

General-Purpose AC Servo



MODEL TM-RFM TM-RG2M TM-RU2M

DIRECT DRIVE MOTOR INSTRUCTION MANUAL

Safety Instructions

Please read the instructions carefully before using the equipment.

To use the equipment correctly, do not attempt to install, operate, maintain or inspect the equipment until you have read through this Instruction Manual and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions.

In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".



Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety. What must not be done and what must be done are indicated by the following diagrammatic symbols.

Indicates what must not be done. For example, "No Fire" is indicated by .
 Indicates what must be done. For example, grounding is indicated by .

In this Instruction Manual, instructions at a lower level than the above, instructions for other functions, and so on are classified into "POINT".

After reading this Instruction Manual, keep it accessible to the operator.

1. To prevent electric shock, note the following

🕂 WARNING

- Before wiring and inspections, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others.
- •Ground the servo amplifier and direct drive motor securely.
- •Any person who is involved in wiring and inspection should be fully competent to do the work.
- •Do not attempt to wire the servo amplifier and direct drive motor until they have been installed. Otherwise, it may cause an electric shock.
- The cables should not be damaged, stressed, loaded, or pinched. Otherwise, it may cause an electric shock.
- To avoid an electric shock, insulate the connections of the power supply terminals.

2. To prevent fire, note the following

▲ CAUTION

Install the servo amplifier, direct drive motor, and regenerative resistor on incombustible material. Installing them directly or close to combustibles will lead to a fire or smoke generation.

• Provide adequate protection to prevent screws and other conductive matter, oil and other combustible matter from entering the servo amplifier and direct drive motor.

3. To prevent injury, note the following

▲ CAUTION

- •Only the power/signal specified in the Instruction Manual should be applied to each terminal. Otherwise, it may cause an electric shock, fire, injury, etc.
- •Connect cables to the correct terminals. Otherwise, a burst, damage, etc. may occur.
- Ensure that polarity (+/-) is correct. Otherwise, a burst, damage, etc. may occur.
- The servo amplifier heat sink, regenerative resistor, direct drive motor, etc. may be hot while power is on or for some time after power-off. Take safety measures, e.g. provide covers, to avoid accidentally touching the parts (cables, etc.) by hand.
- During operation, never touch the rotor of the direct drive motor. Otherwise, it may cause injury.

4. Additional instructions

The following instructions should also be fully noted. Incorrect handling may cause a malfunction, injury, electric shock, fire, etc.

(1) Transportation and installation

| ▲ CAUTION | | | | | |
|---|---|---|--|--|--|
| Stacking | Transport the products correctly according to their mass. Stacking in excess of the specified number of product packages is not allowed. Do not hold the cables, rotor, encoder, or connector when carrying the direct drive motor. Otherwise, it may drop | | | | |
| Instruction | on Manual. | ier and the direct drive motor in a load-bearing place in accordance with the | | | |
| - | • | eavy load on the equipment. Otherwise, it may cause injury. | | | |
| The equ | ipment must b | e installed in the specified direction. | | | |
| •When yo | ou keep or use | the equipment, please fulfill the following environment. | | | |
| | Item | Environment | | | |
| Ambien | t Operation | 0 °C to 40 °C (non-freezing) | | | |
| temperate | ure Storage | -15 °C to 70 °C (non-freezing) | | | |
| Ambien | t Operation | 10 %RH to 80 %RH (non-condensing) | | | |
| humidit | humidity Storage 10 %RH to 90 %RH (non-condensing) | | | | |
| Ambience Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist, dust, | | Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist, dust, and dirt | | | |
| Altitude Altitude Altitude TM-RFM_C20 TM-RFM_C20 TM-RFM_C20 TM-RG2M_C30 TM-RG2M_C30 TM-RG2M_G30 TM-RU2M_C30 TM-RU2M_C30 TM-RU2M_C30 TM-RU2M_C30 | | Max. 2000 m above sea level (Note) | | | |
| | | X, Y: 49 m/s ² X, Y: 24.5 m/s ² | | | |
| <u> </u> | | 7, 1, 27,3 11/87 | | | |

Note. Contact your local sales office for the altitude for options.

- Securely fix the direct drive motor to the machine. If being attached insecurely, the motor may come off during operation.
- Do not install or operate a servo amplifier or direct drive motor, which has been damaged or has any parts missing.
- •Do not drop or strike the direct drive motor. Otherwise, it may cause injury, malfunction, etc.
- Take safety measures, e.g. provide covers, to prevent accidental access to the rotor of the direct drive motor during operation.

▲ CAUTION •Do not apply shocks, e.g. hit with a hammer, when coupling the rotor of the direct drive motor. Otherwise, the encoder may malfunction. • Do not subject the rotor of the direct drive motor to more than the permissible load. Otherwise, the rotor may break. •When the product has been stored for an extended period of time, contact your local sales office. •When handling the direct drive motor, be careful about the edged parts such as corners of the direct drive motor. •Do not strike the connector. Otherwise, it may cause a connection failure, malfunction, etc. •Be sure to check the vibration level with the direct drive motor mounted on the machine. A great vibration may cause the early damage of a bearing and encoder. The great vibration may also cause the poor connector connection or bolt looseness. •For the gain adjustment at the equipment startup, check the torque waveform and the speed waveform with a measurement device to check that no vibration occurs. If the vibration occurs due to high gain, the vibration may cause the early damage of the direct drive motor. To prevent a fire or injury in case of an earthquake or other natural disasters, securely install, mount, and wire the servo motor in accordance with the Instruction Manual. (2) Wiring



heat because of the poor contact. Be sure to tighten the cable with specified torque.

(3) Test run and adjustment

▲ CAUTION

Before operation, check the parameter settings. Improper settings may cause some machines to operate unexpectedly.

Never make a drastic change to the parameter values as doing so will make the operation unstable.

(4) Usage

▲ CAUTION

- Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately.
- •For equipment in which the moving part of the machine may collide against the load side, install a limit switch or stopper to the end of the moving part. The machine may be damaged due to a collision.
- Do not disassemble, repair, or modify the product. Otherwise, it may cause an electric shock, fire, injury, etc. Disassembled, repaired, and/or modified products are not covered under warranty.
- Use the direct drive motor with the specified servo amplifier.
- •Wire options and peripheral equipment, etc. correctly in the specified combination. Otherwise, it may cause an electric shock, fire, injury, etc.
- If the dynamic brake is activated at power-off, alarm occurrence, etc., do not rotate the servo motor by an external force. Otherwise, it may cause a fire.

(5) Corrective actions

▲ CAUTION

- •When it is assumed that a hazardous condition may occur due to a stop or product malfunction, use a motor with an external brake to prevent the condition.
- •When any alarm has occurred, eliminate its cause, ensure safety, and deactivate the alarm before restarting operation.
- Provide an adequate protection to prevent unexpected restart after an instantaneous power failure.

•After an earthquake or other natural disasters, ensure safety by checking the conditions of the installation, mounting, wiring, and equipment before switching the power on to prevent an electric shock, injury, or fire.

(6) Storage

▲ CAUTION

Note the followings when storing the direct drive motor for an extended period of time (guideline: three months or more).

Always store the direct drive motor indoors in a clean and dry place.

- If it is stored in a dusty or damp place, make adequate provision, e.g. cover the whole product.
- If the insulation resistance of the winding decreases, check how to store the equipment.
- Though the motor is rust-proofed before shipment using paint or rust prevention oil, rust may be produced depending on the storage conditions or storage period.

If the direct drive is to be stored for longer than six months, apply rust prevention oil again especially to the machine processing surfaces of the rotor, etc.

- Before using the product after storage for an extended period of time, hand-turn the direct drive motor rotor (output shaft) to confirm that nothing is wrong with the direct drive motor.
- When the product has been stored for an extended period of time, contact your local sales office.

(7) General instruction

●To illustrate details, the equipment in the diagrams of this Instruction Manual may have been drawn without covers and safety guards. When the equipment is operated, the covers and safety guards must be installed as specified. Operation must be performed in accordance with this Specifications and Instruction Manual.

DISPOSAL OF WASTE

Please dispose a direct drive motor and other options according to your local laws and regulations.

«About the manual»

This Instruction Manual is required if you use this direct drive motor for the first time. Ensure to keep this manual accessible to use the direct drive motor safely.

«Cables used for wiring»

The wiring cables mentioned in this Instruction Manual are selected based on the ambient temperature of 40 °C.

«U.S. customary units»

U.S. customary units are not shown in this manual. Convert the values if necessary according to the following table.

| Quantity | SI (metric) unit | U.S. customary unit |
|-------------------------------|---|--------------------------------|
| Mass | 1 [kg] | 2.2046 [lb] |
| Length | 1 [mm] | 0.03937 [inch] |
| Torque | 1 [N•m] | 141.6 [oz•inch] |
| Moment of inertia | 1 [(× 10 ⁻⁴ kg•m ²)] | 5.4675 [oz•inch ²] |
| Load (thrust load/axial load) | 1 [N] | 0.2248 [lbf] |
| Temperature | N [°C] × 9/5 + 32 | N [°F] |

CONTENTS

| 1. INTRODUCTION | 1 - 1 to 1 - 2 |
|---|----------------|
| 1.1. Deting plots | 1 1 |
| 1.1 Rating plate | |
| 1.2 Parts identification | |
| 2. INSTALLATION | 2 - 1 to 2 - 8 |
| | |
| 2.1 Equipment configuration | |
| 2.2 Mounting direction | |
| 2.3 Load mounting/dismounting precautions | |
| 2.4 Permissible load for the rotor | |

2.5Protection from oil and water2 - 42.6Inspection items2 - 52.7Parts having service life2 - 52.8Machine accuracies2 - 62.9Flange size2 - 6

| above sea level | |
|--|----------------|
| 2.11 Magnetic shielding | |
| 3. CONNECTORS USED FOR DIRECT DRIVE MOTOR WIRING | 3 - 1 to 3 - 4 |
| 3.1 Selection of connectors | 3 - 1 |
| 3.2 Wiring connectors (connector configurations A/B/C/D/E/F) | |
| 4. CONNECTOR DIMENSIONS | 4 - 1 to 4 - 4 |

2.10 Restrictions when using this product at altitudes exceeding 1000 m and up to 2000 m

5. CONNECTION OF SERVO AMPLIFIER AND DIRECT DRIVE MOTOR 5 - 1 to 5 - 8 5.1 Connection instructions 5 - 2 5.2 Direct drive motor power cable wiring diagram 5 - 2 5.3 Selection example of wires 5 - 3

6. WIRING OPTION

| 6.1 Connector set | 3 - 1 |
|---|-------|
| 6.1.1 Combinations of connector set | |
| 6.1.2 Connector list6 | 3 - 3 |
| 6.2 Encoder connector set | 3 - 4 |
| 6.2.1 MR-J3DDCNS | 3 - 4 |
| 6.2.2 MR-J3DDSPS6 | 3 - 5 |
| 6.2.3 Combinations for the encoder cable6 | ð - 5 |
| 6.2.4 Fabrication of the encoder cable6 | 3 - 6 |
| 6.3 Absolute position storage unit MR-BTAS016 | 3 - 9 |

6 - 1 to 6 -10

App. - 1 to App. - 7 Selection example of direct drive motor......App. - 1 App. 1 App. 2 Manufacturer list......App. - 3 Crimping connector for CNP3App. - 3 App. 3 Fabrication of the encoder cable......App. - 4 App. 4 App. 5 Compliance with the CE marking......App. - 5 App. 6 Compliance with UL/CSA standard......App. - 6

8.

APPENDIX

| 7.4 Torque characteristics | |
|--|----------------|
| 7.5 Dimensions | |
| B. TM-RG2M SERIES/TM-RU2M SERIES | 8 - 1 to 8 -10 |
| 8.1 Model designation | |
| 8.2 Combinations of servo amplifier and direct drive motor | |

7. TM-RFM SERIES

7 - 1 to 7 -12

2

-10

1. INTRODUCTION

1.1 Rating plate

The following shows an example of rating plate for explanation of each item.



- Note 1. Production year and month of the direct drive motor are indicated in a serial number on the rating plate.
 - The year and month are indicated by the last two digits of the year and one digit of the month [1 to 9, X (10), Y (11), and Z (12)].
 - For January 2012, the Serial No. is like, "SER. _____ 121".
 - 2. Products approved by Certification Bodies are marked. The marks depends on the Certification Bodies.

