YASKAWA

AC Servodrive

Σ-V Series SUPPLEMENT

USER'S MANUAL Design and Maintenance

Rotational Motor/MECHATROLINK-II Communications Reference
Linear Motor/Analog Voltage and Pulse Train Reference
Linear Motor/MECHATROLINK-II Communications Reference

SGMJV/SGMAV/SGMGV/SGMCS/SGLGW/SGLFW/SGLTW/SGLCW Servomotors
SGDV SERVOPACK

M-II Rotary

Analog Linear

M-II Linear

MANUAL NO. SIEZ S800000 58A

About this Supplement

1 About this Supplement

This supplement is an explanatory document in which important information has been gathered from various sources to be used for the following three manuals.

After the following manuals have been issued, dispose of this document to prevent any possible confusion.

Manual Name	Manual Number	Abbreviated Name
Σ-V Series SGM□V/SGDV USER'S MANUAL Design and Maintenance Rotational Motor MECHATROLINK-II Communications Reference	SIEP S800000 46	M-II Rotary
Σ-V Series SGM□V/SGDV USER'S MANUAL Design and Maintenance Linear Motor Analog Voltage and Pulse Train Reference	SIEP S800000 47	Analog Linear
Σ-V Series SGM□V/SGDV USER'S MANUAL Design and Maintenance Linear Motor MECHATROLINK-II Communications Reference	SIEP S800000 48	M-II Linear

This supplement is primarily based on the following manual.

Manual Name	Manual Number	Abbreviated Name
Σ-V Series SGM□V/SGDV USER'S MANUAL Design and Maintenance Rotational Motor Analog Voltage and Pulse Train Reference	SIEP S800000 45	Analog Rotary

For additional information, refer to the following manuals.

Manual Name	Manual Number	Abbreviated Name
Σ-V Series SGM□V/SGDV USER'S MANUAL Setup Rotational Motor	SIEP S800000 43	Setup Rotary
Σ-V Series SGM□V/SGDV USER'S MANUAL Setup Linear Motor	SIEP S800000 44	Setup Linear
Σ-V Series SGM□V/SGDV USER'S MANUAL Digital Operator	SIEP S800000 55	Operator
Σ-V Series SGM□V/SGDV Catalog	KAEP S800000 42	Catalog

2 Precautions

If using a linear servomotor but using it with the reference manuals for a rotary servomotor, replace the following terms with the terms for linear servomotors.

Rotary Motors	Linear Motors
Rotation, Revolution(rev)	Movement (mm)
Speed (min^{-1})	Speed (mm/s)
Torque	Force
Forward Rotation	Forward Direction
Reverse Rotation	Reverse Direction

Some of the drawings in the reference manuals for SERVOPACKs that support MECHATROLINK-II communications are different from those drawings for the SERVOPACKs that use analog voltage and pulse train references.

3 Introduction

This supplement consists of three sections:

Each of the three sections contains appropriate information to be added to the manuals that are currently in circulation.

A list outlining the relevant information for all aspects of use for the relevant product can be found at the beginning of each section.

■ Revision Details for the M-Ⅱ Rotary User's Manual

Until the new manual is issued, refer to the following documents for information on how to use the Σ-V M-II rotary servomotors.

The highlighted sections indicate relevant information.

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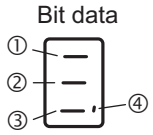
	9.2.5 Number of Encoder Output Pulses (PAO, PBO, and PCO) from the SERVOPACK	9-13	–	–	–	–	–	
	9.2.6 Electronic Gear	9-14	–	–	–	–	–	
	9.2.7 Alarm Detection	9-14	–	–	–	–	–	
	9.2.8 Analog Monitor Signal	9-15	–	–	–	–	–	
Chapter 10	10.1 Alarm Displays	10-2	–	–	–	–	–	
	10.1.1 List of Alarms	–	–	–	–	–	–	Will be included in the new manual.
	10.1.2 Troubleshooting of Alarms	–	Setup Rotary	6.1	73 to 99	–	–	
	10.2 Warning Displays	10-22	–	–	–	–	–	
	10.2.1 List of Warnings	10-22	–	–	–	–	–	
	10.2.2 Troubleshooting of Warnings	10-23	–	–	–	–	–	
	10.3 Troubleshooting Malfunction Based on Operation and Conditions of the Servomotor	–	Setup Rotary	6.2	100 to 107	–	–	

Analog Rotary Manual			Other Documents			Supplement		Notes
Chapter/Section		Page	Name	Chapter/ Section	Page	Section	Page	
Chapter 11	11.1 Connection to Host Controller	–	–	–	–	–	–	
	11.1.1 Example of Connection to MP2200/ MP2300 Motion Module SVA-01	–	–	–	–	–	–	Not applicable.
	11.1.2 Example of Connection to MP920 4-axes Analog Module SVA-01	–	–	–	–	–	–	Not applicable.
	11.1.3 Example of Connection to OMRON's Motion Control Unit	–	–	–	–	–	–	Not applicable.
	11.1.4 Example of Connection to OMRON's Position Control Unit	–	–	–	–	–	–	Not applicable.
	11.1.5 Connection to MITSUBISHI's AD72 Positioning Unit (SERVOPACK in Speed Control Mode)	–	–	–	–	–	–	Not applicable.
	11.1.6 Connection to MITSUBISHI's AD75 Positioning Unit (SERVOPACK in Position Control Mode)	–	–	–	–	–	–	Not applicable.
	11.2 List of Parameters	11-8	–	–	–	–	–	
	11.2.1 Utility Functions	11-8	–	–	–	–	–	
	11.2.2 Parameters	–	–	–	–	MⅡR-13	26	
	11.3 Monitor Modes	–	–	–	–	–	–	Will be included in the new manual.
	11.4 Parameter Recording Table	–	–	–	–	–	–	Not applicable.

■ Status Display on Panel Operator



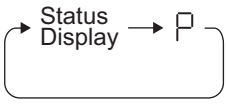
(1) Bit Data Display

Bit Position as shown in the figure	Bit Data	Display Contents
①	Motor rotation detection	Lit when the servomotor is being rotated.
②	Servo ON/OFF	Lit when the servo is OFF. Unlit when the servo is ON.
③	Reference input detection	Lit when a reference is being input.
④	CONNECT completion	Lit when the connection is completed.

(2) Signal Display for Overtravel Prevention

The following figure shows the overtravel prevention signal on the indicator on the front panel of the SERVOPACK.

- Forward run prohibited signal

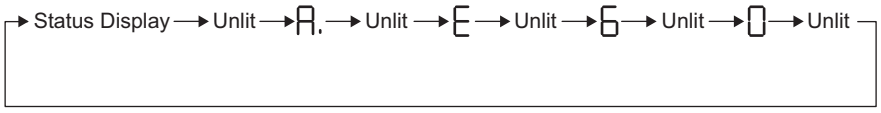


- Reverse run prohibited signal

(3) Alarm and Warning Display

The following figure shows how the alarm or warning codes are displayed letter by letter on the indicator on the front panel of the SERVOPACK.

Example : Alarm A.E60



■ I/O Signal (CN1) Names and Functions

(1) Input Signals

Signal Name		Pin No.	Function	
Com-mon	/DEC	9	Homing deceleration limit switch signal: Connects the deceleration LS (limit switch) for homing.	
	P-OT N-OT	7 8	Forward run prohibited signal Reverse run prohibited signal	Overtravel prevention signal: Stops servomotor when movable part travels beyond the allowable range of motion.
	/EXT1 to EXT3 /EXT2 /EXT3	10 11 12	External latch signals 1, 2, and 3: Connects the external signals that latch the current FB pulse counter.	
	+24VIN	6	Control power supply for sequence signal: Users must provide +24 V power supply. Allowable voltage fluctuation range: +11 to +25 V	
	BAT (+) BAT (-)	14 15	Battery input for absolute encoder: Used for absolute encoder battery input when a battery unit is not used.	
	/SI0	13	General-purpose sequence input signal: Monitored in the I/O monitor field of MECHATROLINK/MECHATROLINK-II.	

Note: 1. The functions allocated to /DEC, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input signals can be changed by setting the parameters.
2. For forward/reverse run prohibited, the SERVOPACK processing for stopping is executed by the software. As the safety specifications of some applications may not satisfy local safety requirements, add the external safety circuits as required.
3. The signal /SI0 (pin No. 13) can be monitored as a general-purpose input with the MECHATROLINK/MECHATROLINK-II.

(2) Output Signals

Signal Name		Pin No.	Function
Com-mon	ALM+ ALM-	3 4	Servo alarm signal: Turns OFF when an error is detected.
	/BK+ (/SO1+) /BK- (/SO1-)	1 2	Brake interlock signal: Controls the brake. The brake is released when the signal is ON.
	/SO2+ /SO2-	23 24	General-purpose output signal: A function can be allocated by setting the parameter.
	/SO3+ /SO3-	25 26	
	FG	Shell	Connected to the frame ground if the shield wire of the I/O signal cable is connected to the connector shell.

Note: The output signals /SO1, /SO2, and /SO3 can be used as the output signal /COIN, /V-CMP, /TGON, /S-RDY, /CLT, /VLT, /BK, /WARN, or /NEAR by setting the parameter Pn50E, Pn50F, or Pn510.

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■ I/O Signal Connector (CN1) Terminal Layout

The following diagram shows the layout of the CN1 terminals.

1	/BK+ (/SO1+)	Brake interlock output	2	/BK- (/SO1-)	Brake interlock output	14	BAT(+)*2	Battery (+) input	15	BAT(-)*2	Battery (-) input
3	ALM+	Servo alarm output	4	ALM-	Servo alarm output	16	SG	Signal ground	17	PAO	PG dividing pulse (Phase-A) output
5			6	+24VIN	Control power supply for sequence signal input	18	/PAO	PG dividing pulse (Phase-A) output	19	PBO	PG dividing pulse (Phase-B) output
7	P-OT (/SI1)	Forward run prohibited input	8	N-OT (/SI2)	Reverse run prohibited input	20	/PBO	PG dividing pulse (Phase-B) output	21	PCO	PG dividing pulse (Phase-C) output
9	/DEC (/SI3)	Homing deceleration switch input	10	/EXT1 (/SI4)	External latch signal 1 input	22	/PCO	PG dividing pulse (Phase-C) output	23	/SO2+*1	General-purpose input
11	/EXT2 (/SI5)	External latch signal 2 input	12	/EXT3 (/SI6)	External latch signal 3 input	24	/SO2-*1	General-purpose input	25	/SO3+*1	General-purpose input
13	/SI0	General-purpose input				26	/SO3-*1	General-purpose input			

* 1. Make the signal allocations using parameters.
* 2. Connect a battery to CN1 or to a battery case. Connecting both batteries creates a loop circuit that is dangerous between the two batteries.

Note: 1. The connector shell is connected to the FG (frame ground)
2. Do not use the unused terminals.

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■ Input Circuit Signal Allocation

The functions allocated to sequence input signal circuits can be changed. CN1 connector input signals are allocated with the factory settings as shown in the following table.

In general, allocate signals according to the standard settings in the following table.

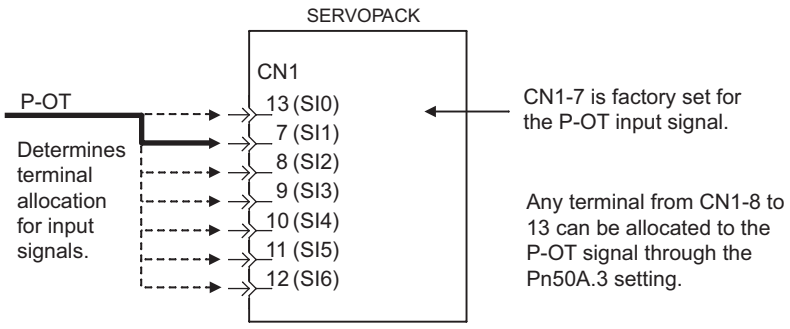
CN1 Connector Terminal Numbers	Input Terminal Name	Factory Setting	
		Symbol	Name
13	SI0	—	—
7	SI1	P-OT	Forward run prohibited
8	SI2	N-OT	Reverse run prohibited
9	SI3	/DEC	Homing deceleration limit switch
10	SI4	/EXT1	External latch signal 1
11	SI5	/EXT2	External latch signal 2
12	SI6	/EXT3	External latch signal 3

The following table shows the factory settings for input signal selections 1 to 5.

Pn50A	Input Signal Selections 1	Factory Setting: 1881
Pn50B	Input Signal Selections 2	Factory Setting: 8882
Pn511	Input Signal Selections 5	Factory Setting: 6543

(1) Examples of Input Signal Allocation

The procedure used to allocate sequence input signals is described using the P-OT (forward run prohibited) signal as a typical example.



Parameter		Description	Remarks
Pn50A	0	ON when CN1-13 input signal is ON (L-level)	Signal Polarity in reverse run: None Example: Forward run prohibited signal (P-OT) is valid when high (OFF).
	1	ON when CN1-7 input signal is ON (L-level)	
	2	ON when CN1-8 input signal is ON (L-level)	
	3	ON when CN1-9 input signal is ON (L-level)	
	4	ON when CN1-10 input signal is ON (L-level)	
	5	ON when CN1-11 input signal is ON (L-level)	
	6	ON when CN1-12 input signal is ON (L-level)	
	7	Sets signal ON	Set the forward run prohibited signal (P-OT) so that it is always valid or always invalid.
	8	Sets signal OFF	
	9	ON when CN1-13 input signal is OFF (H-level)	Signal Polarity in reverse run: Available* Example: Forward run prohibited signal (P-OT) is valid when low (ON).
	A	ON when CN1-7 input signal is OFF (H-level)	
	B	ON when CN1-8 input signal is OFF (H-level)	
	C	ON when CN1-9 input signal is OFF (H-level)	
	D	ON when CN1-10 input signal is OFF (H-level)	
	E	ON when CN1-11 input signal is OFF (H-level)	
	F	ON when CN1-12 input signal is OFF (H-level)	

* Settings 9 through F can be used to reverse signal polarity.

IMPORTANT

1. Signals are input with OR logic when multiple signals are allocated to the same input circuit.
2. If reverse polarity is set for the Forward Run Prohibited or Reverse Run Prohibited signals, the operation may not be safe if broken signal lines occur. You must confirm operational safety when using this function.

As shown in the table above, the P-OT signal can be allocated to any input terminal from CN1-7 to CN1-13. P-OT is always ON when Pn50A.3 is set to 7, and so the SERVOPACK will always be in forward run prohibited status.

The P-OT signal is not used when Pn50A.3 is set to 8. This setting is used in the following instances.

- When terminal CN1-7 is to be replaced by another input signal.
- When the forward run prohibited (P-OT) is temporarily disabled for trial or normal operation.
- In case of system configuration where forward run prohibited (P-OT) function is not needed.

INFO

The forward run prohibited (P-OT) and the reverse run prohibited (N-OT) input signals are valid when OFF (high level). The input terminals must therefore be wired so that these signals remain ON (low level) in systems where they are not required. The need to wire these terminals can be eliminated by setting the Pn50A.3 to 8.

(2) Allocating Other Input Signals

Input signal allocation can be changed as shown below.

Input Signal	Parameter		Description
Name	Number	Setting	
Forward Run Prohibited (P-OT)	Pn50A.3	0	ON when CN1-13 input signal is ON (L-level)
		1	ON when CN1-7 input signal is ON (L-level)
		2	ON when CN1-8 input signal is ON (L-level)
		3	ON when CN1-9 input signal is ON (L-level)
		4	ON when CN1-10 input signal is ON (L-level)
		5	ON when CN1-11 input signal is ON (L-level)
		6	ON when CN1-12 input signal is ON (L-level)
		7	Sets signal ON
		8	Sets signal OFF
		9	ON when CN1-13 input signal is OFF (H-level)
		A	ON when CN1-7 input signal is OFF (H-level)
		B	ON when CN1-8 input signal is OFF (H-level)
		C	ON when CN1-9 input signal is OFF (H-level)
		D	ON when CN1-10 input signal is OFF (H-level)
		E	ON when CN1-11 input signal is OFF (H-level)
		F	ON when CN1-12 input signal is OFF (H-level)
Reverse Run Prohibited (N-OT)	Pn50B.0	0 to F	Same as above.
Forward Current Limit (/P-CL)	Pn50B.2	0 to F	Same as above.
Reverse Current Limit (/N-CL)	Pn50B.3	0 to F	Same as above.
Homing Deceleration LS (/DEC)	Pn511.0	0 to F	Same as above.
External Latch Signal 1 (/EXT1)	Pn511.1	0 to 3	Sets signal OFF
		4	ON when CN1-10 input signal is ON (L-level)
		5	ON when CN1-11 input signal is ON (L-level)
		6	ON when CN1-12 input signal is ON (L-level)
		7	Sets signal ON
		8 to C	Sets signal OFF
		D	ON when CN1-10 input signal is OFF (H-level)
		E	ON when CN1-11 input signal is OFF (H-level)
		F	ON when CN1-12 input signal is OFF (H-level)
External Latch Signal 2 (/EXT2)	Pn511.2	0 to F	Same as above.
External Latch Signal 3 (/EXT3)	Pn511.3	0 to F	Same as above.

■ Output Circuit Signal Allocation

Output signal functions can be allocated to the sequence signal output circuits shown below.

In general, allocate signals according to the standard settings in the following table.

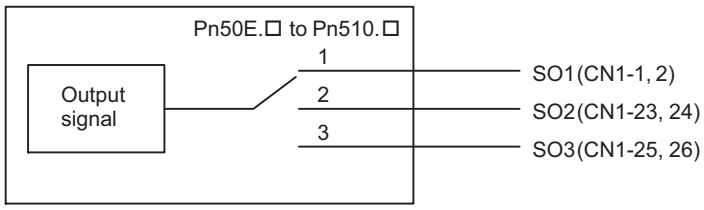
CN1 Connector Terminal Numbers	Output Terminal Name	Factory Setting	
		Symbol	Name
1	SO1	/BK+(/SO1+)	General-purpose signal output 1
2		/BK-(/SO1-)	
23	SO2	/SO2+	General-purpose signal output 2
24		/SO2-	
25	SO3	/SO3+	General-purpose signal output 3
26		/SO3-	

The output signal selection parameters and their factory settings are shown below.

Pn50E	Output Signal Selections 1	Factory Setting: 0000
Pn50F	Output Signal Selections 2	Factory Setting: 0100
Pn510	Output Signal Selections 3	Factory Setting: 0000

(1) Setting of Output Signal Allocation

Select the CN1 connector terminals that will output the signals according to the parameter setting.



Output Signal	Parameter		Description
	Number	Setting	
Positioning Completed (/COIN)	Pn50E.0	0	Disabled (Not used for the output signal on the left.)
		1	Outputs the signal on the left from the CN1-1 and 2 output terminal.
		2	Outputs the signal on the left from the CN1-23 and 24 output terminal.
		3	Outputs the signal on the left from the CN1-25 and 26 output terminal.
Speed Coincidence Detection (/V-CMP)	Pn50E.1	0 to 3	Same as above
Rotation Detection (/TGON)	Pn50E.2	0 to 3	Same as above
Servo Ready (/S-RDY)	Pn50E.3	0 to 3	Same as above
Torque Limit Detection (/CLT)	Pn50F.0	0 to 3	Same as above
Speed Limit Detection (/VLT)	Pn50F.1	0 to 3	Same as above
Brake Interlock (/BK)	Pn50F.2	0 to 3	Same as above
Warning (/WARN)	Pn50F.3	0 to 3	Same as above
Near (/NEAR)	Pn510.0	0 to 3	Same as above

INFO

Signals are output with OR logic when multiple signals are allocated to the same output circuit. Signals that are not used are invalid.

(2) Output Signal Reversal

The following parameter can be used to reverse the signals output on output terminals SO1 to SO3.

Pn512	Output Signal Reversal Settings		Speed Position Torque	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	–	–	0000	After restart

The settings specify which of the connector CN1 output signals are to be reversed.

Output Terminals	Parameter		Description
	Number	Setting	
SO1 (CN1-1, 2)	Pn512.0	0	Output signal not reversed.
		1	Output signal reversed.
SO2 (CN1-23, 24)	Pn512.1	0	Output signal not reversed.
		1	Output signal reversed.
SO3 (CN1-25, 26)	Pn512.2	0	Output signal not reversed.
		1	Output signal reversed.

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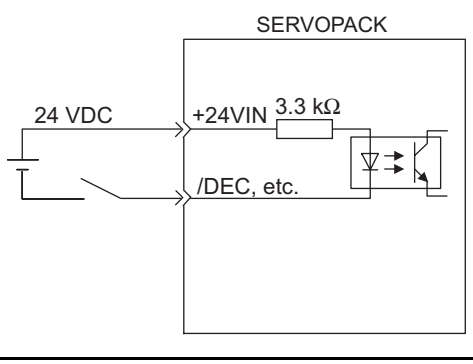
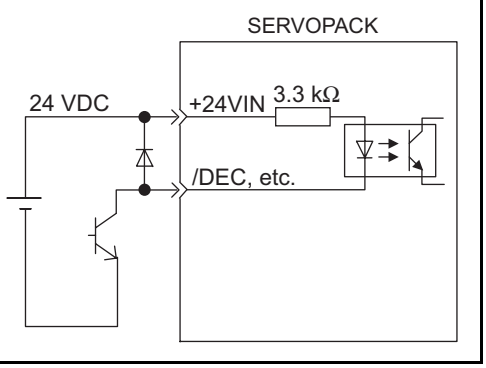
■ Interface Circuit

This section shows examples of SERVOPACK I/O signal connection to the host controller.

(1) Sequence Input Circuit Interface

CN1 connector terminals 6 to 13 is explained below.

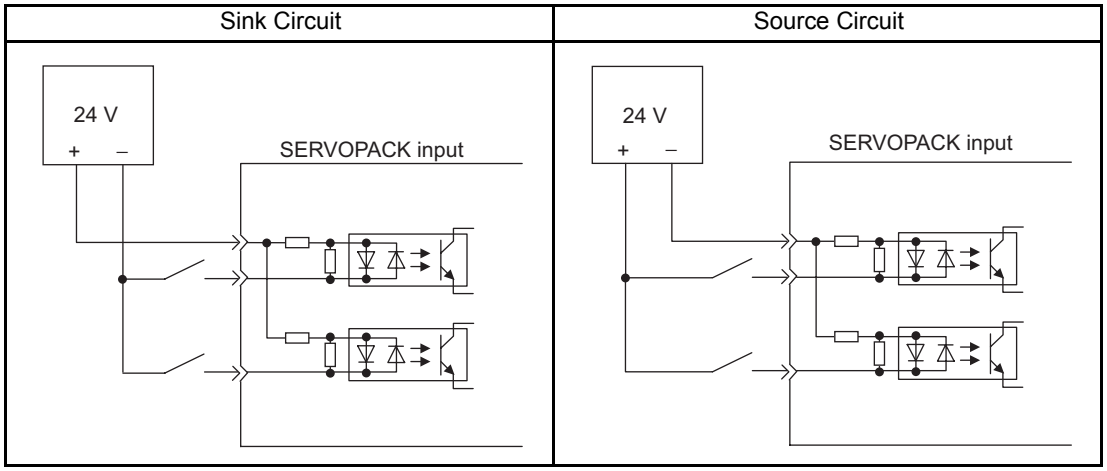
The sequence input circuit interface connects through a relay or open-collector transistor circuit. Select a low-current relay otherwise a faulty contact will result.

Relay Circuit Example	Open-collector Circuit Example
	

Note: The external power supply (24 VDC) needs the capacity of 50 mA and more.

(2) Sink Circuit and Source Circuit

The SERVOPACK's I/O circuit uses a bidirectional photocoupler. Select either the sink circuit or the source circuit according to the specifications required for each machine.



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■ Output Circuit Interface

There are two types of SERVOPACK output circuits:

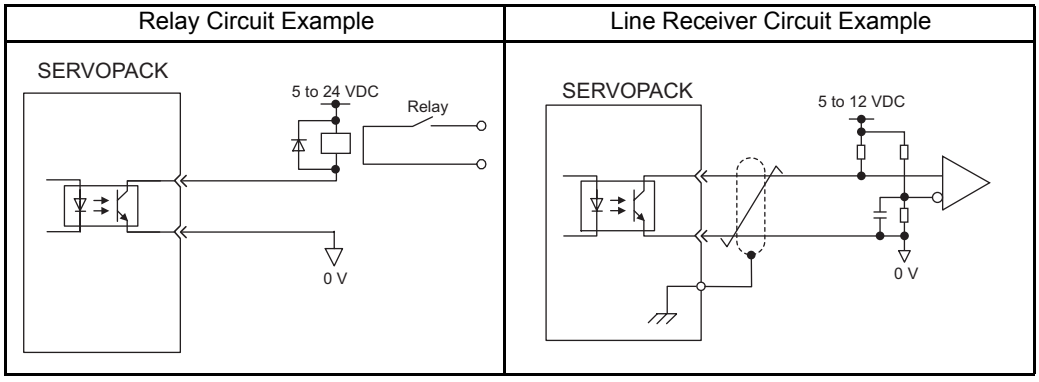
(1) Line Driver Output Circuit

CN1 connector terminals, 17-18 (phase-A signal), 19-20 (phase-B signal), 21-22 (phase-C signal) are explained below.

Encoder serial data converted to two-phase (phases A and B) pulse output signals (PAO, /PAO, PBO, /PBO) and origin pulse signals (PCO, /PCO) are output via line-driver output circuits. Connect the line-driver output circuit through a line receiver circuit at the host controller.

(2) Photocoupler Output Circuit

Photocoupler output circuits are used for servo alarm (ALM), break interlock (/BK), and other sequence output signal circuits. Connect a photocoupler output circuit through a relay or line receiver circuit.



Note: The maximum allowable voltage and current capacities for photocoupler output circuits are as follows.

- Voltage: 30 VDC
- Current: 50 mA DC

■ Electronic Gear

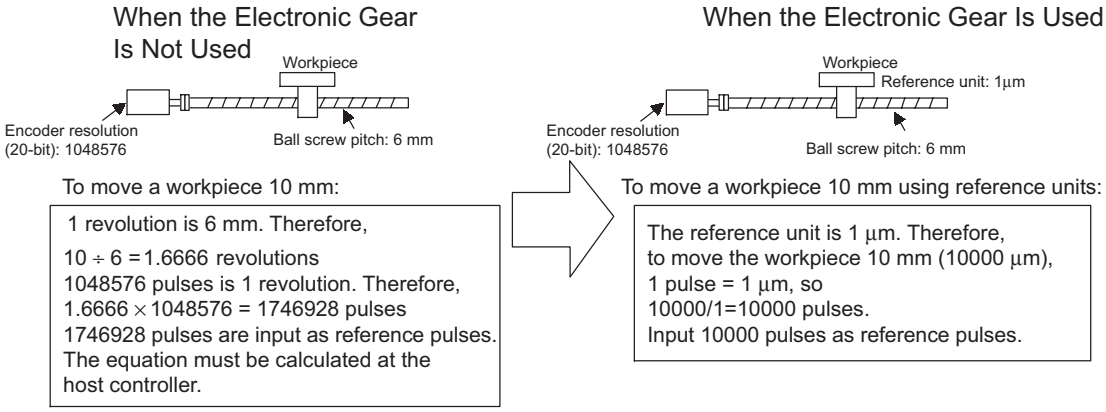
(1) Encoder Resolution

SGM□V-□□□□□□□ (Servomotor model)

Serial Encoder Specifications		
Symbol	Specification	Encoder Resolution
A	13-bit incremental	8192
3	20-bit absolute	1048576
D	20-bit incremental	1048576

(2) Electronic Gear

The electronic gear enables the workpiece travel distance per input reference pulse from the host controller to be set to any value. The minimum position data moving a load is called a reference unit.



(3) Electric Gear Ratio

Set the electric gear ratio using Pn20E and Pn210.

Pn20E	Electronic Gear Ratio (Numerator)			Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1073741824 (2^{30})	-	4	After restart	Setup
Pn210	Electronic Gear Ratio (Denominator)			Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1073741824 (2^{30})	-	1	After restart	Setup

If the deceleration ratio of the motor and the load shaft is given as n/m where m is the rotation of the motor and n is the rotation of the load shaft,

$$\text{Electronic gear ratio: } \frac{B}{A} = \frac{Pn20E}{Pn210} = \frac{\text{Encoder resolution}}{\text{Travel distance per load shaft revolution (reference units)}} \times \frac{m}{n}$$

IMPORTANT

Electronic gear ratio setting range: 0.001 ≤ Electronic gear ratio (B/A) ≤ 1000

If the electronic gear ratio is outside this range, a parameter setting error (A.040) will be output, and the SERVOPACK will not operate properly. In this case, modify the load configuration or reference unit.

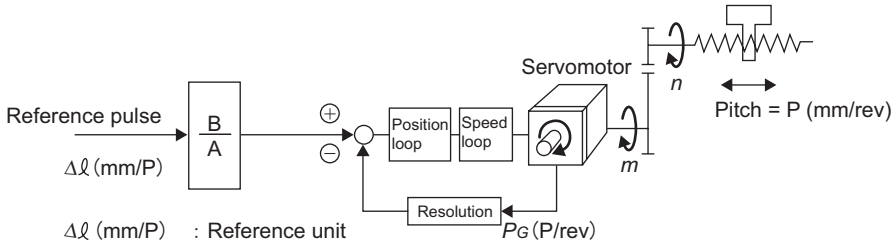
(4) Procedure for Setting the Electronic Gear Ratio

Set value electric gear differs depending on the machine specifications. Use the following procedure to set the electronic gear ratio.

Step	Operation
1	Check machine specifications. Check the deceleration ratio, ball screw pitch, and pulley diameter.
2	Check the encoder resolution. Check the encoder resolution for the servomotor used.
3	Determine the reference unit used. Determine the reference unit from the host controller, considering the machine specifications and positioning accuracy.
4	Calculate the travel distance per load shaft revolution. Calculate the number of reference units necessary to turn the load shaft one revolution based on the previously determined reference units.
5	Calculate the electronic gear ratio. Use the electronic gear ratio equation to calculate the ratio (B/A).
6	Set parameters. Set parameters Pn20E and Pn210 using the calculated values.

(5) Electronic Gear Ratio Equation

Refer to the following equation to determine the electric gear ratio.



$\Delta\ell$ (mm/P) : Reference unit
P_G (P/rev) : Encoder resolution
P (mm/rev) : Ball screw pitch
$\frac{m}{n}$: Gear ratio

$$\frac{n \times P}{\Delta\ell} \times \left(\frac{B}{A}\right) = P_G \times m$$

$$\left(\frac{B}{A}\right) = \frac{P_G \times m \times \Delta\ell}{n \times P} = \frac{P_G}{\frac{P}{\Delta\ell}} \times \frac{m}{n}$$

Set A and B with the following parameters.
A: Pn210 B: Pn20E

■ Operation Sequence When Being Servo ON

Motor control using a host controller is performed using motion commands only while the SERVOPACK is Servo ON (while current flows to the motor). While the SERVOPACK is Servo OFF (while current to the motor is interrupted), management of a position data is performed by the SERVOPACK so that the reference coordinate system (POS, MPOS) and FB coordinate system (APOS) are equal. In order to send appropriate motion commands, it is necessary to use the SMON command after the SERVOPACK changes to Servo ON to read the Servo reference coordinate (POS) and send an appropriate reference position.

■ Operation Sequence When OT (Overtravel Limit Switch) Signal Is Input

When the OT signal is input, the SERVOPACK prohibits rotation in the OT signal direction. This is performed as specified in parameter Pn001, and the SERVOPACK continues to control the motor while this rotation is prohibited. Use the following sequence for processing or canceling when the OT signal is input.

(1) Processing When the OT Signal Is Input

1. Monitor the OT signal or send a stop command if the OT signal will be input. Use either of the following stop commands.
   - Interpolation command (INTERPOLATE, LATCH):
     The interpolation command keeps the interpolation position, then stops. As an alternative, send the HOLD command or SMON command.
   - Movement reference (POSING etc.) command other than the interpolation command:
     Send the HOLD command.
2. Use the output complete flag (DEN = 1) to confirm the completion of SERVOPACK OT processing. By also confirming that PSET = 1, it is possible to detect motor stopping with absolute certainty. The command used in number 1 above is held until these flags are complete.

(2) OT Cancellation (Retraction)

OT cancellation (retraction) is performed with a movement command. Read out the current reference position POS and reset the reference coordinate system of the correct controller. Then execute a retraction command.

■ Operation Sequence At Emergency Stop (Main Circuit OFF)

After detecting SVON or PON bit which in STATUS field of response data was turned OFF, send the SV_OFF command. The SERVOPACK status is monitored by using the SMON command and so on during emergency stop.

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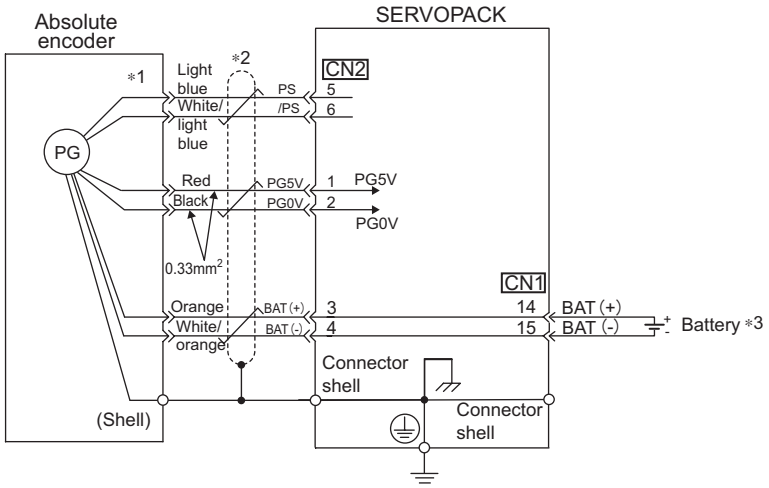
■ Absolute Encoders



*1 The pin numbers for the connector wiring differ depending on the servomotors.

*2 : represents twisted-pair wires.

*3 When using an absolute encoder, the backup power is supplied from the battery on the host controller. If the backup power is not supplied from the battery on the host controller, use an encoder cable with a battery unit JZSP-BA01.

■ CN2 Encoder Connector Terminal Layout

1	PG5V	PG power supply +5 V	2	PG 0 V	PG power supply 0 V
3	BAT (+)	Battery (+) (For an absolute encoder)	4	BAT (-)	Battery (-) (For an absolute encoder)
5	PS	PG serial signal input	6	/PS	PG serial signal input
SHELL	Shield	–	–	–	–

MⅡR-11

■ Absolute Encoder Setup

Perform the setup operation for the absolute encoder in the following circumstances:

- When starting the machine for the first time.
- When an encoder backup error (A.810) occurs.
- When an encoder checksum error (A.820) occurs.
- When the multiturn data of absolute encoder is to be set to within one rotation pulses.

Perform the setup using a digital operator. The absolute encoder can also be initialized by using a MECHATROLINK-II Adjusting (ADJ) command.

IMPORTANT

1. The absolute encoder setup operation is only possible when the SERVOPACK is Servo OFF.
2. If the following absolute encoder alarms are displayed, perform the setup to reset the alarm. The alarm cannot be reset by a MECHATROLINK Clear Alarm or Warning (ALM_CLR) command.
   - Encoder backup alarm (A.810)
   - Encoder checksum alarm (A.820)

   If any other encoder-related alarm occurs, turn OFF the power to reset the alarm.
3. The multiturn data will be -1, 0, or +1 after the setup operation. It depends the motor (encoder) itself and the position where the setup is performed.
   At setup, read the multiturn data and initial incremental pulse number.

■ Multiturn Limit Setting

⚠ WARNING

- Changing the multiturn limit may change the absolute position data. Be sure to set the multiturn limit following the controller's designation.
- If the Multiturn Limit Disagreement (A. CCO) alarm occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct.
  If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected. The machine will move to an unexpected positions, resulting in damages to the machine or in a fatal accident.

When implementing absolute detection systems for machines that turn m times in response to n turns in the load shaft, such as circular tables, it is convenient to reset the multiturn data from the encoder to 0 every m turns. The Multiturn Limit Setting allows the value m to be set for the encoder.

Select the absolute encoder usage with the following parameter.

"0" in Pn002.2 must be set in order to enable the absolute encoder.

Parameter		Description
Pn002	n.□0□□	Use the absolute encoder as an absolute encoder.
	n.□1□□	Use the absolute encoder as an incremental encoder.

The multiturn limit is set in the SERVOPACK using the following parameter.

Pn205	Multiturn Limit Setting		Speed Position Torque	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	0 to 65535	1 rev	65535	After restart

If the Multiturn Limit Setting is set to 65535 (factory setting), the multiturn data will vary from -32768 to 32767. If any other value is set, the multiturn data will vary from 0 to the setting of Pn205.

If the servomotor rotates in the negative direction from 0, the multiturn data will change to the value set in Pn205. If the servomotor rotates in the positive direction from the value set in Pn205, the multiturn data will change to 0. Set Pn205 to m - 1.

INFO

1. The setting is enabled by turning OFF the control power and turning it ON again.
2. When using a SGMCS direct-drive servomotor, be sure to set Pn205 to 0.

Change the setting using the following procedure.

1. Change the multiturn limit setting (Pn205), and then turn OFF the SERVOPACK control power and turn it ON again. The alarm A.CC0 occurs. The multiturn limit value for the encoder is setting 65535, the same as for the SERVOPACK's factory setting. Therefore, if only the multiturn limit value for the SERVOPACK is changed, the alarm occurs.

