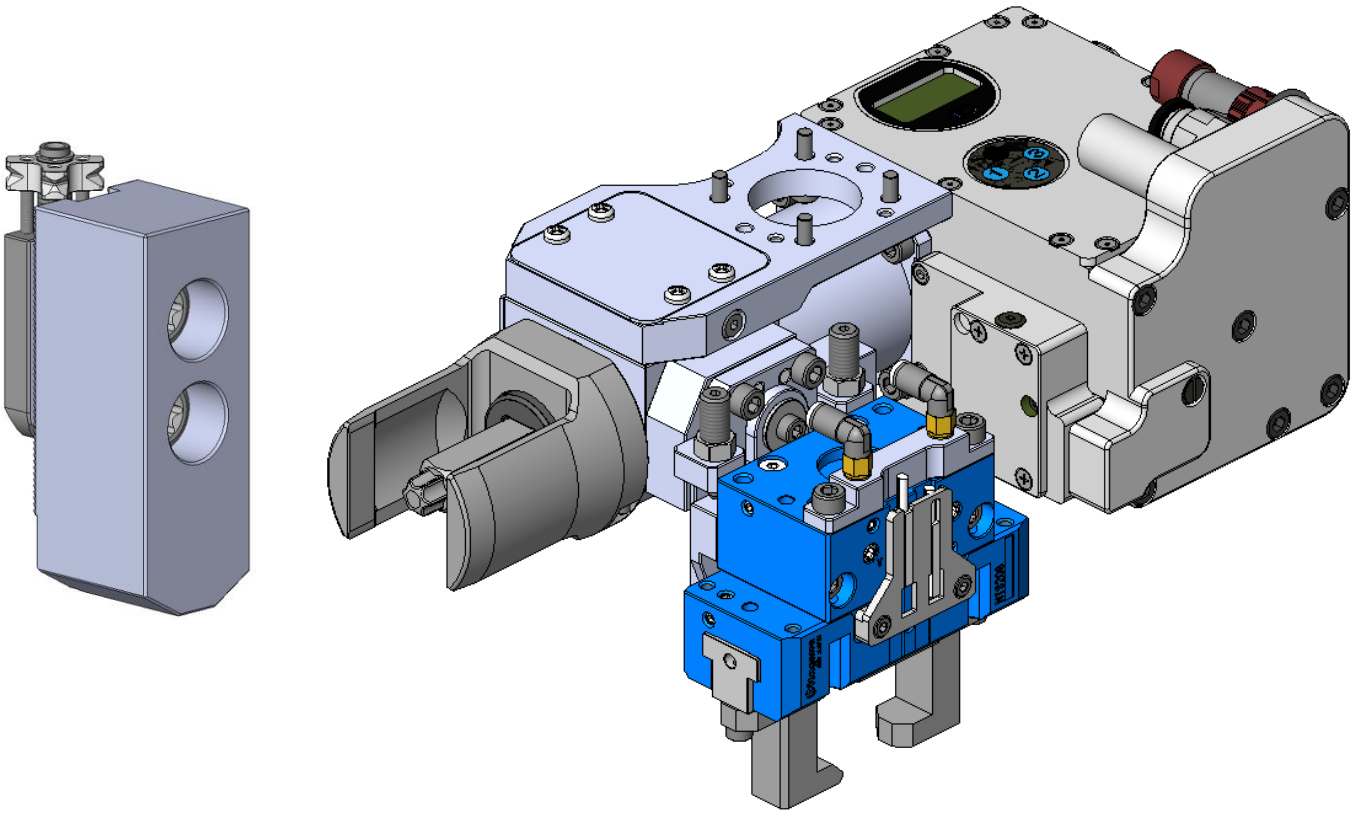
MA1580PHG
Version 1.04 (2024.12.20)

# INSTRUCTION MANUAL

# BR-AJC




## Kitagawa Corporation

77-1,Motomachi,Fuchu-shi,Hiroshima,726-8610,Japan
TEL +81-(0)847-40-0526
FAX +81-(0)847-45-8911


Before using this product, be sure to read this manual carefully to understand how to use it correctly.

# Contents

# 1. Preface

## 1.1. How to Use This Manual

- This manual provides detailed information on this product so that you can understand its performance and functions and use it safely and correctly. Before using this product, be sure to read this manual carefully to understand how to use it correctly.
- Before using this product, be sure to read this instruction manual and the instruction manual for the power chuck (Standard Chuck BR type) and T-nut (BR-AJC_M) to be used in combination with this product carefully to ensure that you correctly understand how to use the product.
- This manual has been prepared for intended use for persons in charge of installation, operation, inspection, and maintenance of this product. When the beginners use this product, be sure to receive the guidance from skilled persons, sales agents, or us in advance.
- Store this manual with care in the specified place at hand, and reread it as necessary for correct use of the product.
- This manual is a part of the product. Do not sell or transfer the product to a third party without attaching this manual.
- Read the section "Important Safety Precautions" at the beginning of this manual especially carefully, which summarizes precautions that particularly you should know or follow.
- Failure to follow the instructions and warnings in this manual could result in serious human accidents. Kitagawa shall not be held liable for human accidents, death, damage, or loss that occurred due to a failure to follow this manual.
- This manual does not predict all potential hazards in installation, operation, maintenance, and inspection under all environmental conditions. Therefore, the matters, unless otherwise mentioned clearly as “can be done” or “may be done” in this manual, should be considered as “cannot be done” or “must not be done”.
- Please contact us or our agents if you have an uncertainty about safety when you try to perform installation, operation, inspection, or maintenance of the product.
- The information and product specifications described in this manual are subject to change without notice for the purpose of improvement.
- “TORX” used in this document is a registered trademark of Accument Intellectual Properties LLC, USA.

## 1.2. Signal Word Definition

The triangle shown on the left indicates warning. The warning signs are used to alert you to potential safety hazards. To avoid death or injuries that could occur, follow all the instructions given with the warning signs.

Handling precautions that are considered especially important are classified and indicated as shown below according to the degree of risk that could result.

| | |
|---|---|
| **Danger** | Failure to follow the safety precautions below will result in death or serious injuries. |
| **Warning** | Failure to follow the safety precautions below could result in death or serious injuries. |
| **Caution** | Failure to follow the safety precautions below may result in minor or moderate injuries. |
| **Notice** | Indicates instructions which, if you do not heed given instructions, could result in damage to the product or shortened service life, or damage to peripheral equipment. |

The signs are classified and indicated as follows according to the type of risk.

General warning

Fire warning

Fly-out warning

High temperature warning

Rotating part warning

Instruction

## 1.3. Type Designation

Table 1

| Correct chuck type | BR-AJC End Effector | | | |
|---|---|---|---|---|
| | Outside view※ | Body ASSY | Wrench ASSY | Reaction lever ASSY |
| BR06 / BRT06 | BR-AJC06E | BR-AJC-E | BRAJCWT10 | BRAJCL06 |
| BR08 / BRT08 | BR-AJC08E | | BRAJCWT12 | BRAJCL08 |
| BR10 / BRT10 | BR-AJC10E | | | BRAJCL10 |

※This drawing combines the Body ASSY, Wrench ASSY, and Reaction lever ASSY.

Table 2

| Correct chuck type | BR-AJC Tnut | | | BR-AJC Jaw stocker |
|---|---|---|---|---|
| | BR-AJC_M | Special jaw mounting bolt | Special washer | |
| BR06 / BRT06 | BR-AJC06M | BRAJCBT10 | BRAJCWS10 | BR-AJC06S |
| BR08 / BRT08 | BR-AJC08M | BRAJCBT12 | BRAJCWS12 | BR-AJC08S |
| BR10 / BRT10 | BR-AJC10M | | | BR-AJC10S |

## 1.4. Application Purpose of This Product

This product is suitable for automatic replacement of the jaws of power chucks mounted on machine tools such as NC lathes and machining centers. The BR-AJC end effector can be mounted on a robot or loader to mount and remove the BR-AJC Tnut from the power chuck. For any other applications, please contact us.

## 1.5. Outline of BR-AJC

### 1.5.1. System Image

The BR-AJC system consists of the following elements.

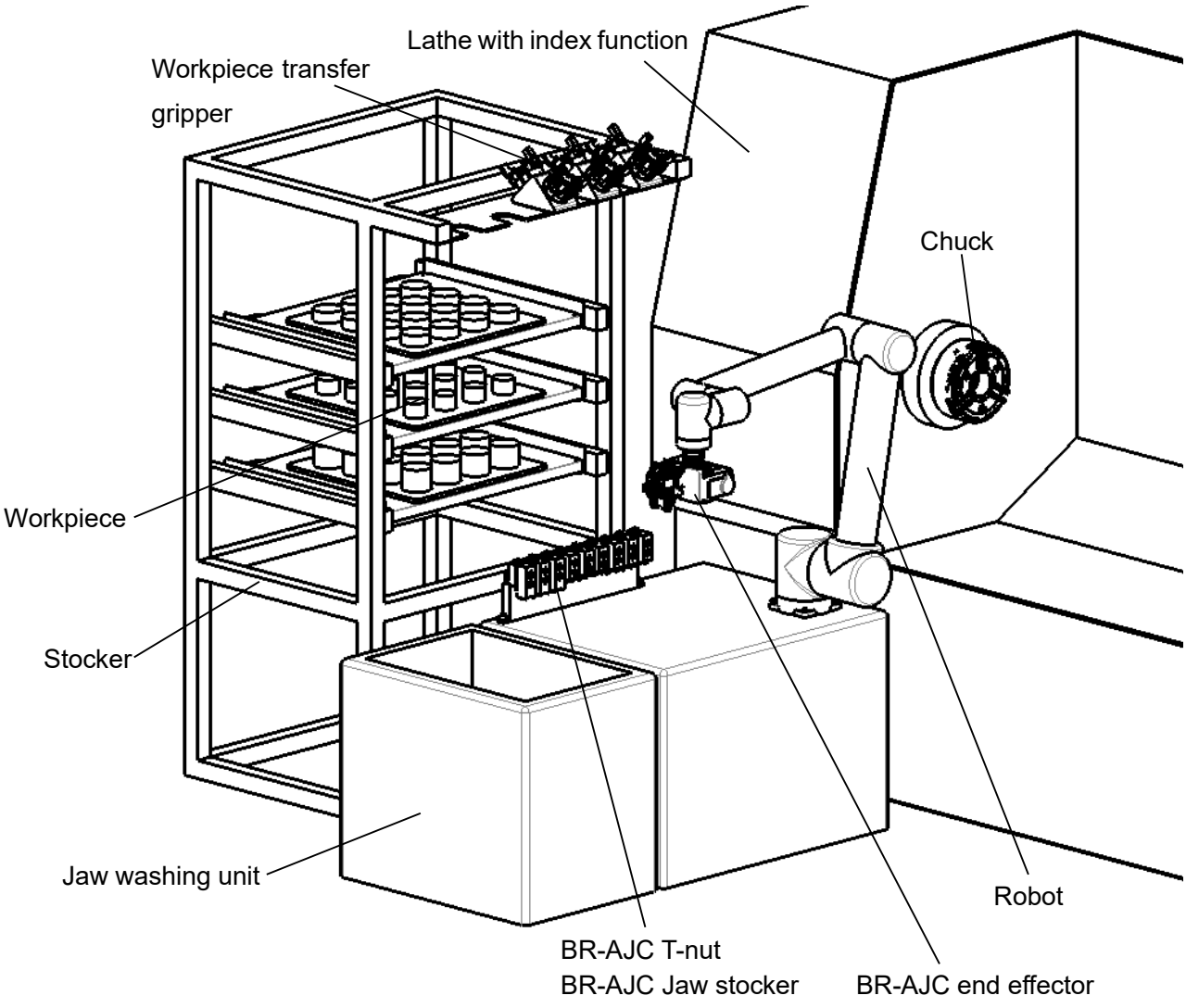
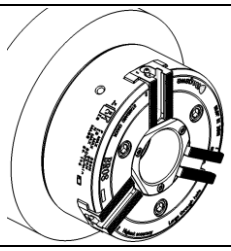
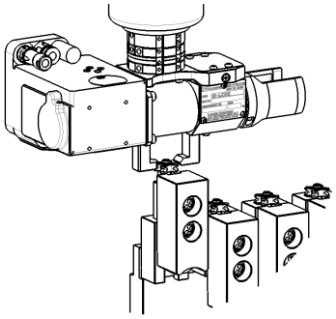
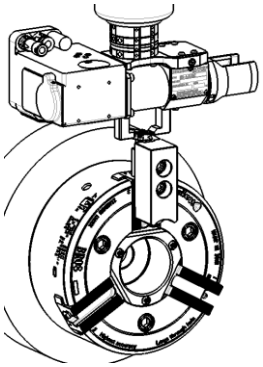
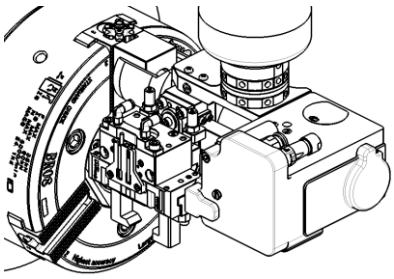


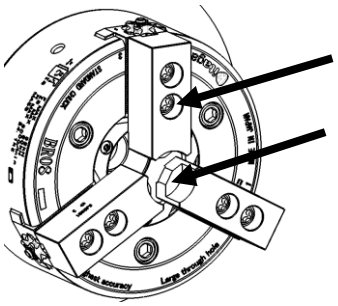
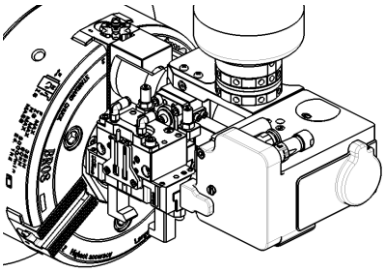
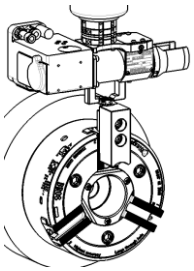
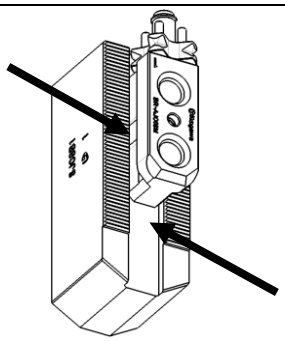
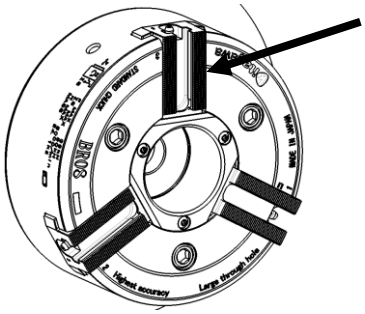

Figure 1 BR-AJC System image

### 1.5.2. Outline of Jaw Change Procedure

Jaws on the chuck are changed by indexing the chuck on the lathe, tightening/loosening the bolts using the jaw change end effector mounted on the robot, and transferring the jaws. The outline of the procedure is shown in Table 3.

Table 3 Jaw Change Procedure

| | | | |
|---|---|---|---|
| ① | Indexing the chuck | The chuck is indexed on the lathe so that the jaw mounting position comes directly above. |  |
| ② | Taking out jaws | Jaws are taken out of the stocker. |  |
| ③ | Inserting the jaws | The jaws are inserted into the chuck. |  |
| ④ | Jaw Mounting Bolt Tightening | The jaw mounting bolts are tightened. |  |
| ⑤ | Machining the workpiece | A workpiece is mounted on the chuck, machined, and removed. | |

| | | | |
|---|---|---|---|
| ⑥ | Washing the chuck | The chuck is washed using coolant or air blow.<br>● Chips remaining on the mounting bolt holes and workpiece gripping surfaces of the soft jaws may cause jaw change failure or decrease in gripping accuracy.(Parts shown by the arrows) |  |
| ⑦ | Jaw Mounting Bolt Loosening | The jaw mounting bolts are loosened. |  |
| ⑧ | Taking out jaws | The jaws are taken out of the chuck. |  |
| ⑨ | Washing the jaws | The jaw washing unit removes chips on the jaws.<br>● Chips remaining on the serrations and T-nut of the soft jaws may cause jaw change failure or decrease in gripping accuracy.<br>(Parts shown by the arrows) |  |
| ⑩ | Washing the chuck | The chuck is washed using coolant or air blow.<br>● Chips remaining on the serrations and groove of the master jaws may cause jaw change failure or decrease in gripping accuracy.<br>(Parts shown by the arrows) |  |

## 1.6. Scope of the Product

This is the instruction manual for the BR-AJC end effector, BR-AJC T-nut, and BR-AJC jaw stocker.

For other peripheral devices, such as work transfer gripper, workpiece stocker, washing tank, and control unit, refer to their respective instruction manuals.

### 1.6.1. Product and Function

#### 1.6.1.1. BR-AJC End Effector

- The BR-AJC end effector rotates the pneumatic nutrunner by the START signal to tighten or loosen the jaw mounting bolts with the predetermined torque.
- When the set tightening torque is reached, the end effector stops automatically and outputs the status by the STOP signal.
- The reaction lever is applied to the side face of a soft jaw to receive the reaction force of the bolt tightening torque, reducing the load on the robot.
- The pneumatic gripper holds and transfers a jaw.

