

AC Servomotor/Servo Drives

Replace Guide

From SMARTSTEP2 series

to G5 Series with General-purpose Pulse Train or Analog Input

R88M-K[], R88D-KT[]

R88M-G[], R7D-BP[]



Replace
Guide

NOTE

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This Guide does not contain safety information and other details that are required for actual use. Thoroughly read and understand the manuals for all of the devices that are used in this Guide to ensure that the system is used safely. Review the entire contents of these materials, including all safety precautions, precautions for safe use, and precautions for correct use.

Intended Audience

This Guide is intended for the following personnel.

- Personnel in charge of introducing FA systems
- Personnel in charge of designing FA systems

The personnel must also have the following knowledge.

- Knowledge of electrical systems (an electrical engineer or the equivalent)
- Knowledge of AC Servomotors/Drives

Applicable Products

This Guide covers the following products.

- SMARTSTEP2-series AC Servomotors/Servo Drivers
- G5-series AC Servomotors/Servo Drives with General-purpose Pulse Train or Analog Input

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Precautions

- When building a system, check the specifications for all devices and equipment that will make up the system and make sure that the OMRON products are used well within their rated specifications and performances. Safety measures, such as safety circuits, must be implemented in order to minimize the risks in the event of a malfunction.
- Thoroughly read and understand the manuals for all devices and equipment that will make up the system to ensure that the system is used safely. Review the entire contents of these manuals, including all safety precautions, precautions for safe use, and precautions for correct use.
- Confirm all regulations, standards, and restrictions that the system must adhere to.
- Check the user program for proper execution before you use it for actual operation.

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Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.

Cat. No.	I879-E1-01
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↑
Revision code

Revision code	Date	Revised content
01	April 2022	Original production

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1. Outline

Thank you for adopting the Omron Servomotors and Servo Drives.

This manual describes the comparative information for replacing the conventional SMARTSTEP2-series AC Servomotors/Servo Drivers, R88M-G and R7D-BP□, (hereinafter called the SS2 series or SS2) with the G5-series AC Servomotors/Servo Drives with General-purpose Pulse Train or Analog Input, R88M-K and R88D-KT□, (hereinafter called the G5 series or G5).

To check the details that are not described in this manual, refer to the User's Manual for the Servomotors and Servo Drives concerned.

No.	Manual No.	Manual name
1.	I561	R88M-G□, R7D-BP□ AC Servomotors/Servo Drives SMARTSTEP2(SS2) series User's Manual
2.	I571	R88M-K□, R88D-KT□ AC Servomotors/Servo Drives with General-purpose Pulse Train or Analog Input G5 series User's Manual

2. Precautions for Replacement

The following table shows the precautions for replacing the SS2 series with the G5 series.

Read the comparisons of both series shown in this manual and the User's Manual of both series, before considering replacement.

No.	Classification	Item	SS2 series	G5 series	Remarks
1.	Specifications and performance	Speed response frequency	1 kHz or equivalent	2 kHz	Both the specifications and performance are improved in the G5 series.
2.		Encoder resolution	<ul style="list-style-type: none"> Incremental encoder Phases A and B: 2,500 pulses/rotation (Multiple of 4: 10,000 pulses/rotation) 	<ul style="list-style-type: none"> Incremental encoder Phases A and B: 262,144 pulses/rotation (Multiple of 4: 1,048,576 pulses/rotation) 	
3.		Parameter Unit	Present	Absent	
4.	Servomotor dimensions	Standard type	Example) 100 W motor: □40×92	Example) 100 W motor: □40×92	Same in dimensions.
5.		Flat type	Example) 100 W motor: □60×60.5	Example) 100 W motor: □40×92	The G5 series has no flat Servomotors, so the dimensions are significantly different.
6.		Drip-proof structure	IP65	IP67	It is improved in the G5 series.
7.	Servo Drive dimensions	Drive body	Example) 100 W drive: 120×35×105	Example) 100 W drive: 150×40×130	The drive dimensions of the G5 series are enlarged.
8.	Function	STO function	Absent	Present	All the functions are covered because of upward compatibility. However, parameter Nos. are different, so refer to 9. <i>Detailed Comparison of Parameters.</i>
9.		RS-232 function	Present	Absent (Substituted with USB function)	
10.		Fully-closed control	Absent	Present	

3. Replacement List

3.1. Servomotors with Rated Rotation Speed of 3,000 r/min

Main circuit power supply voltage	SS3 series			G5 series			Remarks
	Motor capacity	Motor model R88M-	Drive model R7D-	Motor capacity	Motor model R88M-	Drive model R88D-	
Single-phase 100 V	50 W	G05030H□	BPA5L	50 W	K05030H□	KTA5L	Compatible with 200-V Servomotors.
	100 W	G10030L□	BP01L	100 W	K10030L□	KT01L	
	200 W	G20030L□	BP02L	200 W	K20030L□	KT02L	
Single-phase 200 V	50 W	G05030H□	BP01H	50 W	K05030H□	KT01H	
	100 W	G10030H□	BP01H	100 W	K10030H□	KT01H	
	200 W	G20030H□	BP02HH	200 W	K20030H□	KT02H	
	400 W	G40030H□	BP04H	400 W	K40030H□	KT04H	
3-phase 200 V	50 W	G05030H□	BP01H	50 W	K05030H□	KT01H	
	100 W	G10030H□	BP01H	100 W	K10030H□	KT01H	
	200 W	G20030H□	BP02H	200 W	K20030H□	KT02H	
	400 W	G40030H□	BP04H	400 W	K40030H□	KT04H	

3.2. Flat Servomotors with Rated Rotation Speed of 3,000 r/min

Main circuit power supply voltage	SS3 series			G5 series			Remarks
	Motor capacity	Motor model R88M-	Drive model R7D-	Motor capacity	Motor model R88M-	Drive model R88D-	
Single-phase 100 V	100 W	GP10030L□	BP01L	100 W	K10030L□	KT01L	The G5 series has no flat type of Servomotors, so the external dimensions are significantly different.
	200 W	GP20030L□	BP02L	200 W	K20030L□	KT02L	
Single-phase 200 V	100 W	GP10030H□	BP01H	100 W	K10030H□	KT01H	
	200 W	GP20030H□	BP02HH	200 W	K20030H□	KT02H	
	400 W	GP40030H□	BP04H	400 W	K40030H□	KT04H	
3-phase 200 V	100 W	GP10030H□	BP01H	100 W	K10030H□	KT01H	
	200 W	GP20030H□	BP02H	200 W	K20030H□	KT02H	
	400 W	GP40030H□	BP04H	400 W	K40030H□	KT04H	

4. Comparison of Servomotor Dimensions

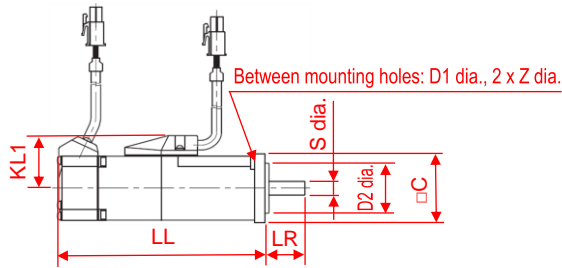
Since the SS2 series and the G5 series are different in Servomotor dimensions, check the following comparison of dimensions in designing.

- Leaders and dimensions (symbols) on outline drawings and dimensional drawings are shown in **red** for ease of recognition.
- For dimensions (numbers) in tables, the dimensions becoming larger and smaller when the SS2 series is replaced with the G5 series are respectively shown in **red** and **blue**.

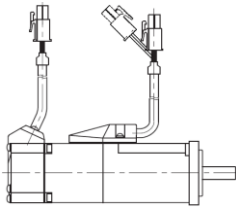
4.1. Servomotors with Rated Rotation Speed of 3,000 r/min (Main Circuit Power Supply Voltage: 100 V or 200 V)

■ 50 W or 100 W motor (100 V or 200 V)

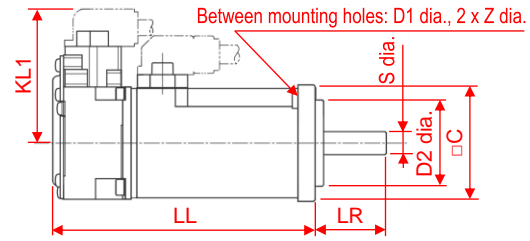
- SS2 without 50 W or 100 W brake



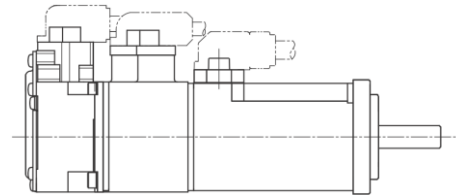
- SS2 with 50 W or 100 W brake



- G5 without 50 W or 100 W brake



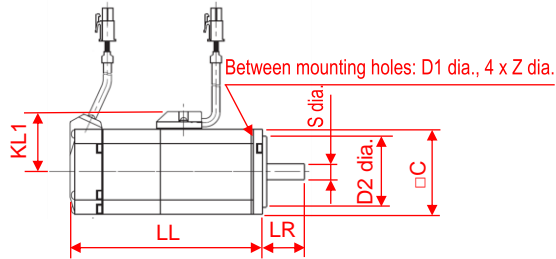
- G5 with 50 W or 100 W brake



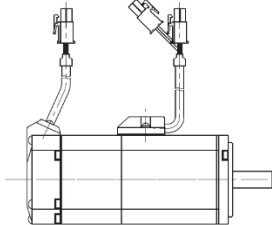
Motor capacity	Specifications	Series	Motor model R88M-	Dimension [mm]								Remarks
				LL	LR	S	D1	D2	C	Z	KL1	
50 W	Without brake	SS2 series	G05030□	72	25	8	46	30	40	4.3	32	Connectors are located differently. • For G, connectors are located on the lead cable ends. • For G5, connectors are located on the Servomotor body.
		G5 series	K05030□	72	25	8	46	30	40	4.3	46.6	
	With brake	SS2 series	G05030□-B□	102	25	8	46	30	40	4.3	32	
		G5 series	K05030□-B□	102	25	8	46	30	40	4.3	46.6	
100 W	Without brake	SS2 series	G10030□	92	25	8	46	30	40	4.3	32	
		G5 series	K10030□	92	25	8	46	30	40	4.3	46.6	
	With brake	SS2 series	G10030□-B□	122	25	8	46	30	40	4.3	32	
		G5 series	K10030□-B□	122	25	8	46	30	40	4.3	46.6	

■ 200 W or 400 W motor (100 V or 200 V)

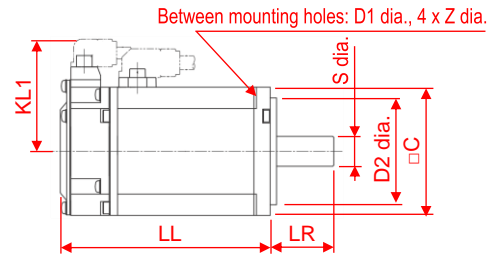
● SS2 without 200 W or 400 W brake



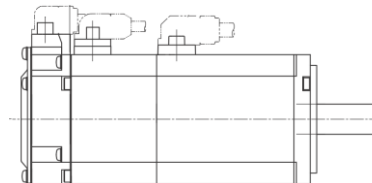
● SS2 with 200 W or 400 W brake



● G5 without 200 W or 400 W brake



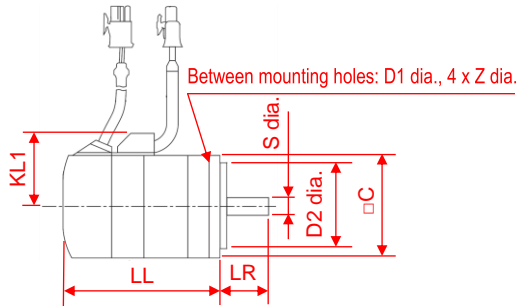
● G5 with 200 W or 400 W brake



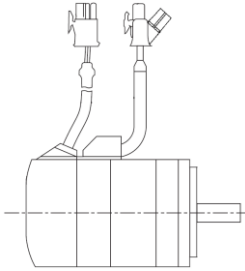
Motor capacity	Specifications	Series	Motor model R88M-	Dimension [mm]								Remarks
				LL	LR	S	D1	D2	C	Z	KL1	
200 W	Without brake	SS2 series	G20030□	79.5	30	11	70	50	60	4.5	43	Connectors are located differently. ● For G, connectors are located on the lead cable ends. ● For G5, connectors are located on the Servomotor body.
		G5 series	K20030□	79.5	30	11	70	50	60	4.5	52.5	
	With brake	SS2 series	G20030□-B□	116	30	11	70	50	60	4.5	43	
		G5 series	K20030□-B□	116	30	11	70	50	60	4.5	52.5	
400 W	Without brake	SS2 series	G40030□	99	30	14	70	50	60	4.5	43	Connectors are located differently. ● For G, connectors are located on the lead cable ends. ● For G5, connectors are located on the Servomotor body.
		G5 series	K40030□	99	30	14	70	50	60	4.5	52.5	
	With brake	SS2 series	G40030□-B□	135.5	30	14	70	50	60	4.5	43	
		G5 series	K40030□-B□	135.5	30	14	70	50	60	4.5	52.5	

