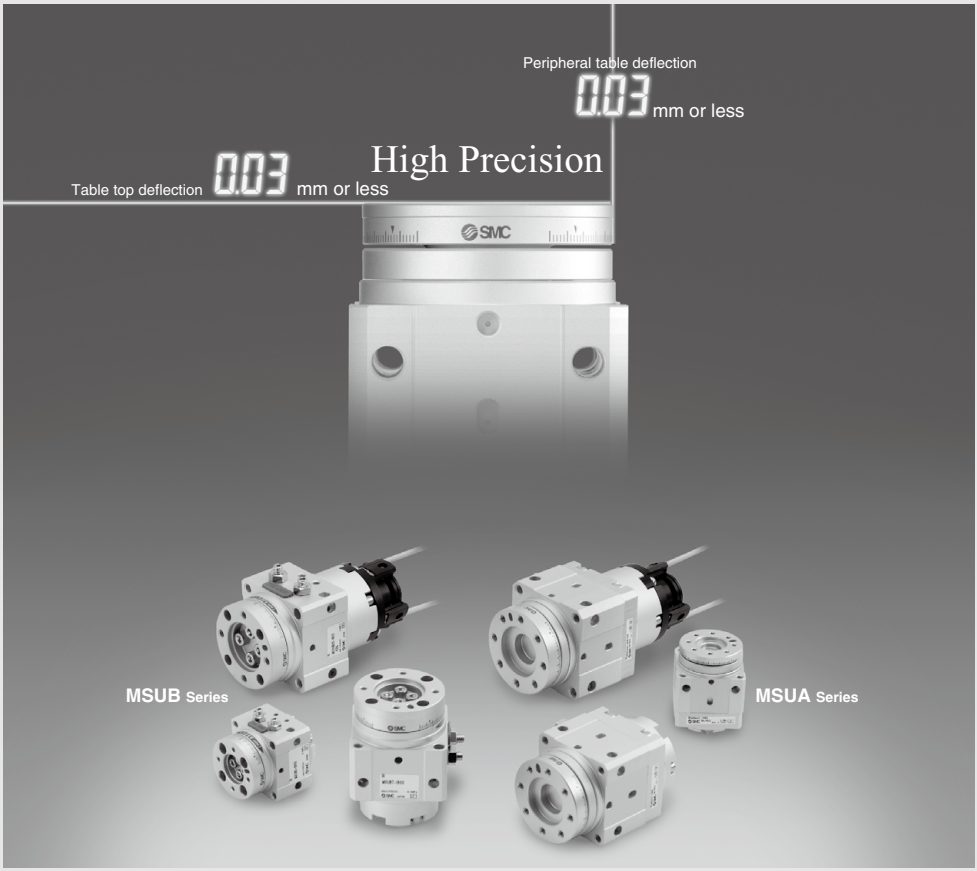
# Rotary Table/Vane Type

## *MSU* Series

## Size: 1, 3, 7, 20



# MSU

## Vane Type/

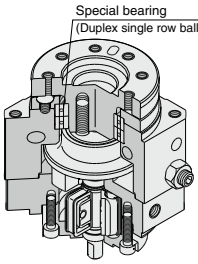
Rotary actuator with lightweight,

**High precision type**
**Size: 1, 3, 7, 20**

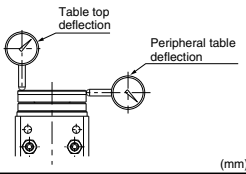
## MSUA Series

Improved table deflection accuracy:
0.03 mm or less

### High precision/High rigidity



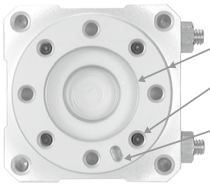

**Deflection accuracy: Displacement for 180° rotation**




(mm)

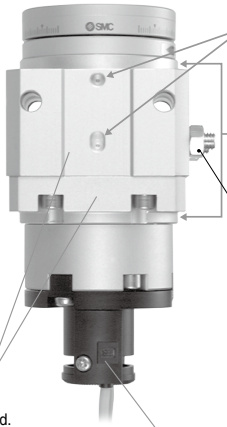
| Model | MSUA |
|---|---|
| Table top deflection | **0.03 (0.1 to 0.2)** |
| Peripheral table deflection | **0.03 (0.1 to 0.2)** |

Values inside ( ) are for MSUB series



### Easy alignment when mounting the load

- **Table inside/outside diameter tolerance H9/h9**
- **Female threads for load mounting provided in eight places.** (Increases freedom in mounting the load)
- **Mounting reference pin holes**

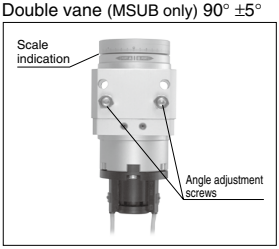


### Easy alignment when mounting the body

- **Mounting reference pin holes** (Alignment with center of body) Provided on three sides, excluding port side
- **Reference diameter h9** (Alignment with center of table rotation)

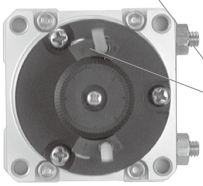
### Angle adjustable

90° ±10°, 180° ±10°
Double vane (MSUB only) 90° ±5°




### Disengageable

Maintenance work is simplified.
The drive unit can be replaced with the load mounted.

### Auto switch capable

Since switches can be moved anywhere on the circumference, they can be mounted at positions which accommodate the specifications.

# Series

## Size: 1, 3, 7, 20

compact table for robotic hands

### Free mount type

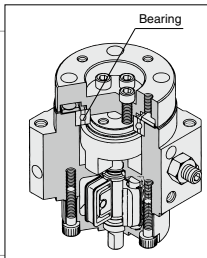
Can be mounted from three directions: axial, lateral, vertical

| | Axial mounting | | Lateral mounting | Vertical mounting |
|---|---|---|---|---|
| MSUA | Bottom mount<br>Tapped holes (4) | Top mount<br>Tapped holes (4) | | |
| MSUB | Through-holes (2)<br>Tapped holes (2) | Tapped holes (2)<br>Through-holes (2) | | |

## Basic type MSUB Series

**Size: 1, 3, 7, 20**

- **Single vane and double vane standardized**
- **Double vane has the same dimensions as single vane**
  (Except size 1)




Single vane

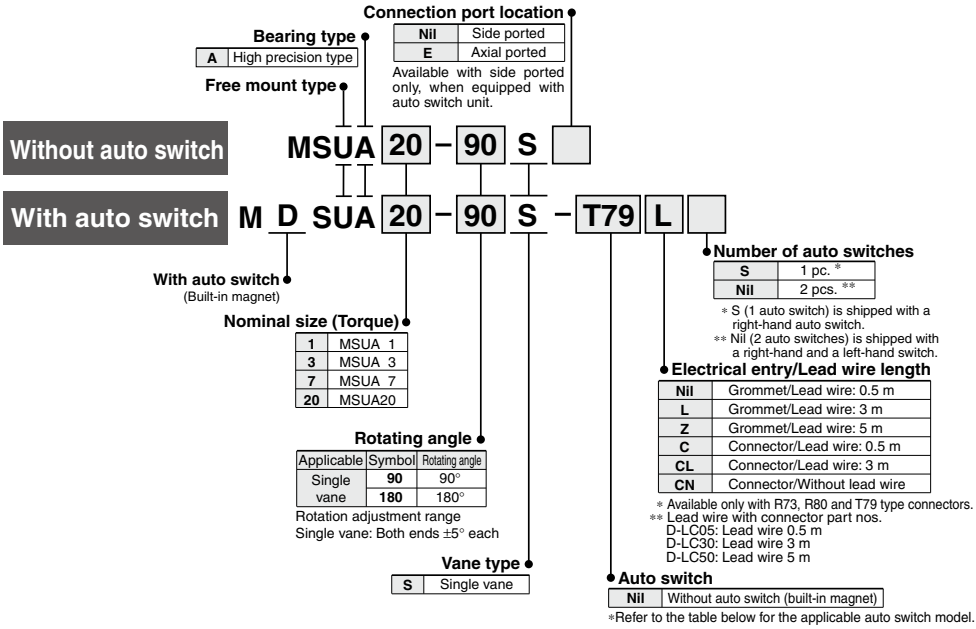
### Series Variations

| Series | Size | Rotating angle | Vane type | Applicable auto switch | Page |
|---|---|---|---|---|---|
| High precision type **MSUA** | 1, 3 | 90° | Single vane | D-9, D-T99<br>D-9□A, D-S99, S9P | P.202 |
| | 7, 20 | 180° | | D-R73, D-T79<br>D-R80, D-S79, S7P | |
| Basic type **MSUB** | 1, 3 | 90° | Single vane | D-9, D-T99<br>D-9□A, D-S99, S9P | P.214 |
| | 7, 20 | 180° | Double vane * | D-R73, D-T79<br>D-R80, D-S79, S7P | |

* Double vane is available with 90° rotation setting only.

# Rotary Table: High Precision Type
## Vane Type
# *MSUA* Series
## Size: 1, 3, 7, 20

### How to Order




**Applicable Auto Switches/**Refer to pages 929 to 983 for further information on auto swiches.

| Applicable model | Type | Special function | Electrical entry | Indicator light | Wiring (Output) | Load voltage DC | Load voltage AC | Auto switch model Perpendicular | Auto switch model In-line | Lead wire type | Lead wire length (m) * 0.5 (Nil) | 3 (L) | 5 (Z) | None (N) | Pre-wired connector | Applicable load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MDSUA1 MDSUA3 | Solid state auto switch | — | Grommet | Yes | 3-wire (NPN) | 5 V, 12 V | — | S99V | S99 | Heavy-duty cord | ● | ● | ○ | — | ○ | IC circuit | Relay, PLC |
| | | | | | 3-wire (PNP) | | | S9PV | S9P | | ● | ● | ○ | — | ○ | | |
| | | | | | 2-wire | 12 V | | T99V | T99 | | ● | ● | ○ | — | ○ | — | |
| | Reed auto switch | — | | No | 2-wire | 24 V 5 V, 12 V | 5 V, 12 V, 24 V | — | 90 | Parallel cord | ● | ● | ● | — | — | IC circuit | |
| | | | | | | 5 V, 12 V, 100 V | 5 V, 12 V, 24 V, 100 V | — | 90A | Heavy-duty cord | ● | ● | ● | — | | | |
| | | | | Yes | | — | — | — | 97 | Parallel cord | ● | ● | ● | — | | — | |
| | | | | | | — | 100 V | — | 93A | Heavy-duty cord | ● | ● | ● | — | | | |
| MDSUA7 MDSUA20 | Solid state auto switch | — | Grommet | Yes | 3-wire (NPN) | 5 V, 12 V | — | — | S79 | Heavy-duty cord | ● | ● | ○ | — | ○ | IC circuit | Relay, PLC |
| | | | | | 3-wire (PNP) | | | — | S7P | | ● | ● | ○ | — | ○ | | |
| | | | | | 2-wire | 12 V | | — | T79 | | ● | ● | ○ | — | ○ | — | |
| | | | Connector | | | | | — | T79C | | ● | ● | ● | ● | — | | |
| | Reed auto switch | — | Grommet | | | — | 100 V | — | R73 | | ● | ● | ○ | — | — | — | |
| | | | Connector | | | | — | — | R73C | | ● | ● | ● | ● | | | |
| | | | Grommet | No | | 48 V, 100 V | 100 V | — | R80 | | ● | ● | ○ | — | | IC circuit | |
| | | | Connector | | | — | 24 V or less | — | R80C | | ● | ● | ● | ● | | — | |

* Lead wire length symbols: 0.5 m ····· Nil (Example) R73C
3 m ····· L (Example) R73CL
5 m ····· Z (Example) R73CZ
None ····· N (Example) R73CN

* Auto switches are shipped together (but not assembled).

* Auto switches marked with "○" are made-to-order specifications.

* Refer to pages 970 and 971 for detailed solid state auto switches with pre-wired connectors.

