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,

**MSUA Series**

Improved table deflection accuracy:
0.03 mm or less

**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

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

**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°

**Auto switch capable**
Since switches can be moved anywhere on the circumference, they can be mounted at positions which accommodate the specifications.
### 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>Through-holes (2)</td>
<td>Tapped holes (2)</td>
</tr>
<tr>
<td>Tapped holes (4)</td>
<td>Tapped holes (2)</td>
<td>Through-holes (2)</td>
</tr>
<tr>
<td>Top mount</td>
<td>Bottom mount</td>
<td>Tapped holes (4)</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-93A, 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>Single vane</td>
<td>D-9, D-T99 D-93A, D-S99, S9P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td>D-R73, D-T79 D-R80, D-S79, S7P</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-93A, D-S99, S9P</td>
<td>P.154</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>Single vane</td>
<td>D-9, D-T99 D-93A, D-S99, S9P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>180°</td>
<td>Double vane</td>
<td>D-R73, D-T79 D-R80, D-S79, S7P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td>D-R73, D-T79 D-R80, D-S79, S7P</td>
<td></td>
</tr>
</tbody>
</table>

* Double vane is available with 90° rotation setting only.
### Rotary Table: High Precision Type

#### MSUA Series

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

---

#### How to Order

- **Connection port location**
  - **Bearing type**
    - **A** High precision type
    - **E** Axial ported
  - **Free mount type**

- **Without auto switch**
  - MSUA 1, 3, 7, 20

- **With auto switch**
  - MSUA 1, 3, 7, 20

---

#### Without auto switch

- MSUA 20 - 90 S

---

#### With auto switch

- MSUA 20 - 90 S - T79 L

---

#### Nominal size (Torque)

- 1: MSUA 1
- 3: MSUA 3
- 7: MSUA 7
- 20: MSUA 20

---

#### Rotating angle

- Single vane: Both ends ±5° each

---

#### Vane type

- S: Single vane

---

#### Auto switch

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

---

#### 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: 3 m
- CL: Connector/Without lead wire

---

#### Applicable Auto Switches

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

---

#### Order example:

MSUA 20 single vane type (connection port side location selected)

1. Standard type (Without auto switches), Rotation 90°, side port location
   - MSUA 20-90S
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

---

* 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.
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>
<thead>
<tr>
<th>Model</th>
<th>MSUA1</th>
<th>MSUA3</th>
<th>MSUA7</th>
<th>MSUA20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vane type</td>
<td>Single vane</td>
<td>Single vane</td>
<td>Single vane</td>
<td>Single vane</td>
</tr>
<tr>
<td>Rotating angle</td>
<td>90° ± 10°</td>
<td>180° ± 10°</td>
<td>90° ± 10°</td>
<td>180° ± 10°</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air (Non-lube)</td>
<td>Air (Non-lube)</td>
<td>Air (Non-lube)</td>
<td>Air (Non-lube)</td>
</tr>
<tr>
<td>Proof pressure (MPa)</td>
<td>1.05</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>5 to 60°C</td>
<td>5 to 60°C</td>
<td>5 to 60°C</td>
<td>5 to 60°C</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>0.15 to 1.0</td>
</tr>
<tr>
<td>Shaft load</td>
<td>20 N</td>
<td>40 N</td>
<td>50 N</td>
<td>60 N</td>
</tr>
<tr>
<td>Allowable radial load</td>
<td>15 N</td>
<td>30 N</td>
<td>60 N</td>
<td>80 N</td>
</tr>
<tr>
<td>Allowable thrust load</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>
<tr>
<td>Bearing</td>
<td>Special bearing</td>
<td>Special bearing</td>
<td>Special bearing</td>
<td>Special bearing</td>
</tr>
<tr>
<td>Port size</td>
<td>Side ported</td>
<td>Side ported</td>
<td>Side ported</td>
<td>Side ported</td>
</tr>
<tr>
<td>Port location</td>
<td>Side ported or Top ported</td>
<td>Side ported or Top ported</td>
<td>Side ported or Top ported</td>
<td>Side ported or Top ported</td>
</tr>
<tr>
<td>Deflection accuracy</td>
<td>0.03 mm or less</td>
<td>0.03 mm or less</td>
<td>0.03 mm or less</td>
<td>0.03 mm or less</td>
</tr>
</tbody>
</table>

