Rotary Table/Vane Type

**MSU Series**

Size: 1, 3, 7, 20

Table top deflection **0.03** mm or less

Peripheral table deflection **0.03** mm or less

High Precision

MSUB Series

MSUA Series
Rotary actuator with lightweight, improved table deflection accuracy: 0.03 mm or less

**MSUA Series**

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

- **High precision/High rigidity**
  - Special bearing (Duplex single row ball bearing)
  - Deflection accuracy: Displacement for 180° rotation

- **Improved table deflection accuracy**
  - 0.03 mm or less

- **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

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

- **Angle adjustable**
  - 90° ±10°, 180° ±10°
  - Double vane (MSUB only) 90° ±5°

- **Auto switch capable**
  - Since switches can be moved anywhere on the circumference, they can be mounted at positions which accommodate the specifications.

- **Table unit**
  - Drive unit
**Table**

**Series**

Size: 1, 3, 7, 20

compact table for robotic hands

**Free mount type**

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

<table>
<thead>
<tr>
<th>Axial mounting</th>
<th>Lateral mounting</th>
<th>Vertical mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom mount</td>
<td>Top mount</td>
<td></td>
</tr>
<tr>
<td>Through-holes (2)</td>
<td>Through-holes (2)</td>
<td>Through-holes (2)</td>
</tr>
<tr>
<td>Tapped holes (4)</td>
<td>Tapped holes (4)</td>
<td></td>
</tr>
</tbody>
</table>

**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)

**Series Variations**

<table>
<thead>
<tr>
<th>Series</th>
<th>Size</th>
<th>Rotating angle</th>
<th>Vane type</th>
<th>Applicable auto switch</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>High precision type MSUA</td>
<td>1</td>
<td>90°</td>
<td>Single vane</td>
<td>D-9, D-T99, D-9□3A, D-S99, S9P</td>
<td>P.142</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>D-R73, D-T79, D-R80, D-S79, S7P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>180°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic type MSUB</td>
<td>1</td>
<td>90°</td>
<td>Single vane</td>
<td>D-9, D-T99, D-9□3A, D-S99, S9P</td>
<td>P.154</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>D-R73, D-T79, D-R80, D-S79, S7P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>180°</td>
<td>Double vane *</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Connection port location</th>
<th>Bearing type</th>
<th>Free mount type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Side ported</td>
<td>E</td>
</tr>
<tr>
<td>E</td>
<td>Axial ported</td>
<td></td>
</tr>
</tbody>
</table>

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

### Without auto switch

| MSUA | 20 | 90 | S |  |

### With auto switch

| M D SUA | 20 | 90 | S | T79 |  |

#### Nominal size (Torque)  
1. MSUA 1  
2. MSUA 3  
3. MSUA 7  
4. MSUA 20

#### Nominal size (Torque)

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

#### Rotating angle

<table>
<thead>
<tr>
<th>Applicable Symbol</th>
<th>Rotation angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single vane</td>
<td>90° 180°</td>
</tr>
</tbody>
</table>

Rotation adjustment range: Single vane: Both ends 90° each

### Vane type

- **S** Single vane

#### Number of auto switches

<table>
<thead>
<tr>
<th>Number of auto switches</th>
<th>S</th>
<th>1 pc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>2 pcs.</td>
<td></td>
</tr>
</tbody>
</table>

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

#### Electrical entry/Lead wire length

<table>
<thead>
<tr>
<th>Electrical entry</th>
<th>Lead wire length (m)</th>
<th>Pre-wired connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Grommet/Lead wire: 0.5 m</td>
<td>I circuit</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td>L</td>
<td>Grommet/Lead wire: 3 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Grommet/Lead wire: 5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Connector/Lead wire: 0.5 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>Connector/Lead wire: 3 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CN</td>
<td>Connector/Without lead wire</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Available only with R73, R80 and T79 type connectors.