Order example: MSUA20 single vane type (connection port side location selected)
1. Standard type (Without auto switches), Rotation 90°, side port location
MSUA20-90S
2. With auto switch unit (Without auto switches), Rotation 180°, side port location
MDSUA20-180S
3. With auto switch unit + Auto switch R73, Rotation 180°, Side port location
MDSUA20-180S-R73

## Specifications

| Model *2 | | MSUA1 | | MSUA3 | | MSUA7 | | MSUA20 | |
|---|---|---|---|---|---|---|---|---|---|
| Vane type | | Single vane | | | | | | | |
| Rotating angle *1 | | 90° ± 10° | 180° ± 10° | 90° ± 10° | 180° ± 10° | 90° ± 10° | 180° ± 10° | 90° ± 10° | 180° ± 10° |
| Fluid | | Air (Non-lube) | | | | | | | |
| Proof pressure (MPa) | | 1.05 | | | | | | 1.5 | |
| Ambient and fluid temperature | | 5 to 60°C | | | | | | | |
| Operating pressure range (MPa) | | 0.2 to 0.7 | | 0.15 to 0.7 | | | | 0.15 to 1.0 | |
| Rotation time adjustment range (s/90°) | | 0.07 to 0.3 (0.5 MPa) | | | | | | | |
| Shaft load | Allowable radial load | 20 N | | 40 N | | 50 N | | 60 N | |
| | Allowable thrust load | 15 N | | 30 N | | 60 N | | 80 N | |
| | Allowable moment | 0.3 N·m | | 0.7 N·m | | 0.9 N·m | | 2.9 N·m | |
| Bearing | | Special bearing | | | | | | | |
| Port location | | Side ported or Top ported | | | | | | | |
| Port size | Side ported | M3 x 0.5 | | M5 x 0.8 | | | | | |
| | Top ported | M3 x 0.5 | | | | M5 x 0.8 | | | |
| Deflection accuracy | | 0.03 mm or less | | | | | | | |

∗1 Single vane 90° can be adjusted to 90° ± 10° (both ends of rotation ± 5° each)
Single vane 180° can be adjusted to 180° ± 10° (both ends of rotation ± 5° each)

Note) Refer to page 45 for allowable kinetic energy.

∗2 Correspondence to equivalent current free-mount types

| Rotary table | Free-mount rotary actuator |
|---|---|
| MSUA 1 | CRBU2W10 |
| MSUA 3 | CRBU2W15 |
| MSUA 7 | CRBU2W20 |
| MSUA20 | CRBU2W30 |

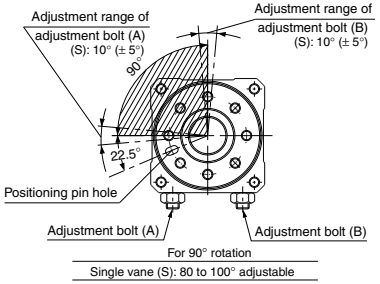
**Symbol**

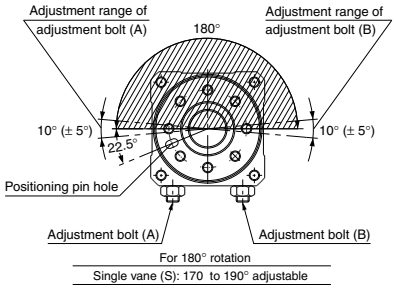
### Moisture Control Tube IDK Series

When operating an actuator with a small diameter and a short stroke at a high frequency, the dew condensation (water droplet) may occur inside the piping depending on the conditions.
Simply connecting the moisture control tube to the actuator will prevent dew condensation from occurring. For details, refer to **the Web Catalog**.

## Table Rotation Range

Angle adjustment is possible as shown in the drawings below using adjustment bolts (A) and (B).




## Weight

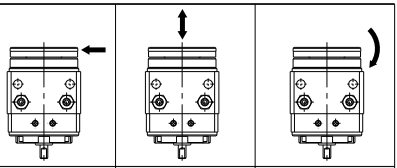
(g)

| Size | Rotating angle | Basic weight Single vane | Auto switch unit Note) |
|---|---|---|---|
| 1 | 90° | 162 | 15 |
| | 180° | 161 | |
| 3 | 90° | 262 | 20 |
| | 180° | 260 | |
| 7 | 90° | 440 | 28 |
| | 180° | 436 | |
| 20 | 90° | 675 | 38 |
| | 180° | 671 | |

Note) Values above do not include auto switch weight.

## Allowable Load

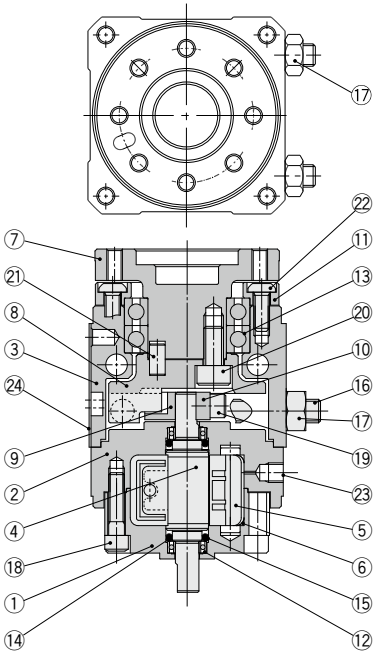
Do not permit the load and moment applied to the table to exceed the allowable values shown in the table below. (Operation above the allowable values can cause adverse effects on service life, such as play in the table and loss of accuracy.)

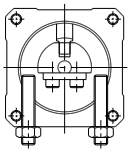


| Size | Allowable radial load (N) | Allowable thrust load (N) | Allowable moment (N·m) |
|---|---|---|---|
| 1 | 20 | 15 | 0.3 |
| 3 | 40 | 30 | 0.7 |
| 7 | 50 | 60 | 0.9 |
| 20 | 60 | 80 | 2.9 |

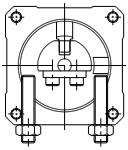
## Construction

### Internal Construction of Rotary Table

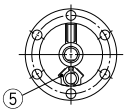


**For 180°**
(Figure in the middle position)



**For 90°**
(Figure with pressure to A port)




**Single vane**
(Figure in the middle position for 180°)

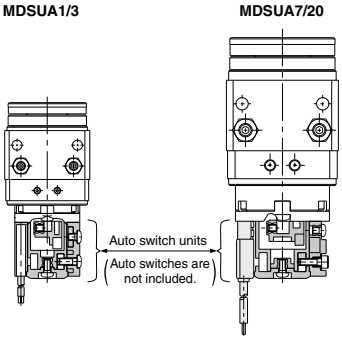
### Component Parts

| No. | Description | Material | Note |
|---|---|---|---|
| 1 | **Body A** | Aluminum alloy | Anodized |
| 2 | **Body B** | Aluminum alloy | Anodized |
| 3 | **Body C** | Aluminum alloy | Anodized |
| 4 | **Vane shaft** | Stainless steel (MSUA20 is chromium molybdenum steel) | Single vane |
| 5 | **Stopper** | Resin | Single vane |
| 6 | **Stopper seal** | NBR | Special seal |
| 7 | **Table** | Aluminum alloy | Anodized, Serigraph |
| 8 | **Stopper lever** | Chromium molybdenum steel | Heat treated, Electroless nickel plated |
| 9 | **Stopper guide** | Stainless steel | Nitriding |
| 10 | **Lever retainer** | Rolled steel | Zync Chromated |
| 11 | **Bearing retainer** | Aluminum alloy | Anodized |
| 12 | **Bearing** | Bearing steel | |
| 13 | **Special bearing** | Bearing steel | |
| 14 | **Back-up ring** | Stainless steel | |
| 15 | **O-ring** | NBR | |
| 16 | **With adjustment bolt** | Chromium molybdenum steel | Heat treated |
| 17 | **Hexagon nut** | Steel wire | |
| 18 | **Hexagon socket head cap screw** | Stainless steel | Special screw |
| 19 | **Hexagon socket head cap screw** | Stainless steel | Special screw |
| 20 | **Hexagon socket head cap screw** | Chromium molybdenum steel | |
| 21 | **Parallel pin** | | |
| 22 | **Button bolt** | Chromium molybdenum steel | |
| 23 | **Hexagon socket head cap screw** | Stainless steel | SE type only |
| 24 | **Label** | | |

∗ The hexagon socket head cap screw ㉓ is used only when the connection port is type SE.
∗ Individual part cannot be shipped. Please purchase the whole unit. (Refer to page 230.)

## Construction

### Internal construction with auto switch




∗ Refer to page 116 for the component parts.

∗ The auto switch unit can be retrofitted on a rotary actuator.
Auto switches should be ordered separately since they are not included.

| Model | Auto switch unit part no. |
|---|---|
| **M(D)SUA 1** | P211070-1 |
| **M(D)SUA 3** | P211090-1 |
| **M(D)SUA 7** | P211060-1 |
| **M(D)SUA20** | P211080-1 |

| Auto switch block unit | | | |
|---|---|---|---|
| **MDSUA1/3** | | | **MDSUA7/20** |
| For reed auto switch | | For solid state auto switch | Combination of reed and solid state auto switches |
| Right-handed | Left-handed | Combination left & right-handed | Combination left & right-handed |
|  |  |  |  |
| Part no.: P211070-8 | Part no.: P211070-9 | Part no.: P211070-13 | Part no.: P211060-8 |

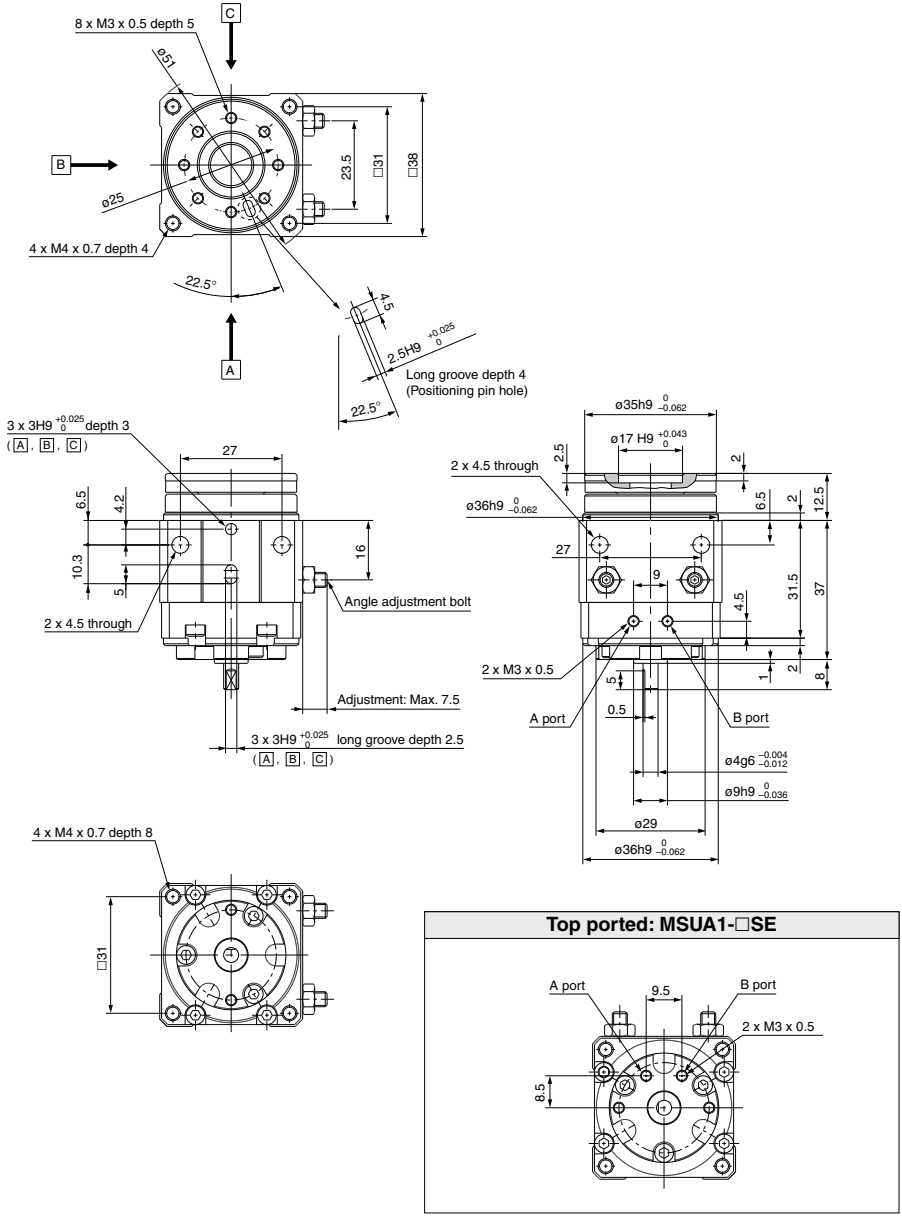
∗ The auto switch block unit is included in the auto switch unit.
∗ Auto switch block unit shows the necessary assembly for mounting 1 piece of auto switch to the auto switch unit.
∗ Individual part cannot be shipped.

## Dimensions

These drawings indicate the condition when the B port is pressurized.