1.2 Parts identification



MEMO

| | <u> </u> |
|--|----------|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

2. INSTALLATION

WARNING To prevent electric shock, ground each equipment securely.

Stacking in excess of the specified number of product packages is not allowed. Install the direct drive motor on incombustible material. Installing them directly or close to combustibles will lead to smoke or a fire. Install the servo amplifier and the direct drive motor in a load-bearing place in accordance with the Instruction Manual. •Do not get on or put heavy load on the equipment. Otherwise, it may cause injury. •Use the equipment within the specified environment. For the environment, refer to section 7.3. Do not drop or strike the direct drive motor as it is precision equipment. •Do not install or operate a direct drive motor, which has been damaged or has any parts missing. Do not hold the cables, rotor, encoder, or connector when carrying the direct drive motor. Otherwise, it may drop. Securely fix the direct drive motor to the machine. If being attached insecurely, the motor may come off during operation, leading to injury. •Do not apply shocks, e.g. hit with a hammer, when coupling the rotor of the direct drive motor. Otherwise, the encoder may malfunction. When coupling a load to the direct drive motor, make sure to align and center the load on the motor flange rabbet. Particularly, when a rigid coupling is used, even a slight center deviation may reduce position accuracy or damage the rotor. Balance the load to the extent possible. Not doing so can cause vibration during direct drive motor operation or damage the bearings and encoder. •Take safety measures, e.g. provide covers, to prevent accidental access to the rotor of the direct drive motor during operation. Do not subject the rotor of the direct drive motor to more than the permissible load. Otherwise, the rotor may break, leading to injury. •When the product has been stored for an extended period of time, contact your local sales office. Be sure to check the vibration level with the direct drive motor mounted on the machine. A great vibration may cause the early damage of a bearing and encoder. The great vibration may also cause the poor connector connection or bolt looseness. •For the gain adjustment at the equipment startup, check the torque waveform and the speed waveform with a measurement device to check that no vibration occurs. If the vibration occurs due to high gain, the vibration may cause the early damage of the direct drive motor. Do not use the direct drive motor where the shaft-through portion may be subject to pressure (e.g. compressed air). Applying air pressure to the inside of the direct drive motor may cause a malfunction.

2.1 Equipment configuration

The following shows the configuration of a direct drive motor. When using the direct drive motor, note the following.

(1) Minimum oscillation angle

If the direct drive motor rotates repeatedly by a small angle (by 70° or less), make the direct drive motor rotate by 90° or more at least once a day in order to keep the bearing lubricated.

(2) Z-phase position

A Z-phase pulse turns on (Z-phase mark passing) when the Z-phase mark on the rotor end of the direct drive motor passes over the connector area. Keep the Z-phase position visible even after the direct drive motor is installed to a machine.



(3) Precautions for Z-phase mark passing

After power on, the Z-phase mark of the direct drive motor must pass the connector area once. In a system which prevents the direct drive motor from making a full rotation, install the direct drive motor in a position where the Z-phase mark can pass over the connector area.

(4) Vertical axis (lift)

For the system where the unbalanced torque occurs, such as a vertical axis system (lift), use the direct drive motor in the absolute position detection system. In the absolute position detection system, the absolute position is established when the Z-phase mark passes the connector area once. Therefore, at system startup, make the Z-phase mark pass over the connector area, and switch the servo amplifier's power supply from off to on.

If the direct drive motor can be rotated manually, make the Z-phase mark pass over the connector area while only the servo amplifier's control circuit power supply is on. After that, switch the servo amplifier's power supply from off to on.

If the direct drive motor cannot be rotated manually, detect the magnetic poles while the torque is balanced, then run the direct drive motor in the test mode to make its Z-phase mark pass over the connector area. After that, switch the servo amplifier's power supply from off to on. After the Z-phase mark passes over the connector area once, magnetic pole detection is not required.

2.2 Mounting direction

The following table indicates the mounting direction of the direct drive motor.

| Direct drive motor series | | Mounting direction |
|---------------------------|------|--------------------|
| TM | -RFM | |
| TM- | RG2M | All directions |
| TM- | RU2M | |

2.3 Load mounting/dismounting precautions

| POINT | |
|---|---|
| During assert may malfund | mbling, the rotor must not be hammered. Otherwise, the encoder ction. |
| | |

- (1) The direction of the encoder on the direct drive motor cannot be changed.
- (2) When mounting the direct drive motor, use spring washers, etc. and fully tighten the bolts so that they do not become loose due to vibration.
- 2.4 Permissible load for the rotor



For the permissible rotor load specific to the direct drive motor, refer to section 7.3.

- (1) When coupling a load to the direct drive motor, the load applied to the rotor must be within the permissible load.
- (2) The load, which exceeds the permissible load, can cause the bearing life to reduce and the rotor to break.
- (3) The load indicated in this section is static load in a single direction and does not include eccentric load. Make eccentric load as small as possible. Not doing so can cause the direct drive motor to be damaged.

2.5 Protection from oil and water

Provide adequate protection to prevent foreign matter, such as oil and water, from entering the rotor of the direct drive motor. When mounting the direct drive motor, consider the items in this section.

(1) Do not use the direct drive motor with its cable soaked in oil or water.



Provide measures so that the direct drive motor is not exposed to oil and water entering from the machine side, rotating table, etc.



- (3) If liquid such as coolant drops on the direct drive motor, the sealant, packing, cable and others may be affected depending on the liquid type.
- (4) In the environment where the direct drive motor is exposed to oil mist, steam, oil, water, grease, and/or the like, a standard specification direct drive motor cannot be used. Provide measures to prevent dust and/or water on the machine side.

2.6 Inspection items

| | Before starting maintenance and/or inspection, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier. To avoid an electric shock, only qualified personnel should attempt inspections. For repair, contact your local sales office. |
|--|---|
|--|---|

Do not perform insulation resistance test on the direct drive motor. Otherwise, it may cause a malfunction. Do not disassemble and/or repair the equipment on customer side.

It is recommended that the following points to be periodically checked.

- (1) Check the bearings, etc. for unusual noise.
- (2) Check the cables and the like for scratches or cracks. Especially when the junction cable is movable, perform periodic inspection according to operating conditions.
- (3) Check the power connector and encoder connector connections for looseness.

2.7 Parts having service life

Service life of the following parts is listed below. However, the service life varies depending on operation and environment. If any fault is found in the parts, they must be replaced immediately regardless of their service life. For parts replacement, contact your local sales office.

| Part name | Life guideline | Remark |
|---|---------------------------------|--|
| Bearings | 20,000 hours to 30,000 hours | The Quideline of Life field since the reference |
| Encoder | 20,000 hours to 30,000 hours | The Guideline of Life field gives the reference time. |
| Absolute position storage unit (option) | 20,000 hours to 30,000 hours | If any fault is found before this time is reached, the part must be changed. |

When the motor is run at rated speed under rated load, bearings should be exchanged in 20,000 to 30,000 hours as a guideline. This differs on the operating conditions. The bearings must also be changed if unusual noise or vibration is found during inspection.

2.8 Machine accuracies

The following table indicates the machine accuracies of the rotor (output shaft) and the mounting area of the direct drive motor (except special products).

| Item | Measuring position | Accuracy [mm] |
|---|-----------------------|---------------|
| Runout of mounting surface to rotor (output shaft) | а | 0.05 |
| Runout of fitting outer diameter of mounting surface | b | 0.07 |
| Runout of rotor (output shaft) | С | 0.04 |
| Runout of rotor (output shaft) end | d | 0.02 |

Reference diagram



2.9 Flange size

The rated torque of the direct drive motor indicates the continuous permissible torque value that can be generated when the motor is mounted on the aluminum flange specified in this table and used in the environment of 0 $^{\circ}$ C to 40 $^{\circ}$ C ambient temperature.

| Flange size [mm] | Direct drive motor | | | |
|---------------------|--------------------|--|--|--|
| | TM-RG2M002C30 | | | |
| | TM-RU2M002C30 | | | |
| 400 × 400 × 20 | TM-RFM002C20 | | | |
| | TM-RFM004C20 | | | |
| | TM-RFM006C20 | | | |
| | TM-RG2M004E30 | | | |
| | TM-RU2M004E30 | | | |
| 550 × 550 × 35 | TM-RFM006E20 | | | |
| | TM-RFM012E20 | | | |
| | TM-RFM018E20 | | | |
| | TM-RG2M009G30 | | | |
| | TM-RU2M009G30 | | | |
| 650 × 650 × 35 | TM-RFM012G20 | | | |
| | TM-RFM048G20 | | | |
| | TM-RFM072G20 | | | |
| 750 × 750 × 45 | TM-RFM040J10 | | | |
| 100 ^ 100 ^ 40 | TM-RFM120J10 | | | |
| 950 × 950 × 50 | TM-RFM240J10 | | | |

2. INSTALLATION

2.10 Restrictions when using this product at altitudes exceeding 1000 m and up to 2000 m above sea level

As heat dissipation effects decrease in proportion to the decrease in air density, use the product within the effective load ratio and regenerative load ratio shown in the following figure.



2.11 Magnetic shielding

Do not place the direct drive motor near magnetic sources, such as a magnet. If it is unavoidable, block the magnetic force by installing a shielding plate, etc.

MEMO

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

3. CONNECTORS USED FOR DIRECT DRIVE MOTOR WIRING

| POINT | |
|-----------------|---|
| ●The IP rating | g indicated is the connector's protection against ingress of dust and |
| water when | the connector is connected to a servo amplifier, direct drive motor, |
| or absolute | position storage unit. |
| If the IP ratir | ng of the connector, servo amplifier, direct drive motor and absolute |
| position stor | age unit vary, the overall IP rating depends on the lowest IP rating of |
| all compone | nts. |

3.1 Selection of connectors

Use the connector configuration products given in the table as the connectors for connection with the direct drive motor. Refer to section 3.2 for the compatible connector configuration products.



Power supply connector Encoder connector

Wiring connector Direct drive motor Absolute position storage unit (option) (Note) For power supply For encoder Servo amplifier side Encoder side TM-RFM_C20 Connector TM-RFM_E20 configuration B Connector TM-RFM_G20 configuration C TM-RFM040J10 Connector configuration D TM-RFM120J10 Connector Connector Connector Connector TM-RFM240J10 configuration E configuration A configuration A configuration F TM-RG2M002C30 TM-RU2M002C30 TM-RG2M004E30 Connector TM-RU2M004E30 configuration B TM-RG2M009G30 TM-RU2M009G30

Note. Used in the absolute position detection system

3.2 Wiring connectors (connector configurations A/B/C/D/E/F)



| | | Plug (Hirose Electric) | | | Recommended (Bando Dense | Direct drive motor encoder connector | |
|-------------------------|---------|------------------------|---------------|----------------|--|--------------------------------------|---|
| Connector configuration | Feature | | Plug | Cord clamp | Model | Cable OD [mm] (reference) | or Absolute position storage unit connector (servo amplifier side) (Note 1) |
| A | IP67 | Straight | RM15WTPZK-12S | JR13WCCA-8(72) | 20276 VSVPAWG#23×6P KB-0492 (Note 2) | 8.2 | RM15WTRZB-12P(72) |

Note 1. The connector to be mated.

2. Purchase from Toa Electric Industrial Co. Ltd., Nagoya Branch



| | | | Plug (DDK) | Ca | able clamp | | |
|-------------------------|---------------------|------------------------------|--|--------------|----------------|--|--|
| Connector configuration | Feature | | Type Model | | Model | Direct drive motor power connector (Note 2) | |
| | | | | 4 to 8 | ACS-08RL-MS14F | | |
| | | | | 4 10 8 | (Nippon Flex) | | |
| | | IP67 I compliant Straight | CE05-6A14S-2SD-D Applicable wire size: AWG 22 to 16 | 8 to 12 | ACS-12RL-MS14F | CE05-2A14S-2PD-D | |
| | IP67 | | | | (Nippon Flex) | | |
| В | EN compliant | | | 5 to 8.3 | YSO14-5 to 8 | | |
| Б | | | | 5 10 8.5 | (Daiwa Dengyo) | | |
| | | | | 8.3 to 11.3 | YSO14-9 to 11 | | |
| | | | | 0.3 10 11.3 | (Daiwa Dengyo) | | |
| | General environment | | D/MS3106B14S-2S | 7.9 or less | D/MS3057-6A | | |
| | (Note 1) | | Applicable wire size: AWG 22 to 16 | (bushing ID) | D/10/03007-0A | | |

Note 1. Not comply with EN.

