New!

OMRON

SMARTSTEP

SMARTSTEP Junior

R7D-ZP□□H
R7M-Z□□□□□-S1/BS1

New from OMRON:
A Compact, Smart, New-generation Servo!

Actual Size

realizing

An Exceptionally Easy-to-Use Servo T
Compact, and Supports a Wide Variet

Easy Setup

This Servo's Definitive Feature!
"Just Connect and Run"

Reduced Startup Time!

Just wire the Servo, set the command pulse type, and turn ON the power to complete the setup. An automatic control function is built-in to provide stable control without difficult settings. The Servo can operate immediately.

Just One Setting

Just set the command pulse type with the front panel rotary switch.

Compact

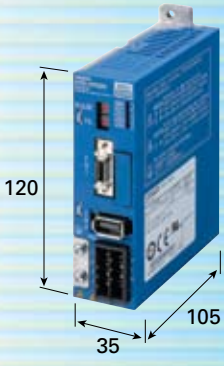
Smallest* in the Industry! Use Control Panel Space More Efficiently.

* Single-phase 200-VAC Units, as of May 2006.

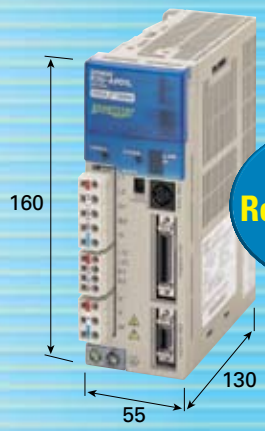
Orderly Control Panels!

Requires less than 1/2 of the volume of the SMARTSTEP Series. Saves space in the control panel.

●100 W Models



SMARTSTEP Junior



SMARTSTEP

Volume Reduced 60%
(Excluding mounting)

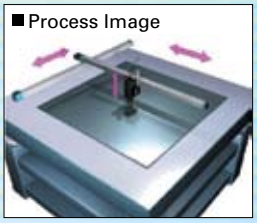
Variety

Excels in High-speed, High-precision Applications.

Can be used easily in a variety of applications, such as conveyors, constant-length feeders, and other feeders.

●For example, in a board-inspector…

■ Process Image



You can take advantage of all of the SMARTSTEP Junior's capabilities by combining the Servo Driver with a CP1H-Y PLC. Maximum response frequency (command pulse response):

CP1H-Y

SMARTSTEP: 250 kpps

↓

SMARTSTEP Junior: 750 kpps

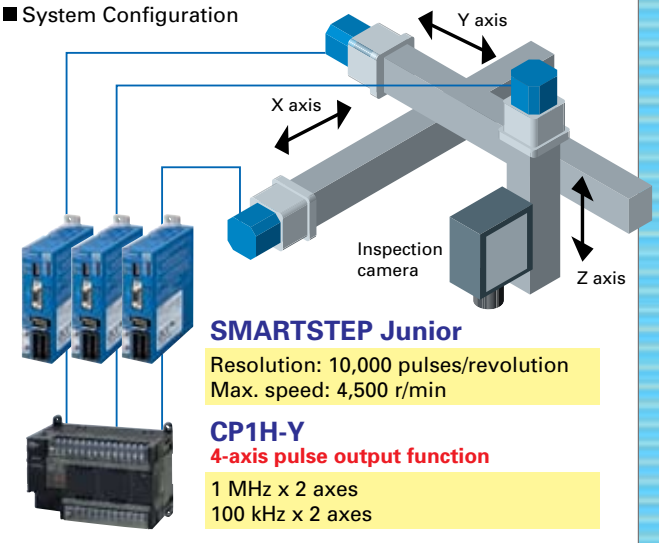
hat is Also Easy to Set Up, y of Applications!

SMARTSTEP Junior

SMARTSTEP

Actual Size
35 x 120 x 105 mm (W x H x D)
(200 W Servo Driver)
(Excluding mounting)

■ System Configuration



SMARTSTEP Junior
Resolution: 10,000 pulses/revolution
Max. speed: 4,500 r/min

CP1H-Y
4-axis pulse output function
1 MHz x 2 axes
100 kHz x 2 axes

This application can be achieved under specialized conditions. Verify the conditions again for any specific application.

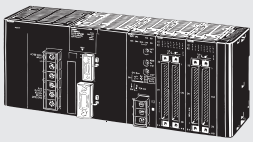
● **Select the Servomotor with the Motor Selection Program.**
Servomotor selection is easy using the Motor Selection Program.

Contents

Features — 2
System Configuration — 4
Components and Functions — 6
AC Servo Driver Specifications — 8
AC Servomotor Specifications — 9
Torque and Rotation Speed Characteristics — 10
Reduction Gear Specifications — 11
Dimensions — 12
I/O Specifications — 16
Startup Operation — 18
Wiring and Operaion Examples — 19
Standard Wiring — 22
Connecting Cables — 23
Model Number Legends — 25
Ordering Guide — 26

Flexible System Configurations for a Variety of Applications

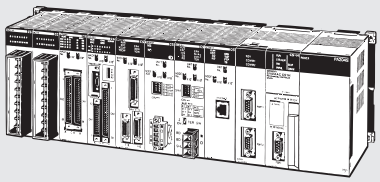
Controllers



SYSMAC CJ Series

●Position Control (NC) Units

CJ1W-NC113/213/413
NC133/233/433

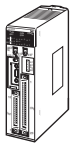


SYSMAC CS Series

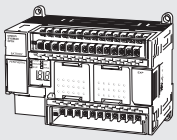
●Position Control (NC) Units

CS1W-NC113/213/413
NC133/233/433
C200HW-NC113/213/413

●Customizable Counter Unit

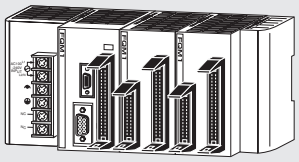


CS1W-HCP22-V1



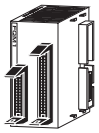
SYSMAC CP1H

SYSMAC CJ1M



FQM1 Series

●Motion Control Module

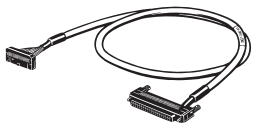


FQM1-MMP22

Pulse Train Command

Position Control Cable

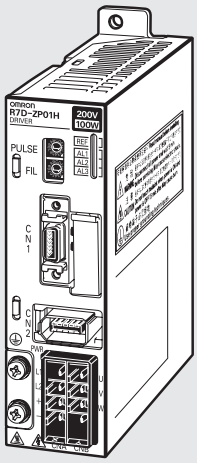
XW2Z-□□□J-A□



Main Circuit Connector

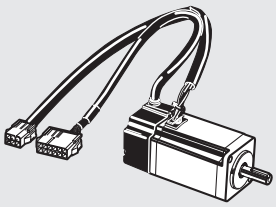
R7A-CNZ01P

AC Servo Driver



R7D-ZP□

AC Servomotor



R7M-Z□

Motor power feedback signal

Power Cables

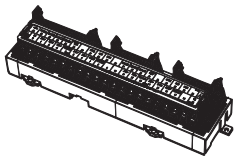
●Motor Power Cables
R7A-CAZ0□□S
(without brake)
R7A-CAZ0□□B
(with brake)

Encoder Cable

R7A-CRZ0□□C

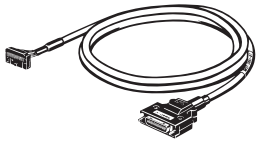
Servo Relay Unit

XW2B-□□J6-□B



Servo Driver Cable

XW2Z-□□□J-B□

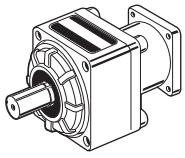


AC Reactor

R88A-PX5□□□

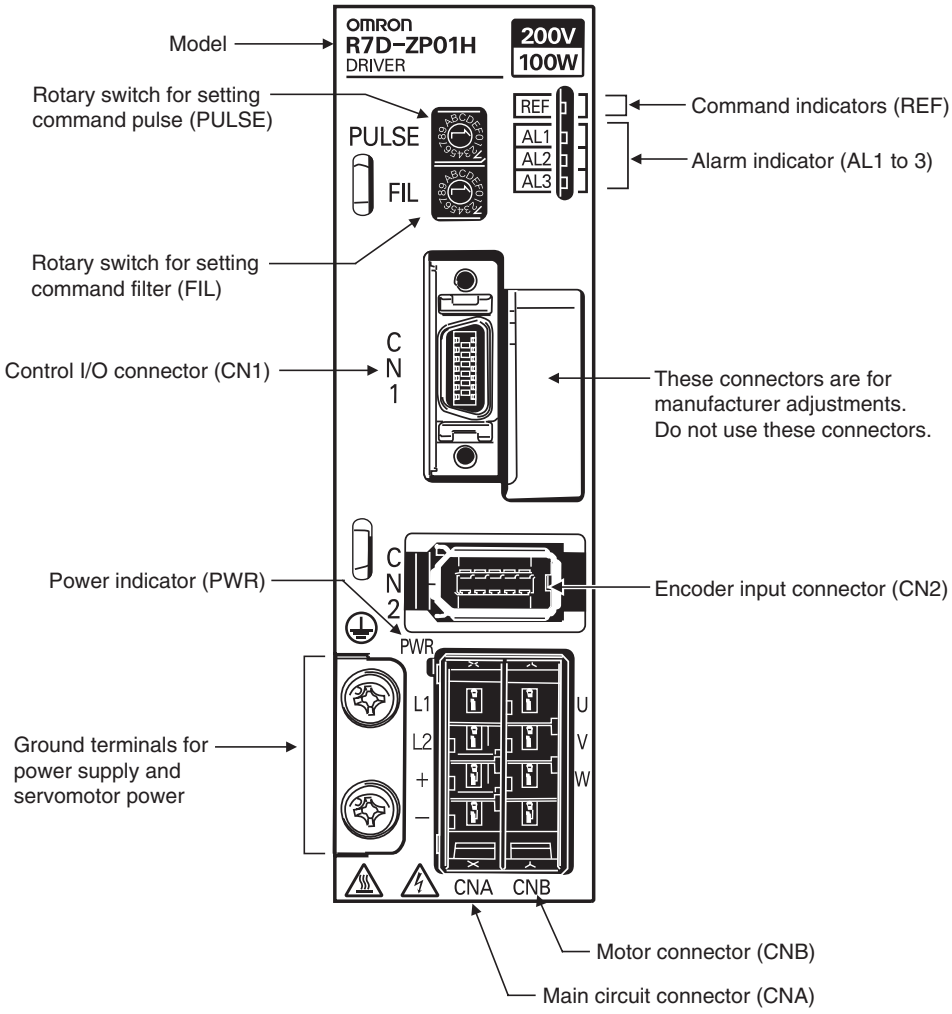
Decelerator

●Backlash within 3 minutes
R7G-VRSFPB□□□□□□
●Backlash within 45 minutes
R7G-RGSF□□□□□□



Components and Functions

●Components



●Rotary Switch for Setting Command Pulse (PULSE)

Always turn OFF the power supply before setting the rotary switch. (The switch is factory-set to 0.)