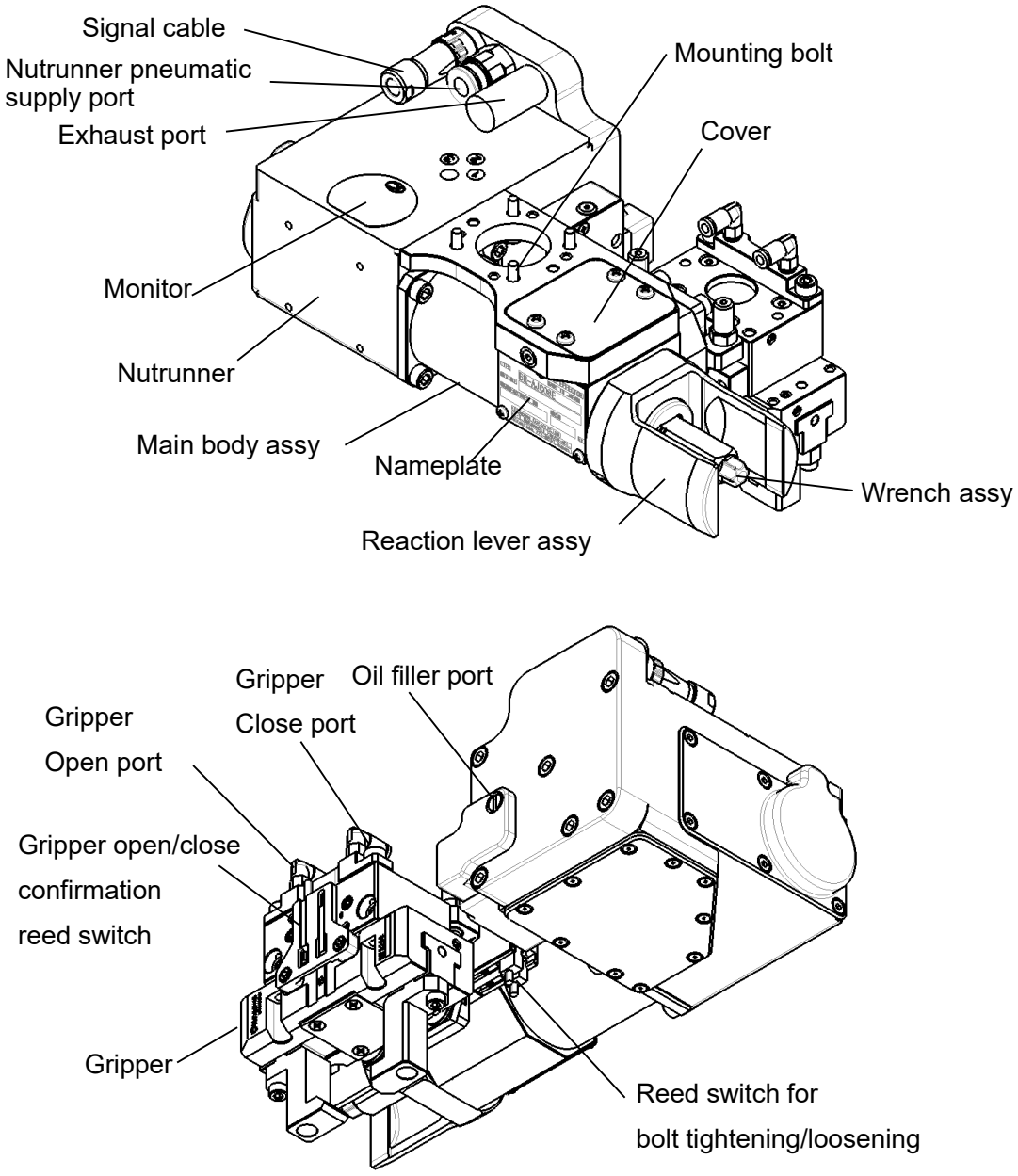



Figure 2 Appearance of BR-AJC end effector

### 1.6.1.2. BR-AJC T-nut

- BR-AJC_M, a product for soft jaw mounting on a power chuck, with a special jaw mounting bolts and special washers
  - ➢ Also refer to the BR-AJC_M instruction manual.
- This T-nut is used to reproduce the serration position.
- Even when a jaw is once removed from the chuck, the T-nut allows maintaining the equivalent gripping accuracy as for the jaw just formed.

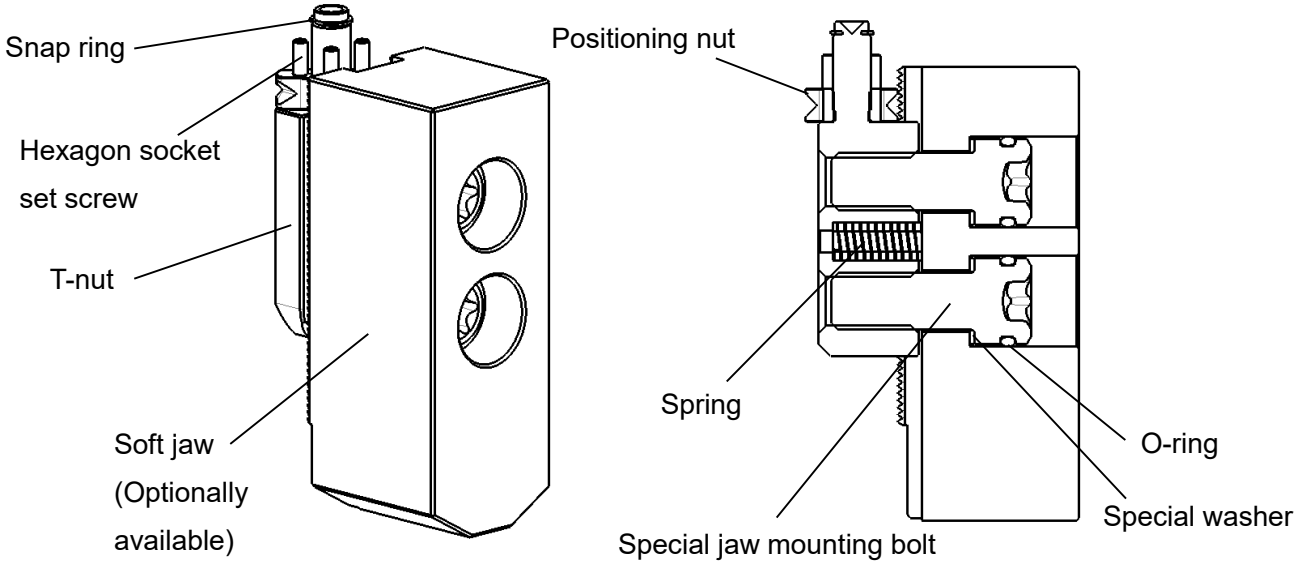



Figure 3 Appearance of BR-AJC T-nut

### 1.6.1.3. BR-AJC Jaw Stocker

- This is used to store the BR-AJC T-nuts.
- The mounting base is to be prepared by the customer.

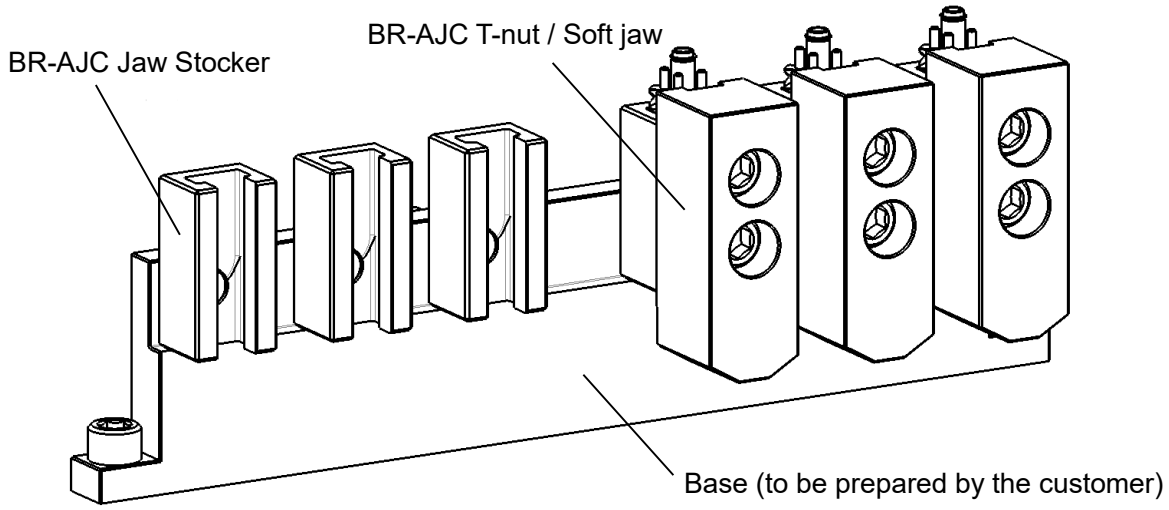



Figure 4 Appearance of BR-AJC jaw stocker

### 1.6.2. Outline of Product Range

The items described in Table 4 and Table 5 are to be prepared by the customer as they are out of the product range.

#### 1.6.2.1. Items to be prepared by the customer

Table 4

| Item | Contents |
|---|---|
| Lathe with index function | The chuck needs to be indexed to the jaw mounting position. |
| Robot | The BR-AJC end effector is to be mounted for jaw change. |
| Jaw washing unit | Necessary to wash off chips on the jaws. |
| Control unit/electric wiring | Necessary for controlling the BR-AJC end effector to tighten/loosen the jaw mounting bolts. |
| Pneumatic source/pneumatic piping | Necessary for driving the BR-AJC end effector. |
| Workpiece stocker | For storing workpieces. |
| Workpiece transfer gripper | For transferring workpieces.<br>The BR-AJC end effector cannot be used for transferring workpieces. |
| Other equipment | Equipment as needed, such as safety fence, measurement device, reversing base, and loader. |

#### 1.6.2.2. Work to be done by the customer

Table 5

| Item | Contents |
|---|---|
| Cleaning of chuck in machine | Remove chips on the chuck. |
| Creation of control program for BR-AJC end effector | Create the control program for tightening/loosening the jaw mounting bolts. |
| Noise countermeasures for BR-AJC end effector | Take countermeasures against noise to prevent malfunction.<br>➢ Be sure to use shielded cables.<br>➢ Install away from high voltage sources and high current sources.<br>➢ Ground each equipment. |

**Notice** Indicates instructions which, if you do not heed given instructions, could result in damage to the product or shortened service life, or damage to peripheral equipment.

**When changing the jaws, clean the chuck inside the machine and the jaws outside the machine to sufficiently remove accumulating chips.**

- Failure to do so will result in the failure of inserting/removing the jaws to/from the chuck.
- Failure to do so will result in the tightening/loosening failure of the jaw mounting bolts.

**Be sure to use shielded cables when connecting the BR-AJC end effector and the host control unit.**

**Install the cables away from high voltage sources and high current sources.**

**Ground the BR-AJC end effector.**

- Malfunction due to noise will result in the failure of jaw change, causing suspension of facilities or breakage of parts.

## 1.7. Warranty

The product is warranted for one year after the date of delivery. However, the following cases will void the warranty.

- When parts other than Kitagawa's genuine parts are used.
- When proper maintenance and inspection such as periodic greasing are not performed.
- Other than above, when the product is used in methods not following this manual.

## 1.8. Parts List

All parts used including consumables shall be genuine parts delivered by Kitagawa.
Kitagawa shall not be held liable for human accidents, death, damage, or loss that occurred due to the use of non-genuine parts.

### 1.8.1. BR-AJC End Effector

#### 1.8.1.1. Body ASSY

Table 6 Delivery range

| No. | Parts name | BR-AJC-E | Qty. | Note |
|---|---|---|---|---|
| 7 | Adaptor plate | 61P865910 | 1 | |
| 8 | Hex. socket head cap screw | M5×15 | 4 | |
| 9 | Cover | 61Q494943 | 1 | |
| 10 | cross-recessed head machine screw | M4×6 | 4 | |
| 11 | Hex. socket head cap screw | M4×16 | 4 | |
| 12 | Washer | 4 | 4 | |
| 13 | Fittings | KQ2L04-M5A | 2 | SMC |
| 14 | Plug | MS-5P | 1 | SMC |
| 15 | Hex. socker head cap screw | M3×6 | 2 | |
| 16 | Reed switch bracket | - | 1 | |
| 17 | Reed switch | D-M9B | 2 | SMC |
| 18 | Signal cable | - | 1 | |
| 19 | Reed switch | D-M9BV | 2 | SMC |
| 20 | Body | - | 1 | |

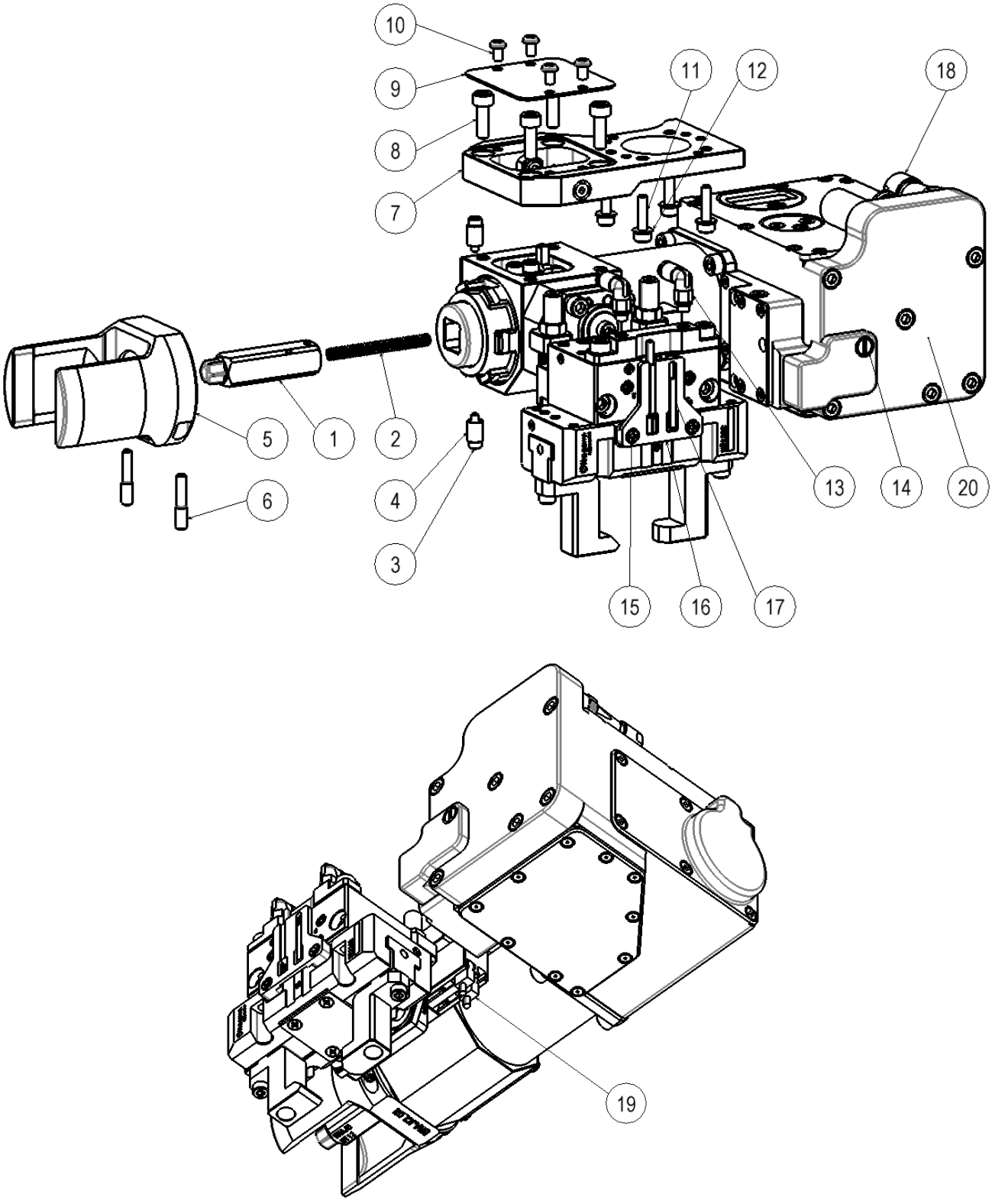



Figure 5 Parts

### 1.8.1.2. Wrench ASSY

Table 7 Delivery range

| No. | Parts name | BRAJCWT10 | BRAJCWT12 | Qty. | Note |
|---|---|---|---|---|---|
| 1 | Wrench | 61P865932 | 61P865914 | 1 | - |
| 2 | Spring | WL5-60 | | 1 | MISUMI |
| 3 | Hex. socket head cap screw | M3×12 | | 2 | - |
| 4 | Washer | FWTAC-D7-M3-T9 | | 2 | MISUMI |

### 1.8.1.3. Reaction lever ASSY

Table 8 Delivery range

| No. | Parts name | BRAJCL06 | BRAJCL08 | BRAJCL10 | Qty. | Note |
|---|---|---|---|---|---|---|
| 5 | Reaction lever | 61P297145 | 61P297130 | 61P297141 | 1 | - |
| 6 | Screw | FMSSG5-24-14 | | | 2 | MISUMI |

## 1.8.2. BR-AJC Tnut

### 1.8.2.1. BR-AJC_M

Table 9 Delivery range

| No. | Parts name | BR-AJC06M | BR-AJC08M | BR-AJC10M | Qty. | Note |
|---|---|---|---|---|---|---|
| 1 | BR-AJC_M | - | - | - | 3 | - |

### 1.8.2.2. Special Jaw mounting bolt

Table 10 Delivery range

| No. | Parts name | BRAJCBT10 | BRAJCBT12 | Qty. | Note |
|---|---|---|---|---|---|
| 2 | Jaw mounting bolt | 61Q494598 | 61Q493434 | 6 | - |
| 3 | O-ring | P12.5 | P15 | 6 | - |

### 1.8.2.3. Special Washer

Table 11 Delivery range

| No. | Parts name | BAJCWS10 | BRAJCWS12 | Qty. | Note |
|---|---|---|---|---|---|
| 4 | Washer | FWSSKB-D16-V10-T1 | FWSSKB-D18-V12-T1 | 6 | MISUMI |

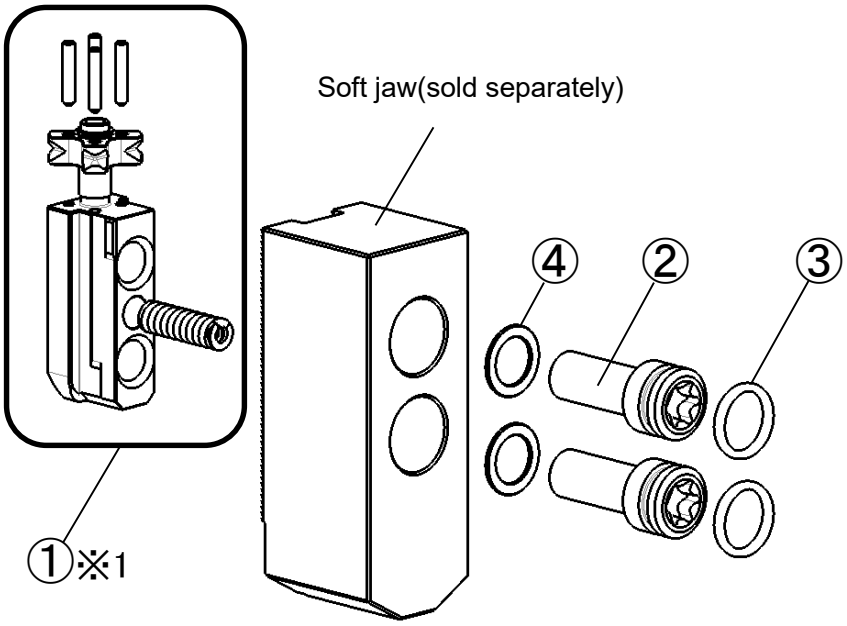



Figure 6 Parts

※1：Refer to BR-AJC_M instruction manual.

### 1.8.3. BR-AJC Jaw Stocker

Table 12 Delivery range

| No. | Parts name | BR-AJC06S | BR-AJC08S | BR-AJC10S | Qty. |
|---|---|---|---|---|---|
| 1 | Jaw stocker | - | - | - | 3 |

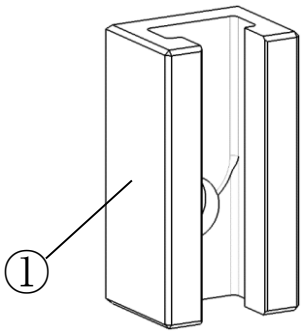



Figure 7 Parts

## 2. Important Safety Precautions

This chapter summarizes precautions that particularly you should know or follow.

Please read them before starting to use the product.

**Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**The jaw mounting bolts must be replaced after a specified number of years or a specified number of times of use. (Refer to "7.2.1. Jaw Mounting Bolt")**

- The bolts may be damaged, causing the chuck and workpiece to fly out.
- Measures shall be taken to ensure that the bolt does not exceed the limit of use.
  - The number of times the upper controller or machine tool is used is controlled and the operator is notified.
  - Establish rules for replacement timing based on frequency of use. etc.

**When installing, inspecting, lubricating, replacing BR-AJC End effector,**
**Be sure to turn off the main power supply,**
**Shut off all air pressure in the work area and relieve any remaining air pressure inside the end effector,**
**Post a sign or notice, or provide a fence, and so on to notify people around the machine that work is in progress.**

- During work, the robot or end effector could move abruptly and collide with body.
- Unexpected machine operation by a third party may result in a collision with body.

**Use the BR-AJC end effector in accordance with the legal safety standards.**

- Comply with the safety standards of laws and regulations set forth in each country, including the installation of safety fences and safety covers.

**Take safety measures so that the operator is not injured even if the conveyed workpiece flies out due to reduced air pressure.**

- Workpiece may fly out and collide with body.

**Be sure to tighten bolts to the specified torque.**
**Use a proper tool that can control torque such as a torque wrench.**

- If insufficient bolts are mounted of tightening torque is improper, the bolts may be damaged, causing the end effector and workpiece to fly out.

**If the BR-AJC end effector or BR-AJC Tnut is impacted due to malfunction or programming error, carefully examine each part for damaged or cracks, and repair or replace if necessary.**

- The impact may cause damage or crack on the parts. Continuous use of faulty parts may damage the BR-AJC end effector/Chuck causing the workpiece to fly out.

| | |
|---|---|
|  | **Prevent your hands and fingers from being caught when gripping a workpiece with the BR-AJC end effector.**<br>● Otherwise, your hands and fingers may be crushed or cut off. |
|  | **Do not modify the product.**<br>● Not only product is damaged but also the workpiece may fly out. |

| **⚠Warning** | Failure to follow the safety precautions below could result in death or serious injuries. |
|---|---|
|  | **Check jaw mounting bolts and wrenches daily for damage. (Refer to "7.1. Periodic Inspection")**<br>● If the jaws are not properly installed due to damaged parts, the workpiece may fly out. |
|  | **BR-AJC end effector should be used at a pneumatic pressure of 0.5 to 0.7 MPa.**<br>● Use of a value other than the specified value may cause the workpiece to fly out or damage the product. |
|  | **Do not wear clothing or accessories such as gloves and necktie which are easy to be caught in.**<br>● Otherwise, your body or clothing may be entangled. |
|  | **Do not perform the work after drinking alcohol or taking medicine.**<br>● Impaired judgment or operation mistake may cause serious hazards. |

# 3. Specifications

## 3.1. BR-AJC End Effector

### 3.1.1. Basic Specifications

Table 13 Basic specifications

| Type | | | BR-AJC06E | BR-AJC08E | BR-AJC10E |
|---|---|---|---|---|---|
| Body ASSY type | | | BR-AJC-E | BR-AJC-E | BR-AJC-E |
| Wrench ASSY type | | | BRAJCWT10 | BRAJCWT12 | BRAJCWT12 |
| Reaction lever ASSY type | | | BRAJCL06 | BRAJCL08 | BRAJCL10 |
| Dimensions | Length | mm | 265 | 265 | 265 |
| | Height | mm | 140 | 140 | 140 |
| | Width | mm | 139 | 139 | 139 |
| Mass ※1 | | kg | 5.5 | 5.5 | 5.5 |
| Correct chuck type | | | BR06/BRT06 | BR08/BRT08 | BR10/BRT10 |
| Correct BR-AJC_M type | | | BR-AJC06M | BR-AJC08M | BR-AJC10M |
| Correct soft jaw type | | | SJ06B1<br>SJ06A1T<br>SJ06A1-066 ※2<br>SJ06A1T066 ※2 | SJ08B1<br>SJ08A1<br>SJ08S1<br>SJ08A1-056<br>SJ08A1T056 | SJ10B1<br>SJ10A1<br>SJ10A1-056 |
| Max. soft jaw height | | mm | 56 ※2 | 56 | 56 |
| Set tightening torque | | N･m | 47 | 80 | 107 |
| Tightening torque accuracy | | % | ±5 | | |
| Max. loosening torque | | N･m | 160 | | |
| Max. number of tightening count | | time<br>s | 16,777,215 | | |
| Wrench stroke | | mm | 13 | | |
| Gripper jaw stroke in dia. | | mm | 16 | | |
| Ambient temperature range ※3 | | ℃ | 5～50 | | |
| Ambient humidity range ※3 | | % | 30～95 | | |
| Noise level | | dB | 79 | | |
| Ingress Protection | | | Equivalent to IP53 | | |
| Lamp | | | Green: Lights up in sync with START signal<br>Red: Lights up in sync with ERR signal<br>Green lighting has priority when START signal = ON while ERR = ON | | |

※1 : Signal cables and pneumatic piping are not included.

※2 : Machining to a max. jaw height to 56mm or less.

※3 : No condensation or freezing.

### 3.1.2. Electrical specifications

Table 14 Electrical specifications

| Type | BR-AJC06E / BR-AJC08E / BR-AJC10E | | |
|---|---|---|---|
| Input signals | START | Pneumatic supply | OFF = Stop、ON = Rotation |
| | | Load | Solenoid valve(DC24V/50mA or more) |
| | DIR | Switching direction of rotation | OFF = Right（Bolt Tightening）<br>ON = Left（Bolt Loosening） |
| | | Load | Solenoid valve(DC24V/50mA or more) |
| | LOW | Low speed reverse rotation instruction | OFF = Tightening/Loosening<br>ON = Low speed reverse rotation |
| | | Load | Photo coupler(DC24V/20mA or more) |
| Output signals | STOP | Auto stop | ON = stop |
| | | Output | Open collector(DC24V/30mA or less) |
| | ERR | Error | ON = Error |
| | | Output | Open Collector(DC24V/30mA or less) |
| Supply voltage | DC 24 V / 10 W or more | | |

#### 3.1.2.1. Description of Input Signals

- START

  This signal is directly connected to the integrated driving solenoid valve. Energizing the end effector supplies pneumatic pressure and the nutrunner starts.

- DIR

  This signal is directly connected to the solenoid valve for changing the rotation direction. During energization, the rotation changes to left.

- LOW

  This signal specifies low speed reverse rotation. During energization, the rotation changes to low speed reverse rotation.

Table 15 Signal, rotation direction, and mode

| DIR signal | LOW signal | Rotation direction | Mode |
|---|---|---|---|
| OFF | OFF | Right | Tightening |
| OFF | **ON** | Left | Low speed |
| **ON** | OFF | Left | Loosening |
| **ON** | **ON** | Right | Low speed |

### 3.1.2.2. Description of Output Signals

The output signal output method can be switched between N.O. (normally open) and N.C. (normally closed). Refer to “5. Setting the Main Body”.

- STOP

  The solenoid valve turns OFF when the set torque is reached or under the ERR conditions. It turns ON when the integrated motor is stopped (at N.O.)

  When the solenoid valve turns OFF, the nutrunner rotates at a low speed to eliminate the remaining torque.

  When the remaining torque is eliminated, STOP turns OFF (at N.O.)

- ERR

  This signal turns ON under the following conditions (at N.O.)

  - Insufficient torque
    - During tightening, the set torque is not reached within the preset time of the insufficient torque timer.
    - The default setting for the insufficient torque timer is 10 seconds.
    - During tightening, a torque of 1 N·m or more is detected and then rotation stops before the set torque is reached.
  - Over torque

    During tightening, the torque reaches set torque + 20 N·m.
  - Loosening limit

    The torque has reached the loosening limit torque of 160 N·m.
  - Offset error

    An internal error occurs.

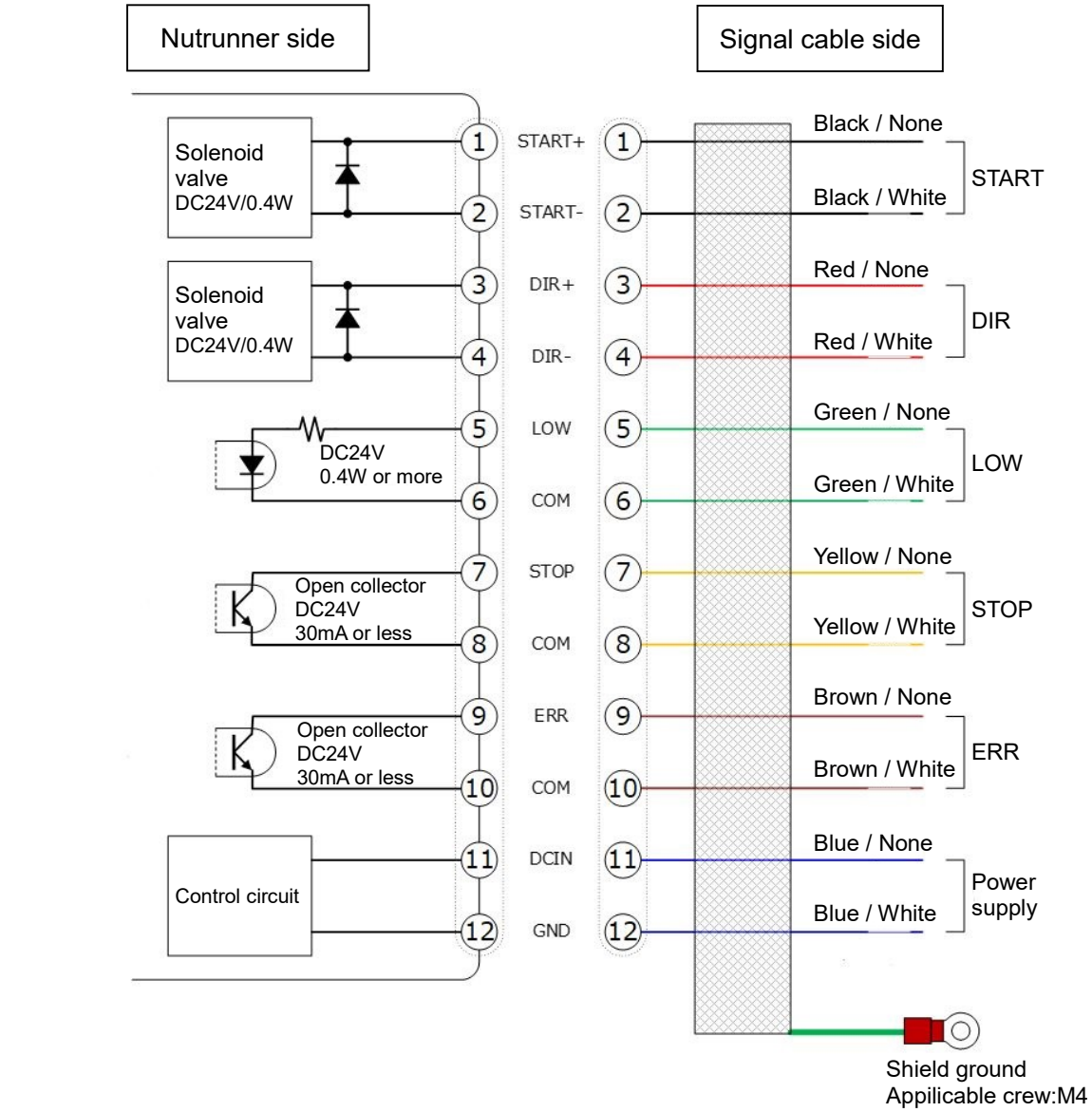
## 3.1.3. Signal Cable Specifications

Table 16 Signal cable parts specifications

| Name | Model | Manufacturer |
|---|---|---|
| Receptacle on nutrunner side | LF10WBRB-12S | HIROSE ELECTRIC |
| Plug on cable side | LF10WBP-12P | HIROSE ELECTRIC |
| Cable | SS300RSB-28-6P-10 | MISUMI |

Table 17 Signal cable Specifications

| Signal name | | Pin No. | Cable color (Sheath color/point color) |
|---|---|---|---|
| Start | START+ | 1 | Black/None |
| | START- | 2 | Black/White |
| Rotation direction switching | DIR+ | 3 | Red/None |
| | DIR- | 4 | Red/White |
| Low speed reverse rotation instruction | LOW+ | 5 | Green/None |
| | COM | 6 | Green/White |
| Automatic stop output | STOP | 7 | Yellow/None |
| | COM | 8 | Yellow/White |
| Error output | ERR | 9 | Brown/None |
| | COM | 10 | Brown/White |
| Power supply | DCIN | 11 | Blue/None |
| | GND | 12 | Blue/White |
| Shielded earth | - | - | Green/Yellow |



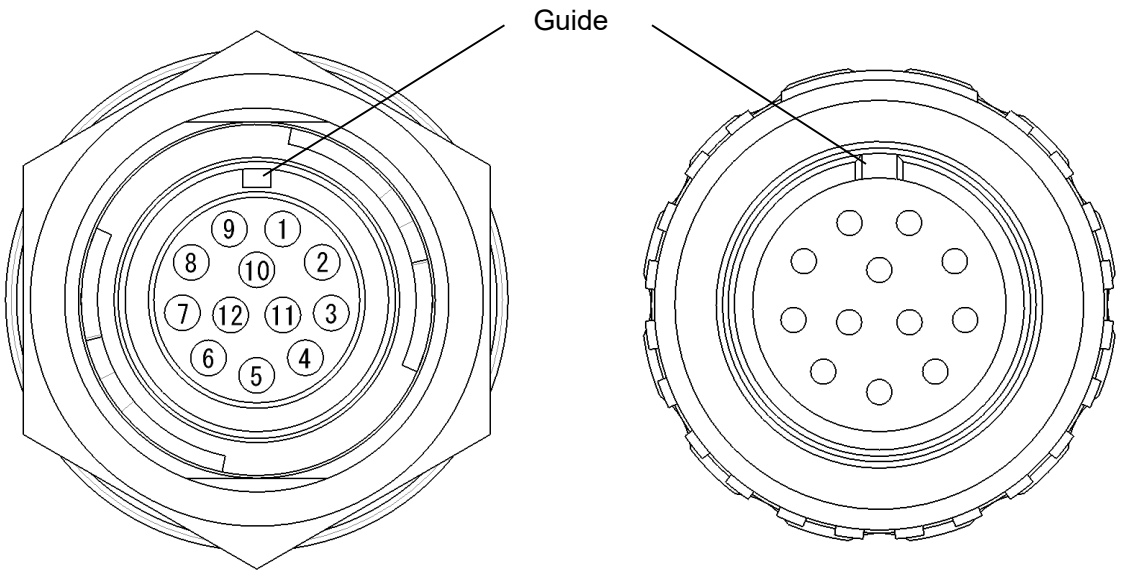




Figure 8 Signal cable specifications

### 3.1.4. Reed switch specifications

Table 18

| Item | For bolt tightening / loosenting PXS1 | For bolt tightening / loosening PXS2 | Confirm gripper opening PXS3 | Confirm fripper closing PXS4 |
|---|---|---|---|---|
| Type | D-M9BV | | D-M9B | |
| Manufacturer | SMC | | | |
| Operating voltage | 10～28 V | | | |
| Operating current | 2.5～40 mA | | | |
| Lead wire length | 500 mm | | | |

### 3.1.5. Pneumatic specifications

Table 19

| Item | Nutrunner | Gripper |
|---|---|---|
| Type | PTS-150EX-KAJC-3A | NTS208 |
| Working air pressure | 0.5～0.7 MPa | 0.5～0.7 MPa |
| Air consumption | 200 L/min(nor) | 18.8 $cm^3$ (reciprocation) |

## 3.2. BR-AJC Tnut

Table 20

| BR-AJC_M type | | BR-AJC06M | BR-AJC08M | BR-AJC10M |
|---|---|---|---|---|
| Jaw mounting bolt | Head shape | TORX | TORX | TORX |
| | Drive size | T50 | T55 | T55 |
| | Thread size | M10×25 | M12×30 | M12×30 |
| O-ring | | P12.5 | P15 | P15 |
| Positioning nut adjustment range | mm | 10.5 | 10.5 | 19.5 |
| Tightening torque | N･m | 47 | 80 | 107 |
| Mass ※1 | kg | 0.12 | 0.19 | 0.23 |

※1：Per jaw. Soft jaws are not included.

## 3.3. BR-AJC Jaw stocker

Table 21

| Type | BR-AJC06S | BR-AJC08S | BR-AJC10S |
|---|---|---|---|
| Correct BR-AJC_M type | BR-AJC06M | BR-AJC08M | BR-AJC10M |

## 3.4. Soft Jaw Machining Prohibition Area

The shaded area in Figure 9 is the machining prohibition area.

Leave the machining inhibition area without machining when forming soft jaws.

- The prohibition area will receive the reaction lever when the jaw mounting bolts are tightened using the BR-AJC end effector.

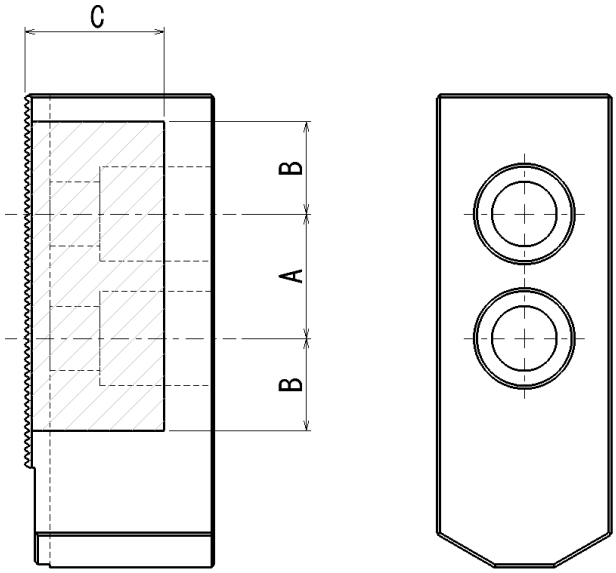



Figure 9 Machining prohibition area(shaded area)

Table 22 Dimension of soft jaw processing prohibition area

| BR-AJC end effector type | BR-AJC06E | BR-AJC08E | BR-AJC10E |
|---|---|---|---|
| A | 20 | 25 | 30 |
| B | 15 | 18.5 | 18.5 |
| C | 28 | 28 | 28 |

# 4. Assembly and Mounting

## 4.1. Assembling the BR-AJC End Effector

Mount the wrench assy and the reaction lever assy to the main body assy.

Refer to Figure 10, Figure 11, and **Table 23**.

① Insert the spring [2] and wrench [1] in the socket.

② Tighten the hex. socket head cap screw [3] to the washer [4], and then tighten it through the hole in the socket ring and into the screw hole of the wrench [1].

The socket ring slides freely before the wrench [1] is installed and may go into the back.

③ Mount the reaction lever [5] with the projection and depression aligned, and tighten the screw [6].

④ Expand and retract the wrench [1] to confirm that it satisfies the wrench stroke specified in 3.1.1. Basic Specifications **Table 13**.

