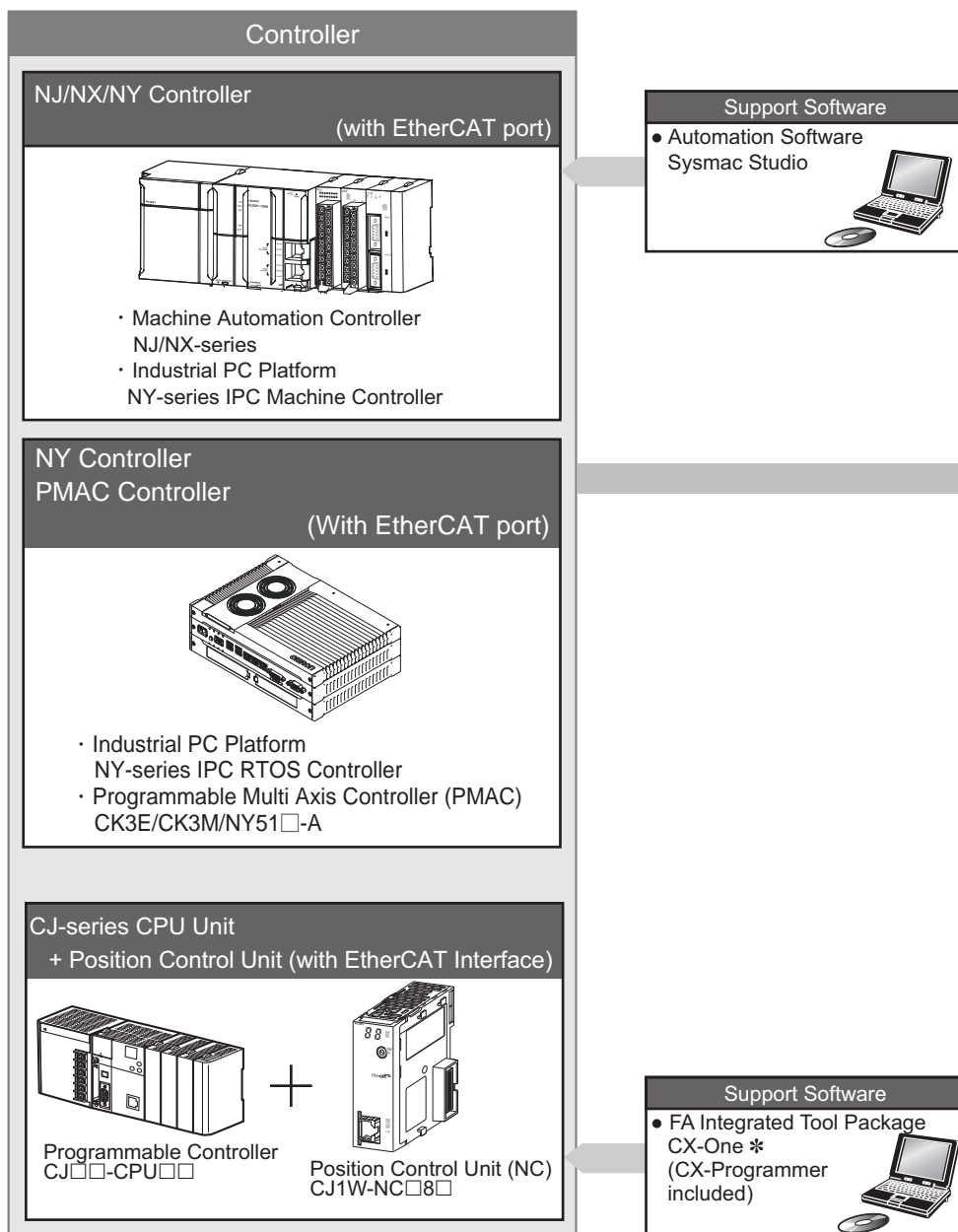


## Best Machine Architecture

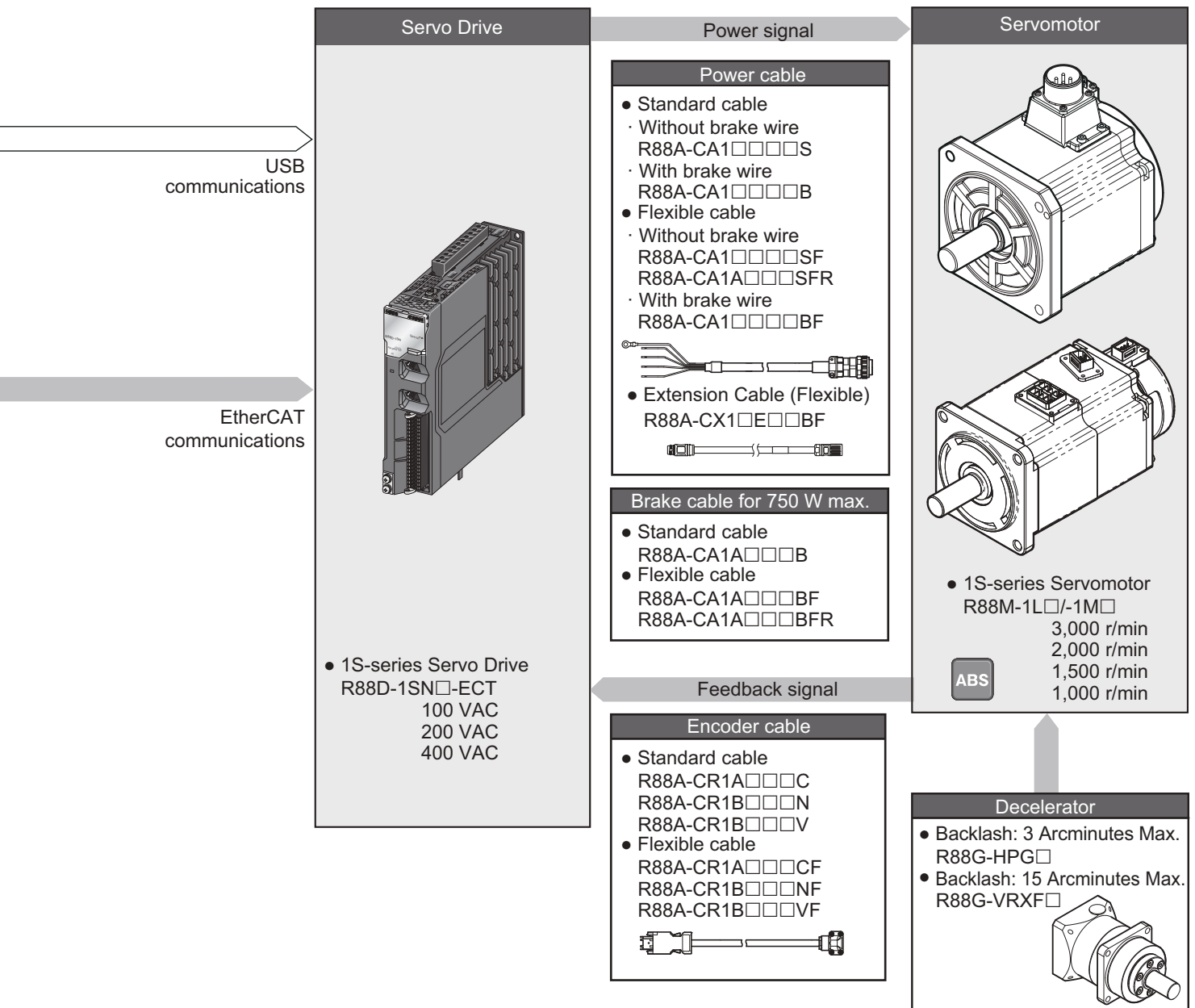
- Simple installation and wiring contributes to board design efficiency
- EtherCAT Communications Cycle of 125 μs
- Achievement of Safety on EtherCAT Network
- Supports two-degree-of-freedom control
- Battery-free system reduces maintenance and space
- Comes equipped with a 23-bit ABS encoder
- 350% momentary maximum torque (200 V, 750 W max.)