■ 100 W, 200 W, or 400 W flat Servomotors (100 V or 200 V)

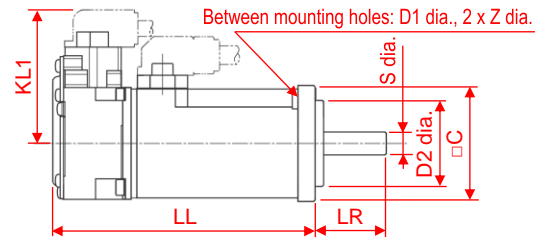
- SS2 without 100 W, 200 W, or 400 W brake



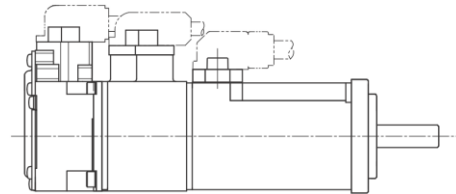
- SS2 with 100 W, 200 W, or 400 W brake



- G5 without 100 W, 200 W, or 400 W brake



- G5 with 100 W, 200 W, or 400 W brake



Motor capacity	Specifications	Series	Motor model R88M-	Dimension [mm]								Remarks
				LL	LR	S	D1	D2	C	Z	KL1	
100 W	Without brake	SS2 series	GP10030□	60.5	25	8	70	50	60	4.5	43	Connectors are located differently. <ul style="list-style-type: none"> • For G, connectors are located on the lead cable ends. • For G5, connectors are located on the Servomotor body.
		G5 series	K10030□	92	25	8	46	30	40	4.3	46.6	
	With brake	SS2 series	GP10030□-B□	84.5	25	8	70	50	60	4.5	43	
		G5 series	K10030□-B□	122	25	8	46	30	40	4.3	46.6	
200 W	Without brake	SS2 series	GP20030□	67.5	30	11	90	70	80	5.5	53	
		G5 series	K20030□	79.5	30	11	70	50	60	4.5	52.5	
	With brake	SS2 series	GP20030□-B□	100	30	11	90	70	80	5.5	53	
		G5 series	K20030□-B□	116	30	11	70	50	60	4.5	52.5	
400 W	Without brake	SS2 series	GP40030H□	82.5	30	14	90	70	80	5.5	53	
		G5 series	K40030□	99	30	14	70	50	60	4.5	52.5	
	With brake	SS2 series	GP40030H-B□	115	30	14	90	70	80	5.5	53	
		G5 series	K40030□-B□	135.5	30	14	70	50	60	4.5	52.5	

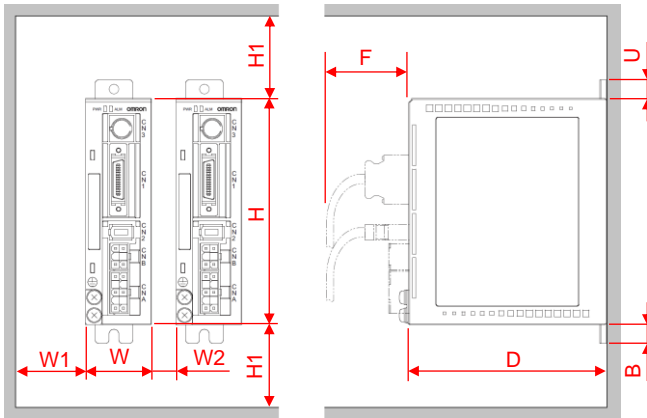
5. Comparison of Servo Drive Dimensions

Since the SS2 series and the G5 series are different in drive dimensions, check the following comparison of dimensions in designing.

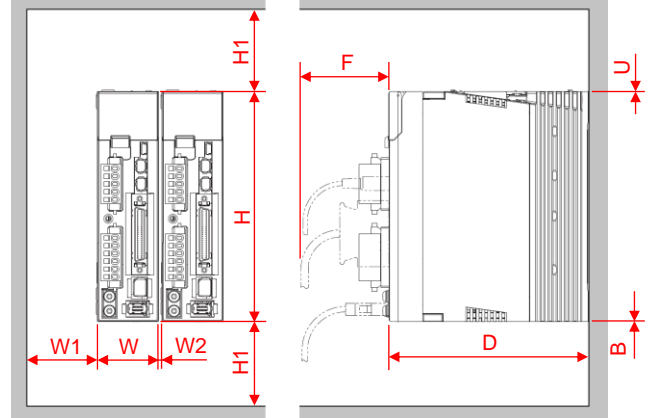
- Leaders and dimensions (symbols) on outline drawings and dimensional drawings are shown in **red** for ease of recognition.
- For dimensions (numbers) in tables, the dimensions becoming larger and smaller when the SS2 series is replaced with the G5 series are respectively shown in **red** and **blue**.

■ Reference outline drawings of drives

• External dimensions of SS2 Drive



• External dimensions of G5 Drive



■ Main circuit power supply voltage 200 V drive dimensions

Motor capacity	Series	Drive model	Dimension [mm]									Remarks
			H	W	D	F	U	B	H1	W1	W2	
50 W or 100 W	SS2 series	R7D-BP01H	120	35	105	70	10	10	100	40	10	The dimension W2 of the G5 series is a dimension when the ambient operating temperature is 0 to 40°C. When it exceeds 40°C, the dimension is 10 mm.
	G5 series	R88D-KT01H	150	40	130	70	0	0	100	40	1	
200 W	SS2 series	R7D-BP02H	120	35	105	70	10	10	100	40	10	
	G5 series	R88D-KT02H	150	40	130	70	0	0	100	40	1	
400 W	SS2 series	R7D-BP04H	120	40	105	70	10	10	100	40	10	
	G5 series	R88D-KT04H	150	55	130	70	0	0	100	40	1	

■ Main circuit power supply voltage 100 V drive dimensions

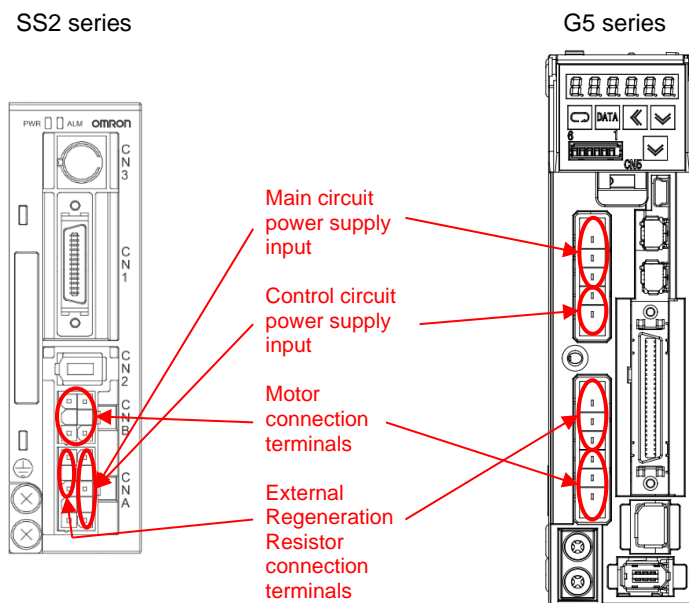
Motor capacity	Series	Drive model	Dimension [mm]									Remarks
			H	W	D	F	U	B	H1	W1	W2	
50 W or 100 W	SS2 series	R7D-BPA5L/BP01L	120	35	105	70	10	10	100	40	10	The dimension W2 of the G5 series is a dimension when the ambient operating temperature is 0 to 40°C. When it exceeds 40°C, the dimension is 10 mm.
	G5 series	R88D-KTA5L/KT01L	150	40	130	70	0	0	100	40	1	
200 W	SS2 series	R7D-BP02L	120	40	105	70	10	10	100	40	10	
	G5 series	R88D-KT02L	150	55	130	70	0	0	100	40	1	

6. Layout and Specifications of Connectors and Terminal Blocks of Servo Drive

The below shows the layout and specifications of the connectors and terminal blocks of the SS2 series and the G5 series. Read the descriptions, and then consider replacement design.

6.1. Layout and Specifications of Connectors and Terminal Blocks of Main Circuit Wiring and Motor Wiring

- 50 W to 200 W drives (100 V) or 100 W to 400 W drives (200 V)
SS2 series: R7D-BPA5L/BP01L/BP02L/BP01H/ BP02HH/BP02H/BP04H
G5 series: R88D-KTA5L/ KT01L/KT02L/KT01H/KT02H/KT04H



The main circuit power supply input of the SS2 series is shared with its control circuit power supply input by a single wiring. For the G5 series, wire the power supply input because the control circuit power supply input is wired separately. In both the SS2 and the G5 series, input single-phase 100 V and 200 V to the L1 terminal and the L3 terminal.

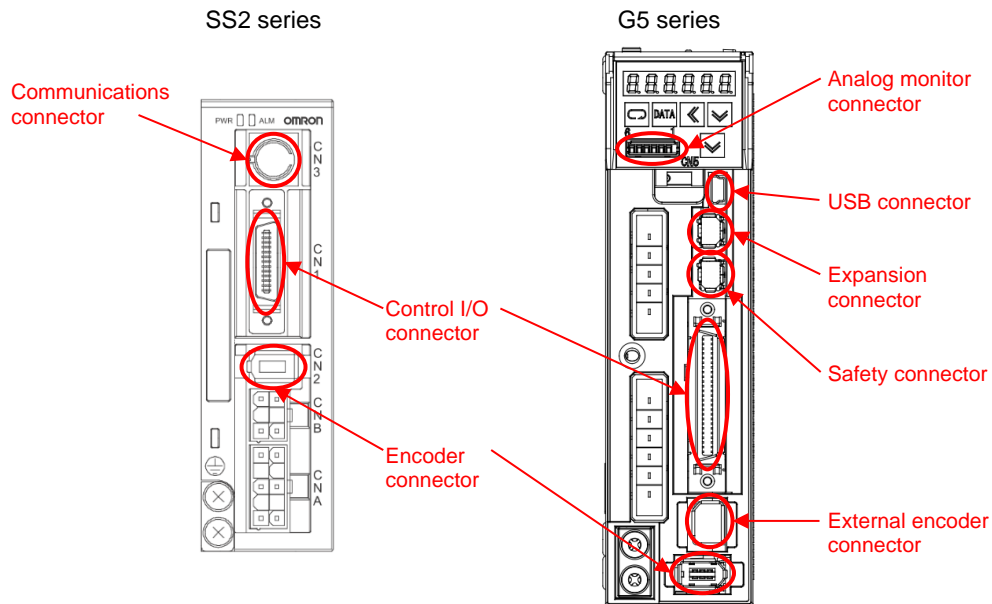
SS2 series					G5 series			
Terminal	No.	Symbol	Name	Outline specifications	Terminal	Symbol	Name	Outline specifications
CNA	10	L1	Main circuit power supply input terminals	Single-phase 100 to 115 VAC Single-phase 200 to 240 VAC 3-phase 200 to 240 VAC	CNA	L1	Main circuit power supply input	Single-phase 100 to 120 VAC Single-phase 200 to 240 VAC 3-phase 200 to 240 VAC
	8	L2				L2		
	6	L3				L3		
	5	P	External Regeneration Resistor connection terminals	External Regeneration Resistor: P-B1 connected		L1C	Control circuit power supply input	Single-phase 100 to 120 VAC Single-phase 200 to 240 VAC
	3	B1	Frame ground	This is a ground terminal.		L2C		
1	FG	Motor connection terminals	Motor output of phase U, phase V, and phase W	B1	CNC	External Regeneration Resistor connection terminals	Internal Regeneration Resistor: B2-B3 short-circuited External Regeneration Resistor: B1-B2 connected	
4	V	Motor connection terminals	Motor output of phase U, phase V, and phase W	B3				
6	W	Frame ground	Connect the motor FG.	B2				
3	⊕			U	CNC	Motor connection terminals	Motor output of phase U, phase V, and phase W.	
				V				
				W				

6.2. Layout and Specifications of Connectors of Control Circuit

■ Layout of connectors of control circuit

The control circuit connectors are arranged on the drive front.

