MOTOMAN-MA2010 OPTIONS
INSTRUCTIONS
FOR ZEROING PARTS ASSEMBLY PROCEDURES

**TYPE:**
YR-MA02010-A** (ZEROING (OPTION))

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS
MOTOMAN-MA2010 INSTRUCTIONS
DX200 INSTRUCTIONS
DX200 OPERATOR’S MANUAL (for each purpose)
DX200 MAINTENANCE MANUAL

The DX200 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.

Part Number: 175897-1CD
Revision: 0
MANDATORY

• This instruction manual is intended to explain operating instructions and maintenance procedures primarily for the MOTOMAN-MA2010.

• General items related to safety are listed in Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 Instructions before reading this manual.

CAUTION

• Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX200.

In this manual, the Notes for Safe Operation are classified as “DANGER”, “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.

---

DANGER

Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

MANDATORY

Always be sure to follow explicitly the items listed under this heading.

PROHIBITED

Must never be performed.

---

Even items described as “CAUTION” may result in a serious accident in some situations.

At any rate, be sure to follow these important items.

To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “WARNING” and “CAUTION”.

---

DANGER

- Maintenance and inspection must be performed by specified personnel.
- Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact your Yaskawa representative.
- Do not remove the motor, and do not release the brake.
- Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.
WARNING

• Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX200 and the programming pendant. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

*Figure 1: Emergency Stop Button*

• Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

*Figure 2: Release of Emergency Stop*

• Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  – Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  – View the manipulator from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
  – Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  – Turning ON the power for the DX200.
  – Moving the manipulator with the programming pendant.
  – Running the system in the check mode.
  – Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem.

The emergency stop buttons are located on the right of front door of the DX200 and the programming pendant.
Definition of Terms Used In this Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and the manipulator cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX200 controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and DX200</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the cabinet of the DX200 after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX200 Instructions before operating the manipulator.
Explaination of Warning Labels

The following warning labels are attached to the manipulator. Always follow the warnings on the labels. Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.

Figure 3: Warning Label Locations
Customer Support Information

If you need assistance with any aspect of your MA2010 Zeroing Function Procedures please contact Motoman Customer Support at the following 24-hour telephone number:

(937) 847-3200

For routine technical inquiries, you can also contact Motoman Customer Support at the following e-mail address:

technicalsupport@motoman.com

When using e-mail to contact Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Motoman Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

- System: MA2010 Zeroing Function
- Primary Application: ____________________________
- Controller: DX200
- Software Version: Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}
- Robot Serial Number: Located on the robot data plate
- Robot Sales Order Number: Located on the DX200 controller data plate
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1 Zeroing Function

Zeroing function automatically allows for the restoration of the home position data when the manipulator’s home position data disappear. (Optional function)

1.1 Outline

The DX200 stores the manipulator home position based on the pulse value of each axis encoder. Since the home position is already set and registered before shipment, zeroing operation does not need to be performed at the normal operation. However, zeroing operation needs to be performed to restore the home position since the home position data disappear when you perform the following operations, or the followings occur.

- Replacement of Motors
- Replacement of Encoders
- Backup Battery Exhaustion in the Manipulator

The home position data is stored by the backup battery. If the battery is exhausted, the home position data disappear again when you turn OFF the DX200 power even if the zeroing operation is performed.

Be sure to replace the battery periodically. For the battery replacement, refer to "Maintenance and Inspection" of "MOTOMAN-MA1440 INSTRUCTIONS" and "MOTOMAN-MH12 INSTRUCTIONS"

The home positioning cannot be performed accurately by the zeroing operation if you change the combination of the manipulator and the DX200.
1.2 Locations of the Zeroing Parts

Locations of the zeroing parts is shown in the following figure. There is no additional parts for the T-axis. (The standard type supports this.)