## System Configuration



\* You cannot use the CX-One to make the settings of 1S-series Servo Drives. Obtain the Sysmac Studio.  
**Note:** PMAC is an abbreviation for Programmable Multi Axis Controller.



USB communications

EtherCAT communications

Power signal

Servomotor

Power cable

- Standard cable
  - Without brake wire  
R88A-CA1□□□□S
  - With brake wire  
R88A-CA1□□□□B
- Flexible cable
  - Without brake wire  
R88A-CA1□□□□SF
  - With brake wire  
R88A-CA1□□□□SFR

- Extension Cable (Flexible)  
R88A-CX1□□□□BF

Brake cable for 750 W max.

- Standard cable  
R88A-CA1A□□□□B
- Flexible cable  
R88A-CA1A□□□□BF  
R88A-CA1A□□□□BFR

Feedback signal

Encoder cable

- Standard cable  
R88A-CR1A□□□□C  
R88A-CR1B□□□□N  
R88A-CR1B□□□□V
- Flexible cable  
R88A-CR1A□□□□CF  
R88A-CR1B□□□□NF  
R88A-CR1B□□□□VF

- 1S-series Servomotor  
R88M-1L□/-1M□  
3,000 r/min  
2,000 r/min  
1,500 r/min  
1,000 r/min

ABS

Decelerator

- Backlash: 3 Arcminutes Max.  
R88G-HPG□
- Backlash: 15 Arcminutes Max.  
R88G-VRXF□

# R88D-1SN□-ECT

## Contents

- Ordering Information
- Specifications
- EtherCAT Communication Specifications
- Version Information
- Names and Functions
- Dimensions



## Ordering Information

Refer to the Ordering Information.

## Specifications

### General Specifications

| Item                                       |   | Specifications  |  |
|--|---|---|--|
| Operating ambient temperature and humidity |   | 0 to 55°C, 90% max. (with no condensation)  |  |
| Storage ambient temperature and humidity   |   | -20 to 65°C, 90% max. (with no condensation)  |  |
| Operating and storage atmosphere           |   | No corrosive gases  |  |
| Operating altitude                         |   | 1,000 m max.  |  |
| Vibration resistance                       |   | 10 to 60 Hz and at an acceleration of 5.88 m/s <sup>2</sup> or less (Not to be run continuously at the resonance frequency) |  |
| Insulation resistance                      |   | Between power supply terminals/power terminals and PE terminals: 0.5 MΩ min. (at 500 VDC)                                   |  |
| Dielectric strength                        |   | Between power supply terminals/power terminals and PE terminals: 1,500 VAC for 1 min (at 50/60 Hz)                          |  |
| Protective structure                       |   | IP20 (Built into IP54 panel)  |  |
| International standard                     | EU Directives                               | EMC Directive   | EN 61800-3 second environment, C3 category (EN61326-3-1 *1; Functional Safety)         |
|  |   | Low Voltage Directive   | EN 61800-5-1   |
|  |   | Machinery Directive   | EN ISO 13849-1 (Cat.3), EN 61508, EN 62061, EN 61800-5-2                               |
|  | UL standards                                |   | UL 61800-5-1   |
|  | CSA standards                               |   | CSA C22.2 No. 274  |
|  | Korean Radio Regulations (KC)               |   | Compliant  |
|  | Australian EMC Labelling Requirements (RCM) |   | Compliant  |
|  | EAC requirements                            |   | Compliant  |
|  | SEMI standards                              |   | Can conform to the standard for momentary power interruptions (for no-load operation). |
| Ship standards (NK/LR)                     |   | Not compliant   |  |

\* The following product models are applicable to EN61000-6-7.

Applicable models: R88D-1SN55□-ECT, R88D-1SN75□-ECT, R88D-1SN150□-ECT

**Note:** The above items reflect individual evaluation testing. The results may differ under compound conditions.

The detail of Machinery Directive is as follows:

The STO function via safety input signals: EN ISO 13849-1 (Cat3 PLe), EN 61508 (SIL3), EN 62061 (SIL3), EN 61800-5-2 (STO)

The STO function via EtherCAT communications: EN ISO 13849-1 (Cat.3 PLd), EN 61508 (SIL2), EN 62061 (SIL2), EN 61800-5-2 (STO)

### Precautions for Correct Use

Disconnect all connections to the Servo Drive before attempting a megger test (insulation resistance measurement) on a Servo Drive. Not doing so may result in the Servo Drive failure.

Do not perform a dielectric strength test on the Servo Drive. Internal elements may be damaged.

## Characteristics

### 100-VAC Input Models

| Servo Drive model (R88D-)  |   |                        | 1SN01L-ECT   | 1SN02L-ECT | 1SN04L-ECT |
|--|---|------------------------|--|------------|------------|
| Item   |   |                        | 100 W  | 200 W      | 400 W      |
| Input  | Main circuit  | Power supply voltage   | Single-phase 100 to 120 VAC (85 to 132 V) *1<br>Rise time 500 ms max. *2 |            |            |
|  |   | Frequency              | 50/60 Hz (47.5 to 63 Hz) *1  |            |            |
|  | Control circuit   | Power supply voltage   | 24 VDC (21.6 to 26.4 V)  |            |            |
|  |   | Current consumption *3 | 600 mA   |            |            |
|  | Rated input current [A (rms)]<br>(Main circuit power supply voltage: 120 VAC) | Single-phase           | 2.9  | 4.9        | 8.4        |
| 3-phase  |   | ---                    | ---  | ---        |            |
| Output   | Rated current [A (rms)]   |                        | 1.5  | 2.5        | 4.8        |
|  | Maximum current [A (rms)]   |                        | 4.7  | 8.4        | 14.7       |
| Heat value [W]   | Main circuit *4   |                        | 14.8   | 23.4       | 33.1       |
|  | Control circuit   |                        | 11   | 11         | 13.2       |
| Applicable Servomotor rated output [W]   |   |                        | 100  | 200        | 400        |
| 3,000-r/min Servomotor (R88M-)   |   | Batteryless 23-bit ABS | 1M05030S<br>1M10030S   | 1M20030S   | 1M40030S   |
| Hold time at momentary power interruption (Main circuit power supply voltage: 100 VAC) |   |                        | 10 ms (Load condition: rated output) *5                                  |            |            |
| Weight [kg]  |   |                        | 1.2  | 1.5        | 1.9        |

\*1. The values outside parentheses indicate the rated value, and the values inside parentheses indicate the range of acceptable variation.

\*2. If the power supply is turned ON slowly, a Regeneration Circuit Error Detected during Power ON (Error No. 14.02) may occur. Check that the power supply has a capacity sufficiently greater than the total capacity of the Servo Drive and the peripheral devices.

\*3. Select a DC power supply in consideration of the current values that are specified in the current consumption.

The rated current value that is printed on the product nameplate is a condition to apply the 1S-series product for the UL/Low Voltage Directive. Therefore, you do not need to consider it when you select a DC power supply for each model.

\*4. This is the maximum heating value in applicable Servomotors.

Refer to the table on the page 14 for the Heating Values of Applicable Servomotors.

\*5. This hold time at momentary power interruption is that of the main circuit. In order to maintain power supply to the control circuit at momentary power interruption, use a DC power supply, which meets the following conditions, for the control power supply:

Reinforced insulation or double insulation, and the output hold time of 10 ms or more.

