

# Servos

# SmartStep

Quick Link  
K091

## Cost-Effective Servo Capability with Stepper Simplicity

Easily migrate from steppers to the higher precision of servos in minutes with Omron's SmartStep servo drivers and ultra-compact 3-phase servo motors. They accept pulse-train input that can be configured quickly via simple DIP switches and have an on-line auto-tuning function. SmartStep offers all the simplicity and cost-effectiveness of a stepper with the added advantages of the servo drive capability.

### Motor Features

- Sizes 30 W to 750 W, rated speed 3,000 rpm
- Accepts incremental encoder input at 2,000 p/r
- Cylindrical and flat type servo motors available
- Peak torque up to three times continuous torque during 3 seconds
- Easy to install with pre-built cables
- Motors with brake are available

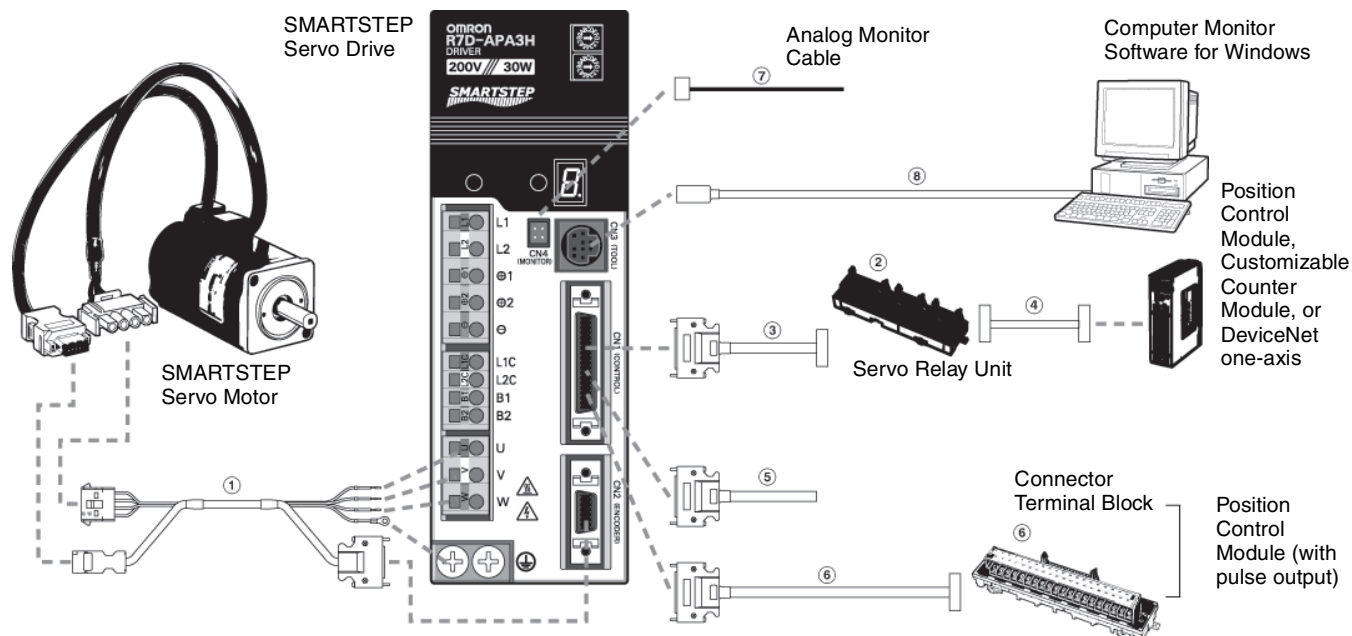
### Driver Features

- Output range from 30 W to 750 W
- 300% peak current over nominal
- Control via pulse train (speed and position)



- Four position resolution settings:
  - 500 pulses/rotation (0.72°/step)
  - 1,000 pulses/rotation (0.36°/step)
  - 5,000 pulses/rotation (0.072°/step)
  - 10,000 pulses/rotation (0.036°/step)
- SmartStep does not require the use of PC configuration software, making setup as easy as using a stepper motor for basic capabilities
- To optimize performance, use PC software for on-line auto-tuning of values and monitoring

## Ordering Information



Add cable length to the part number in place of □□□: 003 for 3 m cable, 005 for 5 m, 010 for 10 m, 015 for 15 m and 020 for 20 m.

