal detection point in zero point return operation.

This is used for fine adjustment of the marker signal position and the machine zero point position.

Positioning is performed in accordance with the operation direction that is set in [P581 (3rd digit)].

If "0" is set, zero point return is completed at the time of marker signal detection.

If the setting is equal to or less than the deceleration distance to stop the motor from the homing creep speed, over-shoot occurs upon completion of zero point return.

### P585: Position data standard point

#### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

#### b. Function

Set the standard position of the absolute position data as the distance from the machine zero point.

The setting is made upon completion of zero point return.

If positioning operation is performed without performing zero point return after the power supply is turned on, the position at which the power supply is turned on becomes the standard position of absolute position data.

Soft OT limit values of parameters [P171] and [P172] are based on this position data standard point.

### P586: OT deceleration time at OT HOME

#### a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0.0 to 99999.9

Initial value: 0.0

#### b. Function

Set the deceleration time for the motor to stop from the rated speed.

This setting is valid only in OT reverse operation of OT-return zero point return and OT return LS-less zero point return.

### 9-4-5 Self-diagnosis- and input and output-related parameters (group 6)

### P600[3rd - 1st digits]: Status display C000 display item selection

a. Setting item

Activating timing: Real-time Setting range: 0 to 999

Initial value: 0

b. Function

Select the item to display in status display C000.

If "0" is set, the display item is "C001".

• 0 - 999: C000 - C999

### P600[4th digit]: Reserved

a. Setting item

b. Function

Reserved area. Set the initial value.

### P600[5th digit]: Status display C000 display multiplier factor selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 6

Initial value: 0

b. Function

Select the display multiplier of status display C000.

The unit is [P161 (2nd digit)].

0: 1

1: 1/10

2: 1/100

3: 1/1000

4: 1/10000

5: 1/100000

6: 1/1000000

### P600[6th digit]: STO operation status indication selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the display status of the data display LED panel during STO operation.

- c. Setting selection
  - 0: Display

STO is displayed in the STO status.

1: Hide

Not displayed even in the STO status.

2: Display 2

Displayed only if [C109: Network connection state] is "Connecting".

### P601[1st digit]: Auto tuning moving direction

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the direction in which to run the motor during the execution of the auto tuning function.

- c. Setting selection
  - 0: Both
  - 1: Forward
  - 2: Reverse

# P601[4th - 2nd digits]: Auto tuning test operation ratio

a. Setting item

Activating timing: Real-time Setting range: 0.01 to 1.00

Initial value: 0.30

b. Function

Set the motor operation speed during the execution of the auto tuning function.

Specify this setting as a ratio to the maximum speed.

If "1.00" is set, the maximum speed is assumed.

### P601[7th - 5th digits]: Max torque at auto tuning

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: 0 to 300

Initial value: 100

**b.** Function

Set the maximum torque during auto tuning.

### P601[8th digit]: Auto tuning inertia multiplying selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the magnitude of the load inertia for the inertia moment of the motor.

c. Setting selection

0: 150 or less times

1: 150 to 300 times

2: More than 300 times

### P604[1st digit]: Test run starting position assignment

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

**b.** Function

Select the position assignment method for the start of test run.

Set the moving amount with [P605: Test run starting position].

ABS: Moves to the position indicated by [C020: Current position].

INC: Moves from the current position by the specified amount.

c. Setting selection

0: INVALID

1: ABS

2: INC

### P604[2nd digit]: Test run traveling direction

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Select the motor command direction for test run.

c. Setting selection

0: Both

1: Forward

2: Reverse

### P604[3rd digit]: Test run SEL selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 7

Initial value: 0

**b.** Function

Select the SEL number used for test run.

0 to 7: SEL.0 to 7

### P604[9th - 4th digits]: Test run stopping time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.000 to 999.999

Initial value: 1.000

b. Function

Set the stopping time for test run.

# P605: Test run starting position

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 0

b. Function

Set the run starting position for test run.

This is the position indicated by [C020: Current position] with ABS in [P604[1st digit]: Test run starting position assignment] or the specified amount by which to move with INC from the current position to the starting position.

### P606: Test run positioning amount

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit Setting range: 0 to 2147483647

Initial value: 0

**b.** Function

Set the repetition positioning amount for test run.

### P607: Test run positioning speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

b. Function

Set the positioning operation speed for test run.

### P608: Test run starting position movement speed

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

**b.** Function

Set the speed at which the motor moves to [P605: Test run starting position] for the start of test run.

# P620[2nd & 1st digits]: Control input signal allocation 1 (DI1)

a. Setting item

Activating timing: Real-time Setting range: 00 to 99 Initial value: 53

b. Function

Set the allocation of control input signal DI1. If "00" is set, the input signal is ineffective.

c. Reference

For information about setting control input signals, refer to "3-4 Control input and output signals".

For information about the allocation number of each signal, in particular, refer to "a. Control input signal" in "3-4-2 Control input and output signal list".

### P620[4th & 3rd digits]: Control input signal allocation 1 (DI2)

### a. Setting item

Activating timing: Real-time Setting range: 00 to 99

Initial value: 59

#### b. Function

Set the allocation of control input signal DI2. If "00" is set, the input signal is ineffective.

#### c. Reference

For information about setting control input signals, refer to "3-4 Control input and output signals".

For information about the allocation number of each signal, in particular, refer to "a. Control input signal" in "3-4-2 Control input and output signal list".

### P620[6th & 5th digits]: Control input signal allocation 1 (DI3)

#### a. Setting item

Activating timing: Real-time Setting range: 00 to 99 Initial value: 60

#### b. Function

Set the allocation of control input signal DI3. If "00" is set, the input signal is ineffective.

#### c. Reference

For information about setting control input signals, refer to "3-4 Control input and output signals".

For information about the allocation number of each signal, in particular, refer to "a. Control input signal" in "3-4-2 Control input and output signal list".

# P620[8th & 7th digits]: Control input signal allocation 1(DI4)

### a. Setting item

Activating timing: Real-time Setting range: 00 to 99 Initial value: 26

**b.** Function

Function

Set the allocation of control input signal DI4. If "00" is set, the input signal is ineffective.

#### c. Reference

For information about setting control input signals, refer to "3-4 Control input and output signals".

For information about the allocation number of each signal, in particular, refer to "a. Control input signal" in "3-4-2 Control input and output signal list".

### P622[2nd & 1st digits]: Control output signal allocation 1 (DO1)

### a. Setting item

Activating timing: Real-time Setting range: 00 to 99

Initial value: 17

#### b. Function

Set the allocation of control output signal DO1. If "00" is set, the output signal is ineffective.

#### c. Reference

For information about setting control output signals, refer to "3-4 Control input and output signals"

For information about the allocation number of each signal, in particular, refer to "b. Control output signal" in "3-4-2 Control input and output signal list".

### P622[4th & 3rd digits]: Control output signal allocation 1 (DO2)

#### a. Setting item

Activating timing: Real-time Setting range: 00 to 99 Initial value: 51

#### b. Function

Set the allocation of control output signal DO2.

If "00" is set, the output signal is ineffective.

#### c. Reference

For information about setting control output signals, refer to "3-4 Control input and output signals".

For information about the allocation number of each signal, in particular, refer to "b. Control output signal" in "3-4-2 Control input and output signal list".

# P623[1st digit]: Control input signal condition setting 1 (RST)

### a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

### b. Function

Set the control input signal conditions.

### c. Setting selection

0: ON/OFF effective

1: OFF fixed

2: ON fixed

### P623[2nd digit]: Control input signal condition setting 1 (ARST)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P623[3rd digit]: Control input signal condition setting 1 (EMG)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

<In communication mode>

The emergency stop signal (EMG) of control input signal (CN1) follows this setting.

<In maintenance mode>

Only the emergency stop signal (EMG) with the switch box of VPH DES operates regardless of this setting.

The emergency stop signal (EMG) of control input signal (CN1) follows this setting.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P623[4th digit]: Control input signal condition setting 1 (SON)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

c. Setting selection

0: ON/OFF effective

1: OFF fixed

2: ON fixed

### P623[5th digit]: Control input signal condition setting 1 (DR)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P623[6th digit]: Control input signal condition setting 1 (CLR)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P623[7th digit]: Control input signal condition setting 1 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

**b.** Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P623[8th digit]: Control input signal condition setting 1 (TL)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P624[1st digit]: Control input signal condition setting 2 (FOT)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P624[2nd digit]: Control input signal condition setting 2 (ROT)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P624[3rd digit]: Control input signal condition setting 2 (MD1)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P624[4th digit]: Control input signal condition setting 2 (MD2)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P624[5th digit]: Control input signal condition setting 2 (GSL1)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P624[6th digit]: Control input signal condition setting 2 (GSL2)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P624[7th digit]: Control input signal condition setting 2 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P624[8th digit]: Control input signal condition setting 2 (RVS)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P625[1st digit]: Control input signal condition setting 3 (SS1)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P625[2nd digit]: Control input signal condition setting 3 (SS2)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P625[3rd digit]: Control input signal condition setting 3 (SS3)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P625[4th digit]: Control input signal condition setting 3 (SS4)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

**b.** Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P625[5th digit]: Control input signal condition setting 3 (SS5)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P625[6th digit]: Control input signal condition setting 3 (SS6)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P625[7th digit]: Control input signal condition setting 3 (SS7)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P625[8th digit]: Control input signal condition setting 3 (SS8)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P626[1st digit]: Control input signal condition setting 4 (ZST)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P626[2nd digit]: Control input signal condition setting 4(ZLS)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

**b.** Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P626[3rd digit]: Control input signal condition setting 4 (ZMK)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P626[4th digit]: Control input signal condition setting 4 (TRG)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P626[5th digit]: Control input signal condition setting 4 (CMDZ)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P626[6th digit]: Control input signal condition setting 4 (ZCAN)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P626[7th digit]: Control input signal condition setting 4 (FJOG)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P626[8th digit]: Control input signal condition setting 4 (RJOG)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P627[1st digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P627[2nd digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P627[3rd digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P627[4th digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P627[5th digit]: Control input signal condition setting 5 (MTOH)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P627[6th digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P627[7th digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

Set the control input signal conditions.

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

# P627[8th digit]: Control input signal condition setting 5 (Reserved)

a. Setting item

Activating timing: Real-time

Setting range: 0 to 2

Initial value: 0

b. Function

- c. Setting selection
  - 0: ON/OFF effective
  - 1: OFF fixed
  - 2: ON fixed

### P631[1st digit]: Deviation clear selection when SON signal is OFF

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the deviation clear setting when the servo on signal (SON) is turned OFF.

If deviation clear is made ineffective, error detection is performed with the value of [P175].

- c. Setting selection
  - 0: Deviation clear effective
  - 1: Deviation clear ineffective

### P633[1st digit]: Stopping selection when EMG signal is ON

a. Setting item

Activating timing: Real-time

Setting range: 0 to 1

Initial value: 0

b. Function

Select the stopping method when the emergency stop signal (EMG) is ON.

- c. Setting selection
  - 0: Servo OFF after braking stop
  - 1: Servo OFF

# P633[5th - 2nd digits]: Deceleration time after EMG signal braking stoppage

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 99.99

Initial value: 0.00

**b.** Function

Set the deceleration time of braking stoppage by turning ON the emergency stop signal (EMG).

The setting is the deceleration time required for stoppage from the motor maximum speed.

### P633[8th - 6th digits]: Servo OFF delay time after EMG braking stoppage

### a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 9.99

Initial value: 0.50

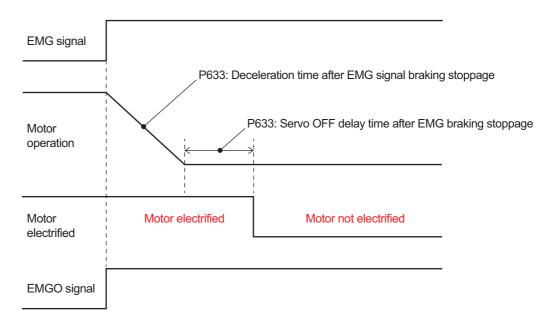
#### b. Function

Set the delay time from the braking stoppage by turning ON the emergency stop signal (EMG) until the motor electrification in-process signal (MTON) turns OFF.

As soon as the emergency stop signal (EMG) is turned ON, the motor performs braking stoppage.