# AC Servo System 1S-series

## 200-VAC Input Models

| Servo Drive model (R88D-)   |   |                        | 1SN01H-ECT  | 1SN02H-ECT   | 1SN04H-ECT   | 1SN08H-ECT |
|---|---|------------------------|---|--------------|--------------|------------|
| Item  |   |                        | 100 W   | 200 W        | 400 W        | 750 W      |
| Input   | Main circuit  | Power supply voltage   | Single-phase and 3-phase 200 to 240 VAC (170 to 252 V) *1<br>Rise time 500 ms max. *2 |              |              |            |
|   |   | Frequency              | 50/60 Hz (47.5 to 63 Hz) *1   |              |              |            |
|   | Control circuit   | Power supply voltage   | 24 VDC (21.6 to 26.4 V)   |              |              |            |
|   |   | Current consumption *3 | 600 mA  |              |              |            |
|   | Rated current [A (rms)]<br>(Main circuit power supply voltage: 240 VAC) | Single-phase           | 1.8   | 2.7          | 4.6          | 7.3        |
|   | 3-phase   | 1.0                    | 1.5   | 2.7          | 4.0          |            |
| Output  | Rated current [A (rms)]   |                        | 0.8   | 1.5          | 2.5          | 4.6        |
|   | Maximum current [A (rms)]   |                        | 3.1   | 5.6          | 9.1          | 16.9       |
| Heat value [W]  |   | Main circuit *4        | 15.7/15.3 *5  | 15.2/14.6 *5 | 22.4/22.4 *5 | 40/39.7 *5 |
|   |   | Control circuit        | 11  | 11           | 11           | 13.2       |
| Applicable Servomotor rated output [W]  |   |                        | 100   | 200          | 400          | 750        |
| 3,000-r/min Servomotor (R88M-)  |   | Batteryless 23-bit ABS | 1M05030T<br>1M10030T  | 1M20030T     | 1M40030T     | 1M75030T   |
| 2,000-r/min Servomotor (R88M-)  |   | Batteryless 23-bit ABS | ---   | ---          | ---          | ---        |
| 1,000-r/min Servomotor (R88M-)  |   | Batteryless 23-bit ABS | ---   | ---          | ---          | ---        |
| Hold time at momentary power interruption<br>(Main circuit power supply voltage: 200 VAC) |   |                        | 10 ms (Load condition: rated output) *6   |              |              |            |
| Weight [kg]   |   |                        | 1.2   | 1.2          | 1.5          | 2.0        |

| Servo Drive model (R88D-)   |   |                        | 1SN10H-ECT  | 1SN15H-ECT  | 1SN20H-ECT                               | 1SN30H-ECT |
|---|---|------------------------|---|---|--|------------|
| Item  |   |                        | 1 kW  | 1.5 kW  | 2 kW                                     | 3 kW       |
| Input   | Main circuit  | Power supply voltage   | 3-phase 200 to 240 VAC (170 to 252 V) *1                | Single-phase and 3-phase 200 to 240 VAC (170 to 252 V) *1 | 3-phase 200 to 240 VAC (170 to 252 V) *1 |            |
|   |   | Frequency              | Rise time 500 ms max. *2<br>50/60 Hz (47.5 to 63 Hz) *1 |   |  |            |
|   | Control circuit   | Power supply voltage   | 24 VDC (21.6 to 26.4 V)                                 |   |  |            |
|   |   | Current consumption *3 | 600 mA  | 900 mA  |  |            |
|   | Rated current [A (rms)]<br>(Main circuit power supply voltage: 240 VAC) | Single-phase           | ---   | 15.7  | ---                                      | ---        |
|   | 3-phase   | 5.8                    | 9.0   | 13.0  | 15.9                                     |            |
| Output  | Rated current [A (rms)]   |                        | 7.7   | 9.7   | 16.2                                     | 22.3       |
|   | Maximum current [A (rms)]   |                        | 16.9  | 28.4  | 41.0                                     | 54.7       |
| Heat value [W]  |   | Main circuit *4        | 46.5  | 85.5/85.5 *5  | 128.9                                    | 167.5      |
|   |   | Control circuit        | 13.2  | 20.4  | 20.4                                     | 20.4       |
| Applicable Servomotor rated output [W]  |   |                        | 1,000   | 1,500   | 2,000                                    | 3,000      |
| 3,000-r/min Servomotor (R88M-)  |   | Batteryless 23-bit ABS | 1L1K030T  | 1L1K530T  | 1L2K030T                                 | 1L3K030T   |
| 2,000-r/min Servomotor (R88M-)  |   | Batteryless 23-bit ABS | 1M1K020T  | 1M1K520T  | 1M2K020T                                 | 1M3K020T   |
| 1,000-r/min Servomotor (R88M-)  |   | Batteryless 23-bit ABS | 1M90010T  | ---   | 1M2K010T                                 | 1M3K010T   |
| Hold time at momentary power interruption<br>(Main circuit power supply voltage: 200 VAC) |   |                        | 10 ms (Load condition: rated output) *6                 |   |  |            |
| Weight [kg]   |   |                        | 2.0   | 3.4   | 3.4                                      | 3.4        |

# AC Servo System 1S-series

| Servo Drive model (R88D-)   |   |                        | 1SN55H-ECT   | 1SN75H-ECT | 1SN150H-ECT            |
|---|---|------------------------|--|------------|------------------------|
| Item  |   |                        | 5.5 kW   | 7.5 kW     | 15 kW                  |
| Input   | Main circuit  | Power supply voltage   | 3-phase 200 to 240 VAC (170 to 252 V) *1<br>Rise time 500 ms max. *2 |            |                        |
|   |   | Frequency              | 50/60 Hz (47.5 to 63 Hz) *1  |            |                        |
|   | Control circuit   | Power supply voltage   | 24 VDC (21.6 to 26.4 V)  |            |                        |
|   |   | Current consumption *3 | 900 mA   |            | 1,200 mA               |
|   | Rated current [A (rms)]<br>(Main circuit power supply voltage: 240 VAC) | 3-phase                | 27.0   | 38.0       | 77.0                   |
| Output  | Rated current [A (rms)]   |                        | 28.6   | 42.0       | 70.0                   |
|   | Maximum current [A (rms)]   |                        | 84.8   | 113        | 169.7                  |
| Heat value [W]  | Main circuit *4   |                        | 320  | 360        | 610                    |
|   | Control circuit   |                        | 19.9   |            | 29.7                   |
| Applicable Servomotor rated output [W]  |   |                        | 5,500  | 7,500      | 15,000                 |
| 3,000-r/min Servomotor (R88M-)  | Batteryless 23-bit ABS  |                        | 1L4K030T<br>1L5K030T (Available soon)                                | ---        | ---                    |
| 2,000-r/min Servomotor (R88M-)  | Batteryless 23-bit ABS  |                        | ---  | ---        | ---                    |
| 1,500-r/min Servomotor (R88M-)  | Batteryless 23-bit ABS  |                        | 1M4K015T (Available soon)<br>1M5K515T (Available soon)               | 1M7K515T   | 1M11K015T<br>1M15K015T |
| 1,000-r/min Servomotor (R88M-)  | Batteryless 23-bit ABS  |                        | ---  | ---        | ---                    |
| Hold time at momentary power interruption<br>(Main circuit power supply voltage: 200 VAC) |   |                        | 10 ms (Load condition: rated output) *6                              |            |                        |
| Weight [kg]   |   |                        | 9.4  | 9.4        | 21                     |

\*1. The values outside parentheses indicate the rated value, and the values inside parentheses indicate the range of acceptable variation.

\*2. If the power supply is turned ON slowly, a Regeneration Circuit Error Detected during Power ON (Error No. 14.02) may occur. Check that the power supply has a capacity sufficiently greater than the total capacity of the Servo Drive and the peripheral devices.

\*3. Select a DC power supply in consideration of the current values that are specified in the current consumption.

The rated current value that is printed on the product nameplate is a condition to apply the 1S-series product for the UL/Low Voltage Directive. Therefore, you do not need to consider it when you select a DC power supply for each model.

\*4. This is the maximum heating value in applicable Servomotors.

Refer to the table on the next page for the heating value of each applicable Servomotor.

\*5. The first value is for single-phase input power and the second value is for 3-phase input power.

\*6. This hold time at momentary power interruption is that of the main circuit. In order to maintain power supply to the control circuit at momentary power interruption, use a DC power supply, which meets the following conditions, for the control power supply:  
Reinforced insulation or double insulation, and the output hold time of 10 ms or more.