**Note:** Circled numbers refer to the configuration diagram on page I-8.

## SmartStep Servos

| Wattage                                                                     | Servo motor model | Servo drive model | ①Power cable/Encoder cable model<br>(Add cable length for □□□) |
|-----------------------------------------------------------------------------|-------------------|-------------------|----------------------------------------------------------------|
| <b>Cylindrical Servo Motors 100 VAC Without Brake, Shaft Without Keyway</b> |                   |                   |                                                                |
| 30 W                                                                        | R7M-A03030-S1     | R7D-APA3L         | R7A-CEA□□□S                                                    |
| 50 W                                                                        | R7M-A05030-S1     | R7D-APA5L         | R7A-CEA□□□S                                                    |
| 100 W                                                                       | R7M-A10030-S1     | R7D-AP01L         | R7A-CEA□□□S                                                    |
| 200 W                                                                       | R7M-A20030-S1     | R7D-AP02L         | R7A-CEA□□□S                                                    |
| 400 W                                                                       | R7M-A40030-S1     | R7D-AP04L         | R7A-CEA□□□S                                                    |
| <b>Cylindrical Servo Motors 100 VAC With Brake, Shaft With Keyway</b>       |                   |                   |                                                                |
| 30 W                                                                        | R7M-A03030-BS1    | R7D-APA3L         | R7A-CEA□□□B                                                    |
| 50 W                                                                        | R7M-A05030-BS1    | R7D-APA5L         | R7A-CEA□□□B                                                    |
| 100 W                                                                       | R7M-A10030-BS1    | R7D-AP01L         | R7A-CEA□□□B                                                    |
| 200 W                                                                       | R7M-A20030-BS1    | R7D-AP02L         | R7A-CEA□□□B                                                    |
| 400 W                                                                       | R7M-A40030-BS1    | R7D-AP04L         | R7A-CEA□□□B                                                    |
| <b>Cylindrical Servo Motors 200 VAC Without Brake, Shaft With Keyway</b>    |                   |                   |                                                                |
| 30 W                                                                        | R7M-A03030-S1     | R7D-APA3H         | R7A-CEA□□□S                                                    |
| 50 W                                                                        | R7M-A05030-S1     | R7D-APA5H         | R7A-CEA□□□S                                                    |
| 100 W                                                                       | R7M-A10030-S1     | R7D-AP01H         | R7A-CEA□□□S                                                    |
| 200 W                                                                       | R7M-A20030-S1     | R7D-AP02H         | R7A-CEA□□□S                                                    |
| 400 W                                                                       | R7M-A40030-S1     | R7D-AP04H         | R7A-CEA□□□S                                                    |
| 750 W                                                                       | R7M-A75030-S1     | R7D-AP08H         | R7A-CEA□□□S                                                    |
| <b>Cylindrical Servo Motors 200 VAC With Brake, Shaft With Keyway</b>       |                   |                   |                                                                |
| 30 W                                                                        | R7M-A03030-BS1    | R7D-APA3H         | R7A-CEA□□□B                                                    |
| 50 W                                                                        | R7M-A05030-BS1    | R7D-APA5H         | R7A-CEA□□□B                                                    |
| 100 W                                                                       | R7M-A10030-BS1    | R7D-AP01H         | R7A-CEA□□□B                                                    |
| 200 W                                                                       | R7M-A20030-BS1    | R7D-AP02H         | R7A-CEA□□□B                                                    |
| 400 W                                                                       | R7M-A40030-BS1    | R7D-AP04H         | R7A-CEA□□□B                                                    |
| 750 W                                                                       | R7M-A75030-BS1    | R7D-AP08H         | R7A-CEA□□□B                                                    |
| <b>Flat Servo Motors 100 VAC Without Brake, Shaft With Keyway</b>           |                   |                   |                                                                |
| 100 W                                                                       | R7M-AP10030-S1    | R7D-AP01L         | R7A-CEA□□□S                                                    |
| 200 W                                                                       | R7M-AP20030-S1    | R7D-AP02L         | R7A-CEA□□□S                                                    |
| 400 W                                                                       | R7M-AP40030-S1    | R7D-AP04L         | R7A-CEA□□□S                                                    |
| <b>Flat Servo Motors 100 VAC With Brake, Shaft With Keyway</b>              |                   |                   |                                                                |
| 100 W                                                                       | R7M-AP10030-BS1   | R7D-AP01L         | R7A-CEA□□□B                                                    |
| 200 W                                                                       | R7M-AP20030-BS1   | R7D-AP02L         | R7A-CEA□□□B                                                    |
| 400 W                                                                       | R7M-AP40030-BS1   | R7D-AP04L         | R7A-CEA□□□B                                                    |
| <b>Flat Servo Motors 200 VAC Without Brake, Shaft With Keyway</b>           |                   |                   |                                                                |
| 100 W                                                                       | R7M-AP10030-S1    | R7D-AP01H         | R7A-CEA□□□S                                                    |
| 200 W                                                                       | R7M-AP20030-S1    | R7D-AP02H         | R7A-CEA□□□S                                                    |
| 400 W                                                                       | R7M-AP40030-S1    | R7D-AP04H         | R7A-CEA□□□S                                                    |
| 750 W                                                                       | R7M-AP75030-S1    | R7D-AP08H         | R7A-CEA□□□S                                                    |
| <b>Flat Servo Motors 200 VAC With Brake, Shaft With Keyway</b>              |                   |                   |                                                                |
| 100 W                                                                       | R7M-AP10030-BS1   | R7D-AP01H         | R7A-CEA□□□B                                                    |
| 200 W                                                                       | R7M-AP20030-BS1   | R7D-AP02H         | R7A-CEA□□□B                                                    |
| 400 W                                                                       | R7M-AP40030-BS1   | R7D-AP04H         | R7A-CEA□□□B                                                    |
| 750 W                                                                       | R7M-AP75030-BS1   | R7D-AP08H         | R7A-CEA□□□B                                                    |

