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 manual, installation guide, and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions. In this manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

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

⚠️ CAUTION Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury.

Note that the CAUTION level may lead to a serious consequence depending on conditions. Please follow the instructions of both levels because they are important to personnel safety. Forbidden actions and required actions are indicated by the following diagrammatic symbols.

🚫 Indicates a forbidden action. For example, "No Fire" is indicated by 🚫.

☐ Indicates a required action. For example, grounding is indicated by ☐.

In this manual, precautions for hazards that can lead to property damage, instructions for other functions, and other information are shown separately in the "POINT" area. After reading this manual, keep it accessible to the operator.
ABOUT THE MANUAL

e-Manuals are Mitsubishi Electric FA electronic book manuals that can be browsed with a dedicated tool. e-Manuals enable the following:

• Searching for desired information in multiple manuals at the same time (manual cross searching)
• Jumping from a link in a manual to another manual for reference
• Browsing for hardware specifications by scrolling over the components shown in product illustrations
• Bookmarking frequently referenced information
• Copying sample programs to engineering tools

If using the servo for the first time, prepare and use the following related manuals to ensure that the servo is used safely. The manuals used differ depending on the interface of the servo amplifier. For details, refer to the User’s Manual (Introduction).

<table>
<thead>
<tr>
<th>U.S. CUSTOMARY UNITS</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Quantity</th>
<th>SI (metric) unit</th>
<th>U.S. customary unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>1 [kg]</td>
<td>2.2046 [lb]</td>
</tr>
<tr>
<td>Length</td>
<td>1 [mm]</td>
<td>0.03937 [inch]</td>
</tr>
<tr>
<td>Torque</td>
<td>1 [N•m]</td>
<td>141.6 [oz•inch]</td>
</tr>
<tr>
<td>Moment of inertia</td>
<td>1 [(× 10^-4 kg•m^2)]</td>
<td>5.4675 [oz•inch^2]</td>
</tr>
<tr>
<td>Load (thrust load/axial load)</td>
<td>1 [N]</td>
<td>0.2248 [lbf]</td>
</tr>
<tr>
<td>Temperature</td>
<td>N [°C] × 9/5 + 32</td>
<td>N [°F]</td>
</tr>
</tbody>
</table>
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1 LINEAR ENCODER

Precautions

• While the linear encoder and the linear servo motor should be oil and dust proofed, oil and dust proofing are especially important for the linear encoder. For details, contact the manufacturer of the linear encoder being used.
• Use the linear encoder cables specified in this chapter. Using products other than those specified may cause a malfunction.
• Contact the manufacturer of the linear encoder being used for information on specifications, performance and guarantees.
• If the linear encoder is incorrectly installed, an alarm or position mismatch may occur. In such situations, refer to the following check points and ensure that the linear encoder is installed in a suitable environment.

Check that the gap between the head and scale is correct.
Check that the scale head is not rolling or yawing (i.e., that the scale head is not loose).
Check the surface of the scale for dust and scratches.
Check that the vibration and temperature are within the specified range.
• Refer to the following page for combinations of linear encoders and servo amplifiers.

Page 5 Compatible encoder list

1.1 Shielding CN2 side connectors

• When using 3M shell kits (36310-3200-008 or 36310-F200-008) or the Molex connector set (54599-1019), ensure the external conductor of the shielded cable is firmly in contact with the ground plate before attaching the connector shell.
1.2 Compatible encoder list

Precautions

For the linear encoders that can be used with your servo amplifier, contact your local sales office.
For information on suitable operating environments and linear encoder specifications such as temperature, vibration resistance, and IP ratings, contact the product manufacturer.