When [0: Servo OFF after braking stop] is selected with [P633 (1st digit)], the motor performs deceleration stops in [P633 (5th - 2nd digits)], and the elapse of the time specified with this parameter, the motor enters the power-off state, and the power electrification inprocess signal (MTON) is switched OFF.

For a torque command, the torque command becomes zero without braking stoppage. If the motor is operating due to external force, etc., the motor un-electrified status is not assumed.



# P634[1st digit]: Reserved

- a. Setting item
- b. Function

Reserved area. Set the initial value.

### P634[5th - 2nd digits]: Deceleration time after OT signal braking stoppage

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 99.99

Initial value: 0.00

**b.** Function

Set the deceleration time of braking stoppage due to OT detection.

The setting is the deceleration time required for stoppage from the motor maximum speed.

For a torque command, the torque becomes zero without braking stoppage.

### P634[8th - 6th digits]: OT condition holding time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 9.99

Initial value: 2.00

b. Function

Set the time for which to hold the OT condition after an OT is detected and the OT is released.

### P635[1st digit]: Reserved

- a. Setting item
- b. Function

Reserved area. Set the initial value.

# P635[5th - 2nd digits]: Soft OT braking stoppage deceleration time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 99.99

Initial value: 0.00

b. Function

Set the deceleration time of braking stoppage due to soft OT detection.

The setting is the deceleration time required for stoppage from the motor maximum speed.

For a torque command, the torque becomes zero without braking stoppage.

### P635[8th - 6th digits]: Soft OT condition holding time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.00 to 9.99

Initial value: 2.00

b. Function

Set the time for which to hold the OT condition after a soft OT is detected and the OT is released.

### P636: TL signal torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 100.0

**b.** Function

Set the forward direction torque limit value when the torque limit signal (TL) is ON.

The torque is limited with whichever is lower of this setting and [P080].

For indirect data assignment, the following applies.

- A negative value results in indirect data assignment.
- · Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

# P637: TL signal torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 100.0

b. Function

Set the reverse direction torque limit value when the torque limit signal (TL) is ON.

The torque is limited with whichever is lower of this setting and [P081].

For indirect data assignment, the following applies.

- A negative value results in indirect data assignment.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

### P638[3rd - 1st digits]: MD signal delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 999

Initial value: 0

b. Function

Set the delay time from the time the mode selection signal (MD1 or MD2) is changed until the run mode is switched.

### P638[6th - 4th digits]: SS signal delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 999

Initial value: 0

b. Function

Set the delay time from the time the command selection signal (SS1 to SS8) is changed until the command is switched.

### P638[9th - 7th digits]: ZST signal delay time

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 999

Initial value: 0

b. Function

Set the delay time from the time the positioning start signal (ZST) is changed until positioning starts.

# P650[1st digit]: RDY signal specifications Selection of OT ALM signal is ON

a. Setting item

Activating timing: Reset or power ON

Setting range: 0 to 1

Initial value: 0

b. Function

Select the servo ready signal (RDY) condition when the alarm signal (ALM) is turned ON due to OT detection.

c. Setting selection

0: RDY signal OFF

1: RDY signal ON

# P650[2nd digit]: RDY signal specifications Selection of motor electrification ALM signal other than OT is ON

#### a. Setting item

Activating timing: Reset or power ON

Setting range: 0 to 1

Initial value: 0

#### **b.** Function

Select the servo ready signal (RDY) condition when the alarm signal (ALM) is turned ON if a non-OT alarm that does not cause servo off occurs.

### c. Setting selection

0: RDY signal OFF

1: RDY signal ON

### P651: SZ signal speed range

### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the speed zero signal (SZ) output range.

If the motor speed is within this setting, the speed zero signal (SZ) is switched ON.

# P652: VCP signal speed deviation range

#### a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 10000 (when P161 is the initial state, 10000 pulse/s)

#### b. Function

Set the speed attainment signal (VCP) output range.

If the difference between the speed command and the motor speed is within this setting, the speed attainment signal (VCP) is switched ON.

# P653: PE1 signal deviation range

### a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 99999999

Initial value: 10

#### b. Function

Set the position deviation range 1 signal (PE1) and positioning complete 1 signal (PN1) output deviation range.

#### P654: PE1 signal delay time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.000 to 9.999

Initial value: 0.000

#### **b.** Function

Set the delay time from the time the deviation becomes equal to or less than the [P653] setting until the position deviation range 1 signal (PE1) and the positioning complete 1 signal (PN1) turn ON.

#### P655: PE2 signal deviation range

a. Setting item

Activating timing: Real-time

Setting unit: FB pulse

Setting range: 0 to 99999999

Initial value: 10

b. Function

Set the position deviation range 2 signal (PE2) and positioning complete 2 signal (PN2) output deviation range.

## P656: PE2 signal delay time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.000 to 9.999

Initial value: 0.000

#### b. Function

Set the delay time from the time the deviation becomes equal to or less than the [P655] setting until the position deviation range 2 signal (PE2) and the positioning complete 2 signal (PN2) turn ON.

#### P657: PRF signal distance

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit

Setting range: -2147483648 to 2147483647

Initial value: 1000 (when P161 is the initial state, 1000 pulses)

b. Function

Set the rough match signal (PRF) output range.

If the sum of the current position and the accumulated amount of the command due to S-curve acceleration/deceleration is within this setting value range, the rough match signal (PRF) is switched ON.

The specifications of the setting are listed below.

- For a positive value, [C020: Current position (Command position)] is used as the current position.
- For a negative value, [C021: Current position (Feedback position)] is used as the current position.

For positioning via communication from a master controller, the settings are listed below.

• Regardless of whether the value is positive or negative, [C021: Current position (Feedback position)] is used as the current position.

#### P658[4th - 1st digits]: Brake release delay time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.000 to 9.999

Initial value: 0.000

b. Function

Set the delay time from the time the motor is electrified until the brake is released (BRK signal ON).

## P658[8th - 5th digits]: Brake activation delay time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.000 to 9.999

Initial value: 0.000

b. Function

Set the delay time from the time the brake is activated (BRK signal OFF) when an alarm, emergency stop, servo OFF, or reset occurs until the motor un-electrified status (MTON signal OFF) is assumed.

## P659: Brake activation effective low speed range

a. Setting item

Activating timing: Real-time Setting unit: P161 setting unit/s Setting range: 0 to 300000000

Initial value: 0

b. Function

Set the speed range in which to activate the brake.

## P660: Brake enforced activation delay time

a. Setting item

Activating timing: Real-time

Setting unit: s

Setting range: 0.000 to 9.999

Initial value: 0.000

**b.** Function

Set the delay time after which to activate the brake.

#### P800[1st digit]: Marker transit selection at communication mode

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 1 Function

Select the zero point return condition after power-on in communication mode.

- \* Effective if [P060: Encoder type] is "S-ABS2".
- \* When ineffective, the operation of "0: Homing can be done after marker transition" is assumed.
- b. Setting selection
  - 0: Homing can be done after marker transition
  - 1: Zero point return possible

## P801[1st digit]: NET SEL number selection at gain switching command OFF

a. Setting item

Activating timing: Real-time

Setting range: 0 to 7

Initial value: 0

b. Function

Select the NET SEL number to use when the gain switching signal of the controller is OFF.

- c. Setting selection
  - 0: NETSEL0
  - 1: NETSEL1
  - 2: NETSEL2
  - 3: NETSEL3
  - 4: NETSEL4
  - 5: NETSEL5
  - 6: NETSEL6
  - 7: NETSEL7

# P801[2nd digit]: NET SEL number selection at gain switching command ON

#### a. Setting item

Activating timing: Real-time

Setting range: 0 to 7

Initial value: 1

#### b. Function

Select the NET SEL number to use when the gain switching signal of the controller is ON.

- c. Setting selection
  - 0: NETSEL0
  - 1: NETSEL1
  - 2: NETSEL2
  - 3: NETSEL3
  - 4: NETSEL4
  - 5: NETSEL5
  - 6: NETSEL6
  - 7: NETSEL7

# P802[1st digit]: VCII communication mode selection for the connection test

#### a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

#### **b.** Function

Set it to connect to a controller not supported by the servo driver in a connection test.

Usually, set "0".

#### c. Setting selection

- 0: Ineffective
- 1: Effective

Connect the servo driver to the network as VCII-D7.

\* Set this setting to "1: Effective" only if it is necessary to run an unsupported controller in a test.

Do not use it in normal operation because the alarm code, etc. do not match.

## P803[1st digit]: Select load factor unit for monitoring

a. Setting item

Activating timing: Power ON

Setting range: 0 to 1

Initial value: 0

b. Function

Select the unit of the load factor to be monitored by the controller.

This setting is applied to the peak load factor, effective load factor, and regenerative load factor.

To monitor the load factor, usually select "1: % unit".

c. Setting selection

0: 0.1% unit

1: % unit

## P820[1st digit]: NET SEL 0 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

Select a gain number to be used in the communication mode.

c. Setting selection

0: Gain No. 0

1: Gain No. 1

2: Gain No. 2

3: Gain No. 3

#### P823: NET SEL 0 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P824[4th - 1st digits]: NET SEL 0 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P824[8th - 5th digits]: NET SEL 0 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

## P825: NET SEL 0 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P826: NET SEL 0 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

## P830[1st digit]: NET SEL 1 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 1

**b**. Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P833: NET SEL 1 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P834[4th - 1st digits]: NET SEL 1 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P834[8th - 5th digits]: NET SEL 1 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

#### P835: NET SEL 1 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P836: NET SEL 1 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

#### P840[1st digit]: NET SEL 2 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 2

b. Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P843: NET SEL 2 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P844[4th - 1st digits]: NET SEL 2 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P844[8th - 5th digits]: NET SEL 2 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

#### P845: NET SEL 2 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P846: NET SEL 2 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

## P850[1st digit]: NET SEL 3 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

**b**. Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P853: NET SEL 3 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P854[4th - 1st digits]: NET SEL 3 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P854[8th - 5th digits]: NET SEL 3 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

#### P855: NET SEL 3 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

**b.** Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P856: NET SEL 3 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

## P860[1st digit]: NET SEL 4 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 0

b. Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P863: NET SEL 4 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P864[4th - 1st digits]: NET SEL 4 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P864[8th - 5th digits]: NET SEL 4 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

#### P865: NET SEL 4 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P866: NET SEL 4 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

## P870[1st digit]: NET SEL 5 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 1

**b.** Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P873: NET SEL 5 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P874[4th - 1st digits]: NET SEL 5 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P874[8th - 5th digits]: NET SEL 5 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

## P875: NET SEL 5 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P876: NET SEL 5 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

## P880[1st digit]: NET SEL 6 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 2

b. Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P883: NET SEL 6 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P884[4th - 1st digits]: NET SEL 6 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P884[8th - 5th digits]: NET SEL 6 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

#### P885: NET SEL 6 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P886: NET SEL 6 Torque limit value -

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Example) To specify the indirect data IX15, set "-1.5".

## P890[1st digit]: NET SEL 7 Gain No. selection

a. Setting item

Activating timing: Real-time

Setting range: 0 to 3

Initial value: 3

**b.** Function

Select a gain number to be used in the communication mode.

- c. Setting selection
  - 0: Gain No. 0
  - 1: Gain No. 1
  - 2: Gain No. 2
  - 3: Gain No. 3

#### P893: NET SEL 7 S-curve time 1

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: -9.9 to 1000.0

Initial value: 10.0

b. Function

Set the S-curve acceleration/deceleration time in the communication mode.

This setting is effective only in the position control mode.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

#### P894[4th - 1st digits]: NET SEL 7 Delay compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the delay compensation time in the communication mode.

This setting is effective in the position control mode.

#### P894[8th - 5th digits]: NET SEL 7 Lead compensation

a. Setting item

Activating timing: Real-time

Setting unit: ms

Setting range: 0 to 99.99

Initial value: 0.00

b. Function

Set the advance compensation time in the communication mode.

This setting is effective in the position control mode.

## P895: NET SEL 7 Torque limit value +

a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no forward direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

## P896: NET SEL 7 Torque limit value -

#### a. Setting item

Activating timing: Real-time

Setting unit: %

Setting range: -9.9 to 799.9

Initial value: 300.0

#### b. Function

Set the motor output torque limit value in communication mode.

Effective if "Torque limit with driver setting" is selected in the controller.

For a setting that exceeds the peak torque of the motor, the output torque is clamped to the peak torque.