Table 23 Tightening torque

| No. | Parts name | Tightening torque |
|---|---|---|
| 3 | Hex. socket head cap screw | 1.6 N・m |
| 6 | Screw | 3.5 N・m |

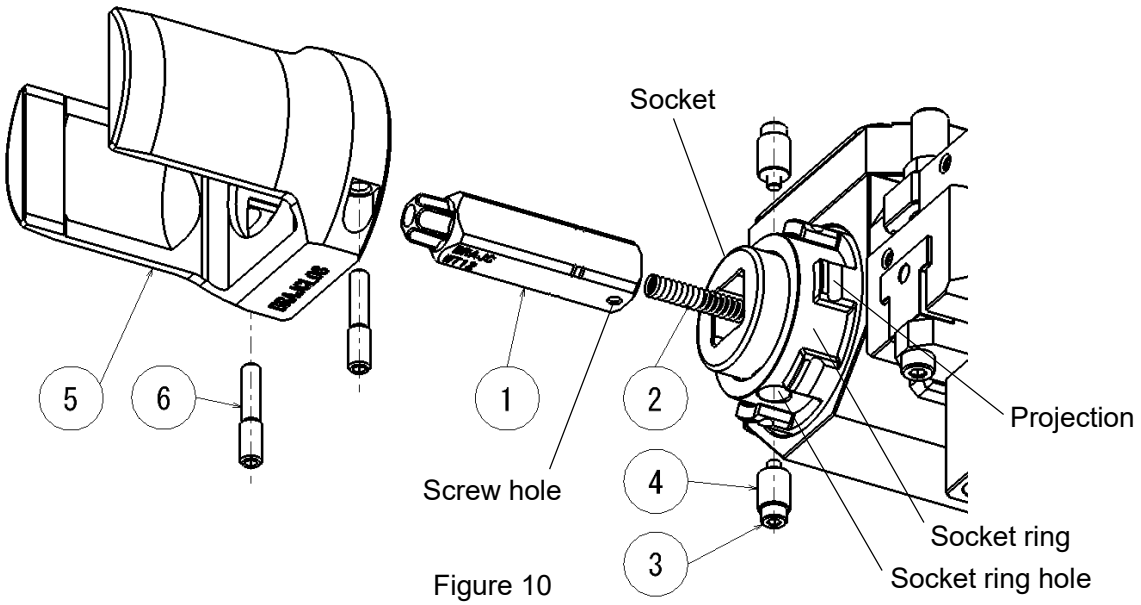



Figure 10

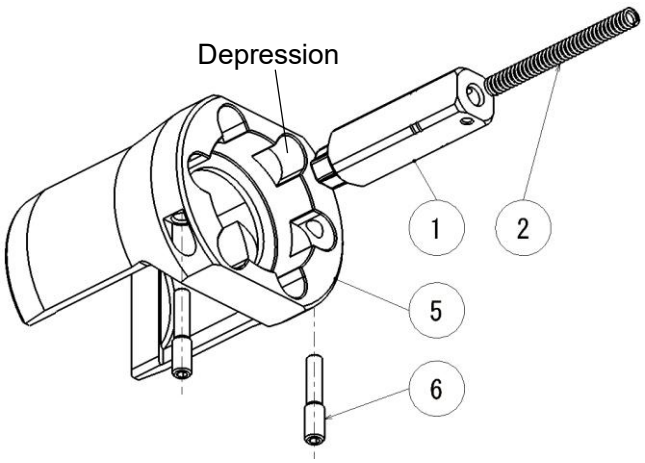



Figure 11

## 4.2. Mounting the BR-AJC End Effector

### 4.2.1. Assembling the BR-AJC End Effector

Two mounting methods are available. Select in accordance with the mounting target.

- When mounting from the bottom surface

Read the following procedure also referring to "1.8.1. BR-AJC End Effector".

① Before start of work, be sure to turn off the main power of the machine.
② Loosen the cross-recessed pan-head head machine screw [10] and remove the cover [9].
③ Loosen the hex. socket head cap screw [8] and remove the adapter plate [7].
④ Mount to the adapter using the hex. socket head cap screw [11] and the washer [12].
The adapter is to be prepared by the customer.
⑤ Assemble in the reverse order. For the tightening torque, refer to Table 24.

Table 24

| No. | Parts name | Tightning torque |
|---|---|---|
| 8 | Hex. socket head cap screw | 6.0 N･m |
| 10 | Cross-recessed head machine screw | 1.1 N･m |
| 11 | Hex. socket head cap screw | 3.0 N･m |

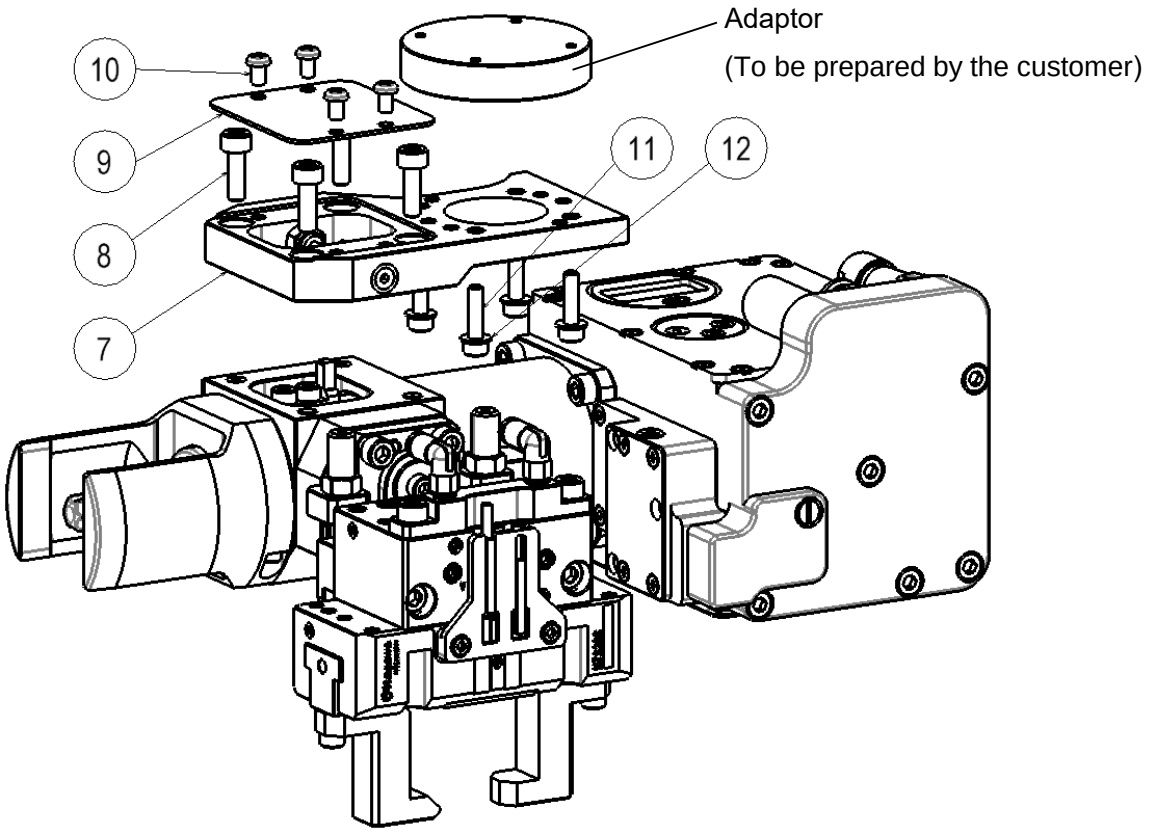



Figure 12 Adaptor mounting

- When mounting from the top surface

Use the screw holes on the adapter plate [7] for installation.

Adapters and mounting bolts must be prepared by the customer.

Table 25

| Mounting bolt | Tightnening Torque |
|---|---|
| M4 | 3.0 N･m |

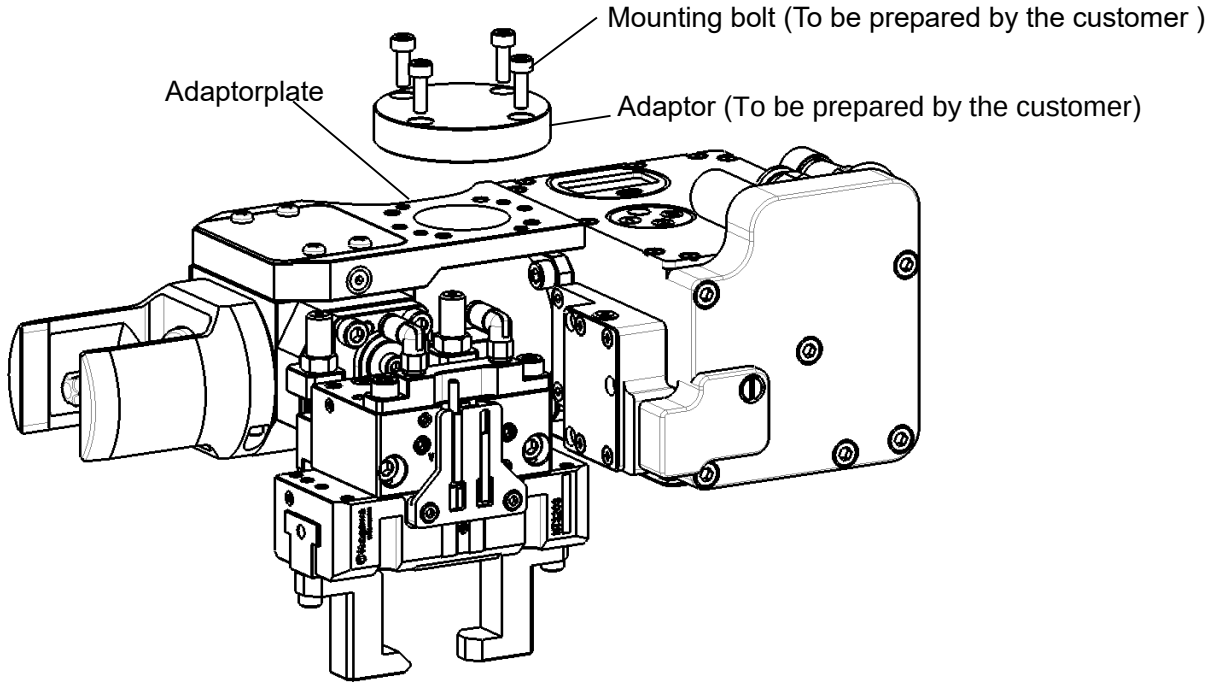



Figure 13 Adaptor mounting

**⚠ Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**Be sure to tighten bolts to the specified torque.**

**Use a proper tool that can control torque such as a torque wrench.**

- **If insufficient bolts are mounted of tightening torque is improper, the bolts may be damaged, causing the end effector and workpiece to fly out.**

### 4.2.2. Reed Switch Mounting Procedure

#### 4.2.2.1. Mounting the Reed Switch for bolt tightening/loosening

Tighten and fix the setscrew provided on the reed switch into the groove in the switch bracket. For the position, see Figure 14 and Figure 15 and Table 26.

The mounting positon of the reed switch may need to be adjusting during robot teaching. Refer to "6.4. Confirm program operation and adjust reed switches ".

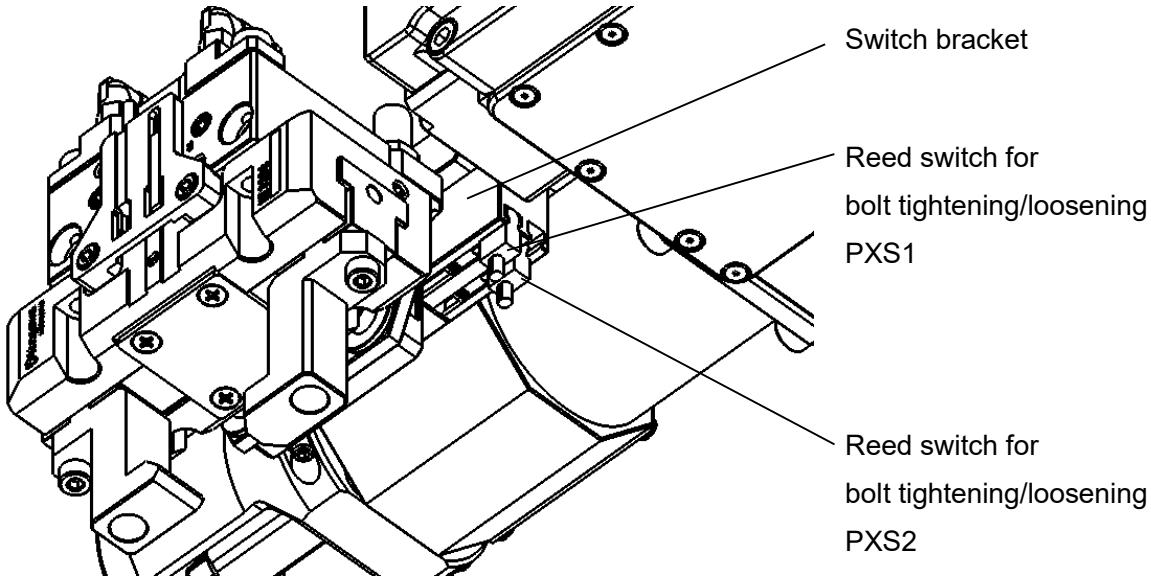



Figure 14 Reed switch mounting location

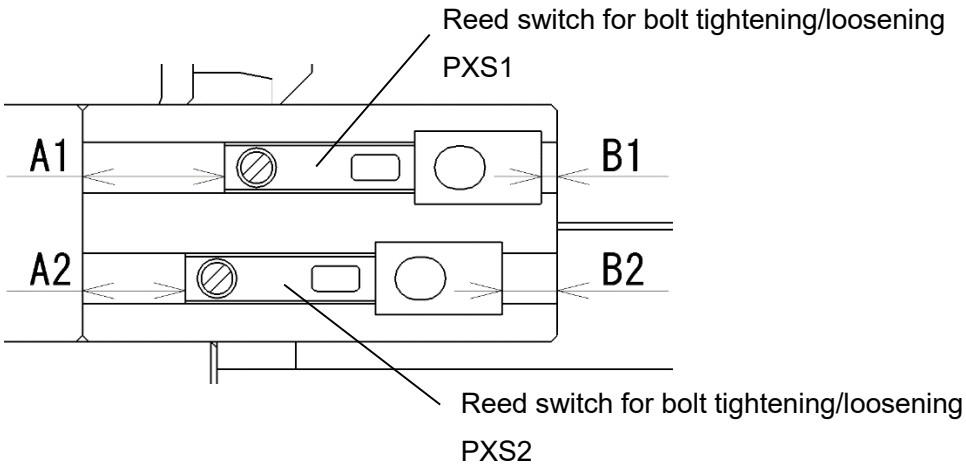



Figure 15 Reed switch mounting position

Table 26 Reed switch mounting position

| Type | PXS1 | | PXS2 | |
|---|---|---|---|---|
| | A1 | B1 | A2 | B2 |
| BR-AJC06E | 8 | 2 | 6 | 4 |
| BR-AJC08E<br>BR-AJC10E | 9.5 | 0.5 | 6.5 | 3.5 |

### 4.2.2.2. Mounting the Gripper Open/Close Confirmation Reed Switch

Mount the supplied reed switch using the reed switch bracket.

For the tightening torque, refer to Table 27.

Table 27

| No. | Mounting bolt | Tightening Torque |
|---|---|---|
| 15 | Hex. socket head cap screw | 1.3 N·m |

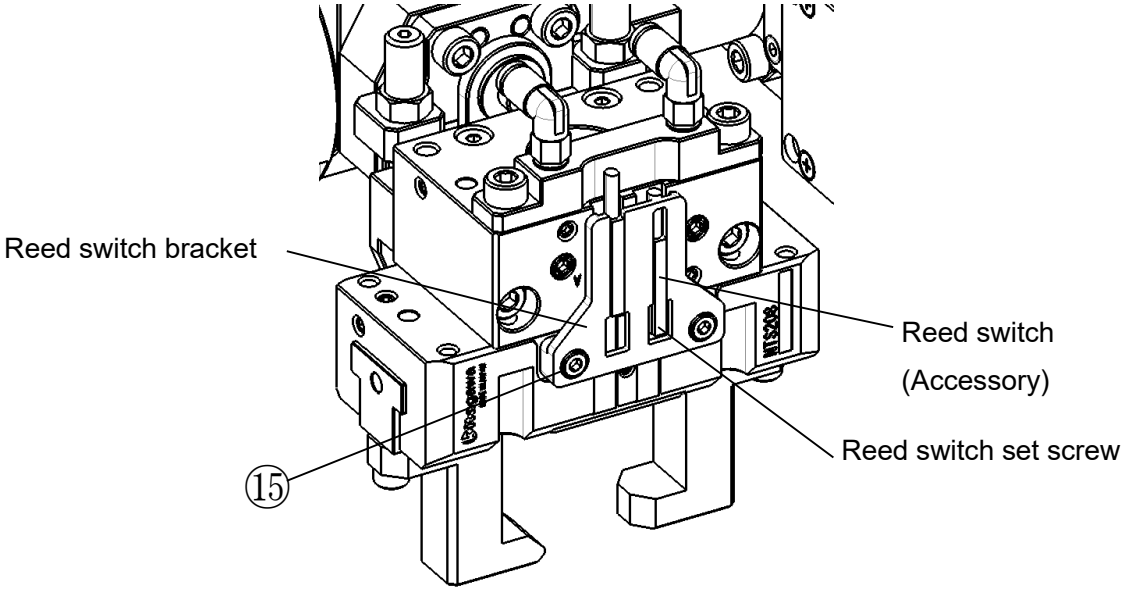



Figure 16 Mounting reed switch

- Mounting procedure for the close end side

① Close the gripper.
② Mount the reed switch using the reed switch bracket.
③ Move up and down the reed switch slowly.
④ Tighten and fix the setscrew provided on the reed switch at the position where the reed switch detected.
⑤ Repeat the opening/closing operation of the master jaws to confirm that the reed switch can detect.

- Mounting procedure for the open end side

① Open the gripper.
② Mount the reed switch using the reed switch bracket.
③ Move up and down the reed switch slowly.
④ Tighten and fix the setscrew provided on the reed switch at the position where the reed switch detected.
⑤ Repeat the opening/closing operation of the master jaws to confirm that the reed switch can detect.

### 4.2.3. Pneumatic Piping Installation Procedure

Install a pneumatic piping tube to the pneumatic port for driving the nutrunner and opening/closing the gripper.

The pneumatic piping is to be prepared by the customer.