<table>
<thead>
<tr>
<th>Encoder type</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Resolution</th>
<th>Rated speed (^*1)</th>
<th>Effective measurement length (maximum) (^*2)</th>
<th>Communication method</th>
<th>Absolute position detection system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute position</td>
<td>Magnescale</td>
<td>SR77</td>
<td>0.05 μm/0.01 μm</td>
<td>3.3 m/s</td>
<td>2040 mm</td>
<td>Two-wire type</td>
<td>Compatible with Mitsubishi Electric serial interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SR87</td>
<td>0.01 μm</td>
<td>3.3 m/s</td>
<td>2040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SR27A</td>
<td>0.01 μm</td>
<td>3.3 m/s</td>
<td>2040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SR87A</td>
<td>0.01 μm</td>
<td>3.3 m/s</td>
<td>2040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mitutoyo</td>
<td>AT343A</td>
<td>0.05 μm</td>
<td>2.0 m/s</td>
<td>3000 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AT543A-SC</td>
<td>0.05 μm</td>
<td>2.5 m/s</td>
<td>2200 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AT545A-SC</td>
<td>0.05 μm</td>
<td>2.5 m/s</td>
<td>2200 mm</td>
<td>Two-wire type</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ST743A</td>
<td>0.1 μm</td>
<td>5.0 m/s</td>
<td>6000 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ST744A</td>
<td>0.1 μm</td>
<td>5.0 m/s</td>
<td>6000 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ST748A</td>
<td>0.1 μm</td>
<td>5.0 m/s</td>
<td>6000 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AT1341A</td>
<td>0.01 μm</td>
<td>8.0 m/s</td>
<td>12000 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ST1342A</td>
<td>0.001 μm</td>
<td>4.0 m/s</td>
<td>4200 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Renishaw</td>
<td>RESOLUTE RL40M</td>
<td>1 nm</td>
<td>100 m/s</td>
<td>2100 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 nm</td>
<td>200 mm</td>
<td>2900 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EVOLUTE EL40M</td>
<td>50 nm/100 nm/500 nm</td>
<td></td>
<td>10010 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heidenhain</td>
<td>LC 495M</td>
<td>0.001 μm/0.1 μm</td>
<td>3.0 m/s</td>
<td>2040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC 195M</td>
<td>0.001 μm/0.1 μm</td>
<td>3.0 m/s</td>
<td>2040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIC 4193M</td>
<td>0.005 μm/0.1 μm</td>
<td>10.0 m/s</td>
<td>3040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIC 4195M</td>
<td>0.005 μm/0.1 μm</td>
<td>10.0 m/s</td>
<td>3040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIC 4197M</td>
<td>0.005 μm/0.1 μm</td>
<td>10.0 m/s</td>
<td>3040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIC 4199M</td>
<td>0.005 μm/0.1 μm</td>
<td>10.0 m/s</td>
<td>3040 mm</td>
<td>Two-wire type/four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIC 2197M</td>
<td>0.05 μm/0.1 μm</td>
<td>10.0 m/s</td>
<td>6020 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIC 2199M</td>
<td>0.05 μm/0.1 μm</td>
<td>10.0 m/s</td>
<td>6020 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heidenhain</td>
<td>LIDA 483 + EIB 392M (/16384)</td>
<td>20 μm/16384 (approx. 1.22 nm)</td>
<td>4.0 m/s</td>
<td>3040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIDA 485 + EIB 392M (/16384)</td>
<td></td>
<td></td>
<td>3040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIDA 487 + EIB 392M (/16384)</td>
<td></td>
<td></td>
<td>3040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIDA 489 + EIB 392M (/16384)</td>
<td></td>
<td></td>
<td>3040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIDA 287 + EIB 392M (/16384)</td>
<td></td>
<td></td>
<td>3040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIDA 289 + EIB 392M (/16384)</td>
<td></td>
<td></td>
<td>3040 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIF 481 + EIB 392M (/4096)</td>
<td>4 μm/4096 (approx. 0.977 nm)</td>
<td>1.6 m/s</td>
<td>1020 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIF 6081 + EIB 392M (/4096)</td>
<td></td>
<td></td>
<td>1440 mm</td>
<td>Four-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NIDEC SANKYO</td>
<td>PSLH041</td>
<td>0.1 μm</td>
<td>5.0 m/s</td>
<td>2400 mm</td>
<td>Two-wire type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not specified</td>
<td>—</td>
<td>0.001 μm to 5 μm (^*3)</td>
<td>Depends on the linear encoder</td>
<td>Depends on the linear encoder</td>
<td>A/B/Z-phase differential output method</td>
<td></td>
</tr>
</tbody>
</table>

\(^*1\) Effective measurement length \(^*2\)

\(^*3\) Depends on the linear encoder
1.3 Linear encoder manufactured by Mitutoyo (absolute position type)

*1 The values shown in this table are the manufacturer specification values. When the linear encoder is used with the MELSERVO-JET series servo amplifiers, the specification value is the lowest value of either the value indicated in the table or the rated speed of the servo motor.