2. The connector to be mated.



| | | Plug (DDK) | | Cable clamp (DDK) | | | |
|-------------------------|---------------------------------|------------|------------------------------------|-------------------|----------------|--|--|
| Connector configuration | Feature | Туре | Type Model (| | Model | Direct drive motor power connector (Note 2) | |
| | IP67 | | CE05-6A18-10SD-D-BSS | 8.5 to 11 | CE3057-10A-2-D | | |
| С | EN compliant | Straight | Applicable wire size: AWG 14 to 12 | 10.5 to 14.1 | CE3057-10A-1-D | CE05-2A18-10PD-D | |
| C | General environment (Note 1) | | D/MS3106B18-10S | 14.3 or less | D/MS3057-10A | CE05-2A10-10FD-D | |
| | | | Applicable wire size: AWG 14 to 12 | (bushing ID) | D/10133037-10A | | |

Note 1. Not comply with EN.

2. The connector to be mated.



| | | Plug (DDK) | | Cable clamp (DDK) | | | |
|-------------------------|------------------------------|------------|--|------------------------------|----------------|--|--|
| Connector configuration | Feature | Туре | Type Model | | Model | Direct drive motor power connector (Note 2) | |
| | IP67 | | CE05-6A22-22SD-D-BSS | 9.5 to 13 | CE3057-12A-2-D | | |
| D | EN compliant | Straight | Applicable wire size: AWG 10 to 8 | 12.5 to 16 | CE3057-12A-1-D | CE05-2A22-22PD-D | |
| | General environment (Note 1) | Straight | D/MS3106B22-22S Applicable wire size: AWG 10 to 8 | 15.9 or less (bushing ID) | D/MS3057-12A | CE05-2A22-22PD-D | |

Note 1. Not comply with EN.

2. The connector to be mated.



| | | Plug (DDK) | | Cable clamp (DDK) | | | |
|-------------------------|---------------------------------|------------|--|--------------------------------------|----------------|---|--|
| Connector configuration | Feature | Туре | Model | el Cable OD [mm] M (reference) | | Direct drive motor power connector (Note 2) | |
| _ | IP67 EN compliant | | CE05-6A32-17SD-D-BSS Applicable wire size: AWG 6 to 4 | 22 to 23.8 | CE3057-20A-1-D | CE05-2A32-17PD-D | |
| | General environment (Note 1) | Straight | D/MS3106B32-17S Applicable wire size: AWG 6 to 4 | 23.8 or less (bushing ID) | D/MS3057-20A | CE00-2A32-17PD-D | |

Note 1. Not comply with EN.

2. The connector to be mated.



| | | Plug (Hirose Electric) | | | Recommended cable (B | Absolute position storage | | |
|----------------------------|------|------------------------|------------------|-----------------|--|---------------------------------|---|--|
| Connector configuration | | Туре | Plug | g Cord clamp Mo | | Cable OD [mm] (reference) | unit connector (encoder side) (Note 1) | |
| F | IP67 | Straight | RM15WTPZ-12P(72) | JR13WCCA-8(72) | 20276 VSVPAWG#23×6P KB-0492 (Note 2) | 8.2 | RM15WTRZB-12S(72) | |

Note 1. The connector to be mated.

2. Purchase from Toa Electric Industrial Co. Ltd., Nagoya Branch

4. CONNECTOR DIMENSIONS

4. CONNECTOR DIMENSIONS

The following shows the dimensions of the connectors used for wiring the direct drive motor.

(1) Hirose Electric

(a) RM15WTPZK-12S/RM15WTPZ-12P(72)

| Model | Connector configuration (Note) |
|------------------|-----------------------------------|
| RM15WTPZK-12S | A |
| RM15WTPZ-12P(72) | F |

Note. Refer to section 3.2 for the connector configuration.



(b) JR13WCCA-8(72)

Refer to the connector configurations A and F of section 3.2 for the connector configuration.



(2) DDK

(a) CE05-6A14S-2SD-D

Refer to the connector configuration B of section 3.2 for the connector configuration.



(b) CE05-6A18-10SD-D-BSS CE05-6A22-22SD-D-BSS CE05-6A32-17SD-D-BSS

[Unit: mm]





| Model | A | B ⁺⁰ -0.38 | C ± 0.8 | D or less | W | Connector configuration (Note) |
|----------------------|-----------------|-----------------------|---------|-----------|------------------|--------------------------------------|
| CE05-6A18-10SD-D-BSS | 1 1/8-18UNEF-2B | 34.13 | 32.1 | 57 | 1-20UNEF-2A | С |
| CE05-6A22-22SD-D-BSS | 1 3/8-18UNEF-2B | 40.48 | 38.3 | 61 | 1 3/16-18UNEF-2A | D |
| CE05-6A32-17SD-D-BSS | 2-18UNS-2B | 56.33 | 54.2 | 79 | 1 3/4-18UNS-2A | E |

Note. Refer to section 3.2 for the connector configuration.

(c) CE3057-10A-1-D CE3057-10A-2-D CE3057-12A-1-D CE3057-12A-2-D CE3057-20A-1-D

[Unit: mm]





| Model | Applicable shell size | A | В | С | (D) | E | F | G | V | Enclosed bushing model | Applicable cable OD (reference) | Connector configuration (Note) | |
|--------------------|--------------------------|------|------|------|--------|------|------|------|----------------|------------------------------|---------------------------------------|--------------------------------------|--|
| CE3057-10A- 1-D | 18 | 23.8 | 30.1 | 10.3 | (41.2) | 15.9 | 14.1 | 31.7 | 1-20UNEF-2B | CE3420-10-1 | 10.5 to 14.1 | с | |
| CE3057-10A- 2-D | 10 | 23.0 | 30.1 | 10.5 | (41.3) | 15.9 | 11.0 | 31.7 | 1-20UNEF-2B | CE3420-10-2 | 8.5 to 11 | | |
| CE3057-12A- 1-D | 22 | 23.8 | 35 | 10.2 | (41.2) | 19 | 16.0 | 37.3 | 1 3/16-18UNEF- | CE342012-1 | 12.5 to 16 | D | |
| CE3057-12A- 2-D | 22 | 23.8 | 35 | 10.3 | (41.3) | 19 | 13.0 | 37.3 | 2B | CE342012-2 | 9.5 to 13 | | |
| CE3057-20A- 1-D | 32 | 27.8 | 51.6 | 11.9 | (43.0) | 32.0 | 23.8 | 51.6 | 1 3/4-18UNS-2B | CE3420-20-1 | 22.0 to 23.8 | E | |

Note. Refer to section 3.2 for the connector configuration.

4. CONNECTOR DIMENSIONS

(d) D/MS3106B14S-2S D/MS3106B18-10S D/MS3106B22-22S D/MS3106B32-17S

[Unit: mm]

[Unit: mm]



| Model | A | J | L | Q | V | W | Y | Connector configuration (Note) |
|-----------------|--------------|-------|-------|-------|---------------|-------|----|--------------------------------------|
| D/MS3106B14S-2S | 7/8-20UNEF | 13.49 | 42.88 | 28.57 | 3/4-20UNEF | 8.00 | 30 | В |
| D/MS3106B18-10S | 1 1/8-18UNEF | 18.26 | 52.37 | 34.13 | 1-20UNEF | 9.53 | 42 | С |
| D/MS3106B22-22S | 1 3/8-18UNEF | 18.26 | 56.57 | 40.48 | 1 3/16-18UNEF | 9.53 | 50 | D |
| D/MS3106B32-17S | 2-18UNS | 18.26 | 61.92 | 56.33 | 1 3/4-18UNS | 11.13 | 66 | E |

Note. Refer to section 3.2 for the connector configuration.

(e) D/MS3057-6A

D/MS3057-10A D/MS3057-12A D/MS3057-20A



| Model | Shell size | A | В | С | D | E | G | V | Bushing | Connector configuration (Note) |
|--------------|------------|------|------|------|------|------|------|------------------|-----------|--------------------------------------|
| D/MS3057-6A | 14S | 22.2 | 24.6 | 10.3 | 11.2 | 7.9 | 27.0 | 3/4-20UNEF | AN3420-6 | В |
| D/MS3057-10A | 18 | 23.8 | 30.1 | 10.3 | 15.9 | 14.3 | 31.7 | 1-20UNEF | AN3420-10 | С |
| D/MS3057-12A | 22 | 23.8 | 35.0 | 10.3 | 19.0 | 15.9 | 37.3 | 1 3/16-18UNEF-2A | AN3420-12 | D |
| D/MS3057-20A | 32 | 27.8 | 51.6 | 11.9 | 31.7 | 23.8 | 51.6 | 1 3/4-18UNS | AN3420-20 | E |

Note. Refer to section 3.2 for the connector configuration.

(3) Daiwa Dengyo

Hexagonal width across flats D O-ring Hexagonal width across flats oD2 Hexagonal width across flats oD2

| Model | Applicable cable OD | А | Length before tightening L | Width across flats D | Width across corners D1 | Width across flats D2 | Width across corners D3 | Connector configuration (Note) |
|----------------------------------|------------------------|---------------|----------------------------------|-------------------------------|----------------------------------|--------------------------------|----------------------------------|--------------------------------------|
| YSO14-5 to 8 YSO14-9 to 11 | 4 to 8.3 7 to 11.3 | 3/4-20UNEF-2B | 44 | 23 | 25 | 26 | 28 | В |

Note. Refer to the connector configuration B of section 3.2 for the connector configuration.

(4) Nippon Flex

(Note 1) L⁽¹⁾ (Note 1) L⁽²⁾ A + 15 Screw C E C

| | | | | | T | ightening n | ut | Nipple body | | | | | |
|--------------------|---------------|------------------------|---|------|----------------------------|---------------------------------|------------------------------|-----------------------------|----------------------------------|-------------------------------|------|----|--|
| Model | Screw C | Applicable cable OD | A | φd | E Two- face width | F Width across corners | G Number of corners | E' Two- face width | F' Width across corners | G' Number of corners | L L1 | L1 | Connector configuration (Note 2) |
| ACS-08RL- MS14F | 3/4-20UNEF-2B | 4.0 to 8.0 | 7 | 15.0 | 20 | 22.0 | 6 | 22 | 24.2 | 6 | 46 | 41 | в |
| ACS-12RL- MS14F | 3/4-20UNEF-2B | 8.0 to 12.0 | 7 | 15.0 | 24 | 26.4 | 6 | 36 | 28.6 | 6 | 46 | 41 | В |

Note 1. (1) indicates the reference dimension before assembling, and (2) indicates the reference dimension after assembling.

2. Refer to the connector configuration B of section 3.2 for the connector configuration.

[Unit: mm]

[Unit: mm]

| • | (| 3 | |
|---|-----|---|--|
| | | | |
| _ | | | |
| ~ | ¥ Ť | | |

5. CONNECTION OF SERVO AMPLIFIER AND DIRECT DRIVE MOTOR

5. CONNECTION OF SERVO AMPLIFIER AND DIRECT DRIVE MOTOR



POINT

•We recommend using HIV wires to connect the servo amplifier to the direct drive motor. Therefore, recommended wire sizes may different from those of the used wires for the previous direct drive motors.

5. CONNECTION OF SERVO AMPLIFIER AND DIRECT DRIVE MOTOR

5.1 Connection instructions

•Refer to chapter 6 for the encoder cable.

POINT

This section explains the connection of the direct drive motor power (U/V/W). Use of the optional connector is recommended for connection between the servo amplifier and direct drive motor. Refer to chapter 6 for details of the options.

For grounding, connect the grounding lead wire from the direct drive motor to the protective earth (PE) terminal of the servo amplifier, and then connect the wire from the servo amplifier to the ground via the protective earth of the cabinet. Do not connect the wire directly to the protective earth of the cabinet.



Note. The number of PE terminals of the servo amplifier differs depending on the amplifier type.