### MSUA1

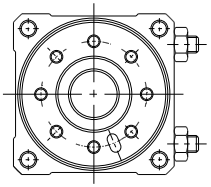
#### MSUA1-□S,SE



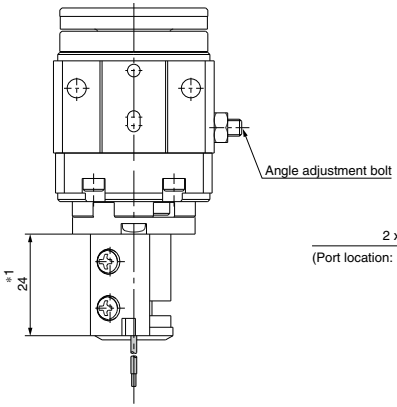

**Top ported: MSUA1-□SE**

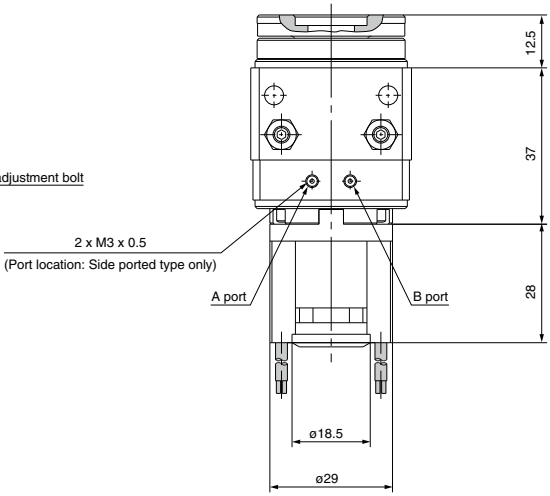
These drawings indicate the condition when the B port is pressurized.

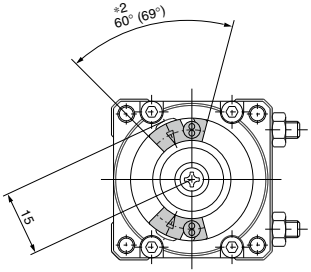
**With auto switch: MDSUA1-□S**



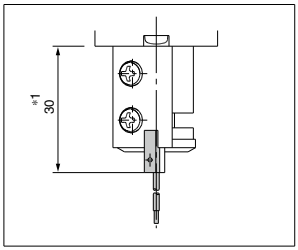
∗1) 24: When using D-90/90A/S99/S99V/S9P/S9PV/T99/T99V
30: When using D-97/93A
∗2) 60°: When using D-90/90A/97/93A
69°: When using D-S99/S99V/S9P/S9PV/T99/T99V




**D-97/93A**

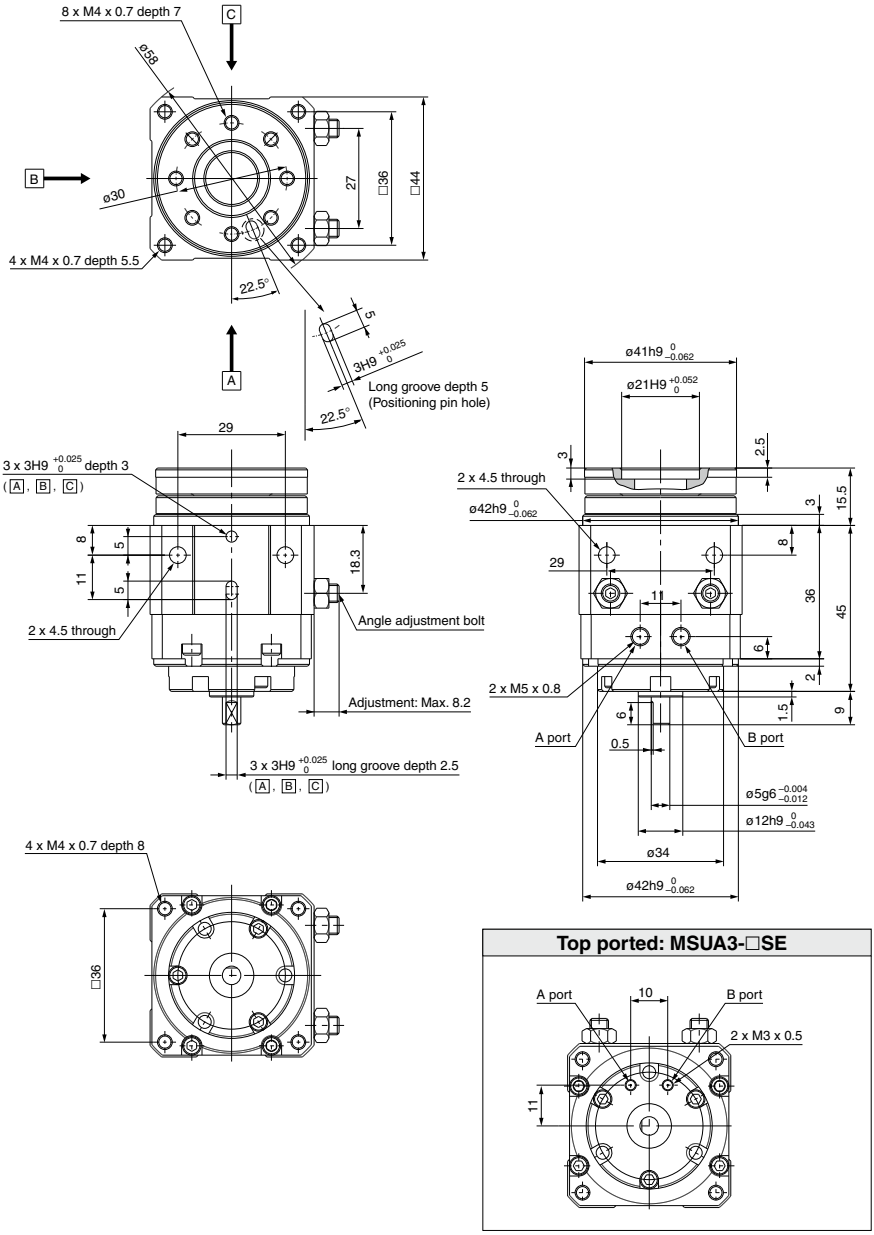


## Dimensions

These drawings indicate the condition when the B port is pressurized.

### MSUA3

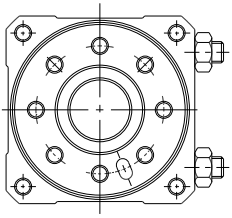
#### MSUA3-□S/SE



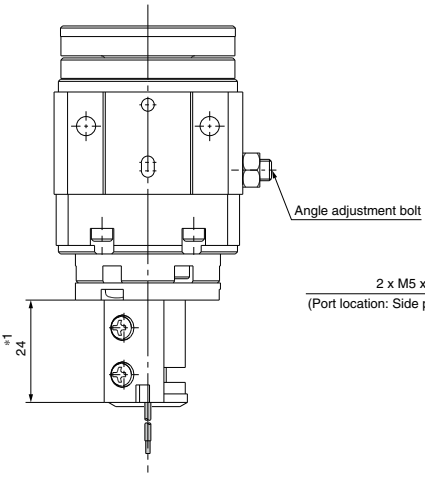

**Top ported: MSUA3-□SE**

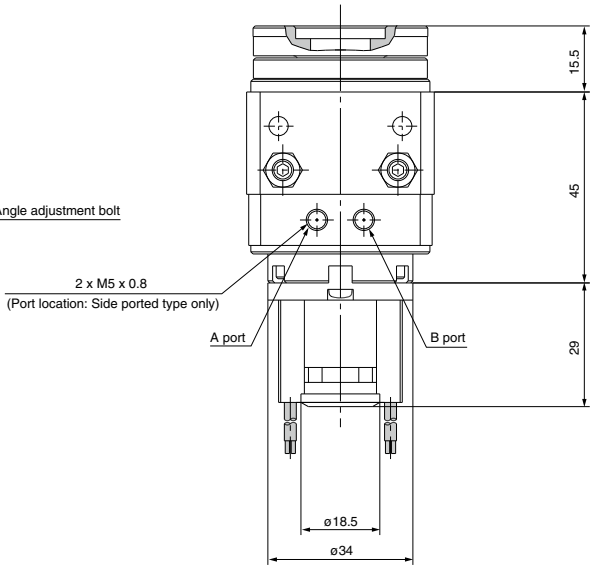
These drawings indicate the condition when the B port is pressurized.

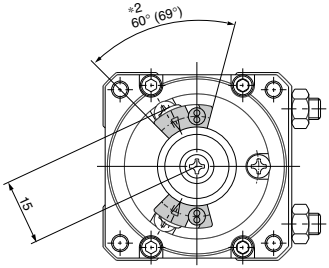
**With auto switch: MDSUA3-□S**



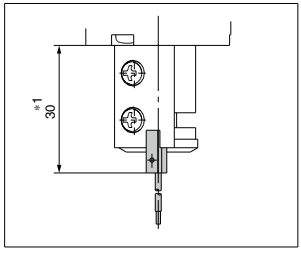
∗ 1) 24: When using D-90/90A/S99/S99V/S9P/S9PV/T99/T99V
30: When using D-97/93A
∗ 2) 60°: When using D-90/90A/97/93A
69°: When using D-S99/S99V/S9P/S9PV/T99/T99V




**D-97/93A**

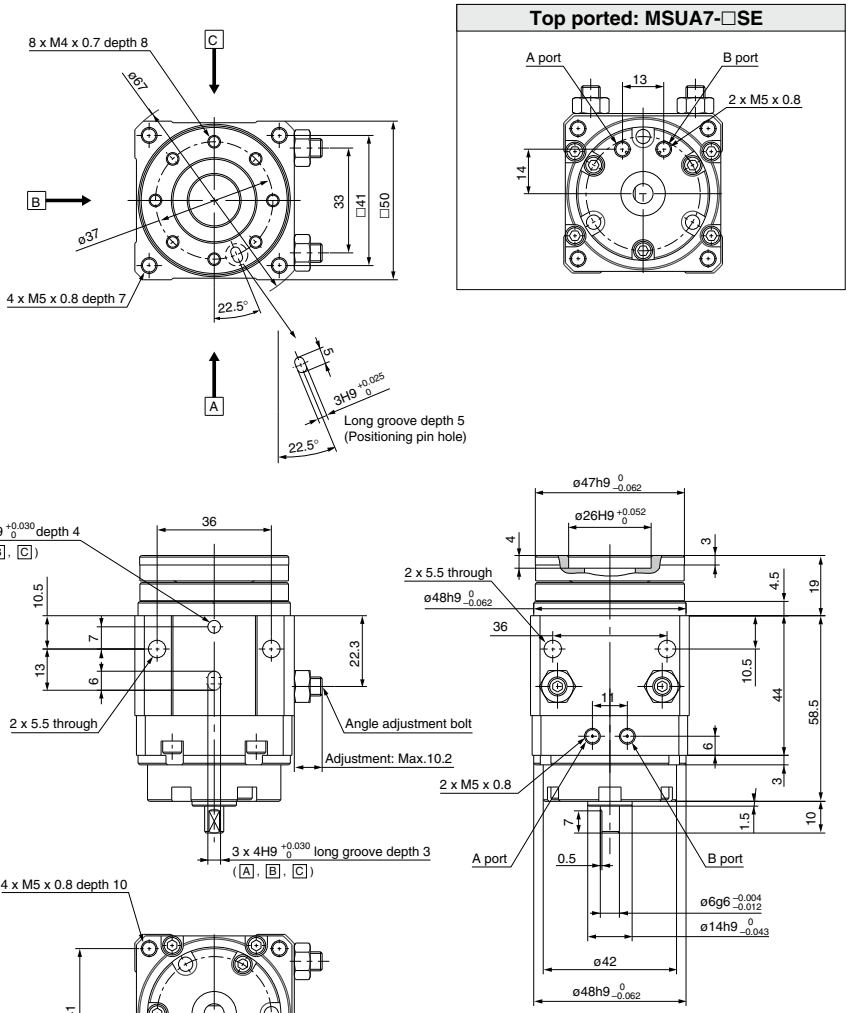


## Dimensions

These drawings indicate the condition when the B port is pressurized.