If "0" is set, no negative direction torque is generated.

For indirect data assignment, the following applies.

- To specify indirect data, set a negative value.
- Set the indirect data number in the lower two digits, regardless of the decimal point.

Low speed position loop derivative time constant

Positioning command delay time

P258 P259 P260

Position loop derivative time constant

P257

Low speed position loop gain

Position loop gain

P255 P256 Speed feed forward filter time constant

Speed feed forward shift ratio

Speed feed forward ratio

Torque feed forward filter time constant

P264

P265

Notch filter center frequency

Viscous friction feed forward ratio

Inertia feed forward ratio

Viscous friction

P261

Low speed loop proportional gain distribution factor Low speed loop derivative gain distribution factor

Speed loop integral torque limit value

# 9-5 Relationships among command selection, SEL numbers, and gain numbers

#### 9-5-1 Communication command

Command selection SS1 - SS3	Speed command parameters		NETSEL1 parameters		Gain No. parameters			Gain No. 1 parameters
	NETSELO	\ _	P830 Communication command Gain No. selection	0	Gain No. 0	/	P240	P240 Low speed gain switching speed
0	P820 - P829	_	P833 Communication command S-curve time 1	<u> </u>	P210 - P239	\	P241	P241 Low speed gain switching deviation pulse
1	NETSEL1	_	P834 Communication command Delay compensation	0	Gain No. 1		P242	Normal speed -> Low speed gain switching filter time constant
_	P830 - P839		Communication command Lead compensation	<u> </u>	P240 - P269			Low speed -> Normal speed gain switching filter time constant
,	NETSEL2	_	P835 Communication command Torque limit value +	_	Gain No. 2			Low speed gain switching spec 1 selection
7	- P840 - P849	_	P836 Communication command Torque limit value -	<u>а</u> /	P270 - P299			Low speed gain switching spec 2 selection
"	NETSEL3				Gain No. 3		P243	Low speed gain switching delay time
ט <u> </u>	P850 - P859			٧	P300 - P329			Low speed gain holding time after switching
	NETSEL4						P244	Speed loop proportional gain
1	P860 - P869						P245	Speed loop integral time constant
5.							P246	Speed loop derivative time constant
י כ	P870 - P879						P247	Speed loop proportional gain distribution factor
ď	NETSEL6						P248	Speed loop derivative gain distribution factor
· -	P880 - P889						P249	Low speed loop proportional gain
7	, NETSEL7						P250	P250 Low speed loop integral time constant
•	P890 - P899						P251	P251 Low speed loop derivative time constant

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the communication command mode

Low speed position loop derivative time constant

Positioning command delay time

P258

P259 P260 P261 P263 P264 P265

Position loop derivative time constant

P257

Low speed position loop gain

Position loop gain

P255 P256

P254

Speed feed forward filter time constant

Speed feed forward shift ratio

Speed feed forward ratio

Filter derivative coefficient while stopping Torque feed forward filter time constant

Viscous friction feed forward ratio

Inertia feed forward ratio

Viscous friction Inertia

P262

Filter time constant while stopping

Notch filter center frequency Notch filter band width ratio

P266

Low speed loop derivative gain distribution factor

Speed loop integral torque limit value

#### **Speed command** 9-5-2

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the speed command mode

<del>,cu c</del>	O.	•••		a		<u>и</u>											
Gain No. 1 parameters	P240 Low speed gain switching speed	P241 Low speed gain switching deviation pulse	P242 Normal speed -> Low speed gain switching filter time constant	Low speed -> Normal speed gain switching filter time constant	Low speed gain switching spec 1 selection	Low speed gain switching spec 2 selection	P243 Low speed gain switching delay time	Low speed gain holding time after switching	P244 Speed loop proportional gain	P245 Speed loop integral time constant	P246 Speed loop derivative time constant	P247 Speed loop proportional gain distribution factor	P248 Speed loop derivative gain distribution factor	P249 Low speed loop proportional gain	P250 Low speed loop integral time constant	P251 Low speed loop derivative time constant	P252 Low speed loop proportional gain distribution factor
								_									
Gain No. parameters	Gain No. 0	P210 - P239	Gain No. 1	P240 - P269	Gain No. 2	P270 - P299	Gain No. 3	P300 - P329									
	7	<u>.                                    </u>	_	_				_									
SPDSEL1 parameters	P413 Speed command Speed command spec selection	Speed command Gain No. selection	Speed command Overtravel spec selection	P414 Speed command Speed command value	P415 Speed command Torque limit value												
	_	\	_	:	_												
Speed command parameters	SPDSEL0	P410 - P412	SPDSEL1	P413 - P415	SPDSEL2	P416 - P418	SPDSEL3	P419 - P421	SPDSEL4	P422 - P424	SPDSEL5		SPDSEL6		SPDSEL7	P431 - P433	
Command selection SS1 - SS3		<b>D</b>	7		C	N -	C	0		1	и	,	9	0		,	

Filter time constant while stopping

Notch filter center frequency Notch filter band width ratio

P266

P265

Notch filter depth

#### 9-5-3 **Torque command**

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the torque command mode

Low speed position loop derivative time constant Low speed -> Normal speed gain switching filter time constant Normal speed -> Low speed gain switching filter time constant Speed loop proportional gain distribution factor Low speed loop proportional gain distribution factor Low speed gain holding time after switching Speed loop derivative gain distribution factor Low speed gain switching spec 1 selection Low speed gain switching spec 2 selection Low speed loop derivative gain distribution factor Low speed gain switching deviation pulse Filter derivative coefficient while stopping Low speed loop derivative time constant Torque feed forward filter time constant Speed feed forward filter time constant Low speed loop integral time constant Position loop derivative time constant Speed loop integral torque limit value Low speed gain switching delay time Speed loop derivative time constant Speed loop integral time constant Viscous friction feed forward ratio Low speed loop proportional gain Positioning command delay time Low speed gain switching speed Sain No. 1 parameters Speed feed forward shift ratio Low speed position loop gain Speed loop proportional gain Speed feed forward ratio Inertia feed forward ratio Position loop gair Viscous friction Inertia P240 P241 P242 P243 P244 P245 P246 P247 P248 P250 P251 P252 P253 P254 P255 P256 P258 P259 P260 P262 P263 P264 P249 P261 >257 P210 - P239 parameters P240 - P269 P270 - P299 P300 - P329 Gain No. 3 Gain No. Gain No. 2 Gain No. 0 Gain No. Torque command spec selection Torque command Overtravel spec selection P445 Torque command Torque command value Forque command Gain No. selectior P446 Torque command Speed limit value **IRQSEL1** parameters P444 Torque command Torque command P444 - P446 P447 - P449 P441 - P443 P450 - P452 P453 - P455 P456 - P458 P462 - P464 P459 - P461 parameters TROSEL4 **TRQSEL6 TRQSEL2 TRQSEL3 TRQSEL5** TRQSEL0 **TRQSEL1 RQSEL7** selection SS1 - SS3 Command

#### 9-5-4 Built-in command (command)

Relationships among command selection SS1 to SS8, SEL numbers, and gain numbers for the POS, INDX, and HOME commands

Low speed position loop derivative time constant Normal speed -> Low speed gain switching filter time constant Low speed -> Normal speed gain switching filter time constant Speed loop proportional gain distribution factor Low speed loop proportional gain distribution factor Speed loop derivative gain distribution factor Low speed gain holding time after switching Low speed gain switching spec 1 selection Low speed gain switching spec 2 selection Low speed loop derivative gain distribution factor Low speed gain switching deviation pulse Filter derivative coefficient while stopping Low speed loop derivative time constant Torque feed forward filter time constant Speed feed forward filter time constant Low speed loop integral time constant Position loop derivative time constant Low speed gain switching delay time Speed loop integral torque limit value Speed loop derivative time constant Filter time constant while stopping Viscous friction feed forward ratio Speed loop integral time constant Low speed loop proportional gain Positioning command delay time Low speed gain switching speed Sain No. 1 parameters Speed feed forward shift ratio Low speed position loop gain Notch filter center frequency Speed loop proportional gair Notch filter band width ratio Speed feed forward ratio Inertia feed forward ratio Position loop gain Notch filter depth Viscous friction Inertia P242 P243 P246 P240 P241 P245 P247 P248 P249 P250 P251 P252 P253 P254 P255 P256 P257 P258 P259 P260 P261 P262 P263 P264 P265 P266 P270 - P299 Gain No. 3 oaram eters 210 - P239 240 - P269 P300 - P329 Gain No. Gain No. 2 Gain No. 0 Gain No. 1 Built-in command Acceleration standard speed Built-in command Homing incomplete signal selection Built-in command Overtravel spec selection Built-in command Gain No. selection Built-in command Deceleration time P527 Built-in command Acceleration time Built-in command Torque limit value >526 Built-in command Deceleration standard speed P529 Built-in command S-curve time 1 SEL1 parameters P525 P528 524 parameters 2538 - P544 2552 - P558 P566 - P572 P517 - P523 P524 - P530 P531 - P537 2559 - P565 <sup>2</sup>545 - P551 SEL SEL3 SEL4 SEL5 SEL6 SEL1 SEL2 SEL7 POS-INDEX-HOME SEL1 POS-INDEX-HOME POS-INDEX-HOME POS-INDEX-HOME POS-INDEX-HOME POS.INDEX.HOME POS-INDEX-HOME POS: INDEX: HOME POS-INDEX-HOME POS-INDEX-HOME POS · INDEX · HOME POS-INDEX-HOME Command SEL0 SEL5 SEL0 SEL6 SEL4 SEL7 253 SEL5 SEL2 252 SEL3 SEL1 254 SEL2 255 Command SS1 - SS8 selection

Filter derivative coefficient while stopping

Filter time constant while stopping

Notch filter center frequency Notch filter band width ratio Notch filter depth

P266

Torque feed forward filter time constant

P264 P265

Viscous friction feed forward ratio

#### 9-5-5 Built-in command (jog)

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the jog mode

Low speed position loop derivative time constant Normal speed -> Low speed gain switching filter time constant Low speed -> Normal speed gain switching filter time constant Speed loop proportional gain distribution factor Low speed loop proportional gain distribution factor Speed loop derivative gain distribution factor Low speed gain holding time after switching Low speed loop derivative gain distribution factor Low speed gain switching spec 1 selection Low speed gain switching spec 2 selection Low speed gain switching deviation pulse Low speed loop derivative time constant Speed feed forward filter time constant Low speed loop integral time constant Low speed gain switching delay time Speed loop integral torque limit value Position loop derivative time constant Speed loop derivative time constant Speed loop integral time constant Low speed loop proportional gain Positioning command delay time Low speed gain switching speed Gain No. 1 parameters Speed feed forward shift ratio Low speed position loop gain Speed loop proportional gain Speed feed forward ratio Inertia feed forward ratio Position loop gain Viscous friction Inertia P240 P241 P242 P243 P244 P245 P246 P247 >248 249 P250 P251 P252 P253 P254 P255 P256 257 P258 P259 P260 P261 P262 P263 P210 - P239 P240 - P269 P270 - P299 P300 - P329 parameters Gain No. Gain No. 2 Gain No. 3 Gain No. 0 Gain No. 1 P518 Built in command Acceleration standard speed Built-in command Homing incomplete signal selection Built-in command Overtravel spec selection Built-in command Gain No. selection P521 Built-in command Deceleration time Built-in command Acceleration time Built-in command Torque limit value P519 Built-in command Deceleration standard speed Built-in command S-curve time 1 SEL0 parameters P520 P523 P517 P517 - P523 parameters SEL SEL0 parameters Jog speed P578 P574 P575 P576 P579 P573 P577 P580 selection SS1 - SS3 Command

# Chapter 10 Status display

10-1 Status display	10-2
10-2 Alarm display	
10-3 Driver information display	10-12

## 10-1 Status display

#### C000: User desired status display item

Displays a user desired status display item.

When C001 or a subsequent status display number is specified in [P600], the value of the specified item is displayed in C000. The value of this item is displayed immediately after the termination of power on initial display (all LEDs are on). You can specify a frequently used item to check the status more smoothly.

If "0" is set in [P600]:

In the communication mode, the "C110: Communication mode operation state" value is displayed.

In the maintenance mode, "PC-" is displayed.

Setting unit	Setting range
Same as for the item selected	Same as for the item selected
in P600	in P600

#### C001: Actual operation speed of motor

Displays the actual motor operation speed.