5.2 Direct drive motor power cable wiring diagram

Fabricate a cable as shown below.

Refer to section 5.3 for the wires used for the cable.



Note. This grounding is for the MR-J4 1-axis servo amplifier. For the MR-J4 multi-axis servo amplifier, connect the grounding lead wire to the connector for CNP3_.

5.3 Selection example of wires

| POINT | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|
| •Wires indicated in this section are separated wires. | | | | | | | | | |
| Selection condition of wire size is as follows. | | | | | | | | | |
| Constructio | Construction condition: Single wire set in midair. | | | | | | | | |
| Wire length | : 30 m or less | | | | | | | | |

The following shows examples for using the 600 V Grade heat-resistant polyvinyl chloride insulated wire (HIV wire).

(1) TM-RFM series

| Direct drive motor | Wire [mm ²] | | | | |
|--------------------|-------------------------|--|--|--|--|
| Direct drive motor | U/V/W/🕀 | | | | |
| TM-RFM002C20 | | | | | |
| TM-RFM004C20 | | | | | |
| TM-RFM006C20 | | | | | |
| TM-RFM006E20 | 1.25 (AWG 16) | | | | |
| TM-RFM012E20 | | | | | |
| TM-RFM018E20 | | | | | |
| TM-RFM012G20 | 1 | | | | |
| TM-RFM048G20 | 3.5 (AWG 12) | | | | |
| TM-RFM072G20 | 3.5 (AWG 12) | | | | |
| TM-RFM040J10 | 1.25 (AWG 16) | | | | |
| TM-RFM120J10 | 3.5 (AWG 12) | | | | |
| TM-RFM240J10 | 5.5 (AWG 10) (Note) | | | | |

Note. Refer to each servo amplifier instruction manual for crimp terminals used for connection with the servo amplifier.

(2) TM-RG2M series/TM-RU2M series

| Direct drive motor | Wire [mm ²] | | | |
|--------------------|-------------------------|--|--|--|
| Direct drive motor | U/V/W/🕀 | | | |
| TM-RG2M002C30 | | | | |
| TM-RU2M002C30 | | | | |
| TM-RG2M004E30 | 0.75 (AWG 18) | | | |
| TM-RU2M004E30 | 0.75 (AWG 16) | | | |
| TM-RG2M009G30 | | | | |
| TM-RU2M009G30 | | | | |

5.4 Servo amplifier terminal section

| POINT | | | | | | | | |
|--|---|--|--|--|--|--|--|--|
| ●For the sizes of wires used for wiring, refer to section 5.3. | | | | | | | | |
| When wiring, remove the power connectors from the servo amplifier. | | | | | | | | |
| Insert only o | ne wire or ferrule to each wire insertion hole. | | | | | | | |

To wire to the servo amplifier, use connectors packed with the servo amplifier or optional connectors. The following table shows the connectors to be connected to the servo amplifiers. The numbers in the rated output field of the table indicate the symbol filling the underline "_" in the servo amplifier model. For details of the connectors, refer to (1) in this section. For wiring, refer to (2) in this section.

| Servo amplifier | Rated output | | | | | | | | | | | | |
|---|--------------|----|-------|---------|----|-----|-------|---------|-----|---------|----------|----------|-----|
| Servo ampliner | 10 | 20 | 40 | 60 | 70 | 100 | 200 | 350 | 500 | 700 | 11K | 15K | 22K |
| MR-J4A MR-J4A-RJ MR-J4B MR-J4B-RJ MR-J4GF MR-J4GF-RJ | | | Conne | ector A | | | Conne | ector B | N | one (Te | rminal b | ox) (Not | e) |

Note. For details on the terminal block, refer to each servo amplifier instruction manual.

| Servo amplifier | Rated output | | | | |
|--|--------------|--------|----|--|--|
| Servo ampliner | 10 | 20 | 40 | | |
| MR-J4A1 MR-J4A1-RJ MR-J4B1 MR-J4B1-RJ | Connec | ctor A | | | |

| Servo amplifier | Rated output (Note) | | | |
|-----------------|---------------------------|--|--|--|
| Servo ampliner | 22 (222) 44 (444) 77 1010 | | | |
| MR-J4W2B | Connector C | | | |
| MR-J4W3B | Connector C | | | |

Note. The numbers in parentheses are for the MR-J4 3-axis servo amplifier.

(1) Connector details

(a) Connector A



Table 5.1 Connector and applicable wire

| Connector | Decenteele cocombly | Applica | ble wire | Stripped | Open tool | Manufac- |
|-----------|---------------------|------------------------|-------------------|-------------|--------------------------------|----------|
| Connector | Receptacle assembly | Wire size Insulator OD | | length [mm] | Open tool | turer |
| CNP3 | 03JFAT-SAXGDK-H7.5 | AWG 18 to 14 | 3.9 mm or shorter | 9 | J-FAT-OT (N) or J-FAT-OT | JST |

(b) Connector B





Table 5.2 Connector and applicable wire

| Connector | Becontacle accombly | Applica | ble wire | Stripped | Open tool | Manufac- |
|-----------|---------------------|--------------|-------------------|-------------|--------------|----------|
| Connector | Receptacle assembly | Wire size | Insulator OD | length [mm] | Open tool | turer |
| CNP3 | 03JFAT-SAXGFK-XL | AWG 16 to 10 | 4.7 mm or shorter | 11.5 | J-FAT-OT-EXL | JST |

5. CONNECTION OF SERVO AMPLIFIER AND DIRECT DRIVE MOTOR

(c) MR-J4W_ - _B



Note. For the 3-axis servo amplifier.

| Table 5.3 Connector and applicable wire | Table 5.3 | Connector | and | applicable | wire |
|---|-----------|-----------|-----|------------|------|
|---|-----------|-----------|-----|------------|------|

| Connector | Receptacle assembly | Applicable wire size | Stripped length [mm] | Open tool | Manufacturer |
|-------------------------|---------------------|----------------------|-------------------------|--------------|--------------|
| CNP3A CNP3B CNP3C | 04JFAT-SAGG-G-KK | AWG 18 to 14 | 9 | J-FAT-OT-EXL | JST |

(2) Cable connection procedure

(a) Fabrication on cable insulator

Refer to tables 5.1 to 5.3 for stripped length of cable insulator. The appropriate stripped length of cables depends on their type, etc. Set the length considering their fabrication status.



Twist strands lightly and straighten them as follows.





Twist and straighten the cores.

(b) Inserting wire

Insert the open tool as follows and push down it to open the spring.

While the open tool is pushed down, insert the stripped wire into the wire insertion hole. Check the wire insertion depth, and make sure that the cable insulator will not be caught by the spring and that the conductive part of the stripped wire will not be exposed.

Release the open tool to fix the wire. Pull the wire lightly to confirm that the wire is surely connected. In addition, make sure that no conductor wire sticks out of the connector.

The following shows a connection example of the CNP3 connector for 2 kW and 3.5 kW of MR-J4 1- axis servo amplifier.



5. CONNECTION OF SERVO AMPLIFIER AND DIRECT DRIVE MOTOR

MEMO

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

6. WIRING OPTION

| <u>∕</u> MARNING | Before connecting any option or peripheral equipment, turn off the power and wait for 15 minutes or more until the charge lamp turns off. Then, confirm that the voltage between P+ and N- is safe with a voltage tester and others. Otherwise, an electric shock may occur. In addition, when confirming whether the charge lamp is off or not, always confirm it from the front of the servo amplifier. |
|------------------|---|
|------------------|---|

CAUTION •Use specified auxiliary equipment and options. Otherwise, it may cause a malfunction or fire.

POINT

•We recommend using HIV wires to wire the servo amplifiers, direct drive motors, options, and peripheral equipment. Therefore, recommended wire sizes may different from those of the used wires for the previous direct drive motors.

6.1 Connector set

POINT

The IP rating indicated is the connector's protection against ingress of dust and water when the connector is connected to a servo amplifier, direct drive motor, or absolute position storage unit. If the IP rating of the connector, servo amplifier, direct drive motor, and absolute position storage unit vary, the overall IP rating depends on the lowest IP rating of all components.

For the connectors used with this direct drive motor, purchase the options indicated in this section. When fabricating an encoder cable, refer to app. 4.
6.1.1 Combinations of connector set



Note 1. Connectors for 3.5 kW or less. For 5 kW or more, it is a terminal block.

- 2. Always make connection for use in an absolute position detection system. (Refer to section 6.3.)
- 3. This connection is for the MR-J4 3-axis servo amplifier.
- 4. Refer to Appendix 3 for the crimp connector for CNP3_.

6.1.2 Connector list

| No. | Product | Model | Description | | Remark |
|-----|--------------------------|------------|--|---|-------------------------|
| 1) | Power connector set | MR-PWCNF | Plug: CE05-6A14S-2SD-D (DDK) Cable clamp: YSO14-9 to 11 (Daiwa Dengyo) Applicable cable Applicable wire size: 0.3 mm ² (AWG 22) to 1.25 mm ² (AWG 16) Cable outer diameter: 8.3 mm to 11.3 mm | For TM-RFM_C20 For TM-RFM_E20 For TM-RG2M_C30 For TM-RG2M_E30 For TM-RG2M_G30 For TM-RU2M_C30 For TM-RU2M_C30 For TM-RU2M_E30 For TM-RU2M_G30 | IP67 EN compliant |
| 2) | Power connector set | MR-PWCNS4 | Plug: CE05-6A18-10SD-D-BSS Cable clamp: CE3057-10A-1-D (DDK) Applicable cable Applicable wire size: 2 mm ² (AWG 14) to 3.5 mm ² (AWG 12) Cable outer diameter: 10.5 mm to 14.1 mm | For TM-RFM_G20 | IP67 EN compliant |
| 3) | Power connector set | MR-PWCNS5 | Plug: CE05-6A22-22SD-D-BSS Cable clamp: CE3057-12A-1-D (DDK) Applicable cable Applicable wire size: 5.5 mm ² (AWG 10) to 8 mm ² (AWG 8) Cable outer diameter: 12.5 mm to 16 mm | For TM-RFM040J10 For TM-RFM120J10 | IP67 EN compliant |
| 4) | Power connector set | MR-PWCNS3 | Plug: CE05-6A32-17SD-D-BSS Cable clamp: CE3057-20A-1-D (DDK) Applicable cable Applicable wire size: 14 mm ² (AWG 6) to 22 mm ² (AWG 4) Cable outer diameter: 22 mm to 23.8 mm | For TM-RFM240J10 | IP67 EN compliant |
| 5) | Encoder connector set | MR-J3DDCNS | For connection between servo amplifier and direct of For connection between servo amplifier and absolut Refer to section 6.2 for details. | | IP67 |
| 6) | Encoder connector set | MR-J3DDSPS | For connection between absolute position storage u Refer to section 6.2 for details. | init and direct drive motor. | IP67 |

6.2 Encoder connector set



6.2.1 MR-J3DDCNS

This connector set is used to fabricate an encoder cable for the incremental system or the absolute position detection system (between the servo amplifier and the absolute position storage unit).

| Parts | Description | | | | | |
|------------------------|---|---------------------------|--|--|--|--|
| Parts Connector set | MR-J3DDCNS CTIMI Servo amplifier side connector Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 | Description | | | | |
| | (Molex) Applicable wire size: 0.25 mm ² (AW0 | G 23) to 0.5 mm² (AWG 20) | | | | |

6.2.2 MR-J3DDSPS

This connector set is used to fabricate an encoder cable for the absolute position detection system (between the absolute position storage unit and the direct drive motor).

| Parts | Description | | | | | |
|---------------|---|--|--|--|--|--|
| Connector set | MR-J3DDSPS Absolute position storage unit-side connector Plug: RM15WTPZ-12P(72) Cord clamp: JR13WCCA-8(72) (Hirose Electric) | Encoder-side connector Plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric) | | | | |
| | Applicable wire size: 0.25 mm ² (AWG | 23) to 0.5 mm ² (AWG 20) | | | | |

6.2.3 Combinations for the encoder cable

(1) For incremental system



Note 1. Refer to section 6.2.4 (1) for details.

2. This connection is for the MR-J4 3-axis servo amplifier.

(2) For absolute position detection system



Note 1. Refer to section 6.2.4 (2) for details.