Table 28 Port specifications

| | Applicable Tube Outer Diameter | Pipe Fitting Thread Size |
|---|---|---|
| Nutrunner pneumatic supply port | 8 mm | - |
| Gripper opening port | 4 mm | M5 |
| Gripper closing port | 4 mm | M5 |

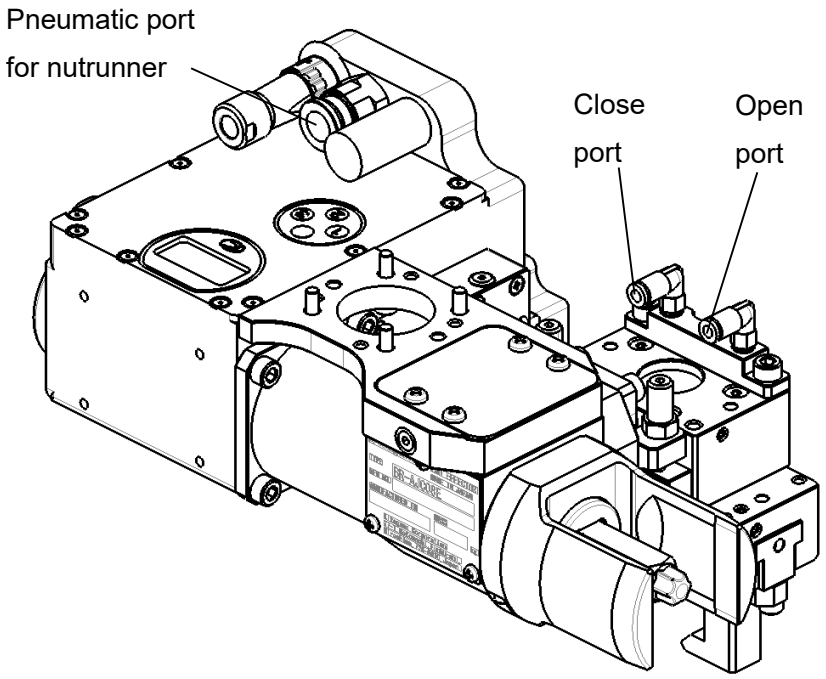



Figure 17 Pneumatic port location

- Installing pipng

① Insert the tube gradually, and securely push it in to the tube end.

② After inserting the tube to the end, pull it lightly to check that it is not pulled out.

③ Check that the tube is not bent or crushed when installing it.

- Removing piping

① Push the release bushing of the piping joint evenly into the direction of arrow with your fingers.

② Pull out the tube while holding the release bushing to prevent it from being pushed back.

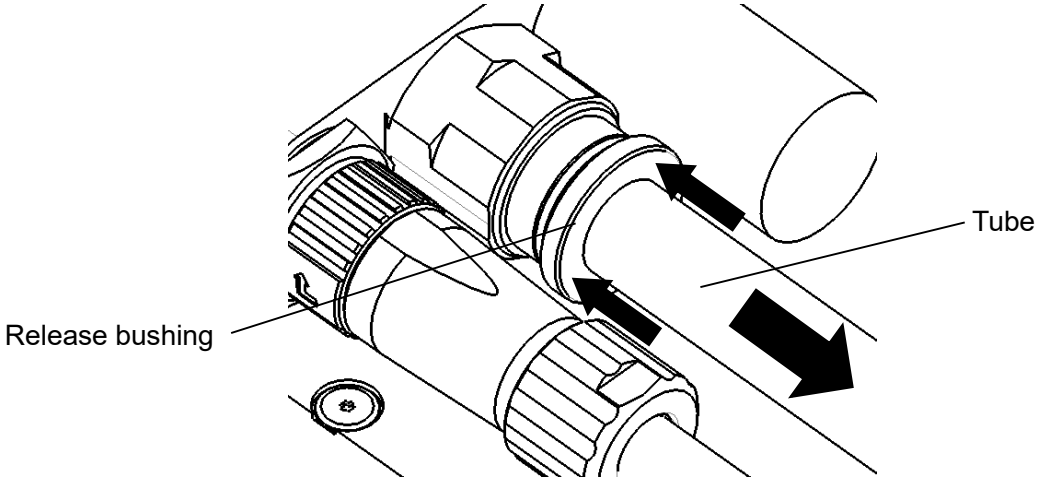



Figure 18 Remove pipng

**⚠Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**Be sure to turn off the main power supply,**
**Shut off all air pressure in the work area and relieve any remaining air pressure inside the end effector,**
**Post a sign or notice, or provide a fence, and so on to notify people around the machine that work is in progress.**

- During work, the robot or end effector could move abruptly and collide with body.
- Unexpected machine operation by a third party may result in a collision with body.

**⚠Warning** Failure to follow the safety precautions below could result in death or serious injuries.

**Use compr essed air as the fluid.**
**Do not use compressed air containing chemicals, synthetic oils containing organic solvents, or salt corrosive gases.**
**Use clean air that has passed through an air filter (filtration of 5 μm or less).**
**Keep the fluid temperature and ambient temperature within the range of 5 to 50°C.**
**Select an after cooler, air dryer, mist separator, etc., according to ISO 8573 1 Class 4, and take measures against drainage.**

- Jaws are not installed properly or grippers are not gripped properly, causing workpieces to fly out.

### 4.2.4. Signal Cable Installation Procedure

Connect the supplied signal cable to the nutrunner.

① Confirm the projection/depression position of each connector.

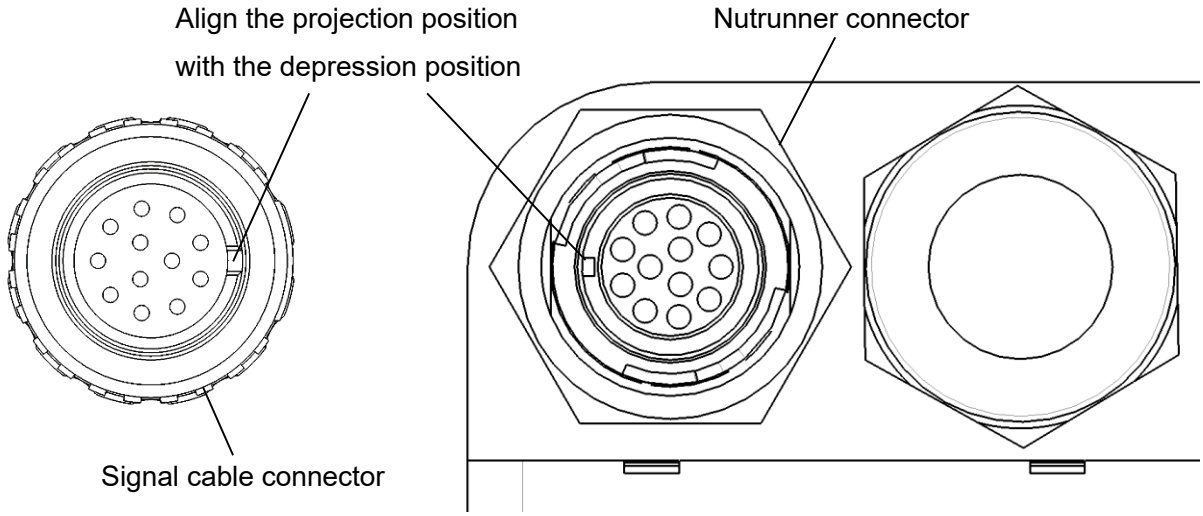



Figure 19 Connector projection/depression position

② After inserting the connector, rotate the sleeve until locked.

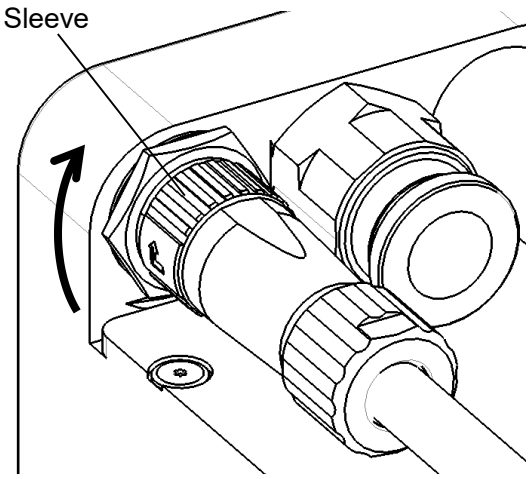



Figure 20 Locking the connector

**Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**Be sure to turn off the main power supply,**
**Shut off all air pressure in the work area and relieve any remaining air pressure inside the end effector,**
**Post a sign or notice, or provide a fence, and so on to notify people around the machine that work is in progress.**

- During work, the robot or end effector could move abruptly and collide with body.
- Unexpected machine operation by a third party may result in a collision with body.

| **Notice** | Indicates instructions which, if you do not heed given instructions, could result in damage to the product or shortened service life, or damage to peripheral equipment. |
|---|---|

**Be sure to use shielded cables when connecting the BR-AJC end effector and the host control unit.**

**Install the cables away from high voltage sources and high current sources.**

**Ground the BR-AJC end effector.**

- Malfunction due to noise will result in the failure of jaw change, causing suspension of facilities or breakage of parts.

## 4.3. Mounting the BR-AJC T-nut

Read the following procedure also referring to "1.8.2. BR-AJC T-nut" and the BR-AJC_M instruction manual.

① Attach the O-ring [2] to the jaw mounting bolt [1].

② Mount soft jaws to BR-AJC_M with ①.

③ Mount them to the chuck and form the soft jaws.

## 4.4. Mounting the BR-AJC Jaw Stocker

Using one of the bolts in Table 29, attach the jaw stocker to the base are as shown as in Figure 21.

The base is to be prepared by the customer.

See Figure 22, Table 30, Figure 23, and Table 31 for reference dimensions.

Table 29 Mounting bolt specifications

| Parts name | BR-AJC06S | BR-AJC08S | BR-AJC10S | Manufacturer |
|---|---|---|---|---|
| Low head hex. socket head cap screw | CBS6 | CBS8 | CBS8 | MISUMI |
| Hex. socket head cap screw | M8 | M10 | M10 | - |

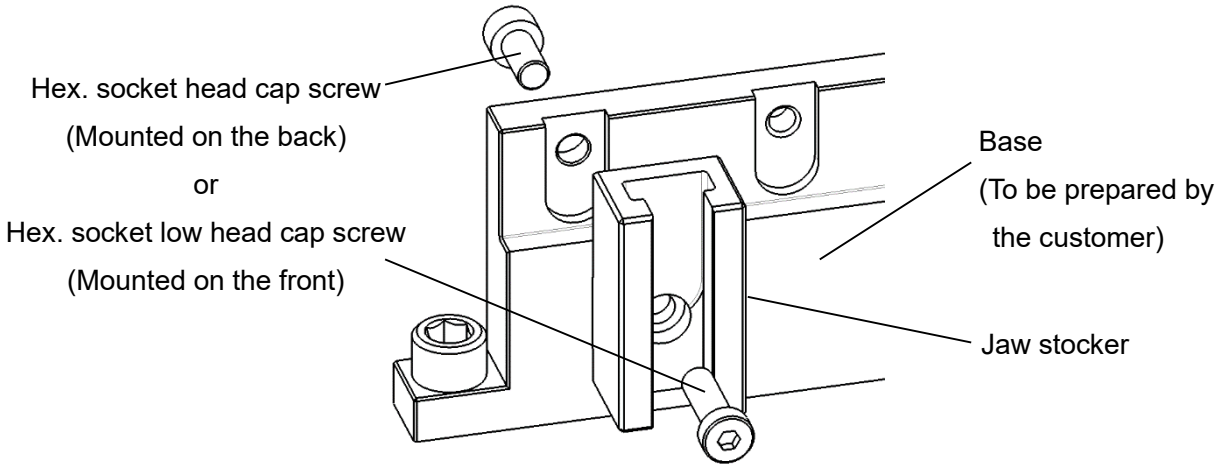



Figure 21 Mounting the BR-AJC Jaw stocker

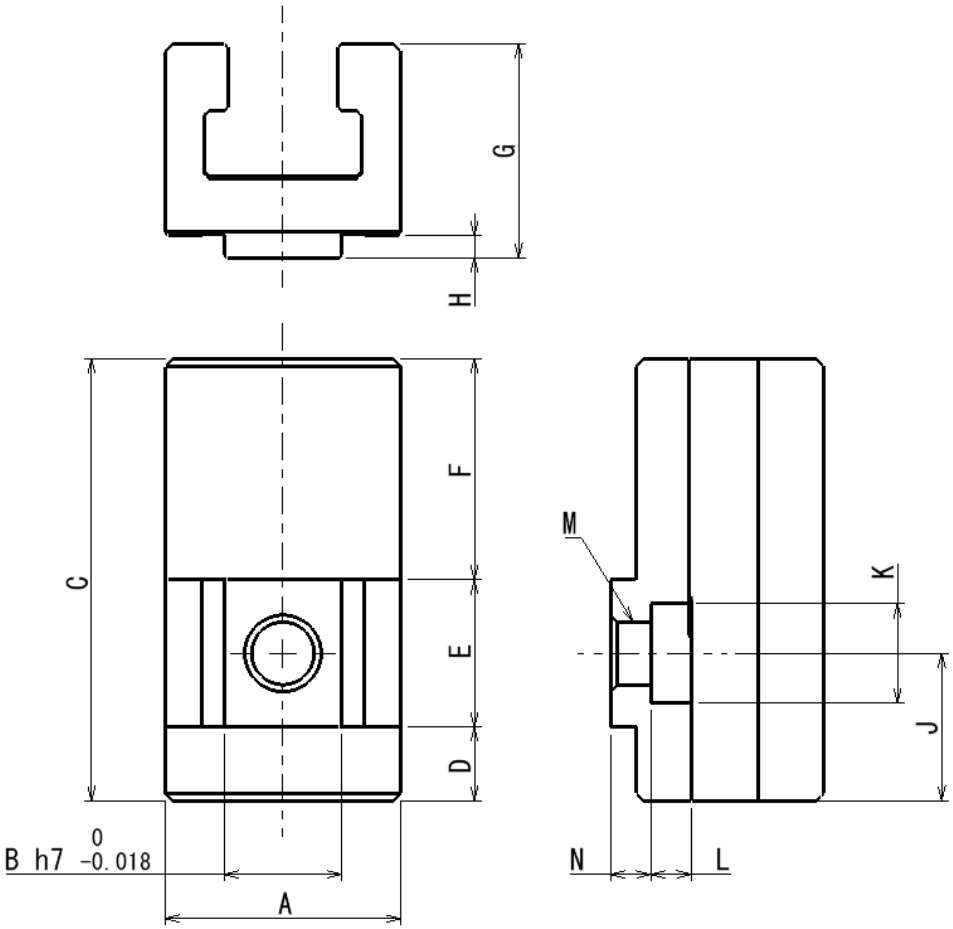



Figure 22 Dimensions of BR-AJC Jaw stocker

Table 30 BR-AJC Jaw stocker dimensions

| Type | A | B | C | D | E | F | G | H | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BR-AJC06S | 29 | 16 | 47.5 | 10 | 20 | 17.5 | 27 | 3 | 20 | 10.5 | 4.5 | M8 | 6.5 |
| BR-AJC08S | 32 | 16 | 60 | 10 | 20 | 30 | 29 | 3 | 20 | 13.5 | 5.5 | M10 | 5.5 |
| BR-AJC10S | 34 | 16 | 72.5 | 10 | 20 | 42.5 | 30 | 3 | 20 | 13.5 | 5.5 | M10 | 5.5 |

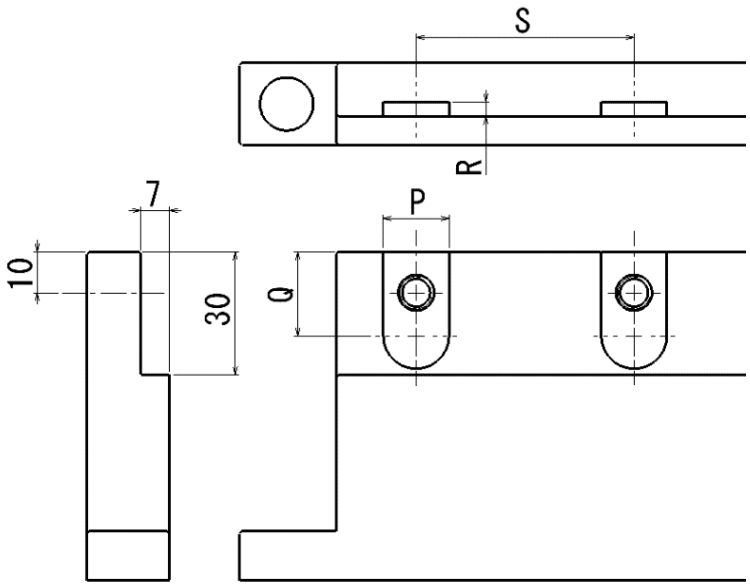



Figure 23 Reference dimensions of base

Table 31 Reference dimensions of base

| Type | P | Q | R | S |
|---|---|---|---|---|
| BR-AJC06S | 16 | 20.5 | 3.5 | 50 |
| BR-AJC08S | 16 | 20.5 | 3.5 | 55 |
| BR-AJC10S | 16 | 20.5 | 3.5 | 60 |

# 5. Setting the Main Body

Each parameter can be confirmed or changed.

Before use, refer to “5.1.1. Change of set torque” and change the set torque according to the type.

**Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**Use the set torque according to the type.**

- Otherwise, they may be broken, causing the workpiece to fly out.

## 5.1. Operation Key and Monitor

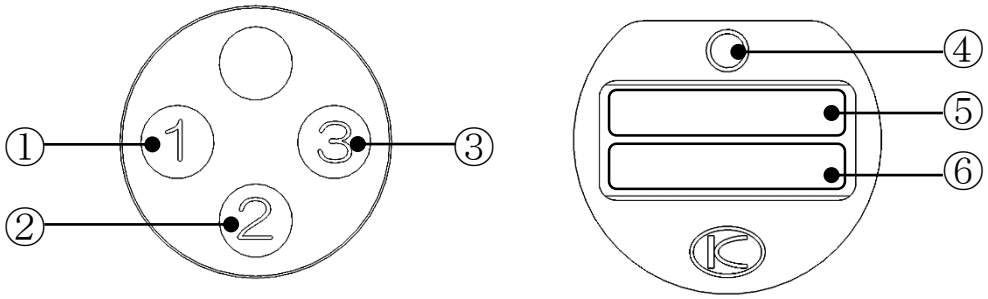



Figure 24 Operation key and monitor

Table 32 Name and function of each part

| Name | | Function | |
|---|---|---|---|
| | | Standby state | Torque change mode<br>Parameter Setting Mode |
| 1 | ①Key | Long press: Transitioning to the set torque change mode | + (plus) key |
| 2 | ②Key | Short press: Displaying the number of bolts tightened | SET key |
| 3 | ③Key | Long press: Transitioning to the parameter setting mode | - (minus) key |
| 4 | Judgment lamp | Rotating: Green lamp ON<br>Outputting ERR: Red lamp ON | - |
| 5 | Display | Set torque | Refer to "5.1.1. Changing the Set Torque". |
| 6 | | Status/Tightening torque | |

### 5.1.1. Changing the Set Torque

A) Press and hold the ① key for at least two seconds.

B) The torque change mode is activated. Increase or decrease the value using the ① (+) or ③ (-) key.

C) To confirm the value, press the ② (SET) key.