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

### Weight

<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>
Internal Construction of Rotary 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></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Hexagon socket head cap screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Hexagon socket head cap screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Button bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Hexagon socket head cap screw</td>
<td></td>
<td>SE type only</td>
</tr>
<tr>
<td>23</td>
<td>Label</td>
<td></td>
<td></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

Auto switch units

* 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>

Auto switch block unit

<table>
<thead>
<tr>
<th>MDSUA1/3</th>
<th>MDSUA7/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>For reed auto switch</td>
<td>For solid state auto switch</td>
</tr>
<tr>
<td>Right-handed</td>
<td>Left-handed</td>
</tr>
<tr>
<td>Part no.: P211070-8</td>
<td>Part no.: P211070-9</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.

**MSUA Series**

### Dimensions

**MSUA1**

**MSUA1-S,SE**

8 x M3 x 0.5 depth 5

4 x M4 x 0.7 depth 4

8 x M3 x 0.5 depth 5

3 x M3 x 0.5 depth 3

4 x M4 x 0.7 depth 8

Angle adjustment bolt

Adjustment: Max. 7.5

Top ported: MSUA1-S,SE

A port

B port

2 x M3 x 0.5

9.5

8.5
These drawings indicate the condition when the B port is pressurized.

**With auto switch: MDSUA1-□S**

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

**MSUA7**

**MSUA7-□S/SE**

- 4 x M5 x 0.8 depth 7
- 22.5°
- 8 x M4 x 0.7 depth 8
- 3 x 4H9 depth 4
- 2 x 5.5 through ø37
- Top ported: MSUA7-□S/SE

- Long groove depth 5 (Positioning pin hole)
- Angle adjustment bolt
  - Adjustment: Max. 10.2
  - 2 x 5.5 through ø48h9 depth 9
  - 2 x M5 x 0.8

- B port: 2 x M5 x 0.8
- A port: 2 x 5.5 through ø47h9 depth 9
- ø26H9 depth 10
- MSUA Series Dimensions
With auto switch: MDSUA7-□S

Connector Type

Angle adjustment bolt

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

A port
B port

20.5 (26.5: Connector type)

65°
These drawings indicate the condition when the B port is pressurized.

MSUA20

MSUA20-□S/SE

Dimensions

A port

B port

2 x M5 x 0.8

Long groove depth 5
(Positioning pin hole)

4 x M6 x 1 depth 7

22.5°

8 x M5 x 0.8 depth 10

2 x M5 x 0.8 depth 11

2 x 6.6 through

4 x M6 x 1 depth 11

22.5°

3 x 4H9 +0.030 depth 4

Angle adjustment bolt
Adjustment: Max. 10.3

2 x 6.6 through

3 x 4H9 +0.030 long groove depth 3

43

10.5

16

5

3 x 4H9 +0.030 depth 4

22.5°

Long groove depth 5
(Positioning pin hole)

8 x M5 x 1 depth 7

22.5°

4 x M6 x 1 depth 7

22.5°

B port

A port

152
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
- Free mount type
- Basic type

#### Connection port location
- Nil
- Side ported
- Axial ported

#### Without auto switch
- MSUB
  - Size: 1, 3, 7, 20

#### With auto switch
- M D SUB
  - Size: 1, 3, 7, 20

#### Number of auto switches
- S (1 pc.)
- Nil (2 pcs.)

#### Electrical entry/Lead wire length
- Nil
- Grommet/Lead wire: 0.5 m
- Grommet/Lead wire: 3 m
- Grommet/Lead wire: 5 m
- Connector/Lead wire: 0.5 m
- Connector/Lead wire: 3 m
- Connector/Without lead wire

#### Auto switch
- Nil

**Note:**
- Without auto switch (built-in magnet)
- Auto switches are shipped together (but not assembled).
- Auto switches marked with "**" are made-to-order specifications.
- Refer to pages 837 to 838 for detailed solid state auto switches with pre-wired connectors.
- Refer to pages 797 to 850 for further information on auto switches.