The G5 series does not support the RS-232 communications and Parameter Unit functions of the SS2 series. For the G5 series, parameters can be set from CX-Drive (computer tool) via USB communications.



■ Control I/O connector

● Pulse input

Input the command pulse of for position control.

SS2 series				G5 series			
Terminal	No.	Symbol	Name	Terminal	No.	Symbol	Name
CN1	22	+CW/PULS/FA	Reverse Pulses Input, Feed Pulses Input, or 90° Phase Difference Pulses (Phase A)	CN1	3	+CW/+PULS/+FA	Reverse pulse, feed pulse, or 90° phase difference signal (phase A)*1
	23	-CW/PULS/FA	Forward Pulses, Direction Signal, or 90° Phase Difference Pulses (Phase B)		4	-CW/-PULS/-FA	Forward pulse, direction signal, or 90° phase difference signal (phase B)*1
	24	+CCW/SIGN/FB			5	+CCW/+SIGN/+FB	
	25	-CCW/SIGN/FB	6		-CCW/-SIGN/-FB		

*1. For the G5 series, select one of two pulse inputs by using **Command Pulse Input Selection (Pn005)**. Use the default setting, 0: Photocoupler input (CN1-1 to 6 pins).

[Electrical specifications]

- In both the SS2 and the G5 series
 - Open collector: Photocoupler input current of 7 to 15 mA
 - Line driver: Applicable line driver AM26LS31A or equivalent

● Control input

The 10 input functions of the G5 series can be changed by using **Input Signal Selection 1** (Pn400) to **10** (Pn409). According to the input functions that are used in the SS2 series, change the input functions of the G5 series.

SS2 series					G5 series				
Terminal	No.	Symbol	Control mode	Name	Terminal	No.	Symbol	Control mode	Name
CN1	1	+24VIN	-	12 to 24-VDC power supply input	CN1	7	+24VIN	-	12 to 24-VDC power supply input
	2	RUN	Total control	RUN Command Input		29	RUN	Total control	Operation command input
	3	RESET	Total control	Alarm Reset Input		31	RESET	Total control	Alarm reset input
	4	ECRST	Position	Deviation Counter Reset Input*1		30	ECRST	Position	Error counter reset input
		VSEL2	Speed	Internally Set Speed Selection 2*1			VSEL2	Speed	Internally set speed selection 2
	5	GSEL	Position	Gain Switch*2		27	GSEL	Total control	Gain switching
		VZERO	Speed	Zero Speed Designation Input*2			28	GESEL1	Position
	6	GESEL	Position	Electronic Gear Switch*3		28		VSEL3	Speed
		VSEL1	Speed	Internally Set Speed Selection 1*3			8	NOT	Total control
	7	NOT	Total control	Reverse Drive Prohibit		9	POT	Total control	Forward drive prohibition input
8	POT	Total control	Forward Drive Prohibit	26	DFSEL1	Position	Damping filter switching 1		
					VZERO	Speed	Zero speed designation input		
					32	TVSEL	Total control	Control mode switching input	
					33	IPG	Position	Pulse prohibition input	
				VSEL1		Speed	Internally set speed selection 1		

*1. Functions are changed by using **Control Mode Selection** (Pn02). It operates as the Deviation Counter Reset Input (ECRST), at the default setting 2: *Advanced Position Control* or 0: *High-response Position Control*. When you set 1: *Internally Set Speed Control*, it operates as the Internally Set Speed Selection 2 (VSEL2).

*2. Functions are changed by using **Zero Speed Designation/Torque Limit Switch** (Pn06).

- At the default setting 1: *Zero Speed Designation Input (VZERO) Enabled*, it operates as the Zero Speed Designation (VZERO) when you set 1: *Internally Set Speed Control* at **Control Mode Selection** (Pn02). It operates as the Gain Switch (GSEL), at the default setting 2: *Advanced Position Control* or 0: *High-response Position Control* of **Control Mode Selection** (Pn02).
- When you set 0: *Disabled*, the Zero Speed Designation (VZERO) function is disabled; however, at the default setting 2: *Advanced Position Control* or 0: *High-response Position Control* of **Control Mode Selection** (Pn02), it operates as the Gain Switch (GSEL).
- When you set 2: *Torque Limit Switch Input (TLSEL) Enabled*, it will always operate as the Torque Limit Switch Input (TLSEL) regardless of the setting of **Control Mode Selection** (Pn02).

*3. Functions are changed by using **Control Mode Selection** (Pn02). It operates as the Electronic Gear Switch (GESEL), at the default setting 2: *Advanced Position Control* or 0: *High-response Position Control*. When you set 1: *Internally Set Speed Control*, it operates as the Internally Set Speed Selection 1 (VSEL1).

[Electrical specifications]

- In both the SS2 and the G5 series
 - 12 to 24-VDC power supply input: 12 VDC-5% to 24 VDC+5%
 - Control input: ON level: 10 V or more, OFF level: 3 V or less (input current: 10 mA max.)

● Control output

A common terminal for the four control outputs of the SS2 series is the output ground common (13 pin).
For the G5 series, be careful to install wiring because a common terminal is for each control output.

SS2 series					G5 series				
Terminal	No.	Symbol	Control mode	Name	Terminal	No.	Symbol	Control mode	Name
CN1	9	/ALM	Total control	Alarm Output	CN1	37	/ALM	Total control	Servo alarm
	10	INP	Position	Positioning Completed Output*1		36	ALMCOM		
						TGON	Speed	Servomotor Rotation Speed Detection Output*1	39
	11	BKIR	Total control	Brake Interlock Output					38
						12	WARN	Total control	Warning Output*2
	13	OGND	-	Output Ground Common					
10						BKIRCOM	Total control	Servo ready completed*5	
35	READY	Total control							
34	READYCOM								

*1. Functions are changed by using **Control Mode Selection** (Pn02). It operates as the Positioning Completed Output (INP), at the default setting 2: *Advanced Position Control* or 0: *High-response Position Control*. When you set 1: *Internally Set Speed Control*, it operates as the Servomotor Rotation Speed Detection Output (TGON).

*2. Set a function to output by using **Warning Output Selection** (Pn09). The default setting is 2: *Output for regeneration, overload, or fan rotation speed alarm warning*.

*3. Set a function to output by using **Output Signal Selection 4** (Pn413). The default setting is *Positioning completion output 1/Motor rotation speed detection output*.

*4. Set a function to output by using **Output Signal Selection 1** (Pn410). The default setting is *Brake interlock output*.

*5. Set a function to output by using **Output Signal Selection 2** (Pn411). The default setting is *Servo ready completed*.

[Electrical specifications]

- In both the SS2 and the G5 series
 - Control output: Maximum service voltage: 30 VDC, Maximum output current: 50 mA

● Encoder output

Wire encoder outputs, e.g. when you convey the encoder information to the host controller.

SS2 series				G5 series			
Terminal	No.	Symbol	Name	Terminal	No.	Symbol	Name
CN1	15	+A	Encoder Phase-A + Output	CN1	21	+A	Encoder phase A +output
	16	-A	Encoder Phase-A - Output		22	-A	Encoder phase A -output
	18	+B	Encoder Phase-B + Output		49	+B	Encoder phase B +output
	17	-B	Encoder Phase-B - Output		48	-B	Encoder phase B -output
	19	+Z	Encoder Phase-Z + Output		23	+Z	Encoder phase Z +output
	20	-Z	Encoder Phase-Z - Output		24	-Z	Encoder phase Z -output
	21	Z	Phase-Z Output*1		19	Z	Encoder phase-Z output*1
	14	GND	(Open collector output)		25	ZGND	(Open collector output)

*1. The common terminals (GND/ZGND) of Phase-Z Output (Z) and Encoder phase-Z output (Z) are the grounds common to all encoder outputs.

[Electrical specifications]

- In both the SS2 and the G5 series
 - Encoder phase-A/B/Z output: Line driver AM26C31 or equivalent
 - Open collector output: Maximum service voltage: 30 VDC, Maximum output current: 50 mA

■ Encoder connector

The SS2 series does not have any wiring of the backup battery for absolute (absolute value) encoder.

SS2 series				G5 series			
Terminal	No.	Symbol	Name	Terminal	No.	Symbol	Name
CN2	1	E5V	Encoder power supply +5 V	CN2	1	E5V	Encoder power supply +5 V
	2	E0V	Encoder power supply GND		2	E0V	Encoder power supply GND
	3	-	Do not connect.		3	BAT+	Battery +
	4	-			4	BAT-	Battery -
	5	S+	Encoder + phase S input		5	PS+	Encoder + phase S input
	6	S-	Encoder - phase S input		6	PS-	Encoder - phase S input
Case	FG	Shield ground	Shell	FG	Frame ground		

■ Communications-related connector

The G5 series does not support the RS-232 communications and Parameter Unit functions of the SS2 series. For the G5 series, parameters can be set from CX-Drive (computer tool) via USB communications.

SS2 series				G5 series			
Terminal	No.	Symbol	Name	Terminal	No.	Symbol	Name
CN3	3	TXD	RS-232 send data	CN7	1	VBUS	USB signal terminal
	4	GND	Ground		2	D-	
	5	RXD	RS-232 receive data		3	D+	
			4		-	Do not connect.	
			5		GND	Signal ground	

■ Analog monitor output terminal and connector

For the G5 series, you can check the Servo Drive status by using analog outputs.

SS2 series				G5 series			
Terminal	No.	Symbol	Name	Terminal	No.	Symbol	Name
				CN5	1	AM1	Analog monitor output 1
					2	AM2	Analog monitor output 2
					3	GND	Analog monitor ground
					4	-	Do not connect.
					5	-	
					6	-	

[Electrical specifications]

- G5 series:

- Analog monitor output 1: Set by using **Analog Monitor 1 Selection** (Pn416) and **Analog Monitor 1 Scale Setting** (Pn417).
- Analog monitor output 2: Set by using **Analog Monitor 2 Selection** (Pn418) and **Analog Monitor 2 Scale Setting** (Pn419).

■ Safety connector

The G5 series supports the Safe Torque OFF (STO) function of the safety standards.

At the time of replacement from the SS2 series, consider this function if you also wish to improve safety in the device.