## Cables and Accessories

| Description                                                                     | Devices connected                                                                                  | Specification              | Model         |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------|---------------|
| ② Servo relay units connect cables from PLC position controller and servo drive | CS1W-NC113/133, CJ1W-NC113/133; 1 axis; does not support communications functions                  | —                          | XW2B-20J6-1B  |
|                                                                                 | CS1W-NC213/233/413/433, CJ1W-NC213/233/413/433; 2 axes; does not support communications functions  | —                          | XW2B-40J6-2B  |
|                                                                                 | CQM1H-PLB21 and CQM1-CPU43-V1; 1 axis; does not support communications functions                   | —                          | XW2B-20J6-3B  |
|                                                                                 | CS1W-NC213/233/413/433, CJ1W-NC213/233/413/433; 2 axes; supports communications functions          | —                          | XW2B-40J6-4A  |
|                                                                                 | CJ1M-CPU22/23; 1 axis; does not support communications functions                                   | —                          | XW2B-20J6-8A  |
|                                                                                 | CJ1M-CPU22/23; 2 axes; does not support communications functions                                   | —                          | XW2B-40J6-9A  |
| ③ Universal terminal block cable to servo drive                                 | Doesn't support communications functions.<br>(For the XW2B-□□J6-□B)                                | 1 m length                 | XW2Z-100J-B5  |
|                                                                                 |                                                                                                    | 2 m length                 | XW2Z-200J-B5  |
| ④ Position controller PLC module cable                                          | CQM1H-PLB21 and CQM1-CPU43-V1 to XW2B-20J6-3B servo relay unit                                     | 1 m length                 | XW2Z-100J-A3  |
|                                                                                 | CJ1W-NC113 to XW2B-20J6-1B servo relay unit                                                        | 1 m length                 | XW2Z-100J-A16 |
|                                                                                 | CJ1W-NC213 or CJ1W-NC413 to XW2B-20J6-2B servo relay unit                                          | 1 m length                 | XW2Z-100J-A17 |
|                                                                                 | CJ1W-NC133 to XW2B-20J6-1B servo relay unit                                                        | 1 m length                 | XW2Z-100J-A20 |
|                                                                                 | CJ1W-NC233 or CJ1W-NC433 to XW2B-40J6-2B servo relay unit                                          | 1 m length                 | XW2Z-100J-A21 |
|                                                                                 | CJ1M-CPU22 or CJ1M-CPU23 to XW2B-20J6-8A (1 axis) or XW2B-40J6-9A (2 axes) servo relay unit        | 1 m length                 | XW2Z-100J-A26 |
|                                                                                 | CS1W-NC113 to XW2B-20J6-1B servo relay unit                                                        | 1 m length                 | XW2Z-100J-A8  |
|                                                                                 | CS1W-NC213 or CS1W-NC413 to XW2B-40J6-2B servo relay unit                                          | 1 m length                 | XW2Z-100J-A9  |
|                                                                                 | CS1W-NC133 to XW2B-20J6-B1 servo relay unit                                                        | 1 m length                 | XW2Z-100J-A12 |
|                                                                                 | CS1W-NC233 or CS1W-NC433 to XW2B-40J6-2B servo relay unit                                          | 1 m length                 | XW2Z-100J-A13 |
| ⑤ Control cable                                                                 | For general-purpose Controllers (mating connector for CJ1 on one end, open ended on the other end) | 1 m length                 | R88A-CPU001S  |
|                                                                                 |                                                                                                    | 2 m length                 | R88A-CPU002S  |
| ⑥ Universal terminal block                                                      | For position control modules with pulse output and general-purpose controllers                     | —                          | XW2B-40F5-P   |
|                                                                                 | Connector cable between terminal block and servo driver                                            | 1 m length                 | R88A-CTU001N  |
|                                                                                 |                                                                                                    | 2 m length                 | R88A-CTU002N  |
| ⑦ Analog monitor cable (port CN4)                                               | Servo drive to PC                                                                                  | 1 m length                 | R88A-CMW001S  |
| ⑧ Computer monitor cable (port CN3)                                             | Servo drive to PC                                                                                  | 2 m length                 | R7A-CCA002P2  |
| Filters                                                                         | For servo drive R7D-APA3H, APA5H, AP01H, AP02H; R7D-APA3L, APA5L, AP01L, AP02L                     | 4 A, 250 VAC single phase  | R88A-FIW104-E |
|                                                                                 | For servo drive R7D-AP04H, AP04L                                                                   | 7 A, 250 VAC single phase  | R88A-FIW107-E |
|                                                                                 | For servo drive R7D-AP08H                                                                          | 15 A, 250 VAC single phase | R88A-FIW115-E |
| Control I/O connector (CN1)                                                     | —                                                                                                  | —                          | R88A-CNU01C   |
| SmartStep encoder connector (CN2)                                               | —                                                                                                  | —                          | R7A-CNA01R    |
| External regeneration resistor                                                  | —                                                                                                  | 200 W, 47 Ω                | R88A-RR22047S |
| Parameter copy unit with cable                                                  | —                                                                                                  | —                          | R7A-PR02A     |
| Configuration and monitoring software                                           | For servo drives and inverters                                                                     | Version 1.11 or higher     | CX-DRIVE      |
| Complete OMRON software suite                                                   | Includes CX-Drive                                                                                  | —                          | CX-ONE        |

## Specifications

### Servo Drives General Specifications

| Item                         | Specification                                                                                                                         |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Operating ambient            | 0° to 55° C (32° F to 131° F), 90% RH max. (with no condensation)                                                                     |
| Storage ambient              | -20° to 85° C (-4° F to 185° F), 90% RH max. (with no condensation)                                                                   |
| Storage/operating atmosphere | No corrosive gases.                                                                                                                   |
| 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 <sup>2</sup> max., whichever is smaller |
| Impact resistance            | Acceleration 19.6 m/s <sup>2</sup> max., in X, Y, and Z directions, three times                                                       |
| Insulation resistance        | Between power line terminals and case: 0.5 MΩ min. (at 500 VDC)                                                                       |
| Dielectric strength          | Between power line terminals and case: 1,500 VAC for 1 min. at 50/60 Hz between each control signal and case: 500 VAC for 1 min.      |
| Protective structure         | Built into panel (IP10).                                                                                                              |
| International standards      | Approval obtained for UL, cUL, and EN (EMC directive and low-voltage directive)                                                       |