*2 The values shown in this table are the manufacturer specification values. The length of the encoder cable between the linear encoder and the servo amplifier should not exceed 30 m.

*3 Select a linear encoder that has a resolution within this range.

The absolute position battery is not required when constructing an absolute position detection system.

AT343A

Cable structure

Prepare a cable based on the following configuration diagram.

For the linear servo motor

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Encoder cable</th>
<th>Output cable</th>
</tr>
</thead>
</table>
| When using an optional encoder cable | (1) MR-EKCBL_M-H 2 m/5 m | (3) Options manufactured by Mitutoyo ^1  
Part No.09BAA598A: 0.2 m  
Part No.09BAA598B: 2 m  
Part No.09BAA598C: 3 m |
| When fabricating an encoder cable | (2) MR-ECNM connector set | Page 8 Encoder cable |

*1 These items should be prepared by the customer.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-ECNM connector set as shown below. The encoder cable may be as long as 30 m.

Encoder cable

Receptacle: 36210-0100PL
Shell kit: 36310-3200-008
(3M)

Connector set: 54599-1019
(Molex)

View from the wiring side.  

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections (when the output cable is 3 m or less)</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>3 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>5 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
AT543A-SC/AT545A-SC

Cable structure
Prepare a cable based on the following configuration diagram.

For the linear servo motor

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Encoder cable</th>
<th>Output cable</th>
<th>Head cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>When using an optional encoder cable</td>
<td>(1) MR-EKCBL_M-H 2 m/5 m</td>
<td>Linear encoder accessory</td>
<td>Linear encoder accessory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cable length: 3 m</td>
<td>Cable length: 2 m</td>
</tr>
<tr>
<td>When fabricating an encoder cable</td>
<td>(2) MR-ECNM connector set</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 38 MR-EKCBL_M-H encoder cable
Page 10 Encoder cable
Fabricating the encoder cable

Fabricate the encoder cable using the MR-ECNM connector set as shown below. The encoder cable may be as long as 30 m.

### Encoder cable

**Receptacle:** 36210-0100PL  
**Shell kit:** 36310-3200-008 (3M)

**Connector set:** 54599-1019 (Molex)

**View from the wiring side:** *2

**Wiring length** | **Number of paired LG and P5 connections**  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
<td></td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>4 pairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>5 pairs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 Encoder cables that meet the following specifications are recommended.

- Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

- Page 4 Shielding CN2 side connectors
Cable structure

Prepare a cable based on the following configuration diagram.

■ For the linear servo motor

![Configuration Diagram]

**Conditions** | **Encoder cable** | **Head cable**
--- | --- | ---
When using an optional encoder cable | (1) Options manufactured by Mitutoyo *1
Part No.06ACF117A: 5 m
Part No.06ACF117B: 10 m | Linear encoder accessory
Cable length: 1 m

When fabricating an encoder cable | (2) MR-J3CN2 connector set *1
Page 12 Encoder cable | (3) Junction connector
15-pin D-SUB (female)
Shell: HDAB-15S
Plug case: HDA-CTH (Hirose Electric)

---

*1 These items should be prepared by the customer.

*2 In order to adjust and check signals when installing the ST743A, ST744A, or ST748A, a personal computer, signal adjustment software, and a converter unit are required. For further details, contact Mitutoyo.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

- Connector set (optional)
  - MR-J3CN2
  - Receptacle: 36210-0100PL
  - Shell kit: 36310-3200-008

- View from the wiring side.

- Connector set: 54599-1019 (Molex)

- View from the wiring side.

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections (when the head cable is 1 m or less)</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>3 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell. See Page 4 Shielding CN2 side connectors.
ST1341A/ST1342A

Cable structure

Prepare a cable based on the following configuration diagram.