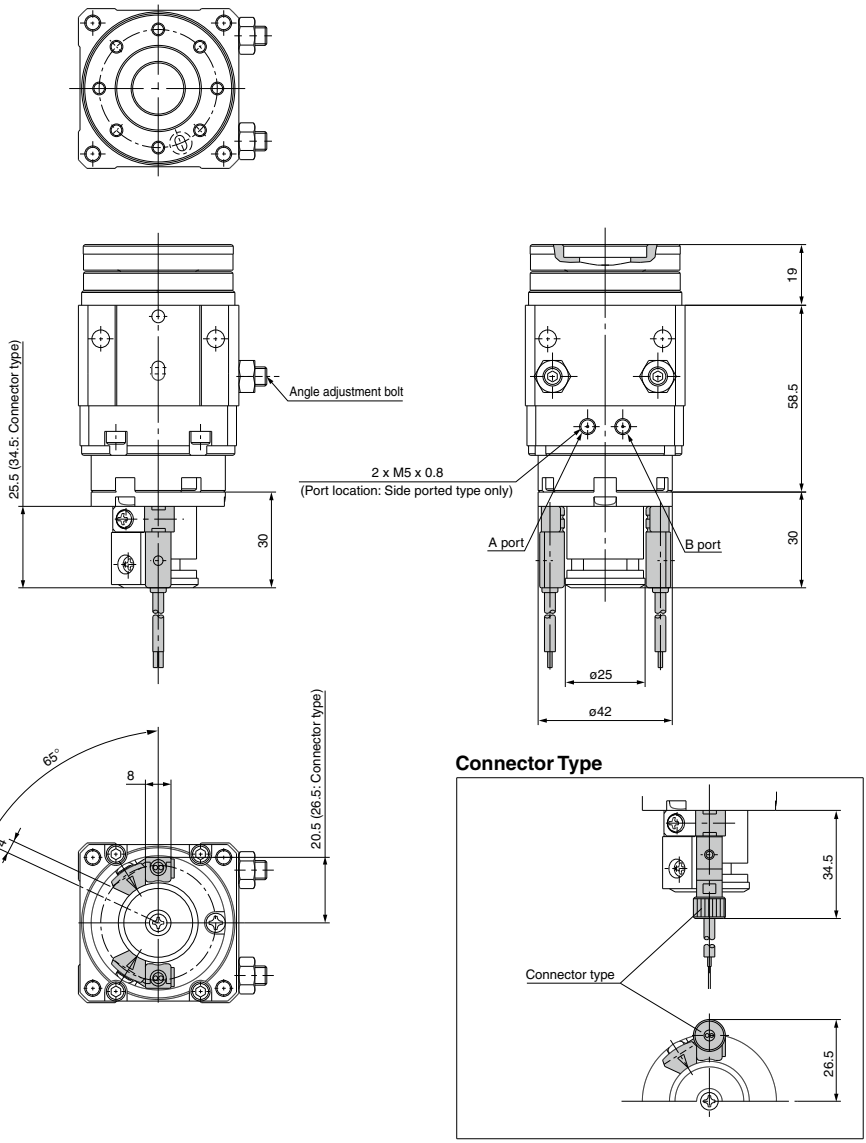
### MSUA7

#### MSUA7-□S/SE



These drawings indicate the condition when the B port is pressurized.

**With auto switch: MDSUA7-□S**



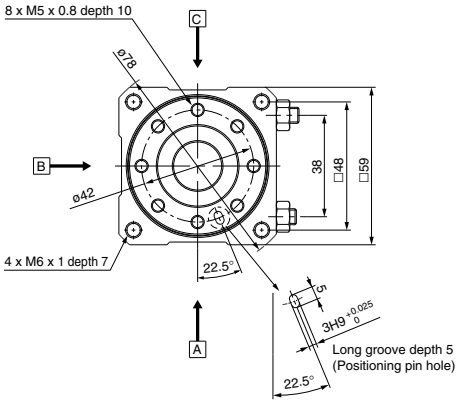

**Connector Type**

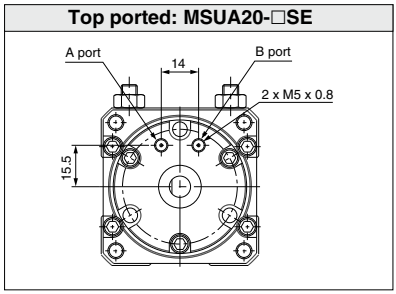
## Dimensions

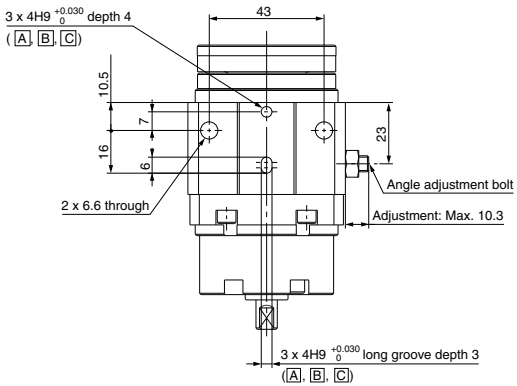
These drawings indicate the condition when the B port is pressurized.

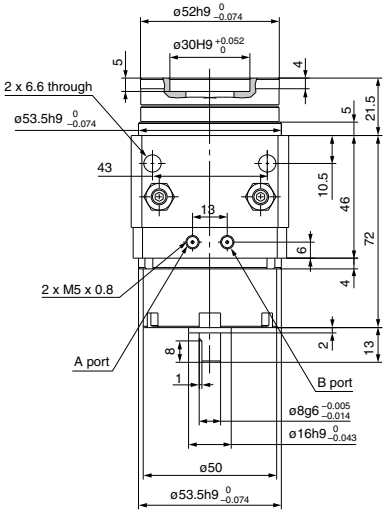
### MSUA20

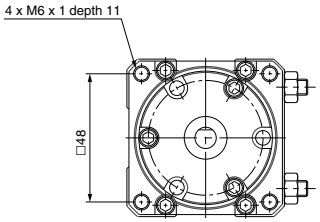
#### MSUA20-□S/SE



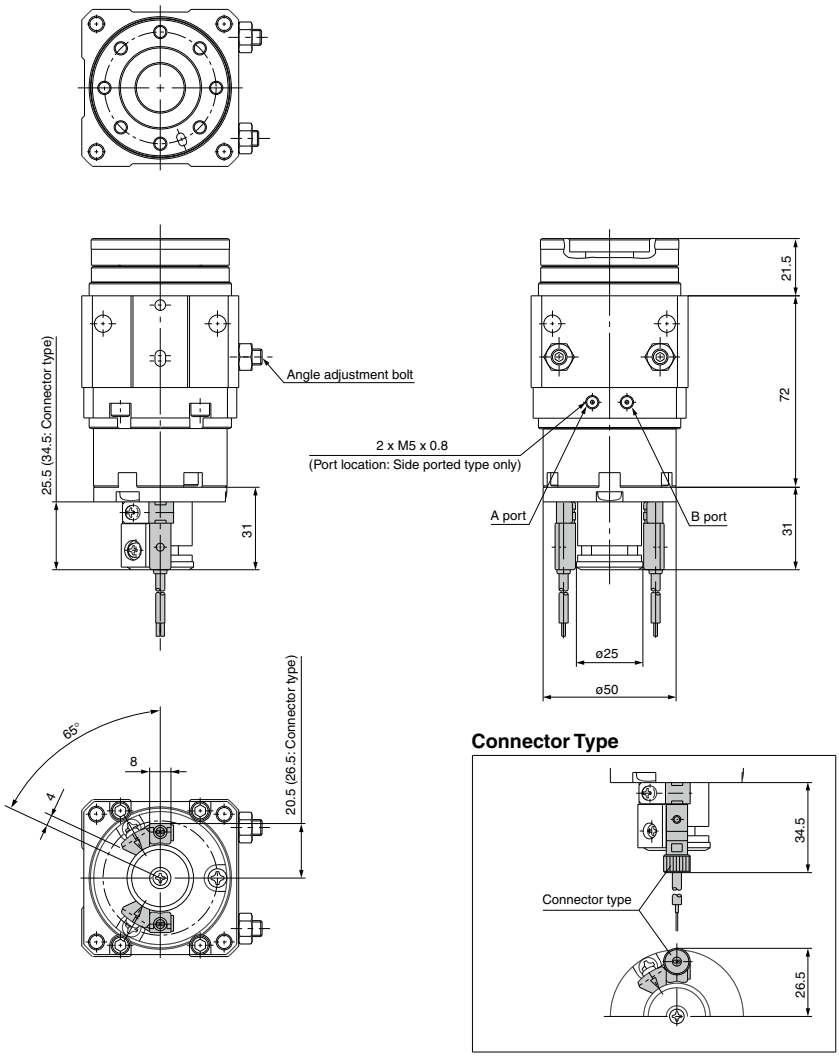



These drawings indicate the condition when the B port is pressurized.

**With auto switch: MDSUA20-□S**




**Connector Type**

# Rotary Table: Basic Type
## Vane Type
# *MSUB* Series
## Size: 1, 3, 7, 20

## How to Order

**Bearing type**

| | |
|---|---|
| B | Basic type |

**Free mount type**

**Connection port location**

| | |
|---|---|
| Nil | Side ported |
| E | Axial ported |

Available with side ported only, when equipped with auto switch unit.

**Without auto switch** MSUB 20 – 90 S

**With auto switch** M D SUB 20 – 90 S – T79 L

**With auto switch (Built-in magnet)**

**Nominal size (Torque)**

| | |
|---|---|
| 1 | MSUB 1 |
| 3 | MSUB 3 |
| 7 | MSUB 7 |
| 20 | MSUB20 |

**Rotating angle**

| Application | Symbol | Rotating angle |
|---|---|---|
| Single vane | 90 | 90° |
| | 180 | 180° |
| Double vane | 90 | 90° |

Rotation adjustment range
Single vane: Both ends ±5° each
Double vane: Both ends ±2.5° each

**Vane type**

| | |
|---|---|
| S | Single vane |
| D | Double vane |

**Auto switch**

| | |
|---|---|
| Nil | Without auto switch (built-in magnet) |

∗Refer to the table below for the applicable auto switch model.

**Number of auto switches**

| | |
|---|---|
| S | 1 pc. ∗ |
| Nil | 2 pcs. ∗∗ |

∗ S (1 auto switch) is shipped with a right-hand auto switch.
∗∗ Nil (2 auto switches) is shipped with a right-hand and a left-hand switch.

**Electrical entry/Lead wire length**

| | |
|---|---|
| Nil | Grommet/Lead wire: 0.5 m |
| L | Grommet/Lead wire: 3 m |
| Z | Grommet/Lead wire: 5 m |
| C | Connector/Lead wire: 0.5 m |
| CL | Connector/Lead wire: 3 m |
| CN | Connector/Without lead wire |

∗ Available only with R73, R80 and T79 type connectors.
∗∗ Lead wire with connector part nos.
D-LC05: Lead wire 0.5 m
D-LC30: Lead wire 3 m
D-LC50: Lead wire 5 m

**Applicable Auto Switches**/Refer to pages 929 to 983 for further information on auto switches.

| Applicable model | Type | Special function | Electrical entry | Indicator light | Wiring (Output) | Load voltage DC | Load voltage AC | Auto switch model Perpendicular | Auto switch model In-line | Lead wire type | Lead wire length (m) ∗ 0.5 (Nil) | 3 (L) | 5 (Z) | None (N) | Pre-wired connector | Applicable load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MDSUB1 MDSUB3 | Solid state auto switch | — | Grommet | Yes | 3-wire (NPN) | 5V,12V | — | S99V | S99 | Heavy-duty cord | ● | ● | ○ | — | ○ | IC circuit | Relay, PLC |
| | | | | | 3-wire (PNP) | | | S9PV | S9P | | ● | ● | ○ | — | ○ | | |
| | | | | | 2-wire | 12V | | T99V | T99 | | ● | ● | ○ | — | ○ | — | |
| | Reed auto switch | — | | No | | 24 V 5 V, 12 V | 5 V, 12 V, 24 V | — | 90 | Parallel cord | ● | ● | ● | — | — | IC circuit | |
| | | | | | | 5 V, 12 V, 100 V | 5 V, 12 V, 24 V, 100 V | — | 90A | Heavy-duty cord | ● | ● | ● | — | | | |
| | | | | Yes | | — | — | — | 97 | Parallel cord | ● | ● | ● | — | | — | |
| | | | | | | — | 100 V | — | 93A | Heavy-duty cord | ● | ● | ● | — | | | |
| MDSUB7 MDSUB20 | Solid state auto switch | — | Grommet | Yes | 3-wire (NPN) | 5V,12V | — | — | S79 | Heavy-duty cord | ● | ● | ○ | — | ○ | IC circuit | Relay, PLC |
| | | | | | 3-wire (PNP) | | | — | S7P | | ● | ● | ○ | — | ○ | | |
| | | | | | 2-wire | 12V | | — | T79 | | ● | ● | ○ | — | ○ | — | |
| | | | Connector | | | | | — | T79C | | ● | ● | ● | ● | — | | |
| | Reed auto switch | — | Grommet | | | — | 100 V | — | R73 | | ● | ● | ○ | — | — | — | |
| | | | Connector | | | | — | — | R73C | | ● | ● | ● | ● | | | |
| | | | Grommet | No | | 48V,100V | 100 V | — | R80 | | ● | ● | ○ | — | | IC circuit | |
| | | | Connector | | | — | 24 V or less | — | R80C | | ● | ● | ● | ● | | — | |

∗ Lead wire length symbols: 0.5 m ····· Nil (Example) R73C
3 m ····· L (Example) R73CL
5 m ····· Z (Example) R73CZ
None ····· N (Example) R73CN

∗ Auto switches are shipped together (but not assembled).