### Servo Drives Performance Specifications

#### 100 VAC Input Models

| Item                                   | Specification                                                            |            |            |            |            |
|----------------------------------------|--------------------------------------------------------------------------|------------|------------|------------|------------|
| Model                                  | R7D-APA3L                                                                | R7D-APA5L  | R7D-AP01L  | R7D-AP02L  | R7D-AP04L  |
| Rated output                           | 30 W                                                                     | 50 W       | 100 W      | 200 W      | 400 W      |
| Continuous output current (rms)        | 0.42                                                                     | 0.6        | 0.89       | 2.0        | 2.6        |
| Momentary maximum output current (rms) | 1.3                                                                      | 1.9        | 2.8        | 6.0        | 8.0        |
| Control power supply                   | Single-phase 100/115 VAC (85 to 127 V) 50/60 Hz                          |            |            |            |            |
| Main-circuit power supply              | Single-phase 100/115 VAC (85 to 127 V) 50/60 Hz (Voltage doubler method) |            |            |            |            |
| Control method                         | All-digital servo                                                        |            |            |            |            |
| Speed feedback                         | 2,000 pulses/revolution Incremental Encoder                              |            |            |            |            |
| Inverter method                        | PWM method based on IGBT                                                 |            |            |            |            |
| PWM frequency                          | 11.7 kHz                                                                 |            |            |            |            |
| Weight [kg (lb)]                       | 0.8 (1.76)                                                               | 0.8 (1.76) | 0.8 (1.76) | 0.8 (1.76) | 1.1 (2.43) |
| Compatible motor voltage               | 200 V                                                                    |            |            |            |            |
| Compatible motor capacity              | 30 W                                                                     | 50 W       | 100 W      | 200 W      | 400 W      |
| Command pulse response                 | 250 kHz                                                                  |            |            |            |            |
| Applicable servo motor (R7M-)          | A03030_                                                                  | A05030_    | A10030_    | A20030_    | A40030_    |
|                                        | —                                                                        | —          | AP10030_   | AP20030_   | AP40030_   |

#### 200 VAC Input Models

| Item                                   | Specification                                                                                                  |            |            |            |            |            |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------|------------|
| Model                                  | R7D-APA3H                                                                                                      | R7D-APA5H  | R7D-AP01H  | R7D-AP02H  | R7D-AP04H  | R7D-AP08H  |
| Rated output                           | 30 W                                                                                                           | 50 W       | 100 W      | 200 W      | 400 W      | 750 W      |
| Continuous output current (rms)        | 0.42                                                                                                           | 0.6        | 0.89       | 2.0        | 2.6        | 4.4        |
| Momentary maximum output current (rms) | 1.3                                                                                                            | 1.9        | 2.8        | 6.0        | 8.0        | 13.9       |
| Control power supply                   | Single-phase 200/230 VAC (170 to 253 V) 50/60 Hz                                                               |            |            |            |            |            |
| Main-circuit power supply              | Single-phase 200/230 VAC (170 to 253 V) 50/60 Hz<br>(Three-phase 200/230 VAC can be used with the 750 W model) |            |            |            |            |            |
| Control method                         | All-digital servo                                                                                              |            |            |            |            |            |
| Speed feedback                         | 2,000 pulses/revolution incremental encoder                                                                    |            |            |            |            |            |
| Inverter method                        | PWM method based on IGBT                                                                                       |            |            |            |            |            |
| PWM frequency                          | 11.7 kHz                                                                                                       |            |            |            |            |            |
| Weight [kg (lb)]                       | 0.8 (1.76)                                                                                                     | 0.8 (1.76) | 0.8 (1.76) | 0.8 (1.76) | 1.1 (2.43) | 1.7 (3.75) |
| Servo motor voltage                    | 200 V                                                                                                          |            |            |            |            |            |
| Servo motor capacity                   | 30 W                                                                                                           | 50 W       | 100 W      | 200 W      | 400 W      | 750 W      |
| Command pulse response                 | 250 kHz                                                                                                        |            |            |            |            |            |
| Applicable servo motor (R7M-)          | A03030                                                                                                         | A05030     | A10030     | A20030     | A40030     | A75030     |
|                                        | —                                                                                                              | —          | AP10030    | AP20030    | AP40030    | AP75030    |

## Servo Motor General Specifications

| Item                         | Specification                                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Operating ambient            | 0°C to 40°C (32°F to 104°F), 20% to 80% RH (with no condensation)                                                                         |
| Storage ambient              | -20°C to 60°C (-4°F to 140°F), 20% to 80% RH (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/s <sup>2</sup> max., whichever is smaller |
| Impact resistance            | Acceleration 98 m/s <sup>2</sup> max., in a vertical direction, two times                                                                 |
| Insulation resistance        | Between power line terminals and FG: 10 MΩ min. (at 500 VDC)                                                                              |
| 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                                                                                                             |
| Protective structure         | IP55 for both the cylindrical and flat servo motors                                                                                       |
| Vibration grade              | V-15                                                                                                                                      |
| Mounting method              | Flange-mounting                                                                                                                           |
| International standards      | Approval obtained for UL, cUL, and EN (EMC directive and low-voltage directive)                                                           |

## Servo Motor Performance Specifications

### Flat Servo Motors without Brakes

| Item                             | R7M-AP10030-S1                                                                  | R7M-AP20030-S1                            | R7M-AP40030-S1                            | R7M-AP75030-S1                            |
|----------------------------------|---------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| Rated output                     | 100 W                                                                           | 200 W                                     | 400 W                                     | 750 W                                     |
| Rated torque                     | 0.318 N•m                                                                       | 0.637 N•m                                 | 1.27 N•m                                  | 2.39 N•m                                  |
| Rated rotation speed             | 3,000 r/min.                                                                    | 3,000 r/min.                              | 3,000 r/min.                              | 3,000 r/min.                              |
| Momentary maximum rotation speed | 4,500 r/min.                                                                    | 4,500 r/min.                              | 4,500 r/min.                              | 4,500 r/min.                              |
| Momentary maximum torque         | 0.96 N•m                                                                        | 1.91 N•m                                  | 3.82 N•m                                  | 7.1 N•m                                   |
| Rated current                    | 0.89 A (rms)                                                                    | 2.0 A (rms)                               | 2.6 A (rms)                               | 4.1 A (rms)                               |
| Momentary maximum current        | 2.8 A (rms)                                                                     | 6.0 A (rms)                               | 8.0 A (rms)                               | 13.9 A (rms)                              |
| Rotor inertia                    | 6.5 × 10 <sup>-6</sup> kg•m <sup>2</sup>                                        | 2.09 × 10 <sup>-5</sup> kg•m <sup>2</sup> | 3.47 × 10 <sup>-5</sup> kg•m <sup>2</sup> | 2.11 × 10 <sup>-4</sup> kg•m <sup>2</sup> |
| Power rate                       | 15.7 kW/s                                                                       | 19.4 kW/s                                 | 46.8 kW/s                                 | 26.9 kW/s                                 |
| Allowable radial load            | 78 N                                                                            | 245 N                                     | 245 N                                     | 392 N                                     |
| Allowable thrust load            | 49 N                                                                            | 68 N                                      | 68 N                                      | 147 N                                     |
| Weight (without brake -S1)       | 0.7 kg                                                                          | 1.4 kg                                    | 2.1 kg                                    | 4.2 kg                                    |
| Applicable servo driver          | R7D-AP01H/L                                                                     | R7D-AP02H/L                               | R7D-AP04H/L                               | R7D-AP08H                                 |
| Encoder resolution               | 2,000 pulses/revolution for phase-A and phase-B, 1 pulse/revolution for phase-Z |                                           |                                           |                                           |
| Radiation shield dimensions      | t6 x250 mm square                                                               |                                           |                                           | t12 x300 mm square                        |