Setting	Command pulse resolution	Command pulse connection method	Command pulse type
0	1000	Open collector or line driver	CW + CCW, positive logic CW CCW
1	2500		
2	5000	Line driver	
3	10000		
4	1000	Open collector or line driver	CW + CCW, negative logic CW CCW
5	2500		
6	5000	Line driver	
7	10000		
8	1000	Open collector or line driver	Sign + pulse string, positive logic PULS SIGN
9	2500		
A	5000	Line driver	
B	10000		
C	1000	Open collector or line driver	Sign + pulse string, negative logic PULS SIGN
D	2500		
E	5000	Line driver	
F	10000		

●Rotary Switch for Setting Command Filter (FIL)

This switch does not need to be set if the machine is not subject to vibration. (The switch is factory-set to 0.)

Filter setting (See note 1.)	Acceleration/ deceleration time for STEP command (See note 3.)	Approx. time from end of command to end of positioning (settling time) (See note 2.)	Description
0	45 ms	100 to 200 ms	↑ Smaller filter time constant (short positioning time)
1	50 ms	110 to 220 ms	
2	60 ms	130 to 260 ms	
3	65 ms	150 to 300 ms	
4	70 ms	170 to 340 ms	
5	80 ms	20 to 400 ms	
6	85 ms	250 to 500 ms	
7	170 ms	500 to 1,000 ms	↓ Larger filter time constant (longer positioning time with little vibration)
8 to F	Do not set this switch to 8 to F.		

Note 1. Increase the value of the filter setting if there is vibration when starting or stopping.
Note 2. The settling time depends on the commanded acceleration/deceleration, the rigidity of the machine motor drive, the encoder resolution, and other factors.
Note 3. Use the acceleration/deceleration times as a guideline for determining the Servomotor capacity that can be driven when using STEP commands without commanded acceleration/deceleration.

●Command Indicators (REF)

Indicator (See note.)	Power to motor	Command pulse
Lit orange.	OFF	None
Flashing orange.	OFF	Pulse being input.
Lit green.	ON	None
Flashing green.	ON	Pulse being input.

Note: The indicator stays lit (yellow) for 1 s when there is a deviation counter reset input.

●Alarm Indicators (AL1/AL2/AL3)

Indicator status	Alarm	Indicator	Alarm
AL1 ■ AL2 ■ AL3 ■	Normal	AL1 □ AL2 ■ AL3 □	Overcurrent
AL1 □ AL2 ■ AL3 ■	Overspeed	AL1 ■ AL2 □ AL3 □	Servo Driver built-in fan is stopped
AL1 ■ AL2 □ AL3 ■	Overload	AL1 □ AL2 □ AL3 □	System error
AL1 □ AL2 □ AL3 ■	Encoder error	AL1 ◪ AL2 ◪ AL3 ◪ Flashes at a set cycle	Rotary switch for setting command pulse (PULSE) has been changed.
AL1 ■ AL2 ■ AL3 □	Voltage error		

Lit: □ Not lit: ■ Flashing: ◪

AC Servo Driver Specifications (R7D-ZP)

●General Specifications

Item			Specification
Ambient operating temperature			0 to 55°C
Ambient operating humidity			90% max. (with no condensation)
Ambient storage temperature			–20 to 70°C
Ambient storage humidity			90% max. (with no condensation)
Storage/operating atmosphere			No corrosive gases, dust, iron powder, water drops, or cutting oil
Vibration resistance			10 to 55 Hz in X, Y, and Z directions with 0.1-mm double amplitude or acceleration of 4.9 m/s^2 max., whichever is smaller
Shock resistance			Acceleration 19.6 m/s^2 max., in X, Y, and Z directions, three times
Insulation resistance			Between power line terminals and FG: 0.5 MΩ min. (at 500 V DC)
Dielectric strength			Between power line terminals and FG: 1,500 V AC for 1 min at 50/60 Hz Between each control signal and FG: 500 V AC for 1 min
Degree of protection			Built into panel (IP10)
International standards	EC Directive	EMC Directive	EN 55011 Class A Group 1 EN 61000-6-2
		Low voltage Directive	EN 50178
	UL Standards		UL 508C
	cUL Standards		cUL C22.2 No.14

●Control Specifications

Item \ Motor capacity	100 W	200 W	400 W	750 W
Servo Driver (R7D-)	ZP01H	ZP02H	ZP04H	ZP08H
Applicable Servomotor (R7M-)	Z10030-S1	Z20030-S1	Z40030-S1	Z75030-S1
Continuous output current (rms)	0.84 A	1.1 A	2.0 A	3.7 A
Momentary maximum output current (rms)	2.5 A	3.3 A	6.0 A	11.1 A
Input power supply (for main circuit and control circuits)	Single-phase 200 to 230 V AC (170 to 253 V), 50/60 Hz			
Control method	All-digital servo			
Inverter method	PWM method based on IGBT			
Maximum response frequency (command pulse response)	750 kpps			
Weight	0.5 kg			1.0 kg

AC Servomotor Specifications (R7M-Z)

●General Specifications

Item			Specification
Ambient operating temperature			0 to 40°C
Ambient operating humidity			20% to 80% (with no condensation)
Ambient storage temperature			–20 to 60°C
Ambient storage humidity			20% to 80% (with no condensation)
Storage/operating atmosphere			No corrosive gases
Vibration resistance			10 to 2,500 Hz in X, Y, and Z directions with 0.2-mm double amplitude or acceleration of 24.5 m/s² max., whichever is smaller
Shock resistance			Acceleration 98 m/s² max., in a vertical direction, two times
Insulation resistance			Between power line terminals and FG: 10 MΩ min. (at 500 V DC)
Dielectric strength			Between power line terminals and FG: 1,500 V AC for 1 min at 50/60 Hz
Run position			Any direction
Insulation grade			Type B
Structure			Totally-enclosed self-cooling
Degree of protection			IP55 (except for through-shaft section)
Vibration grade			V-15
Mounting method			Flange-mounting
International standards	EC Directive	EMC Directive	EN 55011 Class A Group 1 EN 61000-6-2
		Low voltage Directive	IEC 60034-1, -5, -8, -9 EN 60034-1, -9
	UL Standards		UL 1004
	cUL Standards		cUL C22.2 No.100

●Performance Specifications

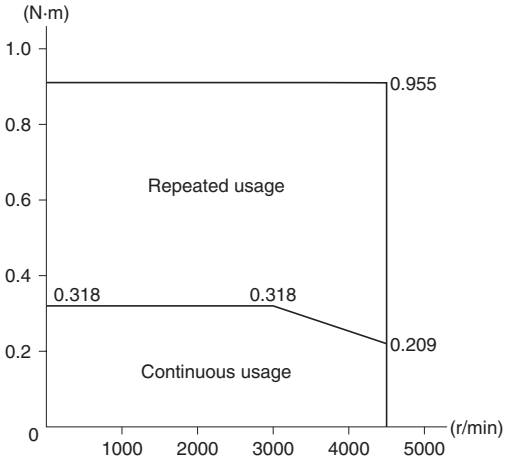
Item / Applicable Servomotor (R7M-)			Z10030-S1	Z20030-S1	Z40030-S1	Z75030-S1
Item / Applicable Servo Driver (R7D-) Pulse train models			ZP01H	ZP02H	ZP04H	ZP08H
Rated output		W	100	200	400	750
Rated torque		N·m	0.318	0.637	1.27	2.39
Rated rotation speed		r/min	3000			
Momentary maximum rotation speed		r/min	4500			
Momentary maximum torque		N·m	0.955	1.91	3.82	7.16
Rated current		A (irms)	0.84	1.1	2.0	3.7
Momentary maximum current		A (irms)	2.5	3.3	6.0	11.1
Rotor inertia		kg·m² (GD²/4)	6.34×10^{-6}	3.30×10^{-5}	6.03×10^{-5}	1.50×10^{-4}
Power rate		kW/s	16.0	12.3	26.7	38.1
Allowable radial load		N	78	245	245	392
Allowable thrust load		N	54	74	74	147
Weight	Without brake	kg	0.5	0.9	1.3	2.6
	With brake	kg	0.7	1.5	1.9	3.5
Radiator dimensions (material)			t6 × □250 (Al)			
Applicable load inertia (See note.)		kg·m²	6.0×10^{-5} (9.5 ×)	3.0×10^{-4} (9.1 ×)	5.0×0^{-4} (8.3 ×)	1.0×10^{-3} (6.7 ×)
Brake Specifications	Brake inertia	kg·m² (GD²/4)	7.54×10^{-7}	6.4×10^{-6}	6.4×10^{-6}	1.71×10^{-5}
	Excitation voltage	V	24 VDC ±10%			
	Power consumption (at 20°C)	W	6	7	7	7.7
	Current consumption (at 20°C)	A	0.25	0.29	0.29	0.32
	Static friction torque	N·m	0.318 min.	0.637 min.	1.27 min.	2.45 min.
	Attraction time	ms	60 max.			80 max.
	Release time	ms	30 max.	20 max.		
	Backlash		1° max.			
	Rating		Continuous			

Note: Use within the applicable load inertia range. Operation may not be stable outside of this range.

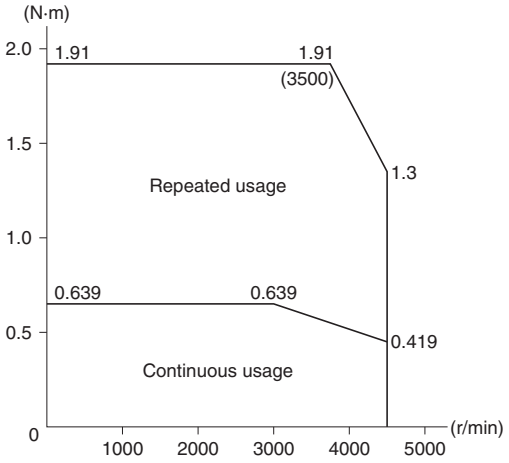
Torque and Rotation Speed Characteristics

The following graphs show the characteristics with a 3-m standard cable and 200-V AC input.