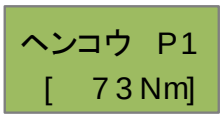



Table 33 Default setting

| Type | | BR-AJC06E | BR-AJC08E | BR-AJC10E |
|---|---|---|---|---|
| Set torque | N･m | 47 | 80 | 107 |
| Setting range | N･m | 20～150 | | |

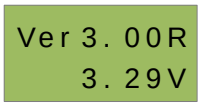
### 5.1.2. Parameter Setting Mode

To activate the parameter setting mode, press and hold the ③ key for at least two seconds.

#### 5.1.2.1. Version Display and Voltage Monitor

The version of the firmware and the voltage of the internal circuit (not the voltage of the external power supply) are displayed.

- When the displayed voltage is less than 3 V, check the voltage of the external power supply.
- Press the ② (SET) key to transition to the next item.

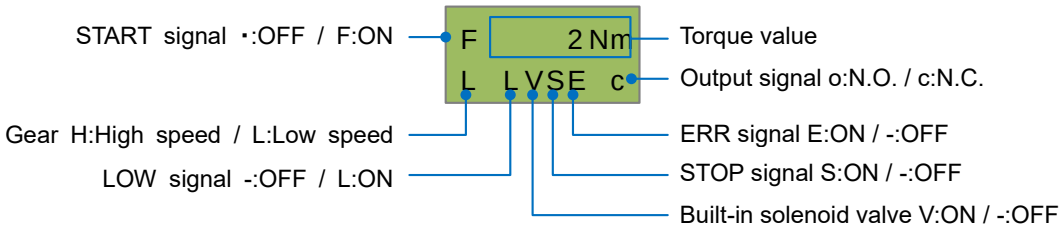



#### 5.1.2.2. Manual Maintenance

The current sensor status and torque selection signal can be monitored.

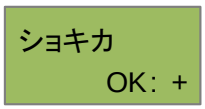
Also, the integrated STOP/ERR signal can be turned ON and OFF manually.

- Each time the ① (+) key is pressed and held, the STOP/ERR signal output system can be switched between N.O. (normal open) and N.C. (normal close).
- Press and hold the ② (SET) key to transition to the next item.



### 5.1.2.3. Initialization

Each parameter can be reset.




- The parameters are initialized by pressing and holding the ① (+) key.
- When not initializing the parameter, press the ② (SET) key to transition to the next item.

Table 34 Initial setting*1

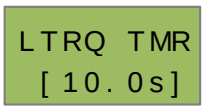
| Type | | BR-AJC06E | BR-AJC08E | BR-AJC10E |
|---|---|---|---|---|
| Set tinghtening torque | N･m | 100 | | |
| Insufficient Torque Timer | Second | 10.0 | | |
| Output signal | | N.O. Normal open | | |

*1 The set tightening torque for each BR-AJC end effector type different from the initial values. (Refer to Table 9 in 3.1.1. Basic Specifications)

### 5.1.2.4. Insufficient Torque Timer

This timer is used for detecting insufficiency of torque when tightening is not completed within the predetermined tightening time.

When tightening starts, the insufficient torque timer starts. When tightening is not completed within the set time, it determines insufficiency of torque and the operation stops automatically. Then, the STOP and ERR signals are output.




- Increase or decrease the value using the ① (+) and ③ (-) keys.
- Press the ② (SET) key to confirm the value and transition to the next item.

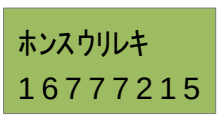
Table 35 Insufficient torque timer specifications

| Type | | BR-AJC06E | BR-AJC08E | BR-AJC10E |
|---|---|---|---|---|
| Default setting | Second | 10.0 | | |
| Setting range | Second | 0.1～19.9 | | |

### 5.1.3. Displaying the Number of time Tightening

The total number of times of tightening can be checked.

- Press the ② (SET) key shortly in the standby state, and the bolt count is displayed.
- Three seconds later, the display transitions to the standby state.
- Maximum value: 16777215



# 6. Control

## 6.1. Outline of Jaw Change Operation

For jaw change, the lathe, robot, and BR-AJC end effector must be controlled.

See Table 36 and create a program for each operation.

Table 36 Flow of jaw change operation

| | Operation | Contents | Reference |
|---|---|---|---|
| ① | Indexing the chuck | The chuck is indexed on the lathe so that the jaw mounting position comes directly above. | To be prepared by the customer. |
| ② | Taking out jaws | Jaws to be mounted are taken out of the jaw stocker. | 6.3.3. Teaching the Jaw Insertion/Removal Position |
| ③ | Inserting the jaws | The jaws are inserted into the chuck. | 6.3.3. Teaching the Jaw Insertion/Removal Position |
| ④ | Jaw Mounting Bolt Tightening | The jaw mounting bolts are tightened. | 6.3.2. Teaching the Bolt Tightening/Loosening Position<br>6.2.2. Bolt Tightening Operation |
| ⑤ | Repeat ① through ④ for the number of jaws to be mounted. | | |
| ⑥ | Machining the workpiece | A workpiece is mounted on the chuck, machined, and removed. | To be prepared by the customer. |
| ⑦ | Washing the chuck | The chuck is washed using coolant or air blow. | To be prepared by the customer. |
| ⑧ | Indexing the chuck | The chuck is indexed on the lathe so that the jaw removing position comes directly above. | To be prepared by the customer. |
| ⑨ | Jaw Mounting Bolt Loosening | The jaw mounting bolts are loosened. | 6.3.2. Teaching the Bolt Tightening/Loosening Position<br>6.2.3. Bolt Loosening Operation |
| ⑩ | Removing the jaws | The jaws are removed from the chuck. | 6.3.3. Teaching the Jaw Insertion/Removal Position |
| ⑪ | Repeat ⑧ through ⑩ for the number of jaws to be removed. | | |
| ⑫ | Washing the jaws (Outside the machine) | The jaw washing unit removes chips on the jaws. | To be prepared by the customer. |
| ⑬ | Storing the jaws | The washed jaws are stored in the stocker. | 6.3.3. Teaching the Jaw Insertion/Removal Position |
| ⑭ | Washing the chuck (Inside the machine) | The chuck is washed using coolant or air blow. | To be prepared by the customer. |

## 6.2. BR-AJC End Effector Control Program

Tightening and loosening the bolts requires operation programs using the nutrunner input/output signals and reed switch signals.

Use a robot controller, PLC, etc. as the host control unit.

### 6.2.1. Operation Outline

Tightening/loosening the jaw mounting bolts is performed in each mode shown in Table 37.

Table 37 Operation mode

| Mode | | Rotation direction | DIR signal | LOW signal |
|---|---|---|---|---|
| A | Tightening | Right | OFF | OFF |
| B | Loosening | Left | ON | OFF |
| C | Inserting the wrench at tightening | Right | ON | ON |
| D | Inserting the wrench at loosening | Left | OFF | ON |

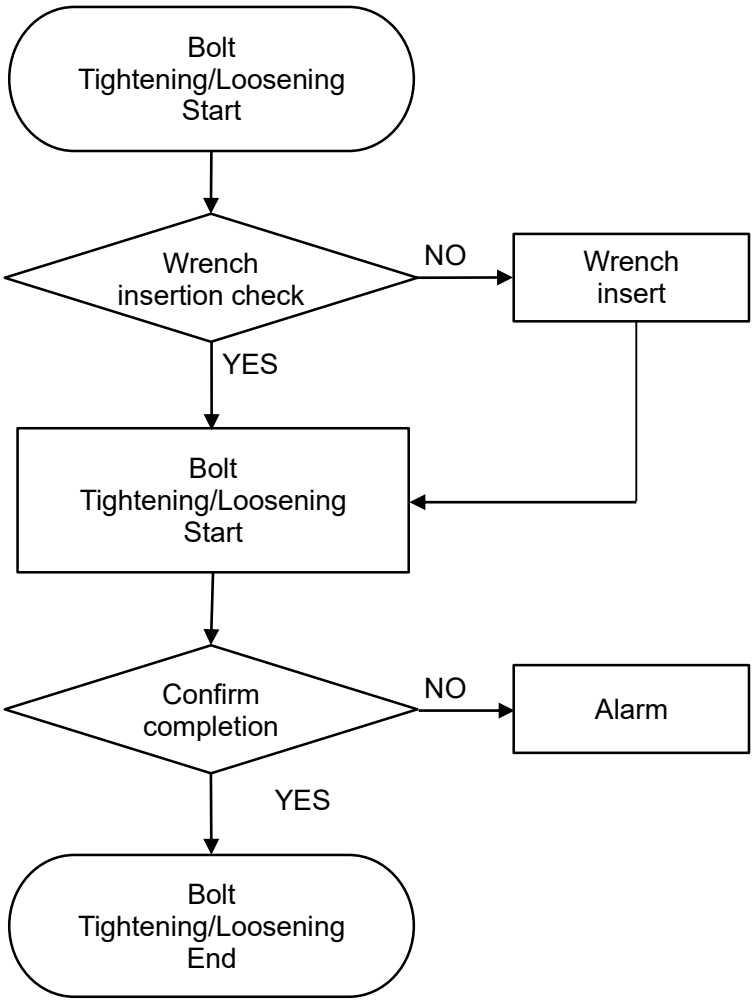



Figure 25 Flow chart of operation overview

### 6.2.2. Bolt Tightening Operation

① Move the robot to the "bolt tightening/loosening position" *1 and check the reed switch PXS1 signal.
When the signal is OFF : The wrench is inserted in the bolt hole. Go to ⑥.
When the signal is ON : The wrench not inserted in the bolt hole. Go to ②.

② Turn ON the START signal for 3 seconds in mode C (refer to Table 37 Operation mode in 6.2.1. Operation Outline).

③ During operation of ②, always check the PXS1 signal.
When the signal is OFF : Turn off the START signal and go to ⑥.
If still ON after 3 seconds : Turn off the START signal and go to ④.

④ Turn ON the START signal for 3 seconds in mode D (refer to Table 37 Operation mode in 6.2.1. Operation Outline).

⑤ During operation of ④, always check the PXS1 signal.
When the signal is OFF : Turn off the START signal and go to ⑥.
If still ON after 3 seconds : Some parts may be damaged. Stop operation of the system.

⑥ Activate mode A. (Refer to Table 37 Operation mode in 6.2.1. Operation Outline.)

⑦ Turn ON the START signal to start the tightening operation.

⑧ When the set torque is reached normally, the operation stops automatically and the STOP signal turns ON. Usually it takes about a few seconds. *2

⑨ The reaction lever rotates automatically in the reverse direction at a low speed. When the remaining torque caused by the reaction lever biting the soft jaw reduces, the STOP signal turns OFF.

⑩ The START signal turns OFF about 0 to 0.3 seconds after the STOP signal turns OFF.
Adjust time so that the reaction lever does not bite the soft jaw. *3

*1 For the bolt tightening/loosening position, refer to "6.3.2. Teaching the Bolt Tightening/Loosening Position".

*2 If the ERR signal turns ON when the START signal is ON, turn OFF the START signal to stop the operation. Bolt tightening may have failed. Parts may be broken if the operation continues.

*3 The appropriate time may vary depending on the pneumatic condition, communication speed of the control unit, etc.
Increase the time when the reaction lever still bites the soft jaw, and decrease the time when the reaction lever rotates excessively, biting the opposite side. We recommend that the adjustment be made in 0.1 second increments.

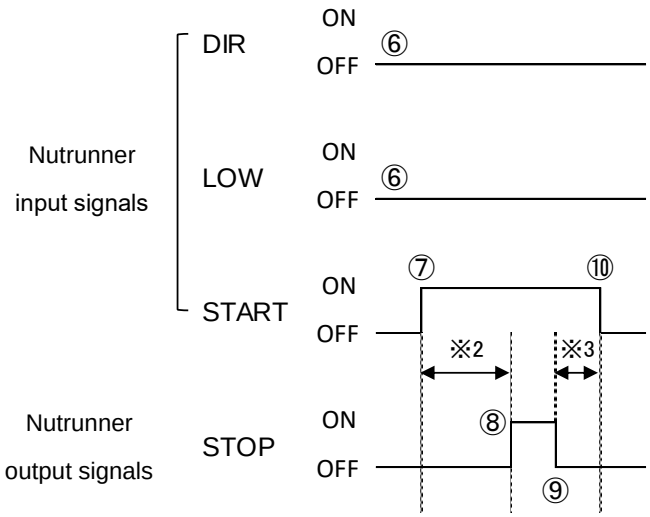



Figure 26 Bolt tightening timing chart

**Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**When the nutrunner ERR signal is output during tightening of the jaw mounting bolts, do not perform gripping or machining of a workpiece using the chuck subsequently.**

- If the jaw mounting bolts are not tightened properly, they may be broken, causing the workpiece to fly out.

### 6.2.3. Bolt Loosening Operation

① Move the robot to the "bolt tightening/loosening position" *1 and check the reed switch PXS1 and PXS2 signals.
When both signals is OFF : The wrench is inserted in the bolt hole. Go to ⑥.
When both of either signals are ON : The wrench not inserted in the bolt hole. Go to ②.

② Turn ON the START signal for 3 seconds in mode D (refer to Table 37 Operation mode in 6.2.1. Operation Outline).

③ During operation of ②, always check PXS1 and PXS2 signals.
When both signals are OFF : Turn off the START signal and go to ⑥.
If both or either are still ON after 3 seconds : Turn off the START signal and go to ④.

④ Turn ON the START signal for 3 seconds in mode C (refer to Table 37 Operation mode in 6.2.1. Operation Outline).

⑤ During operation of ④, always check PXS1 and PXS2 signals.
When both signals are OFF : Turn off the START signal and go to ⑥.
If both or either are still ON after 3 seconds : Some parts may be damaged. Stop operation of the system.

⑥ Activate mode B. (Refer to Table 37 Operation mode in 6.2.1. Operation Outline.)

⑦ Turn ON the START signal to start the loosening operation.

⑧ When the bolt is loosened to the detection position, the PXS2 signal turns ON. Usually it takes about three seconds. ※2

⑨ After confirming that the PXS2 signal is ON, immediately turn OFF the START signal.

*1 For the bolt tightening/loosening position, refer to "6.3.2. Teaching the Bolt Tightening/Loosening Position".

*2 In the following cases, turn OFF the START signal to stop the operation. Bolt loosening may have failed. Parts may be broken if the operation continues.

- When the ERR signal turns ON while the START signal is ON
- When the PXS2 signal does not turn ON even when five to ten seconds have elapsed after turning ON the START signal

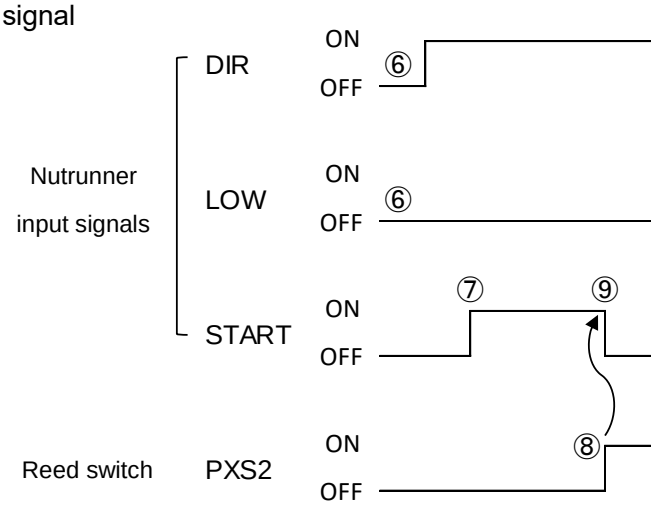



Figure 27 Bolt loosening timing chart

## 6.3. Robot Teaching

This section describes the method of robot teaching that is required for jaw change operation.

For operation of the robot, refer to the instruction manual prepared by your robot manufacturer.

Note that all robot motions in this section are performed in a linear motion.

Teaching can be performed without using force sensors or the sensory control function of the cooperative robot.

### 6.3.1. Creating the User Coordinates

For tightening/loosening the bolts correctly, and inserting/removing jaws to/from the chuck smoothly, we recommend creating user coordinates for the robot with reference to a jaw in the chuck.

① Mount a jaw to the chuck and index it to the jaw change position.

② Create user coordinates using the reference surface of the jaw shown in Figure 28.

- x, y, and z are optional signals for the sake of convenience.
- The x direction can be used for tightening/loosening the bolts. (6.3.2. Teaching the Bolt Tightening/Loosening Position)
- The y direction can be used for inserting/removing jaws. (6.3.3. Teaching the Jaw Insertion/Removal Position)

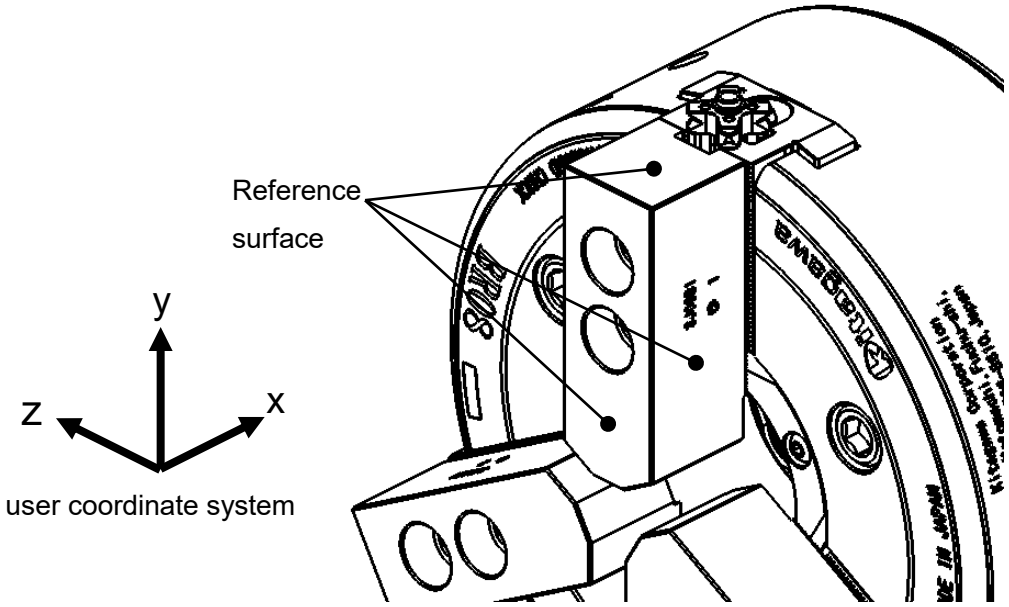



Figure 28

| **Notice** | Indicates instructions which, if you do not heed given instructions, could result in damage to the product or shortened service life, or damage to peripheral equipment. |
|---|---|
| | When changing jaws, index the chuck so that the jaw to be changed is positioned directly above.<br>● Otherwise, jaw change may fail, resulting in breakage of parts and suspension of facilities. |

### 6.3.2. Teaching the Bolt Tightening/Loosening Position

① Mount a jaw to the chuck and index it to the jaw change position.