### Auto switch

- **Nil** Without auto switch (Built-in magnet)

#### Auto switch

- **Pre-wired** connector

#### Wiring (Output)

<table>
<thead>
<tr>
<th>Auto switch model</th>
<th>Lead wire type</th>
<th>Load voltage (V)</th>
<th>Lead wire length (m)</th>
<th>Pre-wired connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy-duty</td>
<td>-</td>
<td>5 V, 12 V</td>
<td>0.5 m</td>
<td>I circuit</td>
</tr>
<tr>
<td>Heavy-duty</td>
<td>-</td>
<td>5 V, 12 V, 24 V</td>
<td>3 m</td>
<td>I circuit</td>
</tr>
<tr>
<td>Heavy-duty</td>
<td>-</td>
<td>12 V</td>
<td>5 m</td>
<td>I circuit</td>
</tr>
<tr>
<td>Heavy-duty</td>
<td>-</td>
<td>12 V</td>
<td>100 V</td>
<td>I circuit</td>
</tr>
</tbody>
</table>

* Auto switches marked with "**" are made-to-order specifications.
* Refer to pages 837 and 838 for detailed solid state auto switches with pre-wired connectors.

### Applicable Auto Switches

Refer to pages 797 to 850 for further information on auto switches.

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Type</th>
<th>Electrical entry</th>
<th>Wiring (Output)</th>
<th>Load voltage</th>
<th>Auto switch model</th>
<th>Lead wire type</th>
<th>Lead wire length (m)</th>
<th>Pre-wired connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSUAD3</td>
<td>Solid state auto switch</td>
<td>Grommet</td>
<td>2-wire</td>
<td>24 V</td>
<td>5 V, 12 V</td>
<td>S99V</td>
<td>S99</td>
<td>0.5 m</td>
<td>I circuit</td>
</tr>
<tr>
<td>MSUAD1</td>
<td>Reed auto switch</td>
<td>Grommet</td>
<td>Yes</td>
<td>2-wire</td>
<td>24 V</td>
<td>5 V, 12 V</td>
<td>S9PV</td>
<td>S9P</td>
<td>3 m</td>
</tr>
<tr>
<td>MSUAD20</td>
<td>Solid state auto switch</td>
<td>Connector</td>
<td>2-wire</td>
<td>24 V</td>
<td>12 V</td>
<td>T99V</td>
<td>5 V, 12 V</td>
<td>100 V</td>
<td>100 V</td>
</tr>
<tr>
<td>MSUAD23</td>
<td>Reed auto switch</td>
<td>Connector</td>
<td>Yes</td>
<td>2-wire</td>
<td>24 V</td>
<td>12 V</td>
<td>T99C</td>
<td>48 V, 100 V</td>
<td>100 V</td>
</tr>
</tbody>
</table>

* 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 marked with "**" are made-to-order specifications.

### 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
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 IDK series in the Best Pneumatics No.6.

### Specifications

#### Table Rotation Range

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

**Adjustment range of adjustment bolt (A)**
- (S): 10° (± 5°)

**Adjustment range of adjustment bolt (B)**
- (S): 10° (± 5°)

**Positioning pin hole**
- Single vane (S): 80 to 100° adjustable

**Adjustment range of adjustment bolt (A)**
- 180° (± 5°)

**Adjustment range of adjustment bolt (B)**
- 180° (± 5°)

**Positioning pin hole**
- Single vane (S): 170 to 190° adjustable

### Weight

#### Table

<table>
<thead>
<tr>
<th>Size</th>
<th>Rotating angle</th>
<th>Basic weight (g)</th>
<th>Auto switch unit (Note)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90°</td>
<td>162</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>161</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>90°</td>
<td>262</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>90°</td>
<td>440</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>436</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>90°</td>
<td>675</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>671</td>
<td></td>
</tr>
</tbody>
</table>