### Flat Servo Motors with Brakes

| Item                             | R7M-AP10030-BS1                                                                 | R7M-AP20030-BS1                           | R7M-AP40030-BS1                           | R7M-AP75030-BS1                           |
|----------------------------------|---------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| Rated output                     | 100 W                                                                           | 200 W                                     | 400 W                                     | 750 W                                     |
| Rated torque                     | 0.318 N•m                                                                       | 0.637 N•m                                 | 1.27 N•m                                  | 2.39 N•m                                  |
| Rated rotation speed             | 3,000 r/min.                                                                    | 3,000 r/min.                              | 3,000 r/min.                              | 3,000 r/min.                              |
| Momentary maximum rotation speed | 4,500 r/min.                                                                    | 4,500 r/min.                              | 4,500 r/min.                              | 4,500 r/min.                              |
| Momentary maximum torque         | 0.96 N•m                                                                        | 1.91 N•m                                  | 3.82 N•m                                  | 7.1 N•m                                   |
| Rated current                    | 0.89 A (rms)                                                                    | 2.0 A (rms)                               | 2.6 A (rms)                               | 4.1 A (rms)                               |
| Momentary maximum current        | 2.8 A (rms)                                                                     | 6.0 A (rms)                               | 8.0 A (rms)                               | 13.9 A (rms)                              |
| Rotor inertia                    | 6.5 × 10 <sup>-6</sup> kg•m <sup>2</sup>                                        | 2.09 × 10 <sup>-5</sup> kg•m <sup>2</sup> | 3.47 × 10 <sup>-5</sup> kg•m <sup>2</sup> | 2.11 × 10 <sup>-4</sup> kg•m <sup>2</sup> |
| Power rate                       | 15.7 kW/s                                                                       | 19.4 kW/s                                 | 46.8 kW/s                                 | 26.9 kW/s                                 |
| Allowable radial load            | 78 N                                                                            | 245 N                                     | 245 N                                     | 392 N                                     |
| Allowable thrust load            | 49 N                                                                            | 68 N                                      | 68 N                                      | 147 N                                     |
| Weight (with brake -BS1)         | 0.9 kg                                                                          | 1.9 kg                                    | 2.6 kg                                    | 5.7 kg                                    |
| Applicable servo driver          | R7D-AP01H/L                                                                     | R7D-AP02H/L                               | R7D-AP04H/L                               | R7D-AP08H                                 |
| Encoder resolution               | 2,000 pulses/revolution for phase-A and phase-B, 1 pulse/revolution for phase-Z |                                           |                                           |                                           |
| Radiation shield dimensions      | t6 x250 mm square                                                               |                                           |                                           | t12 x300 mm square                        |
| Brake specifications             | Brake inertia                                                                   | 3.1 × 10 <sup>-6</sup> kg•m <sup>2</sup>  | 1.52 × 10 <sup>-5</sup> kg•m <sup>2</sup> | 1.52 × 10 <sup>-5</sup> kg•m <sup>2</sup> |
|                                  | Excitation voltage                                                              | 24 V DC ±10%                              |                                           |                                           |
|                                  | Power consumption (at 20°C)                                                     | 6 W                                       | 5 W                                       | 7.6 W                                     |
|                                  | Current consumption (at 20°C)                                                   | 0.25 A                                    | 0.21 A                                    | 0.32 A                                    |
|                                  | Static friction torque                                                          | 0.4 N•m min.                              | 0.9 N•m min.                              | 1.9 N•m min.                              |
|                                  | Attraction time                                                                 | 40 ms max.                                | 40 ms max.                                | 40 ms max.                                |
|                                  | Release time                                                                    | 20 ms max.                                | 20 ms max.                                | 20 ms max.                                |
|                                  | Backlash                                                                        | 1°                                        | 1°                                        | 1°                                        |
|                                  | Rating                                                                          | Continuous                                | Continuous                                | Continuous                                |
|                                  | Insulation grade                                                                | Type F                                    | Type F                                    | Type F                                    |