   Alarm Name: Multiturn Limit Disagreement

Alarm Display	Explanation
A.CC0	The multiturn limit values for the encoder and SERVOPACK are different.

2. The multiturn limit value for the encoder must be set to the same value as that for the SERVOPACK. Change the multiturn limit value for the encoder using the following procedure.

   Use a digital operator for the following operation. This operation is enabled only while the alarm A.CC0 occurs.

Operation Key	Display	Description
MODE/SET ∧ ∨	A.CC0 -FUNCTION- Fn012 Fn013 Fn016 Fn017	Open the Utility Function Mode main menu and select Fn013.
DATA	A.CC0 Multiturn Limit Set Start : [DATA] Return: [SET]	Press the DATA Key. The display is switched to the setting display of Fn013 (Multi-turn Limit Value Setting Change When a Multi-turn Limit Disagreement Alarm (A.CC0) Occurs). Note: If the display is not switched and "NO-OP" is displayed in the status display, the Write Prohibited Setting (Fn010 = 0001) i s set. Check the setting and reset.
DATA	Done Multiturn Limit Set Start : [DATA] Return: [SET]	Press the DATA Key to set the multi-turn limit value. When the setting is completed, "Done" is displayed in the status display. Turn the power OFF then ON to update the multi-turn limit setting. Note: Press the MODE/SET Key not to set the value. The display returns to the Utility Function Mode main menu.
Turn OFF the power, and then turn it ON again to make the setting valid.		

INFO

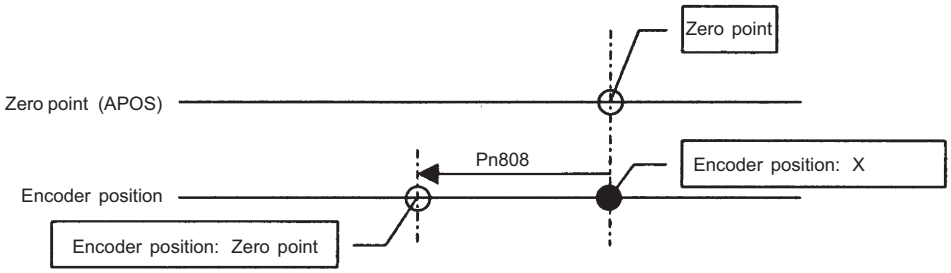
The multiturn limit setting in the encoder can be changed only while the Multiturn Limit Disagreement (A.CC0) has occurred. The setting is enabled by turning OFF the control power and turning it ON again.

■ Absolute Encoder Home Position Offset

When an absolute encoder is used, the offset between the encoder position and the zero position (APOS) can be set.

Pn808	Absolute Home Position Offset			Position
	Setting Range	Setting Unit	Factory Setting	When Enabled
	-1073741823 to 1073741823	1 reference unit	0	Immediately

Settings are as shown in the following figure. To set encoder position (X) as the zero position (0), set Pn808 to -X.



■ Parameter List <M-Ⅱ Rotary>

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn000		Basic Function Select Switch 0		–	0000h to 00B3h	0000h	After restart*1	Setup
	0	Direction Selection		–	0 to 3	0		
		0	Sets CCW as forward direction.					
		1	Sets CW as forward direction (Reverse Rotation Mode)					
Pn001		Application Function Select Switch 1		–	0000h to 1122h	0000h	After restart*1	Setup
	0	Servo OFF or Alarm G1 Stop Mode		–	0 to 2	0		
		0	Stops the motor by applying DB (dynamic brake).					
		1	Stops the motor by applying dynamic brake (DB) and then releases DB.					
		2	Makes the motor coast to a stop state without using the dynamic brake (DB).					
	1	Overtravel (OT) Stop Mode		–	0 to 2	0		
		0	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).					
		1	Sets the torque of Pn406 to the maximum value, decelerate the motor to a stop, and then sets it to servolock state.					
		2	Sets the torque of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to coasting state.					
	2	AC/DC Power Input Selection		–	0, 1	0		
		0	Not applicable to DC power input: Input AC power supply through L1, L2 , (and L3) terminals.					
		1	Applicable to DC power input: Input DC power supply between B1/ + and -, or input DC power supply between B1/ + and - or between P/+ and -2.					
	3	Warning Code Output Selection		–	0, 1	0		
		0	ALO1, ALO2, and ALO3 output only alarm codes.					
		1	ALO1, ALO2, and ALO3 output both alarm codes and warning codes. While warning codes are output, ALM signal output remains ON (normal state).					
Pn002		Application Function Select Switch 2		–	0000h to 4113h	0000h	After restart*1	Setup
	0	MECHATROLINK Command Position/Velocity Control Option		–	0 to 3	0		
		0	Does not use P_TLIM, NTLIM, TFF.					
		1	Uses P_TLIM and NTLIM as torque limit inputs.					
		2	Uses TFF as a torque feedforward.					
		3	When P-CL, N-CL are "available", uses P_TLIM and NTLIM as torque limit inputs.					
	1	Torque Control Option		–	0, 1	0		
		0	Does not use V_LIM.					
		1	Uses V_LIM as a speed limit input.					
	2	Absolute Encoder Usage		–	0, 1	0		
		0	Uses absolute encoder as an absolute encoder.					
		1	Uses absolute encoder as an incremental encoder.					
	3	External Encoder Usage		–	0 to 4	0		
		0	Do not use external encoder.					
		1	Uses external encoder in forward rotation direction.					
		3	Uses external encoder in reversed rotation direction.					

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn006		Application Function Select Switch 6		–	0000h to 005Fh	0002h	Immediately	Setup
	0 1	Analog Monitor 1 Signal Selection		–	00 to 5F	2		
		00	Motor speed (1V/1000min^{-1})					
		01	Speed reference (1V/1000min^{-1})					
		02	Torque reference (1V/100%)					
		03	Position error (0.05V/1 reference unit)					
		04	Position amplifier error (after electronic gears) (0.05V/ 1 encoder pulse unit)					
		05	Position reference speed (1V/1000min^{-1})					
		06	Reserved (Do not use.)					
		07	Motor load position error (0.01V/1 reference unit)					
		08	Positioning completion signal (positioning completed: 5V, positioning not completed: 0V)					
		09	Speed feedforward (1V/1000min^{-1})					
		0A	Torque feedforward (1V/100%)					
		0B	Active gain (1st gain: 1V, 2nd gain: 2V, 3rd gain: 3V, 4th gain: 4V)					
		0C	Completion of position reference (Completed: 5V, Not completed: 0V)					
		0D	External encoder speed (1V/1000min^{-1})					
Pn007		Application Function Select Switch 7		–	0000h to 005Fh	0000h	Immediately	Setup
	0 1	Analog Monitor 2 Signal Selection		–	00 to 5F	2		
		0	Motor speed (1V/1000min^{-1})					
		1	Speed reference (1V/1000min^{-1})					
		2	Torque reference (1V/100%)					
		3	Position error (0.05V/1 reference unit)					
		4	Position amplifier error (after electronic gears) (0.05V/1 encoder pulse unit)					
		5	Position reference speed (1V/1000min^{-1})					
		6	Reserved (Do not use.)					
		7	Motor load position error (0.01V/1 reference unit)					
		8	Positioning completion signal (positioning completed: 5V, positioning not completed: 0V)					
		9	Speed feedforward (1V/1000min^{-1})					
		0A	Torque feedforward (1V/100%)					
		0B	Active gain (1st gain: 1V, 2nd gain: 2V, 3rd gain: 3V, 4th gain: 4V)					
		0C	Completion of position reference (Completed: 5V, Not completed: 0V)					
		0D	External encoder speed (1V/1000min^{-1})					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn008		Application Function Select Switch 8	–	0000h to 7121h	4000h	After restart*1	Setup
	0	Lowered Battery Voltage Alarm/Warning Selection	–	0, 1	0		
		0 Outputs alarm (A.830) for lowered battery voltage.					
		1 Outputs warning (A.930) for lowered battery voltage.					
	1	Function Selection at Main Circuit Voltage Drop	–	0 to 2	0		
		0 Disables detection of the main circuit voltage drop.					
		1 Enables detection of the main circuit voltage drop.					
		2 Detects warning and limits torque by Pn424 and Pn425.					
	2	Warning Detection Selection	–	0, 1	0		
		0 Detects warning.					
		1 Does not detect warning.					
Pn009		Application Function Select Switch 9	–	0000h to 0111h	0010h	After restart*1	Tuning
	1	Current Control Method Selection	–	0, 1	1		
		0 Current control method 1					
		1 Current control method 2					
	2	Speed Detection Method Selection	–	0, 1	0		
		0 Speed detection 1					
		1 Speed detection 2					
Pn00B		Application Function Select Switch B	–	0000h to 1111h	0000h	After restart*1	Setup
	0	Parameter Display Selection	–	0, 1	0		
		0 Setup parameters					
		1 All parameters					
	1	Alarm G2 Stop Method Selection	–	0, 1	0		
		0 Stops the motor by setting the speed reference to "0".					
		1 Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).					
	2	Power Supply Method for Three-phase SERVOPACK	–	0, 1	0		
		0 Three-phase power supply					
		1 Single-phase power supply					
	3	Reserved (Do not change.)	–	0, 1	0		
Pn00C		Application Function Select Switch C	–	0000h to 0111h	0000h	After restart*1	Setup
	0	Selection of Test without Motor	–	0, 1	0		
		0 Test without motor disabled					
		1 Test without motor enabled					
	1	Encoder Resolution for Test without Motor	–	0, 1	0		
		0 13 bits					
		1 20 bits					
	2	Encoder Type for Test without Motor	–	0, 1	0		
		0 Incremental Encoder					
		1 Absolute Encoder					
Pn00D		Reserved (Do not change.)	–	0000h to 0001h	0000h	After restart*1	Setup
Pn080		Reserved (Do not change.)	–	0000h to 1111h	0000h	After restart*1	Setup
Pn100		Speed Loop Gain	0.1Hz	10 to 20000	400	Immediately	Tuning
Pn101		Speed Loop Integral Time Constant	0.01ms	15 to 51200	2000	Immediately	Tuning
Pn102		Position Loop Gain	0.1/s	10 to 20000	400	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn103		Moment of Inertia Ratio	%	0 to 20000	100	Immediately	Tuning
Pn104		2nd Speed Loop Gain	0.1Hz	10 to 20000	400	Immediately	Tuning
Pn105		2nd Speed Loop Integral Time Constant	0.01ms	15 to 51200	2000	Immediately	Tuning
Pn106		2nd Position Loop Gain	0.1/s	10 to 20000	400	Immediately	Tuning
Pn109		Feed Forward Gain	%	0 to 100	0	Immediately	Tuning
Pn10A		Feed Forward Filter Time Constant	0.01ms	0 to 6400	0	Immediately	Tuning
Pn10B		Application Function for Gain Select Switch	–	0000h to 5334h	0000h		Setup
	0	Mode Switch Selection	–	0 to 4	0	Immediately	
		0 Uses internal torque reference as the condition (Level setting: Pn10C)					
		1 Uses speed reference as the condition (Level setting: Pn10D)					
		2 Uses acceleration as the condition (Level setting: Pn10E)					
		3 Uses position error pulse as the condition (Level setting: Pn10F)					
		4 No mode switch function available					
	1	Speed Loop Control Method	–	0 to 3	0	After restart*1	
		0 PI control					
		1 I-P control					
Pn10C		Mode Switch (torque reference)	%	0 to 800	200	Immediately	Tuning
Pn10D		Mode Switch (speed reference)	min^{-1}	0 to 10000	0	Immediately	Tuning
Pn10E		Mode Switch (acceleration)	min^{-1}/s	0 to 30000	0	Immediately	Tuning
Pn10F		Mode Switch (position error pulse)	reference unit	0 to 10000	0	Immediately	Tuning
Pn11F		Position Integral Time Constant	0.1ms	0 to 50000	0	Immediately	Tuning
Pn121		Friction Compensation Gain	%	10 to 1000	100	Immediately	Tuning
Pn122		2nd Gain for Friction Compensation	%	10 to 1000	100	Immediately	Tuning
Pn123		Friction Compensation Coefficient	%	0 to 100	0	Immediately	Tuning
Pn124		Friction Compensation Frequency Correction	0.1Hz	-10000 to 10000	0	Immediately	Tuning
Pn125		Friction Compensation Gain Correction	%	1 to 1000	100	Immediately	Tuning
Pn131		Gain Switching Time 1	ms	0 to 65535	0	Immediately	Tuning
Pn132		Gain Switching Time 2	ms	0 to 65535	0	Immediately	Tuning
Pn135		Gain Switching Waiting Time 1	ms	0 to 65535	0	Immediately	Tuning
Pn136		Gain Switching Waiting Time 2	ms	0 to 65535	0	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn139		Automatic Gain Changeover Related Switch 1	–	0000h to 0052h	0000h	Immediately	Tuning
	0	Gain Switching Selection Switch	–	0 to 4	0		
		0 Manual gain switching Changes gain manually using external input signals (/G-SEL1, /G-SEL2)					
		2 Automatic gain switching pattern 1 Changes automatically 1st gain to 2nd gain when the switching condition A is satisfied. Changes automatically 2nd gain to 1st gain when the switching condition B is satisfied.					
	1	Gain Switching Condition A	–	0 to 5	0		
		0 Positioning completion signal (/COIN) ON					
		1 Positioning completion signal (/COIN) OFF					
		2 NEAR signal (/NEAR) ON					
		3 NEAR signal (/NEAR) OFF					
		4 Position reference filter output = 0 and reference pulse input OFF					
		5 Position reference pulse input ON					
Pn13D		Current Gain Level	%	100 to 2000	2000	Immediately	Tuning
Pn140		Model Following Control Related Switch	–	0000h to 1121h	0100h	Immediately	Tuning
	0	Model Following Control Selection	–	0, 1	0		
		0 Does not use model following control.					
		1 Uses model following control.					
	1	Vibration Suppression Selection	–	0 to 2	0		
		0 Does not perform vibration suppression.					
		1 Performs vibration suppression over the specified frequency.					
		2 Performs vibration suppression over two different kinds of frequencies.					
	2	Vibration Suppression Adjustment Selection	–	0, 1	1		
		0 Does not adjust vibration suppression automatically using utility function.					
		1 Adjusts vibration suppression automatically using utility function.					
	3	Selection of Speed Feedforward (VFF) or Torque Feedforward (TFF)	–	0, 1	0		
		0 Does not use model following control and external speed/torque feedforward at the same time.					
		1 Uses model following control and external speed/torque feedforward at the same time.					
Pn141		Model Following Control Gain	0.1/s	10 to 20000	500	Immediately	Tuning
Pn142		Model Following Control Gain Compensation	0.1%	500 to 2000	1000	Immediately	Tuning
Pn143		Model Following Control Bias (Forward Direction)	0.1%	0 to 10000	1000	Immediately	Tuning
Pn144		Model Following Control Bias (Reverse Direction)	0.1%	0 to 10000	1000	Immediately	Tuning
Pn145		Vibration Suppression 1 Frequency A	0.1Hz	10 to 2500	500	Immediately	Tuning
Pn146		Vibration Suppression 1 Frequency B	0.1Hz	10 to 2500	700	Immediately	Tuning
Pn147		Model Following Control Speed Feedforward Compensation	0.1%	0 to 10000	1000	Immediately	Tuning
Pn148		2nd Model Following Control Gain	0.1/s	10 to 20000	500	Immediately	Tuning
Pn149		2nd Model Following Control Gain Compensation	0.1%	500 to 2000	1000	Immediately	Tuning
Pn14A		Vibration Suppression 2 Frequency	0.1Hz	10 to 2000	800	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn14B		Vibration Suppression 2 Compensation	%	10 to 1000	100	Immediately	Tuning
Pn160		Anti-Resonance Control Related Switch	–	0000h to 0011h	0010h	Immediately	Tuning
	0	Anti-Resonance Control Selection	–	0, 1	0		
		0 Does not use anti-resonance control.					
		1 Uses anti-resonance control.					
	1	Anti-Resonance Control Adjustment Selection	–	0, 1	1		
		0 Does not adjust anti-resonance control automatically using utility function.					
		1 Adjusts anti-resonance control automatically using utility function.					
Pn161		Anti-Resonance Frequency	0.1Hz	10 to 20000	1000	Immediately	Tuning
Pn162		Anti-Resonance Gain Compensation	%	1 to 1000	100	Immediately	Tuning
Pn163		Anti-Resonance Damping Gain	%	0 to 300	0	Immediately	Tuning
Pn164		Anti-Resonance Filter Time Constant 1 Compensation	0.01ms	-1000 to 1000	0	Immediately	Tuning
Pn165		Anti-Resonance Filter Time Constant 2 Compensation	0.01ms	-1000 to 1000	0	Immediately	Tuning
Pn170		Tuning-less Function Related Switch	–	0000h to 2411h	1401h		Setup
	0	Tuning-less Function Selection	–	0, 1	1	After restart*1	
		0 Tuning-less function disabled					
		1 Tuning-less function enabled					
	1	Control Method during speed control	–	0, 1	0	After restart*1	
		0 Uses as speed control.					
		1 Uses as position control at host controller.					
	2	Tuning-less Level	–	0 to 4	4	Immediately	
	3	Tuning-less Load Level	–	0 to 2	1	Immediately	
Pn190		Reserved (Do not change.)	–	0000h to 0011h	0010h	After restart*1	Tuning
Pn200		Reserved (Do not change.)	–	0000h to 2236h	0100h	After restart*1	Setup
Pn205		Multi-turn Limit Setting	Rev	0 to 65535	65535	After restart*1	Setup
Pn207		Position Control Function Switch	–	0000h to 2210h	0010h	After restart*1	Setup
	3	COIN Output Timing	–	0 to 2	0		
		0 Outputs when the position error absolute value is the same or less than the positioning completion width (Pn522).					
		1 Outputs when the position error absolute value is the position completion width (Pn522) or less and the reference after position reference filtering is 0.					
		2 When the absolute value of the position error is below the positioning completed width setting (Pn522), and the position reference input is 0.					
Pn20A		Number of External Encoder Pitch	Pitch/Rev	4 to 1048576	32768	After restart*1	Setup
Pn20E		Electronic Gear Ratio (Numerator)	–	1 to 1073741824	4	After restart*1	Setup
Pn210		Electronic Gear Ratio (Denominator)	–	1 to 1073741824	1	After restart*1	Setup
Pn212		Encoder Output Pulses	P/Rev	16 to 1073741824	2048	After restart*1	Setup
Pn22A		Fully-closed Control Selection Switch	–	0000h to 1003h	0000h	After restart*1	Setup
	3	Speed Feedback Selection at Fully-closed Control	–	0, 1	0		
		0 Uses motor encoder speed.					
		1 Uses external encoder speed.					
Pn281		Encoder Output pulse	edge/ pitch	1 to 4096	20	After restart*1	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn304		JOG Speed	min^{-1}	0 to 10000	500	Immediately	Setup
Pn305		Soft Start Acceleration Time	ms	0 to 10000	0	Immediately	Setup
Pn306		Soft Start Deceleration Time	ms	0 to 10000	0	Immediately	Setup
Pn310		Vibration Detection Switch	–	0000h to 0002h	0000h	Immediately	Setup
	0	Vibration Detection Selection	–	0 to 2	0		
		0 No detection.					
		1 Outputs warning (A.911) when vibration is detected.					
		2 Outputs alarm (A.520) when vibration is detected.					
Pn311		Vibration Detection Sensibility	%	50 to 500	100	Immediately	Tuning
Pn312		Vibration Detection Level	min^{-1}	0 to 5000	50	Immediately	Tuning
Pn324		Moment of Inertia Setting Start Level	%	0 to 20000	300	Immediately	Setup
Pn401		Torque Reference Filter Time Constant	0.01ms	0 to 65535	100	Immediately	Tuning
Pn402		Forward Torque Limit	%	0 to 800	800	Immediately	Setup
Pn403		Reverse Torque Limit	%	0 to 800	800	Immediately	Setup
Pn404		Forward External Torque Limit	%	0 to 800	100	Immediately	Setup
Pn405		Reverse External Torque Limit	%	0 to 800	100	Immediately	Setup
Pn406		Emergency Stop Torque	%	0 to 800	800	Immediately	Setup
Pn407		Speed Limit during Torque Control	min^{-1}	0 to 10000	10000	Immediately	Setup
Pn408		Torque Related Function Switch	–	0000h to 1111h	0000h		Setup
	0	1st Notch Filter Selection	–	0, 1	0	Immediately	
		0 N/A					
		1 Uses 1st notch filter for torque reference.					
	1	Speed Limit Selection	–	0, 1	0	After restart*1	
		0 Uses the smaller value between motor max. speed and parameter Pn407 as speed limit value.					
		1 Uses the smaller value between overspeed detection speed and parameter Pn407 as speed limit value.					
	2	2nd Notch Filter Selection	–	0, 1	0	Immediately	
		0 N/A					
		1 Uses 2nd notch filter for torque reference.					
	3	Friction Compensation Function Selection	–	0, 1	0	Immediately	
		0 Disables friction compensation function.					
		1 Enables friction compensation function.					
Pn409		1st Notch Filter Frequency	Hz	50 to 5000	5000	Immediately	Tuning
Pn40A		1st Notch Filter Q Value	0.01	50 to 1000	70	Immediately	Tuning
Pn40B		1st Notch Filter Depth	0.001	0 to 1000	0	Immediately	Tuning
Pn40C		2nd Notch Filter Frequency	Hz	50 to 5000	5000	Immediately	Tuning
Pn40D		2nd Notch Filter Q Value	0.01	50 to 1000	70	Immediately	Tuning
Pn40E		2nd Notch Filter Depth	0.001	0 to 1000	0	Immediately	Tuning
Pn40F		2nd Step 2nd Torque Reference Filter Frequency	Hz	100 to 5000	5000	Immediately	Tuning
Pn410		2nd Step 2nd Torque Reference Filter Q Value	0.01	50 to 100	50	Immediately	Tuning
Pn412		1st Step 2nd Torque Reference Filter Time Constant	0.01ms	0 to 65535	100	Immediately	Tuning
Pn423		Reserved (Do not change.)	–	0000h to 1111h	0000h	Immediately	Setup

Parameter No. / Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn424	Torque Limit at Main Circuit Voltage Drop	%	0 to 100	50	Immediately	Setup
Pn425	Release time for Torque Limit at Main Circuit Voltage Drop	ms	0 to 1000	100	Immediately	Setup
Pn456	Sweep Torque Reference Amplitude	%	1 to 800	15	Immediately	Tuning
Pn460	Notch Filter Adjustment Switch	–	0000h to 0101h	0101h	Immediately	Tuning
Pn481	Polarity Detection Speed Loop Gain	0.1Hz	1.0 to 2000.0	40.0	Immediately	Tuning
Pn482	Polarity Detection Speed Loop Integral Time Constant	0.01ms	0.15 to 512.00	30.00	Immediately	Tuning
Pn486	Polarity Detection Reference Accel/Decel Time	ms	0 to 100	25	Immediately	Tuning
Pn487	Polarity Detection Constant Speed Time	ms	0 to 300	0	Immediately	Tuning
Pn488	Polarity Detection Reference Waiting Time	ms	50 to 500	100	Immediately	Tuning
Pn490	Polarity Detection Load Level	%	0 to 20000	100	Immediately	Tuning
Pn493	Polarity Detection Reference Speed	min^{-1}	0 to 1000	50	Immediately	Tuning
Pn494	Polarity Detection Range	0.001rev	0.001 to 65.535	0.250	Immediately	Tuning
Pn495	Polarity Detection Confirmation Torque Reference	%	0 to 200	100	Immediately	Tuning
Pn498	Polarity Detection Allowable Error Range	deg	0 to 30	10	Immediately	Tuning
Pn501	Zero Clamp Level	min^{-1}	0 to 10000	10	Immediately	Setup
Pn502	Rotation Detection Level	min^{-1}	1 to 10000	20	Immediately	Setup
Pn503	Speed Coincidence Signal Output Width	min^{-1}	0 to 100	10	Immediately	Setup
Pn506	Brake Reference - Servo OFF Delay Time	10ms	0 to 50	0	Immediately	Setup
Pn507	Brake Reference Output Speed Level	min^{-1}	0 to 10000	100	Immediately	Setup
Pn508	Waiting Time for Brake Signal When Motor Running	10ms	10 to 100	50	Immediately	Setup
Pn509	Instantaneous Power Cut Hold Time	ms	20 to 1000	20	Immediately	Setup
Pn50A	Input Signal Selection 1	–	0000h to FFF1h	2100h	After restart*1	Setup

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50A			Input Signal Selection 1	–	0000h to FFF1h	1881h	After restart*1	Setup
	0		Reserved (Do not change.)	–	–	1		
	1		Reserved (Do not change.)	–	–	8		
	2		Reserved (Do not change.)	–	–	8		
	3		P-OT Signal Mapping	–	0 to F	1		
		0	Forward run allowed when CN1-13 input signal is ON (L-level)					
		1	Forward run allowed when CN1-07 input signal is ON (L-level)					
		2	Forward run allowed when CN1-08 input signal is ON (L-level)					
		3	Forward run allowed when CN1-09 input signal is ON (L-level)					
		4	Forward run allowed when CN1-10 input signal is ON (L-level)					
		5	Forward run allowed when CN1-11 input signal is ON (L-level)					
		6	Forward run allowed when CN1-12 input signal is ON (L-level)					
		7	Forward run prohibited					
		8	Forward run allowed					
		9	Forward run allowed when CN1-13 input signal is OFF (H-level)					
		A	Forward run allowed when CN1-07 input signal is OFF (H-level)					
		B	Forward run allowed when CN1-08 input signal is OFF (H-level)					
		C	Forward run allowed when CN1-09 input signal is OFF (H-level)					
		D	Forward run allowed when CN1-10 input signal is OFF (H-level)					
		E	Forward run allowed when CN1-11 input signal is OFF (H-level)					
		F	Forward run allowed when CN1-12 input signal is OFF (H-level)					

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50B		Input Signal Selection 2		–	0000h to FFFFh	8882h	After restart*1	Setup
	0	N-OT Signal Mapping		–	0 to F	2		
		0	Reverse run allowed when CN1-13 input signal is ON (L-level)					
		1	Reverse run allowed when CN1-07 input signal is ON (L-level)					
		2	Reverse run allowed when CN1-08 input signal is ON (L-level)					
		3	Reverse run allowed when CN1-09 input signal is ON (L-level)					
		4	Reverse run allowed when CN1-10 input signal is ON (L-level)					
		5	Reverse run allowed when CN1-11 input signal is ON (L-level)					
		6	Reverse run allowed when CN1-12 input signal is ON (L-level)					
		7	Reverse run prohibited					
		8	Reverse run allowed					
		9	Reverse run allowed when CN1-13 input signal is OFF (H-level)					
		A	Reverse run allowed when CN1-07 input signal is OFF (H-level)					
		B	Reverse run allowed when CN1-08 input signal is OFF (H-level)					
		C	Reverse run allowed when CN1-09 input signal is OFF (H-level)					
		D	Reverse run allowed when CN1-10 input signal is OFF (H-level)					
		E	Reverse run allowed when CN1-11 input signal is OFF (H-level)					
		F	Reverse run allowed when CN1-12 input signal is OFF (H-level)					
	1	Reserved (Do not change.)		–	0 to F	8		
	2	/P-CL Signal Mapping		–	0 to F	8		
		0	ON when CN1-13 input signal is ON (L-level)					
		1	ON when CN1-07 input signal is ON (L-level)					
		2	ON when CN1-08 input signal is ON (L-level)					
		3	ON when CN1-09 input signal is ON (L-level)					
		4	ON when CN1-10 input signal is ON (L-level)					
		5	ON when CN1-11 input signal is ON (L-level)					
		6	ON when CN1-12 input signal is ON (L-level)					
		7	Sets signal ON					
		8	Sets signal OFF					
		9	ON when CN1-13 input signal is OFF (H-level)					
		A	ON when CN1-07 input signal is OFF (H-level)					
		B	ON when CN1-08 input signal is OFF (H-level)					
		C	ON when CN1-09 input signal is OFF (H-level)					
		D	ON when CN1-10 input signal is OFF (H-level)					
		E	ON when CN1-11 input signal is OFF (H-level)					
		F	ON when CN1-12 input signal is OFF (H-level)					
	3	/N-CL Signal Mapping		–	0 to F	8		
		0 to F	Same as P-CL signal mapping					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50E		Output Signal Selection 1	–	0000h to 3333h	0000h	After restart*1	Setup
	0	Positioning Completion Signal Mapping (/COIN)	–	0 to 3	0		
		0 Disabled (the above signal is not used.)					
		1 Outputs the signal from CN1-1, 2 output terminal.					
		2 Outputs the signal from CN1-23, 24 output terminal.					
		3 Outputs the signal from CN1-25, 26 output terminal.					
	1	Speed Coincidence Detection Signal Mapping (/V-CMP)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	2	Servomotor Rotation Detection Signal Mapping (/TGON)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	3	Servo Ready Signal Mapping (/S-RDY)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
Pn50F		Output Signal Selection 2	–	0000h to 3333h	0100h	After restart*1	Setup
	0	Torque Limit Detection Signal Mapping (/CLT)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	1	Speed Limit Detection Signal Mapping (/VLT)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	2	Brake Interlock Signal Mapping (/BK)	–	0 to 3	1		
		0 to 3 Same as /COIN signal mapping					
	3	Warning Signal Mapping (/WARN)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
Pn510		Output Signal Selection 3	–	0000h to 0033h	0000h	After restart*1	Setup
	0	/NEAR Signal Mapping	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn511			Input Signal Selection 5	–	0000h to FFFFh	6543h	After restart*1	Setup
	0		Homing Deceleration LS Signal (/DEC) Mapping	–	0 to F	3		
		0	Deceleration starts on the falling edge of CN1-13 input signal.					
		1	Deceleration starts on the falling edge of CN1-07 input signal.					
		2	Deceleration starts on the falling edge of CN1-08 input signal.					
		3	Deceleration starts on the falling edge of CN1-09 input signal.					
		4	Deceleration starts on the falling edge of CN1-10 input signal.					
		5	Deceleration starts on the falling edge of CN1-11 input signal.					
		6	Deceleration starts on the falling edge of CN1-12 input signal.					
		7	Sets signal ON.					
		8	Sets signal OFF.					
		9	Deceleration starts on the rising edge of CN1-13 input signal.					
		A	Deceleration starts on the rising edge of CN1-07 input signal.					
		B	Deceleration starts on the rising edge of CN1-08 input signal.					
		C	Deceleration starts on the rising edge of CN1-09 input signal.					
		D	Deceleration starts on the rising edge of CN1-10 input signal.					
		E	Deceleration starts on the rising edge of CN1-11 input signal.					
		F	Deceleration starts on the rising edge of CN1-12 input signal.					
	1		External Latch 1 Signal (/EXT1) Mapping	–	0 to F	4		
		0	Sets signal OFF.					
		1	Sets signal OFF.					
		2	Sets signal OFF.					
		3	Sets signal OFF.					
		4	Latch processing is executed on the falling edge of CN1-10 input signal.					
		5	Latch processing is executed on the falling edge of CN1-11 input signal.					
		6	Latch processing is executed on the falling edge of CN1-12 input signal.					
		7	Sets signal OFF.					
		8	Sets signal OFF.					
		9	Sets signal OFF.					
		A	Sets signal OFF.					
		B	Sets signal OFF.					
		C	Sets signal OFF.					
		D	Latch processing is executed on the rising edge of CN1-10 input signal.					
		E	Latch processing is executed on the rising edge of CN1-11 input signal.					
		F	Latch processing is executed on the rising edge of CN1-12 input signal.					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
	2	External Latch 2 Signal (/EXT2) Mapping	–	0 to F	5		
		0 Sets signal OFF.					
		1 Sets signal OFF.					
		2 Sets signal OFF.					
		3 Sets signal OFF.					
		4 Latch processing is executed on the falling edge of CN1-10 input signal.					
		5 Latch processing is executed on the falling edge of CN1-11 input signal.					
		6 Latch processing is executed on the falling edge of CN1-12 input signal.					
		7 Sets signal OFF.					
		8 Sets signal OFF.					
		9 Sets signal OFF.					
		A Sets signal OFF.					
		B Sets signal OFF.					
		C Sets signal OFF.					
		D Latch processing is executed on the rising edge of CN1-10 input signal.					
		E Latch processing is executed on the rising edge of CN1-11 input signal.					
		F Latch processing is executed on the rising edge of CN1-12 input signal.					
	3	External Latch 3 Signal (/EXT3) Mapping	–	0 to F	6		
		0 Sets signal OFF.					
		1 Sets signal OFF.					
		2 Sets signal OFF.					
		3 Sets signal OFF.					
		4 Latch processing is executed on the falling edge of CN1-10 input signal.					
		5 Latch processing is executed on the falling edge of CN1-11 input signal.					
		6 Latch processing is executed on the falling edge of CN1-12 input signal.					
		7 Sets signal OFF.					
		8 Sets signal OFF.					
		9 Sets signal OFF.					
		A Sets signal OFF.					
		B Sets signal OFF.					
		C Sets signal OFF.					
		D Latch processing is executed on the rising edge of CN1-10 input signal.					
		E Latch processing is executed on the rising edge of CN1-11 input signal.					
		F Latch processing is executed on the rising edge of CN1-12 input signal.					
Pn512		Output Signal Inverse Setting	–	0000h to 0111h	0000h	After restart*1	Setup
	0	Inverses output signals of CN1-1, -2 terminals	–	0, 1	0		
		0 Does not inverse outputs.					
		1 Inverses outputs.					
	1	Inverses output signals of CN1-23, -24 terminals	–	0, 1	0		
		0,1 Same as CN1-1, -2 output signals					
	2	Inverses output signals of CN1-25, -26 terminals	–	0, 1	0		
		0,1 Same as CN1-1, -2 output signals					
Pn51B		Excessive Error Level Between Servomotor and Load Positions	reference unit	0 to 1073741824	1000	Immediately	Setup
Pn51E		Excessive Position Error Warning Level	%	10 to 100	100	Immediately	Setup
Pn520		Excessive Position Error Alarm Level	reference unit	1 to 1073741823	5242880	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn522		Positioning Completed Width	reference unit	0 to 1073741824	7	Immediately	Setup
Pn524		NEAR Signal Width	reference unit	1 to 1073741824	1073741824	Immediately	Setup
Pn526		Excessive Position Error Alarm Level at Servo ON	reference unit	1 to 1073741823	5242880	Immediately	Setup
Pn528		Excessive Position Error Warning Level at Servo ON	%	10 to 100	100	Immediately	Setup
Pn529		Speed Limit Level at Servo ON	min^{-1}	0 to 10000	10000	Immediately	Setup
Pn52A		Multiplier per One Fully-closed Rotation	%	0 to 100	20	Immediately	Tuning
Pn52B		Overload Warning Level	%	1 to 100	20	Immediately	Setup
Pn52C		Derating of base current at detecting overload of motor	%	10 to 100	100	After restart*1	Setup
Pn52F		Monitor Display at Power ON	–	0000 to 0FFF	0FFFh	Immediately	Setup
Pn530		Program JOG Operation Related Switch	–	0000h to 0005h	0000h	Immediately	Setup
	0	Program JOG Operation Related Switch	–	0 to 5	0		
		0 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536					
		1 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536					
		2 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536					
		3 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536					
		4 (Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of times of movement Pn536					
		5 (Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536					
Pn531		Program JOG Movement Distance	reference unit	1 to 1073741824	32768	Immediately	Setup
Pn533		Program JOG Movement Speed	min^{-1}	1 to 10000	500	Immediately	Setup
Pn534		Program JOG Acceleration/Deceleration Time	ms	2 to 10000	100	Immediately	Setup
Pn535		Program JOG Waiting Time	ms	0 to 10000	100	Immediately	Setup
Pn536		Number of Times of Program JOG Movement	time	0 to 1000	1	Immediately	Setup
Pn550		Analog Monitor 1 Offset Voltage	0.1V	-1000.0 to 1000.0	0.0	Immediately	Setup
Pn551		Analog Monitor 2 Offset Voltage	0.1V	-1000.0 to 1000.0	0.0	Immediately	Setup
Pn552		Analog Monitor Magnification (x1)	x 0.01	-100.00 to 100.00	1.00	Immediately	Setup
Pn553		Analog Monitor Magnification (x2)	x 0.01	-100.00 to 100.00	1.00	Immediately	Setup
Pn560		Remained Vibration Detection Width	0.1%	0.1 to 300.0	40.0	Immediately	Setup
Pn561		Overshoot Detection Level	%	0 to 100	100	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn600		Regenerative Resistor Capacity	10W	Depends on SERVOPACK capacity	0	Immediately	Setup
Pn800		Communications Control	–	–	0040h	Immediately	Setup
	0	MECHATROLINK Communications Check Mask (for debug)	–	0 to 3	0		
		0 No mask					
		1 Ignores MECHATROLINK communications error (A.E6).					
		2 Ignores WDT error (A.E5).					
		3 Ignores both MECHATROLINK communications error (A.E6) and WDT error (A.E5).					
	1	Warning Check Mask	–	0 to 7	4		
		0 No mask					
		1 Ignores data setting warning (A.94).					
		2 Ignores command warning (A.95).					
		3 Ignores both data setting warning (A.94) and command warning (A.95).					
		4 Ignores communications warning (A.96).					
		5 Ignores both data setting warning (A.94) and communications warning (A.96).					
		6 Ignores both command warning (A.95) and communications warning (A.96).					
		7 Ignores data setting warning (A.94), command warning (A.95) and communications warning (A.96).					
Pn801		Application Function Select 6 (Software LS)	–	–	0003h	Immediately	Setup
	0	Software Limit Function	–	0 to 3	3		
		0 Enables forward and reverse software limit.					
		1 Disables forward software limit.					
		2 Disables reverse software limit.					
		3 Disables software limit in both directions.					
	2	Software Limit for Reference	–	0,1	0		
		0 Disables software limit for reference.					
		1 Enables software limit for reference.					
	3	Reserved (Do not change.)	–	–	0		
Pn803		Origin Range	1 reference unit	0 to 250	10	Immediately	Setup
Pn804		Forward Software Limit	1 reference unit	-2^30+1 to 2^30-1	1073741823	Immediately	Setup
Pn806		Reverse Software Limit	1 reference unit	-2^30+1 to 2^30-1	-1073741823	Immediately	Setup
Pn808		Absolute Encoder Origin Offset	1 reference unit	-2^30+1 to 2^30-1	0	Unnecessary*2	Setup
Pn80A		1st Linear Acceleration Constant	10000 reference unit/s^2	1 to 65535	100	Unnecessary*3	Setup
Pn80B		2nd Linear Acceleration Constant	10000 reference unit/s^2	1 to 65535	100	Unnecessary*3	Setup
Pn80C		Acceleration Constant Switching Speed	100 reference unit/s	0 to 65535	0	Unnecessary*3	Setup
Pn80D		1st Linear Deceleration Constant	10000 reference unit/s^2	1 to 65535	100	Unnecessary*3	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn80E		2nd Linear Deceleration Constant	10000 reference unit/s^2	1 to 65535	100	Unnecessary*3	Setup
Pn80F		Deceleration Constant Switching Speed	100 reference unit/s	0 to 65535	0	Unnecessary*3	Setup
Pn810		Exponential Function Acceleration/Deceleration Bias	100 reference unit/s	0 to 65535	0	Unnecessary*4	Setup
Pn811		Exponential Function Acceleration/Deceleration Time Constant	0.1ms	0 to 5100	0	Unnecessary*4	Setup
Pn812		Movement Average Time	0.1ms	0 to 5100	0	Unnecessary*4	Setup
Pn814		Final Travel Distance for External Positioning	1 reference unit	-2^30+1 to 2^30-1	100	Immediately	Setup
Pn816		Homing Mode Setting	–	–	0000h	Immediately	Setup
	0	Homing Direction	–	0,1	0		
		0 Forward					
		1 Reverse					
Pn817		Homing Approach Speed 1	100 reference unit/s	0 to 65535	50	Unnecessary*3	Setup
Pn818		Homing Approach Speed 2	100 reference unit/s	0 to 65535	5	Unnecessary*3	Setup
Pn819		Final Travel Distance for Homing	1 reference unit	-2^30+1 to 2^30-1	100	Immediately	Setup
Pn81E		Input Signal Monitor Selection	–	–	0000H	Immediately	Setup
	0	IO12 Signal Mapping	–	0 to 7	0		
		0 No mapping					
		1 Monitors SI0 (CN1-13).					
		2 Monitors SI1 (CN1-7).					
		3 Monitors SI2 (CN1-8).					
		4 Monitors SI3 (CN1-9).					
		5 Monitors SI4 (CN1-10).					
		6 Monitors SI5 (CN1-11).					
		7 Monitors SI6 (CN1-12).					
	1	IO13 Signal Mapping	–	0 to 7	0		
		0 to 7 Refer to IO12 signal mapping.					
	2	IO14 Signal Mapping	–	0 to 7	0		
		0 to 7 Refer to IO12 signal mapping.					
	3	IO15 Signal Mapping	–	0 to 7	0		
		0 to 7 Refer to IO12 signal mapping.					
Pn81F		Command Data Allocation	–	–	0000H	After restart*1	Setup
	0	Option Field Allocation	–	0,1	0		
		0 Disables option field allocation.					
		1 Enables option field allocation.					
	1	Position Control Command TFF/TLIM Function Allocation	–	0,1	0		
		0 Disables allocation.					
		1 Enables allocation.					
Pn820		Forward Latching Allowable Area	1 reference unit	-2^31 to 2^31-1	0	Immediately	Setup
Pn822		Reverse Latching Allowable Area	1 reference unit	-2^31 to 2^31-1	0	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn824		Option Monitor 1 Selection	–	–	0000H	Immediately	Setup
	0000H	Motor rotation speed [1000000H/OS]	high speed				
	0001H	Speed reference [1000000H/OS]	high speed				
	0002H	Torque [1000000H/Max torque]	high speed				
	0003H	Position error (lowermost 32 bits) [reference unit]	high speed				
	0004H	Position error (uppermost 32 bits) [reference unit]	high speed				
	0005H	System reserved	high speed				
	0006H	System reserved	high speed				
	000AH	Encoder count (lower 32 bits) [reference unit]	high speed				
	000BH	Encoder count (upper 32 bits) [reference unit]	high speed				
	000CH	External encoder count (lower 32 bits) [reference unit]	high speed				
	000DH	External encoder count (upper 32 bits) [reference unit]	high speed				
	0010H	Un000: Motor rotation speed [r/min]	low speed				
	0011H	Un001: Speed reference [r/min]	low speed				
	0012H	Un002: Torque reference [%]	low speed				
	0013H	Un003: Rotational angle 1 [pulse]	low speed				
	0014H	Un004: Rotational angle 2 [deg]	low speed				
	0017H	Un005: Input position reference speed [r/min]	low speed				
	0018H	Un006: Input signal monitor	low speed				
	0019H	Un007: Output signal monitor	low speed				
	0018H	Un008: Position error	low speed				
	0019H	Un009: Accumulated load ratio [%]	low speed				
	001AH	Un00A: Regenerative load ratio [%]	low speed				
	001BH	Un00B: DB resistance consumption power [%]	low speed				
	001CH	Un00C: Input reference pulse counter [pulse]	low speed				
	001DH	Un00D: Feedback pulse counter [pulse]	low speed				
	001EH	Un00E: Fully-closed loop feedback pulse counter [pulse]	low speed				
	001FH	System reserved	low speed				
	0023H	Initial multi-turn data [rev]	fixed				
	0024H	Initial incremental pulse [pulse]	fixed				
	0025H	System reserved	fixed				
	0026H	System reserved	fixed				
	0080H	Previous value of latched feedback position (LPOS)	high speed				
Pn825		Option Monitor 2 Selection (Refer to Option Monitor 1 Selection.)	–	–	0	Immediately	Setup