#### 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.)

<table>
<thead>
<tr>
<th>Size</th>
<th>Allowable radial load (N)</th>
<th>Allowable thrust load (N)</th>
<th>Allowable moment (N·m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>15</td>
<td>0.3</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>30</td>
<td>0.7</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>60</td>
<td>0.9</td>
</tr>
<tr>
<td>20</td>
<td>60</td>
<td>80</td>
<td>2.9</td>
</tr>
</tbody>
</table>
## Component Parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body A</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>2</td>
<td>Body B</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>3</td>
<td>Body C</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>4</td>
<td>Vane shaft</td>
<td>Stainless steel (MSUA20 is carbon steel)</td>
<td>Single vane</td>
</tr>
<tr>
<td>5</td>
<td>Stopper</td>
<td>Resin</td>
<td>Single vane</td>
</tr>
<tr>
<td>6</td>
<td>Stopper seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Table</td>
<td>Aluminum alloy</td>
<td>Anodized, Serigraph</td>
</tr>
<tr>
<td>8</td>
<td>Stopper lever</td>
<td>Carbon steel</td>
<td>Heat treated, Electroless nickel plated</td>
</tr>
<tr>
<td>9</td>
<td>Stopper guide</td>
<td>Stainless steel</td>
<td>Nitriding</td>
</tr>
<tr>
<td>10</td>
<td>Lever retainer</td>
<td>Carbon steel</td>
<td>Zinc Chromated</td>
</tr>
<tr>
<td>11</td>
<td>Bearing retainer</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>12</td>
<td>Bearing</td>
<td>High carbon chrome bearing steel</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Special bearing</td>
<td>High carbon chrome bearing steel</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Back-up ring</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>With adjustment bolt</td>
<td>Carbon steel</td>
<td>Heat treated</td>
</tr>
<tr>
<td>17</td>
<td>Hexagon nut</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Hexagon socket head cap screw</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Hexagon socket head cap screw</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Hexagon socket head cap screw</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Button bolt</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Hexagon socket head cap screw</td>
<td>Carbon steel</td>
<td>SE type only</td>
</tr>
</tbody>
</table>

* The plug Ø is used only when the connection port is type SE.
* Individual part cannot be shipped. Please purchase the whole unit. (Refer to page 170.)
**Construction**

**Internal construction with auto switch**

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Auto switch unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M(D)SUA 1</td>
<td>P211070-1</td>
</tr>
<tr>
<td>M(D)SUA 3</td>
<td>P211090-1</td>
</tr>
<tr>
<td>M(D)SUA 7</td>
<td>P211060-1</td>
</tr>
<tr>
<td>M(D)SUA20</td>
<td>P211080-1</td>
</tr>
</tbody>
</table>

- 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.

---

* Refer to page 56 for the component parts.
These drawings indicate the condition when the B port is pressurized.

**MSUA1**

**MSUA1-□S,SE**

Dimensions

8 x M3 x 0.5 depth 5
4 x M4 x 0.7 depth 4

Long groove depth 4
(Positioning pin hole)

A port
B port

Top ported: MSUA1-□SE

A port
B port

Adjustment: Max. 7.5
With auto switch: MDSUA1-S

    30: When using D-97/93A
+2) 60°: When using D-90/90A/97/93A

A port

B port

2 x M3 x 0.5

(Port location: Side ported type only)
These drawings indicate the condition when the B port is pressurized.

For more details, please refer to the MSUA Series Dimensions section.
These drawings indicate the condition when the B port is pressurized.

With auto switch: MDSUA3-□S

30: When using D-97/93A

2) 60°: When using D-90/90A/S97/93A

Port location: Side ported type only

Angle adjustment bolt

2 x M5 x 0.8
(Port location: Side ported type only)
These drawings indicate the condition when the B port is pressurized.

MSUA7

MSUA7-□S/SE

Top ported: MSUA7-□SE

A port

B port

8 x M4 x 0.7 depth 8

4 x M5 x 0.8 depth 7

2 x M5 x 0.8

2 x M5 x 0.8

3 x 4H9 \(0^{0.030}\) depth 4

2 x 5.5 through

A port

B port

2 x M5 x 0.8

2 x M5 x 0.8

3 x 4H9 \(0^{0.030}\) long groove depth 3

Angle adjustment bolt

Adjustment: Max.10.2

Long groove depth 5
(Positioning pin hole)

B port

A port

150
These drawings indicate the condition when the B port is pressurized.

With auto switch: MDSUA7-S

Connector Type

A port

2 x M5 x 0.8
(Port location: Side ported type only)

B port

Connector type

65°

D-□
These drawings indicate the condition when the B port is pressurized.