■For the linear servo motor

![Diagram of cable structure]

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Encoder cable</th>
<th>Head cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>When using an optional encoder cable</td>
<td>(1) Options manufactured by Mitutoyo[^1]</td>
<td>Linear encoder accessory</td>
</tr>
<tr>
<td></td>
<td>Part No.06ACF117A: 5 m</td>
<td>Cable length: 1 m</td>
</tr>
<tr>
<td></td>
<td>Part No.06ACF117B: 10 m</td>
<td></td>
</tr>
<tr>
<td>When fabricating an encoder cable</td>
<td>(2) MR-J3CN2 connector set[^2]</td>
<td>(3) Junction connector[^1]</td>
</tr>
<tr>
<td></td>
<td>☞ Page 14 Encoder cable</td>
<td>15-pin D-SUB (female)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shell: HDAB-15S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plug case: HDA-CTH (Hirose Electric)</td>
</tr>
</tbody>
</table>

[^1]: These items should be prepared by the customer.

[^2]: MR-J3CN2 connector set is not directly mentioned in the diagram, but it is referenced in the conditions.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

■ Encoder cable

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections (when the head cable is 1 m or less)</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>3 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
1.4 Linear encoder manufactured by Heidenhain

Precautions

- The absolute position battery is not required when constructing an absolute position detection system.

LC 495M/LC 195M (absolute position type)

Precautions

- This linear encoder is a four-wire type. To use this linear encoder, change the servo parameter to select the four-wire type. Refer to the following.
  - MR-JET-G User’s Manual (Parameters)

Cable structure

Prepare a cable based on the following configuration diagram.

For the linear servo motor

![Diagram of cable structure]

**Conditions** | **Encoder cable** | **Output cable**
--- | --- | ---
When using an optional encoder cable | (1) Options manufactured by Heidenhain *1 573661-xx_m | (4) 547300-xx_m (Heidenhain) *1
When fabricating an encoder cable | (2) MR-J3CN2 connector set 17-pin coupling (female) 291697-26 (Heidenhain) | (3) Junction connector *1 Page 16 Encoder cable

*1 These items should be prepared by the customer.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

- **Encoder cables that meet the following specifications are recommended.**

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections (when the output cable is 1 m or less)</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>3 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

*3 Page 4 Shielding CN2 side connectors
LIC 4193M/LIC 4195M/LIC 4197M/LIC 4199M/LIC 2197M/LIC 2199M (absolute position type)

Precautions

- These linear encoders are two-wire type or four-wire type. When using a four-wire type linear encoder, change the servo parameter to select the four-wire type. Refer to the following.
  - MR-JET-G User's Manual (Parameters)

Cable structure

Prepare a cable based on the following configuration diagram.

For the linear servo motor

- Encoder cable
- Head cable
- Servo amplifier
- LIC 4193M/LIC 4195M/LIC 4197M/LIC 4199M/LIC 2197M/LIC 2199M

**Conditions**

- When using an optional encoder cable: Options manufactured by Heidenhain *1
  - 630 856-xx _m
- When fabricating an encoder cable: MR-J3CN2 connector set
  - Page 18 Fabricating the encoder cable

**Encoder cable**

- (1) Options manufactured by Heidenhain *1
- (2) MR-J3CN2 connector set
- (3) Junction connector *1
  - 15-pin D-SUB (female)

**Head cable**

- Linear encoder accessory
  - Cable length: 1 m

*1 These items should be prepared by the customer.

*2 In order to adjust and check signals when installing the LIC 4193M, LIC 4195M, LIC 4197M, LIC 4199M, LIC 2197M, or LIC 2199M, a personal computer (with USB port), signal adjustment software, and a measuring device are required. For further details, contact Heidenhain.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

Encoder cable 1 (two-wire type)

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>3 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>4 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*1 Encoder cables that meet the following specifications are recommended.

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.
Encoder cable 2 (four-wire type)

Connector set (optional)
MR-J3CN2
Receptacle: 36210-0100PL
Shell kit: 36310-3200-008
(3M)

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>3 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>4 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
LIDA 483/LIDA 485/LIDA 487/LIDA 489/LIDA 287/LIDA 289/LIF 481/LIP 6081 (incremental type)

Precautions

- This linear encoder is a four-wire type. To use this linear encoder, change the servo parameter to select the four-wire type. Refer to the following.