### Applicable Auto Switches

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Type</th>
<th>Special function</th>
<th>Electrical entry</th>
<th>Wiring (Output)</th>
<th>Load voltage</th>
<th>Auto switch model</th>
<th>Lead wire length (m)</th>
<th>Lead wire type</th>
<th>Pre-wired connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSUB1</td>
<td>Solid state auto switch</td>
<td>—</td>
<td>—</td>
<td>2-wire</td>
<td>5V,12V</td>
<td>S99V</td>
<td>10 (N)</td>
<td>Heavy-duty cord</td>
<td>—</td>
<td>IC circuit</td>
</tr>
<tr>
<td>MSUB3</td>
<td>Reed auto switch</td>
<td>—</td>
<td>—</td>
<td>2-wire</td>
<td>12V</td>
<td>T99V</td>
<td>10 (N)</td>
<td>Heavy-duty cord</td>
<td>—</td>
<td>IC circuit</td>
</tr>
<tr>
<td>MSUB7</td>
<td>Solid state auto switch</td>
<td>—</td>
<td>—</td>
<td>2-wire</td>
<td>5V,12V</td>
<td>S99V</td>
<td>10 (N)</td>
<td>Heavy-duty cord</td>
<td>—</td>
<td>IC circuit</td>
</tr>
<tr>
<td>MSUB20</td>
<td>Reed auto switch</td>
<td>Grommet</td>
<td>Yes</td>
<td>2-wire</td>
<td>12V</td>
<td>T99V</td>
<td>10 (N)</td>
<td>Heavy-duty cord</td>
<td>—</td>
<td>IC circuit</td>
</tr>
</tbody>
</table>

**Note:**
- 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 MSUB20-180S
  3. With auto switch unit + Auto switch R73, Rotation 180°, Side port location MSUB20-180S-R73
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)
(S): 10° (± 5°)
(D): 5° (± 2.5°)
Adjustment range of adjustment bolt (B)
(S): 10° (± 5°)
(D): 5° (± 2.5°)
Positioning pin hole
Adjustment bolt (A)
Adjustment bolt (B)

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

Weight

<table>
<thead>
<tr>
<th>Size</th>
<th>Rotation angle</th>
<th>Basic weight</th>
<th>Auto switch unit [Note]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90°</td>
<td>145</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>140</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>90°</td>
<td>230</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>225</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
<td>90°</td>
<td>360</td>
<td>375</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>355</td>
<td>—</td>
</tr>
<tr>
<td>20</td>
<td>90°</td>
<td>510</td>
<td>580</td>
</tr>
<tr>
<td></td>
<td>180°</td>
<td>505</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 (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>A 15</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>50</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>60</td>
<td>80</td>
<td>40</td>
</tr>
</tbody>
</table>
**Internal Construction of Rotary Table**

**MSUB Series**

<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>Vane shaft</td>
<td>Stainless steel</td>
<td>Double vane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(MSUB20: Carbon steel)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Stopper</td>
<td>Resin</td>
<td>Single vane</td>
</tr>
<tr>
<td>5</td>
<td>Stopper</td>
<td>Stainless steel</td>
<td>Double 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 (D)</td>
<td>Carbon steel</td>
<td>Heat treated, Electroless nickel plated</td>
</tr>
<tr>
<td>9</td>
<td>Stopper lever (S)</td>
<td>Carbon steel</td>
<td>Heat treated, Electroless nickel plated</td>
</tr>
<tr>
<td>10</td>
<td>Lever retainer</td>
<td>Carbon steel</td>
<td>Zync Chromated</td>
</tr>
<tr>
<td>11</td>
<td>Ring collar</td>
<td>Carbon steel</td>
<td>Zync Chromated</td>
</tr>
<tr>
<td>12</td>
<td>Bearing</td>
<td>High carbon chrome bearing steel</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>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>Scraper</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Adjustment bolt</td>
<td>Carbon steel</td>
<td>Heat treated</td>
</tr>
<tr>
<td>18</td>
<td>Hexagon nut</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Hexagon socket head cap screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Hexagon socket head cap screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Hexagon socket head cap screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Button bolt</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Rubber cap</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Hexagon socket head set screw</td>
<td></td>
<td>SE type only</td>
</tr>
<tr>
<td>25</td>
<td>Cover</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Plate</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Gasket</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Label</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.