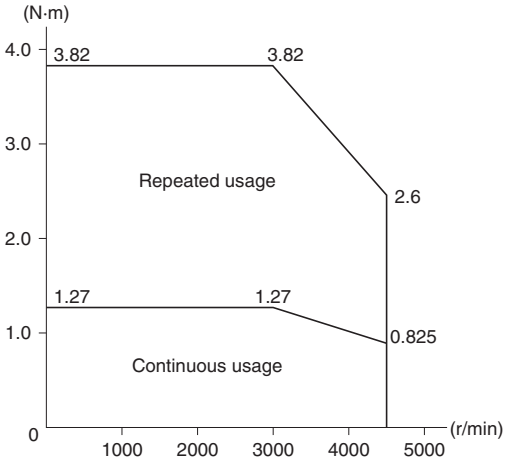
R7M-Z10030-S1 (100W)



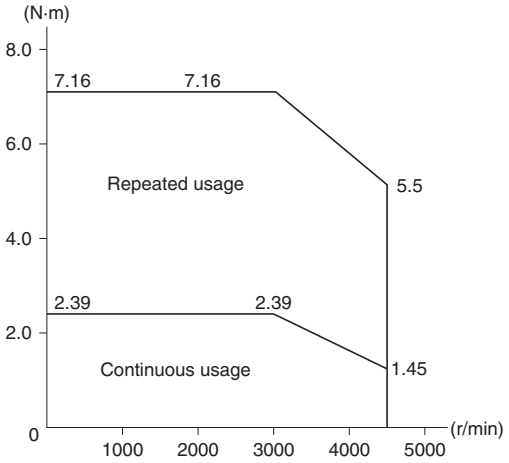
R7M-Z20030-S1 (200W)



R7M-Z40030-S1 (400W)



R7M-Z75030-S1 (750W)



Reduction Gear Specifications

●Performance Specifications

Backlash within 3 Minutes

Motor capacity	Deceleration ratio	Model (R7G-)	Rated rotation speed	Rated torque	Efficiency	Instantaneous peak rotation speed	Instantaneous peak torque	Decelerator inertia	Allowable radial load (shaft center)	Allowable thrust load
			r/min	N·m	%	r/min	N·m	kg·m²	N	N
100W	1/5	**VRSFPB05B100**	600	1.19	75	900	3.60	4.08×10^{-6}	392	196
	1/9	**VRSFPB09B100**	333	2.29	80	500	6.91	3.43×10^{-6}	441	220
	1/15	**VRSFPB15B100**	200	3.82	80	300	11.5	3.62×10^{-6}	588	294
	1/25	**VRSFPB25C100**	120	6.36	80	180	19.2	3.92×10^{-6}	1323	661
200W	1/5	**VRSFPB05B200**	600	2.71	85	900	8.12	1.53×10^{-5}	392	196
	1/9	**VRSFPB09C400**	333	3.78	66	500	11.3	2.68×10^{-5}	931	465
	1/15	**VRSFPB15C400**	200	6.31	66	300	18.9	2.71×10^{-5}	1176	588
	1/25	**VRSFPB25C200**	120	11.1	70	180	33.4	2.67×10^{-5}	1323	661
400W	1/5	**VRSFPB05C400**	600	5.40	85	900	16.2	3.22×10^{-5}	784	392
	1/9	**VRSFPB09C400**	333	9.49	83	500	28.5	2.68×10^{-5}	931	465
	1/15	**VRSFPB15C400**	200	15.8	83	300	47.6	2.71×10^{-5}	1176	588
	1/25	**VRSFPB25D400**	120	26.4	83	180	79.3	2.79×10^{-5}	1617	808
750W	1/5	**VRSFPB05C750**	600	10.8	90	900	32.0	7.17×10^{-5}	784	392
	1/9	**VRSFPB09D750**	333	18.3	85	500	54.3	6.50×10^{-5}	1176	588
	1/15	**VRSFPB15D750**	200	30.5	85	300	90.5	7.09×10^{-5}	1372	686
	1/25	**VRSFPB25E750**	120	50.8	85	180	151	7.05×10^{-5}	2058	1029

Backlash within 45 Minutes

Motor capacity	Deceleration ratio	Model (R7G-)	Rated rotation speed	Rated torque	Efficiency	Instantaneous peak rotation speed	Instantaneous peak torque	Decelerator inertia	Allowable radial load (shaft center)	Allowable thrust load
			r/min	N·m	%	r/min	N·m	kg·m²	N	N
100W	1/5	**RGSF05B100**	600	1.19	75	900	3.60	4.08×10^{-6}	392	196
	1/9	**RGSF09B100**	333	2.29	80	500	6.91	3.43×10^{-6}	441	220
	1/15	**RGSF15B100**	200	3.82	80	300	11.5	3.62×10^{-6}	588	294
200W	1/5	**RGSF05B200**	600	2.71	85	900	8.12	1.53×10^{-5}	392	196
	1/9	**RGSF09C400**	333	3.78	66	500	11.3	2.68×10^{-5}	931	465
	1/15	**RGSF15C400**	200	6.31	66	300	18.9	2.71×10^{-5}	1176	588
400W	1/5	**RGSF05C400**	600	5.4	85	900	16.2	3.22×10^{-5}	784	392
	1/9	**RGSF09C400**	333	9.49	83	500	28.5	2.68×10^{-5}	931	465
	1/15	**RGSF15C400**	200	15.8	83	300	47.6	2.71×10^{-5}	1176	588

Dimensions

(Unit: mm)

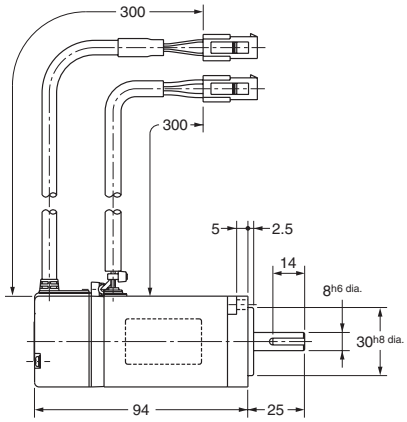
●AC Servomotors

• 100W

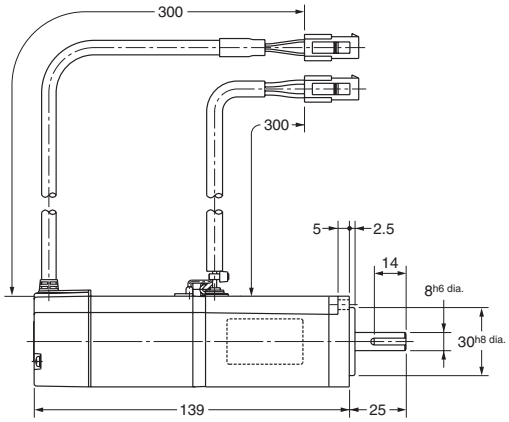
Without Brake **R7M-Z10030-S1**

With Brake **R7M-Z10030-BS1**

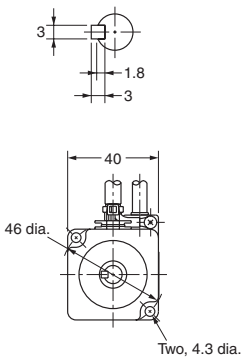
R7M-Z10030-S1 Without Brake



R7M-Z10030-BS1 With Brake



Shaft end dimensions



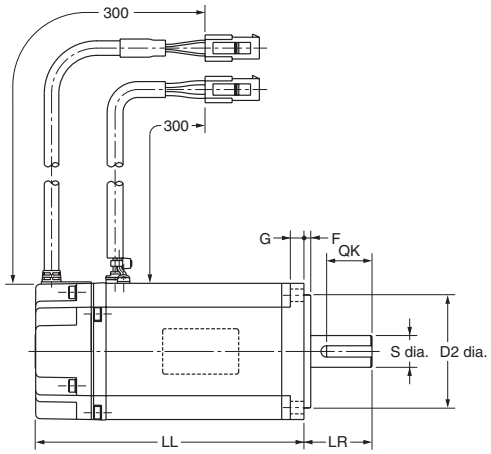
• 200W/400W/750W

Without Brake **R7M-Z20030-S1/Z40030-S1/Z75030-S1**

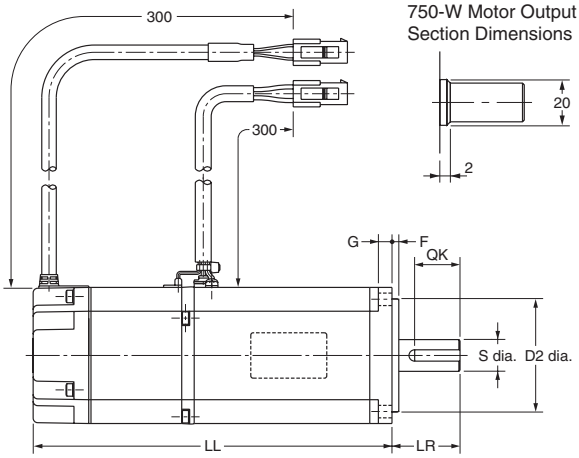
With Brake **R7M-Z20030-BS1/Z40030-BS1/Z75030-BS1**

Dimensions (mm) / Model	LL		LR	Flange surface						Shaft end	
	Without B	With B		C	D1	D2	F	G	Z	S	QK
R7M-Z20030-□S1	95.5	135.5	30	60	70	50h8	3	6	Four, 5.5 dia.	14h6	20
R7M-Z40030-□S1	118.5	158.5									
R7M-Z75030-□S1	133	176	40	80	90	70h8		8	Four, 7 dia.	16h6	30

