

SMARTSTEP 2 SERVO SYSTEM

A new step in servodrive simplicity



» Precise and cost-effective

» Ultra-compact design

» Simple to use and set up

SmartStep 2 - the right step forward...

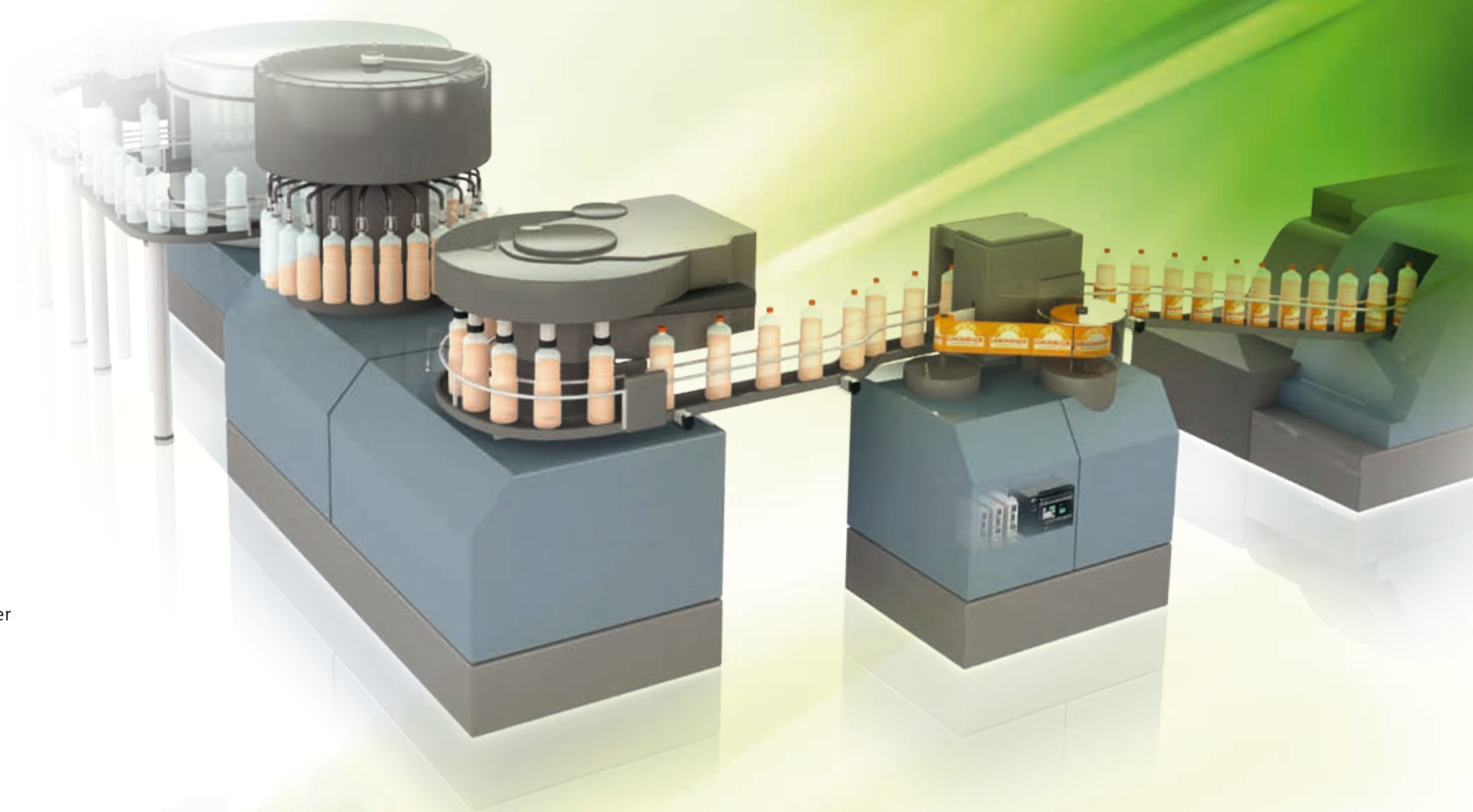
Omron knows that simplicity and precision are vital in your positioning application.

The new SmartStep offers an ideal solution for point-to-point motion applications where simplicity is essential. SmartStep2 keeps things simple whilst combining high performance in a cost-effective solution.

SmartStep2 has a completely new compact design that gives a 50% space saving compared with the previous model. It also has new features and functionality to help you to make your machines more efficient and cost-effective.

Features at a glance:

- Pulse control servo drive
- Ultra-compact size
- Auto-tuning
- Vibration suppression
- Adaptive resonance suppression filter
- Two programmable torque limits
- Feedback pulse output
- Power range from 50 W to 400 W
- Cylindrical and flat servo motors
- Electronic gear
- 10,000 steps per revolution

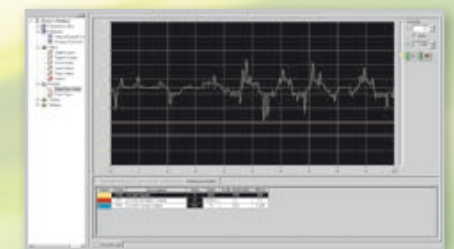


...to faster development with great drive simplicity

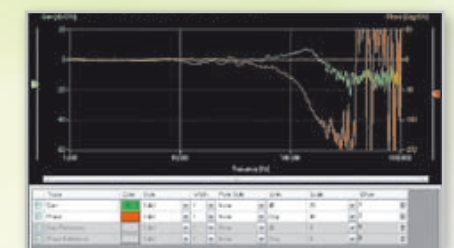
Getting started quickly

CX-Drive is a single, easy-to-use software tool for configuring, commissioning and maintaining both inverters and servos. SmartStep 2 is fully supported with a wide range of features making the servo drive set-up easier and faster than ever:

- Auto-tuning
- Parameter editing and monitoring
- Speed and position diagrams
- I/O status and alarms
- Real-time data trace



Real-time data trace



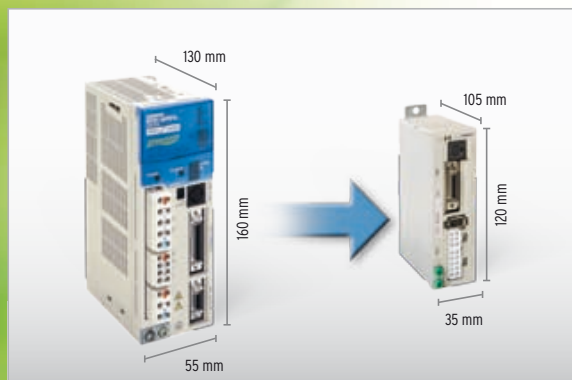
Frequency analysis

A compact design that's easy to connect

Although it has more functionality than previous models, SmartStep 2 has a compact design with an ultra-small footprint that saves considerable space. In addition, SmartStep 2 can be easily integrated with other automation devices such as the CP1L compact machine controller and NS operator terminals, helping to make an efficient and cost-effective machine design.