SS2 series				G5 series			
Terminal	No.	Symbol	Name	Terminal	No.	Symbol	Name
				CN8	1	-	Do not connect.
					2	-	
					3	SF1-	Safety input 1
					4	SF1+	
					5	SF2-	Safety input 2
					6	SF2+	
					7	EDM-	EDM output
					8	EDM+	
				Shell	FG	Frame ground	

[Electrical specifications]

- G5 series
 - Safety Input External Power Supply: 12 VDC-5% to 24 VDC+5%
 - Safety input: ON level: 10 V or more, OFF level: 3 V or less
 - EDM output: Maximum service voltage: 30 VDC, Maximum output current: 50 mA

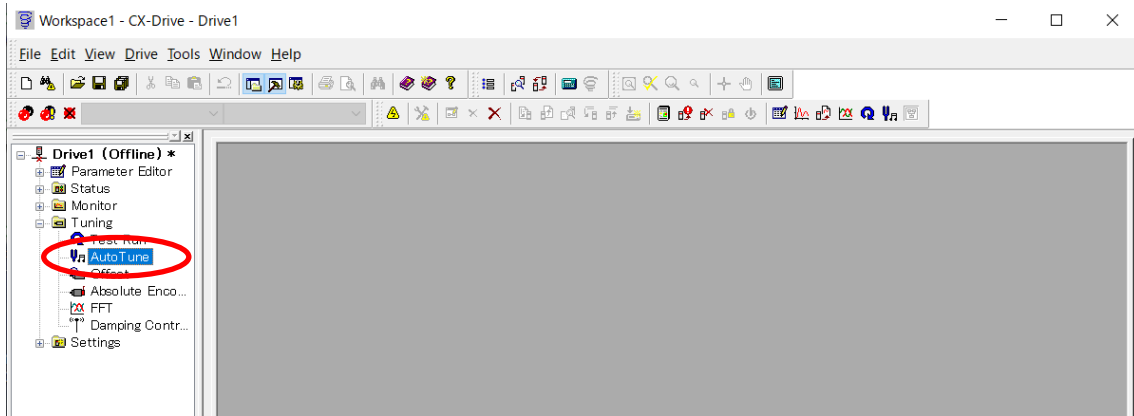
7. Gain Adjustment Methods

7.1. Gain Adjustment Method (Auto Tuning)

Using CX-Drive (computer tool) allows auto tuning of the G5 series to be executed. Auto tuning of the G5 series is described below, so execute auto tuning of the replaced device.

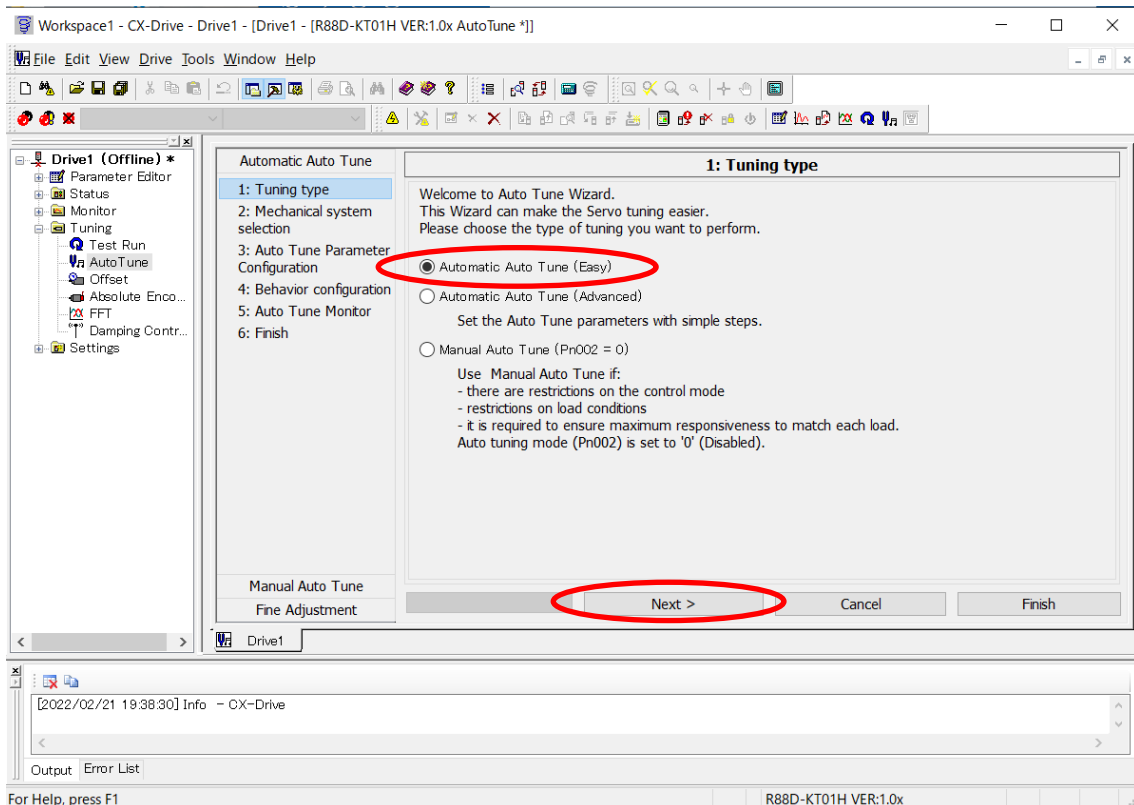
■ Starting *Auto Tune Wizard of G5 series*

Double-click Auto Tune from the tuning function in the workspace of CX-Drive (computer tool) to start the auto tuning wizard.



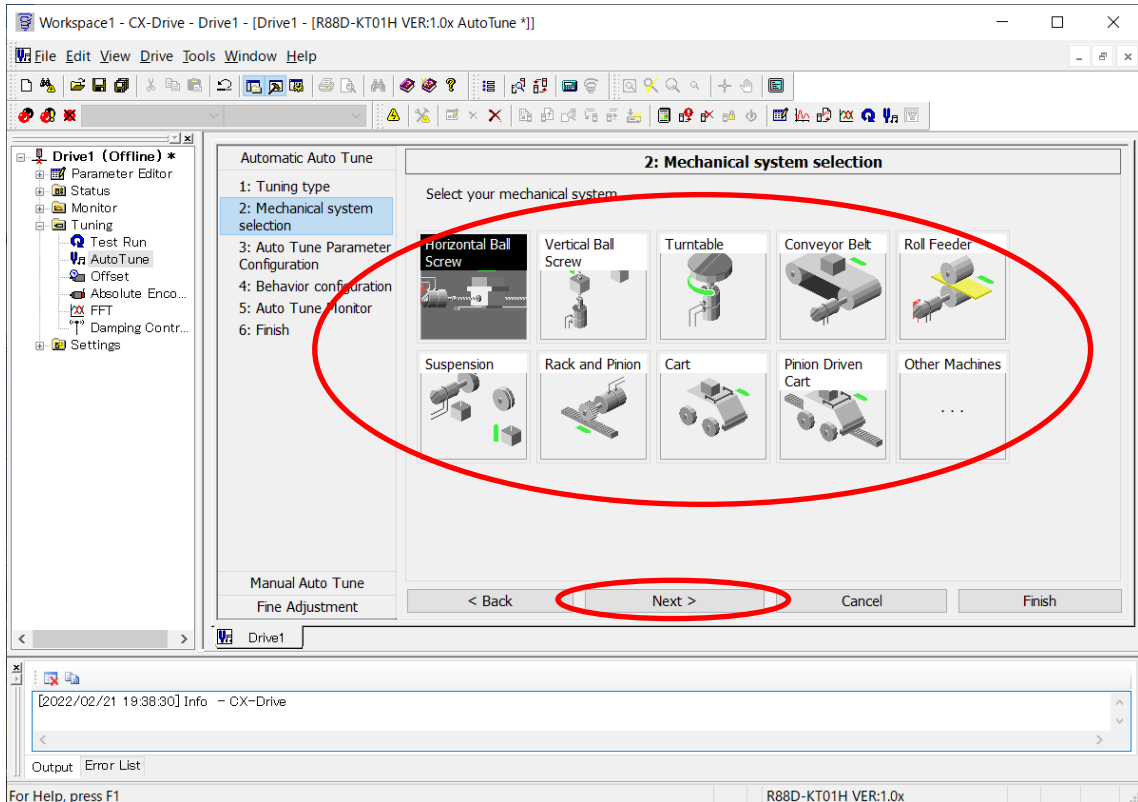
■ Selecting *1: Tuning Type of G5 series*

When the auto tuning wizard is started, *1: Tuning Type* is displayed, then select one of the three tuning modes. Choose *Automatic Auto Tune (Easy)*, and click *Next*.



■ 2: Mechanical system selection of G5 series

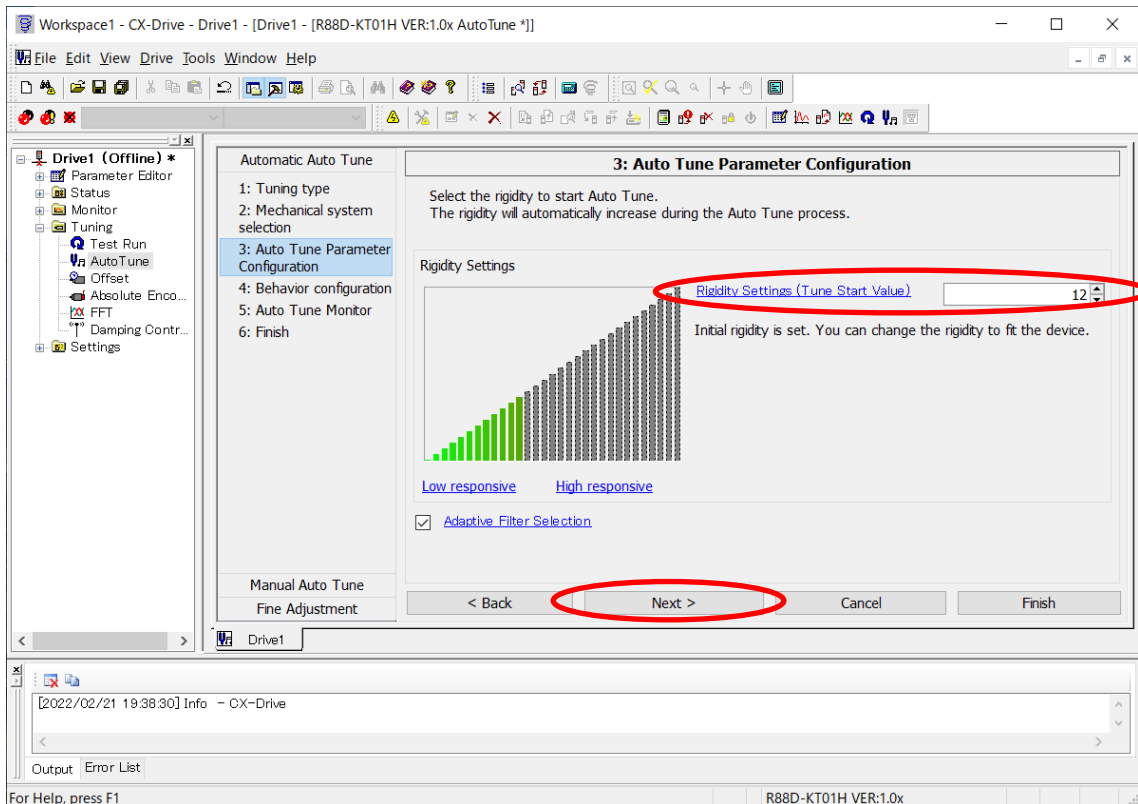
Select a machine configuration of the motor to execute auto tuning for, and click *Next*.



■ 3: Auto Tune Parameter Configuration of G5 series

Set the machine rigidity of the motor to execute auto tuning for.

When the coupling rigidity from the motor shaft to the load end is high and low, increase and decrease the value respectively. If you cannot judge that, set a default value of the selected machine configuration (12 in the following example), and click *Next*.



■ 4: Behavior configuration of G5 series

Fill in the Auto Tune Configuration, Motion Profile Generator, and Criteria for finishing Auto Tune fields of auto tuning, and click *Next*.