MR-JET-G User's Manual (Parameters)

Cable structure

Prepare a cable based on the following configuration diagram.

For the linear servo motor

![Diagram of cable structure]

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Encoder cable</th>
<th>Serial interface conversion unit</th>
<th>Head cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>When using an optional encoder cable</td>
<td>(1) Options manufactured by Heidenhain (^1) 630 856-(\times) (_)_m</td>
<td>EIB 392M</td>
<td>Linear encoder accessory Cable length: 3 m</td>
</tr>
<tr>
<td>When fabricating an encoder cable</td>
<td>(2) MR-J3CN2 connector set Page 21 Encoder cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Junction connector (^1) 15-pin D-SUB (female)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) These items should be prepared by the customer.

\(^2\) In order to adjust and check signals when installing the LIDA 483, LIDA 485, LIDA 487, LIDA 489, LIDA 287, or LIDA 289, a personal computer (with USB port), signal adjustment software, and a measuring device are required. For further details, contact Heidenhain.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

Connect the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>3 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>4 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
1.5 Linear encoder manufactured by Magnescale

Precautions

• SR27A, SR67A, SR77, and SR87 are absolute position type encoders. SR75 and SR85 are incremental type encoders.
• The absolute position battery is not required when constructing an absolute position detection system.

SR77/SR87/SR75/SR85

Cable structure

Prepare a cable based on the following configuration diagram.

■ For the linear servo motor

*1 This optional cable is manufactured by Magnescale and should be prepared by the customer.
## Cable structure

Prepare a cable based on the following configuration diagram.

### For the linear servo motor

![Cable configuration diagram]

### Conditions

<table>
<thead>
<tr>
<th>Encoder cable</th>
<th>Interpolator</th>
</tr>
</thead>
<tbody>
<tr>
<td>When using an optional encoder cable</td>
<td>(1) Options manufactured by Magnescale *1</td>
</tr>
<tr>
<td>When fabricating an encoder cable</td>
<td>(2) MR-J3CN2 connector set</td>
</tr>
<tr>
<td></td>
<td>(3) Junction connector *1</td>
</tr>
</tbody>
</table>

*1 These items should be prepared by the customer.

*Page 24 Encoder cable*
Fabricating the encoder cable used to connect the servo amplifier and interpolator

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Wiring length** | **Number of paired LG and P5 connections** | **Wire size**
--- | --- | ---
Up to 5 m | 1 pair | 22 AWG
Up to 10 m | 2 pairs |
Up to 20 m | 3 pairs |
Up to 30 m | 4 pairs |

*1 Encoder cables that meet the following specifications are recommended.

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
Cable structure
Prepare a cable based on the following configuration diagram.

For the linear servo motor

![Cable Diagram]

*1 This optional cable is manufactured by Magnescale and should be prepared by the customer.

**SQ10 + PQ10 + MQ10 (incremental type)**

Cable structure
Prepare a cable based on the following configuration diagram.

For the linear servo motor

![Cable Diagram]

Encoder cable *1

(1) MR-J3CN2 connector set
(2) Junction connector *2
- Plug: 10114-3000PE (3M)
- Shell kit: 10314-52F0-008 (3M)

*1 Encoder cables are to be fabricated by the customer. Optional cables are not available.
*2 These items should be prepared by the customer.
Fabricating the encoder cable used to connect the servo amplifier and interpolator

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

<table>
<thead>
<tr>
<th>Connector set (optional)</th>
<th>Servo amplifier-side</th>
<th>MQ10 side</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR-J3CN2</td>
<td>P5 LG</td>
<td>13 5 V</td>
</tr>
<tr>
<td>Receptacle: 36210-0100PL</td>
<td>MR MRR</td>
<td>11 0 V</td>
</tr>
<tr>
<td>Shell kit: 36310-3200-008 (3M)</td>
<td>SD Plate</td>
<td>5 SQ</td>
</tr>
</tbody>
</table>

View from the wiring side. *2

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>3 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>4 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
Precautions

- The absolute position battery is not required when constructing an absolute position detection system.

RESOLUTE RL40M (absolute position type)

Cable structure

Prepare a cable based on the following configuration diagram.