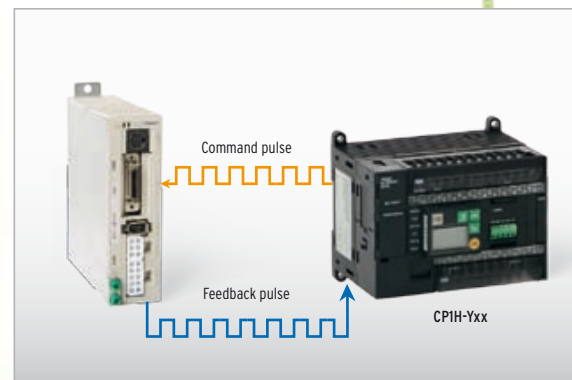
Additional features:

- Position control via pulse input 500 kpps
- Rated speed 4,000 rpm; peak 5,000 rpm
- Wide range of pulse configurations
- Four internal speed settings switched by external signal for easy control
- Servomotors compatible with SmartStep



Compact space-saving design

SmartStep 2 has a footprint 48% smaller than that of previous models and the volume is 39% smaller, saving cabinet space and costs.



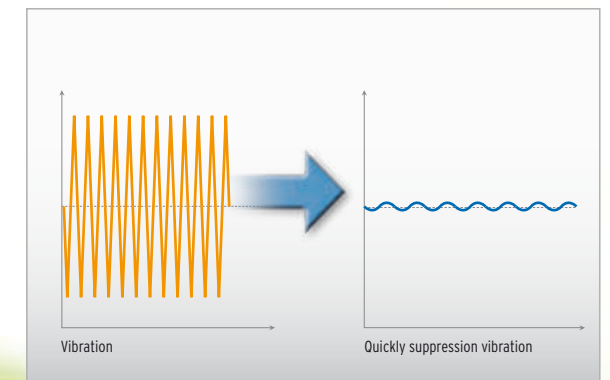
Feedback pulse output

Enables servo position feedback to the controller for close control position loop and monitor real positioning; it can be also used to synchronise with another axis.



Adjustment-free operation

Depending on load variations, the real-time auto-tuning function automatically calculates and adjusts the optimum gain values for the machine.



Vibration suppression

An adaptive filter ensures that resonant frequency changes are automatically followed to reduce the effect of vibration due to low mechanical rigidity. A further filter minimises vibration for better positioning when stopping the load.

R7D, R88M

SmartStep 2 servo system

Another step forward in drive simplicity

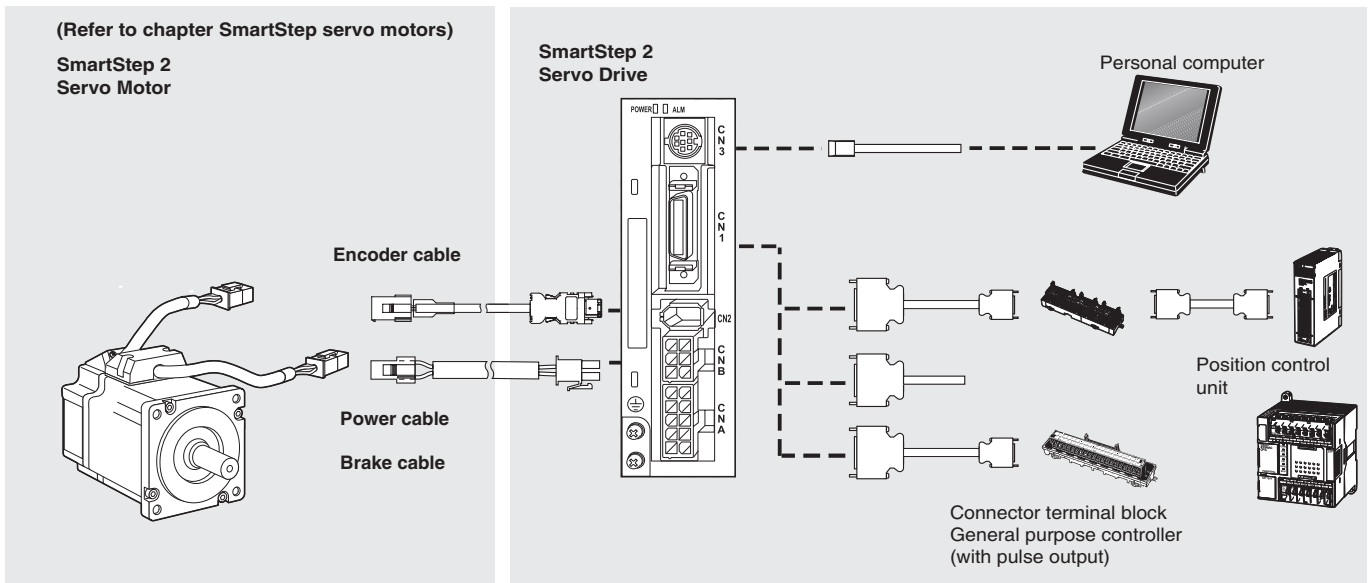
- Easy set up and on-line auto tuning
- The footprint is only 48% that of the SmartStep series
- Two torque limits
- Electronic gear, four internal speed settings and wide range of pulse settings
- Adaptive filters for suppression of vibration and resonance
- Configuration and commissioning with CX Drive- software