∗ Auto switches marked with "○" are made-to-order specifications.

∗ Refer to pages 970 to 971 for detailed solid state auto switches with pre-wired connectors.

Order example: MSUB20 single vane type (connection port side location selected)
1. Standard type (Without auto switches), Rotation 90°, side port location MSUB20-90S
2. With auto switch unit (Without auto switches), Rotation 180°, Side port location MDSUB20-180S
3. With auto switch unit + Auto switch R73, Rotation 180°, Side port location MDSUB20-180S-R73

## Specifications

| Model *3 | | MSUB1 | | MSUB3 | | MSUB7 | | MSUB20 | |
|---|---|---|---|---|---|---|---|---|---|
| Vane type | | Single vane | Double vane | Single vane | Double vane | Single vane | Double vane | Single vane | Double vane |
| Rotating angle *1 | | 90° ± 10° | 180° ± 10° | 90° ± 5° | 90° ± 10° | 180° ± 10° | 90° ± 5° | 90° ± 10° | 180° ± 10° | 90° ± 5° | 90° ± 10° | 180° ± 10° | 90° ± 5° |
| Fluid | | Air (Non-lube) | | | | | | | |
| Proof pressure (MPa) | | 1.05 | | | | | | 1.5 | |
| Ambient and fluid temperature | | 5 to 60°C | | | | | | | |
| Operating pressure range (MPa) | | 0.2 to 0.7 | | 0.15 to 0.7 | | | | 0.15 to 1.0 | |
| Rotation time adjustment range (s/90°) | | 0.07 to 0.3 (0.5 MPa) | | | | | | | |
| Shaft load | Allowable radial load | 20 N | | 40 N | | 50 N | | 60 N | |
| | Allowable thrust load *2 | 15 N | | 30 N | | 60 N | | 80 N | |
| | | 10 N | | 15 N | | 30 N | | 40 N | |
| | Allowable moment | 0.3 N·m | | 0.7 N·m | | 0.9 N·m | | 2.9 N·m | |
| Bearing | | Bearing | | | | | | | |
| Port location | | Side ported or Top ported | | | | | | | |
| Port size | Side ported | M3 x 0.5 | | M5 x 0.8 | | | | | |
| | Top ported | M3 x 0.5 | | | | M5 x 0.8 | | | |

*1 Single vane 90° can be adjusted to 90° ± 10° (both ends of rotation ± 5° each)
Single vane 180° can be adjusted to 180° ± 10° (both ends of rotation ± 5° each)
Double vane 90° type can be adjusted to 90° ± 5° (both ends of rotation ± 2.5° each)
• Rotation angles other than 90° and 180° (single vane) are available by special order.

*2 The allowable thrust load is directional. Refer to the allowable load table below for details.

Note) Refer to page 45 for allowable kinetic energy.

*3 Correspondence to equivalent current free-mount types

| Rotary table | Free-mount rotary actuator |
|---|---|
| MSUB 1 | CRBU2W10 |
| MSUB 3 | CRBU2W15 |
| MSUB 7 | CRBU2W20 |
| MSUB20 | CRBU2W30 |

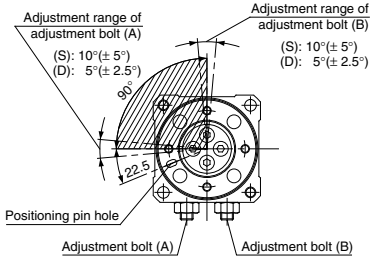
**Symbol**

### Moisture Control Tube IDK Series

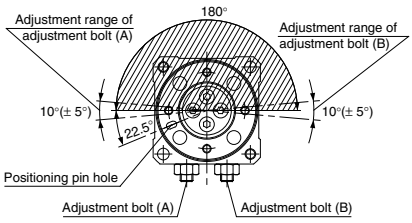
When operating an actuator with a small diameter and a short stroke at a high frequency, the dew condensation (water droplet) may occur inside the piping depending on the conditions.
Simply connecting the moisture control tube to the actuator will prevent dew condensation from occurring. For details, refer to **the Web Catalog**.

## Table Rotation Range

Angle adjustment is possible as shown in the drawings below using adjustment bolts (A) and (B).




For 90° rotation
Single vane (S): 80° to 100° adjustable
Double vane (D): 85° to 95° adjustable




For 180° rotation
Single vane (S): 170° to 190° adjustable
* The double vane type is not available with 180° rotation.

## Weight

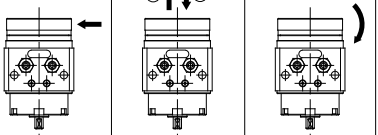
(g)

| Size | Rotation angle | Basic weight | | Auto switch unit Note) |
|---|---|---|---|---|
| | | Single vane | Double vane | |
| 1 | 90° | 145 | 150 | 15 |
| | 180° | 140 | — | |
| 3 | 90° | 230 | 240 | 20 |
| | 180° | 225 | — | |
| 7 | 90° | 360 | 375 | 28 |
| | 180° | 355 | — | |
| 20 | 90° | 510 | 580 | 38 |
| | 180° | 505 | — | |

Note) Values above do not include auto switch weight.

## Allowable Load

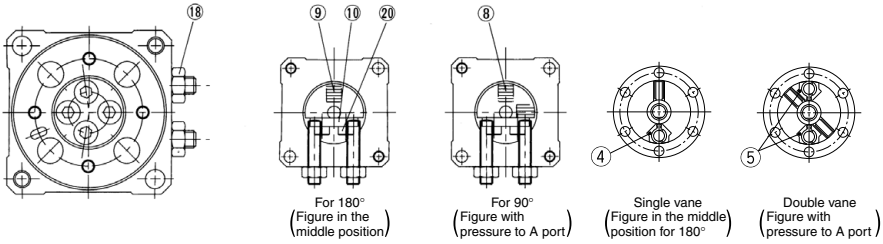
Do not permit the load and moment applied to the table to exceed the allowable values shown in the table below. (Operation above the allowable values can cause adverse effects on service life, such as play in the table and loss of accuracy.)



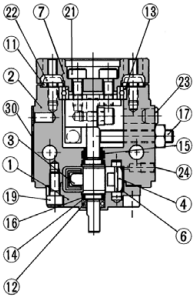

| Size | Allowable radial load (N) | Allowable thrust load (N) | | Allowable moment (N·m) |
|---|---|---|---|---|
| | | Ⓐ | Ⓑ | |
| 1 | 20 | 15 | 10 | 0.3 |
| 3 | 40 | 30 | 15 | 0.7 |
| 7 | 50 | 60 | 30 | 0.9 |
| 20 | 60 | 80 | 40 | 2.9 |

## Construction

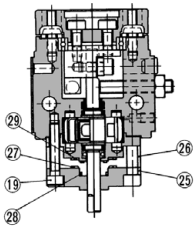
### Internal Construction of Rotary Table



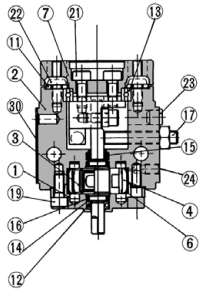

**Single vane: Size 1, 3, 7, 20**



**Double vane: Size 1**



**Double vane: Size 3, 7, 20**



### Component Parts

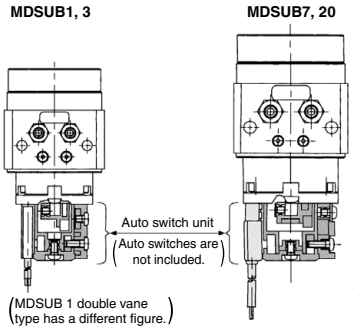
| No. | Description | Material | Note |
|---|---|---|---|
| 1 | **Body (A)** | Aluminum alloy | Anodized |
| 2 | **Body (B)** | Aluminum alloy | Anodized |
| 3 | **Vane shaft** | Stainless steel (MSUB20: Carbon steel) | Single vane |
| | | Carbon steel | Double vane |
| 4 | **Stopper** | Resin | Single vane |
| 5 | **Stopper** | Stainless steel | Double vane |
| 6 | **Stopper seal** | NBR | |
| 7 | **Table** | Aluminum alloy | Anodized, Serigraph |
| 8 | **Stopper lever (D)** | Carbon steel | Heat treated, Electroless nickel plated |
| 9 | **Stopper lever (S)** | Carbon steel | Heat treated, Electroless nickel plated |
| 10 | **Lever retainer** | Carbon steel | Zync Chromated |
| 11 | **Ring collar** | Carbon steel | Zync Chromated |
| 12 | **Bearing** | High carbon chrome bearing steel | |
| 13 | **Bearing** | High carbon chrome bearing steel | |
| 14 | **Back-up ring** | Stainless steel | |
| 15 | **Scraper** | NBR | |
| 16 | **O-ring** | NBR | |
| 17 | **Adjustment bolt** | Carbon steel | Heat treated |
| 18 | **Hexagon nut** | Carbon steel | |
| 19 | **Hexagon socket head cap screw** | | |
| 20 | **Hexagon socket head cap screw** | | |
| 21 | **Hexagon socket head cap screw** | | |
| 22 | **Button bolt** | | |
| 23 | **Rubber cap** | NBR | |
| 24 | **Hexagon socket head set screw** | | SE type only |
| 25 | **Cover** | Aluminum alloy | |
| 26 | **Plate** | Resin | |
| 27 | **Gasket** | NBR | |
| 28 | **O-ring** | NBR | |
| 29 | **O-ring** | NBR | |
| 30 | **Label** | | |

∗ The plug ㉔ is used only when the connection port is type SE.
∗ Individual part cannot be shipped.

## Construction

### Internal construction with auto switch

Units are common for both single and double vane.




∗ Refer to page 116 for the component parts.

∗ The auto switch unit can be retrofitted on a rotary actuator.
Auto switches should be ordered separately since they are not included.

| Model | Auto switch unit part no. |
|---|---|
| **M(D)SUB 1** | P211070-1 |
| **M(D)SUB 3** | P211090-1 |
| **M(D)SUB 7** | P211060-1 |
| **M(D)SUB20** | P211080-1 |

| Auto switch block unit | | | |
|---|---|---|---|
| **MDSUB1/3** | | | **MDSUB7/20** |
| For reed auto switch | | For solid state auto switch | Combination of reed and solid state auto switches |
| Right-handed | Left-handed | Combination left & right-handed | Combination left & right-handed |
|  |  |  |  |
| Part no.: P211070-8 | Part no.: P211070-9 | Part no.: P211070-13 | Part no.: P211060-8 |