For the linear servo motor

<table>
<thead>
<tr>
<th>Encoder cable *1</th>
<th>Output cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) MR-J3CN2 connector set</td>
<td>Linear encoder accessory</td>
</tr>
<tr>
<td>(2) Junction connector ^2</td>
<td>Cable length: 0.5 m</td>
</tr>
<tr>
<td>Encoder cable</td>
<td>15-pin D-SUB (female)</td>
</tr>
</tbody>
</table>

*1 Encoder cables are to be fabricated by the customer. Optional cables are not available.

*2 These items should be prepared by the customer.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

- Connector set (optional)
  - MR-J3CN2
  - Receptacle: 36210-0100PL
  - Shell kit: 36310-3200-008
  (3M)

  ![Diagram](image)

  **View from the wiring side.**

  or

  Connector set: 54599-1019
  (Molex)

  ![Diagram](image)

  **View from the wiring side.**

- *1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections (when the output cable is 0.5 m or less)</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>3 pairs</td>
<td></td>
</tr>
</tbody>
</table>

- *2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

* ✔ Page 4 Shielding CN2 side connectors
EVOLUTE EL40M (absolute position type)

Precautions

• The absolute position battery is not required when constructing an absolute position detection system.

Cable structure

Prepare a cable based on the following configuration diagram.

For the linear servo motor

Encoder cable *1
(1) MR-J3CN2 connector set
(2) Junction connector *2
Page 30 Encoder cable
9-pin D-SUB (female)

Output cable
Linear encoder accessory
Cable length: 0.5 m

*1 Encoder cables are to be fabricated by the customer. Optional cables are not available.

*2 These items should be prepared by the customer.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

**Fabricating the encoder cable**

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**
1.7 Linear encoder PSLH041 manufactured by NIDEC SANKYO (Incremental type)

Cable structure
Prepare a cable based on the following configuration diagram.

For the linear servo motor

![Diagram of cable structure]

<table>
<thead>
<tr>
<th>Encoder cable *1</th>
<th>Output cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) MR-J3CN2 connector set</td>
<td>Linear encoder accessory</td>
</tr>
<tr>
<td>(2) Junction connector *2</td>
<td>Cable length: 0.4 m</td>
</tr>
</tbody>
</table>

*1 Encoder cables are to be fabricated by the customer. Optional cables are not available.
*2 These items should be prepared by the customer.
Fabricating the encoder cable

Fabricate the encoder cable using the MR-J3CN2 connector set and junction connector as shown below. The encoder cable may be as long as 30 m.

**Encoder cable**

Fabricating the encoder cable

*1 Encoder cables that meet the following specifications are recommended.

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections (when the output cable is 0.5 m or less)</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>1 pair</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>2 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>4 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>5 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*2 Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
1.8 A/B/Z-phase differential output type encoder

Precautions

This section explains how to connect an A/B/Z-phase differential output type encoder to a servo amplifier. Fabricate the encoder cable using an MR-J3CN2 connector set as shown in the following wiring diagram.

Page 36 Internal wiring diagram

Use the encoder that satisfies the specifications described in this section. For information on the encoder specifications (resolution and output specifications), contact the manufacturer of the encoder being used.

A/B/Z-phase differential output type encoder specifications

Each signal of the A, B, and Z-phase of the encoder is output by a differential line driver. Open collector outputs cannot be used.

The phase differences of the A-phase and B-phase pulses and the pulse width of the Z-phase pulse need to be 200 ns or more. If the phase difference is less than 200 ns, a signal from the encoder may not be read and a position mismatch may occur.

The multiply-by-four count method is used for A-phase and B-phase output pulses of the A/B/Z-phase differential output type encoder.

Homing cannot be performed on the linear encoders that do not have the Z-phase.

The tolerable resolution range is between 0.001 μm and 5 μm. Select a linear encoder that has a resolution within this range.
### Tolerable resolution range

The following table shows the tolerable resolution of the A/B/Z-phase differential output type encoder. Select an encoder that has a resolution within this range.