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn827			Linear Deceleration Constant 1 for Stopping	10000 reference unit/s^2	1 to 65535	100	Unnecessary*3	Setup
Pn829			SVOFF Waiting Time (SVOFF at deceleration to stop)	10ms	0 to 65535	0	Unnecessary*3	Setup
Pn82A			Option Field Allocation 1	–	0000H to 1E1EH	1813H	After restart*1	Setup
	0	0 to E	ACCFIL bit position		0 to E	3		
	1	0	Disables ACCFIL bit allocation.		0,1	1		
		1	Enables ACCFIL bit allocation.					
	2	0 to E	GSEL bit position		0 to E	8		
	3	0	Disables GSEL bit allocation.		0,1	1		
		1	Enables GSEL bit allocation.					
Pn82B			Option Field Allocation 2	–	0000H to 1F1FH	1D1CH	After restart*1	Setup
	0	0 to F	V_PPI bit position		0 to F	C		
	1	0	Disables V_PPI bit allocation.		0,1	1		
		1	Enables V_PPI bit allocation.					
	2	0 to F	P_PI_CLR bit position		0 to F	D		
	3	0	Disables P_PI_CLR bit allocation.		0,1	1		
		1	Enables P_PI_CLR bit allocation.					
Pn82C			Option Field Allocation 3	–	0000H to 1F1FH	1F1EH	After restart*1	Setup
	0	0 to F	P_CL bit position		0 to F	E		
	1	0	Disables P_CL bit allocation.		0,1	1		
		1	Enables P_CL bit allocation.					
	2	0 to F	N_CL bit position		0 to F	F		
	3	0	Disables N_CL bit allocation.		0,1	1		
		1	Enables N_CL bit allocation.					
Pn82D			Option Field Allocation 4	–	0000H to 1F1CH	0000H	After restart*1	Setup
	0	0 to C	BANK_SEL1 bit position		0 to C	0		
	1	0	Disables BANK_SEL1 bit allocation.		0,1	0		
		1	Enables BANK_SEL1 bit allocation.					
	2	0 to F	LT_DISABLE bit position		0 to F	0		
	3	0	Disables LT_DISABLE bit allocation.		0,1	0		
		1	Enables LT_DISABLE bit allocation.					
Pn82E			Option Field Allocation 5	–	0000H to 1F1CH	0000H	After restart*1	Setup
	0	0 to F	Reserved		0 to F	0		
	1	0	Reserved		0,1	0		
		1	Reserved					
	2	0 to D	OUT_SIGNAL bit position		0 to D	0		
	3	0	Disables OUT_SIGNAL bit allocation.		0,1	0		
		1	Enables OUT_SIGNAL bit allocation.					
Pn833			Motion Setting	–	0000H to 0001H	0000H	After restart*1	Setup
	0		Linear Accel/Decel Constant Selection		0,1	0		
		0	Uses Pn80A to Pn80F and Pn827. (Setting of Pn834 to Pn840 disabled)					
		1	Uses Pn834 to Pn840. (Setting of Pn80A to Pn80F and Pn827 disabled)					
Pn834			1st Linear Acceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Unnecessary*3	Setup
Pn836			2nd Linear Acceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Unnecessary*3	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn838		Acceleration Constant Switching Speed 2	reference unit/s	0 to 2097152000	0	Unnecessary*3	Setup
Pn83A		1st Linear Deceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Unnecessary*3	Setup
Pn83C		2nd Linear Deceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Unnecessary*3	Setup
Pn83E		Deceleration Constant Switching Speed 2	reference unit/s	0 to 2097152000	0	Unnecessary*3	Setup
Pn840		Linear Deceleration Constant 2 for Stopping	10000 reference unit/s^2	1 to 20971520	100	Unnecessary*3	Setup
Pn850		Latch Sequence Number	–	0 to 8	0	Immediately	Setup
Pn851		Continuous Latch Count	–	0 to 255	0	Immediately	Setup
Pn852		Latch Sequence Signal 1 to 4 Setting	–	0000H–3333H	0000h	Immediately	Setup
	0	Latch sequence 1 signal selection	–	0 to 3	0		
		0 Phase C					
		1 EXT1 signal					
		2 EXT2 signal					
		3 EXT3 signal					
	1	Latch sequence 2 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	2	Latch sequence 3 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	3	Latch sequence 4 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
Pn853		Latch Sequence Signal 5 to 8 Setting	–	0000H–3333H	0000h	Immediately	Setup
	0	Latch sequence 5 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3			
	1	Latch sequence 6 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	2	Latch sequence 7 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	3	Latch sequence 8 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
Pn880		Station Address Monitor (for maintenance, read only)	–	40 to 5FH	0	Immediately	Setup
Pn881		Setting Transmission Byte Monitor [byte] (for maintenance, read only)	–	17,32	0	Immediately	Setup
Pn882		Transmission Cycle Setting Monitor [0.25 μs] (for maintenance, read only)	–	0 to FFFFH	0	Immediately	Setup
Pn883		Communications Cycle Setting Monitor (x transmission cycle) (for maintenance, read only)	–	0 to 32	0	Immediately	Setup
Pn88A		M2 Receive Error Counter Monitor (for maintenance, read only)	–	0 to 65535	0	Immediately	Setup
Pn890 to Pn89E		CMD Data Monitor at Alarm/Warning Occurs (for maintenance, read only)	–	0 to FFFFFFFFH	0	Immediately	Setup
Pn8A0 to Pn8AE		RSP Data Monitor at Alarm/Warning Occurs (for maintenance, read only)	–	0 to FFFFFFFFH	0	Immediately	Setup
Pn900		Parameter Bank Number	–	0 to 16	0	After restart*1	Setup
Pn901		Parameter Bank Member Number	–	0 to 15	0	After restart*1	Setup
Pn902 to Pn910		Parameter Bank Member Definition	–	0000H to 08FFH	0	After restart*1	Setup
Pn920 to Pn95F		Parameter Bank Data (nonvolatile memory save disabled)	–	0000H to FFFFH	0	Immediately	Setup

* 1. Validated after CONFIG command is sent or when tuning OFF and then ON the power supply.
* 2. Setting is enabled after SENS_ON command is sent.
* 3. Change the setting when DEN = 1 (reference stop state) to prevent interfering the reference output.
* 4. Setting is updated only when DEN = 1 (reference stop state).

■ Revision Details for the Analog Linear User's Manual

Until the new manual is issued, refer to the following documents for information on how to use the Σ-V analog linear servomotors.
The highlighted sections indicate relevant information.

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	9.1.6 Connection Example of External Encoder by Mitutoyo	–	–	–	–	–	–	Not applicable.
	9.1.7 Connection Example of External Encoder by Renishaw	–	–	–	–	–	–	Not applicable.
	9.1.8 Encoder Output Pulse Signals from SERVOPACK with a External Encoder by Renishaw	–	–	–	–	–	–	Not applicable.
	9.2 Related Parameters	–	–	–	–	–	–	Not applicable.
	9.2.1 Setting Order of Related Parameters	–	–	–	–	–	–	Not applicable.
	9.2.2 Speed Feedback Method during Fully-closed Loop Control	–	–	–	–	–	–	Not applicable.
	9.2.3 Motor Rotation Direction	–	–	–	–	–	–	Not applicable.
	9.2.4 Sine Wave Pitch (Frequency) for an External Encoder	–	–	–	–	–	–	Not applicable.
	9.2.5 Number of Encoder Output Pulses (PAO, PBO, and PCO) from the SERVOPACK	–	–	–	–	–	–	Not applicable.
	9.2.6 Electronic Gear	–	–	–	–	–	–	Not applicable.
	9.2.7 Alarm Detection	–	–	–	–	–	–	Not applicable.
	9.2.8 Analog Monitor Signal	–	–	–	–	–	–	Not applicable.
Chapter 10	10.1 Alarm Displays	–	–	–	–	–	–	
	10.1.1 List of Alarms	–	–	–	–	–	–	Will be included in the new manual.
	10.1.2 Troubleshooting of Alarms	–	Setup Linear	6.1	100 to 128	–	–	
	10.2 Warning Displays	10-22	–	–	–	–	–	
	10.2.1 List of Warnings	10-22	–	–	–	–	–	
	10.2.2 Troubleshooting of Warnings	10-23	–	–	–	–	–	
	10.3 Troubleshooting Malfunction Based on Operation and Conditions of the Servomotor	–	Setup Linear	6.2	129 to 136	–	–	
Chapter 11	11.1 Connection to Host Controller	11-2	–	–	–	–	–	
	11.1.1 Example of Connection to MP2200/ MP2300 Motion Module SVA-01	11-2	–	–	–	–	–	
	11.1.2 Example of Connection to MP920 4-axes Analog Module SVA-01	11-3	–	–	–	–	–	
	11.1.3 Example of Connection to OMRON's Motion Control Unit	11-4	–	–	–	–	–	
	11.1.4 Example of Connection to OMRON's Position Control Unit	11-5	–	–	–	–	–	
	11.1.5 Connection to MITSUBISHI's AD72 Positioning Unit (SERVOPACK in Speed Control Mode)	11-6	–	–	–	–	–	
	11.1.6 Connection to MITSUBISHI's AD75 Positioning Unit (SERVOPACK in Position Control Mode)	11-7	–	–	–	–	–	
	11.2 List of Parameters	11-8	–	–	–	–	–	
	11.2.1 Utility Functions	11-8	–	–	–	–	–	
	11.2.2 Parameters	–	–	–	–	APL-24	85	
	11.3 Monitor Modes	–	–	–	–	–	–	Will be included in the new manual.
	11.4 Parameter Recording Table	–	–	–	–	–	–	Will be included in the new manual.

■ I/O Signal (CN1) Names and Functions

(1) Input Signals

Signal Name		Pin No.	Function		Reference (Analog Rotary manual)
Common	/S-ON	40	Servo ON: Turns ON the linear servomotor when the gate block in the inverter is released.		5.2.1
	/P-CON	41	Function selected by parameter.		–
			Proportional control reference	Switches the speed control loop from PI (proportional/integral) to P (proportional) control when ON.	6.8.4
			Direction reference	With the internal set speed selected: Switch the movement direction.	5.6.1
			Control mode switching	Position ↔ speed Position ↔ force Force ↔ speed } Enables control mode switching.	5.7.3
			Zero-clamp reference	Speed control with zero-clamp function: Reference speed is zero when ON.	5.3.5
			Reference pulse block	Position control with reference pulse stop: Stops reference pulse input when ON.	5.4.7
	P-OT N-OT	42 43	Forward run prohibited Reverse run prohibited	Overtravel prohibited: Stops linear servomotor when movable part travels beyond the allowable range of motion.	5.2.3
	/P-CL /N-CL	45 46	Function selected by parameter.		–
			Forward external force limit ON Reverse external force limit ON	Current limit function enabled when ON.	5.8.2 5.8.4
			Internal speed switching	With the internal set speed selected: Switches the internal speed settings.	5.6.1
	/ALM-RST	44	Alarm reset: Releases the servo alarm state.		–
	+24VIN	47	Control power supply input for sequence signals: Users must provide the +24 V power supply. Allowable voltage fluctuation range: 11 to 25 V		7.4.6
	SEN	4 (2)	Initial data request signal when an absolute encoder is used.		5.9.2
Speed	V-REF	5 (6)	Speed reference speed input: ±2 to ±10 V/rated motor speed (Input gain can be modified using a parameter.)		5.3.1 5.5.3
Force	T-REF	9 (10)	Force reference input: ±1 to ±10 V/rated motor force (Input gain can be modified using a parameter.)		5.5.1 5.8.3 5.8.5
Position	PULS /PULS SIGN /SIGN	7 8 11 12	Reference pulse input for only line driver	Input mode is set from the following pulses. • Sign + pulse string • CCW/CW pulse • Two-phase pulse (90° phase differential)	5.4.1
	CLR /CLR	15 14	Positional error pulse clear input: Clears the positional error pulse during position control.		5.4.2

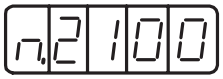
Note: 1. Pin numbers in parentheses () indicate signal grounds.
2. The functions allocated to /S-ON, /P-DET, /P-CON, P-OT, N-OT, /ALM-RST, /P-CL, and /N-CL input signals can be changed by using the parameters. Refer to *3.3.1 Input Circuit Signal Allocation* (Analog Rotary manual).
3. The voltage input range for speed and force references is a maximum of ±12 V.

■ Input Circuit Signal Allocation

Each input signal is allocated to a pin of the input connector CN1 by setting the parameter. The allocation table is shown below.

(1) Factory Setting (Pn50A.0 = 0)

The factory setting for a preset input signal (allocation) is shown in a box outlined with a bold line, ▭ , in the lists below.

Pn50A: 

Pn50B: 

(2) Changing the Allocation (Set as Pn50A.0 = 1)

Set the parameter in accordance with the relation between the signal to be used and the input connector pin. After having changed the parameter, turn OFF the power and ON again to validate the new setting.

□ means factory setting.

Signal Name	Validity Level	Input Signal	CN1 Pin Numbers							Connection Not required (SERVOPACK judges the connection)	
Parameter Setting Allocation			40	41	42	43	44	45	46	Always ON	Always OFF
Servo ON Pn50A.1 = n.xx□x	L	/S-ON	0	1	2	3	4	5	6	7	8
	H	S-ON	9	A	B	C	D	E	F		
Proportional Operation Reference Pn50A.2 = n.x□xx	L	/P-CON	0	1	2	3	4	5	6	7	8
	H	P-CON	9	A	B	C	D	E	F		
Forward Run Prohibited Pn50A.3 = n.□xxx	H	P-OT	0	1	2	3	4	5	6	7	8
	L	/P-OT	9	A	B	C	D	E	F		
Reverse Run Prohibited Pn50B.0 = n.xxx□	H	N-OT	0	1	2	3	4	5	6	7	8
	L	/N-OT	9	A	B	C	D	E	F		
Alarm Reset Pn50B.1 = n.xx□x	L	/ARM-RST	0	1	2	3	4	5	6	–	8
	H	ARM-RST	9	A	B	C	D	E	F		
Forward External Force Limit Pn50B.2 = n.x□xx	L	/P-CL	0	1	2	3	4	5	6	7	8
	H	P-CL	9	A	B	C	D	E	F		
Reserve External Force Limit Pn50B.3 = n.□xxx	L	/N-CL	0	1	2	3	4	5	6	7	8
	H	N-CL	9	A	B	C	D	E	F		
Switching Servomotor Movement Direction Pn50C.0 = n.xxx□	L	/SPD-D	0	1	2	3	4	5	6	7	8
	H	SPD-D	9	A	B	C	D	E	F		
Internal Set Speed Selection Pn50C.1 = n.xx□x	L	/SPD-A	0	1	2	3	4	5	6	7	8
	H	SPD-A	9	A	B	C	D	E	F		
Internal Set Speed Selection Pn50C.2 = n.x□xx	L	/SPD-B	0	1	2	3	4	5	6	7	8
	H	SPD-B	9	A	B	C	D	E	F		
Control Method Selection Pn50C.3 = n.□xxx	L	/C-SEL	0	1	2	3	4	5	6	7	8
	H	C-SEL	9	A	B	C	D	E	F		
Zero Clamp Pn50D.0 = n.xxx□	L	/ZCLAMP	0	1	2	3	4	5	6	7	8
	H	ZCLAMP	9	A	B	C	D	E	F		
Reference Pulse Inhibit Pn50D.1 = n.xx□x	L	/INHIBIT	0	1	2	3	4	5	6	7	8
	H	INHIBIT	9	A	B	C	D	E	F		
Gain Changeover 1 Pn50D.2 = n.x□xx	L	/G-SEL1	0	1	2	3	4	5	6	7	8
	H	G-SEL1	9	A	B	C	D	E	F		
Polarity Detection Pn50D.3 = n.□xxx	L	/P-DET	0	1	2	3	4	5	6	7	8
	H	P-DET	9	A	B	C	D	E	F		

IMPORTANT

1. When using Servo ON, Forward Run Prohibited, and Reverse Run Prohibited signals with the setting “Polarity Reversal,” the machine may not move to the specified safe direction at occurrence of failure such as signal line disconnection. If such setting is absolutely necessary, confirm the operation and observe safety precautions.
2. When two or more signal are allocated to the same input circuit, input signals level is valid all allocated signals.

■ Related Parameters

The following parameters are used for the test without motor.

(1) Application Function Select Switch C

Parameter		Meaning	When Enabled	Classification
Pn00C	n.□□□0	Disables the test without motor. (factory setting)	After restart	Setup
	n.□□□1	Enables the test without motor.		
	n.□0□□	Sets incremental encoder as encoder type for the test without motor. (factory setting)		
	n.□1□□	Sets absolute encoder as encoder type for the test without motor.		

Note: When the linear Servomotor is used, the encoder resolution is set by the 8-bit serial converter and Pn282 (Linear Scale Pitch).

(2) Mass Ratio

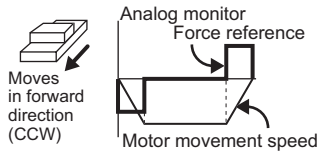
Pn103	Mass Ratio	Speed	Position	Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled	Classification
	0 to 20000	%	0	Immediately	Tuning

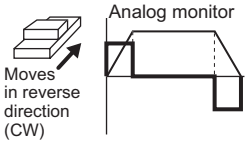
■ Switching the Linear Servomotor Movement Direction

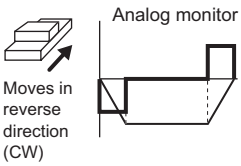
The movement direction of the linear servomotor can be switched without changing the reference pulse to the SERVOPACK or the reference voltage polarity.

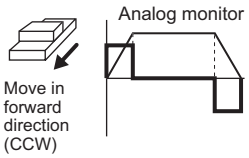
This causes the travel direction (+, -) of the shaft reverse. The output signal polarity such as encoder pulse output and analog monitor signal from the SERVOPACK does not change.

The standard setting for “forward movement” is the linear scale counting up direction.

<table>
<tr><th colspan="2" rowspan="2">Parameter</th><th rowspan="2">Name</th><th colspan="2">Reference</th></tr>
<tr><th>Forward Reference</th><th>Reverse Reference</th></tr>
<tr><td rowspan="2">Pn000</td><td>n.□□□0</td><td>Standard setting
(CCW = Forward)
(Factory setting)</td><td> 

Encoder pulse divided output
PAO
PBO Phase B progression</td><td> 

Encoder pulse devided output
PAO Phase A progression
PBO</td></tr>
<tr><td>n.□□□1</td><td>Reverse Direction Mode
(CW = Forward)</td><td> 

Encoder pulse divided output
PAO
PBO Phase B progression</td><td> 

Encoder pulse divided output
PAO Phase A progression
PBO</td></tr>
<tr><td colspan="5">The direction of P-OT and N-OT change. For Pn000 = n.□□□0 (standard setting), counterclockwise is P-OT. For Pn000 = n.□□□1 (Reverse Direction Mode), clockwise is P-OT.</td></tr>
</table>

■ Setting the Overtravel Limit Function

The overtravel limit function forces movable machine parts to stop if they exceed the allowable range of motion and turn ON a limit switch.

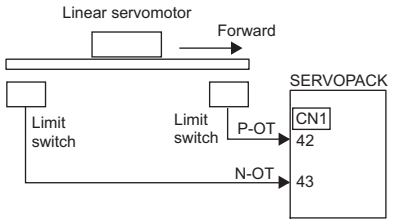
(1) Connecting the Overtravel Signal

To use the overtravel function, connect the following overtravel limit switch input signal terminals.

Type	Name	Connector Pin Number	Setting	Meaning
Input	P-OT	CN1-42	ON (low level)	Forward run allowed. Normal operation status.
			OFF (high level)	Forward run prohibited. Forward overtravel.
Input	N-OT	CN1-43	ON (low level)	Reverse run allowed. Normal operation status.
			OFF (high level)	Reverse run prohibited. Reverse overtravel.

Connect limit switches as shown below to prevent damage to the devices during linear motion.

Movement in the opposite direction is possible during overtravel. For example, reverse run is possible during forward overtravel.



■ IMPORTANT

When the linear servomotor stops due to overtravel during position control, the position error pulses are held. A clear signal (/CLR) input is required to clear the error pulses.

(2) Enabling/Disabling the Overtravel Signal

A parameter can be set to disable the overtravel signal. If the parameter is set, there is no need to wire the overtravel input signal.

Parameter		Meaning
Pn50A	n.2□□□	Inputs the Forward Run Prohibited (P-OT) signal from CN1-42. (Factory setting)
	n.8□□□	Disables the Forward Run Prohibited (P-OT) signal. (Allows constant forward run.)
Pn50B	n.□□□3	Inputs the Reverse Run Prohibited (N-OT) signal from CN1-43. (Factory setting)
	n.□□□8	Disables the Reverse Run Prohibited (N-OT) signal. (Allows constant reverse run.)

- Applicable control methods: Speed control, position control, and force control
- After changing these parameters, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.

* A parameter can be used to re-allocate input connector number for the P-OT and N-OT signals. Refer to *3.3.1 Input Circuit Signal Allocation* (Analog Rotary manual).

(3) Selecting the Motor Stop Method When Overtravel is Used

This is used to set the stop method when an overtravel (P-OT, N-OT) signal is input while the motor is operating.

Parameter		Stop Mode	Mode After Stopping	Meaning
Pn001	n.☐☐00	Stop by dynamic brake	Dynamic Brake	Stops the linear servomotor by applying dynamic brake (DB), then holds it in Dynamic Brake Mode. (Factory setting)
	n.☐☐01		Coast	Stops the linear servomotor by applying dynamic brake (DB), then places it into Coast (power OFF) Mode.
	n.☐☐02	Coast to a stop		Stops the linear servomotor in the same way as when the servo is OFF (coasts to a stop), then places it into Coast (power OFF) Mode.
	n.☐☐1☐	Decelerate to stop	Zero Clamp	Decelerates the linear servomotor with emergency stop force (Pn406), then places it into Zero Clamp (Servolock) Mode.
	n.☐☐2☐		Coast	Decelerates the linear servomotor with emergency stop force (Pn406), then places it into Coast (power OFF) Mode.

- During force control, the linear servomotor enters DB Stop Mode or Coast Mode regardless of the setting of Pn001.1.
- After changing these parameters, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.
- During n.☐☐02 Coast Mode, SERVOPACK can be resumed using the servo ON signal.

■ TERMS

- Stop by dynamic brake: Stops by using the dynamic brake (with short-circuiting by a circuit of SERVOPACK).
- Coast to a stop: Stops naturally, with no brake, by using the friction resistance of the motor in operation.
- Decelerate to stop: Stops by using deceleration (braking) force.
- Zero Clamp Mode: A mode forms a position loop by using the position reference zero.

* For details on stopping methods when the servo turns OFF or when an alarm occurs, refer to *5.2.5 Stopping Method for Servomotor after Servo OFF or Alarm Occurrence* (Analog Rotary manual).

(4) Setting the Stop Force for Overtravel

Pn406	Emergency Stop Force		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	0 to 800	%	800	Immediately

- This sets the stop force for when the overtravel signal (P-OT, N-OT) is input.
- The setting unit is a percentage of the rated force (i.e., the rated force is 100%).
- The value large enough to be the motor maximum force, 800% is set as the factory setting for emergency stop force. However, the actual output emergency stop force is determined by motor ratings.

APL-6

■ Motor Maximum Speed

Sets the linear servomotor maximum speed.

Setting a lower speed realizes more delicate speed control and more strict protection by generating the overspeed alarm (A.510). Also, setting a lower speed allows the upper limit of Encoder output resolution (Pn281) to be set higher.

Pn385	Motor Maximum Speed		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 100 (100 to 10000 mm/s)	100 mm/s	50 (5000 mm/s)	After Restart

- If a value lower than the rated speed is set for Pn385, the rated speed becomes the same value as the setting of Pn385.
- The detection level for the overspeed alarm A.510 is "the set value of Pn385 × 1.1."

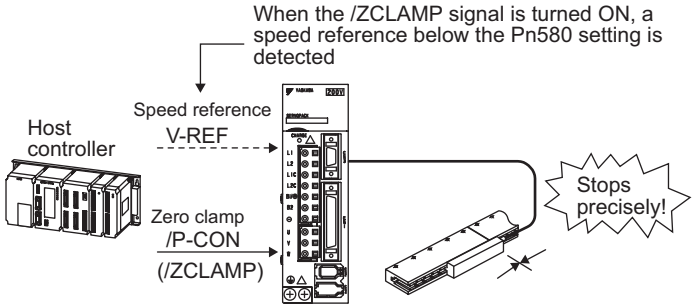
APL-7

■ Zero Clamp Function

(1) Zero Clamp Function

The zero clamp function is used for systems where the host controller does not form a position loop for the speed reference input. When the zero clamp signal (/ZCLAMP) is ON, a position loop is formed inside the SERVOPACK as soon as the input voltage of the speed reference (V-REF) drops below the motor speed level in the zero clamp level (Pn580). The servomotor ignores the speed reference and then quickly stops and locks the servomotor.

The servomotor is clamped within ±1 pulse of when the zero clamp function is turned ON, and will still return to the zero clamp position even if it is forcibly moved by external force.



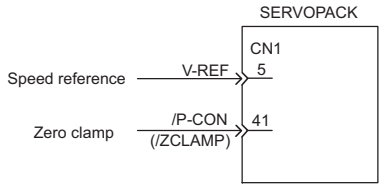
(2) Parameter Setting

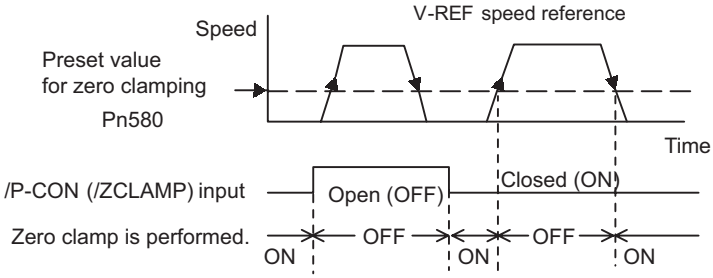
Parameter		Meaning
Pn000	n.☐☐A☐	Control selection: Speed control (analog voltage reference) ⇔ Zero clamp

Zero Clamp Conditions

Zero clamp is performed with Pn000 = n.☐☐A☐ when the following two conditions are satisfied:

- /P-CON (/ZCLAMP) is ON (low level).
- Speed reference (V-REF) drops below the setting of Pn580.





Pn580	Zero Clamp Level		Speed	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	0 to 10000	1 mm/s	10	Immediately

Sets the motor speed at which the zero clamp is performed if zero clamp speed control (Pn000 = n.☐☐A☐) is selected. Even if this value is set higher than the maximum speed of the servomotor, the maximum speed will be used.

(3) Input Signal Setting

Type	Signal Name	Connector Pin Number	Setting	Meaning
Input	/P-CON	CN1-41	ON (low level)	Zero clamp function ON (enabled)
			OFF (high level)	Zero clamp function OFF (disabled)
	/ZCLAMP	Must be allocated	ON (low level)	Zero clamp function ON (enabled)
			OFF (high level)	Zero clamp function OFF (disabled)

This is the input signal for the zero clamp operation.

Either /P-CON or /ZCLAMP can be used to switch the zero clamp.

To use the /ZCLAMP signal, an input signal must be allocated. Refer to *3.3.1 Input Circuit Signal Allocation* (Analog Rotary manual) for more details.

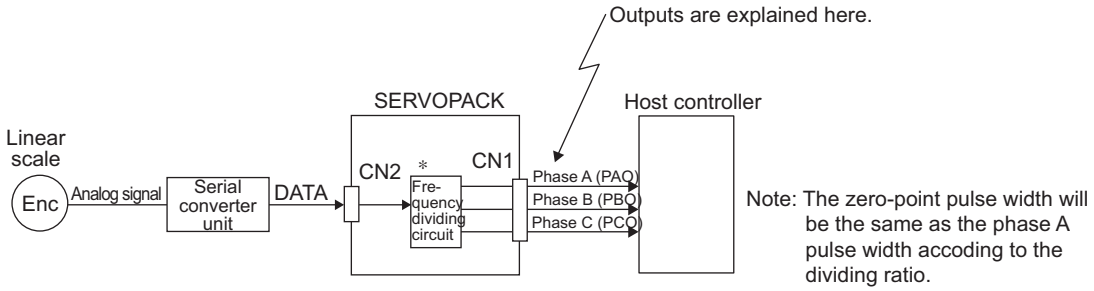
■ IMPORTANT

When the /ZCLAMP signal is allocated, the zero clamp operation will be used even for speed control Pn000 = n.☐☐0☐.

■ Encoder Signal Output

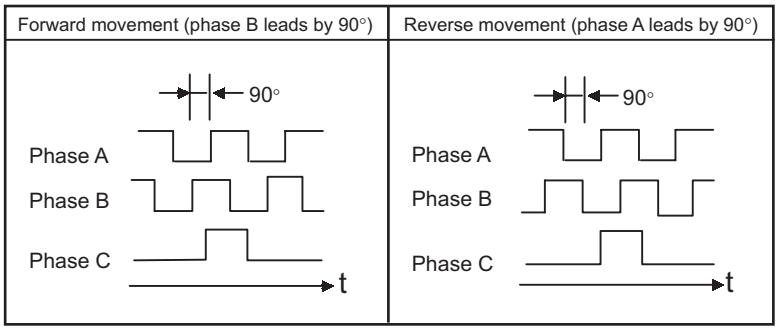
Encoder feedback pulses processed inside the SERVOPACK can be output externally.

Type	Signal Name	Connector Pin Number	Name
Output	PAO	CN1-33	Encoder output phase A
	/PAO	CN1-34	Encoder output phase /A
Output	PBO	CN1-35	Encoder output phase B
	/PBO	CN1-36	Encoder output phase /B
Output	PCO	CN1-19	Encoder output phase C (zero-point pulse)
	/PCO	CN1-20	Encoder output phase /C (zero-point pulse)



* Even in reverse movement mode (Pn000.0 = 1), the dividing output phase form is the same as that for the standard setting (Pn000.0 = 0).

■ Output Phase Form



IMPORTANT

- When performing homing using the zero-point signal of the linear scale, the speed should be 50 mm/s or less.
  If the speed is 50 mm/s or more, the phase C pulse may not be output correctly.
- When using the linear scale which has more then two zero-point signals, the second and after pulse of phase C becomes half as wide as of the phase A pulse.