Setting unit	Setting range
P161 setting unit/sec	-300000000 to 300000000

## C002: Operable max speed

Displays the maximum operable speed.

Setting unit	Setting range				
P161 setting unit/sec	-300000000 to 300000000				

## C004: Actual motor operating rotational speed

Displays the actual motor rotation speed.

Setting unit	Setting range
rpm	-99999 to 99999

## C005: Actual torque command value

Displays the actual torque command value.

When the motor rated torque is set, 100% is displayed.

Setting unit	Setting range
0.1%	-799.9 to 799.9

#### C006: Peak torque command value

Displays the peak torque command value.

When the motor rated torque is set, 100% is displayed.

Setting unit	Setting range
0.1%	-799.9 to 799.9

#### C008: Load factor of motor

Displays the motor load ratio (effective value).

When the motor rated load is applied, 100% is displayed.

Setting unit	Setting range
0.1%	0.0 to 300.0

## C009: + Torque limit value

Displays the + torque limit value.

When the motor rated torque is set, 100% is displayed.

Setting unit	Setting range
0.1%	0.00 to 799.9

## C010: - Torque limit value

Displays the - torque limit value.

When the motor rated torque is set, 100% is displayed.

Setting unit	Setting range
0.1%	0.00 to 799.9

## C011: Speed limit value

Displays the speed limit value.

Setting unit	Setting range
P161 setting unit/sec	0 to 30000000

## C012: Thermal trip rate of motor

Displays the motor thermal trip rate.

When the display data indicates 100.0 (100%), a "motor overload error" is detected.

Setting unit	Setting range
0.1%	0.0 to 100.0

#### C014: Thermal trip ratio of driver

Displays the device thermal trip rate.

When the display data indicates 100.0 (100%), a "driver overload error" is detected.

Setting unit	Setting range
0.1%	0.0 to 100.0

#### C016: Main power supply DC voltage value

Displays the DC voltage value of the main power supply.

Setting unit	Setting range
V	0 to 999

#### C017: Peak servo control error ratio

Displays the peak servo control error detection rate.

When the display data indicates 100.0 (100%), a "servo control error" is detected. This error detection rate can be adjusted using "P120: Servo control error detection dead band torque".

The error detection rate is cleared to 0 when:

- The RST signal is switched ON after a servo control error occurs.
- The setting of P120 is changed.

Setting unit	Setting range
0.1%	0.0 to 300.0

## C018: Regenerative overload factor

Displays the regenerative resistor overload rate.

When the display data indicates 100.0 (100%), "regenerative resistor overload error" is detected.

Setting unit	Setting range
0.1%	0.0 to 100.0

## C019: ABS Encoder position

Displays the ABS encoder position.

Reads position data from the encoder.

Setting unit	Setting range
Encoder pulse	-2147483648 to 2147483647

## C020: Current position(Command position)

Displays the current position (command position).

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

#### **C021: Current position(Feedback position)**

Displays the current position (feedback position).

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

## C022: INC position

Displays the incremental position.

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

#### C023: Encoder pulse cumulative quantity

Displays the accumulated number of encoder pulses.

Setting unit	Setting range
Encoder pulse	-2147483648 to 2147483647

## **C024: Encoder position**

Displays the encoder position.

Setting unit	Setting range
Encoder pulse	-2147483648 to 2147483647

## C025: 1 rotation position of encoder

Displays the encoder 1-rotation position.

Setting unit	Setting range
Encoder pulse	-2147483648 to 2147483647

## C026: Position deviation pulse

Displays the position deviation pulses.

Setting unit	Setting range
Encoder pulse	-2147483648 to 2147483647

## C032: Virtual encoder pulse count

Displays the accumulated number of virtual encoder pulses (mechanical travel amount).

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

#### C033: Virtual encoder position per rotation

Displays the 1 rotation position on virtual encoder pulses.

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

#### C034: Virtual encoder multi turn counter value

Displays the multi turn counter value on virtual encoder pulses.

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

#### C035: Virtual encoder position deviation

Displays the position deviation on virtual encoder pulses.

Setting unit	Setting range
P161 setting unit	-2147483648 to 2147483647

#### C100: External I/O signal status

Displays the external input/output control signal status.

Setting unit	Setting range
None	0 to 9999999

## C101: Internal input signal status 1

Displays internal input control signal status 1.

Setting unit	Setting range
None	0 to 9999999

## C102: Internal input signal status 2

Displays internal input control signal status 2.

Setting unit	Setting range
None	0 to 9999999

## C103: Internal output signal status 1

Displays internal output control signal status 1.

Setting unit	Setting range
None	0 to 99999999

## C104: Internal output signal status 2

Displays internal output control signal status 2.

Setting unit	Setting range
None	0 to 9999999

#### C106: SEL number

Displays the current SEL number.

For each run mode, the following SEL name is assigned.

SPDSEL: Speed command
TRQSEL: Torque command
SEL: Built-in command

• NETSEL: Communication mode command

Setting unit	Setting range
None	0 to 7

#### C107: Gain number

Displays the current gain number.

Setting unit	Setting range
None	0 to 3

#### C108: Command address

Displays the address of the command being executed or the address of the command which has been executed. "0" is displayed from power-on until the execution of the first command.

Setting unit	Setting range
None	0 to 255

#### C109: Network connection state

Displays the network connection state.

- 0: No connection
- 1: Getting ready for connection
- 2: Connecting

Setting unit	Setting range
None	0 to 2

#### C110: Communication mode operation state

Displays the current communication mode.

- 1: Connection station detecting phase
- 2: Network parameter setting phase
- 3: Initial communication 1st phase
- 4: Initial communication 2nd phase
- 5: Initial communication 3rd phase
- 6: Initial communication 4th phase
- 7: Initial communication 5th phase
- 8: Run time phase (Ready OFF & Servo OFF)
- 9: Runtime phase (Ready ON & Servo OFF)
- 10: Run time phase (Ready ON & Servo ON)
- 11: Communication shut down
- 12: Waiting for hot start

Setting unit	Setting range
None	1 to 21

#### C111: SSCNETIII(/H) control axis number

Displays the SSCNETIII(/H) control axis number of this device.

Setting unit	Setting range
Shaft	1 to 64

#### C112: Function mode

Displays the current function mode.

- 0: Maintenance mode
- 1: Communication mode
- 2: Maintenance mode (VPH DES)

Setting unit	Setting range
None	0 to 2

#### C113: Motion mode

Displays the current motion mode.

- 0: Self-diagnosis mode
- 1: Normal operation mode
- 2: Communication operation mode

Setting unit	Setting range
None	0 to 2

## C114: Operation mode

Displays the current operation mode.

- 0: Self-diagnosis in process
- 1: Speed command mode
- 2: Torque command mode
- 3: Position control mode
- 4: Built-in command mode

Setting unit	Setting range
None	0 to 99999999

#### C115: Connection network

Displays the current connection network.

- 0: No connection
- 1: SSCNETIII
- 2: SSCNETIII/H
- 3: No connection (VCII communication test)
- 4: SSCNETIII (VCII communication test)
- 5: SSCNETIII/H (VCII communication test)

Setting unit	Setting range
None	0 to 5

## C116: Frame communication cycle

Displays the frame communication cycle.

Setting unit	Setting range
0.001 ms	0.000 to 9.999

## C117: Data update cycle

Displays the data update cycle.

Setting unit	Setting range
0.001 ms	0.000 to 9.999

# 10-2 Alarm display

In the alarm display mode, an item and its corresponding data are displayed at a time.

#### **AL: Present alarm**

Displays the present alarm.

Setting unit	Setting range
None	AL.A00 to AL.EFF

#### A0: Latest alarm

Displays the latest alarm.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# A1: 1 time previous alarm

Displays the latest alarm but one.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# A2: 2 times previous alarm

Displays the latest alarm but two.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# A3: 3 times previous alarm

Displays the latest alarm but three.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# A4: 4 times previous alarm

Displays the latest alarm but four.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# A5: 5 times previous alarm

Displays the latest alarm but five.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# **FL: Present warning**

Displays the present warning.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# F0: Latest warning

Displays the latest warning.

Setting unit	Setting range
None	AL.A00 to AL.EFF

# 10-3 Driver information display

#### L000: Model number

Displays the model number.

Setting unit	Setting range
None	0 to 9999

## L001: Driver output capacity

Displays the driver output capacity.

Setting unit	Setting range
W	50 to 99999

# L002: Driver input power supply voltage

Displays the driver input power supply voltage.

Setting unit	Setting range
V	100 to 400

#### L003: Hardware version

Displays the hardware version.

Setting unit	Setting range
None	0 to 9999

#### L004: Software version

Displays the software version.

Setting unit	Setting range
None	0 to 9999

# L005: Special software code

Displays the special software code.

Setting unit	Setting range
None	0 to 9999

## L006: Driver serial number (Upper)

Displays the upper digits of the equipment manufacture serial number.

The serial No. is an ASCII code in decimal notation.

[Example]

If the serial number is "AB01", the ASCII code in decimal notation is "65,66,48,49". The serial number "AB01" is displayed as "65664849".

Setting unit	Setting range
None	-2147483648 to 2147483647

## L007: Driver serial number (Lower)

Displays the lower digits of the equipment manufacture serial number.

The serial No. is an ASCII code in decimal notation.

Setting unit	Setting range
None	-2147483648 to 2147483647

#### L010: Driver system software number

Displays the driver system software number.

Setting unit	Setting range
None	0 to 9999

#### L012: Special hardware code

Displays the special hardware code.

Setting unit	Setting range
None	0 to 9999

#### L013: Driver revision number

Displays the driver revision number.

Setting unit	Setting range
None	0 to 9999

# L021: Absolute position compensation data

Displays data indicating whether ABS position compensation data is valid or invalid.

0: Invalid

1: Valid

Setting unit	Setting range
None	0 to 1

## L040: Encoder type

Displays the encoder type.

The encoder selected with [P060: Encoder type] is assumed.

Setting unit	Setting range
None	0 to 17

#### L070 to L077: Motor type (upper to lower 32 characters)

Device No.: D0540 to D0555

Displays the motor type of the connected motor.

The motor type is an ASCII code in decimal notation.

The value is displayed top-aligned (L070), with empty locations replaced by spaces.

#### L070 to L077

Setting unit	Setting range
None	-2147483648 to 2147483647

## L078 to L085: Motor model (upper to lower 32 characters)

Device No.: D0556 to D0571

Displays the motor model of the connected motor.

The motor model is an ASCII code in decimal notation.

The value is displayed top-aligned (L078), with empty locations replaced by spaces.

#### L078 to L085

Setting unit	Setting range
None	-2147483648 to 2147483647

# L086: Motor serial number (upper)

Device No.: D0572 to D0573

Displays the motor serial number of the connected motor.

The motor serial number is an ASCII code in decimal notation.

Setting unit	Setting range	
None	-2147483648 to 2147483647	

## L087: Motor serial number (lower)

Device No.: D0574 to D0575

Displays the motor serial number of the connected motor.

The motor serial number is an ASCII code in decimal notation.

Setting unit	Setting range
None	-2147483648 to 2147483647

# L088: Mechanical angle offset

Device No.: D0576 to D0577

Displays the mechanical angle offset of the connected motor.

Setting unit	Setting range	
None	-2147483648 to 2147483647	

# L089: Electric angle offset

Device No.: D0578 to D0579

Displays the electric angle offset of the connected motor.

Setting unit	Setting range	
None	-2147483648 to 2147483647	

Chapter 10 Status display > 10-3 Driver information display

# Chapter 11 Self-diagnosis

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# 11-1 Self-diagnosis mode configuration

This device has a self-diagnosis function for auto-tuning and checking external input/output signals and internal circuit.

The following three types of self-diagnosis modes are available.

#### 1. Self-diagnosis

In this mode, self-diagnosis is executed for auto-tuning, external wiring of the driver, or driver error check.

Execute self-diagnosis using VPH DES.

#### 2. Self-diagnosis for the manufacturer

In this mode, self-diagnosis dedicated to the manufacturer is executed for adjustment at shipment.

Do not execute this mode unless there are such instructions from the manufacturer.

#### 3. Device parameter edit

In this mode, device parameter editing dedicated to the manufacturer is executed for adjustment at shipment.

Do not execute this mode unless there are such instructions from the manufacturer.