- 2. Refer to section 6.2.4 (3) for details.
- 3. This connection is for the MR-J4 3-axis servo amplifier.
- 4. For cable of 20 m or more, contact your local sales office.

- 6.2.4 Fabrication of the encoder cable
- (1) Encoder cable A
 - (a) Connector details



- Note 1. Do not connect anything to the pins shown as . Especially, the pin 10 is for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally. Referring to POINT of section 6.2, securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.
 - 2. Do not connect anything to the pins shown as \bigtriangledown .
 - 3. Purchase from Toa Electric Industrial Co. Ltd., Nagoya Branch
- (b) Cable internal wiring diagram



Refer to the following table for the required wires to fabricate the encoder cable.

| Core size [mm ²] | Conductor resistance of one core [Ω/km] | Cable OD [mm] | |
|------------------------------|--|---------------|--|
| 0.25 | 63.6 or less | 8.2 | |

(2) Encoder cable B

(a) Connector details



- Note 1. Do not connect anything to the pins shown as _____. Especially, the pin 10 is provided for manufacturer adjustment. If it is connected with any other pin, the servo amplifier cannot operate normally. Referring to POINT of section 6.2, securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.
 - 2. Do not connect anything to the pins shown as \bigtriangledown .
 - 3. Purchase from Toa Electric Industrial Co. Ltd., Nagoya Branch
- (b) Cable internal wiring diagram

When the distance between the servo amplifier and the direct drive motor is within 20 m (Note)



Note. For the cable of 20 m or longer, contact your local sales office.

Refer to the following table for the required wires to fabricate the encoder cable.

| Core size [mm ²] | Conductor resistance of one core [Ω/km] | Cable OD [mm] | |
|------------------------------|--|---------------|--|
| 0.25 | 63.6 or less | 8.2 | |

(3) Encoder cable C

(a) Connector details

| 5) Absolute position storage unit-side connector | 6) Encoder-side connector |
|--|---|
| Straight plug: RM15WTPZ-12P(72) Cord clamp: JR13WCCA-8(72) (Hirose Electric) | Straight plug: RM15WTPZK-12S Cord clamp: JR13WCCA-8(72) (Hirose Electric) |
| Recommended cable: 20276 VSVPAWG#23×6P KB-0492 (Note 2) (Bando Densen) | Recommended cable: 20276 VSVPAWG#23×6P KB-0492 (Note 2) (Bando Densen) |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $ \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \begin{array}{c} \end{array}\\ \end{array}\\ \end{array}$ \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \end{array}\\ \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \end{array}\\ \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \end{array} \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array}\\ \end{array} \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array} \left(\begin{array}{c} \end{array}\\ \end{array}\\ \end{array} \left(\begin{array}{c} \end{array} } \\ \end{array} \left(\begin{array}{c} \end{array} \left(\begin{array}{c} \end{array} } \\ \end{array} \left(\begin{array}{c} \end{array} } \\ \end{array} \left(\begin{array}{c} \end{array} \left(\begin{array}{c} \end{array} } \\ \end{array} \left(\begin{array}{c} \end{array} \left(\end{array}) \\ \end{array} \left(\begin{array}{c} \end{array} \left(\end{array} \left(\end{array}) \\ \end{array} \left(\begin{array}{c} \end{array} \left(\end{array} \left(\end{array}) \\ (\end{array} \left(\end{array} \left(\end{array} \left) \\ (THMT) \\ \left(THMT) \\ \left(|
| View seen from the wiring side. (Note 1) | View seen from the wiring side. (Note 1) |

- Note 1. Do not connect anything to the pins shown as .
 2. Purchase from Toa Electric Industrial Co. Ltd., Nagoya Branch
- (b) Cable internal wiring diagram





Note. For the cable of 20 m or longer, contact your local sales office.

Refer to the following table for the wires required to fabricate the encoder cable.

| Core size [mm ²] | Conductor resistance of one core [Ω/km] | Cable OD [mm] |
|------------------------------|--|---------------|
| 0.25 | 63.6 or less | 8.2 |

6.3 Absolute position storage unit MR-BTAS01

POINT
 Replacing the MR-BTAS01 absolute position storage unit will erase the absolute position. Start up the direct drive motor again and perform home positioning according to each servo amplifier instruction manual.

For absolute position detection system, refer to each servo amplifier instruction manual.



- (1) Connection method with the encoder cable Refer to section 6.2.3 (2).
- (2) Dimensions



Note. When mounting the unit outside the cabinet, fix the mounting surface A with four screws. When mounting the unit inside the cabinet, you can also fix the mounting surface B with two screws.

(3) Environment

The following table indicates the environment for the absolute position storage unit.

| Iter | n | Environment | | |
|----------------------|-----------|---|--|--|
| Ambient | Operation | 0 °C to 55 °C (non-freezing) | | |
| temperature | Storage | -20 °C to 65 °C (non-freezing) | | |
| Ambient | Operation | 10 %RH to 90 %RH (non-condensing) | | |
| humidity | Storage | 10 %RH to 90 %RH (non-condensing) | | |
| Ambience | | Indoors (no direct sunlight), | | |
| Ambience | | free from corrosive gas, flammable gas, oil mist, dust, oil and water. | | |
| Altitude | | Max. 2000 m above sea level | | |
| Vibration resistance | | bration resistance When the mounting surface A is fixed: 49 m/s ² (directions of X, Y, and Z axes) When the mounting surface B is fixed: 5.9 m/s ² (directions of X, Y, and Z axes) | | |

MEMO

| |
|-------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| - |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

7. TM-RFM SERIES

This chapter provides information on the direct drive motor specifications and characteristics. When using the TM-RFM series direct drive motor, always read the Safety Instructions in the beginning of this manual in addition to this chapter.

7.1 Model code definition

The following describes what each block of a model name indicates. Note that not all the combinations of the symbols exist.



7.2 Combinations of servo amplifier and direct drive motor

| | | Serv | o amplifier | |
|--------------------|---|--|---|------------------------------|
| Direct drive motor | | 1-axis | 2-axis | 3-axis |
| | 200 V class | 100 V class | 2 0/10 | 0 400 |
| TM-RFM002C20 | MR-J4-20A MR-J4-20A-RJ MR-J4-20B MR-J4-20B-RJ MR-J4-20GF MR-J4-20GF-RJ | MR-J4-20A1 MR-J4-20A1-RJ MR-J4-20B1 MR-J4-20B1-RJ | MR-J4W2-22B MR-J4W2-44B | MR-J4W3-222B MR-J4W3-444B |
| TM-RFM004C20 | MR-J4-40A MR-J4-40A-RJ MR-J4-40B MR-J4-40B-RJ MR-J4-40GF MR-J4-40GF-RJ | MR-J4-40A1 MR-J4-40A1-RJ MR-J4-40B1 MR-J4-40B1-RJ | MR-J4W2-44B MR-J4W2-77B MR-J4W2-1010B | MR-J4W3-444B |
| TM-RFM006C20 | MR-J4-60A MR-J4-60A-RJ | | | |
| TM-RFM006E20 | MR-J4-60B MR-J4-60B-RJ MR-J4-60GF MR-J4-60GF-RJ | | MR-J4W2-77B MR-J4W2-1010B | |
| TM-RFM012E20 | MR-J4-70A MR-J4-70A-RJ MR-J4-70B MR-J4-70B-RJ MR-J4-70GF MR-J4-70GF-RJ | | MR-J4W2-77B MR-J4W2-1010B | |
| TM-RFM018E20 | MR-J4-100A MR-J4-100A-RJ MR-J4-100B MR-J4-100B-RJ MR-J4-100GF MR-J4-100GF-RJ | | MR-J4W2-1010B | |
| TM-RFM012G20 | MR-J4-70A MR-J4-70A-RJ MR-J4-70B MR-J4-70B-RJ MR-J4-70GF MR-J4-70GF-RJ | | MR-J4W2-77B MR-J4W2-1010B | |
| TM-RFM048G20 | MR-J4-350A MR-J4-350A-RJ | | | |
| TM-RFM072G20 | MR-J4-350B MR-J4-350B-RJ MR-J4-350GF MR-J4-350GF-RJ | | | |
| TM-RFM040J10 | MR-J4-70A MR-J4-70A-RJ MR-J4-70B MR-J4-70B-RJ MR-J4-70GF MR-J4-70GF-RJ | | MR-J4W2-77B MR-J4W2-1010B | |
| TM-RFM120J10 | MR-J4-350A MR-J4-350A-RJ MR-J4-350B MR-J4-350B-RJ MR-J4-350GF MR-J4-350GF-RJ | | | |
| TM-RFM240J10 | MR-J4-500A MR-J4-500A-RJ MR-J4-500B MR-J4-500B-RJ MR-J4-500GF MR-J4-500GF-RJ | | | |

7. TM-RFM SERIES

7.3 Specification list

| | Direct | drive motor | | | TM-RFN | A series | | |
|--------------------------------|---|--------------------------------------|--|------------------|--------------------|---------------|-----------------|-------------|
| Item | 002C20 | 004C20 | 006C20 | 006E20 | 012E20 | 018E20 | | |
| Motor OD (frame OI | φ130 φ180 | | | | | | | |
| Power supply capac | city | | Refer to "U | SING A DIRE | CT DRIVE MO mar | | servo amplifier | instruction |
| Continuous running | Rated output | [W] | 42 | 84 | 126 | 126 | 251 | 377 |
| duty (Note 1) | Rated torque | [N•m] | 2 | 4 | 6 | 6 | 12 | 18 |
| Maximum torque | - | [N•m] | 6 | 12 | 18 | 18 | 36 | 54 |
| Rated speed (Note | 1) | [r/min] | | | 20 | 00 | | |
| Maximum speed | | [r/min] | | | 50 | 00 | | |
| Instantaneous perm | issible speed | [r/min] | | | 57 | 75 | | |
| Power rate at contin | nuous rated torqu | e [kW/s] | 3.7 | 9.6 | 16.1 | 4.9 | 12.9 | 21.8 |
| Rated current | | [A] | 1.3 | 2.2 | 3.2 | 3.0 | 3.8 | 6.0 |
| Maximum current | | [A] | 3.9 | 6.6 | 9.6 | 9.0 | 12 | 18 |
| Moment of inertia J | [× | 10 ⁻⁴ kg•m ²] | 10.9 | 16.6 | 22.4 | 74.0 | 111 | 149 |
| Recommended load (Note 2) | Recommended load to motor inertia ratio | | | 50 times or less | | | | |
| Absolute accuracy (Note 9) [s] | | | ±15 ±12.5 | | | | | |
| Speed/position dete | ector (Note 3) | | 20-bit encoder common to absolute position and incremental detection systems (resolution per direct drive motor revolution: 1048576 pulses/rev) | | | | | |
| Thermistor | | | Built-in | | | | | |
| Insulation class | | | 155 (F) | | | | | |
| Structure | | | Totally enclosed, natural cooling (IP rating: IP42 (Note 4)) | | | | | |
| | Ambient | Operation | 0 °C to 40 °C (non-freezing) | | | | | |
| | temperature | Storage | | | -15 °C to 70 °C | (non-freezing |) | |
| | Ambient | Operation | | 10 % | 6RH to 80 %RH | H (non-conden | sing) | |
| Environment | humidity | Storage | 10 %RH to 90 %RH (non-condensing) | | | | | |
| (Note 5) | Ambience | | Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, oil and water. | | | | | |
| | Altitude | | Max. 2000 m above sea level (Note 10) | | | | | |
| | Vibration resis (Note 6) | tance | X: 49 m/s ² Y: 49 m/s ² | | | | | |
| Vibration rank (Note | e 7) | | V10 | | | | | |
| Rotor permissible | Moment load | [N•m] | | 22.5 | | | 70 | |
| load (Note 8) | Axial load | [N] | 1100 | | | | 3300 | |
| Mass | · | [kg] | 5.2 | 6.8 | 8.4 | 11 | 15 | 18 |