Ratings

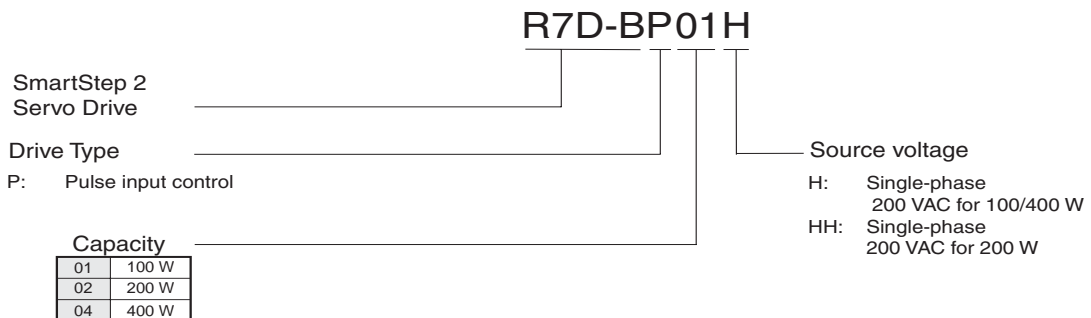
- 230 VAC single-phase 50 W to 400 W (0.16 to 1.3 Nm)



System configuration



Servo drive type designation



Servo drive specifications

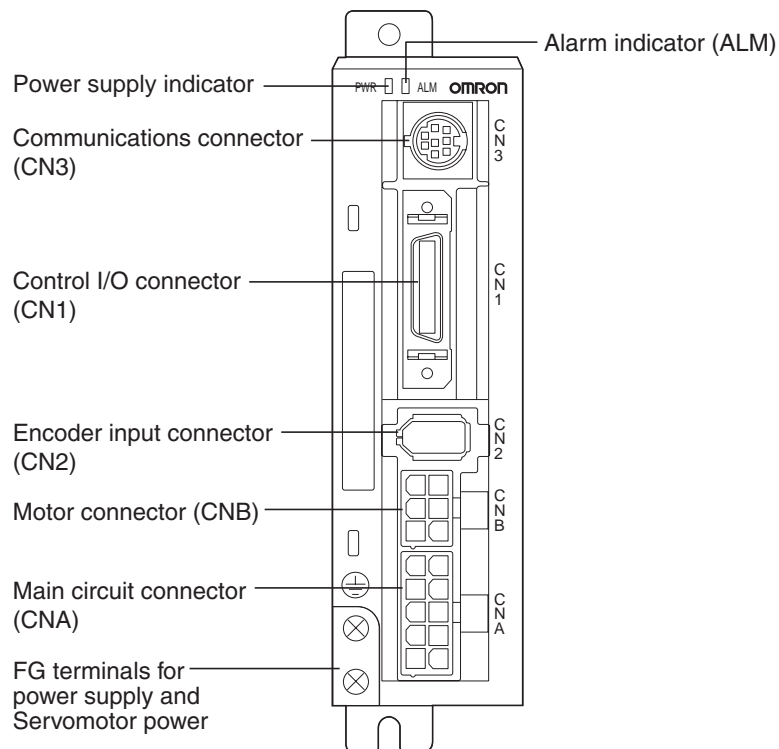
General specifications

Item	Specification
Ambient operating temperature	0 to 55°C
Ambient operating humidity	90% max. (with no condensation)
Ambient storage temperature	-20 to 65°C
Ambient storage humidity	90% max. (with no condensation)
Storage/operating atmosphere	No corrosive gases.
Vibration resistance	10 to 60 Hz; acceleration : 5.9 m/s ² (0.6G) max.
Impact resistance	Acceleration 19.6 m/s ² max., 3 times each in X, Y, and Z directions.
Insulation resistance	Between power supply/power line terminals and frame ground: 0.5 MΩ min. (at 500 VDC)
Dielectric strength	Between power supply/power terminals and frame ground: 1,500 VAC for 1 min at 50/60 Hz Between each control signal and frame ground: 500 VAC for 1 min
Protective structure	Built into panel (IP10).
International standards	Approval obtained for UL: UL 508C; cUL: cUL C22.2 No 14 Approval EC : EMC EN55011 class A Group 1, EN 61000-6-2, low voltage EN50178

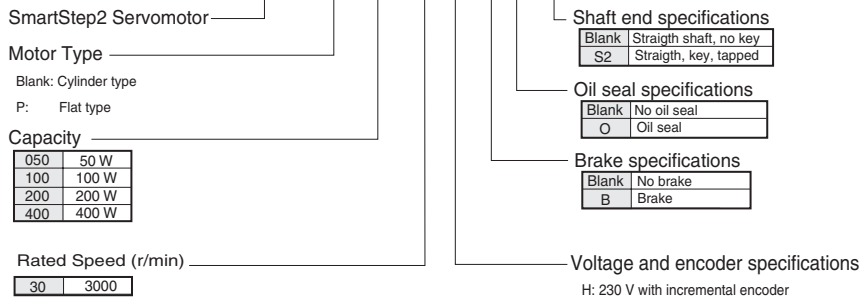
Performance specifications

Item	200 VAC input type		
	100 W	200 W	400 W
	R7D-BP01H	R7D-BP02HH	R7D-BP04H
Continuous output current (rms)	1.0 A	1.6 A	2.5 A
Momentary maximum output current (rms)	3.3 A	4.9 A	7.8 A
Main-circuit power supply	Single-phase 200 to 240 VAC (170 to 264 V), 50/60 Hz		
Control method	All-digital servo		
Speed feedback	10,000 pulses/revolution incremental encoder		
Inverter method	PWM method based on IGBT		
PWM frequency	12 kHz		6 kHz
Weight	0.35 kg	0.42 kg	0.42 kg
Compatible motor voltage	200 V		
Command pulse response	Line drive: 500 kpps		
Compatible motor capacity	50 W 100 W	200 W	400 W
Applicable servo motor (R88M-)	G05030H G10030H GP10030H	G020030H GP20030H	G40030H GP40030H



Servodrive part names



R88M-GP10030H-BOS2



Servo motor / servo drive combination

Servo motor						
Family		Voltage	Speed	Rated torque	Capacity	Model
Cylindric	50-400 W 	230 V	3000 min ⁻¹	0.16 Nm	50 W	R88M-G05030H-□S2
				0.32 Nm	100 W	R88M-G10030H-□S2
				0.64 Nm	200 W	R88M-G20030H-□S2
				1.3 Nm	400 W	R88M-G40030H-□S2
Flat	100-400 W 			0.32 Nm	100 W	R88M-GP10030H-□S2
				0.64 Nm	200 W	R88M-GP20030H-□S2
				1.3 Nm	400 W	R88M-GP40030H-□S2

- Note:**
1. For servo motor and cable part numbers, refer to ordering information at the end of this chapter.
 2. Refer to the servo drive chapter for drive options selection and detailed specifications.