- Auto Tune Configuration
 - Set the number of times in Number of tuning iterations.
 - Set the time of one tuning in Duration of a tuning iteration.
 - * Start tuning with default values; if the tuning was inadequate, set enough number and time.
- Motion Profile Generator
 - Select one of the following two commands for operation to execute auto tuning.
 - The Motion Controller will perform the motion profile: Issues commands from the drive controlling controller to execute auto tuning.
 - CX-Drive (and not the motion controller) will perform the motion profile: The operation is commanded by CX-Drive.
 - * As the JOG commands of CX-Drive, set Operation (operation method), Step distance, Step Jog Speed, and Acceleration/Deceleration Time of the motor.
- Criteria for finishing Auto Tune

Set the positioning stabilization time when auto tuning is completed.

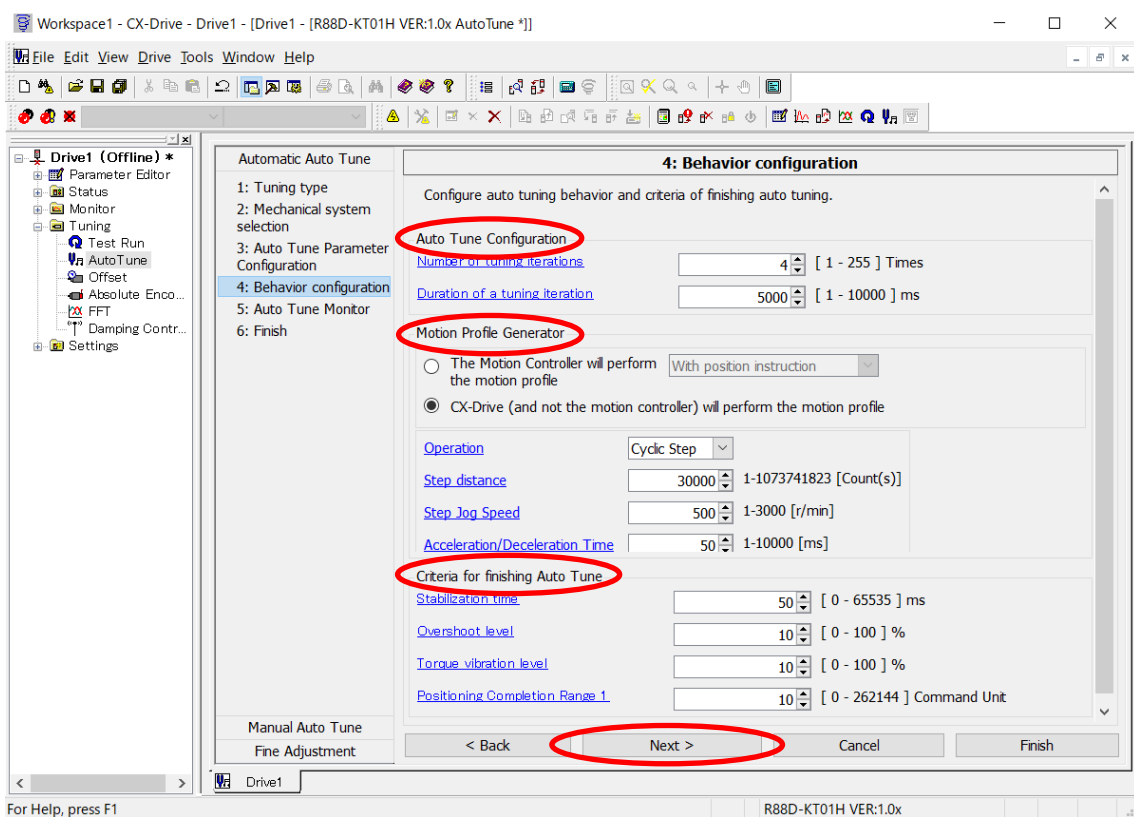
As the conditions for that motion, set *Overshoot level*, *Torque vibration level*, and *Positioning Completion Range 1*.

* Auto tuning may not be completed depending on the setting of *Stabilization time* or *Positioning Completion Range 1*. In that case, increase one of the settings, and execute it again.

* Auto tuning may not be completed if *Overshoot level* is set too low.

* Detecting a vibration of *Torque vibration level* results in a stop. In that case, increase the setting, and execute it again. Alternatively, enable adaptive filters, or read vibration frequencies from torque waveforms and set these frequencies to notch filters to reduce the gains of vibration generating frequencies, and then execute it again.

G5 series			Remarks
Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn200	Adaptive Filter Selection	0	To enable adaptive filters, set 2: <u>Two adaptive filters enabled (3rd and 4th notch filters used)</u> . To use notch filters, set vibrating frequencies to Notch 1 Frequency Setting/Notch 2 Frequency Setting (Pn201/Pn204) .
Pn201	Notch 1 Frequency Setting	5,000 Hz	
Pn204	Notch 2 Frequency Setting		

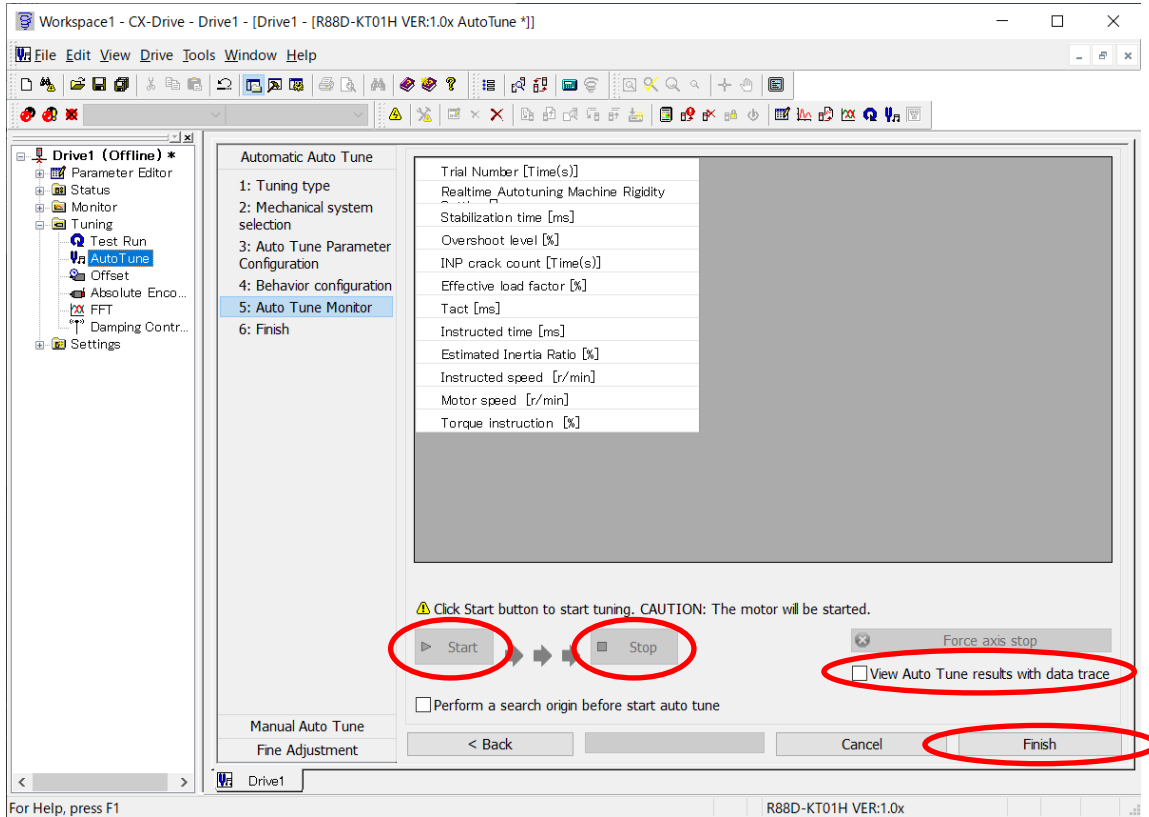


■ 5: Auto Tune Monitor of G5 series

Pressing the *Start* button starts auto tuning. To abort auto tuning, press the *Stop* button.

To check operation waveforms after auto tuning is completed, put a check mark in *View Auto Tune results with data trace*, and then start auto tuning.

When auto tuning is completed, click *Finish*.



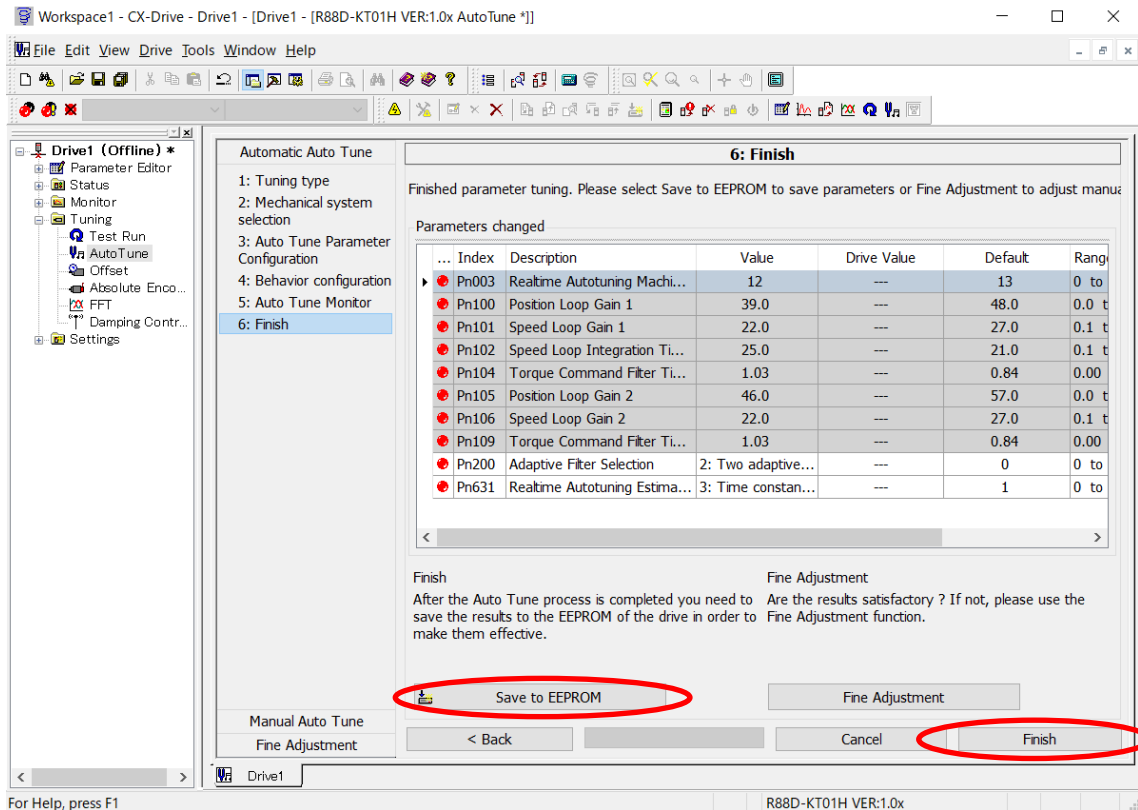
* If you perform auto tuning with rapid acceleration/deceleration applied to operation commands, Error counter overflow (Alarm No. 24) may be detected.

In that case, increase the set value of **Error Counter Overflow Level** (Pn014) temporarily, and execute auto tuning again. After auto tuning is finished, put the **Error Counter Overflow Level** (Pn014) setting back to the original set value, or set it to a proper value again.

G5 series			Remarks
Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn014	Error Counter Overflow Level	100,000 Command unit	Set the detection level of Error counter overflow (Alarm No. 24). For the G5 series, the command unit (command pulse unit) is used in setting. * The setting unit of the G5 series can be changed to 1: <i>Encoder units (external scale units)</i> by using Position Setting Unit Selection (Pn520).