*Fig. 1-1: Locations of the Zeroing Parts*
1.3 Zeroing Parts Assembly Procedures

1.3.1 S-axis Zeroing Parts Assembly Procedures

- Refer to Fig. 1-2 “Assembly of S-axis Zeroing Parts”

**Assembly**

1. Turn OFF the DX200 power supply.

2. Mount the pin \( \oplus \) on the base, and then mount the block \( \oplus \) on the pin \( \oplus \).

3. Attach the conical spring washers to the hexagon socket head cap screws \( \odot \), and then mount the block \( \ominus \) on the base with the tightening torque shown in Table 1-1 “S-axis Zeroing Parts Check List”.

4. Bond the gasket \( \circ \) to the cover \( \odot \).

5. Attach the washers to the cross-recessed pan head screws \( \odot \). Then mount the cover \( \odot \) and the gasket \( \odot \) on the block \( \ominus \) with the cross-recessed pan head screws \( \odot \).

6. Apply Loctite 243 to the thread part of the shaft \( \ominus \) and mount the shaft \( \ominus \) on the S-head.

7. Mount the gasket \( \odot \) on the plug \( \odot \).

8. Mount the plug \( \odot \) and the gasket \( \odot \) on the shaft \( \ominus \).

**NOTE**

Please take care not to lose pins or screws (bolts) for fixing plates during the operation since they are small parts.

**NOTE**

Before approaching the manipulator, be sure to confirm the servo power is turned OFF and there is no danger around. The manipulator may move differently from the operator’s intention and this may lead to injury.
1.3 Zeroing Parts Assembly Procedures

Table 1-1: S-axis Zeroing Parts Check List

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Qty</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pin HW1405947-4-8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Block HW1405470-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hexagon Socket Head Cap Screw M5</td>
<td>2</td>
<td>Tightening Torque</td>
</tr>
<tr>
<td></td>
<td>(length: 14 mm)</td>
<td>each</td>
<td>6.0 N•m</td>
</tr>
<tr>
<td></td>
<td>Conical Spring Washer 2H-5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cover HW1405471-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gasket HW1405472-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cross-recessed pan head screw M5</td>
<td>2</td>
<td>Tightening Torque</td>
</tr>
<tr>
<td></td>
<td>(length: 8 mm)</td>
<td>each</td>
<td>6.0 N•m</td>
</tr>
<tr>
<td></td>
<td>Washer M5</td>
<td>2 each</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Shaft HW1404770-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Plug HW0405202-2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gasket HW0405203-1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1-2: Assembly of S-axis Zeroing Parts
1.3.2 L-axis Zeroing Parts Assembly Procedures

- Refer to Fig. 1-3 “Assembly of L-axis Zeroing Parts”

**Assembly**

1. Turn OFF the DX200 power supply.
2. Apply Loctite 243 to the thread part of the shaft ◎, and then mount the shaft ◎ on the S-head.
3. Mount the gasket ◇ on the plug ◆.
4. Mount the plug ◆ and the gasket ◇ on the shaft ◎.
5. Mount the pin ◆ on the L-arm, and then mount the block ◎ on the pin ◆.
6. Attach the conical spring washers to the hexagon socket head cap screws ◇, and then mount the block ◎ on the L-arm with the tightening torque shown in Table 1-2 “L-axis Zeroing Parts Check List”.
7. Bond the gasket ◇ to the plate ◆.
8. Attach the washers to the cross-recessed pan head screws ◆. Then mount the plate ◆ and the gasket ◇ on the block ◎.

**NOTE**
Please take care not to lose pins or screws (bolts) for fixing plates during the operation since they are small parts.