② Adjust the posture of the BR-AJC end effector so that the rotation axis of the jaw mounting bolt and that of the BR-AJC end effector are coaxial. (Figure 29)

- We recommend removing the reaction lever for good visibility. (Refer to up to ② in 7.3.1. Wrench Replacement Procedure.)
- The adjustment can be made easily by creating user coordinates with reference to the jaw (refer to 6.3.1. Creating User Coordinates) and aligning the posture of the BR-AJC end effector with the user coordinates using the reference surface (Figure 28).

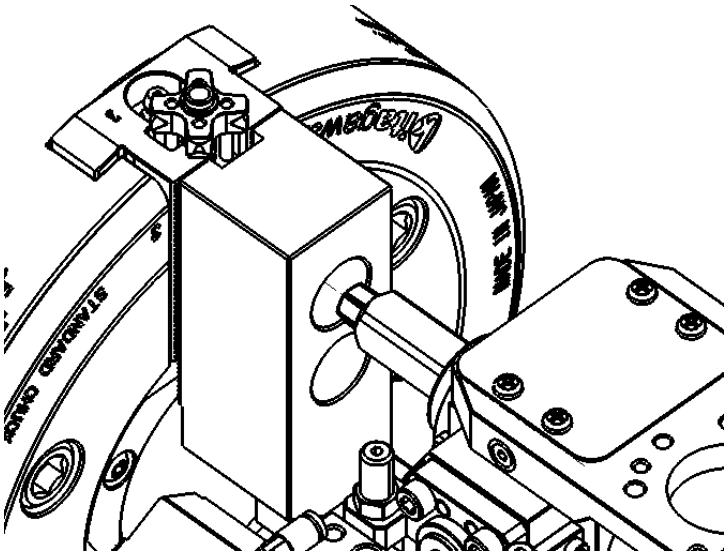


Figure 29

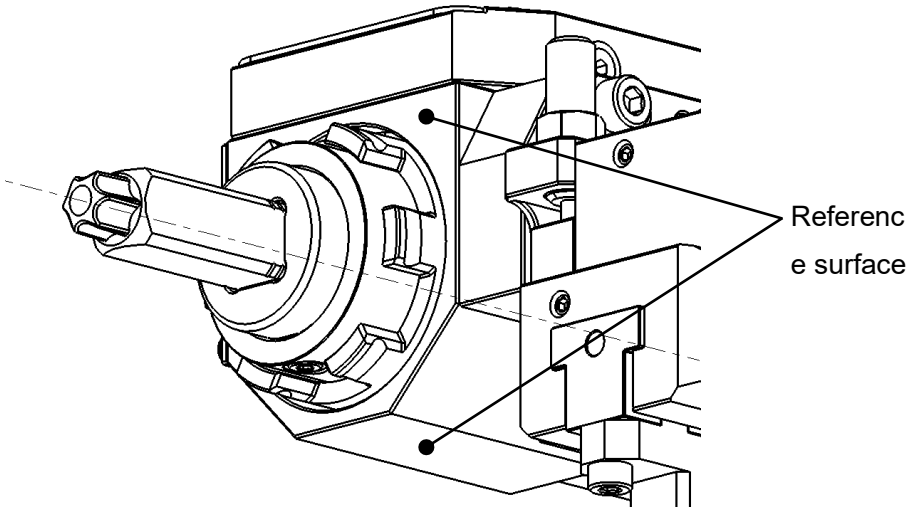



Figure 30

③ Insert the wrench in the mounting bolt hole (Figure 31).

- It can be inserted easily by rotating the nutrunner at a low speed. However, the rotation should be very short, and the bolt should not be tightened without the reaction lever attached.

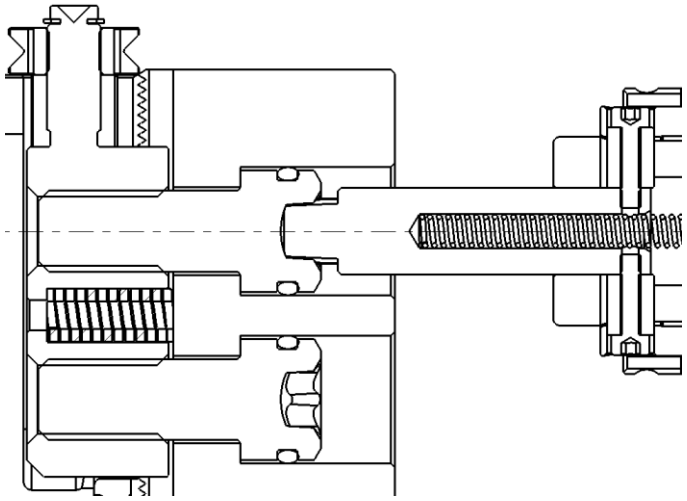


Figure 31

④ Move the BR-AJC end effector to the position where the notch closer to the socket, the one of the two notches on the socket (Figure 32) , is aligned with the socket end face (Figure 33).

⑤ Now teaching of the bolt tightening/loosening position is completed. Store the current position using functions such as the position register of the robot controller.

- For the bolt tightening/loosening position of the other jaw mounting bolt, perform teaching by offsetting the robot in the X-axis direction of Figure 28 (refer to 6.3.1. Creating User Coordinates) by the distance of the jaw mounting bolt, or using steps ② through ⑤.

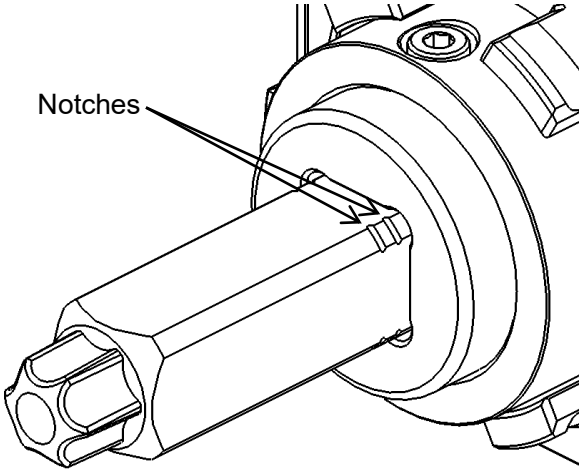



Figure 32

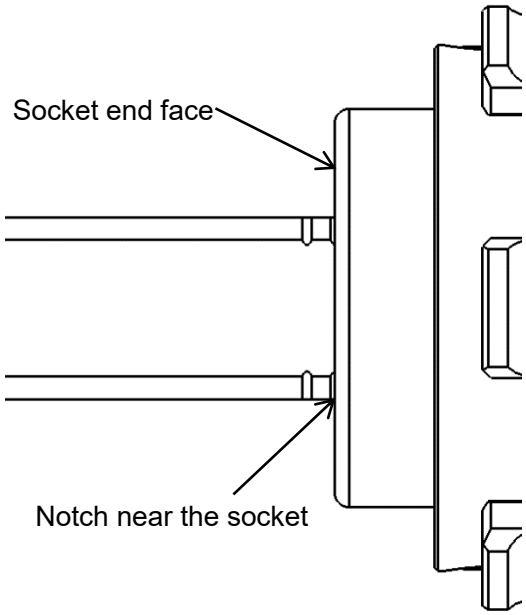



Figure 33

### 6.3.3. Teaching the Jaw Inserting/Removal Position

① Mount a jaw to the chuck and index it to the jaw change position.

② Move the BR-AJC end effector to the positioning nut holding position (Figure 34).

- The adjustment can be made easily by rotating it 90° from the bolt tightening/loosening position. (Figure 35)

③ Open and close the gripper, and move the BR-AJC end effector to the position where the gripper does not deflect.

- As the jaw on the gripper is unsymmetrical, perform positioning vertically and horizontally.

④ Loosen the jaw mounting bolt about one and a half to two turns.

⑤ Close the gripper and confirm that the jaw can be inserted/removed smoothly.

- It can be inserted/removed smoothly by moving it straight up and down using the user coordinates (refer to 6.3.1. Creating User Coordinates).

⑥ If you feel resistance, make fine adjustment to the position of the BR-AJC end effector.

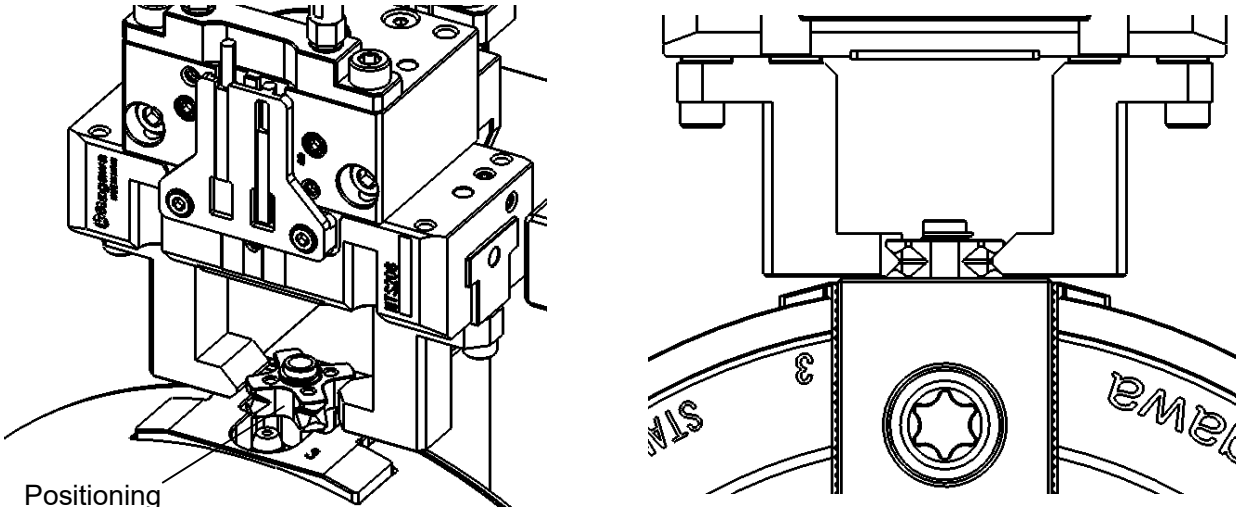



Figure 34 Holding Position

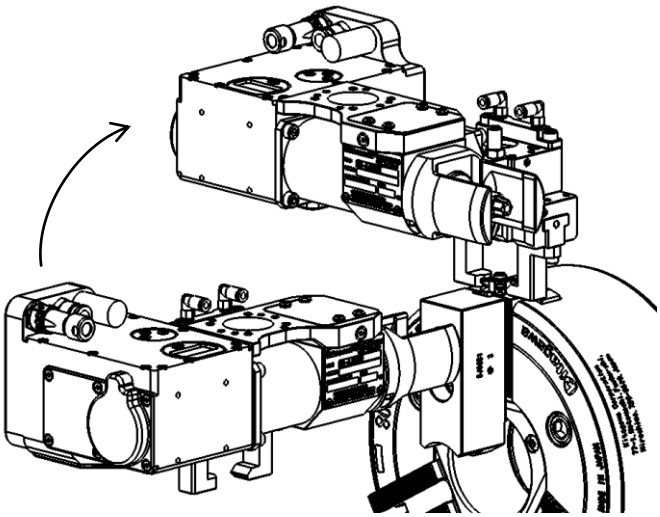


Figure 35

## 6.4. Confirm program operation and adjust reed switches

Confirm the operation of the program created in “6.2. BR-AJC End-effector Control Program” and “6.3. Robot Teaching” and adjust the reed switch installed in “4.2.2. Reed Switch Mounting Procedure”.

The reed switch detects and responses to the magnetic force of the magnet that moves in conjunction with the wrench stroke.

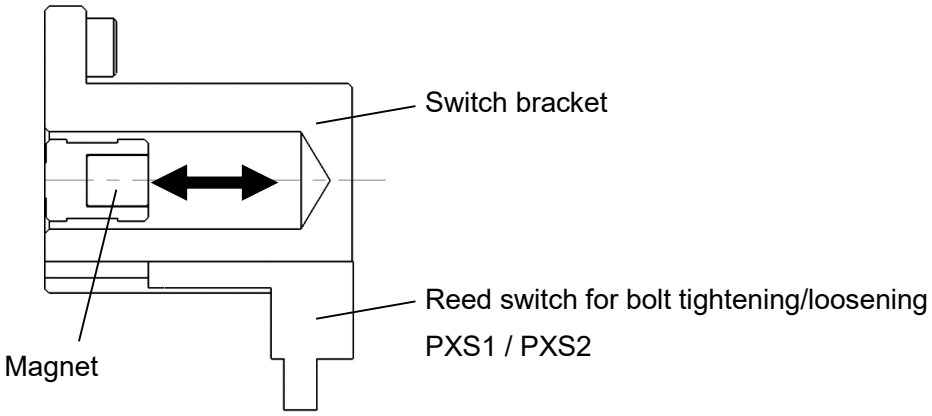



Figure 36 Reed Switch Detection Mechanism

Procedure

Read the following procedure also referring to " Table 38 Reed switch response according to wrench condition and bolt fastening condition".

① Mount a jaw to the chuck and index it to the jaw change position.

② Shift the phase of the wrench to prevent it from entering the bolt hole.

- It can be shifted easily by rotating the nutrunner at a low speed.

③ Move the BR-AJC end effector to the bolt tightening/loosening position (refer to 6.3.2. Teaching the Bolt Tightening/Loosening Position).

④ Check that both or one of the reed switches PXS1 and PXS2 are ON when the wrench is not inserted into the bolt hole and is retracted.

- This is a confirmation of the detection of wrench non-insertion state while the bolt is tightened.

⑤ Loosen the bolts as described in “6.2.3. Bolt Loosening Operation”.

- This is the operation confirmation of the bolt loosening operation.

⑥ Check that the serrations are apart and that the jaws can be removed without interference.

- This is the confirmation of the mounting position of the reed switch PXS2.
- Approximate amount of loosening of jaw mounting bolt: Refer to Table 39.
- If the amount of bolt loosening is too much, reduce A2 in Table 22(Refer to 4.2.2.1. Mounting the Reed Switch for bolt tightening/loosening), and if it is too little, increase A2 in Table 22. At that time, adjust A1 of PXS1 by the same amount.

  After adjustment, confirm the operation by following the procedure ⑤ again.

⑦ Shift the phase of the wrench to prevent it from entering the bolt hole.

- It can be shifted easily by rotating the nutrunner at a low speed.

⑧ Move the BR-AJC end effector to the bolt tightening/loosening position (refer to 6.3.2. Teaching the Bolt Tightening/Loosening Position).

⑨ Check that the reed switch PXS1 is ON when the wrench is not inserted into the bolt hole and is retracted.

- This is a confirmation of the detection of wrench non-insertion state while the bolt is loosened.

⑩ Tighten the bolts as described in “6.2.2. Bolt Tightening Operation”.

- This is the operation confirmation of the bolt tightening operation.

⑪ Confirmation is complete.

Table 38 Reed switch response according to wrench condition and bolt fastening condition

| | Bolt is Tightened | | Bolt is Loosened | |
|---|---|---|---|---|
| Wrench condition | Insertion | Non-insertion | Insertion | Non-insertion |
| Reed switch PXS1 | **OFF** | **ON or OFF※1** | **OFF** | **ON** |
| Reed switch PXS2 | **OFF** | **ON or OFF※1** | (ON or OFF) | (OFF) |

※1 : Both or either PXS1 or PXS2 are ON.

Table 39 Approximate amount of loosening of jaw mounting bolt

| Chuck type | Amount of bolt loosening (turns) |
|---|---|
| BR06 / BRT06 | 1.5～2 |
| BR08 / BRT08 | 1.5～2 |
| BR10 / BRT10 | 1.5～2 |

# 7. Maintenance and Inspection

## 7.1. Periodic Inspection

Table 40 Periodic inspection

| Interval | Contents |
|---|---|
| Daily | ● Lubricate the nutrunner.<br>● Check the jaw mounting bolts and the wrench for damage.<br>● Open and close the gripper of the BR-AJC end effector to confirm that it satisfies the stroke in the specification table and swings.<br>● Confirm that the reaction lever of the BR-AJC end effector swings.<br>● Clean the BR-AJC end effector using an air gun, etc. |
| Every 3 months | ● Check the bolts of each part for looseness.<br>● Disassemble and clean the BR-AJC T-nut and check the thread of the jaw mounting bolts for damage. |

### 7.1.1. Lubrication

- Supply the lubricant shown in Table 41 once a day.
- Remove the screw in the lubrication port when supplying the lubricant.

Table 41 Specified lubricant

| Lubricant | Viscosity grade | Lubrication amount |
|---|---|---|
| Machine oil | ISO VG10 | 1 or 2 drops |

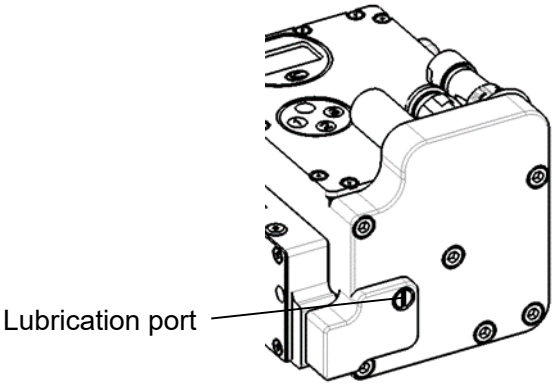



Figure 37 Lubrication port location

### 7.1.2. Inspecting the Jaw Mounting Bolt

Visually check the jaw mounting bolts once a day and replace them if damaged.

| ⚠Warning | Failure to follow the safety precautions below could result in death or serious injuries. |
|---|---|
|  | **Do not use damaged bolts.**<br>● Failure to do so may result in further breakage of parts and suspension of facilities.<br>● If the jaws are not properly installed due to damaged parts, the workpiece may fly out. |

### 7.1.3. Inspecting the Wrench

Visually check the wrench once a day and replace them if damaged.

Also confirm that the wrench satisfies the stroke specified in the specifications.

| ⚠Warning | Failure to follow the safety precautions below could result in death or serious injuries. |
|---|---|
|  | **Do not use the damaged wrench.**<br>● Failure to do so may result in further breakage of parts and suspension of facilities.<br>● If the jaws are not properly installed due to damaged parts, the workpiece may fly out. |

### 7.1.4. Inspecting the Gripper

Open and close the gripper once a day to confirm that it satisfies the stroke specified in Table 13 in 3.1.1. Basic Specifications.

Also, confirm that it swings about ±1°.(Figure 38)

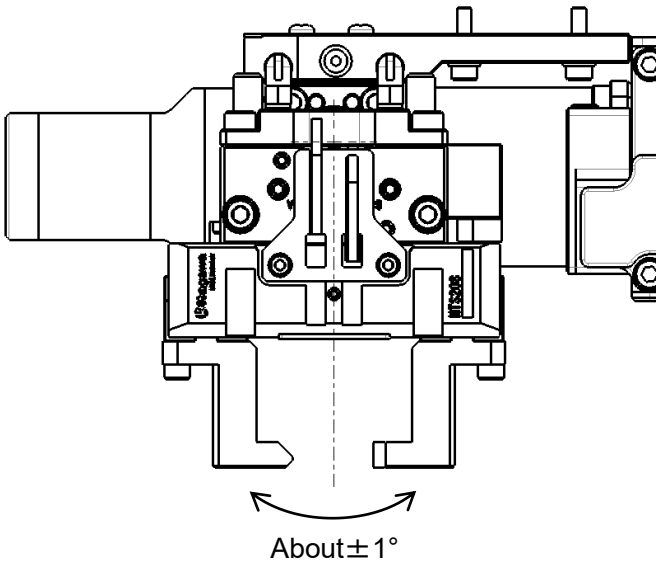



Figure 38 Gripper swing

### 7.1.5. Inspecting the Reaction lever

Confirm that the lever swings about ±7 to 8°.