7. TM-RFM SERIES

| | Direct | drive motor | | | TM-RFI | A series | | |
|--|-----------------------------|-------------|--|--------------------------------|--------------------|---|-----------------|-------------|
| Item | 012G20 | 048G20 | 072G20 | 040J10 | 120J10 | 240J10 | | |
| Motor OD (frame OI | φ230 φ330 | | | | | | | |
| Power supply capac | ity | | Refer to "U | SING A DIRE | CT DRIVE MO mar | | servo amplifier | instruction |
| Continuous running | Rated output | [W] | 251 | 1005 | 1508 | 419 | 1257 | 2513 |
| duty (Note 1) | Rated torque | [N•m] | 12 | 48 | 72 | 40 | 120 | 240 |
| Maximum torque | | [N•m] | 36 | 144 | 216 | 120 | 360 | 720 |
| Rated speed (Note | 1) | [r/min] | | 200 | • | | 100 | |
| Maximum speed | | [r/min] | | 500 | | | 200 | |
| Instantaneous perm | issible speed | [r/min] | | 575 | | | 230 | |
| Power rate at contin | uous rated torqu | e [kW/s] | 6.0 | 37.5 | 59.3 | 9.4 | 40.9 | 91.4 |
| Rated current | | [A] | 3.6 | 11 | 16 | 4.3 | 11 | 19 |
| Maximum current | | [A] | 11 | 33 | 48 | 13 | 33 | 57 |
| Moment of inertia J | 238 | 615 | 875 | 1694 | 3519 | 6303 | | |
| Recommended load to motor inertia ratio (Note 2) | | | 50 times or less | | | | | |
| Absolute accuracy (Note 9) [s] | | | ±12.5 ±10 | | | | | |
| Speed/position dete | ctor (Note 3) | | 20-bit encoder common to absolute position and incremental detection systems (resolution per direct drive motor revolution: 1048576 pulses/rev) | | | | | |
| Thermistor | | | Built-in | | | | | |
| Insulation class | | | 155 (F) | | | | | |
| Structure | | | Totally enclosed, natural cooling (IP rating: IP42 (Note 4)) | | | | | |
| | Ambient | Operation | 0 °C to 40 °C (non-freezing) | | | | | |
| | temperature | Storage | | -15 °C to 70 °C (non-freezing) | | | | |
| | Ambient | Operation | 10 %RH to 80 %RH (non-condensing) | | | | | |
| Environment | humidity | Storage | 10 %RH to 90 %RH (non-condensing) | | | | | |
| (Note 5) | Ambience | | Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, oil and water. | | | | | vater. |
| | Altitude | | | Max. | 2000 m above | sea level (No | te 10) | |
| | Vibration resis (Note 6) | tance | X: 4 | 9 m/s² Y: 49 ı | m/s² | X: 24.5 m/s ² Y: 24.5 m/s ² | | |
| Vibration rank (Note | 7) | | | | V | 10 | | |
| Rotor permissible | Moment load | [N•m] | 93 350 | | | | | |
| load (Note 8) | Axial load | [N] | | 5500 | | | 16000 | |
| Mass | - • | [kg] | 17 | 36 | 52 | 53 | 91 | 146 |

- Note 1. When the power supply voltage drops, the output and the rated speed cannot be guaranteed.
 - 2. If the load inertia moment ratio exceeds the indicated value, contact your local sales office.
 - 3. To configure the absolute position detection system, always connect the battery and absolute position storage unit to the servo amplifier. For details of the battery, refer to each servo amplifier instruction manual. Refer to section 6.3 for details of the absolute position storage unit.
 - 4. Shaft-through portion of the rotor and the connector area are excluded. IP classifies the degrees of protection provided against the intrusion of solid objects and water in electrical enclosures.
 - 5. In the environment where the direct drive motor is exposed to oil mist, oil, and water, a standard specification direct drive motor cannot be used. Provide measures to prevent dust and/or water on the machine side.
 - 6. The following figure shows the vibration direction. The indicated values are the maximum values. When the direct drive motor stops, fretting is likely to occur at the bearing. Therefore, suppress the vibration to about the half the permissible value.



7. V10 indicates that the amplitude of a direct drive motor alone is 10 μm or less. The following figure shows the direct drive motor installation position for measurement and the measuring position.



8. Axial and moment loads, which are applied to the direct drive motor's rotor (output shaft) during operation, can be calculated as below. The axial and moment loads must be maintained to be equal to or below the permissible value.

| F (Outer force) | E (Outer force | e) F (Outer force) | Direct drive motor | Motor OD | Dimension A |
|-----------------|-----------------|---------------------------|--------------------|----------|-------------|
| | | | Direct and motor | [mm] | [mm] |
| | | | TM-RFM002C20 | | |
| | | Bearing \checkmark | TM-RFM004C20 | φ130 | 19.1 |
| | | | TM-RFM006C20 | | |
| | | | TM-RFM006E20 | | |
| | | • • • • • • • • • • • • • | TM-RFM012E20 | φ180 | 20.2 |
| | | | TM-RFM018E20 | | |
| Axial load | Axial load | Axial load | TM-RFM012G20 | | |
| = F + load mass | = F + load mass | = Load mass | TM-RFM048G20 | φ230 | 24.4 |
| | Moment load | Moment load | TM-RFM072G20 | | |
| | = F × L | $= F \times (L + A)$ | TM-RFM040J10 | | |
| | | | TM-RFM120J10 | φ330 | 32.5 |
| | | | TM-RFM240J10 | | |

- 9. Absolute accuracy changes depending on the mounting condition of the load and the surrounding environment.
- 10. Follow the restrictions in section 2.10 when using this product at altitude exceeding 1000 m and up to 2000 m above sea level.

7.4 Torque characteristics

| POINT | |
|----------------|---|
| For the mach | nine where the unbalanced torque occurs, such as a vertical axis |
| system (lift), | use the absolute position detection system. (Refer to section 2.1 |
| (4).) The unt | balanced torque of the machine should be kept at 70% or lower of |
| the motor's r | ated torque. |

Bold lines indicate the torque characteristics with the 3-phase 200 V AC power supply input or 1-phase 230 V AC power supply input to the servo amplifier. For the 1-phase 200 V AC power supply input, part of the torque characteristic is indicated by thin lines. The 1-phase power supply input is available for: TM-RFM002C20, TM-RFM004C20, TM-RFM006C20, TM-RFM006E20, TM-RFM012E20, TM-RFM018E20, TM-RFM012G20, and TM-RFM040J10. For the 1-phase 100 V AC power supply, part of the torque characteristic is indicated by the broken line.



7. TM-RFM SERIES

7.5 Dimensions

The actual dimensions may be 1 mm to 3 mm larger. Design the machine side with some allowances. Apply general tolerances for the dimensions without tolerances.

| | | | Model TM-RFM002C20 | Output [W] 42 | Moment of inertia J [× 10 ⁻⁴ kg•m ²] 10.9 | Mass [kg] 5.2 |
|---------------------------------|---|--------|--|---------------------|--|--|
| Encoder connect RM15WTRZB-12 | _ | V Powe | 4-φ9 mounting ho Use hexagon soch head cap screw | le ket 45' | 60° 60° 60° 60° 60° 60° 60° 60° | [Unit: mm] S-M5 screw hole depth 8 |
| | | | Model | Output [W] | Moment of inertia J [× 10 ⁻⁴ kg•m ²] | Mass [kg] |
| | | | TM-RFM004C20 | 84 | 16.6 | 6.8 [Unit: mm] |
| | 5 | | 4-φ9 mounting Use hexagon s head cap screv | hole ocket N | | 6-M5 screw hole depth 8 |

φ128h7 φ77.5 φ20 φ60h7 φ130 111.5 116.9 Ø $(\boxtimes$ ₽ Botton Z-phase mark B → Caution plate Encoder connector RM15WTRZB-12P(72) Motor plate Power supply connector CE05-2A14S-2PD-D 16 15 17 62 W <u>⊕(PE)</u> Power connector Output shaft side Arrow B BC36497A



| | Model TM-RFM012E20 | Output [W] 251 | Moment of inertia J [× 10 ⁻⁴ kg•m ²] 111 | Mass [kg] 15 |
|--|-----------------------------------|----------------------|---|---|
| Sector supply connector 16,15 Cover supply connector 17,100000000000000000000000000000000000 | Model TM-RFM012E20 | | [× 10 ⁻⁴ kg•m ²] 111 | [kg] 15 Unit: mm] G-M5 screw Jole depth 8 |
| | $\frac{(PE)}{(PE)}$ wer connector | | В | C36499A |

| Model | Output | Moment of inertia J | Mass |
|--------------|--------|---|------|
| | [W] | [× 10 ⁻⁴ kg•m ²] | [kg] |
| TM-RFM018E20 | 377 | 149 | 18 |



| | Model | Output [W] | Moment of inertia J [× 10 ⁻⁴ kg•m ²] | Mass [kg] |
|--------------------------------------|---|---------------|--|-----------------------------|
| L | TM-RFM012G20 | 251 | 238 | 17 |
| | | | | Unit: mm] |
| 2 × 2-M10 screw hole depth 19.5 69 4 | 4-φ14 mounting hole Use hexagon socket head cap screw | 45° | | S-M6 screw hole depth 10 |
| Sign Caution | 530 CB | | | ise mark |
| Arrow B | ector side → | | Motor plate | 3C36599* |

| Model | Output | Moment of inertia J | Mass |
|--------------|--------|---|------|
| | [W] | [× 10 ⁻⁴ kg•m ²] | [kg] |
| TM-RFM048G20 | 1005 | 615 | 36 |





| Model | Output | Moment of inertia J | Mass |
|--------------|--------|---|------|
| | [W] | [× 10 ⁻⁴ kg•m ²] | [kg] |
| TM-RFM040J10 | 838 | 1694 | 53 |



| Model | Output [W] | Moment of inertia J [× 10 ⁻⁴ kg•m ²] | Mass [kg] |
|---|---------------|--|---|
| TM-RFM120J10 | 2513 | 3519 | 91 |
| 4-p18 mounting hole Use hexagon socket head cap screw | | 60° | [Unit: mm] 6-M8 screw hole depth 13 |
| Model | Output [W] | Moment of inertia J [× 10 ⁻⁴ ka•m ²] | Mass [kg] |

| Model | Output | Moment of inertia J | Mass |
|--------------|--------|---|------|
| | [W] | [× 10 ⁻⁴ kg•m ²] | [kg] |
| TM-RFM240J10 | 5027 | 6303 | 146 |



This chapter provides information on the direct drive motor specifications and characteristics. When using the TM-RG2M series or TM-RU2M series direct drive motor, always read the Safety Instructions in the beginning of this manual in addition to this chapter.

8.1 Model designation

The following describes model designation. Not all combinations of the symbols are available.

(1) Flange type

004

009

4.5

9



| - | – Motor OD (frame OD) | | | | | | |
|---|-----------------------|-----------------|--|--|--|--|--|
| | Symbol | Dimensions [mm] | | | | | |
| | С | φ130 | | | | | |
| | E | φ180 | | | | | |
| | G | φ230 | | | | | |

| | | | Servo a | amplifier | | |
|--------------------------------|--|--|----------------------------|--|------------------------------|--|
| | 1-axis | | 2-axis | | 3-axis | |
| Direct drive motor | Standard | For increasing the rated torque/maximum torque (Note) | Standard | For increasing the rated torque/maximum torque (Note) | Standard | For increasing the rated torque/maximum torque (Note) |
| TM-RG2M002C30 TM-RU2M002C30 | MR-J4-20A MR-J4-20A-RJ MR-J4-20A1 MR-J4-20A1-RJ MR-J4-20B MR-J4-20B-RJ MR-J4-20B1 MR-J4-20B1-RJ | | MR-J4W2-22B MR-J4W2-44B | | MR-J4W3-222B MR-J4W3-444B | |
| TM-RG2M004E30 TM-RU2M004E30 | MR-J4-20A MR-J4-20A-RJ MR-J4-20A1 MR-J4-20A1-RJ MR-J4-20B MR-J4-20B-RJ MR-J4-20B1 MR-J4-20B1-RJ | MR-J4-40A MR-J4-40A-RJ MR-J4-40A1 MR-J4-40A1-RJ MR-J4-40B MR-J4-40B-RJ MR-J4-40B1 MR-J4-40B1-RJ | MR-J4W2-22B | MR-J4W2-44B | MR-J4W3-222B | MR-J4W3-444B |
| TM-RG2M009G30 TM-RU2M009G30 | MR-J4-40A MR-J4-40A-RJ MR-J4-40A1 MR-J4-40A1-RJ MR-J4-40B MR-J4-40B-RJ MR-J4-40B1 MR-J4-40B1-RJ | | MR-J4W2-44B | | MR-J4W3-444B | |

8.2 Combinations of servo amplifier and direct drive motor

Note. The rated torque and the maximum torque can be increased by changing the servo amplifier.