<table>
<thead>
<tr>
<th>Encoder type</th>
<th>Tolerable resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear encoder</td>
<td>0.001 [µm] to 5 [µm]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Linear encoder resolution [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper speed limit</td>
<td>0.005  0.025  0.05  0.25  0.50  2.50  5.00  25.00</td>
</tr>
</tbody>
</table>

*1 The table shows the upper speed limits for encoders used with servo amplifiers. For information on the upper speed limit of the encoders, contact the manufacturer of the encoder being used.
Servo amplifier input signal permissible level

The input circuit of the servo amplifier is as shown in the following diagram. Use the encoder whose high and low signal levels at the CN2 connector contact of each phase can be within the following specified values.

- High level: 5 V to 2.4 V
- Low level: 0 V to 0.9 V

Connecting the servo amplifier with the A/B/Z-phase differential output type encoder

Precautions

When connecting an A/B/Z-phase differential output type encoder, set the A/B/Z-phase input encoder connection setting selection to enabled by referring to "[Pr. PC26_Function selection C-8 (**COP8)]" in the following manual.

MR-JET-G User's Manual (Parameters)

For linear encoders
**Internal wiring diagram**

Fabricate cables using wire that can withstand repetitive bending. The maximum cable length is 30 m for RS-422 communication. However, the cable length may need to be shorter due to the power supply voltage drop or the specifications of the encoder being used.

A connection example is shown below. For further information, contact the manufacturer of the encoder being used.

### For encoders with a current consumption of 350 mA or less

<table>
<thead>
<tr>
<th>Wiring length</th>
<th>Number of paired LG and P5 connections</th>
<th>Wire size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 5 m</td>
<td>2 pairs</td>
<td>22 AWG</td>
</tr>
<tr>
<td>Up to 10 m</td>
<td>3 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>6 pairs</td>
<td></td>
</tr>
<tr>
<td>Up to 30 m</td>
<td>8 pairs</td>
<td></td>
</tr>
</tbody>
</table>

*1 For the encoder without the Z-phase, set [Pr. PC27.2] (MR-JET-...) to "1".

*2 Securely connect the shielded wire to the ground plate (plate) of the connector.

*3 Encoder cables that meet the following specifications are recommended when the current consumption of the encoder is 350 mA. If the current consumption of the encoder is less than 350 mA, the number of paired connections can be decreased.

*4 Do not connect anything to the pins 3 and 4.
■ For encoders with a current consumption of more than 350 mA

Precautions

- When turning on the power, turn on the encoder, then turn on the servo amplifier. When turning off the power, turn off the servo amplifier, then turn off the linear encoder.

*1 For the encoder without the Z-phase, set [Pr. PC27.2] (MR-JET-_G) to “1”.
*2 Securely connect the shielded wire to the ground plate (plate) of the connector.
*3 Do not connect anything to the pins 3 and 4.
## 2 OPTION CABLES/CONNECTOR SETS

### 2.1 MR-EKCBL_M-H encoder cable

#### Model explanations

Model: MR-EKCBL_M-H

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Cable length [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Cable structure

The table below shows the structure of this option cable.

<table>
<thead>
<tr>
<th>IP rating</th>
<th>Flex life</th>
<th>Length [m]</th>
<th>Core size [mm²]</th>
<th>Number of cores</th>
<th>Characteristics of one core</th>
<th>Cable OD [mm]</th>
<th>Recommended wire model (Manufacturer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP20</td>
<td>High flex life</td>
<td>2/5</td>
<td>0.2</td>
<td>12 (6 pairs)</td>
<td>Structure [Wires/mm]</td>
<td>0.88</td>
<td>A14B2339 SP (Junkosha)^3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Conductor resistance [Ω/km]</td>
<td>105 or less</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Insulator OD [mm]<strong>1</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 The dimensions (d) are as follows.

*2 Standard OD. The maximum OD is about 10% greater for dimensions without tolerances.

*3 Supplier: Toa Electric Industrial Co. Ltd., Nagoya Branch

---

Do not connect anything to the pins that are marked with a diagonal line. Securely connect the external conductor of the shielded cable to the ground plate and fix it to the connector shell.

Page 4 Shielding CN2 side connectors
2.2 MR-ECNM connector set

The following shows the connector combination for this connector set.