Servo motor specifications

General specifications

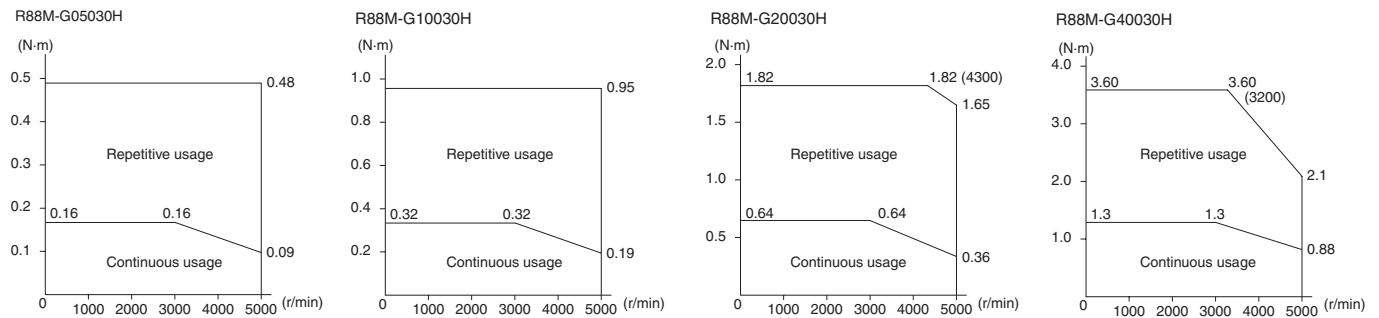
Item	Specification
Ambient operating temperature	0 to 40°C
Ambient operating humidity	85% max. (with no condensation)
Ambient storage temperature	-20 to 65°C
Ambient storage humidity	85% max. (with no condensation)
Storage/operating atmosphere	No corrosive gases
Vibration resistance	49 m/s ² max. in the X, Y, and Z directions
Impact resistance	Acceleration of 98 m/s ² max. 3 times each in the X, Y, and Z directions
Insulation resistance	20 MΩ min. at 500 VDC between the power terminals and FG terminal
Dielectric strength	1,500 VAC (50 or 60 Hz) for 1 minute between the power terminals and FG terminal
Run position	Any direction
Insulation grade	Type B
Structure	Totally-enclosed, self-cooling
Protective structure	IP65 (excluding the through-shaft portion)
Vibration grade	V-15
Mounting method	Flange-mounting
International standards	Approval obtained for UL, cUL, and EN (EMC directive and low-voltage directive)

Performance specifications

Cylindric servo motors

Item	Unit	R88M-G05030H	R88M-G10030H	R88M-G20030H	R88M-G40030H	
Rated output	W	50	100	200	400	
Rated torque	N·m	0.16	0.32	0.64	1.3	
Rated rotation speed	r/min	3000				
Momentary maximum rotation speed	r/min	5000				
Momentary maximum torque	N·Em	0.48	0.95	1.78	3.60	
Rated current	A (rms)	1.1		1.6	2.6	
Momentary maximum current	A (rms)	3.4		4.9	7.9	
Rotor inertia	kg·m ²	2.5 × 10 ⁻⁶	5.1 × 10 ⁻⁶	1.4 × 10 ⁻⁵	2.6 × 10 ⁻⁵	
Power rate	kW/s	10.4	20.1	30.3	62.5	
Allowable radial load	N	68		245		
Allowable thrust load	N	58		98		
Weight	Without brake	kg	0.3	0.5	0.8	1.2
	With brake	kg	0.5	0.7	1.3	1.7
Encoder resolution	---	Phase A and B: 2,500 pulses/rotation, Phase Z: 1 pulse/rotation				
Radiation shield dimensions	---	100 × 80 × t10 (Al)		130 × 120 × t12 (Al)		
Brake specifications	Brake inertia	kg·m ²	2.0 × 10 ⁻⁷	2.0 × 10 ⁻⁷	1.8 × 10 ⁻⁶	7.5 × 10 ⁻⁶
	Excitation voltage	V	24 VDC ±10%			
	Power consumption (at 20 °C)	W	7		9	
	Current consumption (at 20 °C)	A	0.30		0.36	
	Static friction torque	N·m	0.29 min.		1.27 min.	
	Attraction time	ms	35 max.		50 max.	
	Release time	ms	20 max.		15 max.	
	Backlash	-	±1° max.			
	Rating	-	Continuous			
	Brake life	-	10,000,000 operations min.			
Applicable servo driver (R7D-)		BP01H		BP02H	BP04H	