* 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 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 Combination of reed and solid state auto switches</td>
</tr>
<tr>
<td>Right-handed</td>
<td>Left-handed</td>
</tr>
<tr>
<td>Part no.: P211070-8</td>
<td>Part no.: P211070-9</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.
These drawings indicate the condition when the B port is pressurized.

**MSUB1 (Single vane)**

**MSUB1-□S/SE**

- 4 x M3 x 0.5 depth 5
- 2 x 4.5 through
- 2 x M4 x 0.7 depth 8
- 2 x 4 through
- 2 x M3 x 0.5

**Adjustment bolt**

**Top ported: MSUB1-□SE**

- 2 x M3 x 0.5

*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)

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.

Dimensions

Long groove depth 5 (Positioning pin hole)

Adjustment bolt *

Adjustment: Max. 5.75

Top ported: MSUB1-DE

2 x M3 x 0.5

A port

B port

A port

B port

2 x M3 x 0.5
These drawings indicate the condition when the B port is pressurized.

With auto switch: MDSUB1-D

*1) 24: When using D-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**

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

**MSUB3-S/D**

![Diagram of MSUB3-S/D](image1)

- 4 x M4 x 0.7 depth 7
- 2 x 4.5 through
- 2 x M4 x 0.7 depth 8
- δ 59
- δ 30
- Long groove depth 5 (Positioning pin hole)
- Top ported: MSUB3-□SE/DE
  - A port
  - B port
  - 2 x M3 x 0.5

**Adjustment bolt**

- *Adjustment: Max. 6.25*

**Adjustment bolt**

- 2 x M5 x 0.8
- 2 x M4 x 0.7 depth 8
- Chamfer
- 2 x 4.5 through
- 2 x 4.5 through

**Note**

- 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.

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

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

**MSUB7-□S/D**

- 4 x M4 x 0.7 depth 7
- 2 x 5.5 through

**Top ported: MSUB7-□SE**

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

- Long groove depth 5 (Positioning pin hole)

- 3 x 4H9 15.03 depth 6
  - (A B C)

- 2 x 5.5 through

- Adjustment bolt *

- Adjustment: Max. 8.25

- 2 x M5 x 0.8 depth 10 Chamfer

- (Single vane)
  - Chamfer

- (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.
With auto switch: MDSUB7

With auto switch: MDSUB7

Adjustment bolt *

A port

B port

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

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

**MSUB20 (Single vane/Double vane)**

**Dimensions**

**MSUB20-S/D**

- 4 x M5 x 0.8 depth 8
- 2 x 6.6 through
- 2 x M6 x 1 Depth 12

**Top ported: MSUB20-SE**

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

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: MDSUB20

Adjustment bolt *

A port

B port

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

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.

+1) 25.5: Grommet type
    34.5: Connector type

+2) 20.5: Grommet type
    26.5: Connector type
MDSU Series
Auto Switch Mounting

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

**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

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

- 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 MDSU Series**

**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.
**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: \((90^{\circ} \pm 10^{\circ}, 180^{\circ} \pm 10^{\circ})\) (±5° at end of rotation)
   - Double vane type: \((90^{\circ} \pm 10^{\circ})\) (±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.

---

**Selection**

**Warning**

1. Ensure the load energy within the product’s allowable energy value.

**Caution**

1. When there are load fluctuations, allow a sufficient margin in the actuator torque.

---

**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

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSUA 1-90</td>
<td>P402070-2A</td>
</tr>
<tr>
<td>MSUA 1-180</td>
<td>P402070-3B</td>
</tr>
<tr>
<td>MSUA 3-90</td>
<td>P402090-2A</td>
</tr>
<tr>
<td>MSUA 3-180</td>
<td>P402090-3B</td>
</tr>
<tr>
<td>MSUA 7-90</td>
<td>P402060-2A</td>
</tr>
<tr>
<td>MSUA 7-180</td>
<td>P402060-3B</td>
</tr>
<tr>
<td>MSUA20-90</td>
<td>P402080-2A</td>
</tr>
<tr>
<td>MSUA20-180</td>
<td>P402080-3B</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.