## Cylindrical Servo Motors without Brakes

| Item                             | R7M-A03030-S1                                                                   | R7M-A05030-S1                                  | R7M-A10030-S1                                  | R7M-A20030-S1                                   | R7M-A40030-S1                                   | R7M-A75030-S1                                   |
|----------------------------------|---------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Rated output                     | 30 W                                                                            | 50 W                                           | 100 W                                          | 200 W                                           | 400 W                                           | 750 W                                           |
| Rated torque                     | 0.095 N•m                                                                       | 0.159 N•m                                      | 0.318 N•m                                      | 0.637 N•m                                       | 1.27 N•m                                        | 2.39 N•m                                        |
| Rated rotation speed             | 3,000 r/min.                                                                    | 3,000 r/min.                                   | 3,000 r/min.                                   | 3,000 r/min.                                    | 3,000 r/min.                                    | 3,000 r/min.                                    |
| Momentary maximum rotation speed | 4,500 r/min.                                                                    | 4,500 r/min.                                   | 4,500 r/min.                                   | 4,500 r/min.                                    | 4,500 r/min.                                    | 4,500 r/min.                                    |
| Momentary maximum torque         | 0.29 N•m                                                                        | 0.48 N•m                                       | 0.96 N•m                                       | 1.91 N•m                                        | 3.82 N•m                                        | 7.1 N•m                                         |
| Rated current (rms)              | 0.42 A                                                                          | 0.6 A                                          | 0.87 A                                         | 2.0 A                                           | 2.6 A                                           | 4.4 A                                           |
| Momentary maximum current (rms)  | 1.3 A                                                                           | 1.9 A                                          | 2.8 A                                          | 6.0 A                                           | 8.0 A                                           | 13.9 A                                          |
| Rotor inertia                    | $1.7 \times 10^{-6} \text{ kg}\cdot\text{m}^2$                                  | $2.2 \times 10^{-6} \text{ kg}\cdot\text{m}^2$ | $3.6 \times 10^{-6} \text{ kg}\cdot\text{m}^2$ | $1.19 \times 10^{-5} \text{ kg}\cdot\text{m}^2$ | $1.87 \times 10^{-5} \text{ kg}\cdot\text{m}^2$ | $6.67 \times 10^{-5} \text{ kg}\cdot\text{m}^2$ |
| Power rate                       | 5.31 kW/s                                                                       | 11.5 kW/s                                      | 28.1 kW/s                                      | 34.1 kW/s                                       | 86.3 kW/s                                       | 85.6 kW/s                                       |
| Allowable radial load            | 68 N                                                                            | 68 N                                           | 78 N                                           | 245 N                                           | 245 N                                           | 392 N                                           |
| Allowable thrust load            | 54 N                                                                            | 54 N                                           | 54 N                                           | 74 N                                            | 74 N                                            | 147 N                                           |
| Weight without brake             | 0.3 kg                                                                          | 0.4 kg                                         | 0.5 kg                                         | 1.1 kg                                          | 1.7 kg                                          | 3.4 kg                                          |
| Applicable servo driver          | R7D-APA3H                                                                       | R7D-APA5H                                      | R7D-AP01H                                      | R7D-AP02H                                       | R7D-AP04H                                       | R7D-AP08H                                       |
| Encoder resolution               | 2,000 pulses/revolution for phase-A and phase-B, 1 pulse/revolution for phase-Z |                                                |                                                |                                                 |                                                 |                                                 |
| Radiation shield dimensions      | t6× 250 mm square                                                               |                                                |                                                |                                                 |                                                 |                                                 |

## Cylindrical Servo Motors with Brakes

| Item                             | R7M-A0303-BS1                                                                   | R7M-A05030-BS1                                  | R7M-A10030-BS1                                  | R7M-A20030-BS1                                  | R7M-A40030-BS1                                  | R7M-A75030-BS1                                  |
|----------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Rated output                     | 30 W                                                                            | 50 W                                            | 100 W                                           | 200 W                                           | 400 W                                           | 750 W                                           |
| Rated torque                     | 0.095 N•m                                                                       | 0.159 N•m                                       | 0.318 N•m                                       | 0.637 N•m                                       | 1.27 N•m                                        | 2.39 N•m                                        |
| Rated rotation speed             | 3,000 r/min.                                                                    | 3,000 r/min.                                    | 3,000 r/min.                                    | 3,000 r/min.                                    | 3,000 r/min.                                    | 3,000 r/min.                                    |
| Momentary maximum rotation speed | 4,500 r/min.                                                                    | 4,500 r/min.                                    | 4,500 r/min.                                    | 4,500 r/min.                                    | 4,500 r/min.                                    | 4,500 r/min.                                    |
| Momentary maximum torque         | 0.29 N•m                                                                        | 0.48 N•m                                        | 0.96 N•m                                        | 1.91 N•m                                        | 3.82 N•m                                        | 7.1 N•m                                         |
| Rated current (rms)              | 0.42 A                                                                          | 0.6 A                                           | 0.87 A                                          | 2.0 A                                           | 2.6 A                                           | 4.4 A                                           |
| Momentary maximum current (rms)  | 1.3 A                                                                           | 1.9 A                                           | 2.8 A                                           | 6.0 A                                           | 8.0 A                                           | 13.9 A                                          |
| Rotor inertia                    | $1.7 \times 10^{-6} \text{ kg}\cdot\text{m}^2$                                  | $2.2 \times 10^{-6} \text{ kg}\cdot\text{m}^2$  | $3.6 \times 10^{-6} \text{ kg}\cdot\text{m}^2$  | $1.19 \times 10^{-5} \text{ kg}\cdot\text{m}^2$ | $1.87 \times 10^{-5} \text{ kg}\cdot\text{m}^2$ | $6.67 \times 10^{-5} \text{ kg}\cdot\text{m}^2$ |
| Power rate                       | 5.31 kW/s                                                                       | 11.5 kW/s                                       | 28.1 kW/s                                       | 34.1 kW/s                                       | 86.3 kW/s                                       | 85.6 kW/s                                       |
| Allowable radial load            | 68 N                                                                            | 68 N                                            | 78 N                                            | 245 N                                           | 245 N                                           | 392 N                                           |
| Allowable thrust load            | 54 N                                                                            | 54 N                                            | 54 N                                            | 74 N                                            | 74 N                                            | 147 N                                           |
| Weight with brake                | 0.6 kg                                                                          | 0.7 kg                                          | 0.8 kg                                          | 1.6 kg                                          | 2.2 kg                                          | 4.3 kg                                          |
| Applicable servo driver          | R7D-APA3H                                                                       | R7D-APA5H                                       | R7D-AP01H                                       | R7D-AP02H                                       | R7D-AP04H                                       | R7D-AP08H                                       |
| Encoder resolution               | 2,000 pulses/revolution for phase-A and phase-B, 1 pulse/revolution for phase-Z |                                                 |                                                 |                                                 |                                                 |                                                 |
| Radiation shield dimensions      | t6× 250 mm square                                                               |                                                 |                                                 |                                                 |                                                 |                                                 |
| Brake specifications             | Brake inertia                                                                   | $0.85 \times 10^{-6} \text{ kg}\cdot\text{m}^2$ | $0.85 \times 10^{-6} \text{ kg}\cdot\text{m}^2$ | $0.85 \times 10^{-6} \text{ kg}\cdot\text{m}^2$ | $6.4 \times 10^{-6} \text{ kg}\cdot\text{m}^2$  | $1.7 \times 10^{-5} \text{ kg}\cdot\text{m}^2$  |
|                                  | Excitation voltage                                                              | 24 V DC $\pm 10\%$ V                            |                                                 |                                                 |                                                 |                                                 |
|                                  | Power consumption (at 20°C)                                                     | 6 W                                             | 6 W                                             | 6 W                                             | 7 W                                             | 7.7 W                                           |
|                                  | Current consumption (at 20°C)                                                   | 0.25 A                                          | 0.25 A                                          | 0.25 A                                          | 0.29 A                                          | 0.32 A                                          |
|                                  | Static friction torque                                                          | 0.2 N•m min.                                    | 0.2 N•m min.                                    | 0.34 N•m min.                                   | 1.47 N•m min.                                   | 2.45 N•m min.                                   |
|                                  | Attraction time                                                                 | 30 ms max.                                      | 30 ms max.                                      | 30 ms max.                                      | 60 ms max.                                      | 60 ms max.                                      |
|                                  | Release time                                                                    | 60 ms max.                                      | 60 ms max.                                      | 60 ms max.                                      | 20 ms max.                                      | 20 ms max.                                      |
|                                  | Backlash                                                                        | 1°                                              | 1°                                              | 1°                                              | 1°                                              | 1°                                              |
|                                  | Rating                                                                          | Continuous                                      | Continuous                                      | Continuous                                      | Continuous                                      | Continuous                                      |
|                                  | Insulation grade                                                                | Type F                                          | Type F                                          | Type F                                          | Type F                                          | Type F                                          |