IMPORTANT

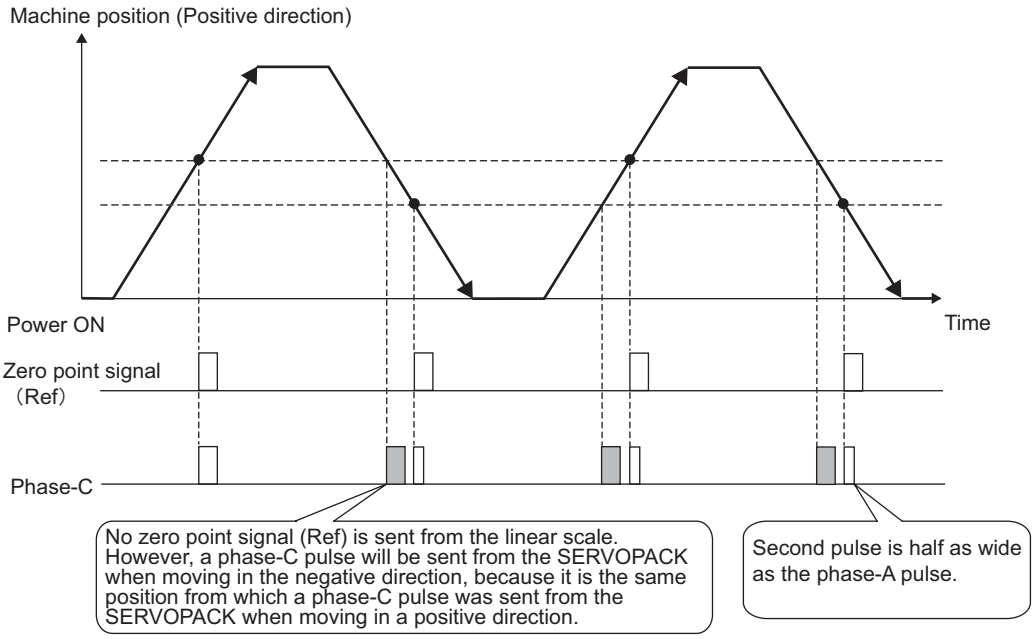
■ Encoder Output Signals from SERVOPACK with a Linear Scale by Renishaw

The output position of the zero point signal (Ref) may vary in some models of the linear scale made by Renishaw.

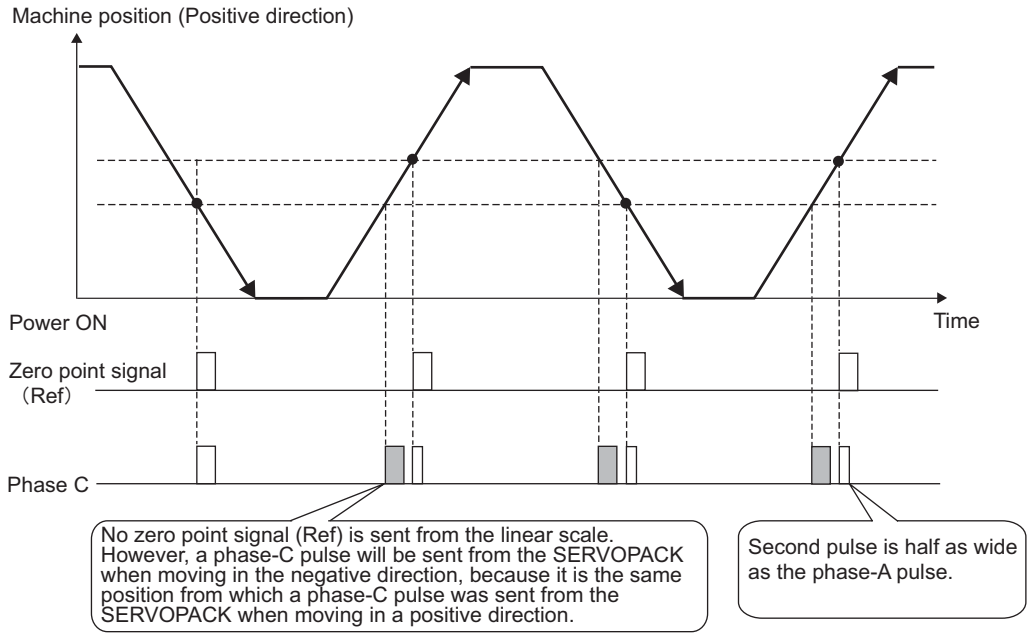
If using a Renishaw model, the phase-C pulses of the SERVOPACK are output at two positions.

For details on the specifications of the zero-point signals for a linear scale, refer to the manual for the Renishaw linear scale.

- When Passing the 1st Zero Point Signal (Ref) in Positive Direction after Power ON



- When Passing the 1st Zero Point Signal (Ref) in Negative Direction after Power ON



■ Pulse Dividing Ratio Setting

Pn281	Encoder Output Resolution		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 4096	1P/{(Pn282)×4}	20	After restart

Set the output pulse resolution for PG output signals (PAO, /PAO, PBO, /PBO) externally from the SERVOPACK.

Feedback pulses per linear scale pitch (Pn282) are divided inside the SERVOPACK by the value set in Pn281 before being output. (Set according to the system specifications of the machine or host controller.)

The setting range varies with the linear servomotor maximum speed (Pn385) and linear scale pitch (Pn282).

The upper limit value for Pn281 can be obtained by the following equation.

$$\text{Upper limit value for Pn281} = \frac{\text{Pn282}}{\text{Pn385}} \times 72$$

Note: 1. When the scale pitch is 4 µm, the motor maximum speed is limited to 1 ms/s because of the maximum response frequency of serial converter unit.

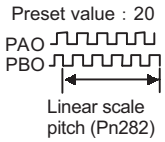
2. If the set value is out of the setting range or does not satisfy the setting conditions, the alarm "Dividing pulse output setting error" (A.041) is output.
   If the motor speed exceeds the upper limit value according to the set encoder output resolution, the alarm "Diving pulse output over speed" (A.511) is output.
3. The upper limit of encoder output resolution is limited by the frequency dividing specification of serial converter unit.
4. When an absolute linear scale is used, the linear scale pitch becomes the value which is obtained by "resolution (µm/pulse)×2^9". (The set value in Pn282 becomes invalid.)

■ Setting Example

When the linear scale pitch = 20 µm (Pn282 = 20.00) and the motor maximum speed = 5 m/s (Pn385 = 50), Pn281 = 28 is accepted, but Pn281 = 29 is not accepted and A.041 is output.

■ Output Example

When Pn281 = 20 (20-edge output (5-pulse output) per linear scale pitch),



■ Speed Coincidence Output

The speed coincidence (/V-CMP) output signal is output when the actual motor speed during speed control is the same as the speed reference input. The host controller uses the signal as an interlock.

Type	Signal Name	Connector Pin Number	Setting	Meaning
Output	/V-CMP	CN1-25, 26 (Factory setting)	ON (low level)	Speed coincides.
			OFF (high level)	Speed does not coincide.
This output signal can be allocated to another output terminal with parameter Pn50E. Refer to *3.3.3 Output Circuit Signal Allocation* (Analog Rotary manual) for details.				

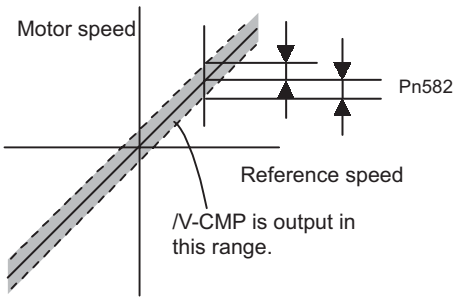
Pn582 Speed Coincidence Signal Output Width [Speed]

Setting Range	Setting Unit	Factory Setting	When Enabled
0 to 100	1 mm/s	10	Immediately

The /V-CMP signal is output when the difference between the speed reference and actual motor speed is the same as the pn582 setting or less.

■ EXAMPLE

The /V-CMP signal turns ON at 1900 to 2100 mm/s if the Pn582 is set to 100 and the reference speed is 2000 mm/s.



/V-CMP is a speed control output signal. When the factory setting is used and the output terminal allocation is not performed with the Pn50E, this signal is automatically used as the positioning completed signal /COIN for position control, and it is always OFF (high level) for force control.

■ Setting the Electronic Gear

(1) Scale Feedback Resolution

• Incremental Encoder

The scale feedback resolution from the SERVOPACK is 1/256 of the scale pitch (Pn282).

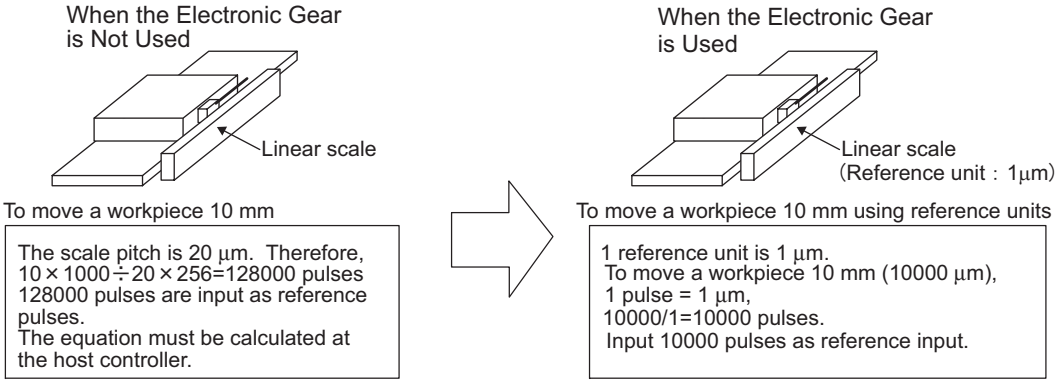
Scale Pitch	Pulse Resolution
40 μm	0.156 μm
20 μm	0.078 μm
4 μm	0.016 μm

• Absolute Encoder

Model	Resolution
ST781A	0.5 μm
ST782A	
ST783A	0.1 μm
ST784A	

(2) Electronic Gear

The electronic gear enables the workpiece travel distance per input reference pulse from the host controller to be set to any value. One reference pulse from the host controller, i.e., the minimum position data unit, is called a reference unit.



(3) Related Parameters

Pn20E	Electronic Gear Ratio (Numerator)			Position
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 1073741824 (2^{30})	–	4	After restart
Pn210	Electronic Gear Ratio (Denominator)			Position
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 1073741824 (2^{30})	–	1	After restart

The electronic gear ratio to be set can be calculated by the following equation:

$$\text{Electronic gear ratio: } \frac{B}{A} = \frac{Pn20E}{Pn210} = \frac{\text{Workpiece travel distance per reference unit}}{\text{Scale pitch}} \times 256$$

* If the ratio is outside the setting range, reduce the fraction (both numerator and denominator) until you obtain integers within the range. Be careful not to change the electronic gear ratio (B/A).

■ IMPORTANT

Electronic gear ratio setting range: 0.001 ≤ Electronic gear ratio (B/A) ≤ 1000

If the electronic gear ratio is outside this range, A.040 (Parameter setting error) is output and the SERVOPACK will not operate properly. In this case, modify the load configuration or reference unit.

(4) Procedure for Setting the Electronic Gear Ratio

Use the following procedure to set the electronic gear ratio.

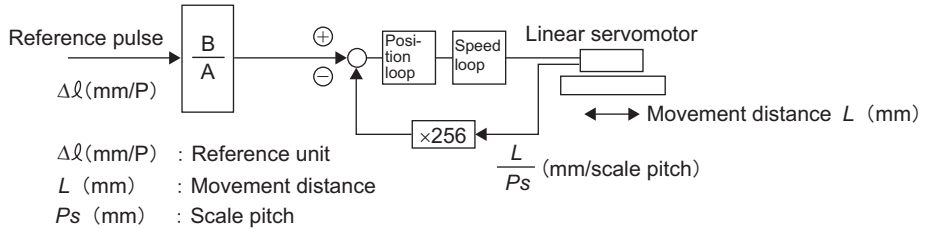
Step	Operation	Description
1	Check the scale pitch.	Check the scale pitch of linear scale used.
2	Determine the reference unit used.	Determine the reference unit from the host controller, considering the machine specifications and positioning accuracy.
3	Calculate the electronic gear ratio.	Use the electronic gear ratio equation to calculate the ratio (B/A).
4	Set parameters.	Set parameters using the calculated values.

(5) Electronic Gear Ratio Setting Example

An example of electronic gear ratio setting is given below.

Step	Operation	Load Configuration	
1	Check the scale pitch.	0.02 mm (20 μm)	
2	Determine the reference unit.	1 reference unit: 0.001 mm (1 μm)	
3	Calculate the electronic gear ratio.	$\frac{B}{A} = \frac{1(\mu m)}{20(\mu m)} \times 256$	
4	Set parameters.	Pn20E	256
		Pn210	20

(6) Electronic Gear Ratio Equation



$$\frac{L}{\Delta\ell} \times \left(\frac{B}{A}\right) = 256 \times \frac{L}{Ps}$$

$$\left(\frac{B}{A}\right) = \frac{256 \times L \times \Delta\ell}{Ps \times L} = \frac{256 \times \Delta\ell}{Ps}$$

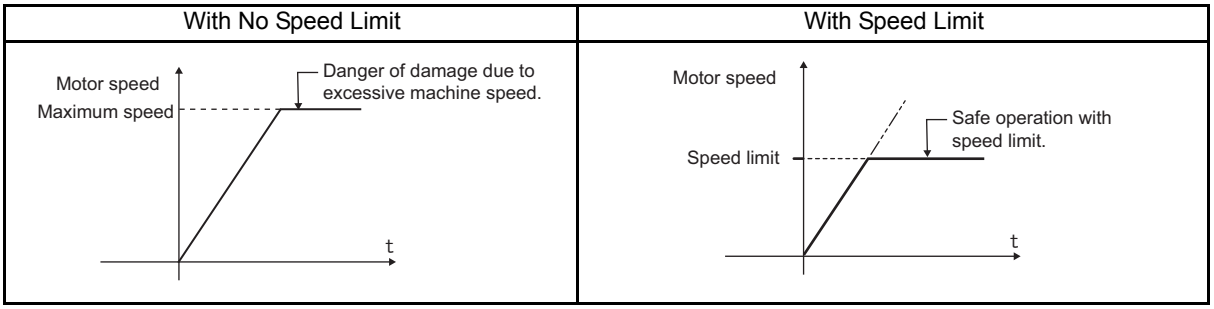
Set A and B with the following parameters.

A : Pn210 B : Pn20E

■ Limiting Linear Servomotor Speed during Force Control

During force control, the linear servomotor is controlled to output the specified force, which means that the linear servomotor speed is not controlled. Accordingly, when an excessive reference force is set for the mechanical load force, it will prevail over the mechanical load force and the linear servomotor speed will greatly increase.

This function serves to limit the linear servomotor speed during force control to protect the machine.



(1) Speed Limit Mode Selection (Force Limit Option)

Parameter		Description
Pn002	n.☐☐0☐	Uses the value set in Pn480 as the speed limit (internal speed limit function).
	n.☐☐1☐	Uses V-REF (CN1-5, 6) as an external speed limit input. Applies a speed limit using the input voltage of V-REF and the setting in Pn300 (external speed limit function).

(2) Internal Speed Limit Function

Pn480 Speed Limit During Force Control — Force

Setting Range	Setting Unit	Factory Setting	When Enabled
0 to 10000	1 mm/s	10000	Immediately

Sets the linear servomotor speed limit value during force control.

The setting in this parameter is enabled when Pn002 = n.☐☐0☐.

The servomotor's maximum speed will be used when the setting in this parameter exceeds the maximum speed of the servomotor used.

Parameter		Meaning
Pn408	n.☐☐0☐	Set the smaller value of motor maximum speed or Pn480 to the speed limit value.
	n.☐☐1☐	Set the smaller value of detected over speed or the value of Pn480 to the speed limit value.

(3) External Speed Limit Function

Type	Signal Name	Connector Pin Number	Name
Input	V-REF	CN1-5	External Speed Limit Input
	SG	CN1-6	Signal Ground

Inputs an analog voltage reference as the linear servomotor speed limit value during force control.

The smaller value is enabled, the speed limit input from V-REF or the Pn480 (Speed Limit during Force Control) when Pn002 = n.☐☐1☐.

The setting in Pn300 determines the voltage level to be input as the limit value. Polarity has no effect.

Pn300 Speed Reference Input Gain — Speed, Position, Force

Setting Range	Setting Unit	Factory Setting	When Enabled
150 to 3000	0.01 V/rated speed	600	Immediately

Sets the voltage level for the speed that is to be externally limited during force control.

With Pn300 = 600 (factory setting) and 6 V input from V-REF (CN1-5, 6), the actual motor speed is limited to the rated speed of the servomotor used.

INFO

■ The Principle of Speed Limiting

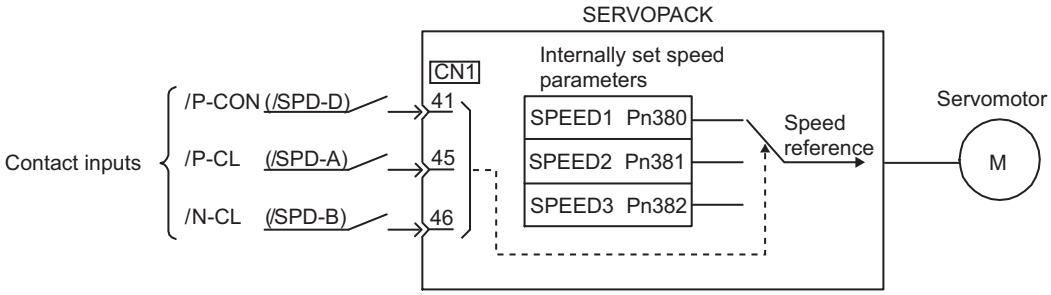
When the speed is outside of the allowable range, a force that is proportional to the difference between the actual speed and the speed limit is used as negative feedback to bring the speed back within the speed limit range. Accordingly, there is a margin generated by the load conditions in the actual motor speed limit value.

(4) Signals Output during Servomotor Speed Limit

Type	Signal Name	Connector Pin Number	Setting	Meaning
Output	/VLT	Must be allocated CN1-□□	ON (low level)	Servomotor speed limit being applied.
			OFF (high level)	Servomotor speed limit not being applied.
This signal is output when the linear servomotor speed reaches the speed limit value set in Pn480 or set by the analog voltage reference. For use, this output signal must be allocated with parameter Pn50F. For details, refer to *3.3.3 Output Circuit Signal Allocation* (Analog Rotary manual).				

■ Operating Using Speed Control with an Internally Set Speed

This function allows speed control operation by externally selecting an input signal from among three servomotor speed settings made in advance with parameters in the SERVOPACK. Since controlling a speed with a parameter inside the SERVOPACK, there is no need for an external speed of pulse generator.



■ Basic Settings for Speed Control with an Internally Set Speed

Set the following signal and parameter for speed control with an internally set speed.

(1) Signal Setting

The following input signals are used to switch the operating speed.

Type	Signal Name	Connector Pin Number	Meaning
Input	/P-CON	CN1-41	Switches the linear servomotor movement direction.
	(/SPD-D)	Must be allocated	
	/P-CL	CN1-45	Selects the internally set speed.
	(/SPD-A)	Must be allocated	
	/N-CL	CN1-46	Selects the internally set speed.
	(/SPD-B)	Must be allocated	

(2) Speed Control with an Internally Set Speed Selection

Select the speed control with an internally set speed with Pn000.

Parameter		Meaning	When Enabled	Classification
Pn000	n.□□3□	Control mode: Internally set speed control	After restart	Setup

(3) Parameter Setting

Set the internally set speed with Pn380, Pn381 and Pn382.

Pn380	Internally Set Speed 1		Speed		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	10	Immediately	Setup
Pn381	Internally Set Speed 2		Speed		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	20	Immediately	Setup
Pn382	Internally Set Speed 3		Speed		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	30	Immediately	Setup

Note: The maximum speed of the servomotor is used whenever the value exceeds the maximum speed is set in the Pn380 to Pn382.

(4) Operating Using an Internally Set Speed

Use ON/OFF combinations of the following input signals to operate with the internally set speeds. Following two kinds of input signals are available.

■ Using input signals /P-CON, /P-CL, /N-CL [factory setting]

Input Signal			Motor Movement Direction	Speed
/P-CON	/P-CL	/N-CL		
OFF	OFF	OFF	Forward	Stops at 0 of the internally set speed.
	OFF	ON		Pn380: Internally Set Speed 1 (SPEED1)
	ON	ON		Pn381: Internally Set Speed 2 (SPEED2)
	ON	OFF		Pn382: Internally Set Speed 3 (SPEED3)
ON	OFF	OFF	Reverse	Stops at 0 of the internally set speed.
	OFF	ON		Pn380: Internally Set Speed 1 (SPEED1)
	ON	ON		Pn381: Internally Set Speed 2 (SPEED2)
	ON	OFF		Pn382: Internally Set Speed 3 (SPEED3)

■ Using input signals /SPD-D, /SPD-A, /SPD-B

Input Signal			Motor Movement Direction	Speed
/SPD-D	/SPD-A	/SPD-B		
OFF	OFF	OFF	Forward	Stops at 0 of the internally set speed.
	OFF	ON		Pn380: Internally Set Speed 1 (SPEED1)
	ON	ON		Pn381: Internally Set Speed 2 (SPEED2)
	ON	OFF		Pn382: Internally Set Speed 3 (SPEED3)
ON	OFF	OFF	Reverse	Stops at 0 of the internally set speed.
	OFF	ON		Pn380: Internally Set Speed 1 (SPEED1)
	ON	ON		Pn381: Internally Set Speed 2 (SPEED2)
	ON	OFF		Pn382: Internally Set Speed 3 (SPEED3)

<Supplementary Information>
When Pn000.1 = 4, 5, or 6, and both /P-CL and /N-CL are OFF, the control mode can be switched.

Example:
Pn000.1 = 5: Internally set speed selection (contact reference) ⇔ Position control (pulse train reference)

■ Factory-set Sequence Signal Allocations: (Pn50A.0 = 0)

Input Signal		Speed
/P-CL	/N-CL	
OFF	OFF	Pulse train reference input (position control)
OFF	ON	Pn380: Internally Set Speed 1 (SPEED1)
ON	ON	Pn381: Internally Set Speed 2 (SPEED2)
ON	OFF	Pn382: Internally Set Speed 3 (SPEED3)

■ Changing Sequence Signal Allocations for Each Signal (Pn50A.0 = 1)

Input Signal			Speed
/SPD-A	/SPD-B	/C-SEL	
OFF	OFF	OFF	Stops at 0 of the Internally Set Speed
OFF	ON	OFF	Pn380: Internally Set Speed 1 (SPEED1)
ON	ON	OFF	Pn381: Internally Set Speed 2 (SPEED2)
ON	OFF	OFF	Pn382: Internally Set Speed 3 (SPEED3)
–	–	ON	Pulse train reference input (position control)

Note: Allocate /C-SEL signal to switch the control mode. For details, refer to *3.3.1 Input Circuit Signal Allocation* (Analog Rotary manual).

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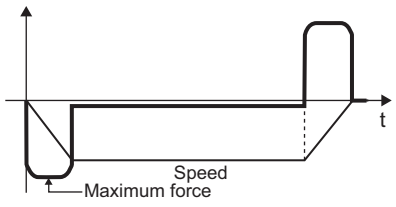
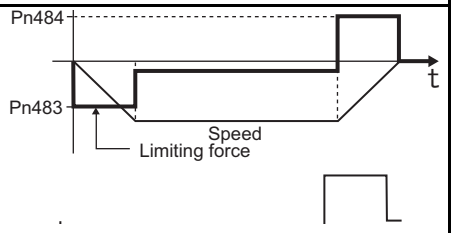
■ Internal Force Limit (Limiting Maximum Output Force)

Maximum force is always limited to the values set in the following parameters.

Pn483	Forward Force Limit		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	0 to 800	%	30	Immediately
Pn484	Reverse Force Limit		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	0 to 800	%	30	Immediately

The settings in these parameters are constantly enabled. The setting unit is a percentage of rated force.

If the force limit is set higher than the maximum force of the linear servomotor, the maximum force of the linear servomotor is used.

No Internal Force Limit (Maximum force can be output.)	Internal Force Limit
	

Too small a force limit setting will result in insufficient force during acceleration and deceleration.

IMPORTANT

For safe operation at setup of linear servomotor, the factory setting of Pn483 and Pn484 are 30%, which are relatively low. After having set up the linear servomotor, increase the settings of Pn483 and Pn484 to the desired level. (Set to 800% if there is no restriction.)

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■ Running Output Signal (/TGON)

Type	Signal Name	Connector Pin Number	Setting	Meaning
Output	/TGON	CN1-27, 28 (Factory setting)	ON (low level)	Linear servomotor is operating (Motor speed is above the setting in Pn581).
			OFF (high level)	Linear servomotor is not operating (Motor speed is below the setting in Pn581).

This signal is output to indicate that the linear servomotor is currently operating above the setting in parameter Pn581.

The /TGON signal can be allocated to another output terminal with parameter Pn50E. For details, refer to *3.3.3 Output Circuit Signal Allocation* (Analog Rotary manual).

- Related Parameter

Pn581	Zero-Speed Level		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 10000	1 mm/s	20	Immediately

Set the range in which the running output signal (/TGON) is output in this parameter.

When the linear servomotor movement speed is above the value set in the Pn581, it is judged to be linear servomotor moving and the running output signal (/TGON) is output. The movement detection signal can also be checked on the panel operator or the digital operator. For details, refer to *2.3 Status Display mode* and *4.1 List of Monitor Modes* (Analog Rotary manual).

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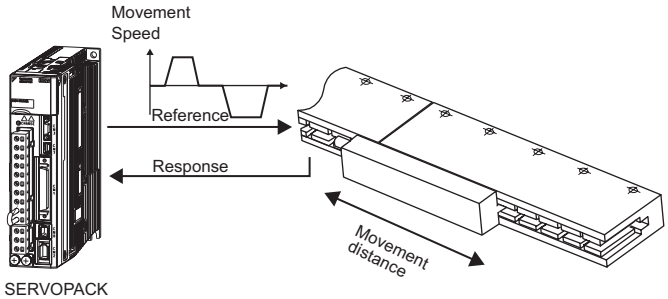
■ Advanced Autotuning

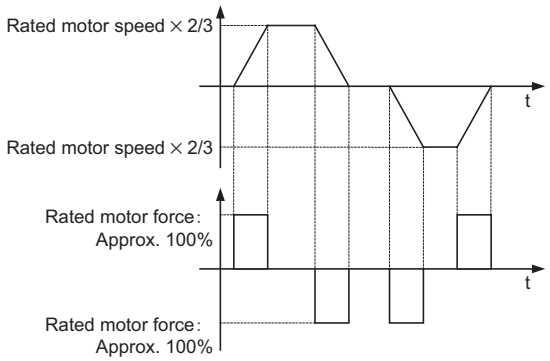
Advanced autotuning automatically operates the SERVOPACK (in reciprocating movement in the forward and reverse directions) within set limits and makes adjustment automatically according to the mechanical characteristics while the SERVOPACK is operating.

Advanced autotuning can be performed without connecting the host.
The following automatic operation specifications apply.

- Motor speed: Rated motor speed × 2/3
- Acceleration force*: Approximately 100% of rated motor force
- Movement distance: Set in unit of 1000 reference unit.

*The acceleration force varies with the influence of the mass ratio (Pn103), machine friction, and external disturbance.





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■ Advanced Autotuning Procedure

The following procedure is used for advanced autotuning.

Advanced autotuning is performed from the Digital Operator (option) or SigmaWin+.

Here, the operating procedure from the Digital Operator is described.

Refer to the *Σ-V series SGM□V/SGDV User's Manual, Operation of Digital Operator* (SIEPS80000055) for basic key operations of the Digital Operator.

Note: The function cannot be performed from the Panel Operator.

(1) Operating Procedure

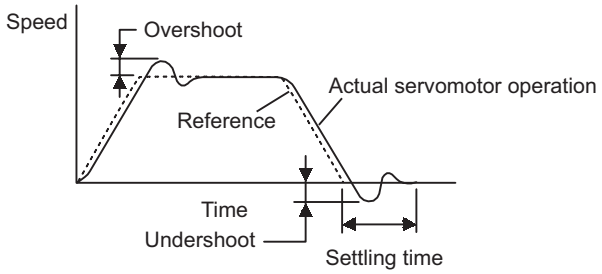
Step	Display after Operation	Keys	Operation
1	BB —FUNCTION— Fn200:TuneLvl Set Fn201:AAT Fn202:Ref-AAT Fn203:OnePrmTun	MODE/SET ∧ ∨	Display the main menu of the utility function mode, and select Fn201.
2	BB Advanced AT Jcalc=ON Mode=2 Type=2 Stroke=+00288000 (0090.0)mm	DATA	Press the DATA Key to display the initial setting screen for advanced autotuning. Note: If the display does not switch and NO-OP is displayed, refer to *(1) Check Points for Settings.*
3	BB Advanced AT Jcalc=ON Mode=2 Type=2 Stroke=+00288000 (0090.0)mm	∧ ∨ SCROLL	Press the ∧, ∨ or SCROLL Key and set the items in steps 3-1 to 3-4.
3-1	■Calculating Mass Select the mode to be used. Normally, set Jcalc to ON. Jcalc = ON: Mass calculated Jcalc = OFF: Mass not calculated <Supplementary Information> If the mass is already known from the machine specifications, set the value in Pn103 and set Jcalc to OFF.		
3-2	■Tuning Level Select the tuning level. Mode = 1: Makes adjustments considering responsiveness and stability. (Standard level) Mode = 2: Makes adjustments for positioning. Mode = 3: Makes adjustments for positioning, giving priority to overshooting suppression. Set this level if position error overshoots at mode 2. Note: Set the mode to 1 if Fn202 (Advanced Autotuning by Reference) is performed after executing this function.		
3-3	■Filter Type Setting Select the filter type to set a filter according to the machine element to be driven. Set the filter referring to the following functional elements. <Supplementary Information> If there is noise or the gain does not increase, good results may be obtained by changing the filter type. Type = 1: Selects a filter suitable for belt drive mechanisms. Type = 2: Selects a filter suitable for ball screw drive mechanisms or linear motor [Factory setting]. Type = 3: Selects a filter suitable for rigid systems, such as a gear.		
3-4	■STROKE (Travel Distance) Setting Specify a travel distance in increments of 1000 references. Travel distance setting range: The travel distance setting range is from -99990000 to +99990000. The negative (-) direction is for reverse rotation, and the positive (+) direction is for forward rotation. Initial value: 90 mm Note: • Move the position using JOG operation to where a suitable movable range is ensured. • Set the travel distance to at least 5 mm; otherwise, "Error" will be displayed and the travel distance cannot be set. • To calculate the mass ratio and ensure precise tuning, it is recommended to set the travel distance to 90 mm.		
4	BB ADVANCED AT Pn103=00000 Pn100=0040.0 Pn101=0020.00 Pn102=0040.0	DATA	Press the DATA Key. The advanced autotuning execution screen will be displayed.
5	RUN ADVANCED AT Pn103=00000 Pn100=0040.0 Pn101=0020.00 Pn141=0050.0	JOG SVON	Press the JOG SVON Key. The servo will be ON and the display will change from "BB" to "RUN." *If the level is set to 3, the "Pn102" display will change to the "Pn141."

■Using the Mode Switch (P/PI Switching)

Use the mode switch (P/PI switching) function in the following cases:

P Control: Proportional control
PI Control: Proportional/integral control

- To suppress overshooting during acceleration or deceleration (for speed control)
- To suppress undershooting during positioning and reduce the settling time (for position control)



The mode switch function automatically switches the speed control mode between PI control mode and P control mode based on a comparison between the servo's internal value and a user-set detection level shown in *(1) Related Parameters.*

<Supplementary Information>

- Monitoring the speed response waveform and position error waveform is required for adjustment.
- If I-P control is selected for speed loop control, the mode switching function will be disabled.

(1) Related Parameters

Select the conditions to switch modes (P or PI control switching) by using the following parameters.

Parameter		Mode Switch Selection	Parameter Containing Detection Point Setting	When Enabled	Classification
Pn10B	n.□□□0	Uses a force reference level for detection point. [Factory setting]	Pn10C	Immediately	Setup
	n.□□□1	Uses a speed reference level for detection point.	Pn181		
	n.□□□2	Uses an acceleration level for detection point.	Pn182		
	n.□□□3	Uses a position error pulse level for detection point.	Pn10F		
	n.□□□4	Does not use mode switch function.	–		

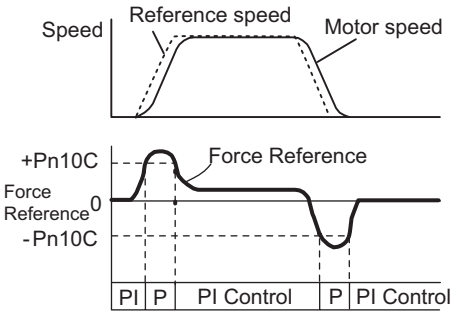
■ Parameters to set the detection point

Pn10C	Mode Switch (Force Reference)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 800	1%	200	Immediately	Tuning
Pn181	Mode Switch (Speed Reference)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	0	Immediately	Tuning
Pn182	Mode Switch (Acceleration)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 30000	1 mm/s^2	0	Immediately	Tuning
Pn10F	Mode Switch (Position Error)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 reference unit	0	Immediately	Tuning

Mode switch functions according to the detection point are as follows.

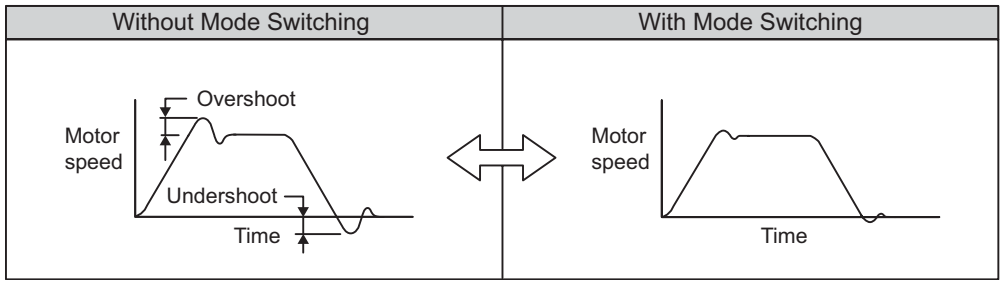
■ Using the Force Reference Level to Switch Modes (Factory Setting)

With this setting, the speed loop is switched to P control when the value of force reference input exceeds the force set in Pn10C. The factory setting for the force reference detection point is 200% of the rated force.



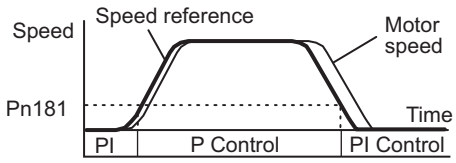
<Example>

If the mode switch function is not being used and the SERVOPACK is always operated with PI control, the speed of the motor may overshoot or undershoot due to force saturation during acceleration or deceleration. The mode switch function suppresses force saturation and eliminates the overshooting or undershooting of the motor speed.



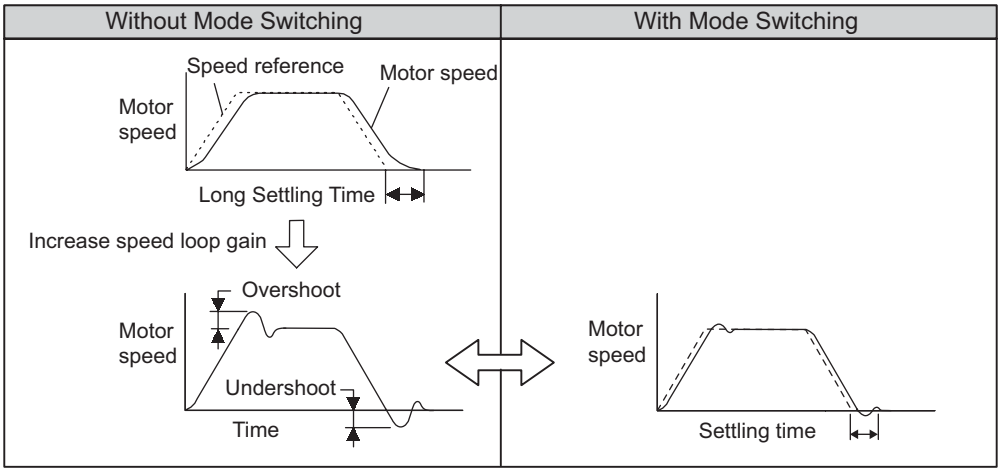
■ Using the Speed Reference Level to Switch Modes

With this setting, the speed loop is switched to P control when the value of speed reference input exceeds the speed set in Pn181.



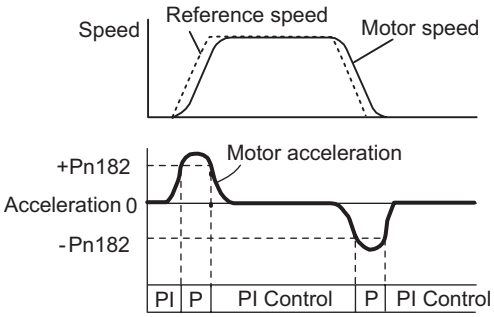
<Example>

In this example, the mode switch is used to reduce the settling time. It is necessary to increase the speed loop gain to reduce the settling time. Using the mode switch suppresses overshooting and undershooting when speed loop gain is increased.



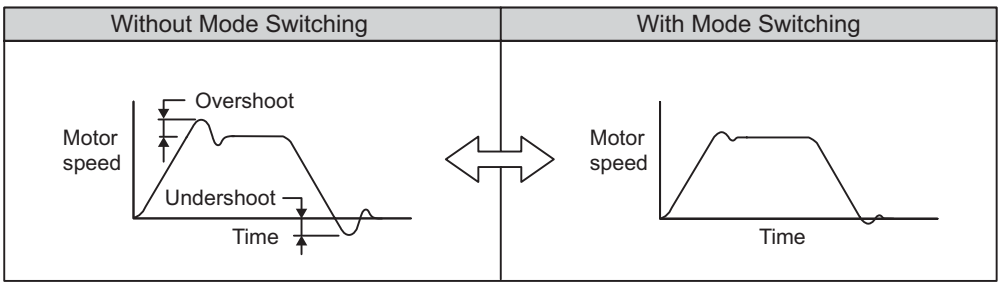
■ Using the Acceleration Level to Switch Modes

With this setting, the speed loop is switched to P control when the speed reference exceeds the acceleration rate set in Pn182.