# AC Servo System 1S-series

## 400-VAC Input Models

Use a neutral grounded 400 VAC 3-phase power supply for the 400 VAC input models.

| Servo Drive model (R88D-)  |  |                           | 1SN06F-ECT   | 1SN10F-ECT           | 1SN15F-ECT | 1SN20F-ECT |
|--|--|---------------------------|--|----------------------|------------|------------|
| Item   |  |                           | 600 W  | 1 kW                 | 1.5 kW     | 2 kW       |
| Input  | Main circuit   | Power supply voltage      | 3-phase 380 to 480 VAC (323 to 504 V) *1<br>Rise time 500 ms max. *2 |                      |            |            |
|  |  | Frequency                 | 50/60 Hz (47.5 to 63 Hz) *1  |                      |            |            |
|  | Control circuit  | Power supply voltage      | 24 VDC (21.6 to 26.4 V)  |                      |            |            |
|  |  | Current consumption *3    | 900 mA   |                      |            |            |
| Output   | Rated current [A (rms)] (Main circuit power supply voltage: 480 VAC) |                           | 2.4  | 3.1                  | 4.3        | 6.5        |
|  | Rated current [A (rms)]  |                           | 1.8  | 4.1                  | 4.7        | 7.8        |
| Heat value [W]   |  | Maximum current [A (rms)] | 5.5  | 9.6                  | 14.1       | 19.8       |
| Main circuit *4  |  |                           | 20.2   | 52.1                 | 77.5       | 106.8      |
| Control circuit  |  |                           | 20.4   | 20.4                 | 20.4       | 20.4       |
| Applicable Servomotor rated output [W]   |  |                           | 600  | 1,000                | 1,500      | 2,000      |
| 3,000-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | ---  | 1L75030C<br>1L1K030C | 1L1K530C   | 1L2K030C   |
| 2,000-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | 1M40020C<br>1M60020C   | 1M1K020C             | 1M1K520C   | 1M2K020C   |
| 1,000-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | ---  | 1M90010C             | ---        | 1M2K010C   |
| Hold time at momentary power interruption (Main circuit power supply voltage: 400 VAC) |  |                           | 10 ms (Load condition: rated output) *5                              |                      |            |            |
| Weight [kg]  |  |                           | 3.4  | 3.4                  | 3.4        | 3.4        |

| Servo Drive model (R88D-)  |  |                           | 1SN30F-ECT   | 1SN55F-ECT           | 1SN75F-ECT | 1SN150F-ECT            |
|--|--|---------------------------|--|----------------------|------------|------------------------|
| Item   |  |                           | 3kW  | 5.5kW                | 7.5kW      | 15kW                   |
| Input  | Main circuit   | Power supply voltage      | 3-phase 380 to 480 VAC (323 to 504 V) *1<br>Rise time 500 ms max. *2 |                      |            |                        |
|  |  | Frequency                 | 50/60 Hz (47.5 to 63 Hz) *1  |                      |            |                        |
|  | Control circuit  | Power supply voltage      | 24 VDC (21.6 to 26.4 V)  |                      |            |                        |
|  |  | Current consumption *3    | 900 mA   |                      |            | 1,200 mA               |
| Output   | Rated current [A (rms)] (Main circuit power supply voltage: 480 VAC) |                           | 8.4  | 16.0                 | 23.0       | 40.0                   |
|  | Rated current [A (rms)]  |                           | 11.3   | 14.5                 | 22.6       | 33.9                   |
| Heat value [W]   |  | Maximum current [A (rms)] | 28.3   | 42.4                 | 56.5       | 84.8                   |
| Main circuit *4  |  |                           | 143.3  | 280.0                | 280.0      | 440.0                  |
| Control circuit  |  |                           | 20.4   | 19.9                 |            | 29.7                   |
| Applicable Servomotor rated output [W]   |  |                           | 3,000  | 5,500                | 7,500      | 15,000                 |
| 3,000-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | 1L3K030C   | 1L4K030C<br>1L5K030C | ---        | ---                    |
| 2,000-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | 1M3K020C   | ---                  | ---        | ---                    |
| 1,500-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | ---  | 1M4K015C<br>1M5K515C | 1M7K515C   | 1M11K015C<br>1M15K015C |
| 1,000-r/min Servomotor (R88M-)   | Batteryless 23-bit ABS   |                           | 1M3K010C   | ---                  | ---        | ---                    |
| Hold time at momentary power interruption (Main circuit power supply voltage: 400 VAC) |  |                           | 10 ms (Load condition: rated output) *5                              |                      |            |                        |
| Weight [kg]  |  |                           | 3.4  | 9.4                  | 9.4        | 21                     |

\*1. The values outside parentheses indicate the rated value, and the values inside parentheses indicate the range of acceptable variation.

\*2. If the power supply is turned ON slowly, a Regeneration Circuit Error Detected during Power ON (Error No. 14.02) may occur. Check that the power supply has a capacity sufficiently greater than the total capacity of the Servo Drive and the peripheral devices.

\*3. Select a DC power supply in consideration of the current values that are specified in the current consumption.

The rated current value that is printed on the product nameplate is a condition to apply the 1S-series product for the UL/Low Voltage Directive. Therefore, you do not need to consider it when you select a DC power supply for each model.

\*4. This is the maximum heating value in applicable Servomotors.

Refer to the table below for the heating value of each applicable Servomotor.

\*5. This hold time at momentary power interruption is that of the main circuit. In order to maintain power supply to the control circuit at momentary power interruption, use a DC power supply, which meets the following conditions, for the control power supply:

Reinforced insulation or double insulation, and the output hold time of 10 ms or more.

**Relationship between Servo Drive, Servomotors and the Main Circuit Heating Value**

| Servo Drive model | Servomotor model                    | Main circuit heat value [W] |
|-------------------|-------------------------------------|-----------------------------|
| R88D-1SN01L-ECT   | R88M-1M05030S-□                     | 11.2                        |
|                   | R88M-1M10030S-□                     | 14.8                        |
| R88D-1SN01H-ECT   | R88M-1M05030T-□                     | 13.2/13.2 *                 |
|                   | R88M-1M10030T-□                     | 15.7/15.3 *                 |
| R88D-1SN10H-ECT   | R88M-1L1K030T-□                     | 46.5                        |
|                   | R88M-1M1K020T-□                     | 37.7                        |
|                   | R88M-1M90010T-□                     | 42.9                        |
| R88D-1SN15H-ECT   | R88M-1L1K530T-□                     | 85.5/85.5 *                 |
|                   | R88M-1M1K520T-□                     | 84/84 *                     |
| R88D-1SN20H-ECT   | R88M-1L2K030T-□                     | 128.9                       |
|                   | R88M-1M2K020T-□                     | 91.3                        |
|                   | R88M-1M2K010T-□                     | 109.1                       |
| R88D-1SN30H-ECT   | R88M-1L3K030T-□                     | 167.5                       |
|                   | R88M-1M3K020T-□                     | 125.5                       |
|                   | R88M-1M3K010T-□                     | 156.7                       |
| R88D-1SN55H-ECT   | R88M-1L4K030T-□                     | 250                         |
|                   | R88M-1M4K015T-□<br>(Available soon) | 270                         |
|                   | R88M-1L5K030T-□<br>(Available soon) | 300                         |
|                   | R88M-1M5K515T-□<br>(Available soon) | 320                         |
| R88D-1SN75H-ECT   | R88M-1M7K515T-□                     | 360                         |
| R88D-1SN150H-ECT  | R88M-1M11K015T-□                    | 490                         |
|                   | R88M-1M15K015T-□                    | 610                         |
| R88D-1SN06F-ECT   | R88M-1M40020C-□                     | 14.4                        |
|                   | R88M-1M60020C-□                     | 20.2                        |
| R88D-1SN10F-ECT   | R88M-1L75030C-□                     | 51.1                        |
|                   | R88M-1L1K030C-□                     | 52.1                        |
|                   | R88M-1M1K020C-□                     | 33.4                        |
|                   | R88M-1M90010C-□                     | 40.2                        |
| R88D-1SN15F-ECT   | R88M-1L1K530C-□                     | 77.5                        |
|                   | R88M-1M1K520C-□                     | 47.9                        |
| R88D-1SN20F-ECT   | R88M-1L2K030C-□                     | 106.8                       |
|                   | R88M-1M2K020C-□                     | 65.7                        |
|                   | R88M-1M2K010C-□                     | 79.6                        |
| R88D-1SN30F-ECT   | R88M-1L3K030C-□                     | 143.3                       |
|                   | R88M-1M3K020C-□                     | 96.5                        |
|                   | R88M-1M3K010C-□                     | 115.5                       |
| R88D-1SN55F-ECT   | R88M-1L4K030C-□                     | 250                         |
|                   | R88M-1M4K015C-□                     | 280                         |
|                   | R88M-1L5K030C-□                     | 250                         |
|                   | R88M-1M5K515C-□                     | 280                         |
| R88D-1SN75F-ECT   | R88M-1M7K515C-□                     | 280                         |
| R88D-1SN150F-ECT  | R88M-1M11K015C-□                    | 390                         |
|                   | R88M-1M15K015C-□                    | 440                         |