Torque-speed characteristics

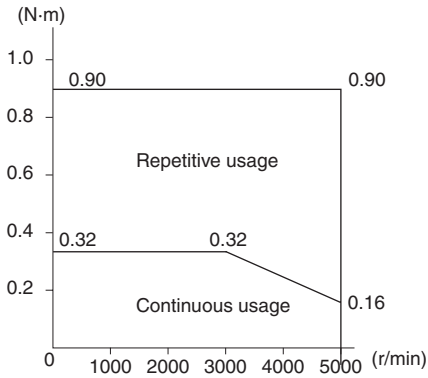


Flat servo motors

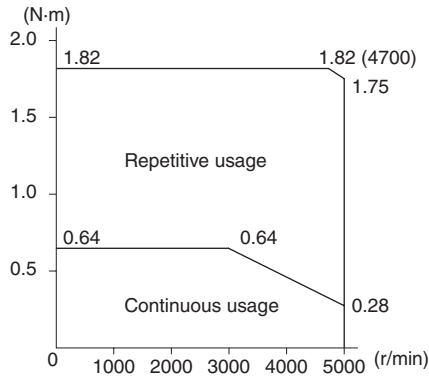
Item	Unit	R88M-GP10030H	R88M-G20030H	R88M-G40030H	
Rated output	W	100	200	400	
Rated torque	N·m	0.32	0.64	1.3	
Rated rotation speed	r/min	3000			
Momentary maximum rotation speed	r/min	5000			
Momentary maximum torque	N·Em	0.90	1.82	3.60	
Rated current	A (rms)	1.0	1.6	4.4	
Momentary maximum current	A (rms)	4.3	6.8	18.6	
Rotor inertia	kg·m ²	9.0 × 10 ⁻⁶	3.4 × 10 ⁻⁵	6.4 × 10 ⁻⁵	
Power rate	kW/s	11.4	11.8	25.5	
Allowable radial load	N	68	245		
Allowable thrust load	N	58	98		
Weight	Without brake	kg	0.7	1.3	1.8
	With brake	kg	0.9	2.0	2.5
Encoder resolution	---	Phase A and B: 2,500 pulses/rotation, Phase Z: 1 pulse/rotation			
Radiation shield dimensions	---	130 × 120 × t10 (Al)	170 × 160 × t12 (Al)		
Brake specifications	Brake inertia	kg·m ²	3.0 × 10 ⁻⁶	9.0 × 10 ⁻⁶	9.0 × 10 ⁻⁶
	Excitation voltage	V	24 VDC ±10%		
	Power consumption (at 20 °C)	W	7	10	
	Current consumption (at 20 °C)	A	0.29	0.41	
	Static friction torque	N·m	0.29 min.		1.27 min.
	Attraction time	ms	50 max.	60 max.	
	Release time	ms	15 max.		
	Backlash	-	±1° max.		
	Rating	-	Continuous		
	Brake life	-	10,000,000 operations min.		
Applicable servo driver (R7D-)		BP01H	BP02H	BP04	

Torque-speed characteristics

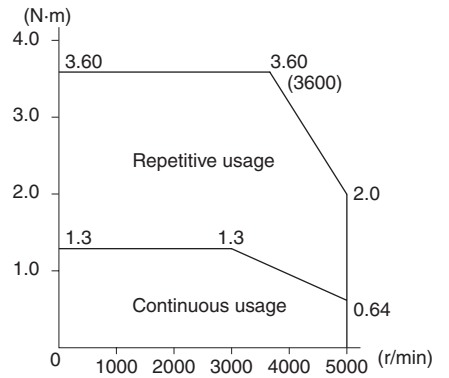
R88M-GP10030H



R88M-GP20030H



R88M-GP40030H

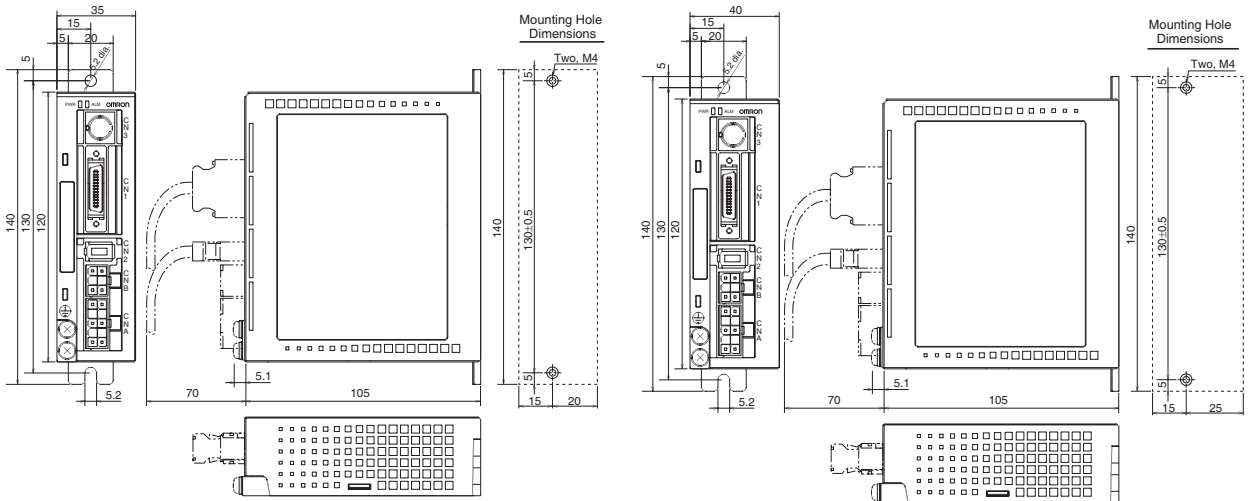


Dimensions

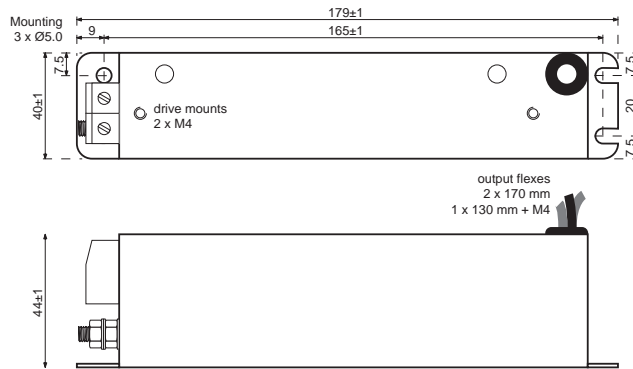
Servo drives

R7D-BP01H

R7D-BP02HH/ 04H



Filters

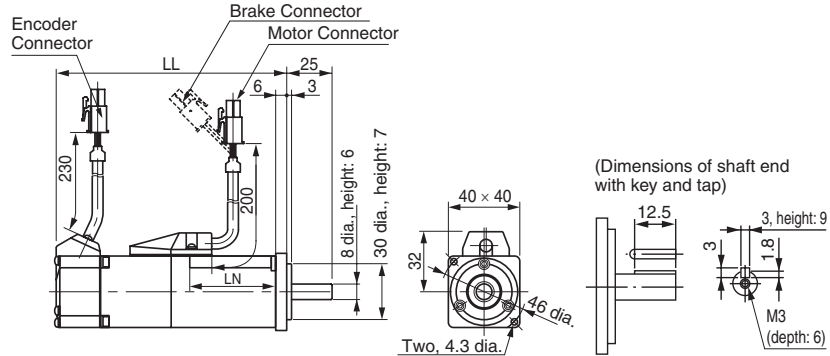


Filter model	Rated current	Leakage current	Rated voltage
R7A-FIB104-RE	4A	3.5 mA	250 VAC single-phase