**NOTE**
Before approaching the manipulator, be sure to confirm the servo power is turned OFF and there is no danger around. The manipulator may move differently from the operator’s intention and this may lead to injury.
1. Zeroing Function
1.3 Zeroing Parts Assembly Procedures

Table 1-2: L-axis Zeroing Parts Check List

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Qty</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Shaft HW1404770-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>②</td>
<td>Plug HW0405202-2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>③</td>
<td>Gasket HW0405203-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>④</td>
<td>Pin HW1405947-4-8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>⑤</td>
<td>Block HW1404725-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Hexagon Socket Head Cap Screw M5 (length: 12 mm)</td>
<td>2</td>
<td>each</td>
</tr>
<tr>
<td></td>
<td>Conical Spring Washer 2H-5</td>
<td></td>
<td>Tightening Torque</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.0 N·m</td>
</tr>
<tr>
<td>⑦</td>
<td>Plate HW1405902-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑧</td>
<td>Gasket HW1405903-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑨</td>
<td>Cross-recessed pan head screw M5 (length: 8 mm)</td>
<td>2</td>
<td>each</td>
</tr>
<tr>
<td></td>
<td>Washer M5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1-3: Assembly of L-axis Zeroing Parts
1.3.3 U-axis Zeroing Parts Assembly Procedures

- Refer to Fig. 1-4 “Assembly of U-axis Zeroing Parts”

**Assembly**

1. Turn OFF the DX200 power supply.

2. Apply Loctite 243 to the thread part of the shaft ①, and then mount the shaft ① on the casing.

3. Mount the gasket ② on the plug ②.

4. Mount the plug ② and the gasket ③ on the shaft ①.

5. Mount the pin ③ on the L-arm, and then mount the block ④ on the pin ③.

6. Attach the conical spring washers to the hexagon socket head cap screws ⑤, and then mount the block ⑤ on the L-arm with the tightening torque shown in Table 1-3 "U-axis Zeroing Parts Check List".

7. Bond the gasket ⑥ to the plate ⑥.

8. Mount the plate ⑥ and the gasket ⑦ on the block ⑦ with the cross-recessed pan head screws ⑧.

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**NOTE**

Please take care not to lose pins or screws (bolts) for fixing plates during the operation since they are small parts.

---

**NOTE**

Before approaching the manipulator, be sure to confirm the servo power is turned OFF and there is no danger around.

The manipulator may move differently from the operator’s intention and this may lead to injury.

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**Table 1-3: U-axis Zeroing Parts Check List**

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Qty</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Shaft HW1404770-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>②</td>
<td>Plug HW0405202-2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>③</td>
<td>Gasket HW0405203-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>④</td>
<td>Pin HW1405947-4-8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>⑤</td>
<td>Block HW1404725-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Hexagon Socket Head Cap Screw M5 (length: 16 mm) Conical Spring Washer 2H-5</td>
<td>2 each</td>
<td>Tightening Torque 6.0 N•m</td>
</tr>
<tr>
<td>⑦</td>
<td>Plate HW1405902-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑧</td>
<td>Gasket HW1405903-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑨</td>
<td>Cross-recessed pan head screw M5 (length: 8 mm) Washer M5</td>
<td>2 each</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 1-4: Assembly of U-axis Zeroing Parts
1.3.4 R-axis Zeroing Parts Assembly Procedures

- Refer to Fig. 1-5 “Assembly of R-axis Zeroing Parts”

**Assembly**

1. Turn OFF the DX200 power supply.

2. Mount the pin  on the casing, and then mount the block  on the pin ．

3. Attach the conical spring washers to the hexagon socket head cap screws , and then mount the block  on the casing with the tightening torque shown in Table 1-4 “R-axis Zeroing Parts Check List”.

4. Mount the gasket  on the plug ．

5. Mount the plug  and the gasket  on the block ．

6. Mount the pin  on the spacer, and then mount the block  on the pin ．

7. Mount the block  on the spacer with the cross-recessed flat head machine screws ．

8. Bond the gasket  to the cover ．

9. Mount the cover  and the gasket  on the block  with the cross-recessed pan head screws ．

**NOTE**

Please take care not to lose pins or screws (bolts) for fixing plates during the operation since they are small parts.