**MSUA20**

**Top ported: MSUA20-□S/SE**

- **A port**
- **B port**

Dimensions:

- **MSUA20**
- **3 x 4H9**
- **depth 10**
- **8 x M5 x 0.8 depth 10**
- **4 x M6 x 1 depth 7**
- **22.5°**
- **ø42**
- **3 x 4H9 +0.030 depth 4**
- **3 x 4H9 +0.030 long groove depth 3**
- **2 x 6.6 through**
- **Angle adjustment bolt**
- **Adjustment: Max. 10.3**
- **3 x 4H9 +0.030 long groove depth 3**
- **2 x 6.6 through**
- **4 x M6 x 1 depth 11**
- **Long groove depth 5 (Positioning pin hole)**
- **MSUA Series**
- **Dimensions**
- **MSUA20**
- **50**
- **59**
- **48**
- **42**
- **22.5°**
- **59**
- **48**
- **22.5°**
- **3H9**
- **ø53.5h9**
- **ø50**
- **ø78**
- **ø42**
- **16**
- **7**
- **23**
- **10.5**
- **53**
- **50**
- **ø53.5h9**
- **ø50**
- **ø8g6**
- **ø2.014**
- **ø19h9**
- **ø2.043**
With auto switch: MDSUA20-S

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

- **Without auto switch**
  - MSUB

- **With auto switch**
  - M
  - D
  - MSUB

---

**Number of auto switches**

- S: 1 pc.
- Nil: 2 pcs.

**Electrical entry/Lead wire length**

- Nil: Grommet/lead wire: 0.5 m
- L: Grommet/lead wire: 3 m
- Z: Grommet/lead wire: 5 m

**Connector/Lead wire:**

- 0.5 m
- 3 m
- 5 m

**Connector/Without lead wire**

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

---

**Applicable Auto Switches**

Refer to pages 797 to 850 for further information on auto switches.

**Vane type**

- S: Single vane
- D: Double vane

---

**How to Order**

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

---

### Nominal size (Torque)

<table>
<thead>
<tr>
<th>Size</th>
<th>Single vane</th>
<th>Double vane</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MSUB 1</td>
<td>90° 180°</td>
<td>90° 90°</td>
</tr>
<tr>
<td>3 MSUB 3</td>
<td>90° 180°</td>
<td>90° 90°</td>
</tr>
<tr>
<td>7 MSUB 7</td>
<td>90° 180°</td>
<td>90° 90°</td>
</tr>
<tr>
<td>20 MSUB20</td>
<td>90° 180°</td>
<td>90° 90°</td>
</tr>
</tbody>
</table>

### Application Auto Switches

**Type**

- Solid state auto switch
- Reed auto switch

**Special function**

- Yes
- No

**Electrical entry**

- Grommet
- Connector

**Wiring (Output)**

- 2-wire

**Load voltage**

- 24 V

**Auto switch model**

- Heavy-duty cord
- Parallel cord

**Lead wire length**(m)

- 0.5 (NIL)
- 3 (L)
- 5 (Z)
- None (N)

**Pre-wired connector**

- IC circuit
- Relay
- PLC

**Applicable load**

- Yes
- No

---

**Lead wire length symbols:**

- 0.5 m: Nil (Example) R73C
- 3 m: L (Example) R73CL
- None: Z (Example) R73CN

---

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

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

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

---

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

---

*Refer to the table below for the applicable auto switch model.*
### 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 IDK series in the Best Pneumatics No.6.