R7M-Z□□□30-S1 Without Brake

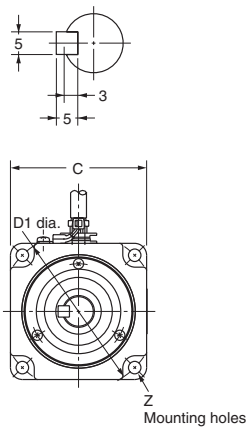


R7M-Z□□□30-BS1 With Brake



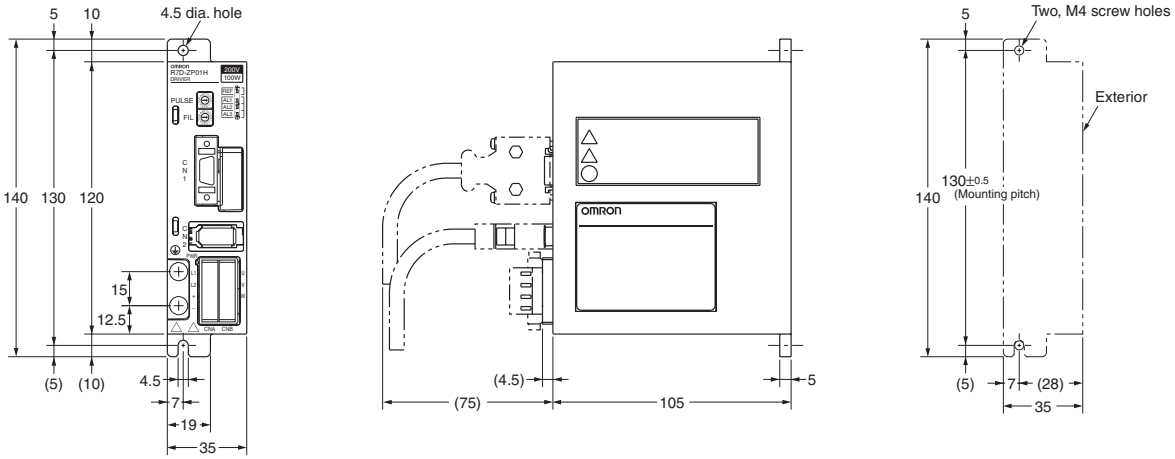
750-W Motor Output Section Dimensions

Shaft end dimensions

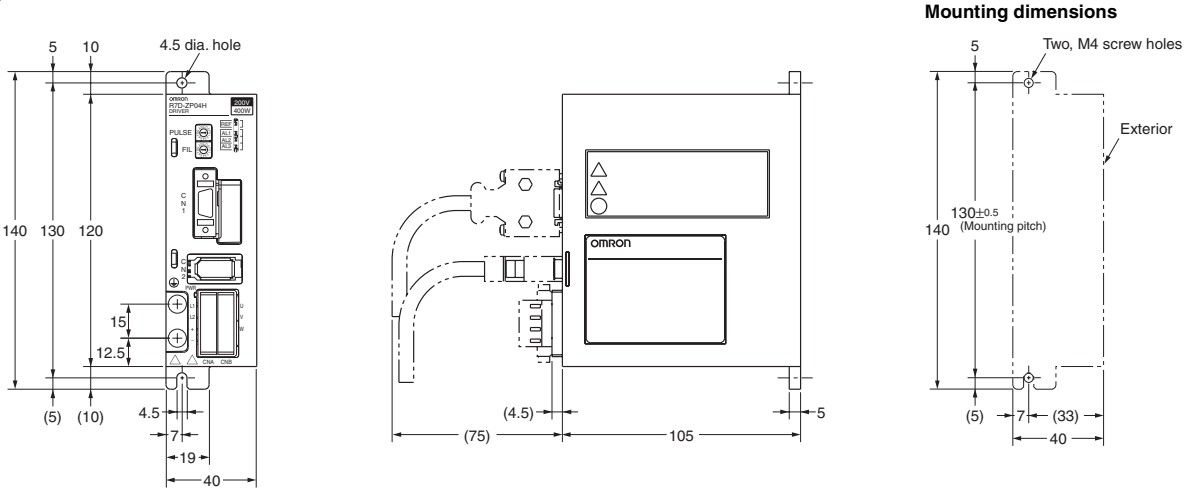


●AC Servo Drivers

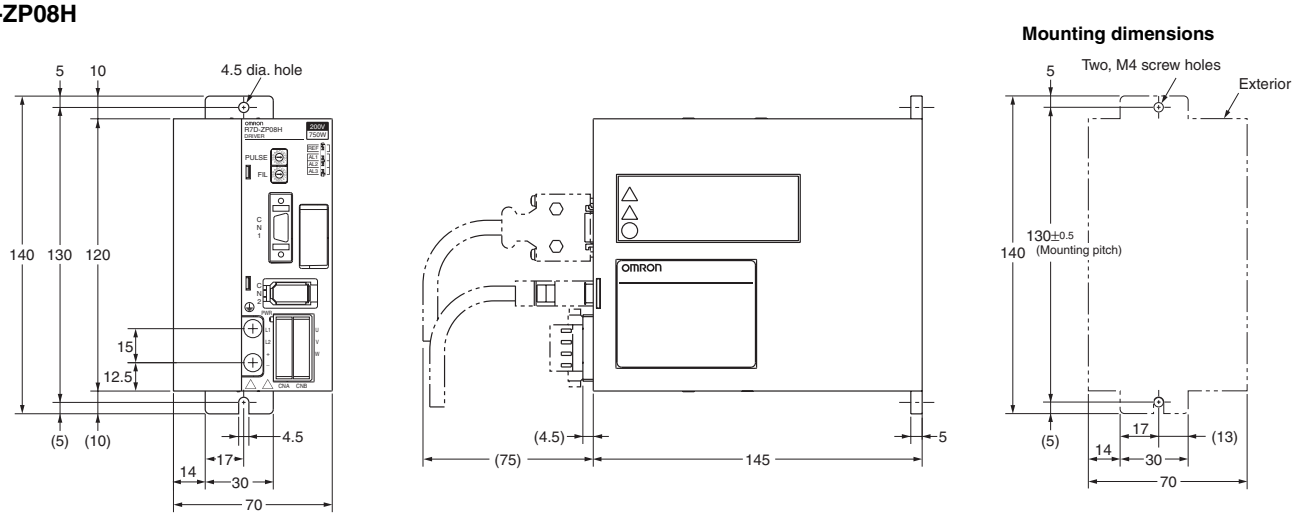
• 200 VAC: 100 W/200 W
R7D-ZP01H/ZP02H



• 200 VAC: 400 W
R7D-ZP04H



• 200 VAC: 750 W
R7D-ZP08H

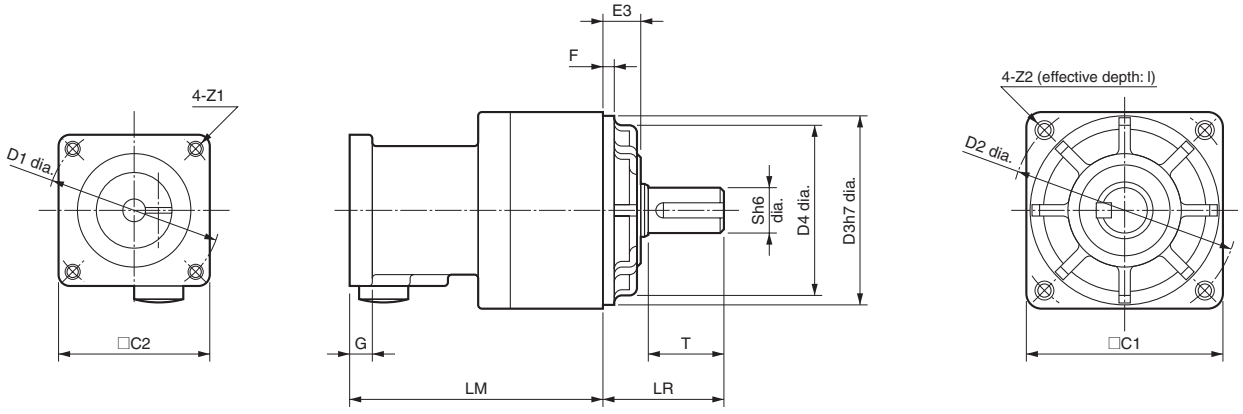


●Reduction Gear

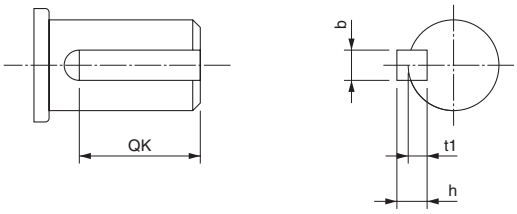
Cylindrical Servomotor (Backlash within 3 Minutes)

Model			Dimensions (mm)																			Weight (kg)
			LM	LR	C1	C2	D1	D2	D3	D4	E3	F	G	S	T	Z1	Z2	l	Key slot dimensions			
																			QK	b	h	t1	
100W	1/5	R7G-VRSFPB05B100	67.5	32	52	40	46	60	50	45	10	3	6	12	20	M4	M5	12	16	4	4	2.5	0.55
	1/9	R7G-VRSFPB09B100	67.5	32	52	40	46	60	50	45	10	3	6	12	20	M4	M5	12	16	4	4	2.5	0.55
	1/15	R7G-VRSFPB15B100	78	32	52	40	46	60	50	45	10	3	6	12	20	M4	M5	12	16	4	4	2.5	0.7
	1/25	R7G-VRSFPB25C100	92	50	78	40	46	90	70	62	17	3	6	19	30	M4	M6	20	22	6	6	3.5	1.7
200W	1/5	R7G-VRSFPB05B200	72.5	32	52	60	70	60	50	45	10	3	10	12	20	M5	M5	12	16	4	4	2.5	0.72
	1/9	R7G-VRSFPB09C400	89.5	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	1.7
	1/15	R7G-VRSFPB15C400	100	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	2.1
	1/25	R7G-VRSFPB25C200	100	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	2.1
400W	1/5	R7G-VRSFPB05C400	89.5	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	1.7
	1/9	R7G-VRSFPB09C400	89.5	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	1.7
	1/15	R7G-VRSFPB15C400	100	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	2.1
	1/25	R7G-VRSFPB25D400	104	61	98	60	70	115	90	75	18	5	8	24	40	M5	M8	20	30	8	7	4	3.2
750W	1/5	R7G-VRSFPB05C750	93.5	50	78	80	90	90	70	62	17	3	10	19	30	M6	M6	20	22	6	6	3.5	2.1
	1/9	R7G-VRSFPB09D750	97.5	61	98	80	90	115	90	75	18	5	10	24	40	M6	M8	20	30	8	7	4	3.4
	1/15	R7G-VRSFPB15D750	110	61	98	80	90	115	90	75	18	5	10	24	40	M6	M8	20	30	8	7	4	3.8
	1/25	R7G-VRSFPB25E750	135	75	125	80	90	135	110	98	17	5	10	32	55	M6	M10	20	45	10	8	5	7.2