<u> </u>				
<b>⊘</b> Prohibition	Do not execute self-diagnosis for the manufacturer or device parameter editing.	If self-diagnosis for the manufacturer or device parameter editing is executed improperly, the motor may run out of control, burn out, or be damaged or the device may burn out or be damaged.		

# 11-2 Input/output signals related to self-diagnosis

The following table indicates whether each signal is valid or invalid during the execution of self-diagnosis.

Table 11-1 List of signals that are valid during self-diagnosis

Control input signal			Control output signal		
Signal name	Signal code		Signal name Signal code		
Reset	RST	0	Alarm	ALM	0
Alarm reset	ARST	0	Warning	WNG	0
Emergency stop	EMG	0	Servo ready	RDY	0
Servo on	SON	_	Speed Zero	SZ	0
Drive	DR	_	Position deviation range 1, 2	PE1, PE2	0
Deviation clear	CLR	_	Positioning complete 1, 2	PN1, PN2	0
_	_		Positioning complete response 1, 2	PZ1, PZ2	_
Torque limit	TL	0	Command complete	ZN	
Forward direction overtravel	FOT	0	Command complete response	ZZ	1
Reverse direction overtravel	ROT	0	Command drive ready	ZRDY	
Mode select 1, 2	MD1, MD2	_	Rough match	PRF	0
Gain select 1, 2	GSL1, GSL2	0	Speed attainment	VCP	0
Command direction inversion	RVS	_	Brake release	BRK	0
Command selection 1 to 3	SS1 - SS3	_	Limit in-Process	LIM	0
Command selection 4 to 8	SS4 - SS8	_	Emergency stop	EMGO	0
Positioning drive	ZST	_	Zero point return complete	НСР	0
Zero point deceleration	ZLS	_	Command zero in- process	HLDZ	_
External zero point marker	ZMK	_	Overtravel in-process	ото	0
External trigger	TRG	_	Motor electrification in- process	MTON	0
Command zero	CMDZ	_	Speed command mode in-process	SMOD	0
Positioning cancel	ZCAN	_	Torque command mode in-process	TMOD	0
Forward direction jog	FJOG	_	Position control mode in- process	PMOD	0
Reverse direction jog	RJOG	_	Built-in command mode in-process	NMOD	0
_	_	_	Common output 1 - 8	OUT1 - OUT8	_
Motor overheat	МТОН	0	Marker output	OCEM	0

# 11-3 Diagnosis items

The self-diagnosis items are listed below.

In the self-diagnosis mode, the data display LED panel indicates P[d.

#### d000: Auto tuning gain number 0

Measures the motor load and sets the position loop gain and speed loop gain for gain No. 0 Parameters.

#### d001: Auto tuning gain number 1

Same as for d000. Sets values for gain No. 1 parameters.

# d002: Auto tuning gain number 2

Same as for d000. Sets values for gain No. 2 parameters.

#### d003: Auto tuning gain number 3

Same as for d000. Sets values for gain No. 3 parameters.

#### d004: Test run

Repeats positioning by the specified distance.

a. Operation specification

[P604] - [P607]

\* The self-diagnosis in which the motor runs stops when an alarm occurs or the RST, EMG, or OT signal is switched ON.

# d005: Forced Jog

Performs motor jog operation.

a. Operation specification

Jog speed = Command number 0, SEL0 (P573)

- \* When the operation speed exceeds ±100000, ±99999 is displayed.
- \* The self-diagnosis in which the motor runs stops when an alarm occurs or the RST, EMG, or OT signal is switched ON.

## d007: DC energization

Performs DC energization at 70% of the motor rated current.

- \* The motor draws in electric angle 0° by DC energization.
- \* The self-diagnosis in which the motor runs stops when an alarm occurs or the RST, EMG, or OT signal is switched ON.

# d012: U phase electric current FB display

Displays U phase current feedback.

#### d013: V phase electric current FB display

Displays V phase current feedback.

## d014: W phase electric current FB display

Displays W phase current feedback.

## d015: Absolute position compensation data transmission (VPH → IPU)

Transfers absolute position compensation related data (compensation values and user parameters) stored in the VPH main unit to the IPU.

#### d020: Auto magnetic pole detection magnetic pole offset setup

Checks the magnetic pole position with auto magnetic pole detection and sets [P087: Magnetic pole position offset special setting].

#### d021: DC energization magnetic offset setting

Checks the position to which the motor draws in electric angle 0° by DC energization and sets [P087: Magnetic pole position offset special setting].

## d022: Current position magnetic pole offset setup

Assumes the electric angle of the spot to be 0° and sets [P087: Magnetic pole position offset special setting].

#### d100: RAM check

Performs a RAM check.

# d101: Control input signal check

Displays the LED corresponding to each of input signals DI1 to DI4.

# d102: Control output signal check

Forcibly outputs the signal corresponding to the set number.

- \* For VPH DES, a signal is switched between ON and OFF with the switch for that signal.
- a. Setting range

0 to 3

0 = DO1 and DO2 signal OFF & DBK (dynamic brake) signal OFF

1 or 2 = DO1 or DO2 signal ON

3 = DBK signal ON

#### d104: 90 deg phase difference encoder marker check

Checks the 90 deg phase difference encoder marker.

The displayed value is incremented by one each time the encoder marker signal is input. When the value exceeds 32767, the counter is set to -32768 and counting continues toward 0.

a. Result display

-32768 to 32767 (starting with 0)

#### H000: Init

Performs the initialization process corresponding to the specified code.

a. Input range

0 to 9999

18 = Data initialization

31 = Absolute position compensation data initialization (0 clear)

# **!** Caution

H000: If "18" is executed during initialization, the following storage data is initialized.

- Parameters
- · Program data
- · Indirect data
- Alarm history

It is recommended to preserve data before initialization. Data can be saved with VPH DES.

# Chapter 12 Specifications

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# 12-1 Device specifications

# 12-1-1 Model

Model of VPH Series is as follows.

NCR- 1 2 3 4 5 - 6 - 7 8 9 - 10

Table 12-1 Model display

No.	Item	Display	Description
		NCR	Servo controller series
1	Series name	Н	VPH Series
2	Function type	В	SSCNETIII(/H) specifications
	Input nower aunnly	1	100 VAC system
3	Input power supply specification	2	200 VAC system
	Specification	3	400 VAC system
4	Output capacity	Example) 401 $ \frac{40.1 = 40 \times 10^{1} = 400W}{ \text{Exponent portion of exponentiation of 10}} $ Significant figures	
5	Hardware specification	А	Standard specification
<b>6</b>	Software type	A TDISC	
7	Reserved	0	Fixed
	Absolute position	0	None
8	compensation Option	1	Absolute position compensation data incorporation
<u></u>	STO option	0	None
9		1	Yes
10	Special appoification	None	Standard specification
10	Special specification	S***	Special specification

# 12-1-2 General specifications

Item		Description
	Temperature	0 to 55 °C (no freezing allowed)
Ambient	Humidity	90%RH or less (no condensation allowed)
condition	Sea level	1000 m or less
(when used)	Atmosphere	Avoid any harmful atmosphere including corrosive gas, grinding oil, metal dust, and oil. Indoor place not exposed to direct sunlight
Vibration resistance		Acceleration 5.9 m/s <sup>2</sup> (10 to 55 Hz) No resonance allowed

# 12-1-3 Functional specifications

Item		Item	Description	
Number of control shafts		trol shafts	1 shaft	
Control method		1	Semiclosed loop with feedback	
Feedback signal		al	Serial method: Up to 2^28/sec 90 deg phase difference method: Maximum of the frequency of 4- multiplication of 25 Mpps	
			Supply voltage: 5.0 VDC±5% Maximum current: 500 mA	
_	pplicable mot		τDISC	
Co	ommunication	n mode		
	Run modes		Speed command, torque command, and position control run modes	
	Speed	Command input	Command based on SSCNETIII(/H).	
	command	Acceleration/ deceleration	A value between 0 to 99.999 sec can be specified for each of acceleration and deceleration.	
	Torque	Command input	Command based on SSCNETIII(/H).	
	command	Torque increase/ decrease time	0 to 9.999 sec	
	Position	Command input	Command based on SSCNETIII(/H)	
	control	S-curve acceleration/ deceleration	2 types (0 to 1.000 sec)	
		Gain change	2 types (switching with the gain switching command from SSCNETIII(/H) and operation conditions)	
	Servo adjustment item	Feed forward	Speed feed forward ratio, speed feed forward shift ratio, inertia torque feed forward ratio, viscous friction torque feed forward ratio	
		Filter	Feedback filter, torque command filter, five torque command notch filters, speed feed forward filter, torque feed forward filter	
		Control input signal	4 external input signals. The following signals can be assigned to each signal:  ARST(alarm reset), EMG (emergency stop), TL (torque limit), FOT (forward direction overtravel), ROT (reverse direction overtravel), ZLS (zero point deceleration), MTOH (motor overheat) The ON/OFF status of the control input signal can be fixed. When assigned to an external input signal, signal logic change is possible.	
	Control input and output signal	Control output signal	2 external output signals. The following signals can be assigned to each signal:  ALM (alarm), WNG (warning), RDY (servo ready), SZ (speed zero), PE1- PE2 (position deviation range), PN1 - PN2 (positioning complete), ZZ (command complete response), ZRDY (command drive ready), PRF (rough match), VCP (speed attainment), BRK (brake release), LIM (limit inprocess), EMGO (emergency stop in-process), HCP (zero point return complete), OTO (overtravel in-process), MTON (motor electrification in-process), SMOD (speed command mode inprocess), TMOD (torque command mode in-process), PMOD (positioning mode in-process), OCEM (marker output)  When assigned to an external output signal, signal logic change is possible (except OCEM).	

Item		Description	
Maintenance r	node		
Run modes \$		Speed command, torque command, and built-in command run modes	
Speed	Internal speed command	7 types, selected with the control signal (speed in the setting unit specified)	
command	Acceleration/ deceleration	A value between 0 to 99.999 sec can be specified for each of acceleration and deceleration.	
Torquo	Internal torque command	7 points, selected with the control signal (setting unit: 0.1%)	
Torque command	Torque increase/ decrease time	0 to 9.999 sec	
	Setting unit	pulse	
	Jog	8 speeds	
	Command	256 commands, 3 types POS (positioning): ABS/INC INDX (index positioning): Short cut/unidirectional HOME (zero point return): STD HOME, LS LESS, OT HOME, STOP HOME, OT LSLESS, SET ABS	
Built-in command	Acceleration/ deceleration	8 types (A value between 0 to 99.999 sec can be specified for each of acceleration and deceleration.)	
	S-curve acceleration/ deceleration	8 types (0 to 1.000 sec)	
	Coordinate management	Infinite feed Absolute position management -2147483648 to +2147483647 Load axis 1-rotation position management (Examples: 0 to 359 deg, -179 to 180 deg)	
	Gain change	4 gains (changed according to the GSL1 and GSL2 signals and operation conditions)	
Servo adjustment item	Feed forward	Speed feed forward ratio, speed feed forward shift ratio, inertia torque feed forward ratio, viscous friction torque feed forward ratio	
TOTT!	Filter	Feedback filter, torque command filter, five torque command notch filters, speed feed forward filter, torque feed forward filter	