<Example>

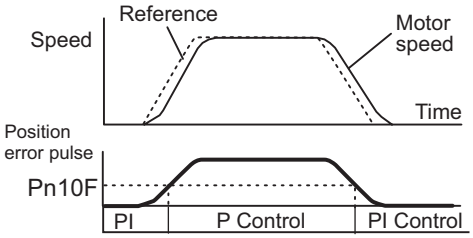
If the mode switch function is not being used and the SERVOPACK is always operated with PI control, the speed of the motor may overshoot or undershoot due to force saturation during acceleration or deceleration. The mode switch function suppresses force saturation and eliminates the overshooting or undershooting of the motor speed.



■ Using the Position Error Pulse Level to Switch Modes

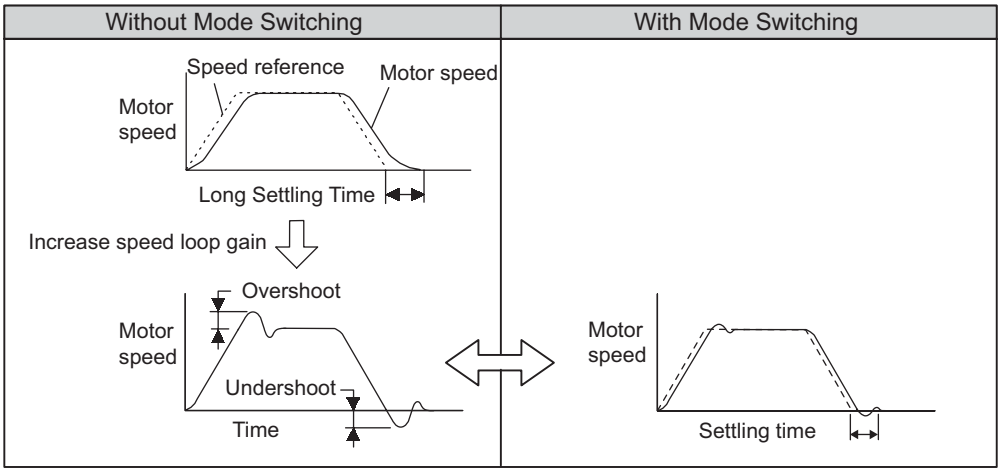
This setting is effective with position control only.

With this setting, the speed loop is switched to P control when the position error pulse exceeds the value set in Pn10F.



<Example>

In this example, the mode switch is used to reduce the settling time. It is necessary to increase the speed loop gain to reduce the settling time. Using the mode switch suppresses overshooting and undershooting when speed loop gain is increased.



■ JOG Operation (Fn002)

JOG operation is used to check the operation of the servomotor under speed control without connecting the SERVOPACK to the host.

> **⚠ CAUTION**
>
> While the SERVOPACK is in JOG operation, the overtravel function will be disabled. Consider the operating range of the machine when performing JOG operation for the SERVOPACK.

(1) Settings before Operation

The following settings are required before performing JOG operation.

- If the S-ON input signal is ON, turn OFF the signal.
- If Pn50A.1 is set to 7 (i.e., the servo is always ON), change the value.
- Considering the operating range of the machine, set the JOG operation speed in Pn383.

Pn383	JOG Speed		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	50	Immediately	Setup

■ Origin Search (Fn003)

The origin search is designed to position the origin pulse position of the incremental encoder (phase-C) and to clamp at the position. This mode is used when the motor shaft needs to be aligned to the machine.

⚠ CAUTION
• Perform origin searches without connecting the coupling. The forward run prohibited (P-OT) and reverse run prohibited (N-OT) signals are not effective in origin search mode.

Execute the origin search without connecting the couplings.
Motor speed at the time of execution: 15 mm/s.

■ Program JOG Operation (Fn004)

The Program JOG Operation is a utility function, that allows continuous automatic operation determined by the preset operation pattern, movement distance, movement speed, acceleration/deceleration time, number of time of repetitive operations.
This function can be used to move the servomotor without it having to be connected to a host controller for the machine as a trial operation in JOG operation mode. Program JOG Operation can be used to confirm the operation and for simple positioning operations.

(1) Settings before Operation

The following settings are required before performing program JOG operation.

- Set correctly the machine operation range and safe operation speed in the parameters such as "program JOG operation movement distance" and "program JOG movement speed."
- The SERVOPACK must be in Servo Ready status to execute this function.
- If the Servo-ON input signal (/S-ON) is ON, turn it OFF.
- Release the Servo-ON signal mask if the parameter Pn 50A.1 is set to 7, and the Servo has been set to always be ON.

(2) Precautions

- Control is position control during program JOG operation. However, the pulse reference input to the SERVOPACK is inhibited (in /INHIBIT status) and no pulse reference input is accepted.

<Supplementary Information>

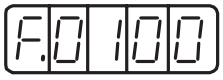
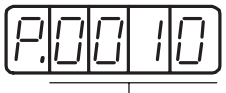
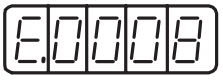
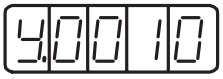
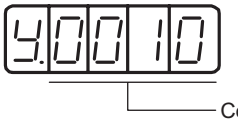
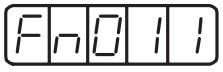
- The overtravel function is enabled in this function.
- When an absolute encoder is used, input is not necessary since SEN signal is always enabled.
- Other functions that are applicable for position control, such as position reference filter, can be used.

(3) Related Parameters

Pn530	Program JOG Operation Related Switch		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	–	–	0000	Immediately	Setup
Pn531	Program JOG Movement Distance		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1073741824(2^{30})	1 Reference unit	32768	Immediately	Setup
Pn585	Program JOG Movement Speed		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 10000	1 mm/s	50	Immediately	Setup
Pn534	Program JOG Acceleration/Deceleration Time		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	2 to 10000	1 ms	100	Immediately	Setup
Pn535	Program JOG Waiting Time		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 ms	100	Immediately	Setup
Pn536	Number of Times of Program JOG Movement		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1000	1 time	1	Immediately	Setup

■ Motor Models Display (Fn011)

This mode is used for motor maintenance, set the parameter Fn011 to select the motor model check mode. If the SERVOPACK has been custom-made, you can also check the specification codes of SERVOPACKs.

<table>
<tr><th>Step</th><th>Display after Operation</th><th>Panel Operator</th><th>Description</th></tr>
<tr><td>1</td><td>  </td><td> 
MODE/SET
(MODE/SET Key)</td><td>Press the MODE/SET Key to select the utility function mode.</td></tr>
<tr><td>2</td><td>  </td><td>  </td><td>Press the UP or DOWN Key to select Fn011.
Note: The enabled digit blinks.</td></tr>
<tr><td>3</td><td>  </td><td> 
DATA◀
(DATA/SHIFT Key)
(Press at least 1 s.)</td><td>Press the DATA/SHIFT Key for more than one second to display the linear servomotor model and voltage code.
 
Linear Servomotor Voltage
Data | Model
01 | 200 VAC
02 | 400 VAC
Linear Servomotor Type
Data | Type
40 | Linear servomotor</td></tr>
<tr><td>4</td><td>  </td><td> 
MODE/SET
(MODE/SET Key)</td><td>Press the MODE/SET Key to display the servomotor capacity.
 
Motor capacity in units of 10 W
The above example indicates 100 W.</td></tr>
<tr><td>5</td><td>  </td><td> 
MODE/SET
(MODE/SET Key)</td><td>Press the MODE/SET Key, and the linear scale type and resolution code will be displayed.
 
Linear Scale Type
Data | Type
00 | Incremental
01 | Absolute
Scale Pitch Multiplication
Data | Resolution
8 | 8-bit
12 | 12-bit</td></tr>
<tr><td>6</td><td>  </td><td> 
MODE/SET
(MODE/SET Key)</td><td>Press the MODE/SET Key to display the SERVO-PACK's code for custom orders.
 
Code for custom orders
Note: The display "y.0000" means standard model.</td></tr>
<tr><td>7</td><td>  </td><td> 
DATA◀
(DATA/SHIFT Key)
(Press at least 1 s.)</td><td>Press the DATA/SHIFT Key for more than one second to return to the utility function mode display Fn011.</td></tr>
</table>

■ List of Monitor Modes

Parameter No.	Content of Display	Unit
Un000	Actual motor speed	mm/s
Un001	Input speed reference	mm/s
Un002	Internal force reference (in percentage to the rated force)	%
Un003	Electrical angle 1 (32-bit decimal code)	Number of pulses from the phase-U
Un004	Electrical angle 2 (Angle from 0 (zero) degree of phase-U))	deg
Un005 *1	Input signal monitor	–
Un006 *1	Output signal monitor	–
Un007	Input reference pulse speed (valid only in position control)	mm/s
Un008	Error counter value (amount of position error) (valid only in position control)	reference unit
Un009	Accumulated load rate (value for the rated force as 100 %. Displays effective force in 10-s cycle.)	%
Un00A	Regenerative load rate (value for the processable regenerative power as 100 %. Displays regenerative power consumption in 10-s cycle.)	%
Un00B	Power consumed by DB resistance (Value for the processable power when dynamic brake is applied as 100 %. Displays power consumed by DB resistance in 10-s cycle.)	%
Un00C *2	Input reference pulse counter (32-bit decimal code) (valid only in position control)	Pulse
Un00D *2	Feedback pulse counter (1/256 of linear scale pitch, 32-bit decimal code)	Pulse
Un010	Allowable maximum motor speed and dividing ratio monitor	–
Un011	Hall sensor signal monitor	–
Un084	Linear scale pitch (Scale pitch = Un084 × 10^{Un085} [pm])	–
Un085	Linear scale pitch index (Scale pitch = Un084 × 10^{Un085} [pm])	–

* 1. Refer to *8.4 Monitoring Input Signals* (Analog Rotary manual).
* 2. Refer to *8.5 Monitoring Output Signals* (Analog Rotary manual).

■ Parameter List <Analog Linear>

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn000			Basic Function Select Switch 0	–	0000h to 00B3h	0000h	After restart	Setup
	0		Direction Selection	–	0 to 3	0		
		0	Sets the linear counting up (phase-A advance) direction as forward direction.					
		1	Sets the linear counting down (phase-B advance) direction as forward direction (Movement direction reversal mode)					
	1		Control Method Selection	–	0 to B	0		
		0	Speed control (analog reference)					
		1	Position control (pulse train reference)					
		2	Force control (analog reference)					
		3	Internal set speed control (contact reference)					
		4	Internal set speed control (contact reference) ⇔ Speed control (analog reference)					
		5	Internal set speed control (contact reference) ⇔ Position control (pulse train reference)					
		6	Internal set speed control (contact reference) ⇔ Force control (analog reference)					
		7	Position control (pulse train reference) ⇔ Speed control (analog reference)					
		8	Position control (pulse train reference) ⇔ Force control (analog reference)					
		9	Force control (analog reference) ⇔ Speed control (analog reference)					
		A	Speed control (analog reference) ⇔ Zero clamp					
		B	Position control (pulse train reference) ⇔ Position control (Inhibit)					
Pn001			Application Function Select Switch 1	–	0000h to 1122h	0000h	After restart	Setup
	0		Servo OFF or Alarm G1 Stop Mode	–	0 to 2	0		
		0	Stops the linear servomotor by applying DB (dynamic brake).					
		1	Stops the linear servomotor by applying dynamic brake (DB) and then releases DB.					
		2	Makes the linear servomotor coast to a stop state without using the dynamic brake (DB).					
	1		Overtravel (OT) Stop Mode	–	0 to 2	0		
		0	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).					
		1	Sets the emergency stop force of Pn406 to the maximum value, decelerate the motor to a stop, and then sets it to servolock state.					
		2	Sets the emergency stop force of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to coasting state.					
	2		AC/DC Power Input Selection	–	0, 1	0		
		0	Not applicable to DC power input: Input AC power supply through L1, L2 , (and L3) terminals.					
		1	Applicable to DC power input: Input DC power supply between B1/ + and -, or input DC power supply between B1/ + and - or between P/+ and -2.					
	3		Warning Code Output Selection	–	0, 1	0		
		0	ALO1, ALO2, and ALO3 output only alarm codes.					
		1	ALO1, ALO2, and ALO3 output both alarm codes and warning codes. While warning codes are output, ALM signal output remains ON (normal state).					

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn002			Application Function Select Switch 2	–	0000h to 4113h	0000h	After restart	Setup
	0		Speed Control Option (T-REF Terminal Allocation)	–	0 to 3	0		
		0	N/A					
		1	Uses T-REF as an external force limit input.					
		2	Uses T-REF as a force feedforward input.					
		3	Uses T-REF as an external force limit input when P-CL and N-CL are ON.					
	1		Force Control Option (V-REF Terminal Allocation)	–	0, 1	0		
		0	N/A					
		1	Uses V-REF as an external speed limit input.					
	2		Absolute Encoder Usage	–	0, 1	0		
		0	Uses absolute encoder as an absolute encoder.					
		1	Uses absolute encoder as an incremental encoder.					
	3		Reserved (Do not set.)	–	0 to 4	0		
Pn006			Application Function Select Switch 6	–	0000h to 005Fh	0002h	Immediately	Setup
	0 1		Analog Monitor 1 Signal Selection	–	00 to 5F	2		
		00	Motor speed (1V/1000mm/s)					
		01	Speed reference (1V/1000mm/s)					
		02	Force reference (1V/100%)					
		03	Position error (0.05V/1 reference unit)					
		04	Position amplifier error (after electronic gears) (0.05V/ 1 encoder pulse unit)					
		05	Position reference speed (1V/1000mm/s)					
		06	Reserved (Do not set.)					
		07	Motor load position error (0.01V/1 reference unit)					
		08	Positioning completion signal (positioning completed: 5V, positioning not completed: 0V)					
		09	Speed feedforward (1V/1000min $^{-1}$)					
		0A	Force feedforward (1V/100%)					
		0B	Active gain (1st gain: 1V, 2nd gain: 2V, 3rd gain: 3V, 4th gain: 4V)					
		0C	Completion of position reference (Completed: 5V, Not completed: 0V)					
		0D	Reserved (Do not set.)					

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn007		Application Function Select Switch 7		–	0000h to 005Fh	0000h	Immediately	Setup
	0 1	Analog Monitor 2 Signal Selection		–	00 to 5F	2		
		0	Motor speed (1V/1000mm/s)					
		1	Speed reference (1V/1000mm/s)					
		2	Force reference (1V/100%)					
		3	Position error (0.05V/1 reference unit)					
		4	Position amplifier error (after electronic gears) (0.05V/ 1 encoder pulse unit)					
		5	Position reference speed (1V/1000mm/s)					
		6	Reserved (Do not set.)					
		7	Motor load position error (0.01V/1 reference unit)					
		8	Positioning completion signal (positioning completed: 5V, positioning not completed: 0V)					
		9	Speed feedforward (1V/1000min $^{-1}$)					
		0A	Force feedforward (1V/100%)					
		0B	Active gain (1st gain: 1V, 2nd gain: 2V, 3rd gain: 3V, 4th gain: 4V)					
		0C	Completion of position reference (Completed: 5V, Not completed: 0V)					
		0D	Reserved (Do not set.)					
Pn008		Application Function Select Switch 8		–	0000h to 7121h	0000h	After restart	Setup
	0	Lowered Battery Voltage Alarm/Warning Selection		–	0, 1	0		
		0	Outputs alarm (A.830) for lowered battery voltage.					
		1	Outputs warning (A.930) for lowered battery voltage.					
	1	Function Selection at Main Circuit Voltage Drop		–	0 to 2	0		
		0	Disables detection of the main circuit voltage drop.					
		1	Enables detection of the main circuit voltage drop.					
		2	Detects warning and limits force by Pn424 and Pn425.					
	2	Warning Detection Selection		–	0, 1	0		
		0	Detects warning.					
		1	Does not detect warning.					
Pn009		Application Function Select Switch 9		–	0000h to 0111h	0010h	After restart	Tuning
	1	Current Control Method Selection		–	0, 1	1		
		0	Current control method 1					
		1	Current control method 2					
	2	Speed Detection Method Selection		–	0, 1	0		
		0	Speed detection 1					
		1	Speed detection 2					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn00B		Application Function Select Switch B	–	0000h to 1111h	0000h	After restart	Setup
	0	Parameter Display Selection	–	0, 1	0		
		0 Setup parameters					
		1 All parameters					
	1	Alarm G2 Stop Method Selection	–	0, 1	0		
		0 Stops the motor by setting the speed reference to "0".					
		1 Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).					
	2	Power Supply Method for Three-phase SERVOPACK	–	0, 1	0		
		0 Three-phase power supply					
		1 Single-phase power supply					
	3	Reserved (Do not change.)	–	0, 1	0		
Pn00C		Application Function Select Switch C	–	0000h to 0111h	0000h	After restart	Setup
	0	Selection of Test without Motor	–	0, 1	0		
		0 Test without motor disabled					
		1 Test without motor enabled					
	1	Reserved (Do not change.)	–	0, 1	0		
	2	Encoder Type for Test without Motor	–	0, 1	0		
		0 Incremental Encoder					
		1 Absolute Encoder					
Pn00D		Reserved (Do not change.)	–	0000h to 0001h	0000h	After restart	Setup
Pn010		Axis Address Selection (for UART/USB communication)	–	0000h to 007Fh	0001h	After restart	Setup
Pn080		Application Function Select Switch 80	–	0000h to 1111h	0000h	After restart	Setup
	0	Hall Sensor Selection	–	0, 1	0		
		0 Enables selection					
		1 Disables selection					
	1	Motor Phase Selection	–	0, 1	0		
		0 Sets phase A lead as phase sequence of U, V, W.					
		1 Sets phase B lead as phase sequence of U, V, W.					
	3	Calculation method for maximum speed or divided output pulses	–	0, 1	0		
		0 Determines divided output pulses with fixed maximum speed.					
		1 Determines maximum speed with fixed divided output pulses.					
Pn100		Speed Loop Gain	0.1Hz	10 to 20000	400	Immediately	Tuning
Pn101		Speed Loop Integral Time Constant	0.01ms	15 to 51200	2000	Immediately	Tuning
Pn102		Position Loop Gain	0.1/s	10 to 20000	400	Immediately	Tuning
Pn103		Mass Ratio	%	0 to 20000	100	Immediately	Tuning
Pn104		2nd Speed Loop Gain	0.1Hz	10 to 20000	400	Immediately	Tuning
Pn105		2nd Speed Loop Integral Time Constant	0.01ms	15 to 51200	2000	Immediately	Tuning
Pn106		2nd Position Loop Gain	0.1/s	10 to 20000	400	Immediately	Tuning
Pn109		Feed Forward Gain	%	0 to 100	0	Immediately	Tuning
Pn10A		Feed Forward Filter Time Constant	0.01ms	0 to 6400	0	Immediately	Tuning

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn10B		Application Function for Gain Select Switch		–	0000h to 5334h	0000h		Setup
	0	Mode Switch Selection		–	0 to 4	0	Immediately	
		0	Uses internal force reference as the condition (Level setting: Pn10C)					
		1	Uses speed reference as the condition (Level setting: Pn181)					
		2	Uses acceleration as the condition (Level setting: Pn182)					
		3	Uses position error pulse as the condition (Level setting: Pn10F)					
		4	No mode switch function available					
	1	Speed Loop Control Method		–	0 to 3	0	After restart	
		0	PI control					
		1	I-P control					
Pn10C		Mode Switch (force reference)		%	0 to 800	200	Immediately	Tuning
Pn10F		Mode Switch (position error pulse)		reference unit	0 to 10000	0	Immediately	Tuning
Pn11F		Position Integral Time Constant		0.1ms	0 to 50000	0	Immediately	Tuning
Pn121		Friction Compensation Gain		%	10 to 1000	100	Immediately	Tuning
Pn122		2nd Gain for Friction Compensation		%	10 to 1000	100	Immediately	Tuning
Pn123		Friction Compensation Coefficient		%	0 to 100	0	Immediately	Tuning
Pn124		Friction Compensation Frequency Correction		0.1Hz	-10000 to 10000	0	Immediately	Tuning
Pn125		Friction Compensation Gain Correction		%	1 to 1000	100	Immediately	Tuning
Pn131		Gain Switching Time 1		ms	0 to 65535	0	Immediately	Tuning
Pn132		Gain Switching Time 2		ms	0 to 65535	0	Immediately	Tuning
Pn135		Gain Switching Waiting Time 1		ms	0 to 65535	0	Immediately	Tuning
Pn136		Gain Switching Waiting Time 2		ms	0 to 65535	0	Immediately	Tuning
Pn139		Automatic Gain Changeover Related Switch 1		–	0000h to 0052h	0000h	Immediately	Tuning
	0	Gain Switching Selection Switch		–	0 to 4	0		
		0	Manual gain switching Changes gain manually using external input signals (/G-SEL1, /G-SEL2)					
		2	Automatic gain switching pattern 1 Changes automatically 1st gain to 2nd gain when the switching condition A is satisfied. Changes automatically 2nd gain to 1st gain when the switching condition B is satisfied.					
	1	Gain Switching Condition A		–	0 to 5	0		
		0	Positioning completion signal (/COIN) ON					
		1	Positioning completion signal (/COIN) OFF					
		2	NEAR signal (/NEAR) ON					
		3	NEAR signal (/NEAR) OFF					
		4	Position reference filter output = 0 and reference pulse input OFF					
		5	Position reference pulse input ON					
Pn13D		Current Gain Level		%	100 to 2000	2000	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn140		Model Following Control Related Switch	–	0000h to 1121h	0100h	Immediately	Tuning
	0	Model Following Control Selection	–	0, 1	0		
		0 Does not use model following control.					
		1 Uses model following control.					
	1	Vibration Suppression Selection	–	0 to 2	0		
		0 Does not perform vibration suppression.					
		1 Performs vibration suppression over the specified frequency.					
		2 Performs vibration suppression over two different kinds of frequencies.					
	2	Vibration Suppression Adjustment Selection	–	0, 1	1		
		0 Does not adjust vibration suppression automatically using utility function.					
		1 Adjusts vibration suppression automatically using utility function.					
	3	Selection of Speed Feedforward (VFF) or Force Feedforward (TFF)	–	0, 1	0		
		0 Does not use model following control and external speed/force feedforward at the same time.					
		1 Uses model following control and external speed/force feedforward at the same time.					
Pn141		Model Following Control Gain	0.1/s	10 to 20000	500	Immediately	Tuning
Pn142		Model Following Control Gain Compensation	0.1%	500 to 2000	1000	Immediately	Tuning
Pn143		Model Following Control Bias (Forward Direction)	0.1%	0 to 10000	1000	Immediately	Tuning
Pn144		Model Following Control Bias (Reverse Direction)	0.1%	0 to 10000	1000	Immediately	Tuning
Pn145		Vibration Suppression 1 Frequency A	0.1Hz	10 to 2500	500	Immediately	Tuning
Pn146		Vibration Suppression 1 Frequency B	0.1Hz	10 to 2500	700	Immediately	Tuning
Pn147		Model Following Control Speed Feedforward Compensation	0.1%	0 to 10000	1000	Immediately	Tuning
Pn148		2nd Model Following Control Gain	0.1/s	10 to 20000	500	Immediately	Tuning
Pn149		2nd Model Following Control Gain Compensation	0.1%	500 to 2000	1000	Immediately	Tuning
Pn14A		Vibration Suppression 2 Frequency	0.1Hz	10 to 2000	800	Immediately	Tuning
Pn14B		Vibration Suppression 2 Compensation	%	10 to 1000	100	Immediately	Tuning
Pn160		Anti-Resonance Control Related Switch	–	0000h to 0011h	0010h	Immediately	Tuning
	0	Anti-Resonance Control Selection	–	0, 1	0		
		0 Does not use anti-resonance control.					
		1 Uses anti-resonance control.					
	1	Anti-Resonance Control Adjustment Selection	–	0, 1	1		
		0 Does not adjust anti-resonance control automatically using utility function.					
		1 Adjusts anti-resonance control automatically using utility function.					
Pn161		Anti-Resonance Frequency	0.1Hz	10 to 20000	1000	Immediately	Tuning
Pn162		Anti-Resonance Gain Compensation	%	1 to 1000	100	Immediately	Tuning
Pn163		Anti-Resonance Damping Gain	%	0 to 300	0	Immediately	Tuning
Pn164		Anti-Resonance Filter Time Constant 1 Compensation	0.01ms	-1000 to 1000	0	Immediately	Tuning
Pn165		Anti-Resonance Filter Time Constant 2 Compensation	0.01ms	-1000 to 1000	0	Immediately	Tuning

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn170		Tuning-less Function Related Switch		–	0000h to 2411h	1401h		Setup
	0	Tuning-less Function Selection		–	0, 1	1	After restart	
		0	Tuning-less function disabled					
		1	Tuning-less function enabled					
	1	Control Method during speed control		–	0, 1	0	After restart	
		0	Uses as speed control					
		1	Uses as position control at host controller					
	2	Tuning-less Level		–	0 to 4	4	Immediately	
	3	Tuning-less Load Level		–	0 to 2	1	Immediately	
Pn181		Mode Switch (speed reference)		mm/s	0 to 10000	0	Immediately	Tuning
Pn182		Mode Switch (acceleration)		mm/s^2	0 to 30000	0	Immediately	Tuning
Pn190		Reserved (Do not change.)		–	0000h to 0011h	0010h	After restart	Tuning
Pn200		Position Control Reference Form Selection Switch		–	0000h to 2236h	0000h	After restart	Setup
	0	Reference Pulse Form		–	0 to 6	0		
		0	Sign + Pulse, positive logic					
		1	CW + CCW, positive logic					
		2	Phase A + Phase B (×1), positive logic					
		3	Phase A + Phase B (×2), positive logic					
		4	Phase A + Phase B (×4), positive logic					
		5	Sign + Pulse, negative logic					
		6	CW + CCW, negative logic					
	1	Clear Signal Form		–	0 to 3	0		
		0	Clears position error pulse when the signal is at H level.					
		1	Clears position error pulse at the rising edge of the signal.					
		2	Clears position error pulse when the signal is at L level.					
		3	Clears position error pulse at the falling edge of the signal.					
	2	Clear Operation		–	0 to 2	0		
		0	Clears position error pulse at the baseblock (Servo OFF or alarm occurred).					
		1	Does not clear position error pulse (Possible to clear error counter only with CLR signal)					
		2	Clears position error pulse when an alarm occurs.					
	3	Filter Selection		–	0 to 2	0		
		0	Reference input filter 1 for line driver signal (to 1Mpps)					
		1	Reference input filter for open collector signal (200kpps)					
		2	Reference input filter 2 for line driver signal (to 4Mpps)					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn207		Position Control Function Switch	–	0000h to 2210h	0000h	After restart	Setup
	1	Position Control Option	–	0, 1	0		
		0 N/A					
		1 Uses V-REF as a speed feedforward input.					
	3	COIN Output Timing	–	0 to 2	0		
		0 Outputs when the position error absolute value is the same or less than the positioning completion width (Pn522).					
		1 Outputs when the position error absolute value is the position completion width (Pn522) or less and the reference after position reference filtering is 0.					
		2 When the absolute value of the position error is below the positioning completed width setting (Pn522), and the position reference input is 0.					
Pn20E		Electronic Gear Ratio (Numerator)	–	1 to 1073741824	4	After restart	Setup
Pn210		Electronic Gear Ratio (Denominator)	–	1 to 1073741824	1	After restart	Setup
Pn216		Position Reference Acceleration/Deceleration Time Constant	0.1ms	0 to 65535	0	Immediately	Setup
Pn217		Average Movement Time of Position Reference	0.1ms	0 to 10000	0	Immediately	Setup
Pn281		Encoder Output pulse	edge/ pitch	1 to 4096	20	After restart	Setup
Pn282		Linear Scale Pitch	0.01um	0.00 to 65536.00	0.00	After restart	Setup
Pn300		Speed Reference Input Gain	0.01V ／ rated speed	150 to 3000	600	Immediately	Setup
Pn305		Soft Start Acceleration Time	ms	0 to 10000	0	Immediately	Setup
Pn306		Soft Start Deceleration Time	ms	0 to 10000	0	Immediately	Setup
Pn307		Speed Reference Filter Time Constant	0.01ms	0 to 65535	40	Immediately	Setup
Pn310		Vibration Detection Switch	–	0000h to 0002h	0000h	Immediately	Setup
	0	Vibration Detection Selection	–	0 to 2	0		
		0 No detection.					
		1 Outputs warning (A.911) when vibration is detected.					
		2 Outputs alarm (A.520) when vibration is detected.					
Pn311		Vibration Detection Sensibility	%	50 to 500	100	Immediately	Tuning
Pn324		Mass Ratio Setting Start Level	%	0 to 20000	300	Immediately	Setup
Pn380		Internal Set Speed 1	mm/s	0 to 10000	10	Immediately	Setup
Pn381		Internal Set Speed 2	mm/s	0 to 10000	20	Immediately	Setup
Pn382		Internal Set Speed 3	mm/s	0 to 10000	30	Immediately	Setup
Pn383		JOG Speed	mm/s	0 to 10000	50	Immediately	Setup
Pn384		Vibration Detection Level	mm/s	0 to 5000	10	Immediately	Tuning
Pn385		Motor max. speed	100mm/s	1 to 100	50	After restart	Setup
Pn400		Force Reference Input Gain	0.1V ／ rated force	10 to 100	30	Immediately	Setup
Pn401		Force Reference Filter Time Constant	0.01ms	0 to 65535	100	Immediately	Tuning
Pn404		Forward External Force Limit	%	0 to 800	100	Immediately	Setup
Pn405		Reverse External Force Limit	%	0 to 800	100	Immediately	Setup
Pn406		Emergency Stop Force	%	0 to 800	800	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn408		Force Related Function Switch	–	0000h to 1111h	0000h		Setup
	0	1st Notch Filter Selection	–	0, 1	0	Immediately	
		0 N/A					
		1 Uses 1st notch filter for force reference.					
	1	Speed Limit Selection	–	0, 1	0	After restart	
		0 Uses the smaller value between motor max. speed and parameter Pn407 as speed limit value.					
		1 Uses the smaller value between overspeed detection speed and parameter Pn407 as speed limit value.					
	2	2nd Notch Filter Selection	–	0, 1	0	Immediately	
		0 N/A					
		1 Uses 2nd notch filter for force reference.					
	3	Friction Compensation Function Selection	–	0, 1	0	Immediately	
		0 Disables friction compensation function.					
		1 Enables friction compensation function.					
Pn409		1st Notch Filter Frequency	Hz	50 to 5000	5000	Immediately	Tuning
Pn40A		1st Notch Filter Q Value	0.01	50 to 1000	70	Immediately	Tuning
Pn40B		1st Notch Filter Depth	0.001	0 to 1000	0	Immediately	Tuning
Pn40C		2nd Notch Filter Frequency	Hz	50 to 5000	5000	Immediately	Tuning
Pn40D		2nd Notch Filter Q Value	0.01	50 to 1000	70	Immediately	Tuning
Pn40E		2nd Notch Filter Depth	0.001	0 to 1000	0	Immediately	Tuning
Pn40F		2nd Step 2nd Force Reference Filter Frequency	Hz	100 to 5000	5000	Immediately	Tuning
Pn410		2nd Step 2nd Force Reference Filter Q Value	0.01	50 to 100	50	Immediately	Tuning
Pn412		1st Step 2nd Force Reference Filter Time Constant	0.01ms	0 to 65535	100	Immediately	Tuning
Pn415		T-REF Filter Time Constant	0.01ms	0.00 to 655.35	0.00	Immediately	Setup
Pn423		Reserved (Do not change.)	–	0000h to 1111h	0000h	Immediately	Setup
Pn424		Force Limit at Main Circuit Voltage Drop	%	0 to 100	50	Immediately	Setup
Pn425		Release time for Force Limit at Main Circuit Voltage Drop	ms	0 to 1000	100	Immediately	Setup
Pn456		Sweep Force Reference Amplitude	%	1 to 800	15	Immediately	Tuning
Pn460		Notch Filter Adjustment Switch	–	0000h to 0101h	0101h	Immediately	Tuning
	0	Notch Filter Adjustment Selection 1	–	0, 1	1		
		0 Utility function does not adjust 1st notch filter automatically.					
		1 Utility function adjusts 1st notch filter automatically.					
	2	Notch Filter Adjustment Selection 2	–	0, 1	1		
		0 Utility function does not adjust 2nd notch filter automatically.					
		1 Utility function adjusts 2nd notch filter automatically.					
Pn480		Speed Limit during Force Control	mm/s	0 to 10000	10000	Immediately	Setup
Pn481		Polarity Detection Speed Loop Gain	0.1Hz	1.0 to 2000.0	40.0	Immediately	Tuning
Pn482		Polarity Detection Speed Loop Integral Time Constant	0.01ms	0.15 to 512.00	30.00	Immediately	Tuning
Pn483		Forward Force Limit	%	0 to 800	30	Immediately	Setup
Pn484		Reverse Force Limit	%	0 to 800	30	Immediately	Setup
Pn485		Polarity Detection Reference Speed	mm/s	0 to 100	20	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn486		Polarity Detection Reference Accel/Decel Time	ms	0 to 100	25	Immediately	Tuning
Pn487		Polarity Detection Constant Speed Time	ms	0 to 300	0	Immediately	Tuning
Pn488		Polarity Detection Reference Waiting Time	ms	50 to 500	100	Immediately	Tuning
Pn48E		Polarity Detection Range	mm	1 to 65535	10	Immediately	Tuning
Pn490		Polarity Detection Load Level	%	0 to 20000	100	Immediately	Tuning
Pn495		Polarity Detection Confirmation Force Reference	%	0 to 200	100	Immediately	Tuning
Pn498		Polarity Detection Allowable Error Range	deg	0 to 30	10	Immediately	Tuning
Pn506		Brake Reference - Servo OFF Delay Time	10ms	0 to 50	0	Immediately	Setup
Pn508		Waiting Time for Brake Signal When Motor Running	10ms	10 to 100	50	Immediately	Setup
Pn509		Instantaneous Power Cut Hold time	ms	20 to 1000	20	Immediately	Setup