Dimensions



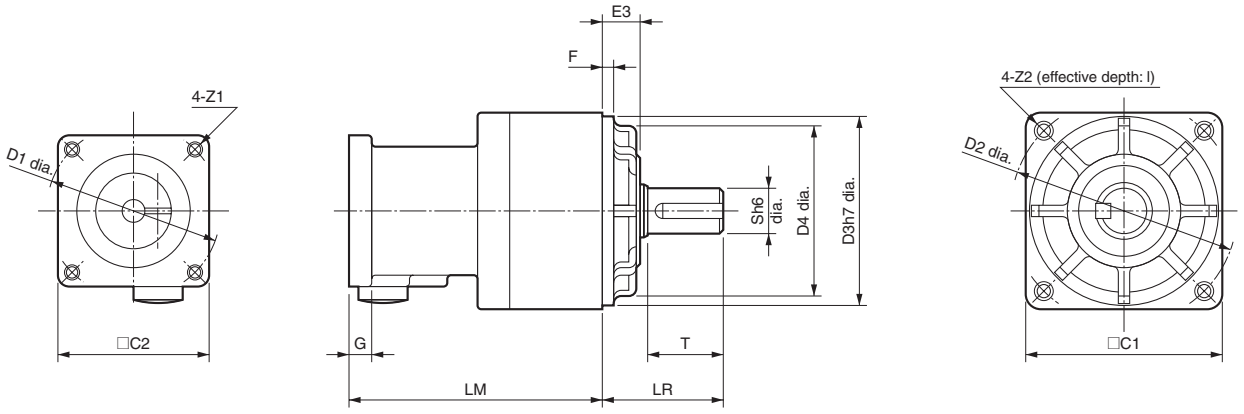
Key dimensions



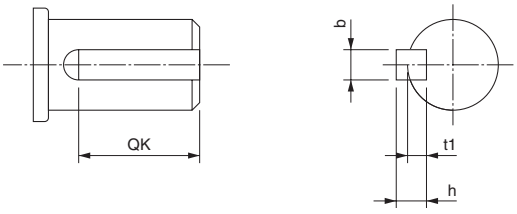
Cylindrical Servomotor (Backlash within 45 Minutes)

Model			Dimensions (mm)																Key slot dimensions				Weight (kg)
			LM	LR	C1	C2	D1	D2	D3	D4	E3	F	G	S	T	Z1	Z2	I	QK	b	h	t1	
100W	1/5	R7G-RGSF05B100	67.5	32	52	40	46	60	50	45	10	3	6	12	20	M4	M5	12	16	4	4	2.5	0.55
	1/9	R7G-RGSF09B100	67.5	32	52	40	46	60	50	45	10	3	6	12	20	M4	M5	12	16	4	4	2.5	0.55
	1/15	R7G-RGSF15B100	78	32	52	40	46	60	50	45	10	3	6	12	20	M4	M5	12	16	4	4	2.5	0.70
200W	1/5	R7G-RGSF05B200	72.5	32	52	60	70	60	50	45	10	3	10	12	20	M5	M5	12	16	4	4	2.5	0.72
	1/9	R7G-RGSF09C400	89.5	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	1.7
	1/15	R7G-RGSF15C400	100	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	2.1
400W	1/5	R7G-RGSF05C400	89.5	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	1.7
	1/9	R7G-RGSF09C400	89.5	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	1.7
	1/15	R7G-RGSF15C400	100	50	78	60	70	90	70	62	17	3	8	19	30	M5	M6	20	22	6	6	3.5	2.1

Dimensions

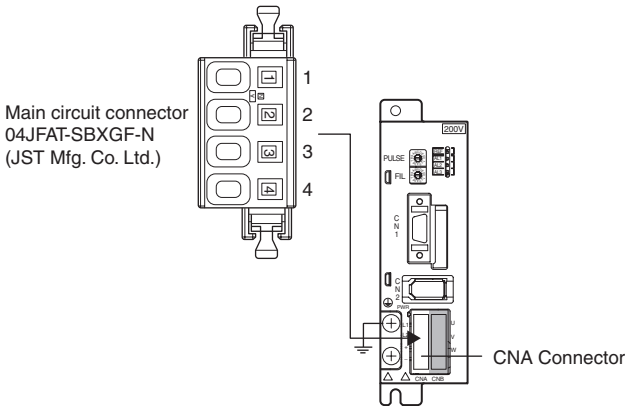


Key dimensions



I/O Specifications

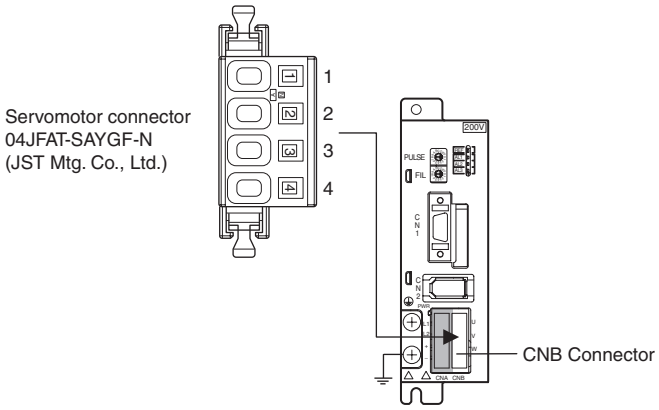
■Main Circuit Connector Specifications (CNA) R7A-CNZ01P



●Main Circuit Connector (CNA) Pin Arrangement

Pin	Symbol	Name	Function
1	L1	Main-circuit Power Supply Terminals	Single-phase 200/230 V AC (170 to 253 V AC) 50/60 Hz
2	L2		
3	+	External Regeneration Resistance Unit connection terminals	If regenerative energy is high, connect an External Regeneration Unit between P and N.
4	–		
⏚	⏚	Frame ground	This is the ground terminal. Ground it to a minimum of 100 Ω (Japanese class D, class 3).

■Servomotor Connector Specifications (CNB) R7A-CNZ01A



●Main Circuit Connector (CNB) Pin Arrangement

Pin	Symbol	Name	Function	
1	U	Servomotor Terminals	Red	These are the terminals for outputs to the Servomotor. Be careful to wire them correctly.
2	V		White	
3	W		Blue	
4	–	---	Do not connect anything to this terminal.	
⏚	⏚	Frame ground	Green/Yellow	Connect the Servomotor FG terminal.

■Control I/O Signals

●CN1 Control Inputs

Pin No.	Signal name	Function	Function/interface
1	+CW/PULS	Reverse pulses, feed pulses	Pulse string input terminals for position commands. Line-driver input: 7 mA at 3 V Maximum response frequency: 750 kpps Open-collector input: 7 to 15 mA Maximum response frequency: 187.5 kpps **Note:** Either forward and reverse pulses (CW/CCW), or feed pulses and direction signal (PULS/SIGN) can be selected using the rotary switch for setting command pulses, located on the front of the Unit.
2	–CW/PULS		
3	+CCW/SIGN	Forward pulses, phase difference signals	
4	–CCW/SIGN		
5	+24VIN	+24-V power supply input for control DC	Power supply input terminal (+24 V DC) for sequence inputs (pin 6).
6	RUN	RUN command input	ON: Servo ON (Starts power to Servomotor.)
8	+ECRST	Deviation counter reset	ON: Pulse commands prohibited and deviation counter cleared. Line-driver input: 7 mA at 3 V Open-collector input: 7 to 15 mA **Note:** Input for at least 20 μs.
9	–ECRST		

●CN1 Control Outputs

Pin No.	Signal name	Function	Function/interface
10	Z	Phase Z output	Outputs the Encoder's phase Z. (1 pulse/revolution) **Note:** Use the rising edge of the ON signal.
11	ZCOM		
12	$\overline{\text{ALM}}$	Alarm output	When the Servo Driver generates an alarm, the output turns OFF. **Note:** OFF for approx. 2 s after the power is turned ON.
13	BKIR	Brake interlock output	Outputs the holding brake timing signals. Release the holding brake when this signal is ON.
14	INP	Positioning completed output	ON when the position deviation is within ±10 pulses.
7	0GND	Output ground common	Ground common for sequence outputs (pins 12, 13 and 14).

Note: An open-collector output interface is used for sequence outputs (maximum operating voltage: 30 V DC; maximum output current: 50 mA).

■CN1 Connectors (14P)

●Soldered Connectors

Name	Model	Manufacturer
Cable solder plug	10114-3000VE	Sumitomo 3M
Cable case (shell kit)	10314-52A0-008	

■CN2 Encoder Connector Specifications

Pin	Symbol	Name
1	E5V	Encoder power supply +5 V
2	E0V	Encoder power supply GND
3	A + Phase A	Encoder + phase-A input
4	A – Phase A	Encoder – phase-A input
5	+ Phase B	Encoder + phase-B input
6	– Phase B	Encoder – phase-B input
7	Phase Z	Encoder phase-Z input
8	Phase U	Poll sensor phase U
9	Phase V	Poll sensor phase V
10	Phase W	Poll sensor phase W
Shell	FG	Cable shield ground

■CN2 Connectors (10P)

●Crimped Connectors

Name	Model	Manufacturer
Plug, Cable, and Cover Set	54559-1005	Molex
Plug Housing	51209-1001	
Crimp Terminal	59351-8187 (Loose wires)	
Crimping Tool	57401-5300	

●Soldered Connectors

Name	Model	Manufacturer
Plug, Cable, and Cover Set	54599-1005	Molex
Plug Connector	51593-1011	

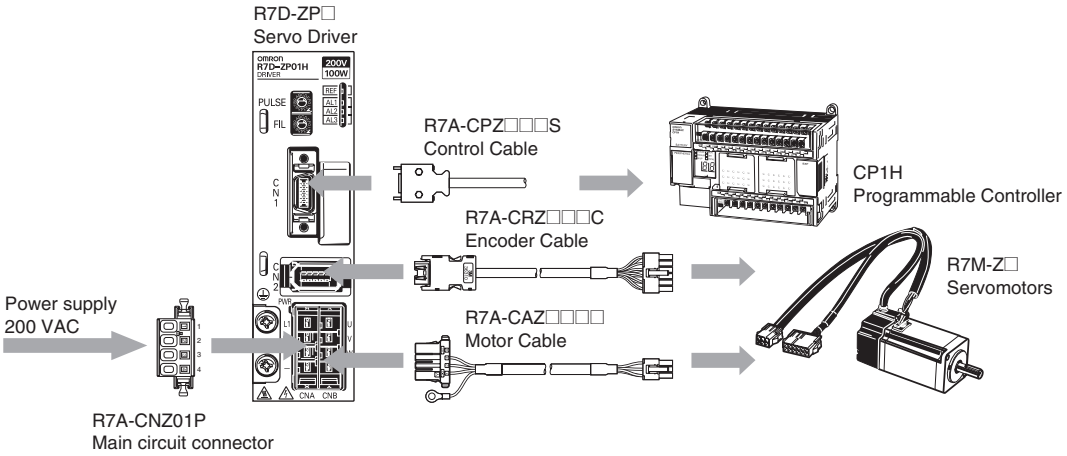
Startup Operation Example

This section presents an example of the SMARTSTEP Junior startup procedure.
In this example a package-type CP1H Programmable Controller is connected.
The no-load operation must always be checked before the Servomotor is connected to the mechanical system.