It.	tem	Description		
Control input and	Control input signal	4 external input signals. The following signals can be assigned to each signal.  RST (reset), ARST (alarm reset), EMG (emergency stop), SON (servo on), DR (drive), CLR (deviation clear), TL (torque limit), FOT (forward direction overtravel), ROT(reverse direction overtravel), MD1 - MD2 (mode select 1 - 2), GSL1 - GSL2 (gain select 1 - 2), RVS (command direction inversion), SS1 - SS8 (command selection 1 - 8), ZST (positioning drive), ZLS (zero point deceleration), ZMK (external marker), TRG (external trigger), CMDZ (command zero), ZCAN (positioning cancel), FJOG (forward direction jog), RJOG (reverse direction jog), MTOH (motor overheat)  The ON/OFF status of the control input signal can be fixed.  When assigned to an external input signal, signal logic change is possible.		
output	Control output signal	2 external output signals. The following signals can be assigned to each signal.  ALM (alarm), WNG (warning), RDY (servo ready), SZ (speed zero), PE1 - PE2 (position deviation range 1 to 2), PN1 - PN2 (positioning complete 1 to 2), PZ1 - PZ2 (positioning complete response), ZN (command complete), ZZ (command complete response), ZRDY (command drive ready), PRF (rough match), VCP (speed attainment), BRK (brake release), LIM (limit in-process), EMGO (emergency stop in-process), HCP (zero point return complete), HLDZ (command zero in-process), OTO (overtravel in-process), MTON (motor electrification in-process), SMOD (speed command mode in-process), TMOD (torque command mode in-process), NMOD (built-in command mode), OUT1 - OUT8 (common output), OCEM (marker output)  When assigned to an external output signal, signal logic change is possible (except OCEM).		
Error detection		Encoder error, over speed error, motor overload error, driver overload error, power supply undervoltage error, excessive voltage error, overcurrent error, servo control error, phase error, magnetic pole error, deviation error, backup data error, CPU error, etc. 5 alarms stored in the history		
Holding brake (BRK signal)		BRK (brake release) signal OFF in the motor power off status With control for drop prevention of the vertical axis (Control for drop prevention is disabled when a power error occurs, however.)		
Dynamic brake *1		External dynamic brake unit (which operates in the motor power off status)		
Torque limit command		Setting in 0.1% units with a parameter		
Compensation function		Absolute position compensation, torque compensation		
Display		CHARGE, power LED, front data display 5-digit LED panel		
Communication	on	USB2.0 (Full Speed): 1ch For connection between a PC (VPH DES) and device		

Item	Description
VPH DES function	<ul> <li>Parameter editing and parameter transmission and reception</li> <li>Oscilloscope display: Waveform monitor: 3ch, Control signal monitor: 1ch</li> <li>FFT analyzer: Vibration frequency analysis display and notch filter setting</li> <li>[Valid only in the maintenance mode]</li> <li>Switch box</li> <li>Frequency response measurement</li> <li>Self-diagnosis: Auto-tuning, test run, etc.</li> </ul>
SEMI F47 compatible function	Torque limit function when the main circuit voltage drops (The control power must be supplied from a UPS.)

<sup>\*1</sup> Can be used with 100 V and 200 V devices.

#### 12-1-4 Performance

	Item		Description *
	Speed control range		1:5000
Speed		Load	0 to 100% load: ±0.01% or less (at rated speed)
control	Speed variation	Voltage	Rated voltage ±10%: 0% (at rated speed)
CONTROL		Temperature	0 to 40 °C : 10 40/ or loss (at rated around)
		characteristics	0 to 40 °C : ±0.1% or less (at rated speed)
Torque	Resolution		1:1000 (up to rated torque)
control	Reproducib	ility	±1% (up to rated torque)

<sup>\*</sup> The above performance values apply to the driver alone. Depending on the motor to be combined, the motor may not meet the performance values.

## 12-1-5 Device electrical specification

# Electrical specification of the 100V, single-phase input device

Table 12-2 Electrical specification of the 100V, single-phase input device

	Item		NCR- HB1051* -A-***	NCR- HB1101* -A-***	NCR- HB1201* -A-***					
	Rated voltage Frequency	[V] [Hz]	100 - 120 AC 1φ 50/60							
Control	Permissible voltage fluctuation	[V]	85 - 132 AC	35 - 132 AC						
power supply	Input rated current	[Arms]	0.24	0.24	0.24					
	Power consumption	[W]	15	15	15					
	Inrush current	[A]*	17 [5 ms]	17 [5 ms]	17 [5 ms]					
	Rated voltage Frequency	[V] [Hz]	100 - 120 A	C 1φ 50/6	60					
Main			85 - 132 AC	35 - 132 AC						
power supply	Input rated current	[Arms]	1.5	3	6					
	Rated capacity	[kVA]	0.15	0.3	0.6					
	Inrush current	[A]*	23 [12 ms]	23 [12 ms]	23 [12 ms]					
Rated out	tput	[W]	50	100	200					
Drive met	thod		3-phase sine wave PWM							
Brake me	thod		Regenerative brake: External regenerative resistor							
Continuo	us output current	[Arms]	1.1	2.0	3.5					
Instant ou	itput current	[Arms]	3.3	6.0	9.9					
Output fre	equency	[Hz]	0 to 400							
Carrier frequency [kHz]			9 (parameter selection: Up to 18)	9						
Structure (IP code)		Air cooling (IP20)								
Mounting type			Panel mounting							
Shape			Type1							
Weight [Kg]			About 1.0							
Accessory			Main power plug terminal × 1 Motor power plug terminal × 1 Control power plug terminal × 1 Open tool × 1							
Option			Regenerative resistor, dynamic brake unit, etc.							

<sup>\*</sup> Value at the rated voltage of 120 VAC. 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.

# Electrical specification of the 200V, 3-phase input device

Table 12-3 Electrical specification of the 200 V, 3-phase input device (1/2)

Rated voltage Frequency	NCR- HB2332* -A-***							
Voltage fluctuation   Input rated current   Input rated (Input rated current   Input rated (Input rated current   Input rated (Input rated Input rated (Input rated Input rated Input rated (Input rated Input rated Input rated (Input rated Input rated Input rated Input rated Input rated (Input rated Input rated								
Dower supply   Input rated current   Input rated   Input ra								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.18							
Rated voltage Frequency	20							
Frequency   [Hz]   200 - 240 AC   1ψ, 3ψ   30/00 Hz   200 - 240 AC   3ψ	34 [2 ms]							
Main power supply         voltage fluctuation         [V] 170 - 264 AC           Input rated current         [Arms] 1.5(1φ) 0.9(3φ) 1.7(3φ) 3.2(3φ) 5.2(3φ) 5.2(3φ) 9.6         9.0(1φ) 9.0(1φ) 9.6         9.6         13.5           Rated capacity         [kVA] 0.3 0.6 1.1 1.8 3 4.2           Inrush current         [A]*1 45 5 ms] 5 ms] 5 ms] 5 ms] 5 ms] 6 ms] 18 ms] 18 ms]         18 ms] 18 ms]	50/60 Hz							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								
capacity   [KVA]   0.3   0.6   1.1   1.8   3   4.2	17							
[5 ms] [5 ms] [5 ms] [18 ms] [18 ms]	5.9							
	85 [10 ms]							
Rated output [W] 100 200 400 800 1.5k 2.2k	3.3k							
Drive method 3-phase sine wave PWM	3-phase sine wave PWM							
Brake method Regenerative brake: External regenerative resistor	Regenerative brake: External regenerative resistor							
Continuous output [Arms] 1.1 2 3.5 6.8 10 16	24.0 (25.0) * <sup>2</sup>							
Instant output current [Arms] 3.3 6 9.9 17 30 35	63							
Output frequency [Hz] 0 to 400	1							
Carrier frequency [kHz] 9 (parameter selection: Up to 18)								
Structure (IP code) Air cooling (IP20) Forced cooling (IP20)								
Mounting type Panel mounting								
Shape Type1 Type2 Type3	Type4							
Weight [Kg] About 1.0 About 1.5 About 2.3	About 3.7							
Accessory  Main power plug terminal × 1  Motor power plug terminal × 1  Control power plug terminal × 1  Open tool × 1								
Option Regenerative resistor, dynamic brake unit, etc.	·							

<sup>\*1</sup> Value at the rated voltage of 240 VAC. 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.

<sup>\*2</sup> If it does not conform to the UL standard, the rated current is "25.0 A".

Table 12-4 Electrical specification of the 200 V, 3-phase input device (2/2)

Item I			NCR- HB2702* -A-***	NCR- HB2153* -A-***					
	Rated voltage Frequency	[V] [Hz]	200 - 240	00 - 240 AC 1φ 50/60 Hz					
Control	Permissible voltage fluctuation	[V]	170 - 264	AC					
power supply	Input rated current	[Arms]	0.4	0.4					
	Power consumption	[W]	45	45					
	Inrush current	[A]*	26 [3 ms]	26 [3 ms]					
	Rated voltage Frequency	[V] [Hz]	200 - 240	AC 3φ 50	0/60 Hz				
Main	Permissible voltage fluctuation	[V]	170 - 264	AC					
power supply	Input rated current	[Arms]	44	68					
	Rated capacity	[kVA]	16	23.5					
	Inrush current	[A]*	73 [30 ms]	73 [38 ms]					
Rated ou	tput	[W]	7k	15k					
Drive me	thod		3-phase sine wave PWM						
Brake me	ethod		Regenerative brake: External regenerative resistor						
Continuo current	us output	[Arms]	48.0	62.6					
Instant output current [Arms]		96.0	125.2						
Output frequency [Hz]		0 to	400						
Carrier frequency [kHz]									
Structure (IP code)		Forced cooling (IP00)							
Mounting type		Panel mou	unting						
Shape		Type5	Type6						
Weight [Kg]		About 7.5	About 9.5						
Accessor	<b>Т</b> у		Control power plug terminal × 1						
Option	at the rated volta		_		-	c brake un			

<sup>\*</sup> Value at the rated voltage of 240 VAC. 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.

# Electrical specification of the 400V, 3-phase input device

Table 12-5 Electrical specification of the 400 V, 3-phase input device

	Item		NCR- HB3702* -A-***						
	Rated voltage Frequency	[V] [Hz]	380 - 480 AC	1φ 50/6	0 Hz				
Control	Permissible voltage fluctuation	[V]	323 - 528 AC	;					
power supply	Input rated current	[Arms]	0.15 * <sup>2</sup>						
	Power consumption	[W]	35						
	Inrush current	[A]* <sup>1</sup>	34 [2.0 ms]						
	Rated voltage Frequency	[V] [Hz]	380 - 480 AC	3φ 50/6	0 Hz				
Main	Permissible voltage fluctuation	[V]	323 - 528 AC	;					
power supply	Input rated current	[Arms]	25.0 * <sup>2</sup>						
	Rated capacity	[kVA]	17.3						
	Inrush current	[A]* <sup>1</sup>	45.2 [16.5 ms]						
Rated o	output	[W]	7k						
Drive m	ethod		3-phase sine wave PWM						
Brake n	nethod		Regenerative brake: External regenerative resistor						
Continu current	ous output	[Arms]	23.4						
Instant o	output current	[Arms]	46.8						
Output	Output frequency [Hz]		0 to 4	00					
Carrier frequency [kHz]		9							
Structure (IP code)			Forced cooling (IP00)						
Mounting type			Panel mounting						
Shape		Type7							
Weight [Kg]			About 7.5						
Accesso	ory		Control power Open tool × 1		ninal × 1				
Option			Regenerative	resistor,	etc.				
'			f 480 VΔC. The value in brackets (Π) indicates the time constant for inrush						

<sup>\*1</sup> Value at the rated voltage of 480 VAC. 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.

<sup>\*2</sup> Value at a rated voltage of 400 V.