\* The first value is for single-phase input power and the second value is for 3-phase input power.



# AC Servo System 1S-series

## EtherCAT Communications Specifications

| Item  | Specifications   |
|---|--|
| Communications standard                       | IEC 61158 Type 12, IEC 61800-7 CiA 402 Drive Profile   |
| Physical layer                                | 100BASE-TX (IEEE802.3)   |
| Connectors                                    | RJ45 x 2 (shielded)<br>ECAT IN: EtherCAT input<br>ECAT OUT: EtherCAT output  |
| Communications media                          | Recommended media:<br>Twisted-pair cable, which is doubly shielded by the aluminum tape and braid, with Ethernet Category 5 (100BASE-TX) or higher   |
| Communications distance                       | Distance between nodes: 100 m max.   |
| Process data                                  | Fixed PDO mapping<br>Variable PDO mapping  |
| Mailbox (CoE)                                 | Emergency messages, SDO requests, SDO responses, and SDO information   |
| Synchronization mode and communications cycle | DC Mode (Synchronous with Sync0 Event)<br>Communications cycle: 125 $\mu$ s, 250 $\mu$ s, 500 $\mu$ s, 750 $\mu$ s, 1 to 10 ms (in 0.25 ms increments)<br>Free Run Mode  |
| Indicators                                    | ECAT-L/A IN (Link/Activity IN) x 1<br>ECAT-L/A OUT (Link/Activity OUT) x 1<br>ECAT-RUN x 1<br>ECAT-ERR x 1   |
| CiA 402 Drive Profile                         | <ul style="list-style-type: none"> <li>• Cyclic synchronous position mode</li> <li>• Cyclic synchronous velocity mode</li> <li>• Cyclic synchronous torque mode</li> <li>• Profile position mode</li> <li>• Profile velocity mode</li> <li>• Homing mode</li> <li>• Touch probe function</li> <li>• Torque limit function</li> </ul> |

## Version Information

| 1S-series Servo Drive |              | Corresponding version  |
|-----------------------|--------------|------------------------|
| Model                 | Unit version | Sysmac Studio          |
| R88D-1SN□-ECT         | Version 1.0  | Version 1.16 or higher |
|                       | Version 1.1  | Version 1.18 or higher |
|                       | Version 1.2  | Version 1.22 or higher |
|                       | Version 1.3  | Version 1.27 or higher |

## Functions That Were Added or Changed for Each Unit Version

| Function                   |   | Addition/change | Unit version |
|----------------------------|---|-----------------|--------------|
| Adjustment Function        | Multiple Drives Tuning Function   | Addition        | Ver.1.1      |
| Object                     | Machine - Inertia Ratio (3001-01 hex)   | Change          | Ver.1.1      |
|                            | TDF Position Control - Command Following Gain Selection (3120-10 hex)           | Addition        | Ver.1.1      |
|                            | TDF Position Control - Command Following Gain 2 (3120-11 hex)                   | Addition        | Ver.1.1      |
|                            | TDF Velocity Control - Command Following Gain Selection (3121-10 hex)           | Addition        | Ver.1.1      |
|                            | TDF Velocity Control - Command Following Gain 2 (3121-11 hex)                   | Addition        | Ver.1.1      |
|                            | Command Dividing Function - Interpolation Method Selection in csp (3041-10 hex) | Addition        | Ver.1.2      |
|                            | Runaway Detection (3B71 hex)  | Addition        | Ver.1.1      |
|                            | Function Output - Physical Outputs (4602-F1 hex)                                | Change          | Ver.1.2      |
|                            | External Brake Interlock Output (4663 hex)                                      | Addition        | Ver.1.2      |
|                            | Digital outputs - Physical Outputs (60FE - 01 hex)                              | Change          | Ver.1.2      |
| Error detection function   | Runaway Detection   | Addition        | Ver.1.1      |
|                            | Synchronization Error   | Change          | Ver.1.1      |
|                            | Regeneration Circuit Error Detected during Power ON                             | Addition        | Ver.1.2      |
|                            |   | Delete          | Ver.1.3      |
|                            | Inrush Current Prevention Circuit Error   | Addition        | Ver.1.3      |
| Regeneration Circuit Error | Addition  | Ver.1.3         |              |
| Applied Functions          | Brake Interlock   | Addition        | Ver.1.2      |

# R88M-1L□/-1M□

## Contents

- Ordering Information
- Specifications
- Names and Functions
- External Dimensions



## Ordering Information

Refer to the Ordering Information.

## Specifications

### General Specifications

| Item                                       |                       | Specifications  |
|--|-----------------------|---|
| Operating ambient temperature and humidity |                       | 0 to 40°C<br>20% to 90% (with no condensation)  |
| Storage ambient temperature and humidity   |                       | -20 to 65°C<br>20% to 90% (with no condensation)  |
| Operating and storage atmosphere           |                       | No corrosive gases  |
| Vibration resistance *1                    |                       | Acceleration of 49 m/s <sup>2</sup> *2<br>24.5 m/s <sup>2</sup> max. in X, Y, and Z directions when the motor is stopped  |
| Impact resistance                          |                       | Acceleration of 98 m/s <sup>2</sup> max. 3 times each in X, Y, and Z directions   |
| Insulation resistance                      |                       | Between power terminals and FG terminals: 10 MΩ min. (at 500 VDC Megger)  |
| Dielectric strength                        |                       | Between power terminals and FG terminals: 1,500 VAC for 1 min (voltage 100 V, 200 V)<br>Between power terminals and FG terminals: 1,800 VAC for 1 min (voltage 400 V)<br>Between brake terminal and FG terminals: 1,000 VAC for 1 min |
| Insulation class                           |                       | Class F   |
| Protective structure                       |                       | IP67 (except for the through-shaft part and connector pins)<br>IP20 if you use a 30-meter or longer encoder cable.  |
| International standard                     | EU Directives         | EN 60034-1/-5   |
|  | Low Voltage Directive |   |
|  | UL standards          | UL 1004-1/-6  |
|  | CSA standards         | CSA C22.2 No.100 (with cUR mark)  |

\*1. The amplitude may be increased by machine resonance. As a guideline, 80% of the specified value must not be exceeded.

\*2. 24.5 m/s<sup>2</sup> for servomotors of 7.5 kW or more.