## Dimensions

### Servo Drives Dimensions (mm)

| Input voltage                | Rating | Drive model | H   | W  | D   |
|------------------------------|--------|-------------|-----|----|-----|
| 1-phase, 100 VAC and 200 VAC | 30 W   | R7D-APA3H/L | 160 | 55 | 130 |
|                              | 50 W   | R7D-APA5H/L | 160 | 55 | 130 |
|                              | 100 W  | R7D-AP01H/L | 160 | 55 | 130 |
|                              | 200 W  | R7D-AP02H/L | 160 | 55 | 130 |
|                              | 400 W  | R7D-AP04H/L | 160 | 75 | 130 |
| 1-phase, 200 VAC             | 750 W  | R7D-AP08H   | 160 | 90 | 180 |

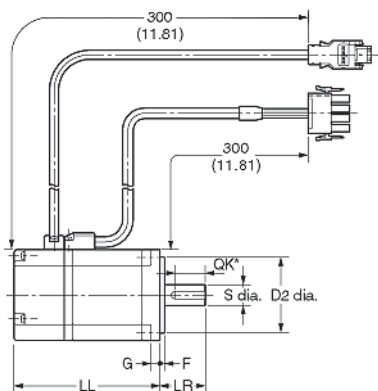
### Cylindrical Servo Motors (3,000 r/min) Dimensions (mm)

#### 200 VAC: 30 W/50 W/100 W/200 W/400 W/750 W

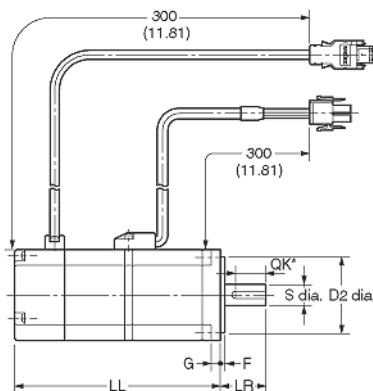
Without brake: R7M-A03030-S1-D/A05030-S1-D/A10030-S1-D/A20030-S1-D/A40030-S1-D/A75030-S1-D

With brake: R7M-A03030-BS1-D/A05030-BS1-D/A10030-BS1-D/A20030-BS1-D/A40030-BS1-D/A75030-BS1-D

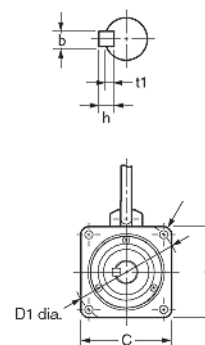
R7M-A□□□30(-S1) (Without Brake)



R7M-A□□□30(-S1) (With Brake)