6: Finish of G5 series

A list of parameter values set as the results of auto tuning is displayed. Check the tuning results of the parameters. For the G5 series, the auto tuning results of gain-related parameters are saved automatically to the non-volatile memory of the drive; however, click *Save to EEPROM* so as to save all the related parameters to the non-volatile memory. Clicking *Finish* will finish the auto tuning wizard.



7.2. Using Gain Adjustment Values for SS2 Series as Those for G5 Series

It is possible to modify the gain adjustment values for SS2 series that had been used, so as to use them as those for G5 series.

The following table shows the four basic parameters related to gain adjustment.

According to *SS2 to G5 settings*, modify the gain adjustment values for SS2 series into those for G5 series.

* The G5 series has higher control performance, so it provides higher-speed and higher-precision operation as compared with the SS2 series.

If possible, you are recommended to use the auto tuning function to set them again, after replacement with the G5 series.

SS2 series			G5 series			SS2 to G5 settings
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn10	Position Loop Gain	40 s ⁻¹	Pn100	Position Loop Gain	48.0/32.0 s ⁻¹ *1	Set the proportional gain of position control. In setting, pay attention to the units, 1 s ⁻¹ for the SS2 series and 0.1 s ⁻¹ for the G5 series.
Pn11	Speed Loop Gain	60 Hz	Pn101	Speed Loop Gain	27.0/18.0 Hz*1	Set the proportional gain of speed control. In setting, pay attention to the units, 1 Hz for the SS2 series and 0.1 Hz for the G5 series.
Pn12	Speed Loop Integration Time Constant	20 ms	Pn102	Speed Loop Integral Time Constant	21.0/31.0 ms*1	Set the integration time constant of speed control. In setting, pay attention to the units, 1 ms for the SS2 series and 0.1 ms for the G5 series.
Pn14	Torque Command Filter Time Constant	1.00 ms	Pn104	Torque Command Filter Time Constant	0.84/1.26 ms*1	Set the torque command filter time constant of torque control. Set the value as it is, because the unit remains unchanged.

*1. For the numerical notation sv/SV, sv represents the setting for less than 1 kW drives of 100 V or 200 V type, and SV represents the setting for other drives.

8. Connecting with Host Controllers

The SS2 series is connected to the host controller of pulse output type, such as the Position Control Unit (for CJ series) CJ1W-NC□□3.

When the SS2 series is replaced with the G5 series, there will be a difference in the encoder resolution of the motor; therefore, if it is made to operate in the G5 series after replacement, positioning will be carried out differently.

As shown below, use the electronic gear functions to correct the encoder resolution.

The following settings will remove the influence on the host controller side and allow you to use the settings and programs of the host controller without having to change them.

SS2 series			G5 series		
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]
Pn46	Electronic Gear Ratio Numerator 1	10,000	Pn008	Electronic Gear Integer Setting	10,000
Pn47	Electronic Gear Ratio Numerator 2	10,000	Pn009	Electronic Gear Ratio Numerator 1	0
Pn4A	Electronic Gear Ratio Numerator Exponent	0	Pn500	Electronic Gear Ratio Numerator 2	0
Pn4B	Electronic Gear Ratio Denominator	2,500	-	-	-
			Pn010	Electronic Gear Ratio Denominator	10,000

■ When electronic gear functions (Pn46/Pn47/Pn4A/Pn4B) of SS2 series are default settings

The default setting of the SS2 series is 2,500 input pulses for one motor rotation.

Set 2,500 pulses to **Electronic Gear Integer Setting** (Pn008) of the G5 series.

■ When Electronic Gear Ratio Numerator 1/2 (Pn46/Pn47) of SS2 series is 10,000 and when Electronic Gear Ratio Numerator Exponent (Pn4A) is 0

Set the value that is set in **Electronic Gear Ratio Denominator** (Pn4B) of SS2 series, to **Electronic Gear Integer Setting** (Pn008) of G5 series.

• SS2 series electronic gear functions

When **Electronic Gear Ratio Numerator 1/2** (Pn46/Pn47) of SS2 series is 10,000 and when **Electronic Gear Ratio Numerator Exponent** (Pn4A) is 0, the encoder resolution of the motor of the SS2 series is set.

Therefore, the motor is rotated once by the input pulse setting of **Electronic Gear Ratio Denominator** (Pn4B).

• G5 series electronic gear functions

The motor is rotated once by the input pulse setting of **Electronic Gear Integer Setting** (Pn008).

■ When Electronic Gear Ratio Numerator 1/2 (Pn46/Pn47) of SS2 series is ≠ 10,000 or when Electronic Gear Ratio Numerator Exponent (Pn4A) is ≠ 0

When **Electronic Gear Ratio Numerator 1/2** (Pn46/Pn47) of SS2 series is ≠ 10,000 or when **Electronic Gear Ratio Numerator Exponent** (Pn4A) is ≠ 0, set the values in which a difference in the encoder resolution of the motor is reflected. Set the following values to the electronic gear functions (Pn008/Pn009/Pn500/Pn010) of the G5 series.

If the following calculation result has exceeded the parameter setting range, reduce fractions to a common denominator to convert the value into a smaller one before setting it.

• **Electronic Gear Integer Setting** (Pn008) = 0

• **Electronic Gear Ratio Numerator 1/2** (Pn009/Pn500)

= **Electronic Gear Ratio Numerator 1/2** (Pn46/Pn47) of SS2 series × 2 ^{Electronic Gear Ratio Numerator Exponent (Pn4A) of SS2 series} × 1,048,576

• **Electronic Gear Ratio Denominator** (Pn010) = **Electronic Gear Ratio Denominator** (Pn4B) of SS2 series × 10,000

9. Detailed Comparison of Parameters

9.1. Function Selection Parameters

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn00	Unit No. Setting	1	Pn531	Axis Number	1	Set the Unit No. <ul style="list-style-type: none"> For the SS2 series, set the Unit No. to be displayed on the Parameter Unit. For the G5 series, it is an axis number setting for USB communications. Normally, do not change the set value. * The G5 series does not have an operator unit.
Pn01	Default Display	1	Pn528	Default Display	1	Set the first data to be displayed on the 7-segment LED display after the power supply is turned ON. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 1: Servomotor rotation speed.
Pn02	Control Mode Selection	2	Pn001	Control Mode Selection	0	Set the control mode to use. <ul style="list-style-type: none"> The default setting of the SS2 series is 2: <i>Advanced Position Control</i>. The default setting of the G5 series is 0: <i>Position control (pulse train command)</i>, which is a function equivalent to or higher than that of the SS2 series. * To use the internally set speed control in the G5 series, set 1: <i>Speed control (analog command)</i> to Control Mode Selection (Pn001), and set 3: <i>No. 1 Internally Set Speed to No. 8 Internally Set Speed (Pn304 to Pn311)</i> to Command Speed Selection (Pn300).
			Pn300	Command Speed Selection	0	
Pn03	Not used.	-	-	-	-	-
Pn04	Drive Prohibit Input Selection	1	Pn504	Drive Prohibition Input Selection	1	Set whether to enable or disable the drive prohibition function. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 1: <u>Disabled</u>.
Pn05	Not used.	-	-	-	-	-
Pn06	Zero Speed Designation/Torque Limit Switch	1	Pn402	Input Signal Selection 3	0091910A hex	Select a function to set to the Gain Switch Input (GSEL) input signal (CN1-5 pin) of the SS2 series. <ul style="list-style-type: none"> The default setting of the SS2 series is 1: For <u>position control: Gain Switch Input (GSEL)</u>, For <u>speed control: Zero Speed Designation Input (VZERO)</u>. * When you set 2: <i>Torque Limit Switch Input (TLSEL)</i>, it will always operate as the Torque Limit Switch Input (TLSEL). For the G5 series, use the general-purpose inputs 3 and 4 for setting. The default setting of Input Signal Selection 3 (Pn402) is 0091910A hex: For <u>position control: Damping Filter Switching 1 (DFSEL1)</u>, For <u>speed control or torque control: Zero Speed Designation (VZERO)</u>. The default setting of Input Signal Selection 4 (Pn403) is 00060606 hex: For <u>position control, speed control, or torque control: Gain Switch Input (GSEL)</u>. * If you set 00090909 hex: <u>Torque Limit Switch Input (TLSEL)</u> to the general-purpose input 3 or 4, it will always operate as the Torque Limit Switch Input (TLSEL).
			Pn403	Input Signal Selection 4	00060606 hex	
Pn07	Not used.	-	-	-	-	-
Pn08	Not used.	-	-	-	-	-

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn09	Warning Output Selection	2	Pn411	Output Signal Selection 2	00020202 hex	<p>Select a function to set to the Warning Output (WARN) output signal (CN1-12, 13 pins) of the SS2 series.</p> <ul style="list-style-type: none"> The default setting of the SS2 series is 2: <i>Output for regeneration, overload, or fan rotation speed alarm warning.</i> For the G5 series, use the general-purpose output 2 for setting. The default setting of Output Signal Selection 2 (Pn411) is <u>00020202 hex: Servo Ready Completed Output (READY).</u> <p>* If you set the <u>00090909 hex: Warning Output 1 (WARN),</u> it will function the same as the Warning Output (WARN) of the SS2.</p>
Pn0A to Pn0F	Not used.	-	-	-	-	-

9.2. Parameters Related to Gain

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn10	Position Loop Gain	40 s ⁻¹	Pn100	Position Loop Gain	48.0/32.0 s ^{-1*1}	Set the proportional gain of position control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. In setting, pay attention to the units, 1 s⁻¹ and 0.1 s⁻¹.
Pn11	Speed Loop Gain	60 Hz	Pn101	Speed Loop Gain	27.0/18.0 Hz*1	Set the proportional gain of speed control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. In setting, pay attention to the units, 1 Hz and 0.1 Hz.
Pn12	Speed Loop Integration Time Constant	20 ms	Pn102	Speed Loop Integral Time Constant	21.0/31.0 ms*1	Set the integration time constant of speed control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. In setting, pay attention to the units, 1 ms and 0.1 ms.
Pn13	Speed Feedback Filter Time Constant	0	Pn103	Speed Feedback Filter Time Constant	0	Set the filter time constant in the speed detection section. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0 (<i>high responsiveness</i>). In both the SS2 and the G5 series, increasing the set value can suppress vibration but will reduce responsiveness.
Pn14	Torque Command Filter Time Constant	1.00 ms	Pn104	Torque Command Filter Time Constant	0.84/1.26 ms*1	Set the torque command filter time constant of torque control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.
Pn15	Feed-forward Amount	30.0 %	Pn110	Speed Feed-forward Amount	30.0 %	Set the feed-forward amount to be transmitted from position control to speed control. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 30%.
Pn16	Feed-forward Command Filter	1.00 ms	Pn111	Speed Feed-forward Command Filter	0.50 ms	Set the filter time constant in the feed-forward section to be transmitted from position control to speed control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.
Pn17	Not used.	-	-	-	-	-
Pn18	Position Loop Gain 2	20 s ⁻¹	Pn105	Position Loop Gain 2	57.0/38.0 s ^{-1*1}	Set the proportional gain of position control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. In setting, pay attention to the units, 1 s⁻¹ and 0.1 s⁻¹.
Pn19	Speed Loop Gain 2	80 Hz	Pn106	Speed Loop Gain 2	27.0/18.0 Hz*1	Set the proportional gain of speed control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. In setting, pay attention to the units, 1 Hz and 0.1 Hz.
Pn1A	Speed Loop Integration Time Constant 2	50 ms	Pn107	Speed Loop Integral Time Constant 2	1,000.0 ms	Set the integration time constant of speed control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. In setting, pay attention to the units, 1 ms and 0.1 ms.
Pn1B	Speed Feedback Filter Time Constant 2	0	Pn108	Speed Feedback Filter Time Constant 2	0	Set the filter time constant in the speed detection section. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0 (<i>high responsiveness</i>).
Pn1C	Torque Command Filter Time Constant 2	1.00 ms	Pn109	Torque Command Filter Time Constant 2	0.84/1.26 ms*1	Set the torque command filter time constant of torque control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.