**Note:** 1. Do not use the cable when it is laying in oil or water.

2. Do not expose the cable outlet or connections to stress due to bending or its own weight.

### Encoder Specifications

| Item                     | Specifications                       |
|--------------------------|--------------------------------------|
| Encoder system           | Optical batteryless absolute encoder |
| Resolution per rotation  | 23 bits                              |
| Multi-rotation data hold | 16 bits                              |
| Power supply voltage     | 5 VDC±10%                            |
| Current consumption      | 230 mA max.                          |
| Output signal            | Serial communications                |
| Output interface         | RS485 compliant                      |

**Note:** It is possible to use an absolute encoder as an incremental encoder.

Refer to the AC Servomotors/Servo Drives 1S-series with Built-in EtherCAT® Communications User's Manual (Cat.No.I586) for details.

## Characteristics

### 3,000-r/min Servomotors

| Item                                 |   | Model (R88M-)<br>Unit              | 100 VAC                   |           |           |           |
|--------------------------------------|---|------------------------------------|---------------------------|-----------|-----------|-----------|
|                                      |   |                                    | 1M05030S                  | 1M10030S  | 1M20030S  | 1M40030S  |
| Rated output *1 *2                   |   | W                                  | 50                        | 100       | 200       | 400       |
| Rated torque *1 *2                   |   | N·m                                | 0.159                     | 0.318     | 0.637     | 1.27      |
| Rated rotation speed *1 *2           |   | r/min                              | 3,000                     |           |           |           |
| Maximum rotation speed               |   | r/min                              | 6,000                     |           |           |           |
| Momentary maximum torque *1          |   | N·m                                | 0.48                      | 0.95      | 1.91      | 3.8       |
| Rated current *1 *2                  |   | A (rms)                            | 1.20                      | 1.50      | 2.50      | 4.8       |
| Momentary maximum current *1         |   | A (rms)                            | 4.00                      | 4.70      | 8.40      | 14.7      |
| Rotor inertia                        | Without brake                               | $\times 10^{-4}$ kg·m <sup>2</sup> | 0.0418                    | 0.0890    | 0.2232    | 0.4452    |
|                                      | With brake                                  | $\times 10^{-4}$ kg·m <sup>2</sup> | 0.0496                    | 0.0968    | 0.2832    | 0.5052    |
| Applicable load inertia              |   | $\times 10^{-4}$ kg·m <sup>2</sup> | 0.810                     | 1.62      | 4.80      | 8.40      |
| Torque constant *1                   |   | N·m/ A (rms)                       | 0.14                      | 0.24      | 0.28      | 0.30      |
| Power rate *1 *3                     |   | kW/s                               | 6.7                       | 11.9      | 18.5      | 36.6      |
| Mechanical time constant *3          |   | ms                                 | 1.7                       | 1.1       | 0.76      | 0.61      |
| Electrical time constant             |   | ms                                 | 0.67                      | 0.84      | 2.4       | 2.4       |
| Allowable radial load *4             |   | N                                  | 68                        | 68        | 245       | 245       |
| Allowable thrust load *4             |   | N                                  | 58                        | 58        | 88        | 88        |
| Weight                               | Without brake                               | kg                                 | 0.35                      | 0.52      | 1.0       | 1.4       |
|                                      | With brake                                  | kg                                 | 0.59                      | 0.77      | 1.3       | 1.9       |
| Radiator plate dimensions (material) |   | mm                                 | 250 × 250 × t6 (aluminum) |           |           |           |
| Brake specifications *5              | Excitation voltage *6                       | V                                  | 24 VDC $\pm$ 10%          |           |           |           |
|                                      | Current consumption (at 20°C)               | A                                  | 0.27                      | 0.27      | 0.32      | 0.32      |
|                                      | Static friction torque                      | N·m                                | 0.32 min.                 | 0.32 min. | 1.37 min. | 1.37 min. |
|                                      | Attraction time                             | ms                                 | 25 max.                   | 25 max.   | 30 max.   | 30 max.   |
|                                      | Release time *7                             | ms                                 | 15 max.                   | 15 max.   | 20 max.   | 20 max.   |
|                                      | Backlash                                    | °                                  | 1.2 max.                  | 1.2 max.  | 1.2 max.  | 1.2 max.  |
|                                      | Allowable braking work                      | J                                  | 9                         | 9         | 60        | 60        |
|                                      | Allowable total work                        | J                                  | 9000                      | 9,000     | 60,000    | 60,000    |
|                                      | Allowable angular acceleration              | rad/s <sup>2</sup>                 | 10,000 max.               |           |           |           |
|                                      | Brake lifetime (acceleration/ deceleration) | ---                                | 10 million times min.     |           |           |           |
| Insulation class                     |   | ---                                | Class F                   |           |           |           |

For models with an oil seal, the following derating is used due to increase in friction torque.

| Item          | Model (R88M-)<br>Unit | 1M05030S-O/ -OS2/<br>-BO/ -BOS2 | 1M10030S-O/ -OS2/<br>-BO/ -BOS2 | 1M20030S-O/ -OS2/<br>-BO/ -BOS2 | 1M40030S-O/ -OS2/<br>-BO/ -BOS2 |
|---------------|-----------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|               |                       | Derating rate                   | %                               | 90                              | 95                              |
| Rated output  | W                     | 45                              | 95                              | 190                             | 320                             |
| Rated current | A (rms)               | 1.20                            | 1.50                            | 2.50                            | 4.0                             |

# AC Servo System 1S-series

| Item                                 |   | Model (R88M-)<br>Unit              | 200 VAC                   |           |           |           |           |
|--------------------------------------|---|------------------------------------|---------------------------|-----------|-----------|-----------|-----------|
|                                      |   |                                    | 1M05030T                  | 1M10030T  | 1M20030T  | 1M40030T  | 1M75030T  |
| Rated output *1 *2                   |   | W                                  | 50                        | 100       | 200       | 400       | 750       |
| Rated torque *1 *2                   |   | N·m                                | 0.159                     | 0.318     | 0.637     | 1.27      | 2.39      |
| Rated rotation speed *1 *2           |   | r/min                              | 3,000                     |           |           |           |           |
| Maximum rotation speed               |   | r/min                              | 6,000                     |           |           |           |           |
| Momentary maximum torque *1          |   | N·m                                | 0.56                      | 1.11      | 2.2       | 4.5       | 8.4       |
| Rated current *1 *2                  |   | A (rms)                            | 0.67                      | 0.84      | 1.5       | 2.5       | 4.6       |
| Momentary maximum current *1         |   | A (rms)                            | 2.60                      | 3.10      | 5.6       | 9.1       | 16.9      |
| Rotor inertia                        | Without brake                               | $\times 10^{-4}$ kg·m <sup>2</sup> | 0.0418                    | 0.0890    | 0.2232    | 0.4452    | 1.8242    |
|                                      | With brake                                  | $\times 10^{-4}$ kg·m <sup>2</sup> | 0.0496                    | 0.0968    | 0.2832    | 0.5052    | 2.0742    |
| Applicable load inertia              |   | $\times 10^{-4}$ kg·m <sup>2</sup> | 0.810                     | 1.62      | 4.80      | 8.40      | 19.4      |
| Torque constant *1                   |   | N·m/ A (rms)                       | 0.25                      | 0.42      | 0.48      | 0.56      | 0.59      |
| Power rate *1 *3                     |   | kW/s                               | 6.7                       | 11.9      | 18.5      | 36.6      | 31.4      |
| Mechanical time constant *3          |   | ms                                 | 1.7                       | 1.2       | 0.78      | 0.56      | 0.66      |
| Electrical time constant             |   | ms                                 | 0.67                      | 0.83      | 2.4       | 2.6       | 3.3       |
| Allowable radial load *4             |   | N                                  | 68                        | 68        | 245       | 245       | 490       |
| Allowable thrust load *4             |   | N                                  | 58                        | 58        | 88        | 88        | 196       |
| Weight                               | Without brake                               | kg                                 | 0.35                      | 0.52      | 1.0       | 1.4       | 2.9       |
|                                      | With brake                                  | kg                                 | 0.59                      | 0.77      | 1.3       | 1.9       | 3.9       |
| Radiator plate dimensions (material) |   | mm                                 | 250 × 250 × t6 (aluminum) |           |           |           |           |
| Brake specifications *5              | Excitation voltage *6                       | V                                  | 24 VDC±10%                |           |           |           |           |
|                                      | Current consumption (at 20°C)               | A                                  | 0.27                      | 0.27      | 0.32      | 0.32      | 0.37      |
|                                      | Static friction torque                      | N·m                                | 0.32 min.                 | 0.32 min. | 1.37 min. | 1.37 min. | 2.55 min. |
|                                      | Attraction time                             | ms                                 | 25 max.                   | 25 max.   | 30 max.   | 30 max.   | 40 max.   |
|                                      | Release time *7                             | ms                                 | 15 max.                   | 15 max.   | 20 max.   | 20 max.   | 35 max.   |
|                                      | Backlash                                    | °                                  | 1.2 max.                  | 1.2 max.  | 1.2 max.  | 1.2 max.  | 1.0 max.  |
|                                      | Allowable braking work                      | J                                  | 9                         | 9         | 60        | 60        | 250       |
|                                      | Allowable total work                        | J                                  | 9000                      | 9,000     | 60,000    | 60,000    | 250,000   |
|                                      | Allowable angular acceleration              | rad/s <sup>2</sup>                 | 10,000 max.               |           |           |           |           |
|                                      | Brake lifetime (acceleration/ deceleration) | ---                                | 10 million times min.     |           |           |           |           |
|                                      | Insulation class                            | ---                                | Class F                   |           |           |           |           |