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50A		Input Signal Selection 1		–	0000h to FFF1h	2100h	After restart	Setup
	0	Input Signal Allocation Mode		–	0, 1	0		
		0	Uses the sequence input signal terminals with standard allocation.					
		1	Changes the sequence input signal allocation for each signal.					
	1	/S-ON Signal Mapping		–	0 to F	0		
		0	ON when CN1-40 input signal is ON (L-level)					
		1	ON when CN1-41 input signal is ON (L-level)					
		2	ON when CN1-42 input signal is ON (L-level)					
		3	ON when CN1-43 input signal is ON (L-level)					
		4	ON when CN1-44 input signal is ON (L-level)					
		5	ON when CN1-45 input signal is ON (L-level)					
		6	ON when CN1-46 input signal is ON (L-level)					
		7	Sets signal ON					
		8	Sets signal OFF					
		9	ON when CN1-40 input signal is OFF (H-level)					
		A	ON when CN1-41 input signal is OFF (H-level)					
		B	ON when CN1-42 input signal is OFF (H-level)					
		C	ON when CN1-43 input signal is OFF (H-level)					
		D	ON when CN1-44 input signal is OFF (H-level)					
		E	ON when CN1-45 input signal is OFF (H-level)					
		F	ON when CN1-46 input signal is OFF (H-level)					
	2	/P-CON Signal Mapping		–	0 to F	1		
		0 to F	Same as /S-ON signal mapping					
	3	P-OT Signal Mapping		–	0 to F	2		
		0	Forward run allowed when CN1-13 input signal is ON (L-level)					
		1	Forward run allowed when CN1-07 input signal is ON (L-level)					
		2	Forward run allowed when CN1-08 input signal is ON (L-level)					
		3	Forward run allowed when CN1-09 input signal is ON (L-level)					
		4	Forward run allowed when CN1-10 input signal is ON (L-level)					
		5	Forward run allowed when CN1-11 input signal is ON (L-level)					
		6	Forward run allowed when CN1-12 input signal is ON (L-level)					
		7	Forward run prohibited					
		8	Forward run allowed					
		9	Forward run allowed when CN1-13 input signal is OFF (H-level)					
		A	Forward run allowed when CN1-07 input signal is OFF (H-level)					
		B	Forward run allowed when CN1-08 input signal is OFF (H-level)					
		C	Forward run allowed when CN1-09 input signal is OFF (H-level)					
		D	Forward run allowed when CN1-10 input signal is OFF (H-level)					
		E	Forward run allowed when CN1-11 input signal is OFF (H-level)					
		F	Forward run allowed when CN1-12 input signal is OFF (H-level)					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50B		Input Signal Selection 2	–	0000h to FFFFh	6543h	After restart	Setup
	0	N-OT Signal Mapping	–	0 to F	3		
		0 Reverse run allowed when CN1-40 input signal is ON (L-level)					
		1 Reverse run allowed when CN1-41 input signal is ON (L-level)					
		2 Reverse run allowed when CN1-42 input signal is ON (L-level)					
		3 Reverse run allowed when CN1-43 input signal is ON (L-level)					
		4 Reverse run allowed when CN1-44 input signal is ON (L-level)					
		5 Reverse run allowed when CN1-45 input signal is ON (L-level)					
		6 Reverse run allowed when CN1-46 input signal is ON (L-level)					
		7 Reverse run prohibited					
		8 Reverse run allowed					
		9 Reverse run allowed when CN1-40 input signal is OFF (H-level)					
		A Reverse run allowed when CN1-41 input signal is OFF (H-level)					
		B Reverse run allowed when CN1-42 input signal is OFF (H-level)					
		C Reverse run allowed when CN1-43 input signal is OFF (H-level)					
		D Reverse run allowed when CN1-44 input signal is OFF (H-level)					
		E Reverse run allowed when CN1-45 input signal is OFF (H-level)					
		F Reverse run allowed when CN1-46 input signal is OFF (H-level)					
	1	/ALM-RST Signal Mapping	–	0 to F	4		
		0 Active on the falling edge of CN1-40 input signal					
		1 Active on the falling edge of CN1-41 input signal					
		2 Active on the falling edge of CN1-42 input signal					
		3 Active on the falling edge of CN1-43 input signal					
		4 Active on the falling edge of CN1-44 input signal					
		5 Active on the falling edge of CN1-45 input signal					
		6 Active on the falling edge of CN1-46 input signal					
		7 Reserved (Do not change.)					
		8 Sets signal OFF.					
		9 Active on the rising edge of CN1-40 input signal					
		A Active on the rising edge of CN1-41 input signal					
		B Active on the rising edge of CN1-42 input signal					
		C Active on the rising edge of CN1-43 input signal					
		D Active on the rising edge of CN1-44 input signal					
		E Active on the rising edge of CN1-45 input signal					
		F Active on the rising edge of CN1-46 input signal					
	2	/P-CL Signal Mapping	–	0 to F	5		
		0 to F Same as /S-ON signal mapping					
	3	/N-CL Signal Mapping	–	0 to F	6		
		0 to F Same as /S-ON signal mapping					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50C		Input Signal Selection 3	–	0000h to FFFFh	8888h	After restart	Setup
	0	/SPD-D Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
	1	/SPD-A Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
	2	/SPD-B Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
	3	/C-SEL Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
Pn50D		Input Signal Selection 4	–	0000h to FFFFh	8888h	After restart	Setup
	0	/ZCLAMP Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
	1	/INHIBIT Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
	2	/G-SEL Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
	3	/P-DET Signal Mapping	–	0 to F	8		
		0 to F: Same as /S-ON signal mapping					
Pn50E		Output Signal Selection 1	–	0000h to 3333h	3211h	After restart	Setup
	0	Positioning Completion Signal Mapping (/COIN)	–	0 to 3	1		
		0: Disabled (the above signal is not used.)					
		1: Outputs the signal from CN1-25, 26 output terminal.					
		2: Outputs the signal from CN1-27, 28 output terminal.					
		3: Outputs the signal from CN1-29, 30 output terminal.					
	1	Speed Coincidence Detection Signal Mapping (/V-CMP)	–	0 to 3	1		
		0 to 3: Same as /COIN signal mapping					
	2	Movement Detection Signal Mapping (/TGON)	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
	3	Servo Ready Signal Mapping (/S-RDY)	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
Pn50F		Output Signal Selection 2	–	0000h to 3333h	0000h	After restart	Setup
	0	Force Limit Detection Signal Mapping (/CLT)	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
	1	Speed Limit Detection Signal Mapping (/VLT)	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
	2	Brake Interlock Signal Mapping (/BK)	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
	3	Warning Signal Mapping (/WARN)	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
Pn510		Output Signal Selection 3	–	0000h to 0033h	0000h	After restart	Setup
	0	/NEAR Signal Mapping	–	0 to 3	0		
		0 to 3: Same as /COIN signal mapping					
Pn511		Input Signal Selection 5	–	0000h to FFFFh	8888h	After restart	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn512		Output Signal Inverse Setting	–	0000h to 0111h	0000h	After restart	Setup
	0	Inverses output signals of CN1-25, -26 terminals	–	0, 1	0		
		0 Does not inverse outputs.					
		1 Inverses outputs.					
	1	Inverses output signals of CN1-27, -28 terminals	–	0, 1	0		
		0,1 Same as CN1-25, -26 output signals					
	2	Inverses output signals of CN1-29, -30 terminals	–	0, 1	0		
		0,1 Same as CN1-25, -26 output signals					
Pn51E		Excessive Position Error Warning Level	%	10 to 100	100	Immediately	Setup
Pn520		Excessive Position Error Alarm Level	reference unit	1 to 1073741823	5242880	Immediately	Setup
Pn522		Positioning Completed Width	reference unit	0 to 1073741824	7	Immediately	Setup
Pn524		NEAR Signal Width	reference unit	1 to 1073741824	1073741824	Immediately	Setup
Pn526		Excessive Position Error Alarm Level at Servo ON	reference unit	1 to 1073741823	5242880	Immediately	Setup
Pn528		Excessive Position Error Warning Level at Servo ON	%	10 to 100	100	Immediately	Setup
Pn52B		Overload Warning Level	%	1 to 100	20	Immediately	Setup
Pn52C		Derating of base current at detecting overload of motor	%	10 to 100	100	After restart	Setup
Pn52F		Monitor Display at Power ON	–	0000 to 0FFF	0FFFh	Immediately	Setup
Pn530		Program JOG Operation Related Switch	–	0000h to 0005h	0000h	Immediately	Setup
	0	Program JOG Operation Related Switch	–	0 to 5	0		
		0 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536					
		1 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536					
		2 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536					
		3 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536					
		4 (Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of times of movement Pn536					
		5 (Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536					
Pn531		Program JOG Movement Distance	reference unit	1 to 1073741824	32768	Immediately	Setup
Pn534		Program JOG Acceleration/Deceleration Time	ms	2 to 10000	100	Immediately	Setup
Pn535		Program JOG Waiting Time	ms	0 to 10000	100	Immediately	Setup
Pn536		Number of Times of Program JOG Movement	time	0 to 1000	1	Immediately	Setup
Pn550		Analog Monitor 1 Offset Voltage	0.1V	-1000.0 to 1000.0	0.0	Immediately	Setup
Pn551		Analog Monitor 2 Offset Voltage	0.1V	-1000.0 to 1000.0	0.0	Immediately	Setup
Pn552		Analog Monitor Magnification (×1)	×0.01	-100.00 to 100.00	1.00	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn553		Analog Monitor Magnification (×2)	×0.01	-100.00 to 100.00	1.00	Immediately	Setup
Pn560		Remained Vibration Detection Width	0.1%	0.1 to 300.0	40.0	Immediately	Setup
Pn561		Overshoot Detection Level	%	0 to 100	100	Immediately	Setup
Pn580		Zero Clamp Level	mm/s	0 to 10000	10	Immediately	Setup
Pn581		Zero Speed Level	mm/s	1 to 10000	20	Immediately	Setup
Pn582		Speed Coincidence Signal Output Width	mm/s	0 to 100	10	Immediately	Setup
Pn583		Brake Reference Output Speed Level	mm/s	0 to 10000	10	Immediately	Setup
Pn584		Speed Limit Level at Servo ON	mm/s	0 to 10000	10000	Immediately	Setup
Pn585		Program JOG Movement Speed	mm/s	1 to 10000	50	Immediately	Setup
Pn586		Motor Running Air-cooling Ratio	%/peak speed	0 to 100	0	Immediately	Setup
Pn587		Polarity Detection for Absolute Scale Selection		0000h to 0001h	0000h	Immediately	Setup
	0	Polarity Detection for Absolute Scale Selection	–	0, 1	0		
		0 Does not detect polarity.					
		1 Detects polarity.					
Pn600		Regenerative Resistor Capacity	10W	Depends on SERVOPACK capacity.	0	Immediately	Setup

■ Revision Details for the M-Ⅱ Linear User's Manual

Until the new manual is issued, refer to the following documents for information on how to use the Σ-V M-Ⅱ linear servomotors. The highlighted sections indicate relevant information.

Analog Rotary Manual			Other Documents			Supplement		Notes
Chapter/Section		Page	Name	Chapter/ Section	Page	Section	Page	
Safety Precautions		VI to X	–	–	–	–	–	
Chapter 1	1.1 ∑ - V Series SERVOPACKs	1-2	–	–	–	–	–	
	1.2 Part Names	–	–	–	–	–	–	Will be included in the new manual.
	1.3 SERVOPACKs Ratings and Specifications	–	–	–	–	–	–	
	1.3.1 Ratings	–	Catalog	–	188	–	–	
	1.3.2 Basic Specifications	–	Catalog	–	189	–	–	
	1.3.3 Speed/Position/Torque Control Modes	–	Catalog	–	190	–	–	
	1.4 Examples of Servo System Configuration	–	–	–	–	–	–	
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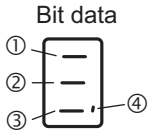
■ Status Display on Panel Operator



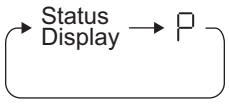
(1) Bit Data Display

Bit Position as shown in the figure	Bit Data	Display Contents
①	Motor run detection	Lit when the servomotor is being operated.
②	Servo ON/OFF	Lit when the servo is OFF. Unlit when the servo is ON.
③	Reference input detection	Lit when a reference is being input.
④	CONNECT completion	Lit when the connection is completed.

(2) Signal Display for Overtravel Prevention

The following figure shows the overtravel prevention signal on the indicator on the front panel of the SERVOPACK.

- Forward run prohibited signal

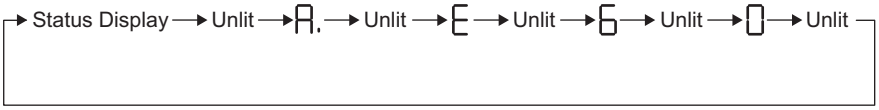


- Reverse run prohibited signal

(3) Alarm and Warning Display

The following figure shows how the alarm or warning codes are displayed letter by letter on the indicator on the front panel of the SERVOPACK.

Example : Alarm A.E60



■ I/O Signal (CN1) Names and Functions

(1) Input Signals

Signal Name		Pin No.	Function	
Common	/DEC	9	Homing deceleration limit switch signal: Connects the deceleration LS (limit switch) for homing.	
	P-OT N-OT	7 8	Forward run prohibited signal Reverse run prohibited signal	Overtravel prevention signal: Stops servomotor when movable part travels beyond the allowable range of motion.
	/EXT1 to EXT3 /EXT2 /EXT3	10 11 12	External latch signals 1, 2, and 3: Connects the external signals that latch the current FB pulse counter.	
	+24VIN	6	Control power supply for sequence signal: Users must provide +24 V power supply. Allowable voltage fluctuation range: +11 to +25 V	
	BAT (+) BAT (-)	14 15	Battery input for absolute encoder: Used for absolute encoder battery input when a battery unit is not used.	
	/SI0	13	General-purpose sequence input signal: Monitored in the I/O monitor field of MECHATROLINK/MECHATROLINK-II.	

Note: 1. The functions allocated to /DEC, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input signals can be changed by setting the parameters.
2. For forward/reverse run prohibited, the SERVOPACK processing for stopping is executed by the software. As the safety specifications of some applications may not satisfy local safety requirements, add the external safety circuits as required.
3. The signal /SI0 (pin No. 13) can be monitored as a general-purpose input with the MECHATROLINK/MECHATROLINK-II.

(2) Output Signals

Signal Name		Pin No.	Function
Common	ALM+ ALM-	3 4	Servo alarm signal: Turns OFF when an error is detected.
	/BK+ (/SO1+) /BK- (/SO1-)	1 2	Brake interlock signal: Controls the brake. The brake is released when the signal is ON.
	/SO2+ /SO2-	23 24	General-purpose output signal: A function can be allocated by setting the parameter.
	/SO3+ /SO3-	25 26	
	FG	Shell	Connected to the frame ground if the shield wire of the I/O signal cable is connected to the connector shell.

Note: The output signals /SO1, /SO2, and /SO3 can be used as the output signal /COIN, /V-CMP, /TGON, /S-RDY, /CLT, /VLT, /BK, /WARN, or /NEAR by setting the parameter Pn50E, Pn50F, or Pn510.

MⅡL-3

■ I/O Signal Connector (CN1) Terminal Layout

The following diagram shows the layout of the CN1 terminals.

1	/BK+ (/SO1+)	Brake interlock output	2	/BK- (/SO1-)	Brake interlock output	14	BAT(+)*2	Battery (+) input	15	BAT(-)*2	Battery (-) input
3	ALM+	Servo alarm output	4	ALM-	Servo alarm output	16	SG	Signal ground	17	PAO	PG dividing pulse (Phase-A) output
5			6	+24VIN	Control power supply for sequence signal input	18	/PAO	PG dividing pulse (Phase-A) output	19	PBO	PG dividing pulse (Phase-B) output
7	P-OT (/SI1)	Forward run prohibited input	8	N-OT (/SI2)	Reverse run prohibited input	20	/PBO	PG dividing pulse (Phase-B) output	21	PCO	PG dividing pulse (Phase-C) output
9	/DEC (/SI3)	Homing deceleration switch input	10	/EXT1 (/SI4)	External latch signal 1 input	22	/PCO	PG dividing pulse (Phase-C) output	23	/SO2+*1	General-purpose input
11	/EXT2 (/SI5)	External latch signal 2 input	12	/EXT3 (/SI6)	External latch signal 3 input	24	/SO2-*1	General-purpose input	25	/SO3+*1	General-purpose input
13	/SI0	General-purpose input				26	/SO3-*1	General-purpose input			

* 1. Make the signal allocations using parameters.
* 2. Connect a battery to CN1 or to a battery case. Connecting both batteries creates a loop circuit that is dangerous between the two batteries.

Note: 1. The connector shell is connected to the FG (frame ground).
2. Do not use the unused terminals.

MⅡL-4

■ Input Circuit Signal Allocation

The functions allocated to sequence input signal circuits can be changed. CN1 connector input signals are allocated with the factory settings as shown in the following table.

In general, allocate signals according to the standard settings in the following table.

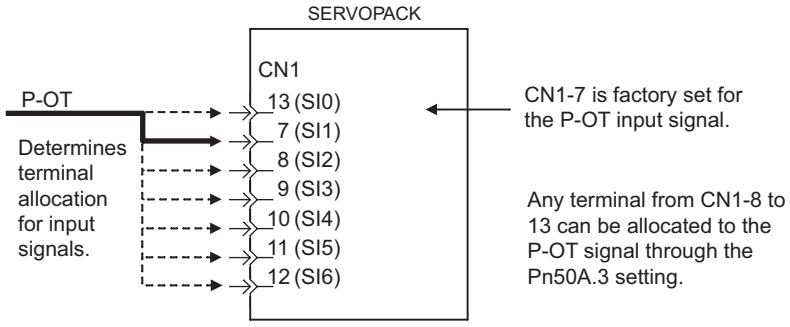
CN1 Connector Terminal Numbers	Input Terminal Name	Factory Setting	
		Symbol	Name
13	SI0	—	—
7	SI1	P-OT	Forward run prohibited
8	SI2	N-OT	Reverse run prohibited
9	SI3	/DEC	Homing deceleration limit switch
10	SI4	/EXT1	External latch signal 1
11	SI5	/EXT2	External latch signal 2
12	SI6	/EXT3	External latch signal 3

The following table shows the factory settings for input signal selections 1 to 5.

Pn50A	Input Signal Selections 1	Factory Setting: 1881
Pn50B	Input Signal Selections 2	Factory Setting: 8882
Pn511	Input Signal Selections 5	Factory Setting: 6543

(1) Examples of Input Signal Allocation

The procedure used to allocate sequence input signals is described using the P-OT (forward run prohibited) signal as a typical example.



Parameter		Description	Remarks
Pn50A	0	ON when CN1-13 input signal is ON (L-level)	Signal Polarity in reverse run: None Example: Forward run prohibited signal (P-OT) is valid when high (OFF).
	1	ON when CN1-7 input signal is ON (L-level)	
	2	ON when CN1-8 input signal is ON (L-level)	
	3	ON when CN1-9 input signal is ON (L-level)	
	4	ON when CN1-10 input signal is ON (L-level)	
	5	ON when CN1-11 input signal is ON (L-level)	
	6	ON when CN1-12 input signal is ON (L-level)	
	7	Sets signal ON	Set the forward run prohibited signal (P-OT) so that it is always valid or always invalid.
	8	Sets signal OFF	
	9	ON when CN1-13 input signal is OFF (H-level)	Signal Polarity in reverse run: Available* Example: Forward run prohibited signal (P-OT) is valid when low (ON).
	A	ON when CN1-7 input signal is OFF (H-level)	
	B	ON when CN1-8 input signal is OFF (H-level)	
	C	ON when CN1-9 input signal is OFF (H-level)	
	D	ON when CN1-10 input signal is OFF (H-level)	
	E	ON when CN1-11 input signal is OFF (H-level)	
	F	ON when CN1-12 input signal is OFF (H-level)	

* Settings 9 through F can be used to reverse signal polarity.

IMPORTANT

1. Signals are input with OR logic when multiple signals are allocated to the same input circuit.
2. If reverse polarity is set for the Forward Run Prohibited or Reverse Run Prohibited signals, the operation may not be safe if broken signal lines occur. You must confirm operational safety when using this function.

As shown in the table above, the P-OT signal can be allocated to any input terminal from CN1-7 to CN1-13. P-OT is always ON when Pn50A.3 is set to 7, and so the SERVOPACK will always be in forward run prohibited status.

The P-OT signal is not used when Pn50A.3 is set to 8. This setting is used in the following instances.

- When terminal CN1-7 is to be replaced by another input signal.
- When the forward run prohibited (P-OT) is temporarily disabled for trial or normal operation.
- In case of system configuration where forward run prohibited (P-OT) function is not needed.

INFO

The forward run prohibited (P-OT) and the reverse run prohibited (N-OT) input signals are valid when OFF (high level). The input terminals must therefore be wired so that these signals remain ON (low level) in systems where they are not required. The need to wire these terminals can be eliminated by setting the Pn50A.3 to 8.

(2) Allocating Other Input Signals

Input signal allocation can be changed as shown below.

Input Signal	Parameter		Description
Name	Number	Setting	
Forward Run Prohibited (P-OT)	Pn50A.3	0	ON when CN1-13 input signal is ON (L-level)
		1	ON when CN1-7 input signal is ON (L-level)
		2	ON when CN1-8 input signal is ON (L-level)
		3	ON when CN1-9 input signal is ON (L-level)
		4	ON when CN1-10 input signal is ON (L-level)
		5	ON when CN1-11 input signal is ON (L-level)
		6	ON when CN1-12 input signal is ON (L-level)
		7	Sets signal ON
		8	Sets signal OFF
		9	ON when CN1-13 input signal is OFF (H-level)
		A	ON when CN1-7 input signal is OFF (H-level)
		B	ON when CN1-8 input signal is OFF (H-level)
		C	ON when CN1-9 input signal is OFF (H-level)
		D	ON when CN1-10 input signal is OFF (H-level)
		E	ON when CN1-11 input signal is OFF (H-level)
		F	ON when CN1-12 input signal is OFF (H-level)
Reverse Run Prohibited (N-OT)	Pn50B.0	0 to F	Same as above.
Forward Current Limit (/P-CL)	Pn50B.2	0 to F	Same as above.
Reverse Current Limit (/N-CL)	Pn50B.3	0 to F	Same as above.
Homing Deceleration LS (/DEC)	Pn511.0	0 to F	Same as above.
External Latch Signal 1 (/EXT1)	Pn511.1	0 to 3	Sets signal OFF
		4	ON when CN1-10 input signal is ON (L-level)
		5	ON when CN1-11 input signal is ON (L-level)
		6	ON when CN1-12 input signal is ON (L-level)
		7	Sets signal ON
		8 to C	Sets signal OFF
		D	ON when CN1-10 input signal is OFF (H-level)
		E	ON when CN1-11 input signal is OFF (H-level)
		F	ON when CN1-12 input signal is OFF (H-level)
External Latch Signal 2 (/EXT2)	Pn511.2	0 to F	Same as above.
External Latch Signal 3 (/EXT3)	Pn511.3	0 to F	Same as above.

■ Output Circuit Signal Allocation

Output signal functions can be allocated to the sequence signal output circuits shown below.

In general, allocate signals according to the standard settings in the following table.

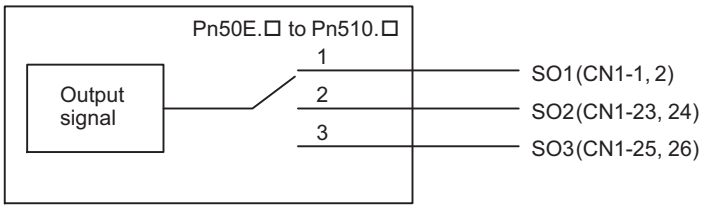
CN1 Connector Terminal Numbers	Output Terminal Name	Factory Setting	
		Symbol	Name
1	SO1	/BK+(/SO1+)	General-purpose signal output 1
2		/BK-(/SO1-)	
23	SO2	/SO2+	General-purpose signal output 2
24		/SO2-	
25	SO3	/SO3+	General-purpose signal output 3
26		/SO3-	

The output signal selection parameters and their factory settings are shown below.

Pn50E	Output Signal Selections 1	Factory Setting: 0000
Pn50F	Output Signal Selections 2	Factory Setting: 0100
Pn510	Output Signal Selections 3	Factory Setting: 0000

(1) Setting of Output Signal Allocation

Select the CN1 connector terminals that will output the signals according to the parameter setting.



Output Signal	Parameter		Description
	Number	Setting	
Positioning Completed (/COIN)	Pn50E.0	0	Disabled (Not used for the output signal on the left.)
		1	Outputs the signal on the left from the CN1-1 and 2 output terminal.
		2	Outputs the signal on the left from the CN1-23 and 24 output terminal.
		3	Outputs the signal on the left from the CN1-25 and 26 output terminal.
Speed Coincidence Detection (/V-CMP)	Pn50E.1	0 to 3	Same as above
Movement Detection (/TGON)	Pn50E.2	0 to 3	Same as above
Servo Ready (/S-RDY)	Pn50E.3	0 to 3	Same as above
Force Limit Detection (/CLT)	Pn50F.0	0 to 3	Same as above
Speed Limit Detection (/VLT)	Pn50F.1	0 to 3	Same as above
Brake Interlock (/BK)	Pn50F.2	0 to 3	Same as above
Warning (/WARN)	Pn50F.3	0 to 3	Same as above

Output Signal	Parameter		Description
	Number	Setting	
Near (/NEAR)	Pn510.0	0 to 3	Same as above

INFO

Signals are output with OR logic when multiple signals are allocated to the same output circuit. Signals that are not used are invalid.

(2) Output Signal Reversal

The following parameter can be used to reverse the signals output on output terminals SO1 to SO3.

Pn512	Output Signal Reversal Settings		Speed	Position	Force
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	–	–	0000	After restart	

The settings specify which of the connector CN1 output signals are to be reversed.

Output Terminals	Parameter		Description
	Number	Setting	
SO1 (CN1-1, 2)	Pn512.0	0	Output signal not reversed.
		1	Output signal reversed.
SO2 (CN1-23, 24)	Pn512.1	0	Output signal not reversed.
		1	Output signal reversed.
SO3 (CN1-25, 26)	Pn512.2	0	Output signal not reversed.
		1	Output signal reversed.

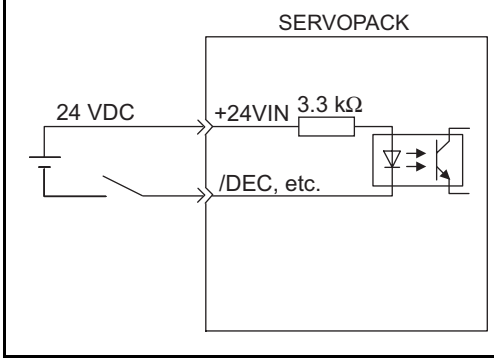
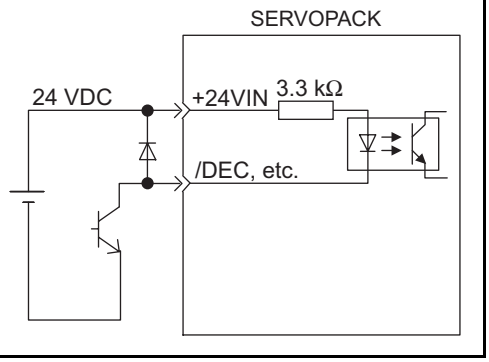
■ Interface Circuit

This section shows examples of SERVOPACK I/O signal connection to the host controller.

(1) Sequence Input Circuit Interface

CN1 connector terminals 6 to 13 is explained below.

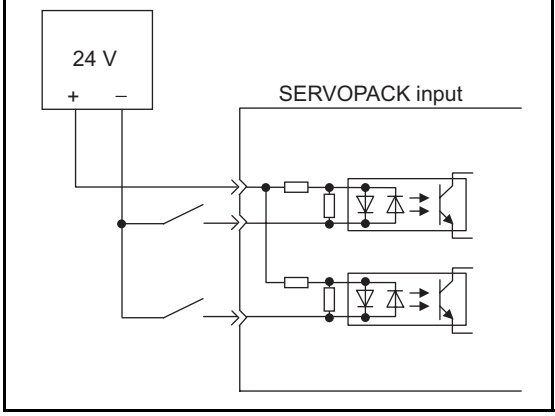
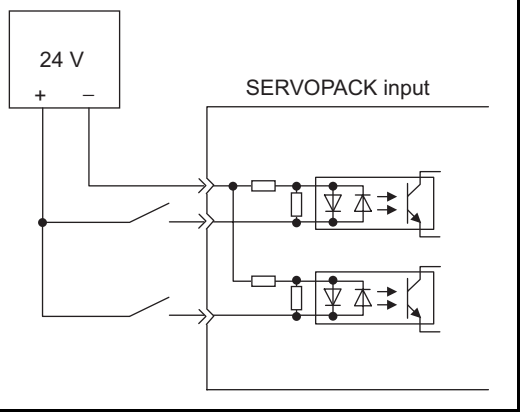
The sequence input circuit interface connects through a relay or open-collector transistor circuit. Select a low-current relay otherwise a faulty contact will result.

Relay Circuit Example	Open-collector Circuit Example
	

Note: The external power supply (24 VDC) needs the capacity of 50 mA and more.

(2) Sink Circuit and Source Circuit

The SERVOPACK's I/O circuit uses a bidirectional photocoupler. Select either the sink circuit or the source circuit according to the specifications required for each machine.

Sink Circuit	Source Circuit
	

■ Output Circuit Interface

There are two types of SERVOPACK output circuits:

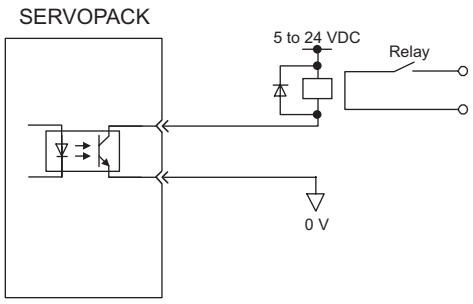
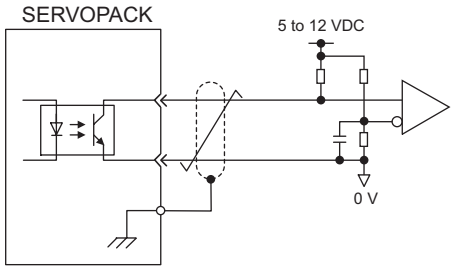
(1) Line Driver Output Circuit

CN1 connector terminals, 17-18 (phase-A signal), 19-20 (phase-B signal), 21-22 (phase-C signal) are explained below.

Encoder serial data converted to two-phase (phases A and B) pulse output signals (PAO, /PAO, PBO, /PBO) and origin pulse signals (PCO, /PCO) are output via line-driver output circuits. Connect the line-driver output circuit through a line receiver circuit at the host controller.

(2) Photocoupler Output Circuit

Photocoupler output circuits are used for servo alarm (ALM), break interlock (/BK), and other sequence output signal circuits. Connect a photocoupler output circuit through a relay or line receiver circuit.

Relay Circuit Example	Line Receiver Circuit Example
	

Note: The maximum allowable voltage and current capacities for photocoupler output circuits are as follows.

- Voltage: 30 VDC
- Current: 50 mA DC

■ Setting the Electronic Gear

(1) Scale Feedback Resolution

• Incremental Encoder

The scale feedback resolution from the SERVOPACK is 1/256 of the scale pitch (Pn282).

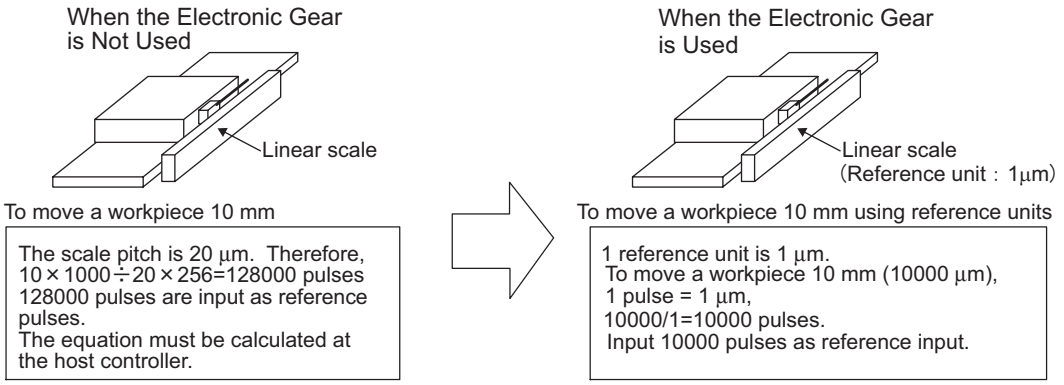
Scale Pitch	Pulse Resolution
40 μm	0.156 μm
20 μm	0.078 μm
4 μm	0.016 μm

• Absolute Encoder

Model	Resolution
ST781A	0.5 μm
ST782A	
ST783A	0.1 μm
ST784A	

(2) Electronic Gear

The electronic gear enables the workpiece travel distance per input reference pulse from the host controller to be set to any value. One reference pulse from the host controller, i.e., the minimum position data unit, is called a reference unit.



(3) Related Parameters

Pn20E	Electronic Gear Ratio (Numerator)			Position
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 1073741824 (2^{30})	–	4	After restart
Pn210	Electronic Gear Ratio (Denominator)			Position
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 1073741824 (2^{30})	–	1	After restart

The electronic gear ratio to be set can be calculated by the following equation:

$$\text{Electronic gear ratio: } \frac{B}{A} = \frac{Pn20E}{Pn210} = \frac{\text{Workpiece travel distance per reference unit}}{\text{Scale pitch}} \times 256$$

* If the ratio is outside the setting range, reduce the fraction (both numerator and denominator) until you obtain integers within the range. Be careful not to change the electronic gear ratio (B/A).

■ IMPORTANT

Electronic gear ratio setting range: $0.001 \leq$ Electronic gear ratio (B/A) ≤ 1000

If the electronic gear ratio is outside this range, A.040 (Parameter setting error) is output and the SERVOPACK will not operate properly. In this case, modify the load configuration or reference unit.

(4) Procedure for Setting the Electronic Gear Ratio

Use the following procedure to set the electronic gear ratio.

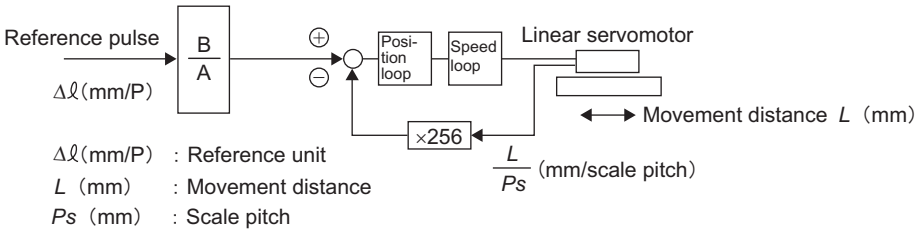
Step	Operation	Description
1	Check the scale pitch.	Check the scale pitch of linear scale used.
2	Determine the reference unit used.	Determine the reference unit from the host controller, considering the machine specifications and positioning accuracy.
3	Calculate the electronic gear ratio.	Use the electronic gear ratio equation to calculate the ratio (B/A).
4	Set parameters.	Set parameters using the calculated values.

(5) Electronic Gear Ratio Setting Example

An example of electronic gear ratio setting is given below.

Step	Operation	Load Configuration	
1	Check the scale pitch.	0.02 mm (20 μm)	
2	Determine the reference unit.	1 reference unit: 0.001 mm (1 μm)	
3	Calculate the electronic gear ratio.	$\frac{B}{A} = \frac{1(\mu m)}{20(\mu m)} \times 256$	
4	Set parameters.	Pn20E	256
		Pn210	20

(6) Electronic Gear Ratio Equation



Δℓ(mm/P) : Reference unit
L (mm) : Movement distance
Ps (mm) : Scale pitch

$$\frac{L}{\Delta \ell} \times \left(\frac{B}{A}\right) = 256 \times \frac{L}{Ps}$$

$$\left(\frac{B}{A}\right) = \frac{256 \times L \times \Delta \ell}{Ps \times L} = \frac{256 \times \Delta \ell}{Ps}$$

Set A and B with the following parameters.

A : Pn210 B : Pn20E

• Pulse Dividing Ratio Setting

Pn281	Encoder Output Resolution		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 4096	1P/{(Pn282)×4}	20	After restart

Set the output pulse resolution for PG output signals (PAO, /PAO, PBO, /PBO) externally from the SERVOPACK.
Feedback pulses per linear scale pitch (Pn282) are divided inside the SERVOPACK by the value set in Pn281 before being output. (Set according to the system specifications of the machine or host controller.)
The setting range varies with the linear servomotor maximum speed (Pn385) and linear scale pitch (Pn282).
The upper limit value for Pn281 can be obtained by the following equation.

$$\text{Upper limit value for Pn281} = \frac{\text{Pn282}}{\text{Pn385}} \times 72$$

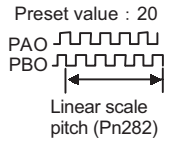
Note: 1. When the scale pitch is 4 µm, the motor maximum speed is limited to 1 ms/s because of the maximum response frequency of serial converter unit.
2. If the set value is out of the setting range or does not satisfy the setting conditions, the alarm "Dividing pulse output setting error" (A.041) is output.
If the motor speed exceeds the upper limit value according to the set encoder output resolution, the alarm "Diving pulse output over speed" (A.511) is output.
3. The upper limit of encoder output resolution is limited by the frequency dividing specification of serial converter unit.
4. When an absolute linear scale is used, the linear scale pitch becomes the value which is obtained by "resolution (µm/pulse)×2^9". (The set value in Pn282 becomes invalid.)

■ Setting Example

When the linear scale pitch = 20 µm (Pn282 = 20.00) and the motor maximum speed = 5 m/s (Pn385 = 50), Pn281 = 28 is accepted, but Pn281 = 29 is not accepted and A.041 is output.

■ Output Example

When Pn281 = 20 (20-edge output (5-pulse output) per linear scale pitch),



■ Related Parameters

The following parameters are used for the test without motor.

(1) Application Function Select Switch C

Parameter		Meaning	When Enabled	Classification
Pn00C	n.□□□0	Disables the test without motor. (factory setting)	After restart	Setup
	n.□□□1	Enables the test without motor.		
	n.□0□□	Sets incremental encoder as encoder type for the test without motor. (factory setting)		
	n.□1□□	Sets absolute encoder as encoder type for the test without motor.		

Note: When the linear Servomotor is used, the encoder resolution is set by the 8-bit serial converter and Pn282 (Linear Scale Pitch).

(2) Mass Ratio

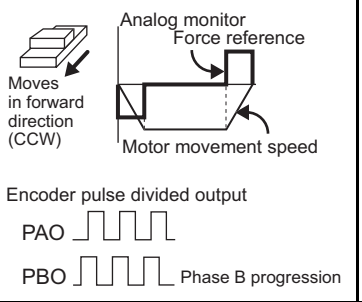
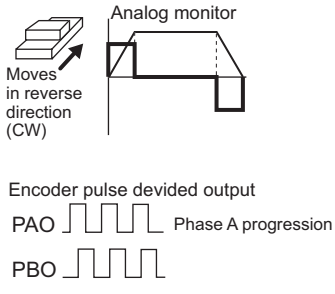
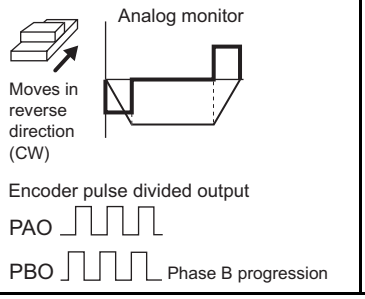
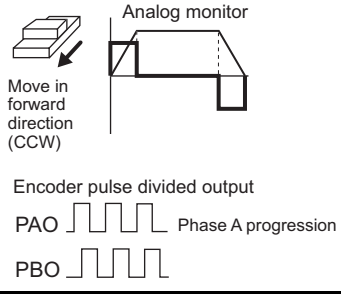
Pn103	Mass Ratio		Speed Position Force		
	Setting Range	Setting Unit	Factory Setting	When Enabled	Classification
	0 to 20000	%	0	Immediately	Tuning

■ Switching the Linear Servomotor Movement Direction

The movement direction of the linear servomotor can be switched without changing the reference pulse to the SERVOPACK or the reference voltage polarity.