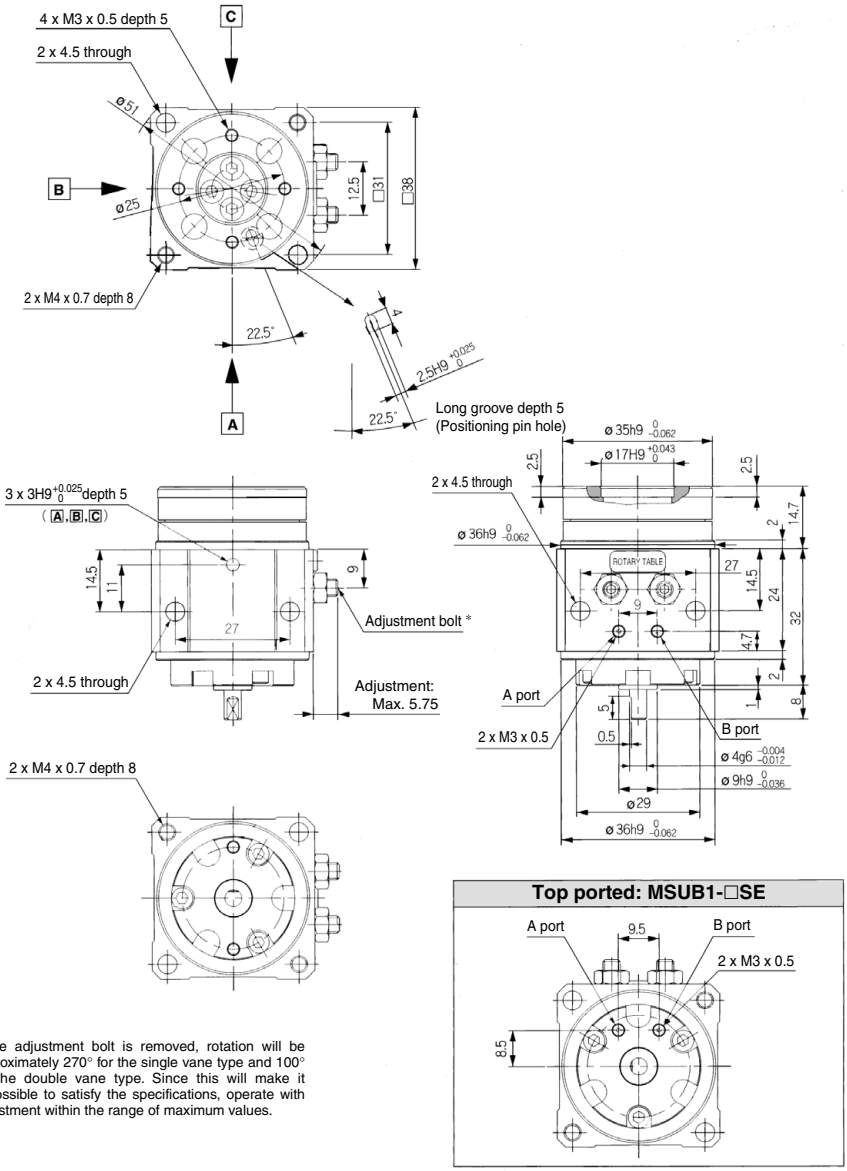
∗ The auto switch block unit is included in the auto switch unit.
∗ Auto switch block unit shows the necessary assembly for mounting 1 piece of auto switch to the auto switch unit.
∗ Individual part cannot be shipped.

## Dimensions

These drawings indicate the condition when the B port is pressurized.

### MSUB1 (Single vane)

#### MSUB1-□S/SE




**Top ported: MSUB1-□SE**

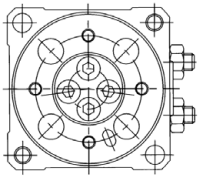


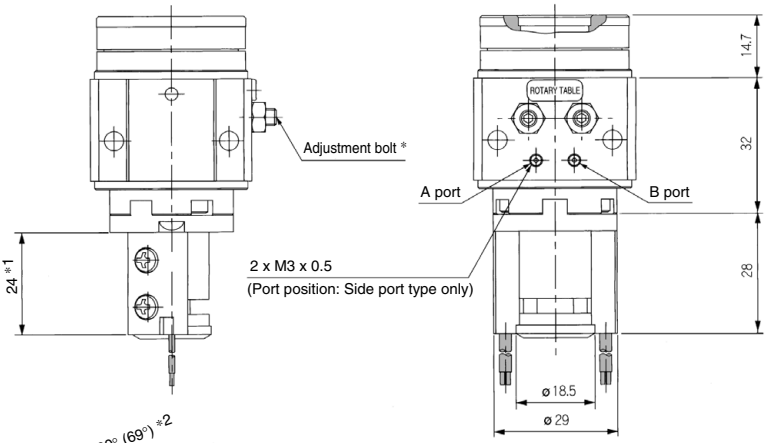

* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

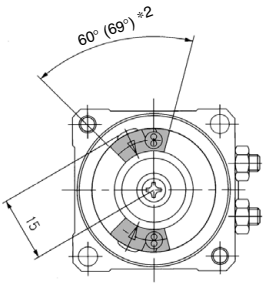
These drawings indicate the condition when the B port is pressurized.

**With auto switch: MDSUB1-□S**

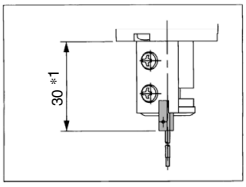
∗1) 24: When using D-90/90A/S99(V)/T99(V)/S9P(V)
30: When using D-97/93A
∗2) 60°: When using D-90/90A/97/93A
69°: When using D-S99(V)/T99(V)/S9P(V)






**D-97/93A**



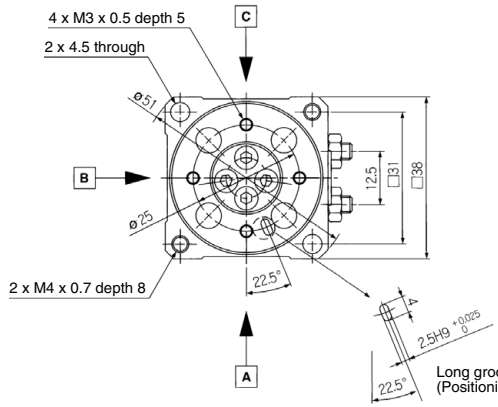

∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

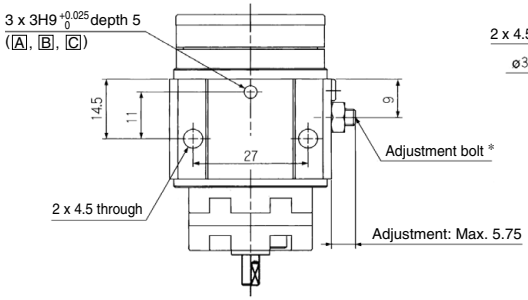
## Dimensions

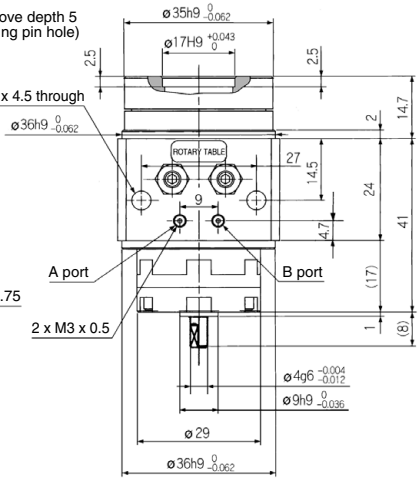
These drawings indicate the condition when the B port is pressurized.

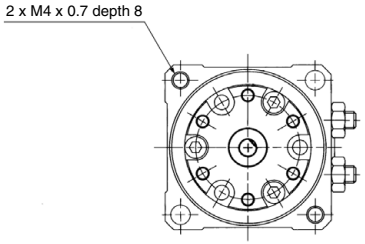
### MSUB1 (Double vane)

#### MSUB1-□D

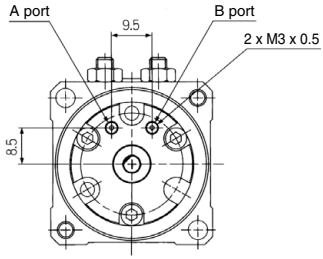



**Top ported: MSUB1-□DE**

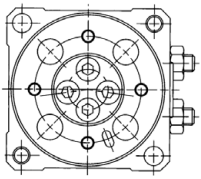


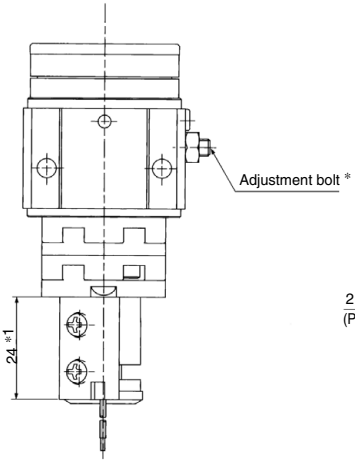

* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

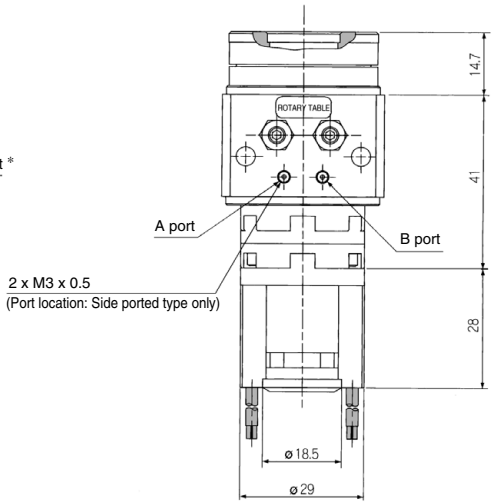
These drawings indicate the condition when the B port is pressurized.

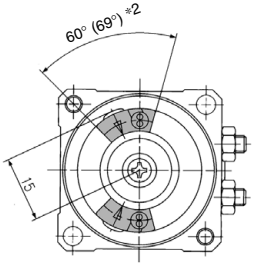
**With auto switch: MDSUB1-□D**

∗1) 24: When using D-90/90A/S99(V)/T99(V)/S9P(V)
30: When using D-97/93A
∗2) 60°: When using D-90/90A/97/93A
69°: When using D-S99(V)/T99(V)/S9P(V)

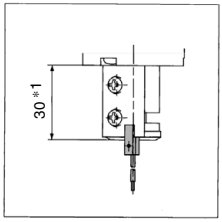





**D-97/93A**



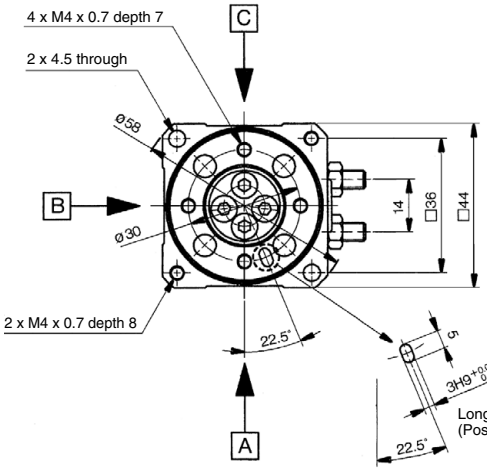

∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

## Dimensions

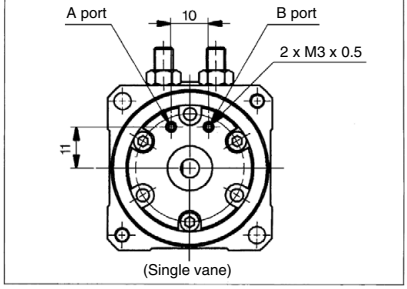
These drawings indicate the condition when the B port is pressurized.

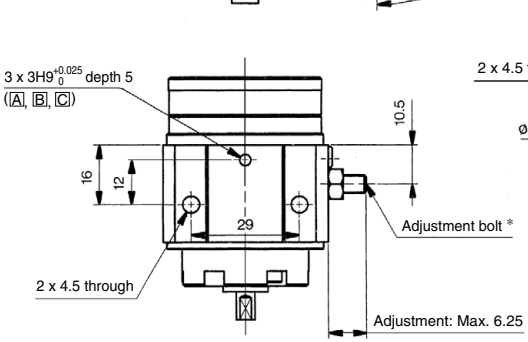
### MSUB3 (Single vane/Double vane)

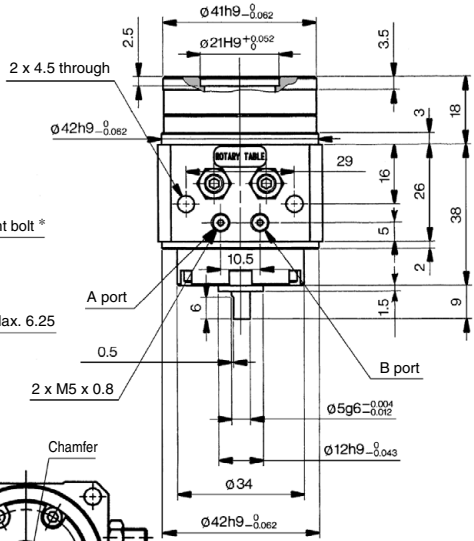
**MSUB3-□S/D**

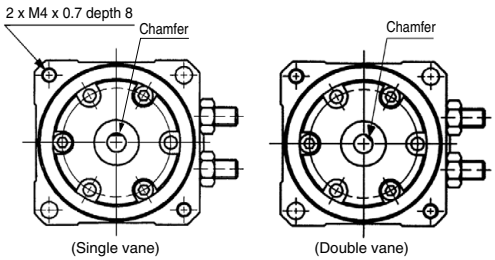



**Top ported: MSUB3-□SE/DE**




(Single vane) (Double vane)

The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs from single and double vane.