Servo motors

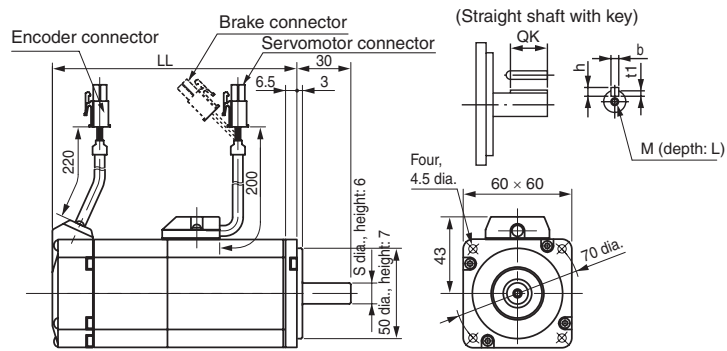
Cylindrical type 3000 r/min (230 V, 50 - 100W)

Dimensions (mm)	Without brake		With brake		LN	Aprox. Mass (Kg)	
	LL	LL	LL	LL		Without brake	With brake
R88M-G05030H-□S2	72		102		26.5	0.3	0.5
R88M-G10030H-□S2	92		122		46.5	0.5	0.7



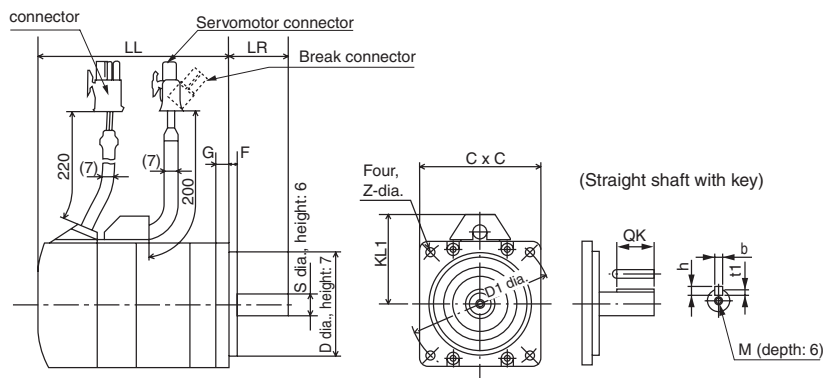
Cylindrical type 3000 r/min (230 V, 200 - 400W)

Dimensions (mm)	Without brake		With brake		LR	KL1	Flange surface					Shaft end						Aprox. Mass (Kg)	
	LL	LL	D1	D2			C	G	Z	S	QK	b	h	M	t1	L	Without brake	With brake	
R88M-G20030H-□S2	79.5	116	30	43	70	50	60	6.5	4.5	11	18	4h9	4	M4	2.5	8	0.8	1.3	
R88M-G40030H-□S2	99	135.5								14	22.5	5h9	5	M5	3	10	1.2	1.7	



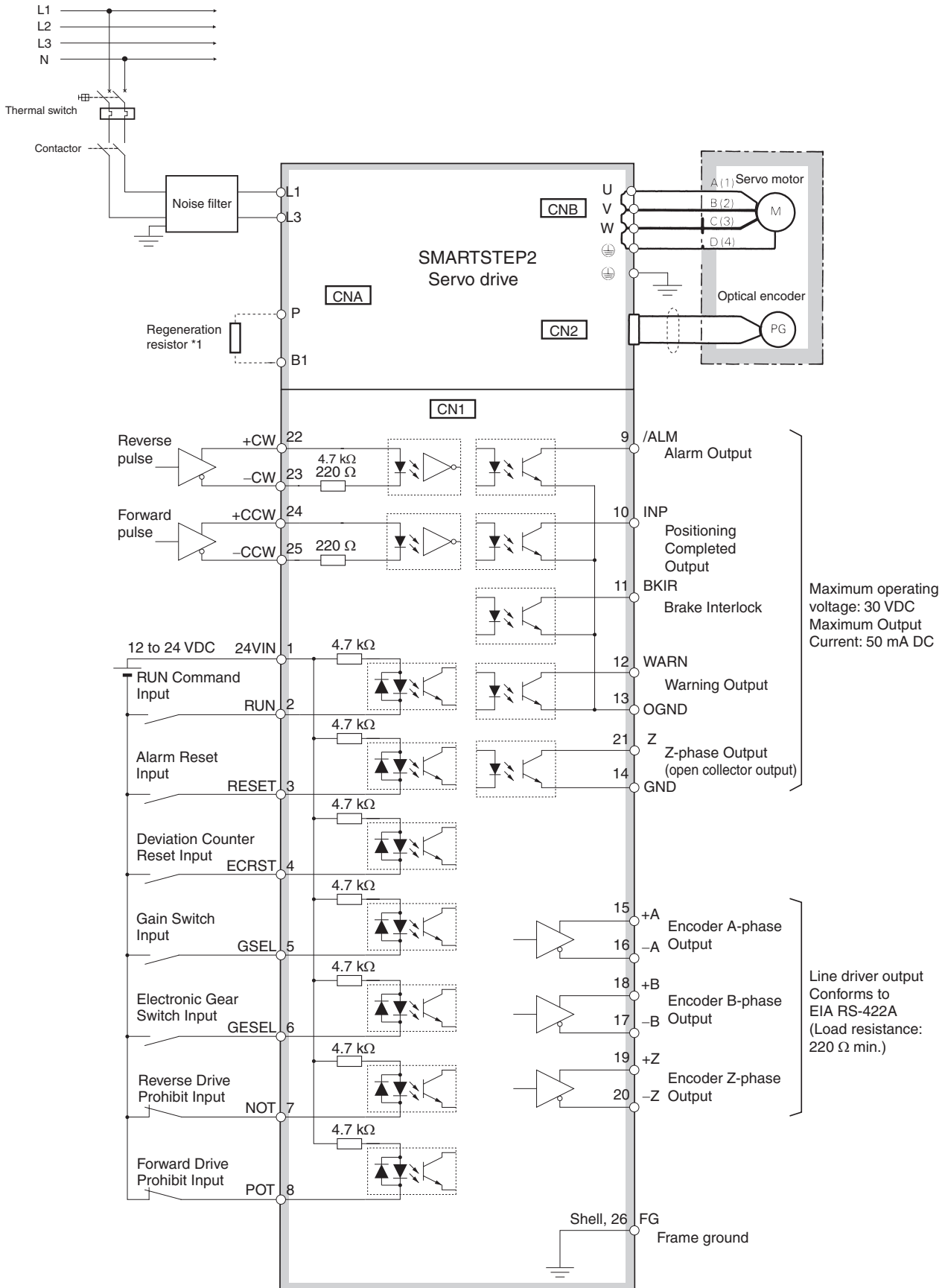
Flat type 3000 r/min (230 V, 100 W - 400 W)