■Startup Flow

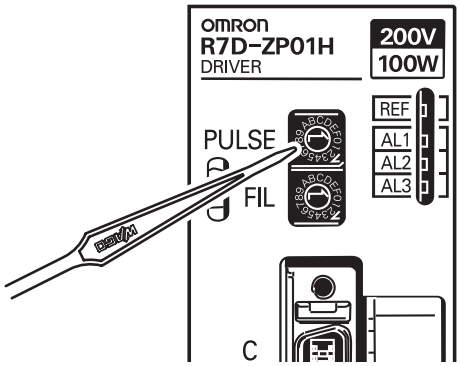
(1) Wiring

Connect the power supply, Encoder Cable, Power Cable, and Control Cable.
An example of connecting the Control Cable to the CP1H is shown below.



(2) Setting Command Pulses

Set the rotary switch for setting command pulse (PULSE) according to the Controller.
For example, set 3 for a command pulse resolution of 10,000 pulses/rotation and a command pulse type of CW + CCW positive logic. (Turn OFF the power before setting the rotary switch.)



(3) Completing the Setup

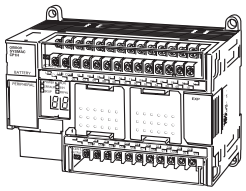
To complete the setup, recheck the power supply voltage and the wiring, and then turn ON the power.
Check the LED indicators to confirm that no alarms have occurred.

Wiring and Operation Examples

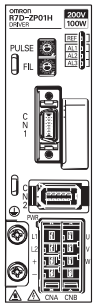
In these examples, the SMARTSTEP Junior is operated using the CP1H PLC.
The wiring and operations are shown below.

■Example: Connecting to the CP1H

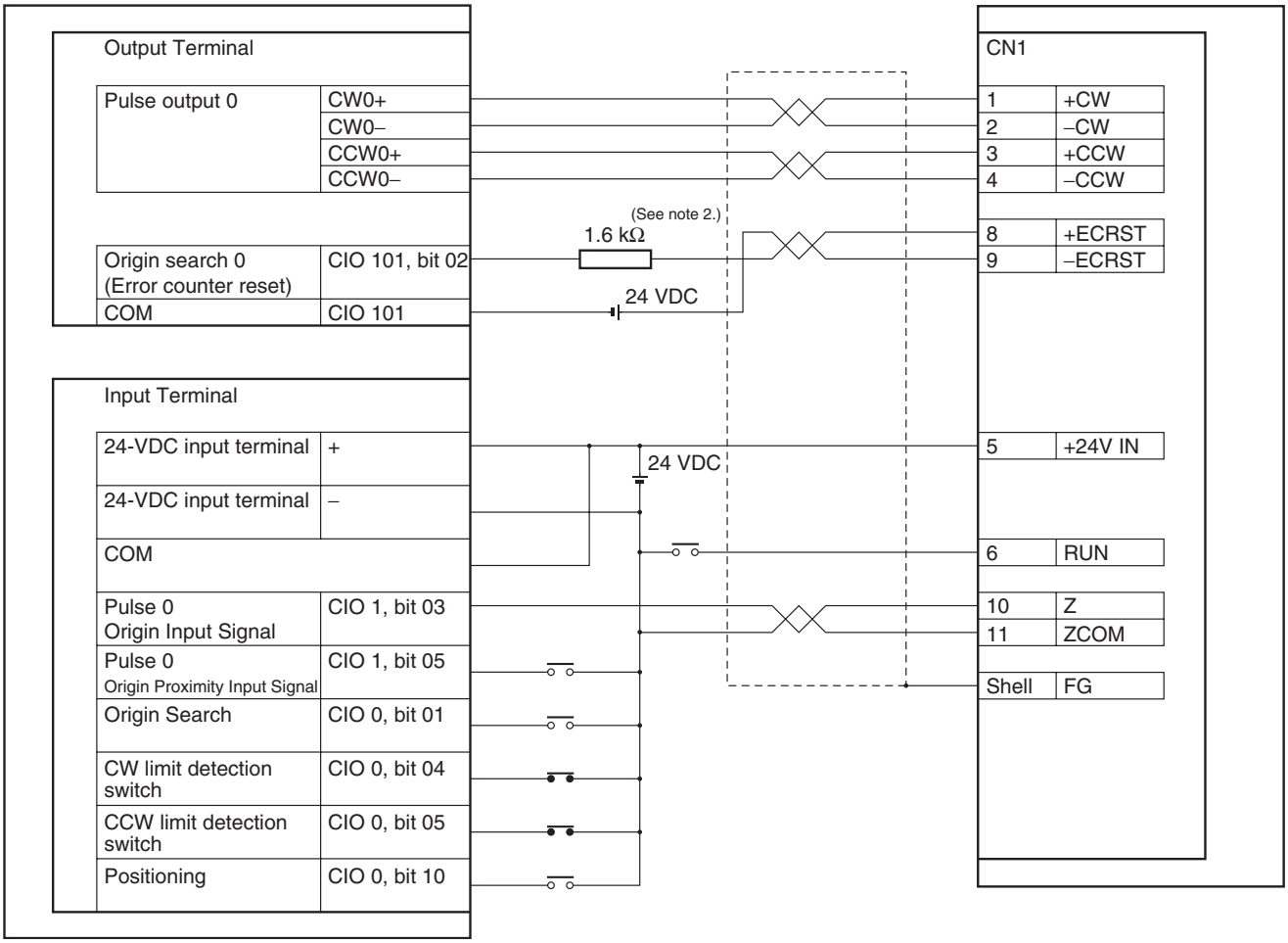
This example shows the Control Cable connection between the SMARTSTEP Junior and the CP1H PLC.



CP1H-Y20DT-D



R7D-ZP□

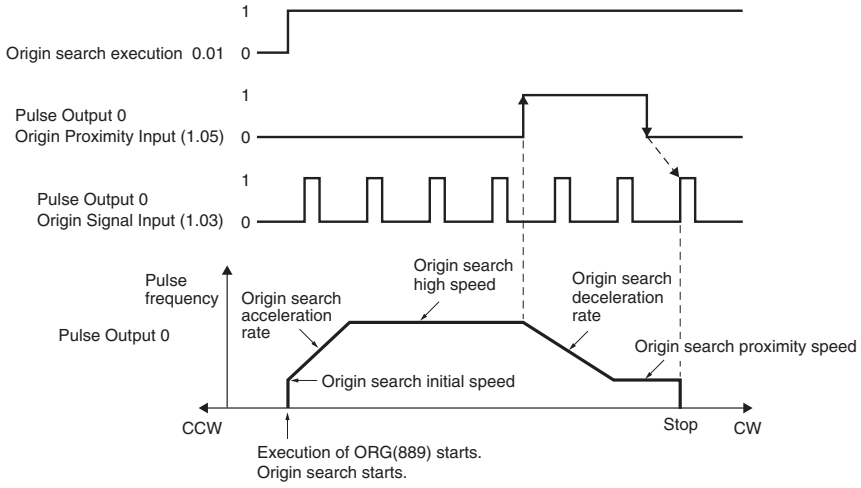


Note 1. This is only a wiring example. Refer to the specific user's manuals for the actual wiring and PLC allocations for your system.
Note 2. Insert a resistance of 1.6 to 2.2 kΩ so that the ECRST input current will be 7 to 15 mA.

■(1) Operation Example Using the CP1H: Origin Search

An origin search can be easily executed using the ORG command.

●Operation

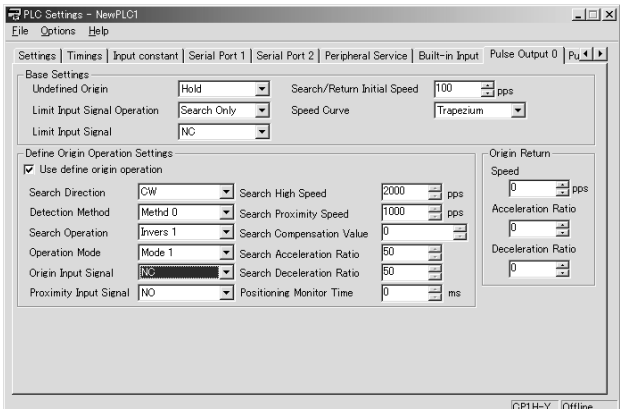


●PLC Setup

The settings for the CP1H PLC Setup are made using the CX-Programmer.

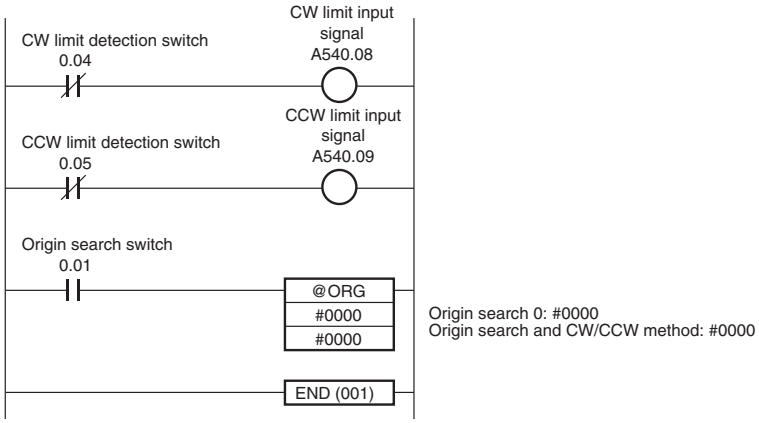
To make new settings, start the CX-Programmer and select File - New and then specify the device name and the device type.

Double-click Setting Icon in the new project to display the PLC Settings Dialog Box. The illustration below shows example settings.



Note: The settings for using origin search and the origin input signal type are read when the power is turned ON.

●Ladder Program



When the origin search switch CIO 0.01 is turned ON, an origin search is started and the origin search is executed at high speed.

When the origin proximity input signal turns ON, the origin proximity speed is used.

When the origin proximity input signal turns OFF, the origin search stops at the next origin signal input and the origin search is completed.