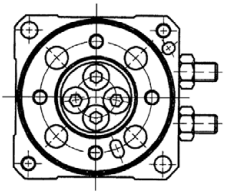
* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

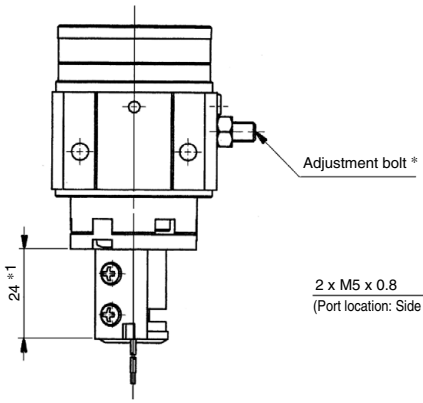
These drawings indicate the condition when the B port is pressurized.

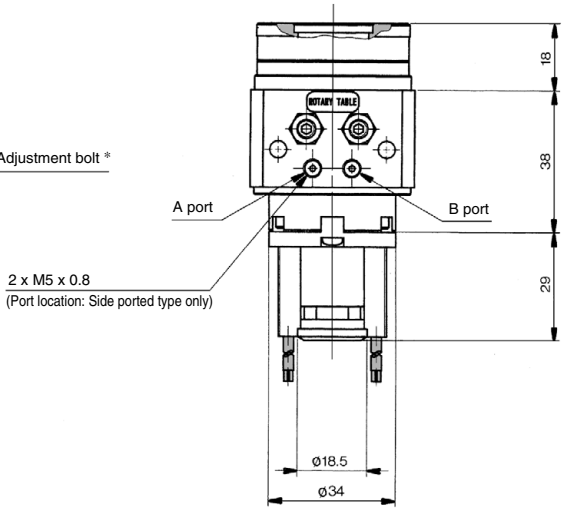
**With auto switch: MDSUB3**

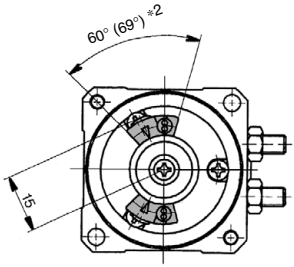
∗1) 24: When using D-90/90A/S99(V)/T99(V)/S9P(V)
30: When using D-97/93A
∗2) 60°: When using D-90/90A/97/93A
69°: When using D-S99(V)/T99(V)/S9P(V)

∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

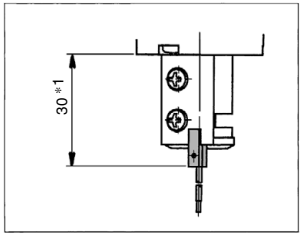





**D-97/93A**

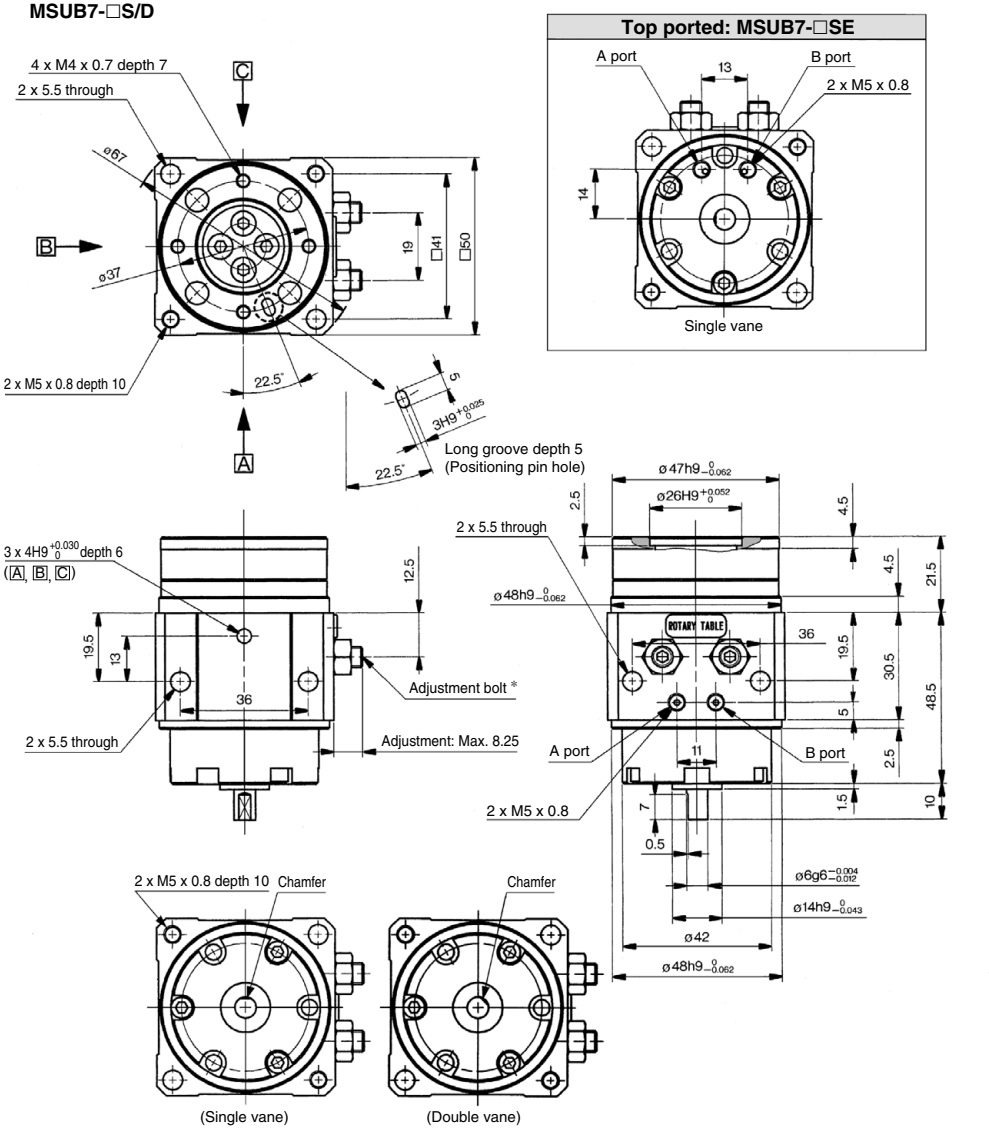


## Dimensions

These drawings indicate the condition when the B port is pressurized.

### MSUB7 (Single vane/Double vane)

**MSUB7-□S/D**



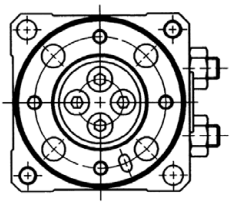

The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs from single and double vane.

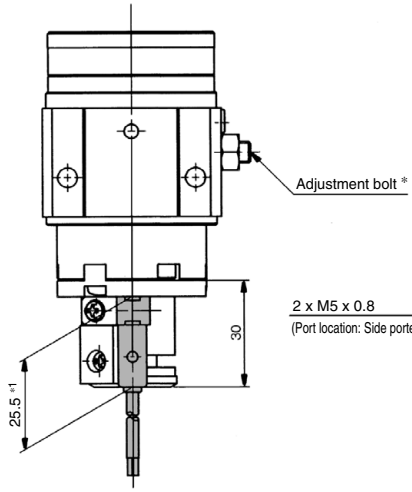
* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

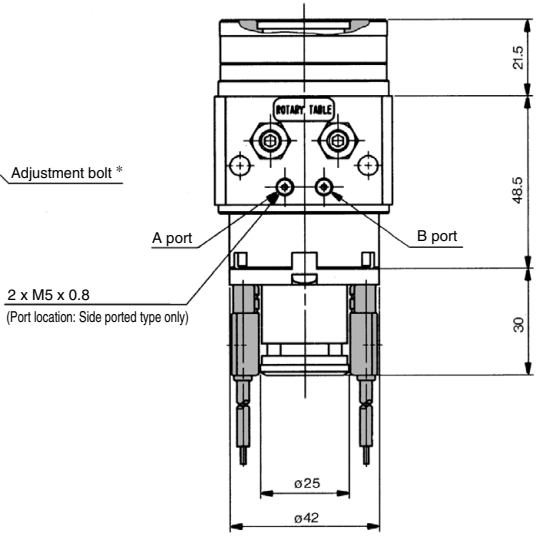
These drawings indicate the condition when the B port is pressurized.

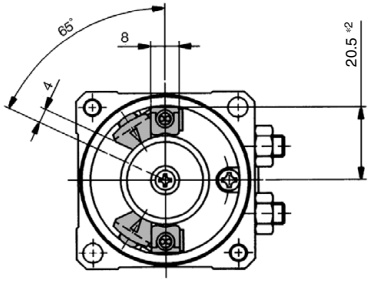
**With auto switch: MDSUB7**

∗1) 25.5: Grommet type
34.5: Connector type
∗2) 20.5: Grommet type
26.5: Connector type

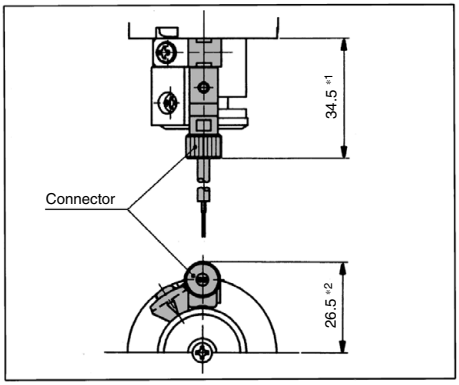





**Connector Type**



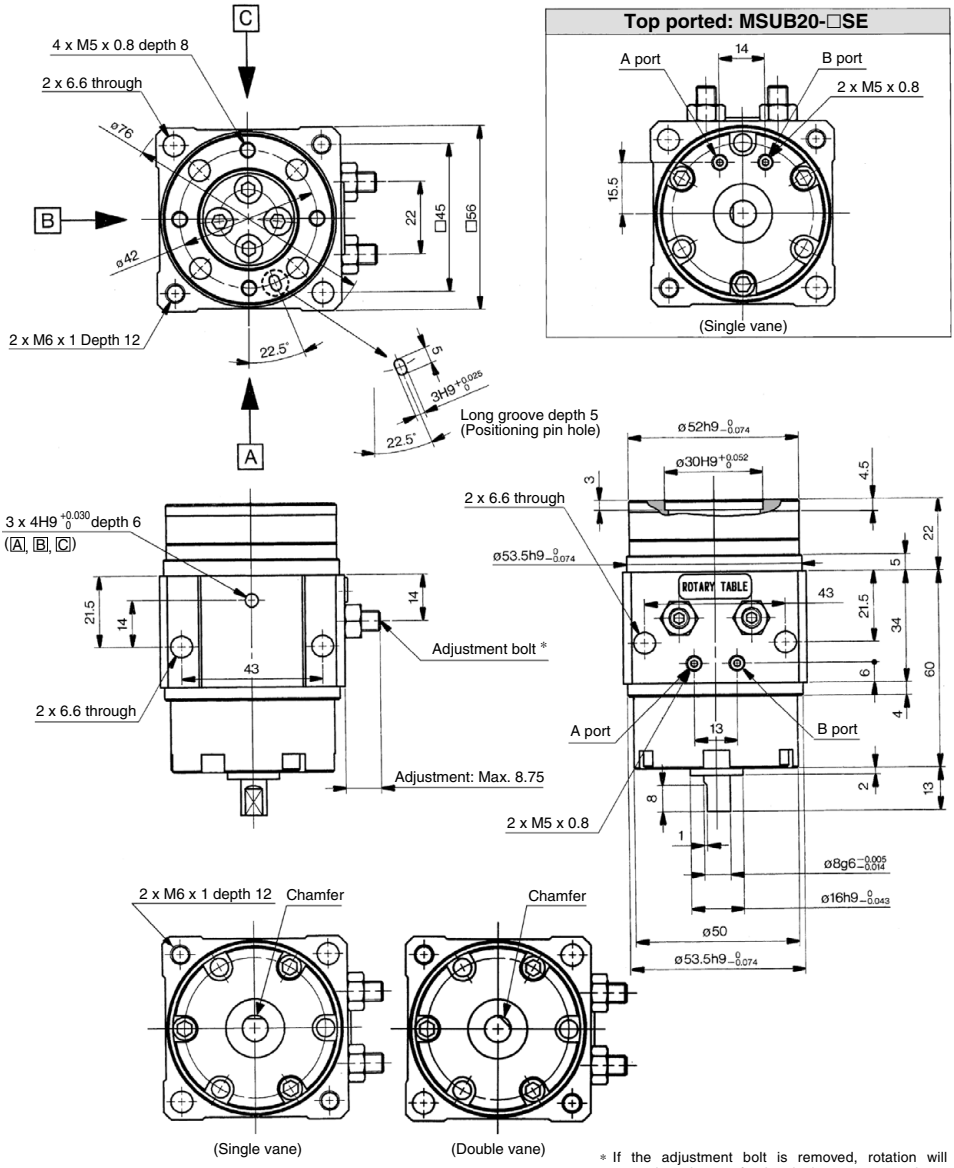

∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

## Dimensions

These drawings indicate the condition when the B port is pressurized.