This causes the travel direction (+, -) of the shaft reverse. The output signal polarity such as encoder pulse output and analog monitor signal from the SERVOPACK does not change.

The standard setting for “forward movement” is the linear scale counting up direction.

Parameter		Name	Reference	
			Forward Reference	Reverse Reference
Pn000	n.□□□0	Standard setting (CCW = Forward) (Factory setting)		
	n.□□□1	Reverse Direction Mode (CW = Forward)		

The direction of P-OT and N-OT change. For Pn000 = n.□□□0 (standard setting), counterclockwise is P-OT. For Pn000 = n.□□□1 (Reverse Direction Mode), clockwise is P-OT.

■ Setting the Overtravel Limit Function

The overtravel limit function forces movable machine parts to stop if they exceed the allowable range of motion and turn ON a limit switch.

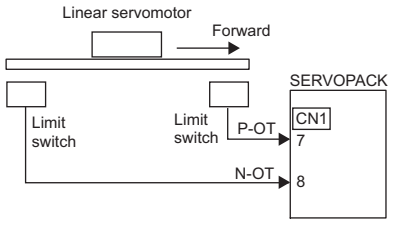
(1) Connecting the Overtravel Signal

To use the overtravel function, connect the following overtravel limit switch input signal terminals.

Type	Name	Connector Pin Number	Setting	Meaning
Input	P-OT	CN1-7	ON (low level)	Forward run allowed. Normal operation status.
			OFF (high level)	Forward run prohibited. Forward overtravel.
Input	N-OT	CN1-8	ON (low level)	Reverse run allowed. Normal operation status.
			OFF (high level)	Reverse run prohibited. Reverse overtravel.

Connect limit switches as shown below to prevent damage to the devices during linear motion.

Movement in the opposite direction is possible during overtravel. For example, reverse run is possible during forward overtravel.



■ IMPORTANT

When the linear servomotor stops due to overtravel during position control, the position error pulses are held. A clear signal (/CLR) input is required to clear the error pulses.

(2) Enabling/Disabling the Overtravel Signal

A parameter can be set to disable the overtravel signal. If the parameter is set, there is no need to wire the overtravel input signal.

Parameter		Meaning
Pn50A	n.1□□□	Inputs the Forward Run Prohibited (P-OT) signal from CN1-7. (Factory setting)
	n.8□□□	Disables the Forward Run Prohibited (P-OT) signal. (Allows constant forward run.)
Pn50B	n.□□□2	Inputs the Reverse Run Prohibited (N-OT) signal from CN1-8. (Factory setting)
	n.□□□8	Disables the Reverse Run Prohibited (N-OT) signal. (Allows constant reverse run.)

- Applicable control methods: Speed control, position control, and force control
- After changing these parameters, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.

* A parameter can be used to re-allocate input connector number for the P-OT and N-OT signals. Refer to *3.3.1 Input Circuit Signal Allocation* (Analog Rotary manual).

■ Operation Sequence When Being Servo ON

Motor control using a host controller is performed using motion commands only while the SERVOPACK is Servo ON (while current flows to the motor). While the SERVOPACK is Servo OFF (while current to the motor is interrupted), management of a position data is performed by the SERVOPACK so that the reference coordinate system (POS, MPOS) and FB coordinate system (APOS) are equal. In order to send appropriate motion commands, it is necessary to use the SMON command after the SERVOPACK changes to Servo ON to read the Servo reference coordinate (POS) and send an appropriate reference position.

■ Operation Sequence When OT (Overtravel Limit Switch) Signal Is Input

When the OT signal is input, the SERVOPACK prohibits movement in the OT signal direction. This is performed as specified in parameter Pn001, and the SERVOPACK continues to control the motor while this movement is prohibited. Use the following sequence for processing or canceling when the OT signal is input.

(1) Processing When the OT Signal Is Input

1. Monitor the OT signal or send a stop command if the OT signal will be input. Use either of the following stop commands.
   - Interpolation command (INTERPOLATE, LATCH):
     The interpolation command keeps the interpolation position, then stops. As an alternative, send the HOLD command or SMON command.
   - Movement reference (POSING etc.) command other than the interpolation command:
     Send the HOLD command.
2. Use the output complete flag (DEN = 1) to confirm the completion of SERVOPACK OT processing. By also confirming that PSET = 1, it is possible to detect motor stopping with absolute certainty. The command used in number 1 above is held until these flags are complete.

(2) OT Cancellation (Retraction)

OT cancellation (retraction) is performed with a movement command. Read out the current reference position POS and reset the reference coordinate system of the correct controller. Then execute a retraction command.

(3) Selecting the Motor Stop Method When Overtravel is Used

This is used to set the stop method when an overtravel (P-OT, N-OT) signal is input while the motor is operating.

Parameter		Stop Mode	Mode After Stopping	Meaning
Pn001	n.☐☐00	Stop by dynamic brake	Dynamic Brake	Stops the linear servomotor by applying dynamic brake (DB), then holds it in Dynamic Brake Mode. (Factory setting)
	n.☐☐01		Coast	Stops the linear servomotor by applying dynamic brake (DB), then places it into Coast (power OFF) Mode.
	n.☐☐02	Coast to a stop		Stops the linear servomotor in the same way as when the servo is OFF (coasts to a stop), then places it into Coast (power OFF) Mode.
	n.☐☐1☐	Decelerate to stop	Zero Clamp	Decelerates the linear servomotor with emergency stop force (Pn406), then places it into Zero Clamp (Servolock) Mode.
	n.☐☐2☐		Coast	Decelerates the linear servomotor with emergency stop force (Pn406), then places it into Coast (power OFF) Mode.

- During force control, the linear servomotor enters DB Stop Mode or Coast Mode regardless of the setting of Pn001.1.
- After changing these parameters, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.
- During n.☐☐02 Coast Mode, SERVOPACK can be resumed using the servo ON signal.

■ TERMS

- Stop by dynamic brake: Stops by using the dynamic brake (with short-circuiting by a circuit of SERVOPACK).
- Coast to a stop: Stops naturally, with no brake, by using the friction resistance of the motor in operation.
- Decelerate to stop: Stops by using deceleration (braking) force.
- Zero Clamp Mode: A mode forms a position loop by using the position reference zero.

* For details on stopping methods when the servo turns OFF or when an alarm occurs, refer to *5.2.5 Stopping Method for Servomotor after Servo OFF or Alarm Occurrence* (Analog Rotary manual).

(4) Setting the Stop Force for Overtravel

Pn406	Emergency Stop Force		Speed	Position	Force
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 800	%	800	Immediately	

- This sets the stop force for when the overtravel signal (P-OT, N-OT) is input.
- The setting unit is a percentage of the rated force (i.e., the rated force is 100%).
- The value large enough to be the motor maximum force, 800% is set as the factory setting for emergency stop force. However, the actual output emergency stop force is determined by motor ratings.

■ Motor Maximum Speed

Sets the linear servomotor maximum speed.

Setting a lower speed realizes more delicate speed control and more strict protection by generating the overspeed alarm (A.510). Also, setting a lower speed allows the upper limit of Encoder output resolution (Pn281) to be set higher.

Pn385	Motor Maximum Speed		Speed Position Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	1 to 100 (100 to 10000 mm/s)	100 mm/s	50 (5000 mm/s)	After Restart

- If a value lower than the rated speed is set for Pn385, the rated speed becomes the same value as the setting of Pn385.
- The detection level for the overspeed alarm A.510 is "the set value of Pn385 × 1.1."

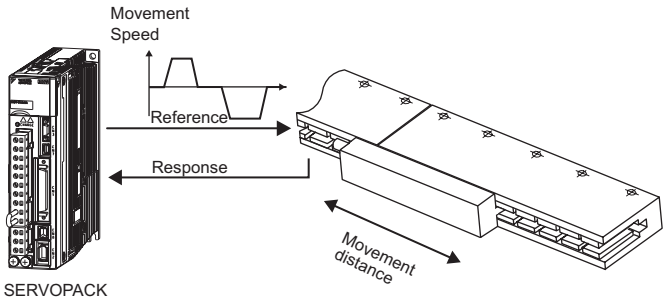
■ Advanced Autotuning

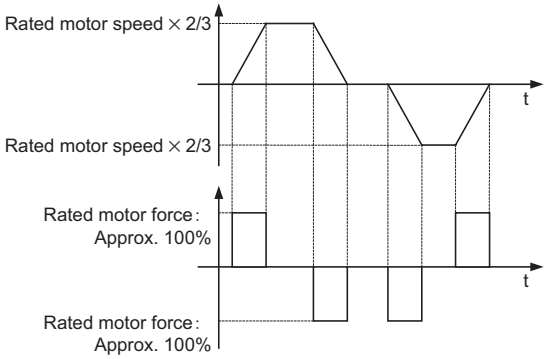
Advanced autotuning automatically operates the SERVOPACK (in reciprocating movement in the forward and reverse directions) within set limits and makes adjustment automatically according to the mechanical characteristics while the SERVOPACK is operating.

Advanced autotuning can be performed without connecting the host.
The following automatic operation specifications apply.

- •Motor speed: Rated motor speed × 2/3
- •Acceleration force*: Approximately 100% of rated motor force
- •Movement distance: Set in unit of 1000 reference unit.

*The acceleration force varies with the influence of the mass ratio (Pn103), machine friction, and external disturbance.





■ Advanced Autotuning Procedure

The following procedure is used for advanced autotuning.

Advanced autotuning is performed from the Digital Operator (option) or SigmaWin+.

Here, the operating procedure from the Digital Operator is described.

Refer to the *Σ-V series SGM□V/SGDV User's Manual, Operation of Digital Operator* (SIEPS80000055) for basic key operations of the Digital Operator.

Note:The function cannot be performed from the Panel Operator.

(1) Operating Procedure

Step	Display after Operation	Keys	Operation
1	BB —FUNCTION— Fn200:TuneLvl Set Fn201:AAT Fn202:Ref-AAT Fn203:OnePrmTun	MODE/SET ∧ ∨	Display the main menu of the utility function mode, and select Fn201.
2	BB Advanced AT Jcalc=ON Mode=2 Type=2 Stroke=+00288000 (0090.0)mm	DATA	Press the DATA Key to display the initial setting screen for advanced autotuning. Note: If the display does not switch and NO-OP is displayed, refer to *(1) Check Points for Settings.*
3	BB Advanced AT Jcalc=ON Mode=2 Type=2 Stroke=+00288000 (0090.0)mm	∧ ∨ SCROLL	Press the ∧, ∨ or SCROLL Key and set the items in steps 3-1 to 3-4.
3-1	■Calculating Mass Select the mode to be used. Normally, set Jcalc to ON. Jcalc = ON: Mass calculated Jcalc = OFF: Mass not calculated <Supplementary Information> If the mass is already known from the machine specifications, set the value in Pn103 and set Jcalc to OFF.		
3-2	■Tuning Level Select the tuning level. Mode = 1: Makes adjustments considering responsiveness and stability.(Standard level) Mode = 2: Makes adjustments for positioning. Mode = 3: Makes adjustments for positioning, giving priority to overshooting suppression. Set this level if position error overshoots at mode 2. Note: Set the mode to 1 if Fn202 (Advanced Autotuning by Reference) is performed after executing this function.		
3-3	■Filter Type Setting Select the filter type to set a filter according to the machine element to be driven. Set the filter referring to the following functional elements. <Supplementary Information> If there is noise or the gain does not increase, good results may be obtained by changing the filter type. Type = 1: Selects a filter suitable for belt drive mechanisms. Type = 2: Selects a filter suitable for ball screw drive mechanisms or linear motor [Factory setting]. Type = 3: Selects a filter suitable for rigid systems, such as a gear.		

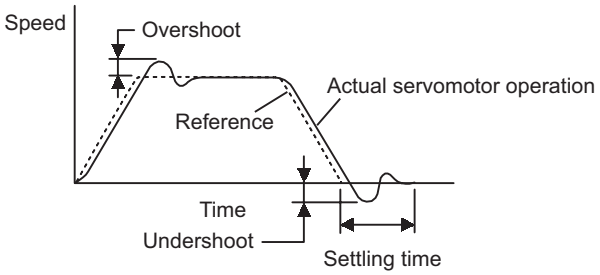
Step	Display after Operation	Keys	Operation
3-4	■STROKE (Travel Distance) Setting Specify a travel distance in increments of 1000 references. Travel distance setting range: The travel distance setting range is from -99990000 to +99990000. The negative (-) direction is for reverse rotation, and the positive (+) direction is for forward rotation. Initial value: 90 mm Note: • Move the position using JOG operation to where a suitable movable range is ensured. • Set the travel distance to at least 5 mm; otherwise, "Error" will be displayed and the travel distance cannot be set. • To calculate the mass ratio and ensure precise tuning, it is recommended to set the travel distance to 90 mm.		
4	BB ADVANCED AT Pn103=00000 Pn100=0040.0 Pn101=0020.00 Pn102=0040.0	DATA	Press the DATA Key. The advanced autotuning execution screen will be displayed.
5	RUN ADVANCED AT Pn103=00000 Pn100=0040.0 Pn101=0020.00 Pn141=0050.0	JOG SVON	Press the JOG SVON Key. The servo will be ON and the display will change from "BB" to "RUN." ∗If the level is set to 3, the "Pn102" display will change to the "Pn141."

■ Using the Mode Switch (P/PI Switching)

Use the mode switch (P/PI switching) function in the following cases:

P Control: Proportional control
PI Control: Proportional/integral control

- To suppress overshooting during acceleration or deceleration (for speed control)
- To suppress undershooting during positioning and reduce the settling time (for position control)



The mode switch function automatically switches the speed control mode between PI control mode and P control mode based on a comparison between the servo's internal value and a user-set detection level shown in *(1) Related Parameters*.

<Supplementary Information>

- Monitoring the speed response waveform and position error waveform is required for adjustment.
- If I-P control is selected for speed loop control, the mode switching function will be disabled.

(1) Related Parameters

Select the conditions to switch modes (P or PI control switching) by using the following parameters.

Parameter		Mode Switch Selection	Parameter Containing Detection Point Setting	When Enabled	Classification
Pn10B	n.□□□0	Uses a force reference level for detection point. [Factory setting]	Pn10C	Immediately	Setup
	n.□□□1	Uses a speed reference level for detection point.	Pn181		
	n.□□□2	Uses an acceleration level for detection point.	Pn182		
	n.□□□3	Uses a position error pulse level for detection point.	Pn10F		
	n.□□□4	Does not use mode switch function.	–		

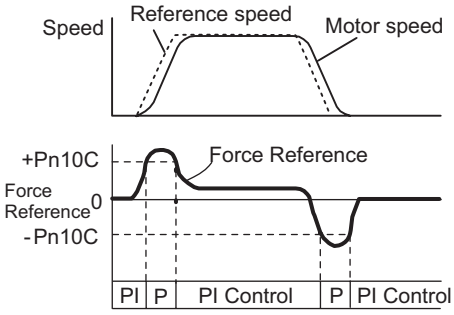
■ Parameters to set the detection point

Pn10C	Mode Switch (Force Reference)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 800	1%	200	Immediately	Tuning
Pn181	Mode Switch (Speed Reference)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	0	Immediately	Tuning
Pn182	Mode Switch (Acceleration)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 30000	1 mm/s^2	0	Immediately	Tuning
Pn10F	Mode Switch (Position Error)			Speed Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 reference unit	0	Immediately	Tuning

Mode switch functions according to the detection point are as follows.

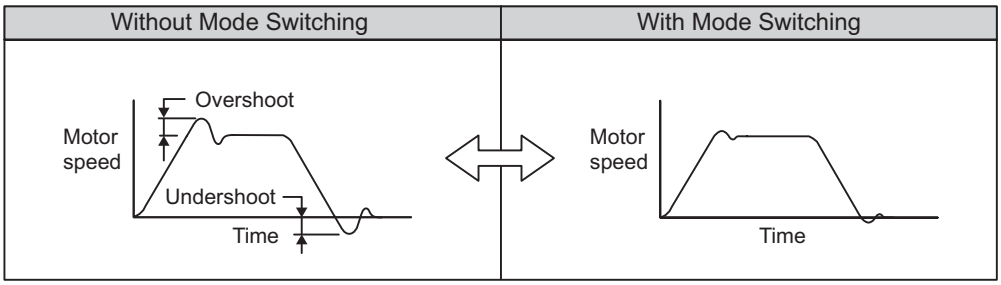
■ Using the Force Reference Level to Switch Modes (Factory Setting)

With this setting, the speed loop is switched to P control when the value of force reference input exceeds the force set in Pn10C. The factory setting for the force reference detection point is 200% of the rated force.



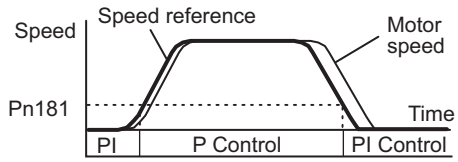
<Example>

If the mode switch function is not being used and the SERVOPACK is always operated with PI control, the speed of the motor may overshoot or undershoot due to force saturation during acceleration or deceleration. The mode switch function suppresses force saturation and eliminates the overshooting or undershooting of the motor speed.



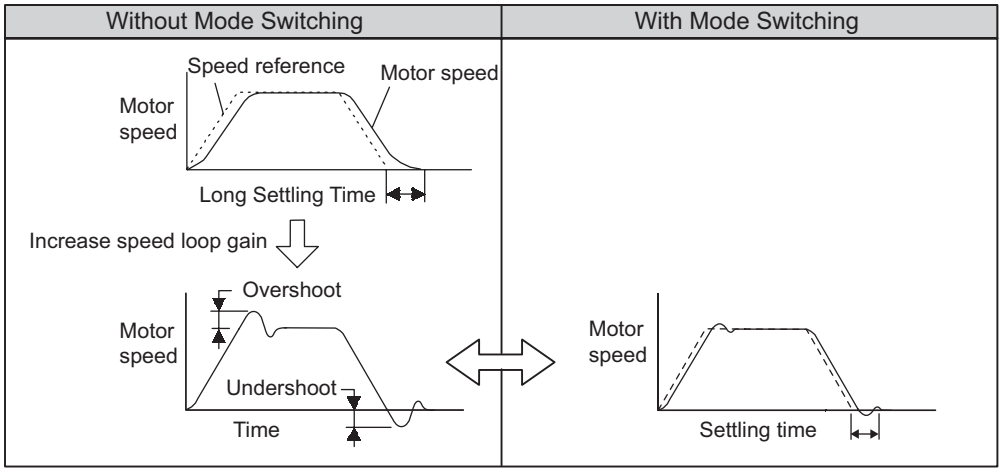
■ Using the Speed Reference Level to Switch Modes

With this setting, the speed loop is switched to P control when the value of speed reference input exceeds the speed set in Pn181.



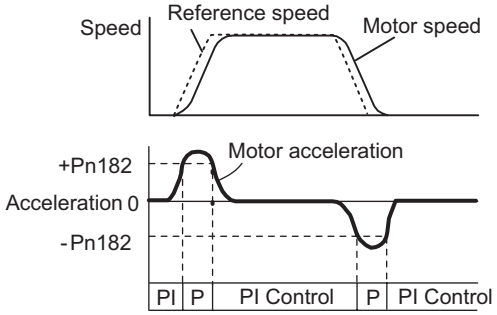
<Example>

In this example, the mode switch is used to reduce the settling time. It is necessary to increase the speed loop gain to reduce the settling time. Using the mode switch suppresses overshooting and undershooting when speed loop gain is increased.



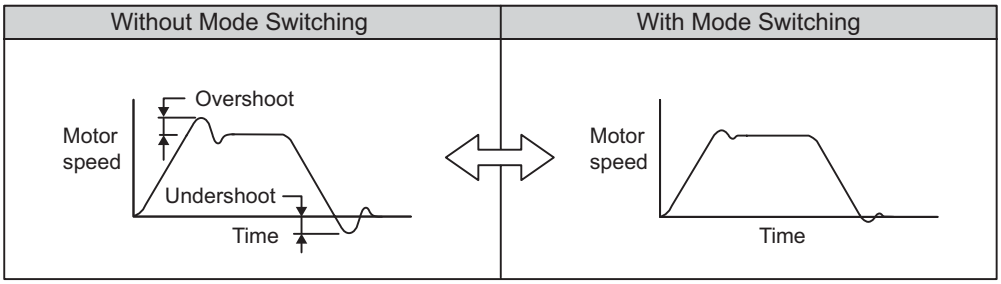
■ Using the Acceleration Level to Switch Modes

With this setting, the speed loop is switched to P control when the speed reference exceeds the acceleration rate set in Pn182.



<Example>

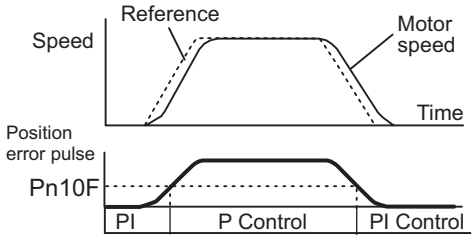
If the mode switch function is not being used and the SERVOPACK is always operated with PI control, the speed of the motor may overshoot or undershoot due to force saturation during acceleration or deceleration. The mode switch function suppresses force saturation and eliminates the overshooting or undershooting of the motor speed.



■ Using the Position Error Pulse Level to Switch Modes

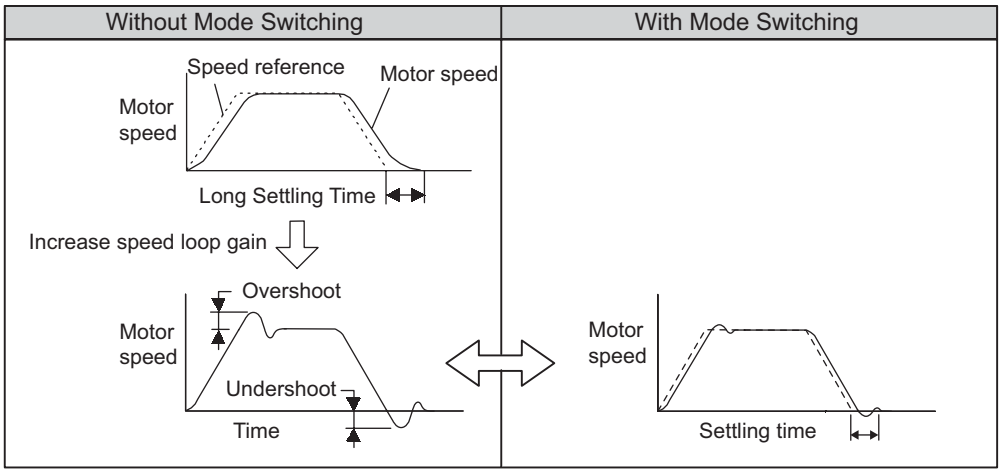
This setting is effective with position control only.

With this setting, the speed loop is switched to P control when the position error pulse exceeds the value set in Pn10F.



<Example>

In this example, the mode switch is used to reduce the settling time. It is necessary to increase the speed loop gain to reduce the settling time. Using the mode switch suppresses overshooting and undershooting when speed loop gain is increased.



■ JOG Operation (Fn002)

JOG operation is used to check the operation of the servomotor under speed control without connecting the SERVOPACK to the host.

⚠ CAUTION

While the SERVOPACK is in JOG operation, the overtravel function will be disabled. Consider the operating range of the machine when performing JOG operation for the SERVOPACK.

(1) Settings before Operation

The following settings are required before performing JOG operation.

- If the S-ON input signal is ON, turn OFF the signal.
- If Pn50A.1 is set to 7 (i.e., the servo is always ON), change the value.
- Considering the operating range of the machine, set the JOG operation speed in Pn383.

Pn383	JOG Speed		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	50	Immediately	Setup

■ Origin Search (Fn003)

The origin search is designed to position the origin pulse position of the incremental encoder (phase-C) and to clamp at the position. This mode is used when the motor shaft needs to be aligned to the machine.

⚠ CAUTION

- Perform origin searches without connecting the coupling.
  The forward run prohibited (P-OT) and reverse run prohibited (N-OT) signals are not effective in origin search mode.

Execute the origin search without connecting the couplings.
Motor speed at the time of execution: 15 mm/s.

■ Program JOG Operation (Fn004)

The Program JOG Operation is a utility function, that allows continuous automatic operation determined by the preset operation pattern, movement distance, movement speed, acceleration/deceleration time, number of time of repetitive operations.
This function can be used to move the servomotor without it having to be connected to a host controller for the machine as a trial operation in JOG operation mode. Program JOG Operation can be used to confirm the operation and for simple positioning operations.

(1) Settings before Operation

The following settings are required before performing program JOG operation.

- Set correctly the machine operation range and safe operation speed in the parameters such as "program JOG operation movement distance" and "program JOG movement speed."
- The SERVOPACK must be in Servo Ready status to execute this function.
- Release the Servo-ON signal mask if the parameter Pn 50A.1 is set to 7, and the Servo has been set to always be ON.

(2) Precautions

- Control is position control during program JOG operation. However, the pulse reference input to the SERVOPACK is inhibited (in /INHIBIT status) and no pulse reference input is accepted.

<Supplementary Information>

- The overtravel function is enabled in this function.
- When an absolute encoder is used, input is not necessary since SEN signal is always enabled.
- Other functions that are applicable for position control, such as position reference filter, can be used.

(3) Related Parameters

Pn530	Program JOG Operation Related Switch		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	–	–	0000	Immediately	Setup
Pn531	Program JOG Movement Distance		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1073741824(2^{30})	1 Reference unit	32768	Immediately	Setup
Pn585	Program JOG Movement Speed		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 10000	1 mm/s	50	Immediately	Setup
Pn534	Program JOG Acceleration/Deceleration Time		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	2 to 10000	1 ms	100	Immediately	Setup
Pn535	Program JOG Waiting Time		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 10000	1 ms	100	Immediately	Setup
Pn536	Number of Times of Program JOG Movement		Speed Position Force		Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1000	1 time	1	Immediately	Setup

■ List of Monitor Modes

Parameter No.	Content of Display	Unit
Un000	Actual motor speed	mm/s
Un001	Input speed reference	mm/s
Un002	Internal force reference (in percentage to the rated force)	%
Un003	Electrical angle 1 (32-bit decimal code)	Number of pulses from the phase-U
Un004	Electrical angle 2 (Angle from 0 (zero) degree of phase-U))	deg
Un005	Input signal monitor	–
Un006	Output signal monitor	–
Un007	Input reference pulse speed (valid only in position control)	mm/s
Un008	Error counter value (amount of position error) (valid only in position control)	reference unit
Un009	Accumulated load rate (value for the rated force as 100 %. Displays effective force in 10-s cycle.)	%
Un00A	Regenerative load rate (value for the processable regenerative power as 100 %. Displays regenerative power consumption in 10-s cycle.)	%
Un00B	Power consumed by DB resistance (Value for the processable power when dynamic brake is applied as 100 %. Displays power consumed by DB resistance in 10-s cycle.)	%
Un00C	Input reference pulse counter (32-bit decimal code) (valid only in position control)	Pulse
Un00D	Feedback pulse counter (1/256 of linear scale pitch, 32-bit decimal code)	Pulse
Un010	Allowable maximum motor speed and dividing ratio monitor	–
Un011	Hall sensor signal monitor	–
Un084	Linear scale pitch (Scale pitch = Un084 × 10^{Un085} [pm])	–
Un085	Linear scale pitch index (Scale pitch = Un084 × 10^{Un085} [pm])	–

■ Parameter List <M- ⅡLinear>

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn000		Basic Function Select Switch 0		–	0000h to 00B3h	0000h	After restart*1	Setup
	0	Direction Selection		–	0 to 3	0		
		0	Sets the linear counting up (phase-A advance) direction as forward direction.					
		1	Sets the linear counting down (phase-B advance) direction as forward direction (Movement direction reversal mode)					
Pn001		Application Function Select Switch 1		–	0000h to 1122h	0000h	After restart*1	Setup
	0	Servo OFF or Alarm G1 Stop Mode		–	0 to 2	0		
		0	Stops the linear servomotor by applying DB (dynamic brake).					
		1	Stops the linear servomotor by applying dynamic brake (DB) and then releases DB.					
		2	Makes the linear servomotor coast to a stop state without using the dynamic brake (DB).					
	1	Overtravel (OT) Stop Mode		–	0 to 2	0		
		0	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).					
		1	Sets the emergency stop force of Pn406 to the maximum value, decelerate the motor to a stop, and then sets it to servolock state.					
		2	Sets the emergency stop force of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to coasting state.					
	2	AC/DC Power Input Selection		–	0, 1	0		
		0	Not applicable to DC power input: Input AC power supply through L1, L2 (,and L3) terminals.					
		1	Applicable to DC power input: Input DC power supply between B1/+ and -, or input DC power supply between B1/+ and - or between P/+ and -2.					
Pn002		Application Function Select Switch 2		–	0000h to 4113h	0000h	After restart*1	Setup
	0	MECHATROLINK Command Position/Velocity Control Option		–	0 to 3	0		
		0	Does not use P_TLIM, NTLIM, TFF.					
		1	Uses P_TLIM and NTLIM as force limit inputs.					
		2	Uses TFF as a force feedforward.					
		3	When P-CL, N-CL are "available", uses P_TLIM and NTLIM as force limit inputs.					
	1	Force Control Option		–	0, 1	0		
		0	Does not use V_LIM.					
		1	Uses V_LIM as a speed limit input.					
	2	Absolute Encoder Usage		–	0, 1	0		
		0	Uses absolute encoder as an absolute encoder.					
		1	Uses absolute encoder as an incremental encoder.					
	3	Reserved (Do not set.)		–	0 to 4	0		

Parameter No.	Digit	Name		Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn006		Application Function Select Switch 6		–	0000h to 005Fh	0002h	Immediately	Setup
	0 1	Analog Monitor 1 Signal Selection		–	00 to 5F	2		
		00	Motor speed (1V/1000mm/s)					
		01	Speed reference (1V/1000mm/s)					
		02	Force reference (1V/100%)					
		03	Position error (0.05V/1 reference unit)					
		04	Position amplifier error (after electronic gears) (0.05V/1 encoder pulse unit)					
		05	Position reference speed (1V/1000mm/s)					
		06	Reserved (Do not set.)					
		07	Motor load position error (0.01V/1 reference unit)					
		08	Positioning completion signal (positioning completed: 5V, positioning not completed: 0V)					
		09	Speed feedforward (1V/1000mm/s)					
		0A	Force feedforward (1V/100%)					
		0B	Active gain (1st gain: 1V, 2nd gain: 2V, 3rd gain: 3V, 4th gain: 4V)					
		0C	Completion of position reference (Completed: 5V, Not completed: 0V)					
		0D	Reserved (Do not set.)					
Pn007		Application Function Select Switch 7		–	0000h to 005Fh	0000h	Immediately	Setup
	0 1	Analog Monitor 2 Signal Selection		–	00 to 5F	2		
		0	Motor speed (1V/1000mm/s)					
		1	Speed reference (1V/1000mm/s)					
		2	Force reference (1V/100%)					
		3	Position error (0.05V/1 reference unit)					
		4	Position amplifier error (after electronic gears) (0.05V/1 encoder pulse unit)					
		5	Position reference speed (1V/1000mm/s)					
		6	Reserved (Do not set.)					
		7	Motor load position error (0.01V/1 reference unit)					
		8	Positioning completion signal (positioning completed: 5V, positioning not completed: 0V)					
		9	Speed feedforward (1V/1000mm/s)					
		0A	Force feedforward (1V/100%)					
		0B	Active gain (1st gain: 1V, 2nd gain: 2V, 3rd gain: 3V, 4th gain: 4V)					
		0C	Completion of position reference (Completed: 5V, Not completed: 0V)					
		0D	Reserved (Do not set.)					
Pn008		Application Function Select Switch 8		–	0000h to 7121h	4000h	After restart*1	Setup
	0	Lowered Battery Voltage Alarm/Warning Selection		–	0, 1	0		
		0	Outputs alarm (A.830) for lowered battery voltage.					
		1	Outputs warning (A.930) for lowered battery voltage.					
	1	Function Selection at Main Circuit Voltage Drop		–	0 to 2	0		
		0	Disables detection of the main circuit voltage drop.					
		1	Enables detection of the main circuit voltage drop.					
		2	Detects warning and limits force by Pn424 and Pn425.					
	2	Warning Detection Selection		–	0, 1	0		
		0	Detects warning.					
		1	Does not detect warning.					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn009		Application Function Select Switch 9	–	0000h to 0111h	0010h	After restart*1	Tuning
	1	Current Control Method Selection	–	0, 1	1		
		0 Current control method 1					
		1 Current control method 2					
	2	Speed Detection Method Selection	–	0, 1	0		
		0 Speed detection 1					
		1 Speed detection 2					
Pn00B		Application Function Select Switch B	–	0000h to 1111h	0000h	After restart*1	Setup
	0	Parameter Display Selection	–	0, 1	0		
		0 Setup parameters					
		1 All parameters					
	1	Alarm G2 Stop Method Selection	–	0, 1	0		
		0 Stops the motor by setting the speed reference to "0".					
		1 Same setting as Pn001.0 (Stops the motor by applying DB or by coasting.)					
	2	Power Supply Method for Three-phase SERVOPACK	–	0, 1	0		
		0 Three-phase power supply					
		1 Single-phase power supply					
	3	Reserved (Do not set.)	–	0, 1	0		
Pn00C		Application Function Select Switch C	–	0000h to 0111h	0000h	After restart*1	Setup
	0	Selection of Test without Motor	–	0, 1	0		
		0 Test without motor disabled					
		1 Test without motor enabled					
	1	Reserved (Do not set.)	–	0, 1	0		
	2	Encoder Type for Test without Motor	–	0, 1	0		
		0 Incremental encoder					
		1 Absolute encoder					
Pn00D		Reserved (Do not set.)	–	0000h to 0001h	0000h	After restart*1	Setup
Pn080		Application Function Select Switch 80	–	0000h to 1111h	0000h	After restart*1	Setup
	0	Hall Sensor Selection	–	0, 1	0		
		0 Enables selection					
		1 Disables selection					
	1	Motor Phase Selection	–	0, 1	0		
		0 Sets phase A lead as phase sequence of U, V, W					
		1 Sets phase B lead as phase sequence of U, V, W					
	3	Calculation Method for Maximum Speed or Divided Output Pulses	–	0, 1	0		
		0 Determines divided output pulses with fixed maximum speed.					
		1 Determines maximum speed with fixed divided output pulses.					
Pn100		Speed Loop Gain	0.1Hz	10 to 20000	400	Immediately	Tuning
Pn101		Speed Loop Integral Time Constant	0.01ms	15 to 51200	2000	Immediately	Tuning
Pn102		Position Loop Gain	0.1/s	10 to 20000	400	Immediately	Tuning
Pn103		Mass Ratio	%	0 to 20000	100	Immediately	Tuning
Pn104		2nd Speed Loop Gain	0.1Hz	10 to 20000	400	Immediately	Tuning
Pn105		2nd Speed Loop Integral Time Constant	0.01ms	15 to 51200	2000	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn106		2nd Position Loop Gain	0.1/s	10 to 20000	400	Immediately	Tuning
Pn109		Feed Forward Gain	%	0 to 100	0	Immediately	Tuning
Pn10A		Feed Forward Filter Time Constant	0.01ms	0 to 6400	0	Immediately	Tuning
Pn10B		Application Function for Gain Select Switch	–	0000h to 5334h	0000h		Setup
	0	Mode Switch Selection	–	0 to 4	0	Immediately	
		0 Uses internal force reference as the condition (Level setting: Pn10C)					
		1 Uses speed reference as the condition (Level setting: Pn181)					
		2 Uses acceleration as the condition (Level setting: Pn182)					
		3 Uses position error pulse as the condition (Level setting: Pn10F)					
		4 No mode switch function available					
	1	Speed Loop Control Method	–	0 to 3	0	After restart*1	
		0 PI control					
		1 I-P control					
Pn10C		Mode Switch (force reference)	%	0 to 800	200	Immediately	Tuning
Pn10F		Mode Switch (position error pulse)	reference unit	0 to 10000	0	Immediately	Tuning
Pn11F		Position Integral Time Constant	0.1ms	0 to 50000	0	Immediately	Tuning
Pn121		Friction Compensation Gain	%	10 to 1000	100	Immediately	Tuning
Pn122		2nd Gain for Friction Compensation	%	10 to 1000	100	Immediately	Tuning
Pn123		Friction Compensation Coefficient	%	0 to 100	0	Immediately	Tuning
Pn124		Friction Compensation Frequency Correction	0.1Hz	-10000 to 10000	0	Immediately	Tuning
Pn125		Friction Compensation Gain Correction	%	1 to 1000	100	Immediately	Tuning
Pn131		Gain Switching Time 1	ms	0 to 65535	0	Immediately	Tuning
Pn132		Gain Switching Time 2	ms	0 to 65535	0	Immediately	Tuning
Pn135		Gain Switching Waiting Time 1	ms	0 to 65535	0	Immediately	Tuning
Pn136		Gain Switching Waiting Time 2	ms	0 to 65535	0	Immediately	Tuning
Pn139		Automatic Gain Changeover Related Switch 1	–	0000h to 0052h	0000h	Immediately	Tuning
	0	Gain Switching Selection Switch	–	0 to 4	0		
		0 Manual gain switching Changes gain manually using external input signals (/G-SEL1, /G-SEL2)					
		2 Automatic gain switching pattern 1 Changes automatically 1st gain to 2nd gain when the switching condition A is satisfied. Changes automatically 2nd gain to 1st gain when the switching condition B is satisfied.					
	1	Gain Switching Condition A	–	0 to 5	0		
		0 Positioning completion signal (/COIN) ON					
		1 Positioning completion signal (/COIN) OFF					
		2 NEAR signal (/NEAR) ON					
		3 NEAR signal (/NEAR) OFF					
		4 Position reference filter output = 0 and reference pulse input OFF					
		5 Position reference pulse input ON					
Pn13D		Current Gain Level	%	100 to 2000	2000	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn140		Model Following Control Related Switch	–	0000h to 1121h	0100h	Immediately	Tuning
	0	Model Following Control Selection	–	0, 1	0		
		0 Does not use model following control.					
		1 Uses model following control.					
	1	Vibration Suppression Selection	–	0 to 2	0		
		0 Does not perform vibration suppression.					
		1 Performs vibration suppression over the specified frequency.					
		2 Performs vibration suppression over two different kinds of frequencies.					
	2	Vibration Suppression Adjustment Selection	–	0, 1	1		
		0 Does not adjust vibration suppression automatically using utility function.					
		1 Adjusts vibration suppression automatically using utility function.					
	3	Selection of Speed Feedforward (VFF) or Force Feedforward (TFF)	–	0, 1	0		
		0 Does not use model following control and external speed/force feedforward at the same time.					
		1 Uses model following control and external speed/force feedforward at the same time.					
Pn141		Model Following Control Gain	0.1/s	10 to 20000	500	Immediately	Tuning
Pn142		Model Following Control Gain Compensation	0.1%	500 to 2000	1000	Immediately	Tuning
Pn143		Model Following Control Bias (Forward Direction)	0.1%	0 to 10000	1000	Immediately	Tuning
Pn144		Model Following Control Bias (Reverse Direction)	0.1%	0 to 10000	1000	Immediately	Tuning
Pn145		Vibration Suppression 1 Frequency A	0.1Hz	10 to 2500	500	Immediately	Tuning
Pn146		Vibration Suppression 1 Frequency B	0.1Hz	10 to 2500	700	Immediately	Tuning
Pn147		Model Following Control Speed Feedforward Compensation	0.1%	0 to 10000	1000	Immediately	Tuning
Pn148		2nd Model Following Control Gain	0.1/s	10 to 20000	500	Immediately	Tuning
Pn149		2nd Model Following Control Gain Compensation	0.1%	500 to 2000	1000	Immediately	Tuning
Pn14A		Vibration Suppression 2 Frequency	0.1Hz	10 to 2000	800	Immediately	Tuning
Pn14B		Vibration Suppression 2 Compensation	%	10 to 1000	100	Immediately	Tuning
Pn160		Anti-Resonance Control Related Switch	–	0000h to 0011h	0010h	Immediately	Tuning
	0	Anti-Resonance Control Selection	–	0, 1	0		
		0 Does not use anti-resonance control.					
		1 Uses anti-resonance control.					
	1	Anti-Resonance Control Adjustment Selection	–	0, 1	1		
		0 Does not adjust anti-resonance control automatically using utility function.					
		1 Adjusts anti-resonance control automatically using utility function.					
Pn161		Anti-Resonance Frequency	0.1Hz	10 to 20000	1000	Immediately	Tuning
Pn162		Anti-Resonance Gain Compensation	%	1 to 1000	100	Immediately	Tuning
Pn163		Anti-Resonance Damping Gain	%	0 to 300	0	Immediately	Tuning
Pn164		Anti-Resonance Filter Time Constant 1 Compensation	0.01ms	-1000 to 1000	0	Immediately	Tuning
Pn165		Anti-Resonance Filter Time Constant 2 Compensation	0.01ms	-1000 to 1000	0	Immediately	Tuning