<table>
<thead>
<tr>
<th>IP rating</th>
<th>Parts</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP20</td>
<td>Connector set</td>
<td>MR-ECNM</td>
</tr>
<tr>
<td></td>
<td>MR-J3CN2</td>
<td>Servo amplifier-side connector</td>
</tr>
<tr>
<td></td>
<td>Receptacle: 36210-0100PL</td>
<td>Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex)</td>
</tr>
<tr>
<td></td>
<td>Junction connector</td>
<td>Housing: 1-172161-9</td>
</tr>
<tr>
<td></td>
<td>Connector pin: 170359-1</td>
<td>(TE Connectivity or equivalent)</td>
</tr>
<tr>
<td></td>
<td>Cable clamp: MTI-0002</td>
<td>(Toa Electric Industrial)</td>
</tr>
</tbody>
</table>

2.3 MR-J3CN2 connector set

The following shows the details of this connector set.

- Connector set
- MR-J3CN2
- Receptacle: 36210-0100PL
- Shell kit: 36310-3200-008 (3M or equivalent)

or

- Connector set: 54599-1019
  (Molex)
If the cause of [AL. 02A Linear encoder error 1] cannot be identified, confirm the alarm display details in MR Configurator2, then contact the manufacturer of the product being used.

<table>
<thead>
<tr>
<th>Alarm No.</th>
<th>Detail information No.</th>
<th>[AL. 02A Linear encoder error 1] details</th>
<th>Mitutoyo</th>
<th>Magnescale</th>
<th>Heidenhain</th>
<th>Renishaw</th>
<th>NIDEC</th>
<th>SANKYO</th>
</tr>
</thead>
<tbody>
<tr>
<td>02A.1</td>
<td>01</td>
<td>Initialization error</td>
<td>Overspeed error</td>
<td>Laser diode error</td>
<td>Encoder mismatch error</td>
<td>Initialization error</td>
<td>Initial error</td>
<td>EEP-ROM error</td>
</tr>
<tr>
<td>02A.2</td>
<td>02</td>
<td>Photoelectric capacitive data mismatch</td>
<td>Initialization error</td>
<td>Encoder mismatch error</td>
<td>Encoder warning</td>
<td>Scale level error</td>
<td>INC/ABS data mismatch error</td>
<td>Temperature error</td>
</tr>
<tr>
<td>02A.3</td>
<td>03</td>
<td>Photoelectric error</td>
<td>Hardware error</td>
<td>Incremental signal error</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Speed error</td>
</tr>
<tr>
<td>02A.4</td>
<td>04</td>
<td>Capacitive error</td>
<td>ABS detection error</td>
<td>Absolute signal error</td>
<td>—</td>
<td>ABS data error</td>
<td>Absolute signal error</td>
<td>Offset error</td>
</tr>
<tr>
<td>02A.5</td>
<td>05</td>
<td>CPU error</td>
<td>Transducer error</td>
<td>—</td>
<td>—</td>
<td>CPU error</td>
<td>—</td>
<td>Amplitude error</td>
</tr>
<tr>
<td>02A.6</td>
<td>06</td>
<td>EEP-ROM error</td>
<td>Signal strength error</td>
<td>System memory error</td>
<td>Encoder alarm</td>
<td>EEP-ROM error</td>
<td>Thermal alarm</td>
<td>—</td>
</tr>
<tr>
<td>02A.7</td>
<td>07</td>
<td>ROM/RAM error</td>
<td>Signal strength alarm</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>02A.8</td>
<td>08</td>
<td>Optical overspeed</td>
<td>Thermal alarm</td>
<td>Speed error</td>
<td>—</td>
<td>Overspeed error</td>
<td>Overspeed</td>
<td>—</td>
</tr>
</tbody>
</table>
**REVISIONS**

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

<table>
<thead>
<tr>
<th>Revision date</th>
<th><em>Manual number</em></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2020</td>
<td>IB(NA)-0300523ENG-A</td>
<td>First edition</td>
</tr>
</tbody>
</table>

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WARRANTY

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]
For terms of warranty, please contact your original place of purchase.

[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;
   1. a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
   2. a failure caused by any alteration, etc. to the Product made on your side without our approval
   3. 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
   4. a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
   5. any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
   6. 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
   7. 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
   8. 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 AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in AC Servo, and a backup or fail-safe function should operate on an external system to AC Servo when any failure or malfunction occurs.
(2) Our 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.
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