Dimensions (mm)	Without brake		With brake		LR	KL1	Flange surface					Shaft end						Aprox. Mass (Kg)	
	LL	LL	D1	D2			C	F	G	Z	S	QK	b	h	t1	Tap x depth	Without brake	With brake	
R88M-GP10030H-□S2	60.5	84.5	25	43	70	50	60	3	7	4.5	8	12.5	3h9	3	1.8	M3x6	0.7	0.9	
R88M-GP20030H-□S2	67.5	100	30	53	90	70	80	5	8	5.5	11	18	4h9	4	2.5	M4x8	1.3	2	
R88M-GP40030H-□S2	82.5	115									14	22.5	5h9	5	3.0	M5x10	1.8	2.5	



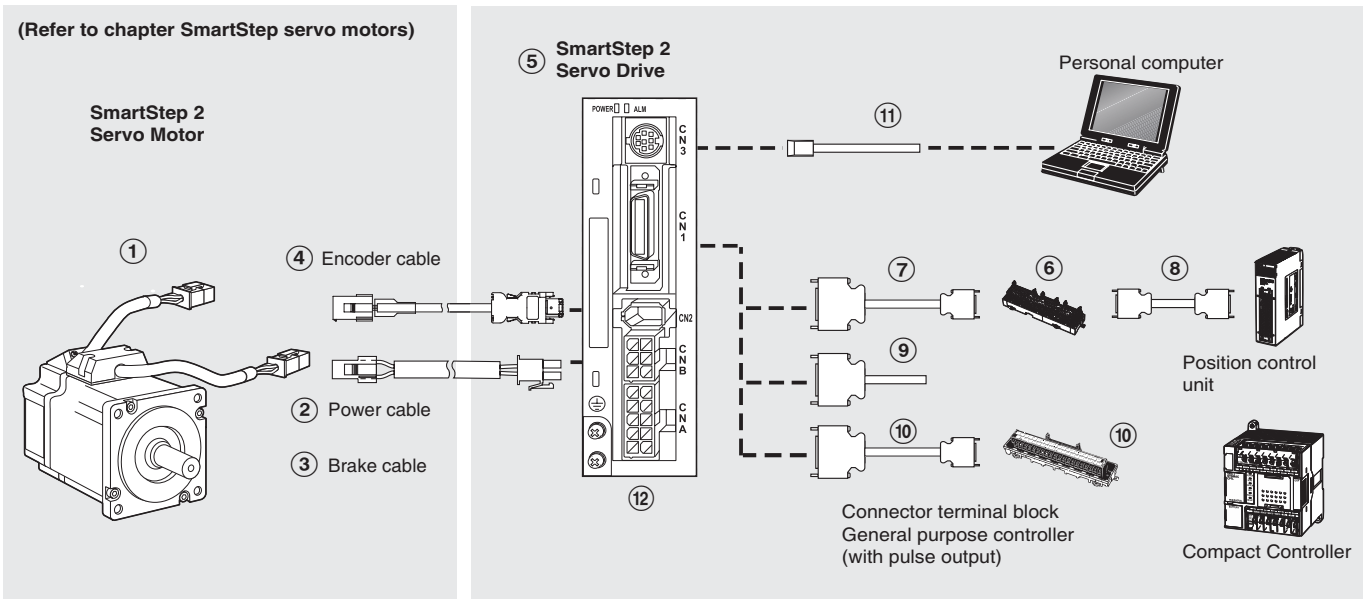
Installation

Single-phase, 230 VAC



*1. An External Regeneration Resistor can be connected. Connect this resistor if the regenerative energy exceeds regeneration absorption capacity in the Servo Drive.
Note: 1. The dynamic brake operates when the main circuit power supply or the control circuit power supply is turned OFF.
Note: 2. When turning OFF the main circuit power supply, turn OFF the RUN Command Input (RUN) signal at the same time.

Ordering information



Note: The symbols ①②③④⑤... show the recommended sequence to select the components in a SmartStep 2 servo system

Servo motor

Cylindrical servo motors (3,000-r/min)

Symbol	Specifications		Rated torque	Capacity	Servo motor model	Compatible servo drives ⑤	
	Design					SmartStep 2	
①	Cylindrical servo motors (3,000-r/min)	Without brake	0.16 Nm	50 W	R88M-G05030H-S2	R7D-BP01H	
			0.32 Nm	100 W	R88M-G10030H-S2		
			0.64 Nm	200 W	R88M-G20030H-S2	R7D-BP02HH	
		Straight shaft with key	With brake	1.3 Nm	400 W	R88M-G40030H-S2	R7D-BP04H
				0.16 Nm	50 W	R88M-G05030H-BS2	R7D-BP01H
				0.32 Nm	100 W	R88M-G10030H-BS2	
			0.64 Nm	200 W	R88M-G20030H-BS2	R7D-BP02HH	
			1.3 Nm	400 W	R88M-G40030H-BS2	R7D-BP04H	

Flat servo motors (3,000-r/min)

Symbol	Specifications		Rated torque	Capacity	Servo motor model	Compatible servo drives ⑤	
	Design					SmartStep 2	
①	Flat servo motors (3,000-r/min)	Without brake	0.32 Nm	100 W	R88M-GP10030H-S2	R7D-BP01H	
			0.64 Nm	200 W	R88M-GP20030H-S2	R7D-BP02HH	
			1.3 Nm	400 W	R88M-GP40030H-S2	R7D-BP04H	
		Straight shaft with key	With brake	0.32 Nm	100 W	R88M-GP10030H-BS2	R7D-BP01H
				0.64 Nm	200 W	R88M-GP20030H-BS2	R7D-BP02HH
				1.3 Nm	400 W	R88M-GP40030H-BS2	R7D-BP04H