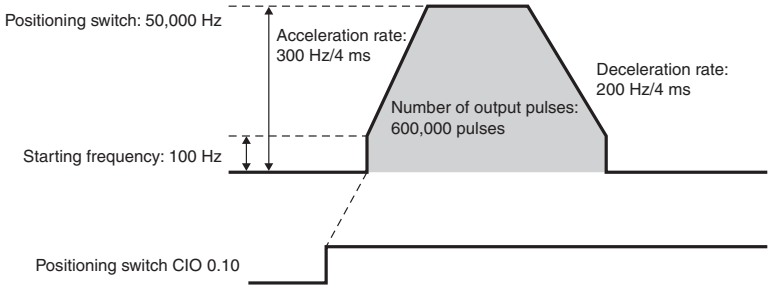
Note: This is only an operation example. Refer to the specific user's manuals for the actual wiring and PLC allocations for your system. For instructions and sample programs, refer to the CP1H Operation Manual (Cat. No. W450).

■(2) Operation Example Using the CP1H: Positioning

Trapezoidal control can be easily executed by using the PLS2 instruction.

●Operation

When positioning switch CIO 0.10 is turned ON, the number of output pulses increases from 0 to 600,000 and the motor turns.



●PLC Setup

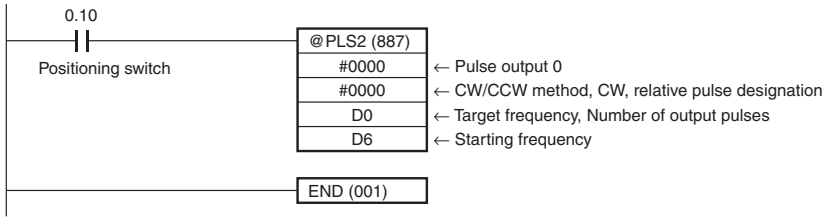
There are no settings that need to be made in the PLC Setup.

●DM Area Settings

PLS2 Instruction Settings (D0 to D7)

Setting details	Address	Data
Acceleration rate: 300 Hz/4ms	D0	#012C
Deceleration rate: 200 Hz/4ms	D1	#00C8
Target frequency: 50,000 Hz	D2	#C350
	D3	#0000
Number of output pulses: 600,000 pulses	D4	#27C0
	D5	#0009
Starting frequency: 100 Hz	D6	#0064
	D7	#0000

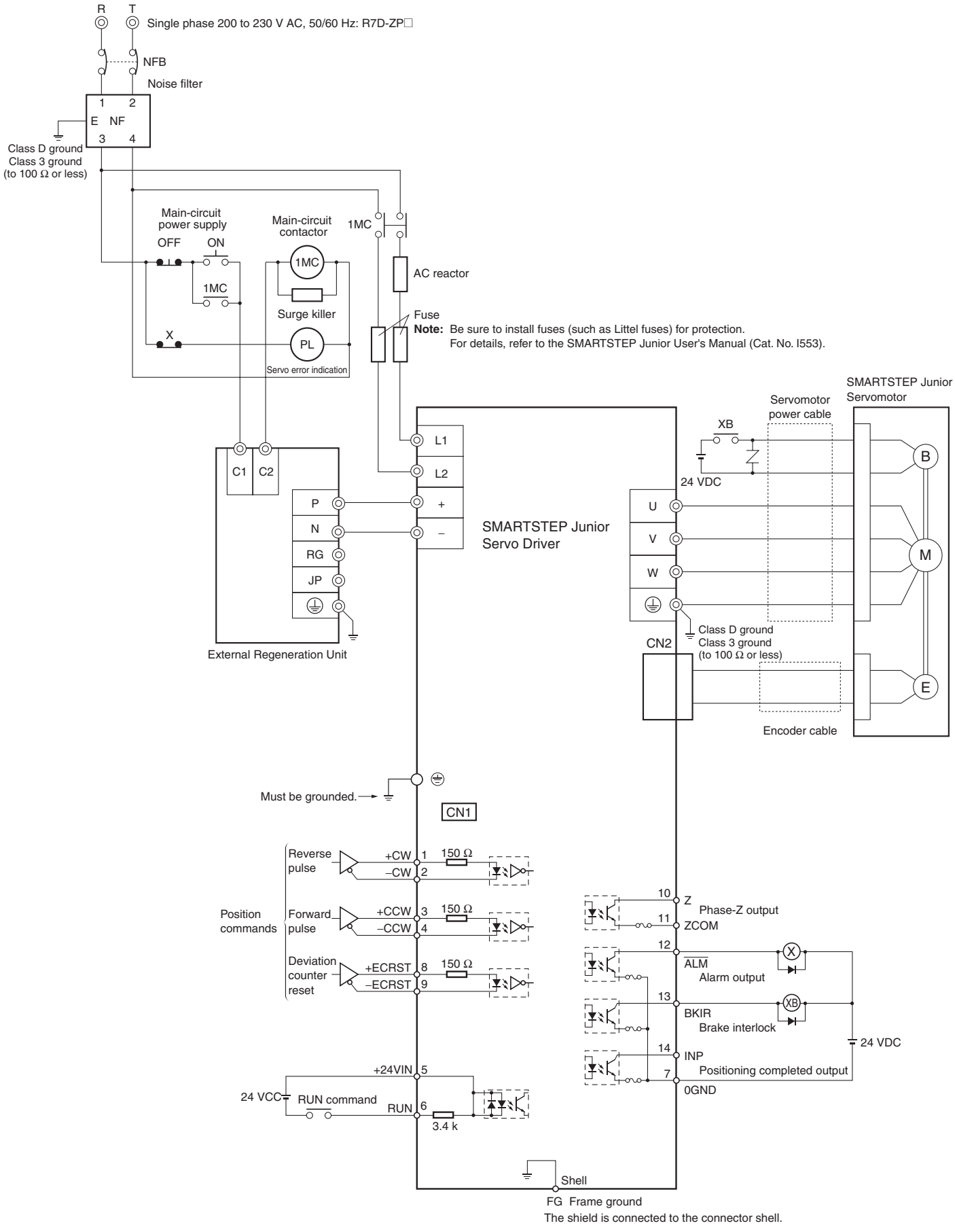
●Ladder Program



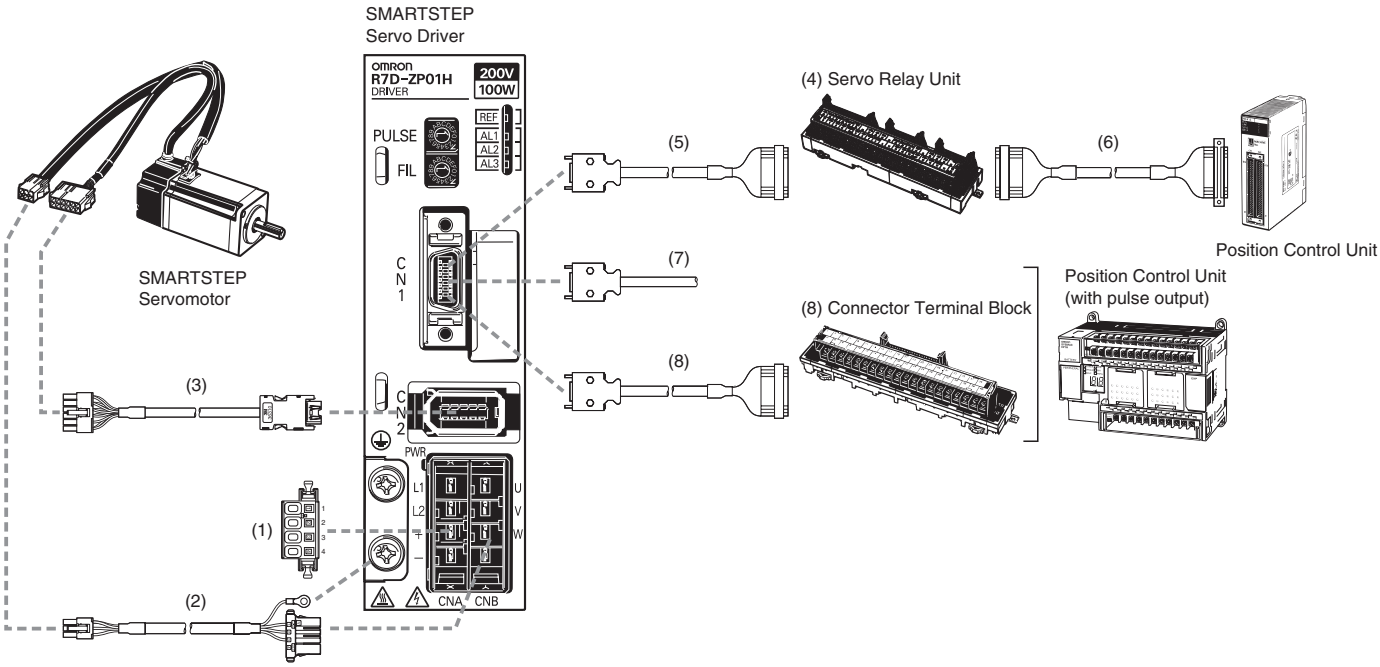
When positioning switch CIO 0.10 turns ON, positioning is executed using trapezoidal control.

Note: This is only an operation example. Refer to the specific user's manuals for the actual wiring and PLC allocations for your system. For instructions and sample programs, refer to the CP1H Operation Manual (Cat. No. W450).

Standard Wiring



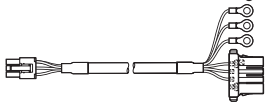
Connecting Cables



●Main Circuit Connector (for CNA)

Symbol	Name	Connects to	Model	Description
(1)	Main Circuit Connector	R7D-ZP Connector	R7A-CNZ01P	Model: 04JFAT-SBXGF-N (JST Mfg. Co. Ltd.) 

●Power Cables (for CNB)

Symbol	Name	Connects to	Model	Description
(2)	Power Cable without brake line	Motor without Brake R7M-Z□□□30-S1	R7A-CAZ□□□S The boxes in the model number are for the cable length: 3 m, 5 m or 10 m (See note.)	Motor Connector (Molex) Connector Plug: 5557-06R-210 Connector Case: 5556TL Driver Connector (JST Mfg. Co. Ltd.) Connector Plug: 04JFAT-SAYGF-N 
	Power Cable with brake line	Motor with Brake R7M-Z□□□30-BS1	R7A-CAZ□□□B The boxes in the model number are for the cable length: 3 m, 5 m or 10 m (See note.)	Motor Connector (Molex) Connector Plug: 5557-06R-210 Connector Case: 5556TL Driver Connector (JST Mfg. Co. Ltd.) Connector Plug: 04JFAT-SAYGF-N 

●Encoder Cables (For CN2)

Symbol	Name	Connects to	Model	Description
(3)	Encoder Cable	R7M-Z□□□30-□S1	R7A-CRZ□□□C The boxes in the model number are for the cable length:3 m, 5 m or 10 m (See note.)	Motor Connector (Molex) Connector Plug: 5557-12R-210 Connector Case: 5556T2L Driver Connector (Sumitomo 3M) Connector Plug: 36210-0100FD Connector Case: 36310-3200-008 

Note: The maximum cable length that can be used between the Servo Driver and Servomotor is 20 m. Cable over 10 m must be prepared by the user.