*1. For the numerical notation sv/SV, sv represents the setting for less than 1 kW drives of 100 V or 200 V type, and SV represents the setting for other drives.

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn1D	Notch Filter 1 Frequency	1,500 Hz	Pn201	Notch 1 Frequency Setting	5,000 Hz	Set the frequency of the 1st resonance suppression notch filter. <ul style="list-style-type: none"> For the default setting of the SS2 series, the notch function is disabled at 1,500 Hz. For the default setting of the G5 series, the notch function is disabled at 5,000 Hz.
Pn1E	Notch Filter 1 Width	2	Pn202	Notch 1 Width Setting	2	Set the width of the 1st resonance suppression notch filter. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 2. In both the SS2 and the G5 series, increasing the set value will obtain a larger width. * For the G5 series, the notch filter depth can be set to Notch 1 Depth Setting (Pn203).
			Pn203	Notch 1 Depth Setting	0	
Pn1F	Not used.	-	-	-	-	-
Pn20	Inertia Ratio	300 %	Pn004	Inertia Ratio	250 %	Set the ratio of load inertia to the motor rotor inertia in units of %. <ul style="list-style-type: none"> For the SS2 series, it is automatically set when you execute normal mode auto tuning. Or, it is automatically updated when you enable Realtime Autotuning Mode Selection (Pn21). For the G5 series, it is automatically updated when you enable Realtime Autotuning Mode Selection (Pn002).
Pn21	Realtime Autotuning Mode Selection	0	Pn002	Realtime Autotuning Mode Selection	1	Set the functional operation that estimates the load condition in real time and corrects the control constant. <ul style="list-style-type: none"> The default setting of the SS2 series is <u>0: Disabled</u>. The default setting of the G5 series is <u>1: This mode focuses on stability</u>. * In replacement, set it to <u>0: Disabled</u> like the SS2 series.
Pn22	Realtime Autotuning Machine Rigidity Selection	2	Pn003	Realtime Autotuning Machine Rigidity Setting	13/11*1	Set the rigidity of equipment for real-time auto tuning. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. Adjust the setting according to the rigidity of equipment.
Pn23	Not used.	-	-	-	-	-
Pn24	Not used.	-	-	-	-	-
Pn25	Autotuning Operation Setting	0	-	-	-	Set the operation pattern for normal mode auto tuning. <ul style="list-style-type: none"> The G5 series does not have the related parameter. * For the G5 series, execute the auto tuning with the operation pattern set, from CX-Drive (computer tool).
Pn26	Overrun Limit Setting	1.0 Rotation	Pn514	Overrun Limit Setting	1.0 Rotation	Set the allowable operating range for the position command input range. Going beyond the range causes an Overrun Limit Error (Alarm No. 34) to be detected. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is <u>1.0 rotation</u>.
Pn27	Not used.	-	-	-	-	-
Pn28	Not used.	-	-	-	-	-
Pn29	Not used.	-	-	-	-	-
Pn2A	Not used.	-	-	-	-	-
Pn2B	Vibration Frequency	0.0 Hz	Pn214	Damping Frequency 1	0.0 Hz	Damping control is a function that suppresses vibration at the load end. Set the damping frequency for the damping filter. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is <u>0.0 Hz</u> and the damping filter is disabled. * Setting 0.0 to 0.9 Hz disables the damping filter.

*1. For the numerical notation sv/SV, sv represents the setting for less than 1 kW drives of 100 V or 200 V type, and SV represents the setting for other drives.

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn2C	Vibration Filter Setting	0.0 Hz	Pn215	Damping Filter 1 Setting	0.0 Hz	Set the vibration suppression effect of the damping filter. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0.0 Hz. In both the SS2 and the G5 series, increasing the value will hasten the operation of vibration suppression. Decrease the value if torque saturation occurs to prevent vibration suppression.
Pn2D	Not used.	-	-	-	-	-
Pn2E	Not used.	-	-	-	-	-
Pn2F	Adaptive Filter Table Number Display	0	Pn207	Notch 3 Frequency Setting	5,000 Hz	This is a monitor that checks the operating status of adaptive filters. <ul style="list-style-type: none"> For the SS2 series, you can check the operating frequencies of adaptive filters. For the G5 series, the operating status of adaptive filters is updated automatically to the parameters of Notch 3/4 Frequency Setting (Pn207/Pn210). For the default setting, the notch function is disabled at 5,000 Hz.
			Pn210	Notch 4 Frequency Setting	5,000 Hz	
Pn30	Gain Switching Input Operating Mode Selection	1	Pn114	Gain Switching Input Operating Mode Selection	1	Set the function of gain switching input (GSEL). <ul style="list-style-type: none"> The default setting of the SS2 series is 1: <i>The gain will be switched between gain 1 in (Pn10 to Pn14) and gain 2 (Pn18 to Pn1C).</i> The default setting of the G5 series is 1: <i>Gain 1 (Pn100 to Pn104)/gain 2 (Pn105 to Pn109) switching available.</i> <p>* When 0: <i>Gain 1 (PI/P switching enabled)</i> is set, speed control can be switched to proportional (P) control to reduce the gain.</p>
Pn31	Gain Switch Setting	0	Pn115	Switching Mode in Position Control	0	Select a condition for switching between Gain 1 and Gain 2. <ul style="list-style-type: none"> The default setting of the SS2 series is 0: <i>Always gain 1 (Pn10 to Pn14).</i> For the G5 series, position control and speed control can be configured differently. <ul style="list-style-type: none"> The default setting of Switching Mode in Position Control (Pn115) is 0: <i>Always Gain 1 (Pn100 to Pn104).</i> The default setting of Switching Mode in Speed Control (Pn120) is 0: <i>Always the Gain 1 (Pn100 to Pn104).</i>
			Pn120	Switching Mode in Speed Control	0	
Pn32	Gain Switch Time	30 x 166 us	Pn116	Gain Switching Delay Time in Position Control	5.0 ms	Set the delay time for returning from Gain 2 to Gain 1. <ul style="list-style-type: none"> The default setting of the SS2 series is 30 x 166 us (4,980 us). For the G5 series, position control and speed control can be configured differently. <ul style="list-style-type: none"> The default setting of Gain Switching Delay Time in Position Control (Pn116) is 5.0 ms. The default setting of Gain Switching Delay Time in Speed Control (Pn121) is 0.0 ms.
			Pn121	Gain Switching Delay Time in Speed Control	0.0 ms	

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn33	Gain Switch Level Setting	600	Pn117	Gain Switching Level in Position Control	50	<p>Set the judgment level for switching between Gain 1 and Gain 2.</p> <ul style="list-style-type: none"> The default setting of the SS2 series is <i>600</i>. * The unit varies with the set value of Gain Switch Setting (Pn31). For the G5 series, position control and speed control can be configured differently. <ul style="list-style-type: none"> The default setting of Gain Switching Level in Position Control (Pn117) is <i>50</i>. * The unit varies with the set value of Switching Mode in Position Control (Pn115). The default setting of Gain Switching Level in Speed Control (Pn122) is <i>0</i>. * The unit varies with the set value of Switching Mode in Speed Control (Pn120).
			Pn122	Gain Switching Level in Speed Control	0	
Pn34	Gain Switch Hysteresis Setting	50	Pn118	Gain Switching Hysteresis in Position Control	33	<p>Set a hysteresis to the judgment level for switching between Gain 1 and Gain 2.</p> <ul style="list-style-type: none"> The default setting of the SS2 series is <i>50</i>. * The unit varies with the set value of Gain Switch Setting (Pn31). For the G5 series, position control and speed control can be configured differently. <ul style="list-style-type: none"> The default setting of Gain Switching Hysteresis in Position Control (Pn118) is <i>33</i>. * The unit varies with the set value of Switching Mode in Position Control (Pn115). The default setting of Gain Switching Hysteresis in Speed Control (Pn123) is <i>0</i>. * The unit varies with the set value of Switching Mode in Speed Control (Pn120).
			Pn123	Gain Switching Hysteresis in Speed Control	0	
Pn35	Position Loop Gain Switching Time	20 x 166 us	Pn119	Position Gain Switching Time	3.3 ms	<p>In switching between gains, the phased switching time can be set for position loop gain only.</p> <ul style="list-style-type: none"> The default setting of the SS2 series is <i>20 x 166 us (3,320 us)</i>. The default setting of the G5 series is <i>3.3 ms</i>.
Pn36 to Pn3F	Not used.	-	-	-	-	-

9.3. Parameters Related to Position Control

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn40	Command Pulse Multiplying Setting	4	-	-	-	<p>Set the input pulse multiplication function when you set 0 or 2: 90° phase difference (phases A and B) signal inputs in Command Pulse Mode (Pn42).</p> <ul style="list-style-type: none"> The default setting of the SS2 series is 4: <i>Multiply the input pulses by 4.</i> The G5 series does not have the related parameter, but it always uses 4-fold input pulses for judgment. <p>* To use 2-fold or so ones, use Electronic Gear functions (Pn008 to Pn010) for adjustment.</p>
Pn41	Command Pulse Rotation Direction Switch	0	Pn006	Command Pulse Rotation Direction Switching Selection	0	<p>Set the motor rotation direction for command pulse inputs.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0: <u>The motor rotates in the direction specified by the command pulse.</u>
Pn42	Command Pulse Mode	1	Pn007	Command Pulse Mode Selection	1	<p>Set the input form of input command pulses.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 1: <u>Reverse pulse/forward pulse.</u>
Pn43	Not used.	-	-	-	-	-
Pn44	Encoder Dividing Rate Setting	2,500 pulses/rotation	Pn011	Encoder Dividing Numerator	2,500 pulses/rotation	<p>Set the number of encoder pulses per motor rotation to be output from the Servo Drive.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is <i>2,500 pulses/rotation.</i>
Pn45	Encoder Output Direction Switch	0	Pn012	Encoder Output Direction Switching Selection	0	<p>Set the logic of the encoder pulses to be output from the Servo Drive.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0: <u>Positive logic (Phase A advance in forward operation).</u>
Pn46	Electronic Gear Ratio Numerator 1	10,000	Pn008	Electronic Gear Integer Setting	10,000	<p>Set the electronic gear function.</p> <ul style="list-style-type: none"> The default setting of the SS2 series is <i>Pn46/Pn47 = 10,000, Pn4A = 0, Pn4B = 2,500</i>, meaning 2,500 input pulses for one motor rotation. The G5 series has two setting methods. <ul style="list-style-type: none"> Using Electronic Gear Integer Setting (Pn008) Use Electronic Gear Integer Setting (Pn008) to set the number of input pulses for one motor rotation. The default setting is <i>10,000</i>, meaning 10,000 input pulses for one motor rotation. If you set <i>2,500</i>, it will become the same as the default setting of the SS2. Using Electronic Gear Ratio Numerator 1/2 (Pn009/Pn500) and Electronic Gear Ratio Denominator (Pn010) When you set 0 to Electronic Gear Integer Setting (Pn008), the settings of Pn009, Pn500, and Pn010 will be enabled. If 0 is set to Electronic Gear Ratio Numerator 1/2 (Pn009/Pn500), the resolution of the motor in use will be set automatically to the electronic gear numerator. The G5 series does not have the Electronic Gear Ratio Numerator Exponent parameter.
Pn47	Electronic Gear Ratio Numerator 2	10,000	Pn009	Electronic Gear Ratio Numerator 1	0	
			Pn500	Electronic Gear Ratio Numerator 2	0	
Pn48	Not used.	-	-	-	-	
Pn49	Not used.	-	-	-	-	
Pn4A	Electronic Gear Ratio Numerator Exponent	0	-	-	-	
Pn4B	Electronic Gear Ratio Denominator	2,500	Pn010	Electronic Gear Ratio Denominator	10,000	
Pn4C	Position Command Filter Time Constant Setting	0	Pn222	Position Command Filter Time Constant	0.0 ms	<p>Set the first-order lag filter time constant in the command pulse input section.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is <i>0.0 ms</i>. Be careful in setting because the setting unit is different.
Pn4D	Not used.	0	-	-	-	-