8.3 Specification list

| | Direct | drive motor | | TM-RG2M/RU2M series | | |
|--|---|--------------------------------------|---|---------------------------------|-----------------------------|--|
| Item | | | 002C30 | 004E30 | 009G30 | |
| Motor OD (frame OD) [mm] | | | φ130 | φ180 | φ230 | |
| Power supply capacity | | | Refer to "USING A DIRE | CT DRIVE MOTOR" of each manual. | servo amplifier instruction | |
| Continuous running | Rated output [W] (Note 9) | | 69 | 141 (188) | 283 | |
| duty (Note 1) | Rated torque (Note 9) [N•m] | | 2.2 | 4.5 (6) | 9 | |
| Maximum torque (No | ote 9) | [N•m] | 8.8 | 13.5 (18) 27 | | |
| Rated speed (Note 1 | 1) | [r/min] | | 300 | | |
| Maximum speed | | [r/min] | | 600 | | |
| Instantaneous permi | issible speed | [r/min] | | 690 | | |
| Power rate at contin (Note 9) | uous rated torque | e [kW/s] | 6.1 | 3.4 (6.0) | 5.5 | |
| Rated current (Note | 9) | [A] | 1.2 | 1.3 (1.7) | 2.2 | |
| Maximum current (N | lote 9) | [A] | 4.9 | 4.0 (5.3) | 6.7 | |
| Moment of inertia J | [× | 10 ⁻⁴ kg•m ²] | 7.88 | 60.2 | 147 | |
| Recommended load to motor inertia ratio (Note 2) | | | 50 times or less | 20 times or less | | |
| Absolute accuracy (I | Note 11) | [s] | ±15 | ±12.5 | | |
| Speed/position | Common to absolute position/incremental systems | | 21-bit encoder | 22-bit encoder | | |
| detector (Note 3) | Resolution per direct drive motor revolution | | 2097152 pulses/rev | 4194304 pulses/rev | | |
| Thermistor | | | Built-in | | | |
| Insulation class | | | | 155 (F) | | |
| Structure | | | Totally-enclosed, natural-cooling (IP rating: IP40 (Note 4)) | | | |
| | Ambient | Operation | 0 °C to 40 °C (non-freezing) | | | |
| | temperature | Storage | -15 °C to 70 °C (non-freezing) | | | |
| | Ambient | Operation | 10 %RH to 80 %RH (non-condensing) | | | |
| Environment | humidity | Storage | 10 % | 6RH to 90 %RH (non-conden | sing) | |
| (Note 5) | Ambience | | Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust, oil and water. | | | |
| | Altitude | | 2000 m or less above sea level (Note 10) | | | |
| | Vibration resistance (Note 6) | | X: 49 m/s ² Y: 49 m/s ² | | | |
| Vibration rank (Note 7) | | | V10 | | | |
| Rotor permissible | Moment load | [N•m] | 15 | 49 | 65 | |
| load (Note 8) | Axial load | [N] | 770 | 2300 | 3800 | |
| Mass | | [kg] | 2.7 | 5.5 | 8.3 | |

- Note 1. When the power supply voltage drops, the output and the rated speed cannot be guaranteed.
 - 2. If the load inertia moment ratio exceeds the indicated value, contact your local sales office.
 - 3. To configure the absolute position detection system, always connect the battery and absolute position storage unit to the servo amplifier. For details of the battery, refer to each servo amplifier instruction manual. For details of the absolute position storage unit, refer to section 6.3.
 - 4. Shaft-through portion of the rotor and the connector area are excluded. IP classifies the degrees of protection provided against the intrusion of solid objects and water in electrical enclosures.
 - 5. In the environment where the direct drive motor is exposed to oil mist, oil, and water, a standard specification direct drive motor cannot be used. Provide measures to prevent dust and/or water on the machine side.
 - 6. The vibration direction is as shown below. The indicated values are the maximum values. When the direct drive motor stops, fretting is likely to occur at the bearing. Therefore, suppress the vibration to about the half of the permissible value.



7. V10 indicates that the amplitude of a direct drive motor alone is 10 μm or less. The following figure shows the direct drive motor mounting position for measurement and the measuring position.



8. Axial and moment loads, which are applied to the direct drive motor's rotor (output shaft) during operation, can be calculated as below. The axial and moment loads must be maintained to be equal to or below the permissible value.



9. The value inside () applies when the torque is increased. The rated torque and the maximum torque can be increased by changing the servo amplifier.

Refer to section 8.2 for the combinations.

- 10. Follow the restrictions in section 2.10 when using this product at altitude exceeding 1000 m and up to 2000 m above sea level.
- 11. Absolute accuracy changes depending on the mounting condition of the load and the surrounding environment.

8.4 Torque characteristics

| POINT | |
|----------------|--|
| For the mac | hine where the unbalanced torque occurs, such as a vertical axis |
| system (lift), | use the absolute position detection system. (Refer to section 2.1 |
| (4).) The un | balanced torque should be kept at 70% or less of the rated torque. |

When the power supply input of the servo amplifier is 3-phase 200 V AC or 1-phase 230 V AC, the torque characteristic is indicated by the heavy line. For the 1-phase 100 V AC power supply, part of the torque characteristic is indicated by the broken line.



Note. The rated torque and the maximum torque can be increased by changing the servo amplifier. Refer to section 8.2 for the combinations.

8.5 Mounting method



Mounting precautions

- If the mounting surface has low rigidity, machine resonance may occur. Securely mount the direct drive motor on the mounting surface having high rigidity.
- To ensure sufficient rigidity, fully tighten the mounting screws for the direct drive motor and rotary table.
- To ensure the accuracy and heat dissipation of the direct drive motor, closely mount the motor on the mounting surface having a sufficient heat dissipation area and high rigidity. Do not leave a gap between the mounting surface and the bottom of the direct drive motor.
- The mounting accuracy of the flange type is higher than that of the table type. If the direct drive motor needs to be mounted with high accuracy, select the flange type.

For the machine accuracies of each direct drive motor, refer to section 2.8. For the dimension tolerance, refer to section 8.6.

8.6 Dimensions

The actual dimensions may be 1 mm to 3 mm larger. Design the machine side with some allowances. The dimensions without tolerances are general tolerance.





| Model | Output [W] (Note) | Moment of inertia J [× 10 ⁻⁴ kg•m ²] | Mass [kg] |
|---------------|----------------------|--|-----------|
| TM-RG2M004E30 | 141 (188) | 60.2 | 5.5 |

Note. The value inside () applies when the torque is increased.



| Model | Output [W] (Note) | Moment of inertia J [× 10 ^{.4} kg•m²] | Mass [kg] |
|---------------|----------------------|---|-----------|
| TM-RU2M004E30 | 141 (188) | 60.2 | 5.5 |

Note. The value inside () applies when the torque is increased.



| | | Model | Output [W] | Moment of inertia J [× 10 ⁻⁴ kg•m ²] | Mass [kg] |
|--|--------------------|---|------------------------------|--|-------------------|
| | | TM-RG2M009G30 | 283 | 147 | 8.3 |
| Encoder connector MISWITRZB-12P(72) | | 4-φ14 moun Use hexago head cap so | 283 ting hole n socket | 6-M5 screw hole depth 8 | 8.3 [Unit: mm] |
| 16 View A | Bottom Top Caution | | | | BC45324B |
| | Boloin Top | | | | BC40324B |
| | | Model | Output [W] | Moment of inertia J [× 10 ⁻⁴ kg•m²] | Mass [kg] |
| | | TM-RU2M009G30 | 283 | 147 | 8.3 |
| | | | | | [Unit: mm] |
| E230 P.C.D.260+17 dept P.C.D.260+17 CD.260+100+100+10+100+100+100+10+10+100+10+10 | | er connector out shaft side → | n socket | | e_{2} |
| L <u>∠ L</u> View A | Bottom Top Cautio | | | | BC61741B |

APPENDIX

App. 1 Selection example of direct drive motor

App. 1.1 Selection conditions

(1) Machine configuration



| Table mass | W | = 19 [kg] |
|--------------------------------|---------------------------|--------------------|
| Rotary table diameter | DT | = 300 [mm] |
| Rotation angle per cycle | θ | = 270 [degree] |
| Positioning time | to | = 0.45 [s] or less |
| Acceleration/deceleration time | $t_p = t_{psa} = t_{psd}$ | = 0.125 [s] |
| Operation cycle | t _f | = 2.0 [s] |
| Load torque | T∟ | = 0 [N•m] |

(2) Direct drive motor speed

$$\begin{split} \mathsf{N}_{o} &= \frac{\theta}{360} \times \frac{60}{(t_{0} - t_{p} - t_{s})} \\ &= \frac{270}{360} \times \frac{60}{(0.45 - 0.125 - 0.1)} = 200 \text{ [r/min]} \\ &\quad t_{s}: \text{ Settling time (Here, this is assumed to be 0.1 s.)} \end{split}$$

(3) Operation pattern



App. 1.2 Selection of direct drive motor

(1) Load moment of inertia

$$J_{L} = \frac{1}{8} \times D_{T}^{2} \times W$$
$$= \frac{1}{8} \times (300 \times 10^{-3})^{2} \times 19 = 0.214 \text{ [kg·m2]}$$

(2) Acceleration/deceleration torques of load

$$T_{a} = J_{L} \times 2\pi \times \frac{N_{o} / 60}{t_{p}}$$
$$= \frac{J_{L} \times N_{o}}{\frac{60}{2\pi} \times t_{p}}$$
$$= \frac{0.214 \times 200}{9.55 \times 0.125}$$
$$= 35.9 [N \cdot m]$$

- (3) Temporary selection of direct drive motor
 - Selection conditions

Acceleration/deceleration torques of load < maximum torque of DD motor

Load moment of inertia < J_R × moment of inertia of DD motor

J_R: Recommended load to motor inertia ratio

From the above, the following direct drive motor is temporarily selected. TM-RFM018E20 (rated torque: 18 [N•m], maximum torque: 54 [N•m], moment of inertia: 149×10^{-4} [kg•m²])

(4) Acceleration/deceleration torque Torque necessary for acceleration

 $T_{Ma} = \frac{(J_L + J_M) \times N_o}{9.55 \times t_{psa}} = 38.3 \text{ [N•m]}$ $J_M: \text{ Moment of inertia of DD motor}$

Torque necessary for deceleration

$$T_{Md} = -\frac{(J_{L} + J_{M}) \times N_{o}}{9.55 \times t_{psd}} = -38.3 \text{ [N-m]}$$

The torque required for acceleration/deceleration must be lower than the DD motor's maximum torque.

(5) Continuous effective load torque

$$Tr_{ms} = \sqrt{\frac{T_{Ma}^2 \times t_{psa} + T_L^2 \times t_c + T_{Md}^2 \times t_{psd}}{t_f}} = 13.5 \text{ [N-m]}$$

t_c: t₀ - t_s - t_{psa} - t_{psd}

The continuous effective load torque must be lower than the DD motor's rated torque.

(6) Torque pattern



(7) Selection results

The following direct drive motor and servo amplifier are selected as the result of the calculation.Direct drive motorTM-RFM018E20Servo amplifierMR-J4-100B

App. 2 Manufacturer list

Names given in the table are as of October 2017.