For models with an oil seal, the following derating is used due to increase in friction torque.

| Item          | Model (R88M-)<br>Unit | 1M05030T-O/ -OS2/<br>-BO/ -BOS2 | 1M10030T-O/<br>-OS2/ -BO/ -BOS2 | 1M20030T-O/<br>-OS2/ -BO/ -BOS2 | 1M40030T-O/<br>-OS2/ -BO/ -BOS2 | 1M75030T-O/<br>-OS2/ -BO/ -BOS2 |
|---------------|-----------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|               |                       | Derating rate                   | %                               | 90                              | 95                              | 95                              |
| Rated output  | W                     | 45                              | 95                              | 190                             | 320                             | 675                             |
| Rated current | A (rms)               | 0.67                            | 0.84                            | 1.5                             | 2.1                             | 4.2                             |

# AC Servo System 1S-series

| Item                                 |   | Model (R88M-)                      | 200 VAC                       |          |                               |           |                               | 1L5K030T<br>(Available soon) |
|--------------------------------------|---|------------------------------------|-------------------------------|----------|-------------------------------|-----------|-------------------------------|------------------------------|
|                                      |   |                                    | 1L1K030T                      | 1L1K530T | 1L2K030T                      | 1L3K030T  | 1L4K030T                      |                              |
| Rated output *1 *2                   |   | W                                  | 1,000                         | 1,500    | 2,000                         | 3,000     | 4,000                         | 5,000                        |
| Rated torque *1 *2                   |   | N·m                                | 3.18                          | 4.77     | 6.37                          | 9.55      | 12.7                          | 15.9                         |
| Rated rotation speed *1 *2           |   | r/min                              | 3,000                         |          |                               |           |                               |                              |
| Maximum rotation speed               |   | r/min                              | 5,000                         |          |                               |           |                               |                              |
| Momentary maximum torque *1          |   | N·m                                | 9.55                          | 14.3     | 19.1                          | 28.7      | 38.2                          | 47.7                         |
| Rated current *1 *2                  |   | A (rms)                            | 5.2                           | 8.8      | 12.5                          | 17.1      | 22.8                          | 27.4                         |
| Momentary maximum current *1         |   | A (rms)                            | 16.9                          | 28.4     | 41.0                          | 54.7      | 74                            | 84.8                         |
| Rotor inertia                        | Without brake                               | $\times 10^{-4}$ kg·m <sup>2</sup> | 2.1042                        | 2.1042   | 2.4042                        | 6.8122    | 8.8122                        | 10.6122                      |
|                                      | With brake                                  | $\times 10^{-4}$ kg·m <sup>2</sup> | 2.5542                        | 2.5542   | 2.8542                        | 7.3122    | 11.3122                       | 13.1122                      |
| Applicable load inertia              |   | $\times 10^{-4}$ kg·m <sup>2</sup> | 35.3                          | 47.6     | 60.2                          | 118       | 213                           | 279                          |
| Torque constant *1                   |   | N·m/A (rms)                        | 0.67                          | 0.58     | 0.56                          | 0.64      | 0.63                          | 0.65                         |
| Power rate *1 *3                     |   | kW/s                               | 48                            | 108      | 169                           | 134       | 183                           | 238                          |
| Mechanical time constant *3          |   | ms                                 | 0.58                          | 0.58     | 0.50                          | 0.47      | 0.37                          | 0.37                         |
| Electrical time constant             |   | ms                                 | 5.9                           | 6.1      | 6.4                           | 11        | 12                            | 12                           |
| Allowable radial load *4             |   | N                                  | 490                           |          |                               |           |                               | 880                          |
| Allowable thrust load *4             |   | N                                  | 196                           |          |                               |           |                               | 343                          |
| Weight                               | Without brake                               | kg                                 | 5.7                           | 5.7      | 6.4                           | 11.5      | 13.5                          | 16                           |
|                                      | With brake                                  | kg                                 | 7.4                           | 7.4      | 8.1                           | 12.5      | 16                            | 18.5                         |
| Radiator plate dimensions (material) |   | mm                                 | 400 × 400 × t20<br>(aluminum) |          | 470 × 470 × t20<br>(aluminum) |           | 540 × 540 × t20<br>(aluminum) |                              |
| Brake specifications *5              | Excitation voltage *6                       | V                                  | 24 VDC±10%                    |          |                               |           |                               |                              |
|                                      | Current consumption (at 20°C)               | A                                  | 0.70                          | 0.70     | 0.70                          | 0.66      | 0.6                           | 0.6                          |
|                                      | Static friction torque                      | N·m                                | 9.3 min.                      | 9.3 min. | 9.3 min.                      | 12.0 min. | 16 min.                       | 16 min.                      |
|                                      | Attraction time                             | ms                                 | 100 max.                      | 100 max. | 100 max.                      | 100 max.  | 150 max.                      | 150 max.                     |
|                                      | Release time *7                             | ms                                 | 30 max.                       | 30 max.  | 30 max.                       | 30 max.   | 50 max.                       | 50 max.                      |
|                                      | Backlash                                    | °                                  | 1.0 max.                      | 1.0 max. | 1.0 max.                      | 0.8 max.  | 0.6 max.                      | 0.6 max.                     |
|                                      | Allowable braking work                      | J                                  | 500                           | 500      | 500                           | 1,000     | 350                           | 350                          |
|                                      | Allowable total work                        | J                                  | 900,000                       | 900,000  | 900,000                       | 3,000,000 | 1,000,000                     | 1,000,000                    |
|                                      | Allowable angular acceleration              | rad/s <sup>2</sup>                 | 10,000 max.                   |          |                               |           |                               |                              |
|                                      | Brake lifetime (acceleration/ deceleration) | ---                                | 10 million times min.         |          |                               |           |                               |                              |
| Insulation class                     | ---   | Class F                            |                               |          |                               |           |                               |                              |