●Control Cables (For CN1)

Symbol	Name	Connects to		Model
(4)	Servo Relay Unit	Position Control Units (CS1W-NC113/133, CJ1W-NC113/133, C200HW-NC113)		XW2B-20J6-1B
		Position Control Units (CS1W-NC213/233/413/433, CJ1W-NC213/233/413/433, C200HW-NC213/413)		XW2B-40J6-2B
		FQM1 Series (FQM1-MMP22) Customizable Counter Unit (CS1W-HCP22-V1)		XW2B-80J7-1A
		One-axis Servo Relay Unit for CJ1M-CPU21/22/23 CPU Unit		XW2B-20J6-8A
		Two-axis Servo Relay Unit for CJ1M-CPU21/22/23 CPU Unit		XW2B-40J6-9A
(5)	Cable to Servo Driver	XW2B-□□J6-□B (Position Control Unit)		XW2Z-□□□J-B17 The boxes in the model number are for the cable length: 1 m or 2 m.
		XW2B-20J6-8A/-40J6-9A (CJ1M-CPU)		XW2Z-□□□J-B17 The boxes in the model number are for the cable length: 1 m or 2 m.
		XW2B-80J7-1A (FQM1)		XW2Z-□□□J-B20 The boxes in the model number are for the cable length: 1 m or 2 m.
		XW2B-80J7-1A (Customizable Counter Unit)		XW2Z-□□□J-B18 The boxes in the model number are for the cable length: 1 m or 2 m.
(6)	Cable to Position Control Unit	CS1W-NC113 and C200HW-NC113		XW2Z-□□□J-A8 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CS1W-NC213/413 and C200HW-NC213/413		XW2Z-□□□J-A9 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CS1W-NC133		XW2Z-□□□J-A12 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CS1W-NC233/433		XW2Z-□□□J-A13 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CJ1W-NC113		XW2Z-□□□J-A16 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CJ1W-NC213/413		XW2Z-□□□J-A17 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CJ1W-NC133		XW2Z-□□□J-A20 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CJ1W-NC233/433		XW2Z-□□□J-A21 The boxes in the model number are for the cable length: 0.5 m or 1 m
		FQM1-MMP22	General-purpose I/O Cables	XW2Z-□□□J-A28 The boxes in the model number are for the cable length: 0.5 m or 1 m
			Special I/O Cables	XW2Z-□□□J-A30 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CS1W-HCP22-V1	General-purpose I/O Cables	XW2Z□□□J-A29 The boxes in the model number are for the cable length: 0.5 m or 1 m
			Special I/O Cables	XW2Z-□□□J-A32 The boxes in the model number are for the cable length: 0.5 m or 1 m
		CJ1M-CPU21/22/23 for 2 axes		XW2Z-100J-A26 Cable length: 1 m
(7)	Control Cable	For general-purpose Controllers		R7A-CPZ□□□S The boxes in the model number are for the cable length: 1 m or 2 m.
(8)	Connector-Terminal Block Cable	For general-purpose Controllers		XW2Z-□□□J-B19 The boxes in the model number are for the cable length: 1 m or 2 m.
	Connector-Terminal Block Conversion Unit			XW2B-20G5

Model Number Legends

●AC Servomotors

R7M-Z□□□□□-□□□

(1) (2) (3) (4) (5) (6)

No.	Item	Code	Specification
(1)	Indicates a Servomotor		
(2)	Series	Z	SMARTSTEP Junior
(3)	Motor capacity	100	100 W
		200	200 W
		400	400 W
		750	750 W
(4)	Speed	30	3000 r/min
(5)	Brake	Blank	No brake
		B	24-V DC brake
(6)	Shaft	S1	Straight shaft with key

●AC Servo Drivers

R7D-ZP□□□

(1) (2) (3) (4)

No.	Item	Code	Specification
(1)	Indicates a Servo Driver		
(2)	Series	Z	SMARTSTEP Junior
	Input signal designation	P	Pulse train input
(3)	Maximum output capacity	01	100 W
		02	200 W
		04	400 W
		08	750 W
(4)	Power supply specification	H	200 VAC

●Servomotor and Servo Driver Combinations

Rated output	Servomotor		Servo Driver
	Without brake	With Brake	Pulse train input
100 W	R7M-Z10030-S1	R7M-Z10030-BS1	R7D-ZP01H
200 W	R7M-Z20030-S1	R7M-Z20030-BS1	R7D-ZP02H
400 W	R7M-Z40030-S1	R7M-Z40030-BS1	R7D-ZP04H
750 W	R7M-Z75030-S1	R7M-Z75030-BS1	R7D-ZP08H

Ordering Guide

●AC Servomotors

Cylindrical Servomotors (3000-r/min)

Specifications			Model
Straight shaft with key	Without brake	100 W	R7M-Z10030-S1
		200 W	R7M-Z20030-S1
		400 W	R7M-Z40030-S1
		750 W	R7M-Z75030-S1
	With brake	100 W	R7M-Z10030-BS1
		200 W	R7M-Z20030-BS1
		400 W	R7M-Z40030-BS1
		750 W	R7M-Z75030-BS1

●AC Servo Drivers

Specifications		Model
200 V AC	100 W	R7D-ZP01H
	200 W	R7D-ZP02H
	400 W	R7D-ZP04H
	750 W	R7D-ZP08H

Note: The Main Circuit Connector is not included and must be obtained separately.

●Main Circuit Connector

Specification	Model
Main Circuit Connector (for CNA)	R7A-CNZ01P

●Reduction Gear (Straight Shaft with Key)

Cylindrical Servomotor (Backlash within 45 Minutes)

Motor capacity	Model	Deceleration (deceleration ratio)		
		1/5	1/9	1/15
100 W	R7G-RGSF05B100	❍		
	R7G-RGSF09B100		❍	
	R7G-RGSF15B100			❍
200 W	R7G-RGSF05B200	❍		
	R7G-RGSF09C400		❍	
	R7G-RGSF15C400			❍
400 W	R7G-RGSF05C400	❍		
	R7G-RGSF09C400		❍	
	R7G-RGSF15C400			❍

Cylindrical Servomotor (Backlash within 3 Minutes)

Motor capacity	Model	Deceleration (deceleration ratio)			
		1/5	1/9	1/15	1/25
100 W	R7G-VRSFPB05B100	❍			
	R7G-VRSFPB09B100		❍		
	R7G-VRSFPB15B100			❍	
	R7G-VRSFPB25C100				❍
200 W	R7G-VRSFPB05B200	❍			
	R7G-VRSFPB09C400		❍		
	R7G-VRSFPB15C400			❍	
	R7G-VRSFPB25C200				❍
400 W	R7G-VRSFPB05C400	❍			
	R7G-VRSFPB09C400		❍		
	R7G-VRSFPB15C400			❍	
	R7G-VRSFPB25D400				❍
750 W	R7G-VRSFPB05C750	❍			
	R7G-VRSFPB09D750		❍		
	R7G-VRSFPB15D750			❍	
	R7G-VRSFPB25E750				❍

●Control Cables for CN1

Specifications			Model
Control Cable for General-purpose Controllers		1 m	R7A-CPZ001S
		2 m	R7A-CPZ002S
For General-purpose Controllers	Cable for Connector terminal blocks	1 m	XW2Z-100J-B19
		2 m	XW2Z-200J-B19
	Connector-Terminal Block Conversion Unit		XW2B-20G5

Note: For details on "*Servo Relay Units*" and "*Connecting Cable*", refer to pages 23 and 24.

●Power Cables

Specifications			Model
Power Cables	For Motors without brakes	3 m	R7A-CAZ003S
		5 m	R7A-CAZ005S
		10 m	R7A-CAZ010S
	For Motors with brakes	3 m	R7A-CAZ003B
		5 m	R7A-CAZ005B
		10 m	R7A-CAZ010B

●Encoder Cables

Specifications		Model
Encoder Cables	3 m	R7A-CRZ003C
	5 m	R7A-CRZ005C
	10m	R7A-CRZ010C

●Connectors

Specifications	Model
Control I/O Connector	R7A-CNA01R
Motor Connector (CNB)	R7A-CNZ01A
Encoder Input Connector (CN2)	R7A-CNZ01R
Encoder Connector (Motor side)	R7A-CNZ02R
Servomotor Connector for Servomotor Power Cable	R7A-CNZ02A

●External Regeneration Unit

Specifications	Model
Regeneration current: 8 A Built-in resistance: 50 Ω, 12 W	R88A-RG08UA

●External Regeneration Resistor

Specifications	Model
Regeneration capacity: 70 W, 47 Ω	R88A-RR22047S

●AC Reactor

Specifications	Model
For the R7D-ZP01H	R88A-PX5052
For the R7D-ZP02H	R88A-PX5053
For the R7D-ZP04H	R88A-PX5054
For the R7D-ZP08H	R88A-PX5056

Read and Understand this Catalog

Please read and understand this catalog before purchasing the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user’s programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON’s test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

Printed on 100% Recycled Paper

PRINTED WITH SOY INK
Trademark of American Soybean Association
TM

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

OMRON Corporation
Industrial Automation Company
Control Devices Division H.Q.
Shiokoji Horikawa, Shimogyo-ku,
Kyoto, 600-8530 Japan
Tel: (81)75-344-7109
Fax: (81)75-344-7149

Regional Headquarters

OMRON EUROPE B.V.
Wegalaan 67-69, NL-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300
Fax: (31)2356-81-388

OMRON ELECTRONICS LLC
1 East Commerce Drive, Schaumburg,
IL 60173 U.S.A.
Tel: (1)847-843-7900/Fax: (1)847-843-8568

OMRON ASIA PACIFIC PTE. LTD.
83 Clemenceau Avenue,
#11-01, UE Square,
Singapore 239920
Tel: (65)6835-3011/Fax: (65)6835-2711

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120 China
Tel: (86)21-5037-2222/Fax: (86)21-5037-2200

Authorized Distributor:

Note: Specifications subject to change without notice.

Cat. No. I812-E1-01A

0107