\*Axis End Dimensions



| Model          | Overall length |    | Flange surface |    |      | Axis end |   |                |      |    |   |   |     |
|----------------|----------------|----|----------------|----|------|----------|---|----------------|------|----|---|---|-----|
|                | LL             | LR | C              | D1 | D2   | F        | G | Z              | S    | QK | b | h | t1  |
| R7M-A03030-S1  | 69.5           | 25 | 40             | 46 | 30h7 | 2.5      | 5 | Two, 4.3 dia.  | 6h6  | 14 | 2 | 2 | 1.2 |
| R7M-A03030-BS1 | 101            | 25 | 40             | 46 | 30h7 | 2.5      | 5 | Two, 4.3 dia.  | 6h6  | 14 | 2 | 2 | 1.2 |
| R7M-A05030-S1  | 77             | 25 | 40             | 46 | 30h7 | 2.5      | 5 | Two, 4.3 dia.  | 6h6  | 14 | 2 | 2 | 1.2 |
| R7M-A05030-BS1 | 108.5          | 25 | 40             | 46 | 30h7 | 2.5      | 5 | Two, 4.3 dia.  | 6h6  | 14 | 2 | 2 | 1.2 |
| R7M-A10030-S1  | 94.5           | 25 | 40             | 46 | 30h7 | 2.5      | 5 | Two, 4.3 dia.  | 8h6  | 14 | 3 | 3 | 1.8 |
| R7M-A10030-BS1 | 135            | 25 | 40             | 46 | 30h7 | 2.5      | 5 | Two, 4.3 dia.  | 8h6  | 14 | 3 | 3 | 1.8 |
| R7M-A20030-S1  | 96.5           | 30 | 60             | 70 | 50h7 | 3        | 6 | Four, 5.5 dia. | 14h6 | 20 | 5 | 5 | 3   |
| R7M-A20030-BS1 | 136            | 30 | 60             | 70 | 50h7 | 3        | 6 | Four, 5.5 dia. | 14h6 | 20 | 5 | 5 | 3   |
| R7M-A40030-S1  | 124.5          | 30 | 60             | 70 | 50h7 | 3        | 6 | Four, 5.5 dia. | 14h6 | 20 | 5 | 5 | 3   |
| R7M-A40030-BS1 | 164            | 30 | 60             | 70 | 50h7 | 3        | 6 | Four, 5.5 dia. | 14h6 | 20 | 5 | 5 | 3   |
| R7M-A75030-S1  | 145            | 40 | 80             | 90 | 70h7 | 3        | 8 | Four, 7 dia.   | 16h6 | 30 | 5 | 5 | 3   |
| R7M-A75030-BS1 | 189.5          | 40 | 80             | 90 | 70h7 | 3        | 8 | Four, 7 dia.   | 16h6 | 30 | 5 | 5 | 3   |

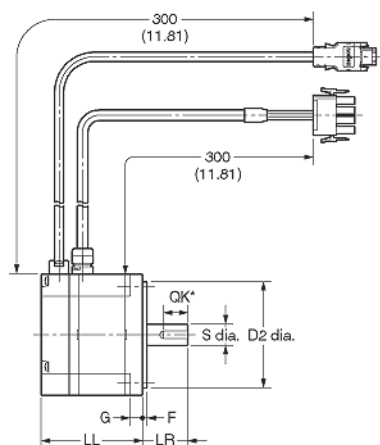
## Flat Servo Motors (3,000 r/min) Dimensions (mm)

### 200 VAC: 100 W/200 W/400 W/750 W

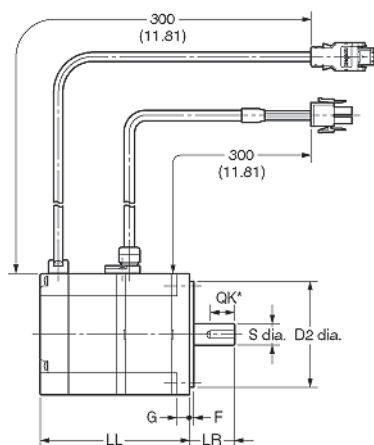
Without brake: R7M-AP10030-S1-D/AP20030-S1-D/AP40030-S1-D/AP75030-S1-D

With brake: R7M-AP10030-BS1-D/AP20030-BS1-D/AP40030-BS1-D/AP75030-BS1-D

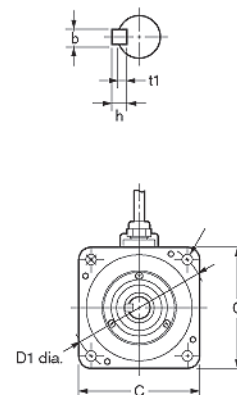
R7M-AP□□□30(-S1) (Without Brake)



R7M-AP□□□30(-S1) (With Brake)



\*Axis End Dimensions



| Model           | Overall length |    | Flange surface |     |       | Axis end |    |          |      |    |   |   |     |
|-----------------|----------------|----|----------------|-----|-------|----------|----|----------|------|----|---|---|-----|
|                 | LL             | LR | C              | D1  | D2    | F        | G  | Z        | S    | QK | b | h | t1  |
| R7M-AP10030-S1  | 62             | 25 | 60             | 70  | 50h7  | 2.5      | 6  | 5.5 dia. | 8h6  | 14 | 3 | 3 | 1.8 |
| R7M-AP10030-BS1 | 91             | 25 | 60             | 70  | 50h7  | 2.5      | 6  | 5.5 dia. | 8h6  | 14 | 3 | 3 | 1.8 |
| R7M-AP20030-S1  | 67             | 30 | 80             | 90  | 70h7  | 3        | 8  | 7 dia.   | 14h6 | 16 | 5 | 5 | 3   |
| R7M-AP20030-BS1 | 98.5           | 30 | 80             | 90  | 70h7  | 3        | 8  | 7 dia.   | 14h6 | 16 | 5 | 5 | 3   |
| R7M-AP40030-S1  | 87             | 30 | 80             | 90  | 70h7  | 3        | 8  | 7 dia.   | 14h6 | 16 | 5 | 5 | 3   |
| R7M-AP40030-BS1 | 118.5          | 30 | 80             | 90  | 70h7  | 3        | 8  | 7 dia.   | 14h6 | 16 | 5 | 5 | 3   |
| R7M-AP75030-S1  | 86.5           | 40 | 120            | 145 | 110h7 | 3.5      | 10 | 10 dia.  | 16h6 | 22 | 5 | 5 | 3   |
| R7M-AP75030-BS1 | 120            | 40 | 120            | 145 | 110h7 | 3.5      | 10 | 10 dia.  | 16h6 | 22 | 5 | 5 | 3   |