**NOTE**

Before approaching the manipulator, be sure to confirm the servo power is turned OFF and there is no danger around. The manipulator may move differently from the operator’s intention and this may lead to injury.

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Qty</th>
<th>Remark</th>
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<tr>
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<tr>
<td>②</td>
<td>Block HW1404523-1</td>
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<td></td>
</tr>
<tr>
<td>③</td>
<td>Hexagon Socket Head Cap Screw M4</td>
<td>2</td>
<td>Tightening Torque 2.8 N•m</td>
</tr>
<tr>
<td></td>
<td>(length: 12 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conical Spring Washer 2H-4</td>
<td>2</td>
<td>each</td>
</tr>
<tr>
<td>④</td>
<td>Plug HW0405202-2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑤</td>
<td>Gasket HW0405203-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Pin HW1405947-4-8</td>
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<td></td>
</tr>
<tr>
<td>⑦</td>
<td>Block HW1404726-1</td>
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<tr>
<td>⑧</td>
<td>Cross-recessed flat head machine screw M4</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(length: 10 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑨</td>
<td>Cover HW1404521-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑩</td>
<td>Gasket HW1404522-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑪</td>
<td>Cross-recessed flat head machine screw M4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(length: 8 mm)</td>
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<td></td>
</tr>
</tbody>
</table>
Fig. 1-5: Assembly of R-axis Zeroing Parts
1.3 Zeroing Parts Assembly Procedures

1.3.5 B-axis Zeroing Parts Assembly Procedures

- Refer to Fig. 1-6 “Assembly of B-axis Zeroing Parts”

**Assembly**

1. Turn OFF the DX200 power supply.

2. Mount the pin 1 on the U-arm, and then mount the block 2 on the pin 1.

3. Attach the conical spring washers to the hexagon socket head cap screws 3, and then mount the block 2 on U-arm with the tightening torque shown in Table 1-5 "B-axis Zeroing Parts Check List".

4. Mount the gasket 4 on the plug 5.

5. Mount the plug 5 and the gasket 4 on the block 2.

6. Mount the pin 1 on the wrist, and then mount the block 2 on the pin 1.

7. Mount the block 2 on the wrist with the cross-recessed flat head machine screws 6.

8. Bond the gasket 4 to the cover 7.

9. Mount the cover 7 and the gasket 4 on the block 2 with the cross-recessed pan head screws 8.

**NOTE**

Please take care not to lose pins or screws (bolts) for fixing plates during the operation since they are small parts.

Before approaching the manipulator, be sure to confirm the servo power is turned OFF and there is no danger around. The manipulator may move differently from the operator’s intention and this may lead to injury.

**Table 1-5: B-axis Zeroing Parts Check List**

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Qty</th>
<th>Remark</th>
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<td>Block HW1404520-1</td>
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<tr>
<td>③</td>
<td>Hexagon Socket Head Cap Screw M4 (length: 25 mm)</td>
<td>2 each</td>
<td>Tightening Torque 2.8 N-m</td>
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<tr>
<td></td>
<td>Conical Spring Washer 2H-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>④</td>
<td>Plug HW0405202-2</td>
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<td>⑤</td>
<td>Gasket HW0405203-1</td>
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<td>Pin HW1405947-4-8</td>
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<td>Block HW1404727-1</td>
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<td>⑧</td>
<td>Cross-recessed flat head machine screw M4 (length: 10 mm)</td>
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<td>⑨</td>
<td>Cover HW1404518-1</td>
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<td>⑩</td>
<td>Gasket HW1404519-1</td>
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<tr>
<td>⑪</td>
<td>Cross-recessed flat head machine screw M4 (length: 8 mm)</td>
<td>2</td>
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</table>
Fig. 1-6: Assembly of B-axis Zeroing Parts
MOTOMAN-MA2010 OPTIONS
INSTRUCTIONS
FOR ZEROING PARTS ASSEMBLY PROCEDURES

Specifications are subject to change without notice for ongoing product modifications and improvements.