For information, such as the delivery time, price, and specifications of the recommended products, contact each manufacturer.

| Manufacturer | Contact information |
|-----------------|---------------------------|
| DDK | DDK Ltd. |
| Daiwa Dengyo | Daiwa Dengyo Co., Ltd. |
| Nippon Flex | Nippon Flex Co., Ltd. |
| JST | J.S.T. Mfg. Co., Ltd. |
| 3M | 3M |
| Molex | Molex |
| Hirose Electric | Hirose Electric Co., Ltd. |

App. 3 Crimping connector for CNP3_



Note. This figure shows the 3-axis servo amplifier.

| No. | Name | Model | Description | Application |
|-----|---------------|------------------------|--|---------------------------------------|
| 1) | Connector set | MR-J3WCNP3- D2L | | Quantity: 1 For thick wires |
| | | | For CNP3A/CNP3B/CNP3C Receptacle housing: F35FDC-04V-K Receptacle contact: BF3F-71GF-P2.0 | |
| 2) | Connector set | MR-J3WCNP3- D2L-20P | (JST) Applicable wire Wire size: 1.25 mm ² (AWG 6) to 2.0 mm ² (AWG 14) Insulator OD: 2.4 mm to 3.4 mm The crimping tool (YRF-1070) is required. | Quantity: 20 For thick wires |

App. 4 Fabrication of the encoder cable



When you fabricate an encoder cable, the descriptions in this appendix should be noted to ensure reliability of communication.

| Cable fabrication | |
|-------------------------|---|
| Connector selection (1) | Selection of connectors Check the cable clamp size to select a connector indicated in chapter 3 and chapter 4. Obtain the specification and wiring guide of the connector from the manufacturer. Purchase an assembly jig or others as necessary. |
| Cable selection (2) | Selection of cables Select a shielded twisted pair cable. Select a cable having a diameter suitable to clamp to the connector cable clamp. Select a cable whose length, diameter, and bending life are appropriate. |
| Cable assembly (3) | Assembly of the cable Check the wiring guide of the connector manufacturer to connect the connector properly. Check internal wiring described in chapter 6 to connect it properly. Perform a shielding process on the encoder cable properly. Do not connect anything to unused pins. For CN2, CN2A, CN2B, and CN2C side connectors, connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell. For the direct drive motor-side connector, connect the external conductor of the shielded cable to the SHD terminal. Check if the pin arrangement is correct. Connect the twisted pair cable in correct combination. Check if the number of pairs of P5/LG wirings connected in parallel is correct. Fix the cable to the connector with a proper clamping torque. |
| Completion (4) | Inspection After assembly, perform conduction, insulation, and other inspections to check if the connection is correct. Check the surface for scratches and contamination. Check the connector pins for a distortion, bending, dent, etc. Check the connector pins for foreign matter adhesion, contamination, and discoloration. |

App. 5 Compliance with the CE marking

App. 5.1 What is CE marking?

The CE marking is mandatory and must be affixed to specific products placed on the European Union. When a product conforms to the requirements, the CE marking must be affixed to the product. The CE marking also applies to machines and equipment incorporating servos.

A manual is available in different languages. For details, contact your local sales office.

(1) EMC directive

The EMC directive applies to the direct drive motor alone. Therefore direct drive motor is designed to comply with the EMC directive. The EMC directive also applies to machines and equipment incorporating direct drive motors. TM-RFM, TM-RG2M, TM-RU2M series comply with EN61800-3 Category 3. They are not intended to be used on a low-voltage public network which supplies domestic premises; radio frequency interference is expected if it is used on such a network. The installer shall provide a guide for installation and use, including recommended mitigation devices.

(2) Low voltage directive

The low voltage directive also applies to the direct drive motor alone. The direct drive motor is designed to comply with the low voltage directive.

(3) Machinery directive

The direct drive motor as a single unit does not comply with the Machinery directive due to correspondence with article1 2. (k). However, machines and equipment incorporating direct drive motors will be complied. Please check your machines and equipment as a whole if they are complied.

App. 5.2 For compliance

Be sure to perform an appearance inspection of every unit before installation. In addition, have a final performance inspection on the entire machine/system, and keep the inspection record.

(1) Wiring

Use wirings which complies with EN for the direct drive motor power. Complying EN products are available as options. Refer to chapter 6 for details of the options.

(2) Performing EMC tests

When EMC tests are run on a machine and device into which the direct drive motor and direct drive motor have been installed, it must conform to the electromagnetic compatibility (immunity/emission) standards after it has satisfied the operating environment and electrical equipment specifications. For EMC directive conforming methods about servo amplifiers and direct drive motors, refer to "EMC Installation Guidelines" and each Servo Amplifier Instruction Manual.

App. 6 Compliance with UL/CSA standard

Use the UL/CSA standard-compliant direct drive motor. For the latest information of compliance, contact your local sales office.

Unless otherwise specified, the handling, performance, specifications, etc. of the UL/CSA standardcompliant models are the same as those of the standard models.

(1) Flange size

The direct drive motor is compliant with the UL/CSA standard when the motor is mounted on the aluminum flange of the same size as indicated in the following table.

The rated torque of the direct drive motor under the UL/CSA standard indicates the continuous permissible torque value that can be generated when the motor is mounted on the flange specified in this table and used in the environment of 0 °C to 40 °C ambient temperature. Therefore, to conform to the UL/CSA standard, mount the direct drive motor on a flange with a heat radiating effect equivalent to that of this flange.

| Flange size [mm] | Direct drive motor |
|---------------------|--------------------|
| | TM-RG2M002C30 |
| | TM-RU2M002C30 |
| 400 × 400 × 20 | TM-RFM002C20 |
| | TM-RFM004C20 |
| | TM-RFM006C20 |
| | TM-RG2M004E30 |
| | TM-RU2M004E30 |
| 550 × 550 × 35 | TM-RFM006E20 |
| | TM-RFM012E20 |
| | TM-RFM018E20 |
| | TM-RG2M009G30 |
| | TM-RU2M009G30 |
| 650 × 650 × 35 | TM-RFM012G20 |
| | TM-RFM048G20 |
| | TM-RFM072G20 |
| 750 × 750 × 45 | TM-RFM040J10 |
| 750 ^ 750 * 45 | TM-RFM120J10 |
| 950 × 950 × 50 | TM-RFM240J10 |

(2) Selection example of wires

To comply with UL 1004-1 and CSA-C22.2 No. 100, use UL-approved copper wires rated at 75 °C for wiring.

The following table shows the wire size [AWG] rated at 75 °C, which is used for wiring of TM-RFM, TM-RG2M and TM-RU2M series.

(a) TM-RFM series

| Direct drive motor | Wire [AWG] | |
|--------------------|-------------|--|
| Direct arive motor | U/V/W/ | |
| TM-RFM002C20 | | |
| TM-RFM004C20 | | |
| TM-RFM006C20 | | |
| TM-RFM006E20 | 16 (Note 2) | |
| TM-RFM012E20 | | |
| TM-RFM018E20 | | |
| TM-RFM012G20 | | |
| TM-RFM048G20 | 12 | |
| TM-RFM072G20 | 12 | |
| TM-RFM040J10 | 16 (Note 2) | |
| TM-RFM120J10 | 12 | |
| TM-RFM240J10 | 10 (Note 1) | |

- Note 1. Refer to each servo amplifier instruction manual for crimp terminals used for connection with the servo amplifier.
 - 2. To comply with UL 508A and NFPA 79, AWG 14 or more is required.

(b) TM-RG2M series and TM-RU2M series

| Direct drive motor | Wire [AWG] |
|--------------------|------------|
| Direct drive motor | U/V/W/🕀 |
| TM-RG2M002C30 | |
| TM-RU2M002C30 | |
| TM-RG2M004E30 | 18 (Note) |
| TM-RU2M004E30 | |
| TM-RG2M009G30 | |
| TM-RU2M009G30 | |

Note. To comply with UL 508A and NFPA 79, AWG 14 or more is required.

REVISIONS

*The manual number is given on the bottom left of the back cover.

| Revision Date | * Manual Number | | Revision |
|---------------|-------------------|-------------------------------|--|
| Mar. 2012 | SH(NA)030112ENG-A | First edition | |
| May 2012 | SH(NA)030112ENG-B | Chapter 4 (3) | The part of diagram is changed. |
| Feb. 2013 | SH(NA)030112ENG-C | Section 1.1 | The part of diagram is changed. |
| | | Section 2.1 (2) | The part of sentences are changed. |
| | | Section 2.9 | The part of sentences are changed. |
| | | Chapter 5 | POINT is added. |
| | | Section 5.4 | A part is newly added, construction of sentences is changed. |
| | | Chapter 6 | POINT is added. |
| | | Section 6.2.4 (1) to (2) | The part of diagram is changed. |
| | | Section 7.2 | The part of table is changed. |
| | | Section 7.5 | The part of diagram is changed. |
| Jan. 2015 | SH(NA)030112ENG-D | 1-phase 100 V AC of servo a | amplifier power supply input is added to torque characteristics of |
| | | the direct drive motor. | |
| | | Section 1.1 | The diagram is changed. |
| | | Section 5.4 | The table is added. |
| | | Section 6.2.4 (1) to (2) | Note 1 is changed. |
| | | Section 7.2 | The part of table is changed. |
| | | Section 7.3 | Note 4 is changed. |
| | | Section 7.4 | POINT is changed. The sentences are added. The part of |
| | | | diagram is changed. |
| Sep. 2015 | SH(NA)030112ENG-E | Torque characteristic at 1-ph | ase 200 V AC input is added. |
| | | 2. To prevent fire, note the | Partially added. |
| | | following | |
| | | 4. Additional instructions | Partially added. |
| | | Section 1.1 | The diagram is changed. |
| | | Section 1.2 | Partially changed. |
| | | Section 6.1.1 | Partially added. |
| | | Section 6.2.4 | Partially changed. |
| | | Section 7.4 | Partially added and partially changed. |
| | | App. 2 | Partially changed. |
| | | App. 4 | Added. |
| Feb. 2016 | SH(NA)030112ENG-F | Model names MR-J4GF of | |
| | | Section 5.4 | Model names are added. |
| | | | Partially changed. |
| | | Section 7.2 | Model names are added. |
| | | Section 7.3 | Partially added. |
| | | App. 2 | Partially changed. |
| Mar. 2017 | | | |
| | | 4. Additional instructions | Partially changed. |
| | | Section 1.1 | Changed. |
| | | Chapter 2 | CAUTION is added. |
| | | Section 2.2 | TM-RG2M/TM-RU2M are added. |
| | | Section 2.6 | Partially changed. |
| | | Section 2.7 | Partially changed. |
| | | Section 2.9 | Partially changed. |
| | | Section 2.10 | Added. |
| | | Section 3.1 | TM-RG2M/TM-RU2M are added. |
| | | Section 5.3 | TM-RG2M/TM-RU2M are added. |
| | | Section 6.1 Section 6.2 | TM-RG2M/TM-RU2M are added. |
| | | Section 6.2.3 | POINT is changed. TM-RG2M/TM-RU2M are added. |
| | | | |
| | | Section 6.3 | Partially changed. |

| Revision Date | *Manual Number | | Revision |
|---------------|-------------------|--|--|
| Mar. 2017 | SH(NA)030112ENG-G | Section 7.3 | Partially changed. |
| | | Chapter 8 | Added. |
| | | App. 2 | Partially changed. |
| | | App. 5 | Added. |
| | | Арр. 6 | Added. |
| Oct. 2017 | SH(NA)030112ENG-H | TM-RG2M002C30/TM-RU2M002C30 direct drive motors are added. | |
| | | 4. Additional instructions | Partially changed. |
| | | Section 2.9 | Partially changed. |
| | | Section 3.1 | Partially changed. |
| | | Section 5.3 | TM-RG2M002C30/TM-RU2M002C30 are added. |
| | | Section 6.1.2 | TM-RG2M002C30/TM-RU2M002C30 are added. |
| | | Chapter 8 | TM-RG2M002C30/TM-RU2M002C30 are added. |
| | | Арр. 6 | Partially changed. |
| | | | |
| | | | |

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

MEMO

MELSERVO is a trademark or registered trademark of Mitsubishi Electric Corporation in Japan and/or other countries. All other product names and company names are trademarks or registered trademarks of their respective companies.

Warranty

1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

- (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
- It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.
- (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
- (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
 - (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
 - (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
 - a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
 - (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
 - (v) any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
 - (vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
 - (vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
 - (viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for
- 2. Term of warranty after the stop of production
- (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
- (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.
- 3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

- 4. Exclusion of loss in opportunity and secondary loss from warranty liability Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:
- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.
- 5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

- 6. Application and use of the Product
- (1) For the use of our General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.
- (2) Our General-Purpose AC Servo is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used

In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

| MODEL | DIRECT DRIVEMOTOR |
|---------------|-------------------|
| MODEL CODE | 1CW948 |

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG MARUNOUCHI TOKYO 100-8310