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn170		Tuning-less Function Related Switch	–	0000h to 2411h	1401h		Setup
	0	Tuning-less Function Selection	–	0, 1	1	After restart*1	
		0 Tuning-less function disabled					
		1 Tuning-less function enabled					
	1	Control Method during speed control	–	0, 1	0	After restart*1	
		0 Uses as speed control					
		1 Uses as position control at host controller					
	2	Tuning-less Level	–	0 to 4	4	Immediately	
	3	Tuning-less Load Level	–	0 to 2	1	Immediately	
Pn181		Mode Switch (speed reference)	mm/s	0 to 10000	0	Immediately	Tuning
Pn182		Mode Switch (acceleration)	mm/s^2	0 to 30000	0	Immediately	Tuning
Pn190		Reserved (Do not change.)	–	0000h to 0011h	0010h	After restart*1	Tuning
Pn200		Reserved (Do not change.)	–	0000h to 2236h	0100h	After restart*1	Setup
Pn207		Position Control Function Switch	–	0000h to 2210h	0010h	After restart*1	Setup
	3	COIN Output Timing	–	0 to 2	0		
		0 Outputs when the position error absolute value is the same or less than the positioning completion width (Pn522).					
		1 Outputs when the position error absolute value is the position completion width (Pn522) or less and the reference after position reference filtering is 0.					
		2 When the absolute value of the position error is below the positioning completed width setting (Pn522), and the position reference input is 0.					
Pn20E		Electronic Gear Ratio (Numerator)	–	1 to 1073741824	4	After restart*1	Setup
Pn210		Electronic Gear Ratio (Denominator)	–	1 to 1073741824	1	After restart*1	Setup
Pn281		Encoder Output pulse	edge/ pitch	1 to 4096	20	After restart*1	Setup
Pn282		Linear Scale Pitch	0.01um	0.00 to 65536.00	0.00	After restart*1	Setup
Pn305		Soft Start Acceleration Time	ms	0 to 10000	0	Immediately	Setup
Pn306		Soft Start Deceleration Time	ms	0 to 10000	0	Immediately	Setup
Pn310		Vibration Detection Switch	–	0000h to 0002h	0000h	Immediately	Setup
	0	Vibration Detection Selection	–	0 to 2	0		
		0 No detection.					
		1 Outputs warning (A.911) when vibration is detected.					
		2 Outputs alarm (A.520) when vibration is detected.					
Pn311		Vibration Detection Sensibility	%	50 to 500	100	Immediately	Tuning
Pn324		Mass Ratio Setting Start Level	%	0 to 20000	300	Immediately	Setup
Pn383		JOG Speed	mm/s	0 to 10000	50	Immediately	Setup
Pn384		Vibration Detection Level	mm/s	0 to 5000	10	Immediately	Tuning
Pn385		Motor max. speed	100mm/s	1 to 100	50	After restart*1	Setup
Pn401		Force Reference Filter Time Constant	0.01ms	0 to 65535	100	Immediately	Tuning
Pn404		Forward External Force Limit	%	0 to 800	100	Immediately	Setup
Pn405		Reverse External Force Limit	%	0 to 800	100	Immediately	Setup
Pn406		Emergency Stop Force	%	0 to 800	800	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn408		Force Related Function Switch	–	0000h to 1111h	0000h		Setup
	0	1st Notch Filter Selection	–	0, 1	0	Immediately	
		0 N/A					
		1 Uses 1st notch filter for force reference.					
	1	Speed Limit Selection	–	0, 1	0	After restart*1	
		0 Uses the smaller value between motor max. speed and parameter Pn407 as speed limit value.					
		1 Uses the smaller value between overspeed detection speed and parameter Pn407 as speed limit value.					
	2	2nd Notch Filter Selection	–	0, 1	0	Immediately	
		0 N/A					
		1 Uses 2nd notch filter for force reference.					
	3	Friction Compensation Function Selection	–	0, 1	0	Immediately	
		0 Disables friction compensation function.					
		1 Enables friction compensation function.					
Pn409		1st Notch Filter Frequency	Hz	50 to 5000	5000	Immediately	Tuning
Pn40A		1st Notch Filter Q Value	0.01	50 to 1000	70	Immediately	Tuning
Pn40B		1st Notch Filter Depth	0.001	0 to 1000	0	Immediately	Tuning
Pn40C		2nd Notch Filter Frequency	Hz	50 to 5000	5000	Immediately	Tuning
Pn40D		2nd Notch Filter Q Value	0.01	50 to 1000	70	Immediately	Tuning
Pn40E		2nd Notch Filter Depth	0.001	0 to 1000	0	Immediately	Tuning
Pn40F		2nd Step 2nd Force Reference Filter Frequency	Hz	100 to 5000	5000	Immediately	Tuning
Pn410		2nd Step 2nd Force Reference Filter Q Value	0.01	50 to 100	50	Immediately	Tuning
Pn412		1st Step 2nd Force Reference Filter Time Constant	0.01ms	0 to 65535	100	Immediately	Tuning
Pn423		Reserved (Do not change.)	–	0000h to 1111h	0000h	Immediately	Setup
Pn424		Force Limit at Main Circuit Voltage Drop	%	0 to 100	50	Immediately	Setup
Pn425		Release time for Force Limit at Main Circuit Voltage Drop	ms	0 to 1000	100	Immediately	Setup
Pn456		Sweep Force Reference Amplitude	%	1 to 800	15	Immediately	Tuning
Pn460		Notch Filter Adjustment Switch	–	0000h to 0101h	0101h	Immediately	Tuning
	0	Notch Filter Adjustment Selection 1	–	0, 1	1		
		0 Utility function does not adjust 1st notch filter automatically.					
		1 Utility function adjusts 1st notch filter automatically.					
	2	Notch Filter Adjustment Selection 2	–	0, 1	1		
		0 Utility function does not adjust 2nd notch filter automatically.					
		1 Utility function adjusts 2nd notch filter automatically.					
Pn480		Speed Limit during Force Control	mm/s	0 to 10000	10000	Immediately	Setup
Pn481		Polarity Detection Speed Loop Gain	0.1Hz	1.0 to 2000.0	40.0	Immediately	Tuning
Pn482		Polarity Detection Speed Loop Integral Time Constant	0.01ms	0.15 to 512.00	30.00	Immediately	Tuning
Pn483		Forward Force Limit	%	0 to 800	30	Immediately	Setup
Pn484		Reverse Force Limit	%	0 to 800	30	Immediately	Setup
Pn485		Polarity Detection Reference Speed	mm/s	0 to 100	20	Immediately	Tuning
Pn486		Polarity Detection Reference Accel/Decel Time	ms	0 to 100	25	Immediately	Tuning
Pn487		Polarity Detection Constant Speed Time	ms	0 to 300	0	Immediately	Tuning

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn488			Polarity Detection Reference Waiting Time	ms	50 to 500	100	Immediately	Tuning
Pn48E			Polarity Detection Range	mm	1 to 65535	10	Immediately	Tuning
Pn490			Polarity Detection Load Level	%	0 to 20000	100	Immediately	Tuning
Pn495			Polarity Detection Confirmation Force Reference	%	0 to 200	100	Immediately	Tuning
Pn498			Polarity Detection Allowable Error Range	deg	0 to 30	10	Immediately	Tuning
Pn506			Brake Reference - Servo OFF Delay Time	10ms	0 to 50	0	Immediately	Setup
Pn508			Waiting Time for Brake Signal When Motor Running	10ms	10 to 100	50	Immediately	Setup
Pn509			Instantaneous Power Cut Hold time	ms	20 to 1000	20	Immediately	Setup
Pn50A			Input Signal Selection 1	–	0000h to FFF1h	1881h	After restart*1	Setup
	0		Reserved (Do not change.)	–	–	1		
	1		Reserved (Do not change.)	–	–	8		
	2		Reserved (Do not change.)	–	–	8		
	3		P-OT Signal Mapping	–	0 to F	1		
		0	Forward run allowed when CN1-13 input signal is ON (L-level)					
		1	Forward run allowed when CN1-07 input signal is ON (L-level)					
		2	Forward run allowed when CN1-08 input signal is ON (L-level)					
		3	Forward run allowed when CN1-09 input signal is ON (L-level)					
		4	Forward run allowed when CN1-10 input signal is ON (L-level)					
		5	Forward run allowed when CN1-11 input signal is ON (L-level)					
		6	Forward run allowed when CN1-12 input signal is ON (L-level)					
		7	Forward run prohibited					
		8	Forward run allowed					
		9	Forward run allowed when CN1-13 input signal is OFF (H-level)					
		A	Forward run allowed when CN1-07 input signal is OFF (H-level)					
		B	Forward run allowed when CN1-08 input signal is OFF (H-level)					
		C	Forward run allowed when CN1-09 input signal is OFF (H-level)					
		D	Forward run allowed when CN1-10 input signal is OFF (H-level)					
		E	Forward run allowed when CN1-11 input signal is OFF (H-level)					
		F	Forward run allowed when CN1-12 input signal is OFF (H-level)					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50B		Input Signal Selection 2	–	0000h to FFFFh	8882h	After restart*1	Setup
	0	N-OT Signal Mapping	–	0 to F	2		
		0 Reverse run allowed when CN1-13 input signal is ON (L-level)					
		1 Reverse run allowed when CN1-07 input signal is ON (L-level)					
		2 Reverse run allowed when CN1-08 input signal is ON (L-level)					
		3 Reverse run allowed when CN1-09 input signal is ON (L-level)					
		4 Reverse run allowed when CN1-10 input signal is ON (L-level)					
		5 Reverse run allowed when CN1-11 input signal is ON (L-level)					
		6 Reverse run allowed when CN1-12 input signal is ON (L-level)					
		7 Reverse run prohibited					
		8 Reverse run allowed					
		9 Reverse run allowed when CN1-13 input signal is OFF (H-level)					
		A Reverse run allowed when CN1-07 input signal is OFF (H-level)					
		B Reverse run allowed when CN1-08 input signal is OFF (H-level)					
		C Reverse run allowed when CN1-09 input signal is OFF (H-level)					
		D Reverse run allowed when CN1-10 input signal is OFF (H-level)					
		E Reverse run allowed when CN1-11 input signal is OFF (H-level)					
		F Reverse run allowed when CN1-12 input signal is OFF (H-level)					
	1	Reserved (Do not change.)	–	0 to F	8		
	2	/P-CL Signal Mapping	–	0 to F	8		
		0 ON when CN1-13 input signal is ON (L-level)					
		1 ON when CN1-07 input signal is ON (L-level)					
		2 ON when CN1-08 input signal is ON (L-level)					
		3 ON when CN1-09 input signal is ON (L-level)					
		4 ON when CN1-10 input signal is ON (L-level)					
		5 ON when CN1-11 input signal is ON (L-level)					
		6 ON when CN1-12 input signal is ON (L-level)					
		7 Sets signal ON					
		8 Sets signal OFF					
		9 ON when CN1-13 input signal is OFF (H-level)					
		A ON when CN1-07 input signal is OFF (H-level)					
		B ON when CN1-08 input signal is OFF (H-level)					
		C ON when CN1-09 input signal is OFF (H-level)					
		D ON when CN1-10 input signal is OFF (H-level)					
		E ON when CN1-11 input signal is OFF (H-level)					
		F ON when CN1-12 input signal is OFF (H-level)					
	3	/N-CL Signal Mapping	–	0 to F	8		
		0 to F Same as P-CL signal mapping					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn50E		Output Signal Selection 1	–	0000h to 3333h	0000h	After restart*1	Setup
	0	Positioning Completion Signal Mapping (/COIN)	–	0 to 3	0		
		0 Disabled (the above signal is not used.)					
		1 Outputs the signal from CN1-1, 2 output terminal.					
		2 Outputs the signal from CN1-23, 24 output terminal.					
		3 Outputs the signal from CN1-25, 26 output terminal.					
	1	Speed Coincidence Detection Signal Mapping (/V-CMP)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	2	Movement Detection Signal Mapping (/TGON)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	3	Servo Ready Signal Mapping (/S-RDY)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
Pn50F		Output Signal Selection 2	–	0000h to 3333h	0100h	After restart*1	Setup
	0	Force Limit Detection Signal Mapping (/CLT)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	1	Speed Limit Detection Signal Mapping (/VLT)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
	2	Brake Interlock Signal Mapping (/BK)	–	0 to 3	1		
		0 to 3 Same as /COIN signal mapping					
	3	Warning Signal Mapping (/WARN)	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					
Pn510		Output Signal Selection 3	–	0000h to 0033h	0000h	After restart*1	Setup
	0	/NEAR Signal Mapping	–	0 to 3	0		
		0 to 3 Same as /COIN signal mapping					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn511		Input Signal Selection 5	–	0000h to FFFFh	6543h	After restart*1	Setup
	0	Homing Deceleration LS Signal (/DEC) Mapping	–	0 to F	3		
		0 Deceleration starts on the falling edge of CN1-13 input signal.					
		1 Deceleration starts on the falling edge of CN1-07 input signal.					
		2 Deceleration starts on the falling edge of CN1-08 input signal.					
		3 Deceleration starts on the falling edge of CN1-09 input signal.					
		4 Deceleration starts on the falling edge of CN1-10 input signal.					
		5 Deceleration starts on the falling edge of CN1-11 input signal.					
		6 Deceleration starts on the falling edge of CN1-12 input signal.					
		7 Sets signal ON.					
		8 Sets signal OFF.					
		9 Deceleration starts on the rising edge of CN1-13 input signal.					
		A Deceleration starts on the rising edge of CN1-07 input signal.					
		B Deceleration starts on the rising edge of CN1-08 input signal.					
		C Deceleration starts on the rising edge of CN1-09 input signal.					
		D Deceleration starts on the rising edge of CN1-10 input signal.					
		E Deceleration starts on the rising edge of CN1-11 input signal.					
		F Deceleration starts on the rising edge of CN1-12 input signal.					
	1	External Latch 1 Signal (/EXT1) Mapping	–	0 to F	4		
		0 Sets signal OFF.					
		1 Sets signal OFF.					
		2 Sets signal OFF.					
		3 Sets signal OFF.					
		4 Latch processing is executed on the falling edge of CN1-10 input signal.					
		5 Latch processing is executed on the falling edge of CN1-11 input signal.					
		6 Latch processing is executed on the falling edge of CN1-12 input signal.					
		7 Sets signal OFF.					
		8 Sets signal OFF.					
		9 Sets signal OFF.					
		A Sets signal OFF.					
		B Sets signal OFF.					
		C Sets signal OFF.					
		D Latch processing is executed on the rising edge of CN1-10 input signal.					
		E Latch processing is executed on the rising edge of CN1-11 input signal.					
		F Latch processing is executed on the rising edge of CN1-12 input signal.					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
	2	External Latch 2 Signal (/EXT2) Mapping	–	0 to F	5		
		0 Sets signal OFF.					
		1 Sets signal OFF.					
		2 Sets signal OFF.					
		3 Sets signal OFF.					
		4 Latch processing is executed on the falling edge of CN1-10 input signal.					
		5 Latch processing is executed on the falling edge of CN1-11 input signal.					
		6 Latch processing is executed on the falling edge of CN1-12 input signal.					
		7 Sets signal OFF.					
		8 Sets signal OFF.					
		9 Sets signal OFF.					
		A Sets signal OFF.					
		B Sets signal OFF.					
		C Sets signal OFF.					
		D Latch processing is executed on the rising edge of CN1-10 input signal.					
		E Latch processing is executed on the rising edge of CN1-11 input signal.					
		F Latch processing is executed on the rising edge of CN1-12 input signal.					
	3	External Latch 3 Signal (/EXT3) Mapping	–	0 to F	6		
		0 Sets signal OFF.					
		1 Sets signal OFF.					
		2 Sets signal OFF.					
		3 Sets signal OFF.					
		4 Latch processing is executed on the falling edge of CN1-10 input signal.					
		5 Latch processing is executed on the falling edge of CN1-11 input signal.					
		6 Latch processing is executed on the falling edge of CN1-12 input signal.					
		7 Sets signal OFF.					
		8 Sets signal OFF.					
		9 Sets signal OFF.					
		A Sets signal OFF.					
		B Sets signal OFF.					
		C Sets signal OFF.					
		D Latch processing is executed on the rising edge of CN1-10 input signal.					
		E Latch processing is executed on the rising edge of CN1-11 input signal.					
		F Latch processing is executed on the rising edge of CN1-12 input signal.					
Pn512		Output Signal Inverse Setting	–	0000h to 0111h	0000h	After restart*1	Setup
	0	Inverses output signals of CN1-1, -2 terminals	–	0, 1	0		
		0 Does not inverse outputs.					
		1 Inverses outputs.					
	1	Inverses output signals of CN1-23, -24 terminals	–	0, 1	0		
		0,1 Same as CN1-1, -2 output signals					
	2	Inverses output signals of CN1-25, -26 terminals	–	0, 1	0		
		0,1 Same as CN1-1, -2 output signals					
Pn51E		Excessive Position Error Warning Level	%	10 to 100	100	Immediately	Setup
Pn520		Excessive Position Error Alarm Level	reference unit	1 to 1073741823	5242880	Immediately	Setup
Pn522		Positioning Completed Width	reference unit	0 to 1073741824	7	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn524		NEAR Signal Width	reference unit	1 to 1073741824	1073741824	Immediately	Setup
Pn526		Excessive Position Error Alarm Level at Servo ON	reference unit	1 to 1073741823	5242880	Immediately	Setup
Pn528		Excessive Position Error Warning Level at Servo ON	%	10 to 100	100	Immediately	Setup
Pn52B		Overload Warning Level	%	1 to 100	20	Immediately	Setup
Pn52C		Derating of base current at detecting overload of motor	%	10 to 100	100	After restart*1	Setup
Pn52F		Monitor Display at Power ON	–	0000 to 0FFF	0FFFh	Immediately	Setup
Pn530		Program JOG Operation Related Switch	–	0000h to 0005h	0000h	Immediately	Setup
	0	Program JOG Operation Related Switch	–	0 to 5	0		
		0 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536					
		1 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536					
		2 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536					
		3 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536					
		4 (Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of times of movement Pn536					
		5 (Waiting time Pn535→ Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536					
Pn531		Program JOG Movement Distance	reference unit	1 to 1073741824	32768	Immediately	Setup
Pn534		Program JOG Acceleration/Deceleration Time	ms	2 to 10000	100	Immediately	Setup
Pn535		Program JOG Waiting Time	ms	0 to 10000	100	Immediately	Setup
Pn536		Number of Times of Program JOG Movement	time	0 to 1000	1	Immediately	Setup
Pn550		Analog Monitor 1 Offset Voltage	0.1V	-1000.0 to 1000.0	0.0	Immediately	Setup
Pn551		Analog Monitor 2 Offset Voltage	0.1V	-1000.0 to 1000.0	0.0	Immediately	Setup
Pn552		Analog Monitor Magnification (×1)	× 0.01	-100.00 to 100.00	1.00	Immediately	Setup
Pn553		Analog Monitor Magnification (×2)	× 0.01	-100.00 to 100.00	1.00	Immediately	Setup
Pn560		Remained Vibration Detection Width	0.1%	0.1 to 300.0	40.0	Immediately	Setup
Pn561		Overshoot Detection Level	%	0 to 100	100	Immediately	Setup
Pn580		Zero Clamp Level	mm/s	0 to 10000	10	Immediately	Setup
Pn581		Zero Speed Level	mm/s	1 to 10000	20	Immediately	Setup
Pn582		Speed Coincidence Signal Output Width	mm/s	0 to 100	10	Immediately	Setup
Pn583		Brake Reference Output Speed Level	mm/s	0 to 10000	10	Immediately	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn584		Speed Limit Level at Servo ON	mm/s	0 to 10000	10000	Immediately	Setup
Pn585		Program JOG Movement Speed	mm/s	1 to 10000	50	Immediately	Setup
Pn586		Motor Running Air-cooling Ratio	%/peak speed	0 to 100	0	Immediately	Setup
Pn587		Polarity Detection for Absolute Scale Selection		0000h to 0001h	0000h	Immediately	Setup
	0	Polarity Detection for Absolute Scale Selection	–	0, 1	0		
		0 Does not detect polarity.					
		1 Detects polarity.					
Pn600		Regenerative Resistor Capacity	10W	Depends on SERVOPACK capacity.	0	Immediately	Setup
Pn800		Communications Control	–	–	0040h	Immediately	Setup
	0	MECHATROLINK Communications Check Mask (for debug)	–	0 to 3	0		
		0 No mask					
		1 Ignores MECHATROLINK communications error (A.E6).					
		2 Ignores WDT error (A.E5).					
		3 Ignores both MECHATROLINK communications error (A.E6) and WDT error (A.E5).					
	1	Warning Check Mask	–	0 to 7	4		
		0 No mask					
		1 Ignores data setting warning (A.94).					
		2 Ignores command warning (A.95).					
		3 Ignores both data setting warning (A.94) and command warning (A.95).					
		4 Ignores communications warning (A.96).					
		5 Ignores both data setting warning (A.94) and communications warning (A.96).					
		6 Ignores both command warning (A.95) and communications warning (A.96).					
		7 Ignores data setting warning (A.94), command warning (A.95) and communications warning (A.96).					
Pn801		Application Function Select 6 (Software LS)	–	–	0003h	Immediately	Setup
	0	Software Limit Function	–	0 to 3	3		
		0 Enables forward and reverse software limit.					
		1 Disables forward software limit.					
		2 Disables reverse software limit.					
		3 Disables software limit in both directions.					
	2	Software Limit for Reference	–	0,1	0		
		0 Disables software limit for reference.					
		1 Enables software limit for reference.					
	3	Reserved (Do not change.)	–	–	0		
Pn803		Origin Range	1 reference unit	0 to 250	10	Immediately	Setup
Pn804		Forward Software Limit	1 reference unit	-2^30+1 to 2^30-1	1073741823	Immediately	Setup
Pn806		Reverse Software Limit	1 reference unit	-2^30+1 to 2^30-1	-1073741823	Immediately	Setup
Pn808		Absolute Encoder Origin Offset	1 reference unit	-2^30+1 to 2^30-1	0	Immediately*2	Setup
Pn80A		1st Linear Acceleration Constant	10000 reference unit/s^2	1 to 65535	100	Immediately*3	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn80B		2nd Linear Acceleration Constant	10000 reference unit/s^2	1 to 65535	100	Immediately*3	Setup
Pn80C		Acceleration Constant Switching Speed	100 reference unit/s	0 to 65535	0	Immediately*3	Setup
Pn80D		1st Linear Deceleration Constant	10000 reference unit/s^2	1 to 65535	100	Immediately*3	Setup
Pn80E		2nd Linear Deceleration Constant	10000 reference unit/s^2	1 to 65535	100	Immediately*3	Setup
Pn80F		Deceleration Constant Switching Speed	100 reference unit/s	0 to 65535	0	Immediately*3	Setup
Pn810		Exponential Function Acceleration/Deceleration Bias	100 reference unit/s	0 to 65535	0	Immediately*4	Setup
Pn811		Exponential Function Acceleration/Deceleration Time Constant	0.1ms	0 to 5100	0	Immediately*4	Setup
Pn812		Movement Average Time	0.1ms	0 to 5100	0	Immediately*4	Setup
Pn814		Final Travel Distance for External Positioning	1 reference unit	-2^30+1 to 2^30-1	100	Immediately	Setup
Pn816		Homing Mode Setting	–	–	0000h	Immediately	Setup
	0	Homing Direction	–	0,1	0		
		0 Forward					
		1 Reverse					
Pn817		Homing Approach Speed 1	100 reference unit/s	0 to 65535	50	Immediately*3	Setup
Pn818		Homing Approach Speed 2	100 reference unit/s	0 to 65535	5	Immediately*3	Setup
Pn819		Final Travel Distance for Homing	1 reference unit	-2^30+1 to 2^30-1	100	Immediately	Setup
Pn81E		Input Signal Monitor Selection	–	–	0000H	Immediately	Setup
	0	IO12 Signal Mapping	–	0 to 7	0		
		0 No mapping					
		1 Monitors SI0 (CN1-13).					
		2 Monitors SI1 (CN1-7).					
		3 Monitors SI2 (CN1-8).					
		4 Monitors SI3 (CN1-9).					
		5 Monitors SI4 (CN1-10).					
		6 Monitors SI5 (CN1-11).					
		7 Monitors SI6 (CN1-12).					
	1	IO13 Signal Mapping	–	0 to 7	0		
		0 to 7 Refer to IO12 signal mapping.					
	2	IO14 Signal Mapping	–	0 to 7	0		
		0 to 7 Refer to IO12 signal mapping.					
	3	IO15 Signal Mapping	–	0 to 7	0		
		0 to 7 Refer to IO12 signal mapping.					
Pn81F		Command Data Allocation	–	–	0000H	After restart*1	Setup
	0	Option Field Allocation	–	0,1	0		
		0 Disables option field allocation.					
		1 Enables option field allocation.					
	1	Position Control Command TFF/TLIM Function Allocation	–	0,1	0		
		0 Disables allocation.					
		1 Enables allocation.					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn820		Forward Latching Allowable Area	1 reference unit	-2^31 to 2^31-1	0	Immediately	Setup
Pn822		Reverse Latching Allowable Area	1 reference unit	-2^31 to 2^31-1	0	Immediately	Setup
Pn824		Option Monitor 1 Selection	–	–	0000H	Immediately	Setup
	0000H	Motor movement speed [1000000H/OS]	high speed				
	0001H	Speed reference [1000000H/OS]	high speed				
	0002H	Force [1000000H/max. force]	high speed				
	0003H	Position error (lowermost 32 bits) [reference unit]	high speed				
	0004H	Position error (uppermost 32 bits) [reference unit]	high speed				
	0005H	System reserved	high speed				
	0006H	System reserved	high speed				
	000AH	Encoder count (lower 32 bits) [reference unit]	high speed				
	000BH	Encoder count (upper 32 bits) [reference unit]	high speed				
	000CH	System reserved	high speed				
	000DH	System reserved	high speed				
	0010H	Un000: Motor movement speed [mm/s]	low speed				
	0011H	Un001: Speed reference [mm/s]	low speed				
	0012H	Un002: Force reference [%]	low speed				
	0013H	Un003: Movement angle 1 [pulse]	low speed				
	0014H	Un004: Movement angle 2 [deg]	low speed				
	0017H	Un005: Input position reference speed [mm/s]	low speed				
	0018H	Un006: Input signal monitor	low speed				
	0019H	Un007: Output signal monitor	low speed				
	0018H	Un008: Position error [reference unit]	low speed				
	0019H	Un009: Accumulated load ratio [%]	low speed				
	001AH	Un00A: Regenerative load ratio [%]	low speed				
	001BH	Un00B: DB resistance consumption power [%]	low speed				
	001CH	Un00C: Input reference pulse counter [pulse]	low speed				
	001DH	Un00D: Feedback pulse counter [pulse]	low speed				
	001EH	System reserved	low speed				
	001FH	System reserved	low speed				
	0023H	System reserved	fixed				
	0024H	System reserved	fixed				
	0025H	Initial Absolute Position Data (lower 32 bits) [pulse]	fixed				

Parameter No.	Digit		Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn824		0026H	Initial Absolute Position Data (upper 32 bits) [pulse]	fixed	–	0000H	Immediately	Setup
		0080H	Previous value of latched feedback position (LPOS)	high speed				
Pn825		Option Monitor 2 Selection (Refer to Option Monitor 1 Selection.)		–	–	0	Immediately	Setup
Pn827		Linear Deceleration Constant 1 for Stopping		10000 reference unit/s^2	1 to 65535	100	Immediately*3	Setup
Pn829		SVOFF Waiting Time (SVOFF at deceleration to stop)		10ms	0 to 65535	0	Immediately*3	Setup
Pn82A		Option Field Allocation 1		–	0000H to 1E1EH	1813H	After restart*1	Setup
	0	0 to E	ACCFIL bit position		0 to E	3		
	1	0	Disables ACCFIL bit allocation.		0,1	1		
		1	Enables ACCFIL bit allocation.					
	2	0 to E	GSEL bit position		0 to E	8		
	3	0	Disables GSEL bit allocation.		0,1	1		
		1	Enables GSEL bit allocation.					
Pn82B		Option Field Allocation 2		–	0000H to 1F1FH	1D1CH	After restart*1	Setup
	0	0 to F	V_PPI bit position		0 to F	C		
	1	0	Disables V_PPI bit allocation.		0,1	1		
		1	Enables V_PPI bit allocation.					
	2	0 to F	P_PI_CLR bit position		0 to F	D		
	3	0	Disables P_PI_CLR bit allocation.		0,1	1		
		1	Enables P_PI_CLR bit allocation.					
Pn82C		Option Field Allocation 3		–	0000H to 1F1FH	1F1EH	After restart*1	Setup
	0	0 to F	P_CL bit position		0 to F	E		
	1	0	Disables P_CL bit allocation.		0,1	1		
		1	Enables P_CL bit allocation.					
	2	0 to F	N_CL bit position		0 to F	F		
	3	0	Disables N_CL bit allocation.		0,1	1		
		1	Enables N_CL bit allocation.					
Pn82D		Option Field Allocation 4		–	0000H to 1F1CH	0000H	After restart*1	Setup
	0	0 to C	BANK_SEL1 bit position		0 to C	0		
	1	0	Disables BANK_SEL1 bit allocation.		0,1	0		
		1	Enables BANK_SEL1 bit allocation.					
	2	0 to F	LT_DISABLE bit position		0 to F	0		
	3	0	Disables LT_DISABLE bit allocation.		0,1	0		
		1	Enables LT_DISABLE bit allocation.					
Pn82E		Option Field Allocation 5		–	0000H to 1F1CH	0000H	After restart*1	Setup
	0	0 to F	Reserved		0 to F	0		
	1	0	Reserved		0,1	0		
		1	Reserved					
	2	0 to D	OUT_SIGNAL bit position		0 to D	0		
	3	0	Disables OUT_SIGNAL bit allocation.		0,1	0		
		1	Enables OUT_SIGNAL bit allocation.					
Pn833		Motion Setting		–	0000H to 0001H	0000H	After restart*1	Setup
	0	Linear Accel/Decel Constant Selection			0,1	0		
		0	Uses Pn80A to Pn80F and Pn827. (Setting of Pn834 to Pn840 disabled)					
		1	Uses Pn834 to Pn840. (Setting of Pn80A to Pn80F and Pn827 disabled)					

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn834		1st Linear Acceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Immediately*3	Setup
Pn836		2nd Linear Acceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Immediately*3	Setup
Pn838		Acceleration Constant Switching Speed 2	reference unit/s	0 to 2097152000	0	Immediately*3	Setup
Pn83A		1st Linear Deceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Immediately*3	Setup
Pn83C		2nd Linear Deceleration Constant 2	10000 reference unit/s^2	1 to 20971520	100	Immediately*3	Setup
Pn83E		Deceleration Constant Switching Speed 2	reference unit/s	0 to 2097152000	0	Immediately*3	Setup
Pn840		Linear Deceleration Constant 2 for Stopping	10000 reference unit/s^2	1 to 20971520	100	Immediately*3	Setup
Pn850		Latch Sequence Number	–	0 to 8	0	Immediately	Setup
Pn851		Continuous Latch Count	–	0 to 255	0	Immediately	Setup
Pn852		Latch Sequence Signal 1 to 4 Setting	–	0000H–3333H	0000h	Immediately	Setup
	0	Latch sequence 1 signal selection	–	0 to 3	0		
		0 Phase C					
		1 EXT1 signal					
		2 EXT2 signal					
		3 EXT3 signal					
	1	Latch sequence 2 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	2	Latch sequence 3 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	3	Latch sequence 4 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
Pn853		Latch Sequence Signal 5 to 8 Setting	–	0000H–3333H	0000h	Immediately	Setup
	0	Latch sequence 5 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3			
	1	Latch sequence 6 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	2	Latch sequence 7 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
	3	Latch sequence 8 signal selection. (Refer to latch sequence 1 signal selection.)	–	0 to 3	0		
Pn880		Station Address Monitor (for maintenance, read only)	–	40 to 5FH	0	Immediately	Setup
Pn881		Setting Transmission Byte Monitor [byte] (for maintenance, read only)	–	17,32	0	Immediately	Setup
Pn882		Transmission Cycle Setting Monitor [0.25 μs] (for maintenance, read only)	–	0 to FFFFH	0	Immediately	Setup
Pn883		Communications Cycle Setting Monitor [x transmission cycle] (for maintenance, read only)	–	0 to 32	0	Immediately	Setup
Pn88A		M2 Receive Error Counter Monitor (for maintenance, read only)	–	0 to 65535	0	Immediately	Setup
Pn890 to Pn89E		CMD Data Monitor at Alarm/Warning Occurs (for maintenance, read only)	–	0 to FFFFFFFFH	0	Immediately	Setup
Pn8A0 to Pn8AE		RSP Data Monitor at Alarm/Warning Occurs (for maintenance, read only)	–	0 to FFFFFFFFH	0	Immediately	Setup
Pn900		Parameter Bank Number	–	0 to 16	0	After restart*1	Setup
Pn901		Parameter Bank Member Number	–	0 to 15	0	After restart*1	Setup
Pn902 to Pn910		Parameter Bank Member Definition	–	0000H to 08FFH	0	After restart*1	Setup

Parameter No.	Digit	Name	Setting Unit	Setting Range	Factory Setting	When Enabled	Classification
Pn920 to Pn95F		Parameter Bank Data (nonvolatile memory save disabled)	–	0000H to FFFFH	0	Immediately	Setup

* 1. Validated after CONFIG command is sent or when tuning OFF and then ON the power supply.
* 2. Setting is enabled after SENS_ON command is sent.
* 3. Change the setting when DEN = 1 (reference stop state) to prevent interfering the reference output.
* 4. Setting is updated only when DEN = 1 (reference stop state).

AC Servodrive

Σ-V Series SUPPLEMENT

USER'S MANUAL Design and Maintenance

Rotational Motor/MECHATROLINK-II Communications Reference
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Linear Motor/MECHATROLINK-II Communications Reference

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Specifications are subject to change without notice for ongoing product modifications and improvements.

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