### MSUB20 (Single vane/Double vane)

**MSUB20-□S/D**



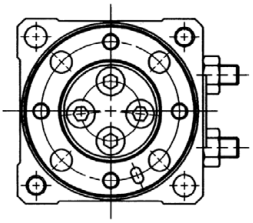

The outside drawings show the single vane type, but only the position of the chamfered sections shown in the above drawings differs from single and double vane.

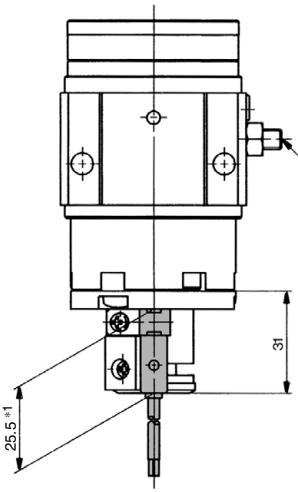
* If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

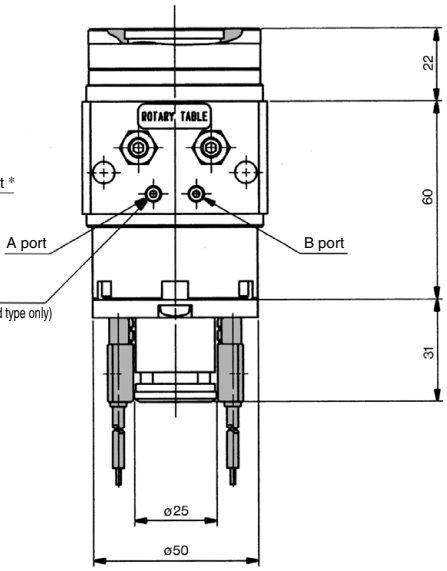
These drawings indicate the condition when the B port is pressurized.

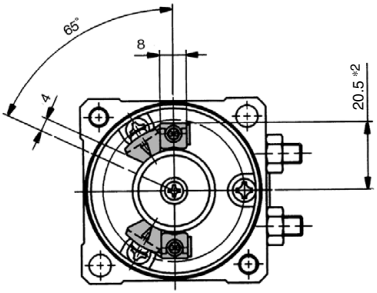
**With auto switch: MDSUB20**

∗1) 25.5: Grommet type
34.5: Connector type
∗2) 20.5: Grommet type
26.5: Connector type

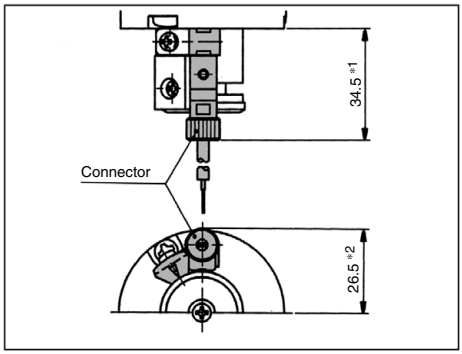




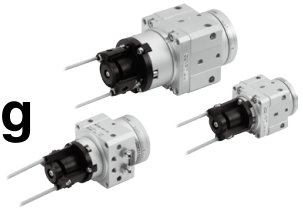




**Connector Type**




∗ If the adjustment bolt is removed, rotation will be approximately 270° for the single vane type and 100° for the double vane type. Since this will make it impossible to satisfy the specifications, operate with adjustment within the range of maximum values.

# *MDSU Series*
# Auto Switch Mounting

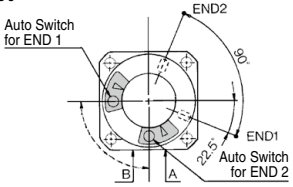


## Table Positioning Pin Hole Rotation Range and Auto Switch Mounting Position

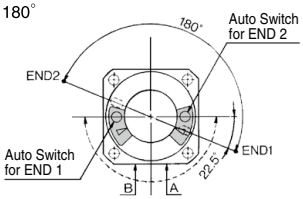
### MSU□1/3

**Single vane type**

90°

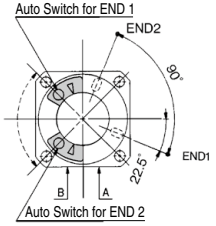



180°




**Double vane type (MSUB only)**

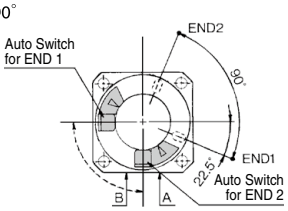
90°



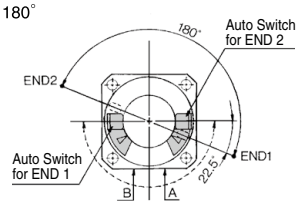

### MSU□7/20

**Single vane type**

90°

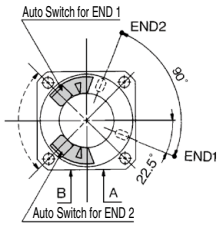



180°

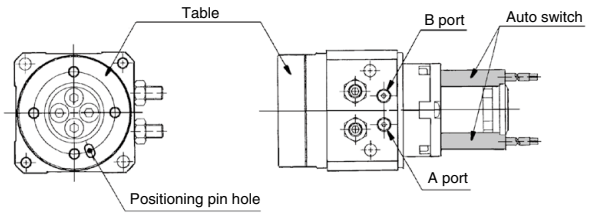



**Double vane type (MSUB only)**

90°




- In drawings that show the rotation range, the arrows on the solid line 90° (180°) indicate the rotation range of the positioning pin holes on the table surface. When the pin hole is at END1, the END1 auto switch operates, and when the pin hole is at END2, the END2 auto switch operates.
- The arrows on the broken line indicate the rotation range of the internal magnet. The rotation range of each auto switch can be reduced by moving the END1 auto switch clockwise and the END2 auto switch counterclockwise.




**Auto Switch Operating Angle and Hysteresis Angle**

| Model | Operating angle | Hysteresis angle |
|---|---|---|
| **MDSU□1, 3** | 110° | 10° |
| **MDSU□7, 20** | 90° | |

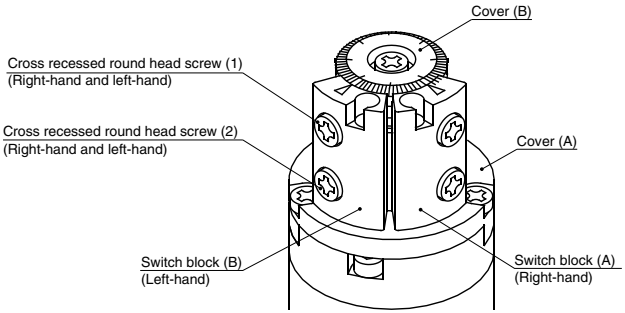
Note) Since the above values are only provided as a guideline, they are not guaranteed. In the actual setting, adjust them after confirming the auto switch performance.

Refer to page 162 for operating angle of auto switch and angle of hysteresis and the procedure for moving the auto switch detection position.

## MSU□1·3Auto Switch Mounting

### External view and descriptions of auto switch unit

The following shows the external view and typical descriptions of the auto switch.




### Solid state auto switch

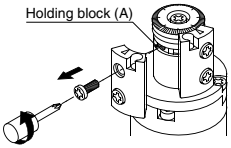
**<Applicable auto switch>**

**3-wire····· D-S99(V)□/S9P(V)□**
**2-wire····· D-T99(V)□**

* For details about shape and specifications of the auto switch, refer to SMC's catalog.

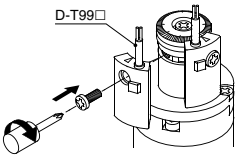
①**Switch block detaching**

Remove the cross recessed round head screw (1) to detach the switch block.




②**Solid state auto switch mounting**

Secure the solid state auto switch with the cross recessed round head screw (1) and holding block (A).
Proper tightening torque:
0.4 to 0.6(N·m)




* Since the holding block (A) moves inside the groove, move it to the mounting position beforehand.
* Use the auto switch after the operating position has been adjusted with the cross recessed round head screw (1). For details about how to adjust the operating position, refer to SMC's catalog.

### Reed auto switch

**<Applicable auto switch>**

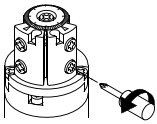
**D-97/93A(With indicator light)**
**D-90/90A(Without indicator light)**

* For details about shape and specifications of the auto switch, refer to SMC's catalog.

①**Preparations**

Loosen the cross recessed round head screw (2). (About 2 to 3 turns)

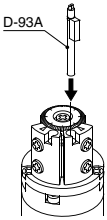
* This screw has been secured temporarily at shipment.



②**Reed auto switch mounting**

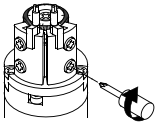
Insert the reed auto switch until it is in contact with the hole in the switch block.

* Insert the D-97/93A in the direction shown in the figure on the right.
* Since the D-90/90A is a round type, it has no directionality.




③**Reed auto switch securing**

Tighten the cross recessed round head screw (2) to secure the reed auto switch.
Proper tightening torque:
0.4 to 0.6(N·m)



* Use the auto switch after the operating position has been adjusted with the cross recessed round head screw (1). For details about how to adjust the operating position, refer to SMC's catalog.

# *MSU Series*
# Specific Product Precautions

**Be sure to read this before handling the products.**
**Refer to page 7 for safety instructions, pages 8 to 13 for rotary actuator precautions, and pages 18 to 22 for auto switch precautions.**

## Selection

### ⚠Warning

**1. Ensure the load energy within the product's allowable energy value.**

Operation with a load kinetic energy exceeding the allowable value can cause human injury and/or damage to equipment or machinery. (Refer to model section procedures in this catalog.)

### ⚠Caution

**1. When there are load fluctuations, allow a sufficient margin in the actuator torque.**
**In case of horizontal mounting (operation with product facing sideways), malfunction may occur due to load fluctuations.**

## Mounting

### ⚠Caution

**1. Adjust the rotation angle within the prescribed ranges.**
**Single vane type: (90°±10°, 180°±10°) (±5° at end of rotation)**
**Double vane type: (90°±10°) (±2.5° at end of rotation)**

∗ MSUB series only.

Adjustment outside the prescribed ranges may cause malfunction of the product or failure of switches to operate.

**2. Adjust the rotation time within the prescribed values using a speed controller, etc. (0.07 to 0.3 s/90°)**

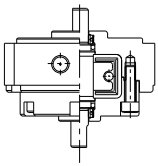
Adjustment to a speed slower than 0.3 s/90° can cause sticking and slipping or stopping of operation.

## Maintenance

### ⚠Caution

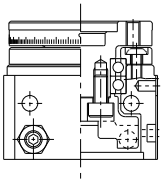
**<High precision type/MSUA>**
**In case a rotary unit and table unit are required for maintenance, order with the unit part numbers shown below.**

**Rotary unit**



| Model | Unit part no. |
|---|---|
| **MSUA 1-□S** | P402070-2A |
| **MSUA 1-□SE** | P402070-2B |
| **MSUA 3-□S** | P402090-2A |
| **MSUA 3-□SE** | P402090-2B |
| **MSUA 7-□S** | P402060-2A |
| **MSUA 7-□SE** | P402060-2B |
| **MSUA20-□S** | P402080-2A |
| **MSUA20-□SE** | P402080-2B |

**Table unit**



| Model | Unit part no. |
|---|---|
| **MSUA 1- 90□** | P402070-3A |
| **MSUA 1-180□** | P402070-3B |
| **MSUA 3- 90□** | P402090-3A |
| **MSUA 3-180□** | P402090-3B |
| **MSUA 7- 90□** | P402060-3A |
| **MSUA 7-180□** | P402060-3B |
| **MSUA20- 90□** | P402080-3A |
| **MSUA20-180□** | P402080-3B |

Note 1) Note that the rotation angle should not be changed even though the rotary unit has been changed. For maintenance, order units with a part number suitable for the model being used.
Note 2) Due to the integral construction of the MSUB series, the rotary and table units cannot be ordered separately.