# 12-2 Outline drawings and names of parts

# 12-2-1 Device with up to 400 W

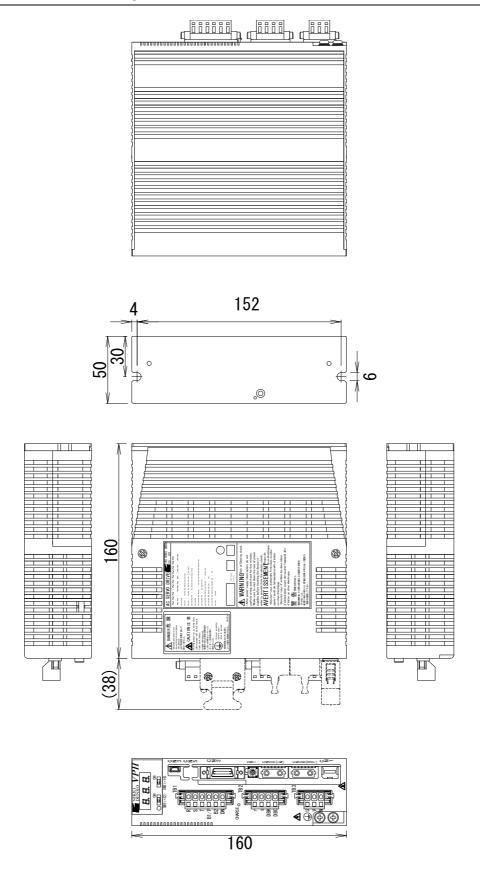


Figure 12-1 Outline drawing of the main unit of the device with up to 400 W (Type 1)

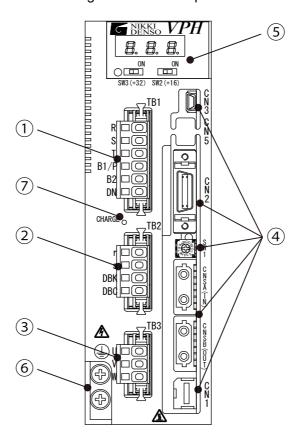


Figure 12-2 Front view of the main unit of the device with up to 400 W (Type 1)

Table 12-6 Name of each part

No.	Name	Function				
1	TB1	<ul> <li>Main power supply terminals (R, S, T)</li> <li>Regenerative resistor connection terminals (B1/P, B2)</li> <li>Unused (DN)</li> </ul>				
2	TB2	Control power supply connection terminals (r, s) Dynamic brake connection terminals (DBK, DBC)				
3	TB3	Motor connection terminals (U, V, W)				
	SW1	SSCNETIII(/H) axis number selection switch				
	CN1	Control input/output signal connector				
	CN2	Encoder connection connector     Input the encoder feedback signal from the encoder mounted on the motor.				
4	CN3	USB communication connector     Used to connect a PC on which VPH DES is installed for USB communication.				
	CNSA	SSCNETIII(/H) cable connection connector     Used to connect the controller or the front shaft servo amplifier.				
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.				
	Power LED	Status LED				
<b>⑤</b>	LED1 - 3	Data display LED panel for displaying the status and alarm (3 digits)				
	SW2, SW3	SSCNETIII(/H) axis number setting switches (+16, +32)				
6	E	Terminal for connecting power and motor grounding cables Size M4				
7	CHARGE LED	On when high voltage is charged in the main circuit capacitor in the device.				

# 12-2-2 Device with 800 W

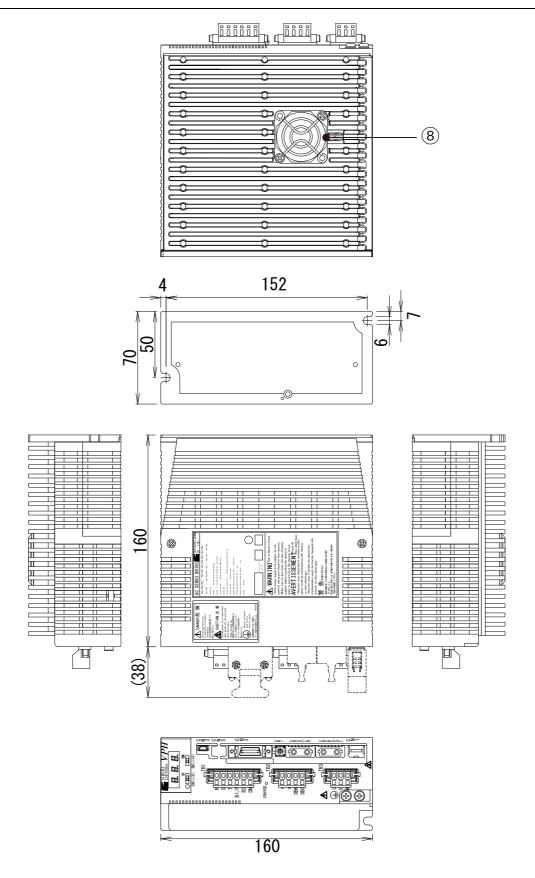


Figure 12-3 Outline drawing of the main unit of the device with 800 W (Type 2)

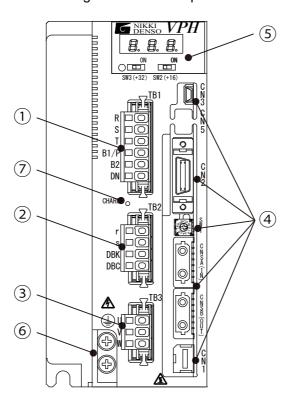


Figure 12-4 Front view of the main unit of the device with 800 W (Type2)

Table 12-7 Name of each part

No.	Name	Function
1	TB1	<ul> <li>Main power supply terminals (R, S, T)</li> <li>Regenerative resistor connection terminals (B1/P, B2)</li> <li>Unused (DN)</li> </ul>
2	TB2	<ul> <li>Control power supply connection terminals (r, s)</li> <li>Dynamic brake connection terminals (DBK, DBC)</li> </ul>
3	TB3	Motor connection terminals (U, V, W)
	CN1	Control input/output signal connector
	CN2	Encoder connection connector     Input the encoder feedback signal from the encoder mounted on the motor.
4	CN3	USB communication connector     Used to connect a PC on which VPH DES is installed for USB communication.
	CNSA	SSCNETIII(/H) cable connection connector     Used to connect the controller or the front shaft servo amplifier.
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.
	SW1	SSCNETIII(/H) axis number setting switch
	Power LED	Status LED
<b>⑤</b>	LED1 - 3	Data display LED panel for displaying the status and alarm (3 digits)
	SW2, SW3	SSCNETIII(/H) axis number setting switches (+16, +32)
6	E	Terminal for connecting power and motor grounding cables Size M4
7	CHARGE LED	On when high voltage is charged in the main circuit capacitor in the device.
8	FAN	Cooling fan. Refer to "Figure 12-3 Outline drawing of the main unit of the device with 800 W (Type 2)".

## 12-2-3 Device with 1.5 kW or 2.2 kW

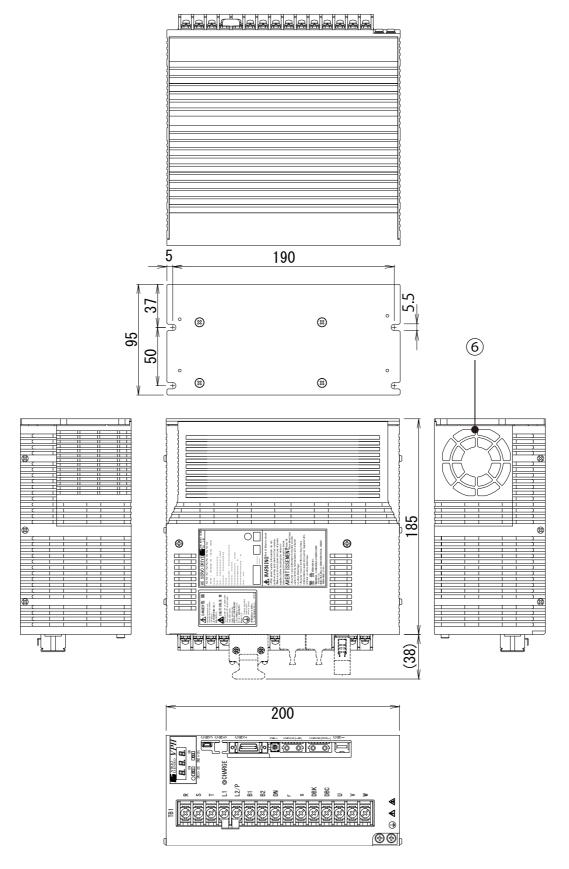


Figure 12-5 Outline drawing of the main unit of the device with 1.5 kW or 2.2 kW (Type 3)

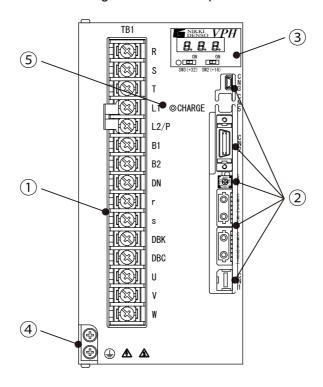


Figure 12-6 Front view of the main unit of the device with 1.5 kW or 2.2 kW (Type 3)

Table 12-8 Name of each part

No.	Name	Function
1	TB1	<ul> <li>Main power supply terminals (R, S, T)</li> <li>DC reactor connection terminals (L1, L2/P)</li> <li>Regenerative resistor connection terminals (B1, B2)</li> <li>Unused (DN)</li> <li>Control power supply connection terminals (r, s)</li> <li>Dynamic brake connection terminals (DBK, DBC)</li> <li>Motor connection terminals (U, V, W)</li> </ul>
	CN1	Control input/output signal connector
	CN2	Encoder connection connector     Input the encoder feedback signal from the encoder mounted on the motor.
2	CN3	USB communication connector     Used to connect a PC on which VPH DES is installed for USB communication.
	CNSA	SSCNETIII(/H) cable connection connector     Used to connect the controller or the front shaft servo amplifier.
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.
	SW1	SSCNETIII(/H) axis number setting switch
	Power LED	Status LED
3	LED1 - 3	Data display LED panel for displaying the status and alarm (3 digits)
	SW2, SW3	SSCNETIII(/H) axis number setting switches (+16, +32)
4	E	Terminal for connecting power and motor grounding cables Size M4
5	CHARGE LED	On when high voltage is charged in the main circuit capacitor in the device.
6	FAN	Cooling fan. Refer to "Figure 12-5 Outline drawing of the main unit of the device with 1.5 kW or 2.2 kW (Type 3)".

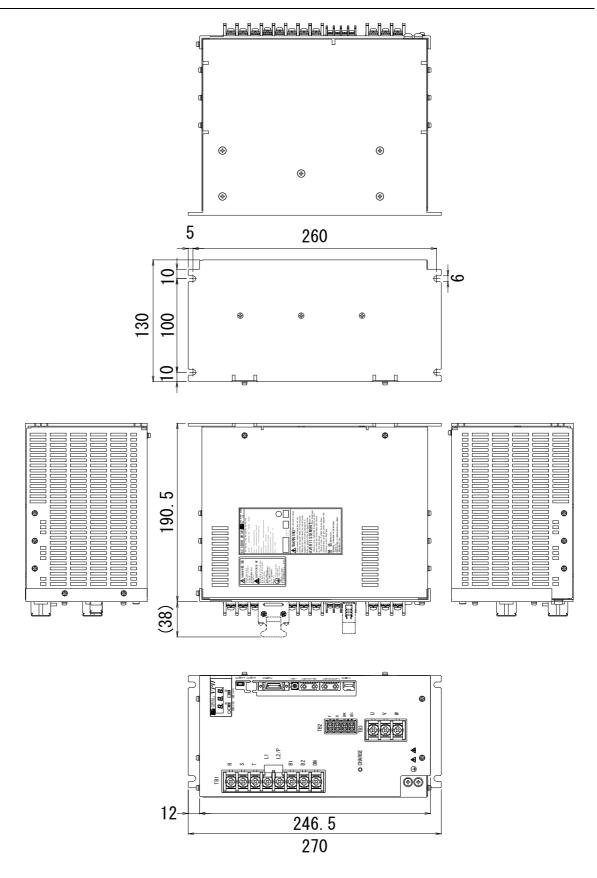


Figure 12-7 Outline drawing of the main unit of the device with 3.3 kW (Type 4)

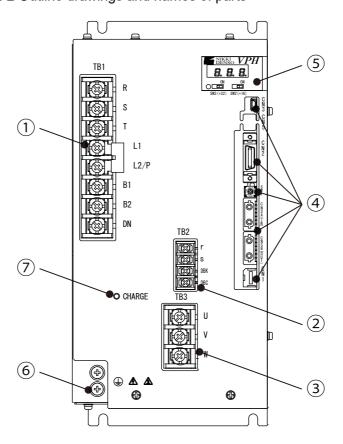


Figure 12-8 Front view of the main unit of the device with 3.3 kW (Type 4)

Table 12-9 Name of each part

No.	Name	Function	
1	TB1	<ul> <li>Main power supply terminals (R, S, T)</li> <li>Regenerative resistor connection terminals (B1/P, B2)</li> <li>Unused (DN)</li> </ul>	Size M4
2	TB2	<ul> <li>Control power supply connection terminals (r, s)</li> <li>Dynamic brake connection terminals (DBK, DBC)</li> </ul>	Size M3
3	TB3	Motor connection terminals (U, V, W)	Size M4
	CN1	Control input/output signal connector	
	CN2	Encoder connection connector     Input the encoder feedback signal from the encoder mou motor.	nted on the
4	CN3	USB communication connector     Used to connect a PC on which VPH DES is installed for communication.	USB
	CNSA	SSCNETIII(/H) cable connection connector     Used to connect the controller or the front shaft servo am	plifier.
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.	
	SW1	SSCNETIII(/H) axis number setting switch	
	Power LED	Status LED	
<b>⑤</b>	LED1 - 3	Data display LED panel for displaying the status and alar	m (3 digits)
	SW2, SW3	• SSCNETIII(/H) axis number setting switches (+16, +32)	
6	E	Terminal for connecting power and motor grounding cables	Size M4
7	CHARGE LED	On when high voltage is charged in the main circuit capacit device.	or in the