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn4E	Smoothing Filter Setting	0	Pn223	Smoothing Filter Time Constant	0.0 ms	Set the FIR filter time constant of command pulses. <ul style="list-style-type: none"> • In both the SS2 and the G5 series, the default setting is <i>0.0 ms</i>. • Be careful in setting because the setting unit is different.
Pn4F	Not used.	0	-	-	-	-

9.4. Parameters Related to Internally Set Speed Control

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn50	Not used.	-	-	-	-	-
Pn51	Not used.	-	-	-	-	-
Pn52	Not used.	-	-	-	-	-
Pn53	No. 1 Internally Set Speed	100 r/min	Pn304	No. 1 Internally Set Speed	0 r/min	Set the speed to use in the internally set speed control. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.
Pn54	No. 2 Internally Set Speed	200 r/min	Pn305	No. 2 Internally Set Speed	0 r/min	
Pn55	No. 3 Internally Set Speed	300 r/min	Pn306	No. 3 Internally Set Speed	0 r/min	
Pn56	No. 4 Internally Set Speed	400 r/min	Pn307	No. 4 Internally Set Speed	0 r/min	
Pn57	Jog Speed	200 r/min	Pn308	No. 5 Internally Set Speed	0 r/min	
Pn58	Soft Start Acceleration Time	0 x 2 ms	Pn312	Soft Start Acceleration Time	0 ms	Set the acceleration/deceleration time to the speed command inside the Servo Drive and the internally set speed control. <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0 ms. In both the SS2 and the G5 series, set the acceleration/deceleration time of up to 1,000 r/min. Be careful in setting because the setting unit is different. * In both the SS2 and the G5 series, for position control, set 0 ms to the soft start acceleration/deceleration time.
Pn59	Soft Start Deceleration Time	0 x 2 ms	Pn313	Soft Start Deceleration Time	0 ms	
Pn5A	Not used.	-	-	-	-	-
Pn5B	Not used.	-	-	-	-	-
Pn5C	Not used.	-	-	-	-	-
Pn5D	Not used.	-	-	-	-	-
Pn5E	Torque Limit	300 %	Pn521	Torque Limit Selection	1	Set the limit value of torque limits in units of %, with the rated motor torque regarded as 100%. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series. The torque limit function of the SS2 series is enabled for both forward and reverse operation. For the G5 series, you can use the setting of Torque Limit Selection (Pn521) to set how to limit torque. The default selection of Torque Limit Selection (Pn521) is <u>1: No. 1 Torque Limit (Pn013) for both forward and reverse operation.</u>
			Pn013	No. 1 Torque Limit	500 %	
Pn5F	Not used.	-	-	-	-	-

9.5. Parameters Related to Sequence

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn60	Positioning Completion Range	25 Encoder unit	Pn431	Positioning Completion Range 1	10 Command unit	<p>Set the positioning completion range.</p> <ul style="list-style-type: none"> For the SS2 series, the encoder unit (multiple of 4) is used in setting. For the G5 series, the command unit (command pulse unit) is used in setting. <ul style="list-style-type: none"> * Be careful in setting because the setting unit and motor resolution are different between the SS2 and the G5 series. * For the SS2 series, the output turns ON when the position error reaches not more than Positioning Completion Range (Pn60). * For the G5 series, you can use Positioning Completion Condition Selection (Pn432) to set the output condition. The default setting is 0: <i>Positioning completion output (INP1) turns ON when the position error is within the Positioning Completion Range 1 (Pn431).</i> * The setting unit of the G5 series can be changed to 1: <i>Encoder units (external scale units)</i> by using Position Setting Unit Selection (Pn520).
			Pn432	Positioning Completion Condition Selection	0	
			Pn520	Position Setting Unit Selection	0	
Pn61	Zero Speed Detection	20 r/min	Pn434	Zero Speed Detection	50 r/min	<p>Set the rotation speed at which to output the zero speed detection output.</p> <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.
Pn62	Rotation Speed for Servomotor Rotation Detection	50 r/min	Pn436	Rotation Speed for Motor Rotation Detection	1,000 r/min	<p>Set the rotation speed at which to output the motor rotation speed detection output (TGON).</p> <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.
Pn63	Deviation Counter Overflow Level	100 x 256 Encoder unit	Pn014	Error Counter Overflow Level	100,000 Command unit	<p>Set the detection level of an Error Counter Overflow Error (Alarm No. 24).</p> <ul style="list-style-type: none"> For the SS2 series, the encoder unit (multiple of 4) is used in setting. For the G5 series, the command unit (command pulse unit) is used in setting. <ul style="list-style-type: none"> * Be careful in setting because the setting unit and motor resolution are different between the SS2 and the G5 series. * The setting unit of the G5 series can be changed to 1: <i>Encoder units (external scale units)</i> by using Position Setting Unit Selection (Pn520).
			Pn520	Position Setting Unit Selection	0	
Pn64	Deviation Counter Overflow Alarm Disabled	0	-	-	-	<p>The G5 series has no parameter of Deviation Counter Overflow Alarm Disabled. Increase the set value of Error Counter Overflow Level (Pn014) to avoid detection.</p>
Pn65	Not used.	-	-	-	-	-
Pn66	Stop Selection for Drive Prohibit Input	0	Pn505	Stop Selection for Drive Prohibition Input	0	<p>Set the stop method when the drive prohibition function is activated by the input of Forward/Reverse drive prohibition input (POT/NOT).</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0: <u>After a dynamic brake stop (error counter cleared), the torque command is 0 in the drive prohibition direction (error counter held).</u>
Pn67	Not used.	-	-	-	-	-
Pn68	Stop Selection at Alarm	0	Pn510	Stop Selection for Alarm Detection	0	<p>Set the stop method for alarm (error) occurrence.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0: <u>After a dynamic brake stop, the dynamic brake is held.</u>
Pn69	Stop Selection with Servo OFF	0	Pn506	Stop Selection with Servo OFF	0	<p>Set the stop method for servo OFF.</p> <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0: <u>After a dynamic brake stop, the dynamic brake is held.</u>

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn6A	Brake Timing When Stopped	10 x 2 ms	Pn437	Brake Timing when Stopped	0 ms	Set the servo ON hold time, at servo OFF, after the brake interlock output turned OFF. <ul style="list-style-type: none"> The default setting differs between SS2 and G5 series.
Pn6B	Brake Timing during Operation	50 x 2 ms	Pn438	Brake Timing During Operation	0 ms	Set the time spent waiting for the brake that reduces rotation to be applied when the Servo OFF is applied to the running motor. <ul style="list-style-type: none"> The default setting of the SS2 series is 50 x 2 ms (100 ms). * For the SS2 series, when the speed reaches 30 r/min or less, the brake will be applied even if the wait time set in Brake Timing during Operation (Pn6B) has not elapsed. The default setting of the G5 series is 0 ms. * For the G5 series, when the motor speed reaches not more than the speed set in Brake Release Speed Setting (Pn439), the brake will be applied even if the wait time set in Brake Timing During Operation (Pn438) has not elapsed.
			Pn439	Brake Release Speed Setting	30 r/min	
Pn6C	Regeneration Resistor Selection	0	Pn016	Regeneration Resistor Selection	3/0*2	Set the regeneration processing method. <ul style="list-style-type: none"> The default setting of the SS2 series is 0: <u>Built-in capacitor</u>. The default setting of the G5 series is 3: <u>Built-in capacitor</u>. * The default setting of the Servo Drive with a built-in regeneration resistor is 0: <u>Built-in regeneration resistor</u>.
Pn6D	Not used.	-	-	-	-	-
Pn6E	Not used.	-	-	-	-	-
Pn6F	Not used.	-	-	-	-	-
Pn70	Overspeed Detection Level Setting	0 r/min	Pn513	Overspeed Detection Level Setting	0 r/min	Set the detection level of an Overspeed error (Alarm No. 26). <ul style="list-style-type: none"> In both the SS2 and the G5 series, the default setting is 0 r/min. * In both the SS2 and the G5 series, if you set 0 r/min, it will be detected when the motor speed is 1.2 times as high as the maximum one.
Pn71	No. 2 Torque Limit	100 %	Pn521	Torque Limit Selection	1	When Torque Limit Switch Input (TLSEL) is enabled, set the No. 2 torque limit in units of %, with the rated motor torque regarded as 100%. <ul style="list-style-type: none"> For the SS2 series, it will be enabled when you set 2: <u>Torque Limit Switch Input (TLSEL) Enabled to Zero Speed Designation/Torque Limit Switch</u> (Pn06). No. 2 Torque Limit (Pn71) is enabled for forward and reverse operation when Torque Limit Switch Input (TLSEL) is used. For the G5 series, it will be enabled when you set 3: <u>No. 1 Torque Limit (Pn013) / No. 2 Torque Limit (Pn522) Switching to Torque Limit Selection</u> (Pn521). No. 2 Torque Limit (Pn522) is enabled for forward and reverse operation when Torque Limit Switch Input (TLSEL) is used.
			Pn522	No. 2 Torque Limit	500 %	
Pn72	No. 2 Deviation Counter Overflow Level	100 x 256 Command unit	Pn014	Error Counter Overflow Level	100,000 Command unit	When Torque Limit Switch Input (TLSEL) is enabled, set the Error Counter Overflow Error (Alarm No. 24) detection level limited by the No. 2 torque limit. <ul style="list-style-type: none"> * The G5 series has no parameter of No. 2 Deviation Counter Overflow Level. Use Error Counter Overflow Level (Pn014) together with the No. 1 torque limit.

*2. For the numerical notation sv/SV, sv represents the setting for the following drives. SV represents the setting for other drives.
• 100 V type: 200 W or less • 200 V type: 400 W or less, 7.5 kW, 15 kW • 400 V type: 7.5 kW, 15 kW

SS2 series			G5 series			Remarks
Parameter No. [hex]	Parameter name	Default setting [dec]	Parameter No. [dec]	Parameter name	Default setting [dec]	
Pn73	No. 2 Overspeed Detection Level	0 r/min	Pn513	Overspeed Detection Level Setting	0 r/min	When Torque Limit Switch Input (TLSEL) is enabled, set the Overspeed error (Alarm No. 26) detection level limited by the No. 2 torque limit. * The G5 series has no parameter of No. 2 Overspeed Detection Level . Use Overspeed Detection Level Setting (Pn513) together with the No. 1 torque limit.
Pn74 to Pn7F	Not used.	-	-	-	-	-

Appendix. List of Cables Connecting G5-series Servo Drives and Servomotors

Rated rotation speed	Main circuit power supply voltage	Motor capacity	Motor model R88M-	Power cable without brake R88A-		Power cable with brake R88A-		Encoder cable R88A-	
				Standard	Flexible	Standard	Flexible	Standard	Flexible
3,000 r/min	100 V	50 W	K05030H/T□	CAKA△S	CAKA△SR	CAKA△S, CAKA△B	CAKA△SR, CAKA△BR	CRKA△C *2	CRKA△CR *2
		100 W	K10030L/S□						
		200 W	K20030L/S□						
	200 V	50 W	K05030H/T□	CAKA△S	CAKA△SR	CAKA△S, CAKA△B	CAKA△SR, CAKA△BR		
		100 W	K10030H/T□						
		200 W	K20030H/T□						
		400 W	K40030H/T□						

*1. □ represents an optional specification for the motor. △ represents a 3-digit cable length (005 for 5 m).

*2. When you use an absolute (absolute value) encoder, use the battery cable for absolute encoder (R88A-CRGD0R3C) in addition.

Note: Do not use this document to operate the Unit.

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Cat. No. I879-E1-01

0422 (0422)