Servo drives


Symbol	Specifications		SmartStep 2 drive model	Compatible servo motors ①	
				Cylindrical type	Flat type
⑤	200 VAC	100 W	R7D-BP01H	R88M-G05030-□	-
		200 W	R7D-BP02HH	R88M-G10030-□	R88M-GP10030-□
		400 W	R7D-BP04H	R88M-G20030-□	R88M-GP20030-□
				R88M-G40030-□	R88M-GP40030-□

Power Supply cables (for CNA)

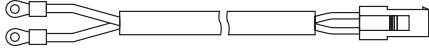
Symbol	Specifications	Model	Appearance
⑤	Power Supply Input Cable for Single-Phase Power (connectors attached)	R7A-CLB002S2	

Servo motor cables

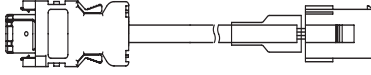
Power cables (for CNB)

Symbol	Specifications	Model	Appearance	
②	Power cables for SmartStep 2 Servo motors	Flexible cables shielded		
		1.5 m		R7A-CAB001-5SR-E
		3 m		R7A-CAB003SR-E
		5 m		R7A-CAB005SR-E
		10 m		R7A-CAB010SR-E
		15 m		R7A-CAB015SR-E
20 m	R7A-CAB020SR-E			

Brake cables

Symbol	Specifications	Model	Appearance	
③	Brake cables for SmartStep 2 Servo motors	Flexible cables		
		1.5 m		R88A-CAGA001-5BR-E
		3 m		R88A-CAGA003BR-E
		5 m		R88A-CAGA005BR-E
		10 m		R88A-CAGA010BR-E
		15 m		R88A-CAGA015BR-E
20 m	R88A-CAGA020BR-E			

Encoder cables (for CN2)

Symbol	Specifications	Model	Appearance	
④	Encoder cables for SmartStep 2 Servo motors	Flexible cables shielded		
		1.5 m		R88A-CRGB001-5CR-E
		3 m		R88A-CRGB003CR-E
		5 m		R88A-CRGB005CR-E
		10 m		R88A-CRGB010CR-E
		15 m		R88A-CRGB015CR-E
20 m	R88A-CRGB020CR-E			

Control cables (for CN1)

Symbol	Name	Compatible units	Model	Available lengths
⑥	Servo relay unit	Use with position control units (doesn't support communications functions.) Units: CS1W-NC113/133, CJ1W-NC113/133 and C200HW-NC113/NC112	XW2B-20J6-1B (1 axis)	---
		Use with position control units (doesn't support communications functions.) Units: CS1W-NC213/233/413/433, CJ1W-NC213/233/413/433 and C200HW-NC213/413	XW2B-40J6-2B (2 axes)	
		Use with position control units (doesn't support communications functions.) Units: CQM1H-PLB21	XW2B-20J6-3B (1 axis)	
		Use with position control units (supports communications functions.) Units: CS1W-NC213/233/413/433, CJ1W-NC213/233/413/433	XW2B-40J6-4A (2 axes)	
		Use with CJ1M-CPU21/22/23 (doesn't support communications functions.)	XW2B-20J6-8A (1 axis) XW2B-40J6-9A (2 axes)	
⑦	Cable to servo drive	Position Control Unit/ CQM1H	XW2Z-□□□J-B29	1 m or 2 m (the cable length goes in the empty boxes.)
		CJ1M	XW2Z-□□□J-B32	
⑧	Cable to position control unit	CQM1H-PLB21	XW2Z-□□□J-A3	0.5 m or 1 m (the cable length goes in the empty boxes.)
		C200H-NC112	XW2Z-□□□J-A4	
		C200H-NC211 and C500-NC113/211	XW2Z-□□□J-A5	
		CS1W-NC113 and C200HW-NC113	XW2Z-□□□J-A6	
		CS1W-NC213/413 and C200HW-NC213/413	XW2Z-□□□J-A7	
		CS1W-NC133	XW2Z-□□□J-A10	
		CS1W-NC233/433	XW2Z-□□□J-A11	
		CJ1W-NC113	XW2Z-□□□J-A14	
		CJ1W-NC213/413	XW2Z-□□□J-A15	
		CJ1W-NC133	XW2Z-□□□J-A18	
		CJ1W-NC233/433	XW2Z-□□□J-A19	
CJ1M-CPU21/22/23	XW2Z-□□□J-A33			
⑨	Control cable	For general-purpose controllers	R7A-CPB-□□□S	1 m or 2 m (the cable length goes in the empty boxes.)
⑩	Connector terminal block cable	For general-purpose controllers	XW2Z-□□□J-B28	---
	Connector-Terminal Block Conversion Units	For general-purpose controllers	XW2B-34G4	Terminal block with M3 screws
			XW2B-34G5	Terminal block with M3.5 screws
			XW2D-34G6	Terminal block with M3 screws

Cable for CN3

Symbol	Name	Connected to	Length	Model
⑪	Personal Computer Monitor Cable	Windows	2 m	R88A-CCG002P2

Filters

Symbol	Applicable servo drive	Filter model	Rated current	Rated voltage
⑫	R7D-BP01H/ 02HH/ 04H	R7A-FIB104-RE	4 A	1 pH, 230 V

Connectors

Specifications	Model
Main Circuit Connector (CNA)	R7A-CNB01P
Servomotor Connector (CNB)	R7A-CNB01A
Control I/O Connector (CN1)	R88A-CNW01C
Encoder Input Connector (CN2)	R88A-CNW01R
Servomotor Connector for Encoder Cable	R88A-CNG02R
Servomotor Connector for Servomotor Power Cable	R88A-CNG01A
Brake Cable Connector	R88A-CNG01B

External regeneration resistor

Specification	Model
80 W, 50 Ω	R88A-RR08050S
80 W, 100 Ω	R88A-RR080100S
220 W, 47 Ω	R88A-RR22047S

External regeneration resistor cable

Specifications	Model
External Regenerative Resistor Connection Cable, 2 meters	R7A-CLB002RG

Parameter unit & computer software

Specifications	Model
Parameter copy unit (with cable)	R88A-PR02G
Configuration and monitoring software tool for servo drives and inverters. (CX-drive version 1.8 or higher)	CX-drive

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