# 12-2-5 7 kW device (200 V)

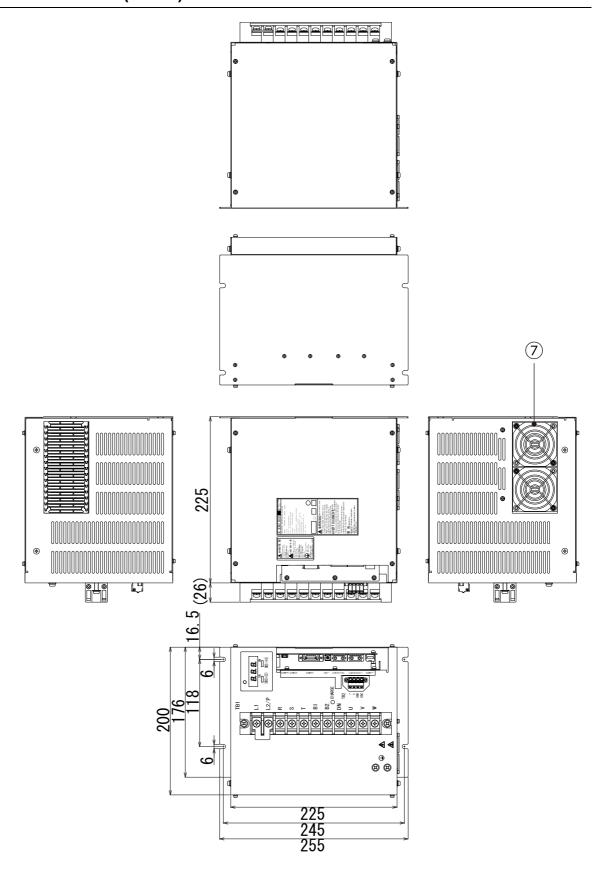


Figure 12-9 Outline drawing of the main unit of the device with 200 V and 7 kW (Type 5)

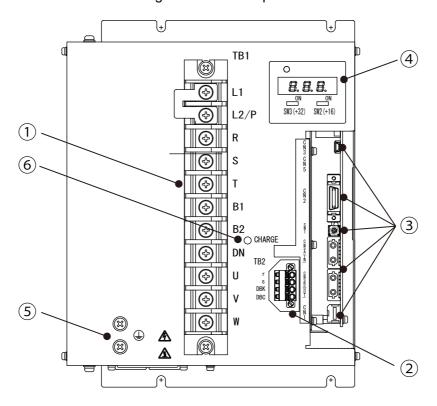


Figure 12-10 Front view of the main unit of the device with 200 V and 7 kW (Type 5)

Table 12-10 Name of each part

No.	Name	Function				
1)	TB1	<ul> <li>Main power supply terminals (R, S, T)</li> <li>DC reactor connection terminals (L1, L2/P)</li> <li>Regenerative resistor connection terminals (B1, B2)</li> <li>Unused (DN)</li> <li>Motor connection terminals (U, V, W)</li> </ul>				
2	TB2	<ul> <li>Control power supply connection terminals (r, s)</li> <li>Dynamic brake connection terminals (DBK, DBC)</li> </ul>				
	CN1	Control input/output signal connector				
	CN2	Encoder connection connector     Input the encoder feedback signal from the encoder mounted on the motor.				
3	CN3	<ul> <li>USB communication connector         Used to connect a PC on which VPH DES is installed for USB         communication.</li> </ul>				
	CNSA	SSCNETIII(/H) cable connection connector     Used to connect the controller or the front shaft servo amplifier.				
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.				
	SW1	SSCNETIII(/H) axis number setting switch				
	Power LED	Status LED				
4	LED1 - 3	Data display LED panel for displaying the status and alarm (3 digits)				
	SW2, SW3	SSCNETIII(/H) axis number setting switches (+16, +32)				
5	E	Terminal for connecting power and motor grounding cables Size M5				
6	CHARGE LED	On when high voltage is charged in the main circuit capacitor in the device.				
7	FAN	Cooling fan. Refer to "Figure 12-9 Outline drawing of the main unit of the device with 200 V and 7 kW (Type 5)".				

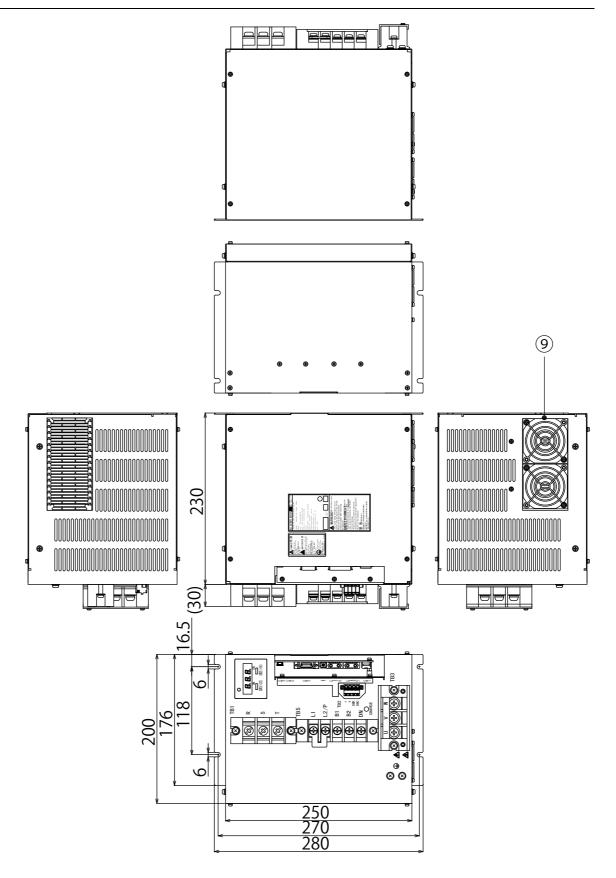


Figure 12-11 Outline drawing of the main unit of the device with 15 kW (Type 6)

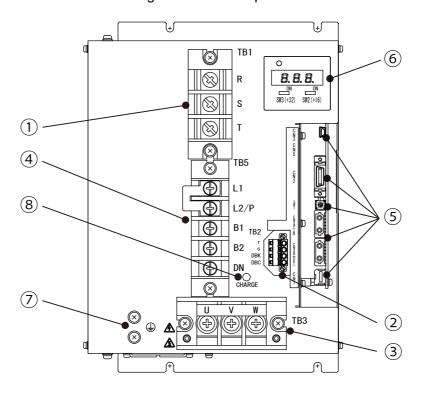


Figure 12-12 Front view of the main unit of the device with 15 kW (Type 6)

Table 12-11 Name of each part

No.	Name	Function		
1	TB1	Main power supply terminals (R, S, T)	Size M6	
2	TB2	<ul> <li>Control power supply connection terminals (r, s)</li> <li>Dynamic brake connection terminals (DBK, DBC)</li> </ul>		
3	TB3	Motor connection terminals (U, V, W)	Size M6	
4	TB5	<ul> <li>DC reactor connection terminals (L1, L2/P)</li> <li>Regenerative resistor connection terminals (B1, B2)</li> <li>Unused (DN)</li> </ul>	Size M5	
(5)	CN1	Control input/output signal connector		
	CN2	Encoder connection connector     Input the encoder feedback signal from the encoder mounted on the motor.		
	CN3	USB communication connector     Used to connect a PC on which VPH DES is installed for USB communication.		
	CNSA	<ul> <li>SSCNETIII(/H) cable connection connector         Used to connect the controller or the front shaft servo amplifier.     </li> </ul>		
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.		
	SW1	SSCNETIII(/H) axis number setting switch		
6	Power LED	Status LED		
	LED1 - 3	Data display LED panel for displaying the status and alarm (3 digits)		
	SW2, SW3	SSCNETIII(/H) axis number setting switches (+16, +32)		
7	E	Terminal for connecting power and motor grounding cables	Size M5	
8	CHARGE LED	On when high voltage is charged in the main circuit capacitor in the device.		
9	FAN	Cooling fan. Refer to "Figure 12-11 Outline drawing of the the device with 15 kW (Type 6)".	main unit of	

# 12-2-7 7 kW device (400 V)

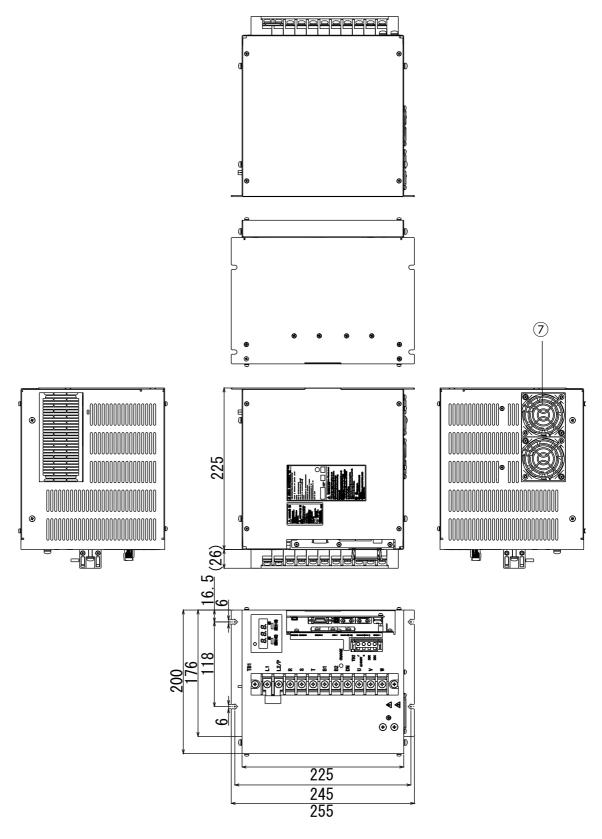


Figure 12-13 Outline drawing of the main unit of the device with 400 V and 7 kW (Type 7)

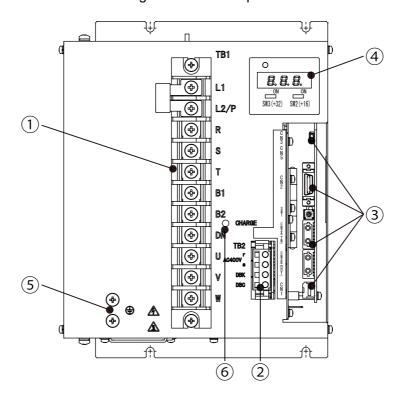


Figure 12-14 Front view of the main unit of the device with 400 V and 7 kW (Type 7)

Table 12-12 Name of each part

No.	Name	Function		
1	TB1	<ul> <li>Main power supply terminals (R, S, T)</li> <li>DC reactor connection terminals (L1, L2/P)</li> <li>Regenerative resistor connection terminals (B1, B2)</li> <li>Unused (DN)</li> <li>Motor connection terminals (U, V, W)</li> </ul>		
2	TB2	<ul><li>Control power supply connection terminals (r, s)</li><li>Unused (DBK, DBC)</li></ul>		
3	CN1	Control input/output signal connector		
	CN2	Encoder connection connector Input the encoder feedback signal from the encoder mounted on the motor.		
	CN3	USB communication connector     Used to connect a PC on which VPH DES is installed for USB communication.		
	CNSA	SSCNETIII(/H) cable connection connector     Used to connect the controller or the front shaft servo amplifier.		
	CNSB	SSCNETIII(/H) cable connection connector     Used to connect the rear shaft servo amplifier.		
	SW1	SSCNETIII(/H) axis number setting switch		
4	Power LED	Status LED		
	LED1 - 3	• Data display LED panel for displaying the status and alarm (3 digits)		
	SW2, SW3	SSCNETIII(/H) axis number setting switches (+16, +32)		
<b>⑤</b>	E	Terminal for connecting power and motor grounding cables Size M5		
6	CHARGE LED	On when high voltage is charged in the main circuit capacitor in the device.		
7	FAN	Cooling fan. Refer to "Figure 12-13 Outline drawing of the main unit of the device with 400 V and 7 kW (Type 7)".		

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