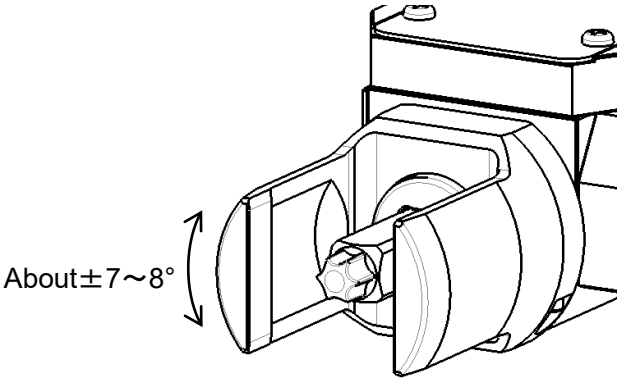



Figure 39 Reaction lever swing

## 7.2. Periodic Replacement

The jaw mounting bolts, the washers and the wrenches are consumables. Never use them for more than the specified number of years or times.

- Take the following measures against them being used exceeding the use limit.
  - Determine the rule of replacement timing based on the use frequency of the BR-AJC T-nut.
  - Record the number of times of use on the host control unit that controls the BR-AJC end effector, and when the number of times for replacement is reached, notify of the manager or workers.

**Danger** Failure to follow the safety precautions below will result in death or serious injuries.

**Do not use the jaw mounting bolts for more than the specified number of years or times.**

- Otherwise, they may be broken, causing the workpiece to fly out.

### 7.2.1. Jaw Mounting Bolt and Washer

Be sure to replace the jaw mounting bolts and washers when they reach the "number of years of use", "number of times of tightening", or "number of times of holding" shown in Table 42, whichever comes first. The jaw mounting bolts will be broken by fatigue due to two factors: the tightening torque, and the load that the jaw mounting bolts receive when the chuck holds a workpiece. Therefore, the limited number of times of use is determined respectively.

Table 42 Use limit of jaw mounting bolt and washer

| Chuck size | Years of use (years) | Bolt tightening (times) | Chuck gripping (times) |
|---|---|---|---|
| 6 inch | 1 | 1,000 | 100,000 |
| 8 inch | 1 | 1,000 | 100,000 |
| 10 inch | 0.3 | 300 | 10,000 |

- Example of determining replacement rule

Assume that the use conditions are as follows.

Chuck size : 8 inch

Number of times the jaws are used per day : 1

Number of times the jaws hold per day : 300

Number of days in operation per year : 365

- Number of years of use according to the chuck size: 1 year

- Calculate the number of years required for reaching the use limit based on the number of times of tightening.

$$\frac{\text{Use limit according to the number of times of tightening}}{\text{Number of times the jaws are used (/day)} \times \text{Number of days in operation (day/year)}} = \frac{1000}{1 \times 365} \cong 2.7 \text{ years}$$

- Calculate the number of years required for reaching the use limit based on the number of times the chuck gripped.

$$\frac{\text{Use limit according to the number of times the chuck holds}}{\text{Number of times the jaws hold (/day)} \times \text{Number of days in operation (day/year)}} = \frac{100000}{300 \times 365} \cong 0.9 \text{ years}$$

"0.9 years" calculated based on the number of times the chuck holds is reached first.

The replacement rule is determined to be replacing in 0.5 year for safety reasons.

### 7.2.2. Wrench

Replace the wrench when the number of times of tightening reaches 10,000 times.

Table 43 Use limit of wrench

| Bolt Tightening(times) |
|---|
| 10,000 |

- Example of determining replacement rule

Assume that the use conditions are as follows.

Number of times the jaws are changed per day : 4

Chuck : BR08 (3-jaws)

Number of days in operation per year : 365

➢ Calculate the number of years required for reaching the use limit.

$$\text{Number of times of tightening per jaw change (times)} = \text{Bolt quantity per one jaw} \times \text{Number of jaws} = 2 \times 3 = 6 \text{ times}$$

$$\frac{\text{Use limit}}{\begin{array}{l}\text{Number of times the jaws are changed (times/day)} \\ \times \text{ Number of times of tightening per jaw change (times)} \\ \times \text{ Number of days in operation (day/year)}\end{array}} = \frac{10000}{4 \times 6 \times 365} \cong 1.1 \text{ years}$$

The use limit is 1.1 years.

The replacement rule is determined to be replacing in 1 year for safety reasons.

| **Notice** | Indicates instructions which, if you do not heed given instructions, could result in damage to the product or shortened service life, or damage to peripheral equipment. |
|---|---|
| | Do not use the wrench more than the determined number of times.<br>● Otherwise, the wrench may be broken, causing failure of tightening/loosening the jaw mounting bolts, resulting in breakage of parts and suspension of facilities. |

### 7.2.3. Overhaul

An overhaul is required when the system has been used for a long time. For details, consult our sales agents, the sales agent you purchased the product, the machine manufacturer, or our service office nearest you.

The number of times of tightening can be confirmed on the monitor. (Refer to 5.1.3. Displaying the Number of time Tightening.)

Table 44 Approximate number of times to overhaul

| Tightening times(times) |
|---|
| 50,000 |

## 7.3. Replacement Work

### 7.3.1. Wrench Replacement Procedure

Read the following procedure also referring to "4.1. Assembling the BR-AJC End Effector".

① Before start of work, be sure to turn off the main power of the machine.

② Loosen the screw [6] and remove the reaction lever [5].

③ Loosen the hex. socket head cap screw [3] and the washer [4], and remove the wrench [1] and the spring [2].

④ Replace the wrench [1], and assemble by referring to "4.1. Assembling the BR-AJC End Effector".

● After the replacement, conduct a test run for operation check.

### 7.4. Maintenance of the Air Circuit

- Drain the air filter, etc. periodically.
- To prevent malfunction of the nutrunner and the gripper, be careful not to let foreign matter, such as a carbide of compressor oil, enter the circuit during maintenance and inspection of the compressor.

## 8. Troubleshooting

### 8.1. Troubleshooting

If a failure is suspected, check the contents in Table 45 again and take necessary measures. If the problem persists, please contact the dealer where you purchased the product or us.

Table 45 Troubleshooting

| Problem | Cause | Countermeasures |
|---|---|---|
| Tightening/loosening of the jaw mounting bolts has failed. | The jaw mounting bolts are broken. | Replace the jaw mounting bolts. (4.3. Mounting the BR-AJC T-nut) |
| | The wrench is broken. | Replace the wrench. (7.3.1. Wrench Replacement Procedure) |
| | The control program is created incorrectly. | Check and correct the program. (6.2. BR-AJC End Effector Control Program) |
| | The bolt tightening/loosening position is improper. | Check and correct the program.(6.3. Robot Teaching) |
| | The reed switch is positioned incorrectly. | Adjust in the proper range. (6.4. Confirm program operation and adjust reed switches) |
| | The nutrunner malfunctions due to noise. | Eliminate the noise source.<br>Take measures against the noise by changing the cable connected to the BR-AJC end effector to a shielded cable, etc. |
| | The pneumatic pressure is reduced. | Confirm that the pneumatic pressure falls within the range specified in the specifications.<br>Check for air leakage. |
| | The pneumatic pressure flow is reduced. | Ensure the pneumatic consumption specified in the specifications. (3.1.5. Pneumatic specifications)<br>Check for air leakage. |
| | The nutrunner is faulty. | Immediately stop the use, and consult our sales agents or our service office. |
| | Chips accumulate on the jaw mounting bolts. | Remove the chips. |

| | | |
|---|---|---|
| The reaction lever bites the jaw when the jaw mounting bolts are tightened. | The low speed reverse rotation time is improper. | In the bolt tightening operation program, adjust the low speed reverse rotation time after the set torque is reached. (6.2.2. Bolt Tightening Operation) |
| Inserting/removing the jaws in/from the chuck has failed. | The jaw insertion/removal position is improper. | Check and correct the jaw insertion/removal position. (6.3.3. Teaching the Jaw Inserting/Removal Position) |
| | Chips accumulate on the chuck. | Remove the chips. |
| | Chips accumulate on the BR-AJC T-nut. | Remove the chips. |
| Gripper does not operate. | Gripper internal part is broken. | Replace the gripper with a new one. |
| | The reed switch is faulty or mounted improperly. | Check that the reed switch can detect normally.(4.2.2.2. Mounting the Gripper Open/Close Confirmation Reed Switch) |
| | The pneumatic pressure is reduced. | Confirm that the pneumatic pressure falls within the range specified in the specifications. (3.1.5. Pneumatic specifications)<br>Check for air leakage. |

# 9. Others

## 9.1. Marking

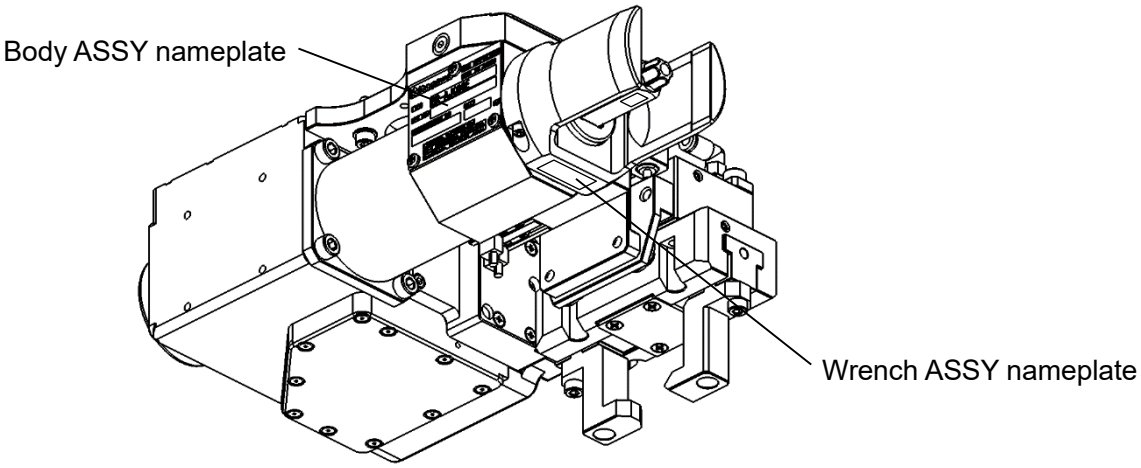



Figure 40 Marking position

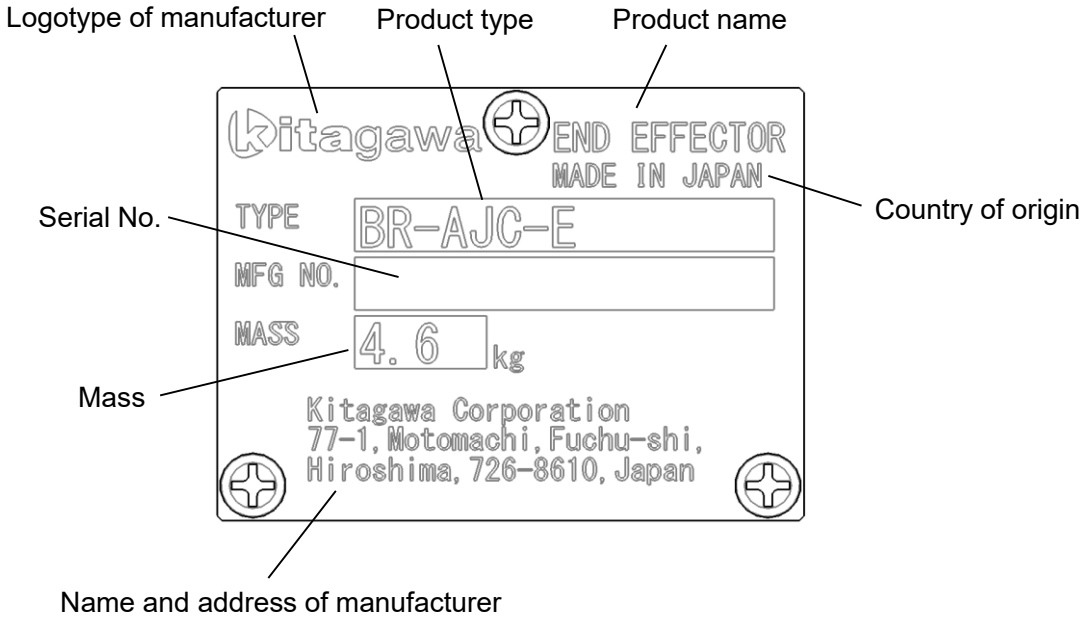



Figure 41 Body ASSY nameplate

## 9.2. Disposal

Dispose of this unit in accordance with the laws and regulations of your country.

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https://www.kiw.co.jp
https://www.kitagawa.com

**Kitagawa Corporation Kitagawa Global hand Company**
**77-1,Motomachi,Fuchu-shi,Hiroshima,726-8610,Japan Tel. +81-847-40-0561 Fax. +81-847-45-8911**

## ■ JAPAN DOMESTIC

| | |
|---|---|
| **Tokyo office** | 1-405-1,Kita-ku,Yosino-cho,Saitama-shi,Saitama,331-9634,JAPAN<br>**Tel. +81-48-667-3469 Fax. +81-48-663-4678** |
| **Sendai office** | 4-15-13,Yamatomachi,Wakabayashi-ku,Sendai-shi,Miyagi,984-0042,Japan<br>**Tel. +81-22-232-6732 Fax. +81-22-232-6739** |
| **Nagoya office** | 2-62,Kamitakabata,Nakagawa-ku,Nagoya-shi,Aichi,454-0873,Japan<br>**Tel. +81-52-363-0371 Fax. +81-52-362-0690** |
| **Osaka office** | 3-2-9,Kitakagaya,Suminoe-ku,Osaka-shi,Osaka,559-0011,Japan<br>**Tel. +81-6-6685-9065 Fax. +81-6-6684-2025** |
| **Hiroshima office** | 77-1,Motomachi,Fuchu-shi,Hiroshima,726-8610,Japan<br>**Tel. +81-847-40-0541 Fax. +81-847-46-1721** |
| **Kyushu office** | 7-6-39,Itazuke,Hakata-ku,Fukuoka-shi,Fukuoka,812-0888,Japan<br>**Tel. +81-92-501-2102 Fax. +81-92-501-2103** |
| **Overseas office** | 77-1,Motomachi,Fuchu-shi,Hiroshima,726-8610,Japan<br>**Tel. +81-847-40-0526 Fax. +81-847-45-8911** |

## ■ OVERSEAS

| | |
|---|---|
| **America Contact** | **KITAGAWA-NORTHTECH INC.** **https://www.kitagawa-usa.com**<br>301 E. Commerce Dr,Schaumburg,IL. 60173 USA<br>**Tel. +1 847-310-8787 Fax. +1 847-310-9484** |
| | **KITAGAWA MEXICO S.A. DE C.V**<br>Circuito Progreso No. 102, Parque Industrial Logistica Automotriz, Aguascalientes, Ags., C.P.20340<br>**Tel. +52 449-917-8825 Fax. +52 449-971-1966** |
| **Europe Contact** | **KITAGAWA EUROPE LTD.** **https://www.kitagawa.global/en**<br>Unit 1 The Headlands,Downton,Salisbury,Wiltshire SP5 3JJ,United Kingdom<br>**Tel. +44 1725-514000 Fax. +44 1725-514001** |
| | **KITAGAWA EUROPE GmbH** **https://www.kitagawa.global/de**<br>Borsigstrasse 3,40880,Ratingen Germany<br>**Tel. +49 2102-123-78-00 Fax. +49 2102-123-78-69** |
| | **KITAGAWA EUROPE GmbH Poland Office** **https://www.kitagawa.global/pl**<br>44-240 Zory,ul. Niepodleglosci 3 Poland<br>**Tel. +48 607-39-8855** |
| | **KITAGAWA EUROPE GmbH Czech Office** **https://www.kitagawa.global/cz**<br>Purkynova 125,612 00 Brno,Czech Republic<br>**Tel. +420 603-856-122 Fax. +420 549-273-246** |
| | **KITAGAWA EUROPE GmbH Romania Office** **https://www.kitagawa.global/ro**<br>Strada Heliului 15,Bucharest 1,013991,Romania<br>**Tel. +40 727-770-329** |
| | **KITAGAWA EUROPE GmbH Hungary Office** **https://www.kitagawa.global/hu**<br>Dery T.u.5,H-9024 Gyor,Hungary<br>**Tel. +36 30-510-3550** |
| **Asia Contact** | **KITAGAWA INDIA PVT LTD.** **https://www.kitagawa.global/in**<br>Plot No 42, 2nd Phase Jigani Industrial Area, Jigani, Bangalore – 560105, Karnataka, India<br>**Tel. +91-80-2976-5200 Fax. +91-80-2976-5205** |
| | **KITAGAWA TRADING (THAILAND) CO., LTD.** **https://www.smri.asia/jp/kitagawa/**<br>9th FL,Home Place Office Building,283/43 Sukhumvit 55Rd. (Thonglor 13),Klongton-Nua,Wattana,Bangkok 10110,Thailand<br>**Tel. +66 2-712-7479 Fax. +66 2-712-7481** |
| | **Kitagawa Corporation(Shanghai)** **https://www.kitagawa.com.cn**<br>Room308 3F Building B. Far East International Plaza,No.317 Xian Xia Road,Chang Ning,Shanghai,200051,China<br>**Tel. +86 21-6295-5772 Fax. +86 21-6295-5792** |
| | **Kitagawa Corporation(Shanghai) Guangzhou Office**<br>B07,25/F,West Tower,Yangcheng International Trading Centre,No.122 East Tiyu Road,Tianhe District,Guangzhou,China<br>**Tel.+86 20-2885-5276** |
| | **DEAMARK LIMITED** **https://www.deamark.com.tw**<br>No. 6,Lane 5,Lin Sen North Road,Taipei,Taiwan<br>**Tel. +886 2-2393-1221 Fax. +886 2-2395-1231** |
| | **KITAGAWA KOREA AGENT CO., LTD.** **http://www.kitagawa.co.kr**<br>803 Ho,B-Dong,Woolim Lion's Valley,371-28 Gasan-Dong,Gumcheon-Gu,Seoul,Korea<br>**Tel. +82 2-2026-2222 Fax. +82 2-2026-2113** |
| **Oceania Contact** | **DIMAC TOOLING PTY. LTD.** **https://www.dimac.com.au**<br>69-71 Williams Rd,Dandenong South,Victoria,3175 Australia<br>**Tel. +61 3-9561-6155 Fax. +61 3-9561-6705** |