# AC Servo System 1S-series

| Item                                 |   | Model (R88M-)<br>Unit              | 400 VAC                       |                            |          |
|--------------------------------------|---|------------------------------------|-------------------------------|----------------------------|----------|
|                                      |   |                                    | 1L75030C                      | 1L1K030C                   | 1L1K530C |
| Rated output *1 *2                   |   | W                                  | 750                           | 1,000                      | 1,500    |
| Rated torque *1 *2                   |   | N·m                                | 2.39                          | 3.18                       | 4.77     |
| Rated rotation speed *1 *2           |   | r/min                              | 3,000                         |                            |          |
| Maximum rotation speed               |   | r/min                              | 5,000                         |                            |          |
| Momentary maximum torque *1          |   | N·m                                | 7.16                          | 9.55                       | 14.3     |
| Rated current *1 *2                  |   | A (rms)                            | 3.0                           | 3.0                        | 4.5      |
| Momentary maximum current *1         |   | A (rms)                            | 9.6                           | 9.6                        | 14.1     |
| Rotor inertia                        | Without brake                               | $\times 10^{-4}$ kg·m <sup>2</sup> | 1.3042                        | 2.1042                     | 2.1042   |
|                                      | With brake                                  | $\times 10^{-4}$ kg·m <sup>2</sup> | 1.7542                        | 2.5542                     | 2.5542   |
| Applicable load inertia              |   | $\times 10^{-4}$ kg·m <sup>2</sup> | 38.6                          | 35.3                       | 47.6     |
| Torque constant *1                   |   | N·m/ A (rms)                       | 0.91                          | 1.17                       | 1.17     |
| Power rate *1 *3                     |   | kW/s                               | 44                            | 48                         | 108      |
| Mechanical time constant *3          |   | ms                                 | 1.09                          | 0.6                        | 0.58     |
| Electrical time constant             |   | ms                                 | 4.3                           | 5.9                        | 5.9      |
| Allowable radial load *4             |   | N                                  | 490                           |                            |          |
| Allowable thrust load *4             |   | N                                  | 196                           |                            |          |
| Weight                               | Without brake                               | kg                                 | 4.1                           | 5.7                        | 5.7      |
|                                      | With brake                                  | kg                                 | 5.8                           | 7.4                        | 7.4      |
| Radiator plate dimensions (material) |   | mm                                 | 305 × 305 × t20<br>(aluminum) | 400 × 400 × t20 (aluminum) |          |
| Brake specifications *5              | Excitation voltage *6                       | V                                  | 24 VDC $\pm$ 10%              |                            |          |
|                                      | Current consumption (at 20°C)               | A                                  | 0.70                          | 0.70                       | 0.70     |
|                                      | Static friction torque                      | N·m                                | 9.3 min.                      | 9.3 min.                   | 9.3 min. |
|                                      | Attraction time                             | ms                                 | 100 max.                      | 100 max.                   | 100 max. |
|                                      | Release time *7                             | ms                                 | 30 max.                       | 30 max.                    | 30 max.  |
|                                      | Backlash                                    | °                                  | 1.0 max.                      | 1.0 max.                   | 1.0 max. |
|                                      | Allowable braking work                      | J                                  | 500                           | 500                        | 500      |
|                                      | Allowable total work                        | J                                  | 900,000                       | 900,000                    | 900,000  |
|                                      | Allowable angular acceleration              | rad/s <sup>2</sup>                 | 10,000 max.                   |                            |          |
|                                      | Brake lifetime (acceleration/ deceleration) | ---                                | 10 million times min.         |                            |          |
| Insulation class                     |   | ---                                | Class F                       |                            |          |

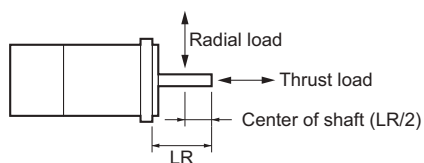
| Item                                 |   | Model (R88M-)                      | 400 VAC                    |           |           |                            |
|--------------------------------------|---|------------------------------------|----------------------------|-----------|-----------|----------------------------|
|                                      |   |                                    | 1L2K030C                   | 1L3K030C  | 1L4K030C  | 1L5K030C                   |
| Rated output *1 *2                   |   | W                                  | 2,000                      | 3,000     | 4,000     | 5,000                      |
| Rated torque *1 *2                   |   | N·m                                | 6.37                       | 9.55      | 12.7      | 15.9                       |
| Rated rotation speed *1 *2           |   | r/min                              | 3,000                      |           |           |                            |
| Maximum rotation speed               |   | r/min                              | 5,000                      |           |           |                            |
| Momentary maximum torque *1          |   | N·m                                | 19.1                       | 28.7      | 38.2      | 47.7                       |
| Rated current *1 *2                  |   | A (rms)                            | 6.3                        | 8.7       | 12.8      | 13.6                       |
| Momentary maximum current *1         |   | A (rms)                            | 19.8                       | 27.7      | 42.4      | 42.4                       |
| Rotor inertia                        | Without brake                               | $\times 10^{-4}$ kg·m <sup>2</sup> | 2.4042                     | 6.8122    | 8.8122    | 10.6122                    |
|                                      | With brake                                  | $\times 10^{-4}$ kg·m <sup>2</sup> | 2.8542                     | 7.3122    | 11.3122   | 13.1122                    |
| Applicable load inertia              |   | $\times 10^{-4}$ kg·m <sup>2</sup> | 60.2                       | 118       | 213       | 279                        |
| Torque constant *1                   |   | N·m/ A (rms)                       | 1.15                       | 1.23      | 1.11      | 1.32                       |
| Power rate *1 *3                     |   | kW/s                               | 169                        | 134       | 183       | 238                        |
| Mechanical time constant *3          |   | ms                                 | 0.52                       | 0.49      | 0.36      | 0.35                       |
| Electrical time constant             |   | ms                                 | 6.3                        | 11        | 12        | 13                         |
| Allowable radial load *4             |   | N                                  | 490                        |           | 880       |                            |
| Allowable thrust load *4             |   | N                                  | 196                        |           | 343       |                            |
| Weight                               | Without brake                               | kg                                 | 6.4                        | 11.5      | 13.5      | 16                         |
|                                      | With brake                                  | kg                                 | 8.1                        | 12.5      | 16        | 18.5                       |
| Radiator plate dimensions (material) |   | mm                                 | 470 × 470 × t20 (aluminum) |           |           | 540 × 540 × t20 (aluminum) |
| Brake specifications *5              | Excitation voltage *6                       | V                                  | 24 VDC±10%                 |           |           |                            |
|                                      | Current consumption (at 20°C)               | A                                  | 0.70                       | 0.66      | 0.6       | 0.6                        |
|                                      | Static friction torque                      | N·m                                | 9.3 min.                   | 12 min.   | 16 min.   | 16 min.                    |
|                                      | Attraction time                             | ms                                 | 100 max.                   | 100 max.  | 150 max.  | 150 max.                   |
|                                      | Release time *7                             | ms                                 | 30 max.                    | 30 max.   | 50 max.   | 50 max.                    |
|                                      | Backlash                                    | °                                  | 1.0 max.                   | 0.8 max.  | 0.6 max.  | 0.6 max.                   |
|                                      | Allowable braking work                      | J                                  | 500                        | 1,000     | 350       | 350                        |
|                                      | Allowable total work                        | J                                  | 900,000                    | 3,000,000 | 1,000,000 | 1,000,000                  |
|                                      | Allowable angular acceleration              | rad/s <sup>2</sup>                 | 10,000 max.                |           |           |                            |
|                                      | Brake lifetime (acceleration/ deceleration) | ---                                | 10 million times min.      |           |           |                            |
| Insulation class                     |   | ---                                | Class F                    |           |           |                            |

\*1. This is a typical value for when the Servomotor is used at a normal temperature (20°C, 65%) in combination with a Servo Drive.

\*2. The rated values are the values with which continuous operation is possible at an ambient temperature of 40°C when the Servomotor is horizontally installed on a specified radiator plate.

\*3. This value is for models without options.

\*4. The allowable radial and thrust loads are the values determined for a limit of 20,000 hours at normal operating temperatures. The allowable radial loads are applied as shown in the following diagram.



\*5. When the brake is released for a vertical axis, refer to the *AC Servomotors/Servo Drives 1S-series with Built-in EtherCAT® Communications User's Manual* (Cat.No.I586) to set an appropriate value for Brake Interlock Output (4610 hex).

\*6. This is a non-excitation brake. It is released when excitation voltage is applied.

\*7. This value is a reference value.