### Table Rotation Range

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

- Adjustment range of adjustment bolt (A)：
  - Single vane (S): 10° ± 5° (both ends of rotation ± 5° each)
  - Double vane (D): 5° ± 2.5°

- Adjustment range of adjustment bolt (B)：
  - Single vane (S): 10° ± 5° (both ends of rotation ± 5° each)
  - Double vane (D): 5° ± 2.5°

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>MSUB1</th>
<th>MSUB3</th>
<th>MSUB7</th>
<th>MSUB20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vane type</td>
<td>Single vane</td>
<td>Double vane</td>
<td>Single vane</td>
<td>Double vane</td>
</tr>
<tr>
<td>Rotating angle</td>
<td>90° ± 5°</td>
<td>90° ± 5°</td>
<td>90° ± 5°</td>
<td>90° ± 5°</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air (Non-tube)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proof pressure (MPa)</td>
<td>1.05</td>
<td></td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>5 to 60°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure range (MPa)</td>
<td>0.2 to 0.7</td>
<td>0.15 to 0.7</td>
<td>0.15 to 1.0</td>
<td></td>
</tr>
<tr>
<td>Rotation time adjustment range (s/90°)</td>
<td>0.07 to 0.3 (0.5 MPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft load</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable radial load</td>
<td>20 N</td>
<td>40 N</td>
<td>50 N</td>
<td>60 N</td>
</tr>
<tr>
<td>Allowable thrust load</td>
<td>15 N</td>
<td>30 N</td>
<td>60 N</td>
<td>80 N</td>
</tr>
<tr>
<td>Allowable moment</td>
<td>0.3 N·m</td>
<td>0.7 N·m</td>
<td>0.9 N·m</td>
<td>2.9 N·m</td>
</tr>
</tbody>
</table>

### Weight

<table>
<thead>
<tr>
<th>Size</th>
<th>Rotation angle</th>
<th>Basic weight</th>
<th>Auto switch unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90°</td>
<td>145</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>90°</td>
<td>230</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>90°</td>
<td>360</td>
<td>28</td>
</tr>
<tr>
<td>20</td>
<td>90°</td>
<td>510</td>
<td>38</td>
</tr>
</tbody>
</table>

### 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.)

<table>
<thead>
<tr>
<th>Size</th>
<th>Allowable radial load (N)</th>
<th>Allowable thrust load (N)</th>
<th>Allowable moment (N·m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>15</td>
<td>0.3</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>30</td>
<td>0.7</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>60</td>
<td>0.9</td>
</tr>
<tr>
<td>20</td>
<td>60</td>
<td>80</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Note) Refer to page 35 for allowable kinetic energy.
Internal Construction of Rotary Table

**Construction**

**Component Parts**

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

* The plug 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.

MDSUB 1 double vane (type has a different figure.)

* Refer to page 56 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.

<table>
<thead>
<tr>
<th>Model</th>
<th>Auto switch unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M(D)SUB 1</td>
<td>P211070-1</td>
</tr>
<tr>
<td>M(D)SUB 3</td>
<td>P211090-1</td>
</tr>
<tr>
<td>M(D)SUB 7</td>
<td>P211060-1</td>
</tr>
<tr>
<td>M(D)SUB20</td>
<td>P211080-1</td>
</tr>
</tbody>
</table>

Auto switch block unit

<table>
<thead>
<tr>
<th>MDSUB1/3</th>
<th>MDSUB7/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>For reed auto switch</td>
<td>For solid state auto switch</td>
</tr>
<tr>
<td>Combination of reed and</td>
<td>Combination left &amp; right-handed</td>
</tr>
<tr>
<td>solid state auto switches</td>
<td></td>
</tr>
<tr>
<td>Right-handed</td>
<td>Left-handed</td>
</tr>
<tr>
<td>Combination left &amp; right-handed</td>
<td></td>
</tr>
</tbody>
</table>

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.
MSUB Series

Dimensions

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

MSUB1 (Single vane)

MSUB1-S/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.
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)

* 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.

**MSUB1 (Double vane)**

**MSUB1-□D**

* 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)
-2) 60°: When using D-90/90A/97/93A
-2) 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.
These drawings indicate the condition when the B port is pressurized.

**MSUB3 (Single vane/Double vane)**

**MSUB3-□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.
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.
These drawings indicate the condition when the B port is pressurized.

**Dimensions**

**MSUB Series**

**MSUB7 (Single vane/Double vane)**

**MSUB7-S/D**

- 4 x M4 x 0.7 depth 7
- 2 x 5.5 through
- 2 x M5 x 0.8 depth 10
- 3 x 4H9-0.030 depth 6
- 2 x 5.5 through
- 2 x M5 x 0.8 depth 10 Chamfer
- Chamfer

**Top ported: MSUB7-SE**

- A port
- B port

- 2 x M5 x 0.8
- Chamfer

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.

- Adjustment: Max. 8.25

- 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.
Rotary Table: Basic Type
Vane Type MSUB Series

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

With auto switch: MDSUB7

2 x M5 x 0.8
(Port location: Side ported type only)

Adjustment bolt

A port

B port

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.
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.

- **Dimensions**
  - **2 x M5 x 0.8 depth 8**
  - **2 x 6.6 through**
  - **2 x M6 x 1 Depth 12**
  - **3 x 4H9 -0.029/0 depth 6**

**Top ported: MSUB20-□SE**

- **A port**
- **B port**
- **2 x M5 x 0.8**

- **Adjustment bolt**
  - Max. 8.75

- **Long groove depth 5**
  - (Positioning pin hole)

- **Adjustment**: Max. 8.75

- **2 x M6 x 1 depth 12**

**Additional Information**

- 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.
With auto switch: MDSUB20

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

MSU□1/3

**Single vane type 90°**

- Auto Switch for END 1
- Auto Switch for END 2

**Double vane type (MSUB only) 90°**

- Auto Switch for END 1
- Auto Switch for END 2

MSU□7/20

**Single vane type 90°**

- Auto Switch for END 1
- Auto Switch for END 2

**Double vane type (MSUB only) 90°**

- Auto Switch for END 1
- Auto Switch for END 2

- 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**

<table>
<thead>
<tr>
<th>Model</th>
<th>Operating angle</th>
<th>Hysteresis angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDSU□1, 3</td>
<td>110°</td>
<td>10°</td>
</tr>
<tr>
<td>MDSU□7, 20</td>
<td>90°</td>
<td></td>
</tr>
</tbody>
</table>

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 102 for operating angle of auto switch and angle of hysteresis and the procedure for moving the auto switch detection position.
Auto Switch Mounting

MSU □ 1-3 Auto 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.
**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.

**Maintenance**

**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.

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.

---

**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**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSUA 1- S</td>
<td>P402070-2A</td>
</tr>
<tr>
<td>MSUA 1- SE</td>
<td>P402070-2B</td>
</tr>
<tr>
<td>MSUA 3- S</td>
<td>P402090-2A</td>
</tr>
<tr>
<td>MSUA 3- SE</td>
<td>P402090-2B</td>
</tr>
<tr>
<td>MSUA 7- S</td>
<td>P402060-2A</td>
</tr>
<tr>
<td>MSUA 7- SE</td>
<td>P402060-2B</td>
</tr>
<tr>
<td>MSUA20- S</td>
<td>P402080-2A</td>
</tr>
<tr>
<td>MSUA20- SE</td>
<td>P402080-2B</td>
</tr>
</tbody>
</table>

**Table unit**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSUA 1- 90</td>
<td>P402070-3A</td>
</tr>
<tr>
<td>MSUA 1-180</td>
<td>P402070-3B</td>
</tr>
<tr>
<td>MSUA 3- 90</td>
<td>P402090-3A</td>
</tr>
<tr>
<td>MSUA 3-180</td>
<td>P402090-3B</td>
</tr>
<tr>
<td>MSUA 7- 90</td>
<td>P402060-3A</td>
</tr>
<tr>
<td>MSUA 7-180</td>
<td>P402060-3B</td>
</tr>
<tr>
<td>MSUA20- 90</td>
<td>P402080-3A</td>
</tr>
<tr>
<td>MSUA20-180</td>
<td>P402080-3B</td>
</tr>
</tbody>
</table>

**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.