Plate Cylinder with Lock

Series MLU
ø25, ø32, ø40, ø50

New release-plate cylinder (oval piston) with lock
Ideal for maintaining supply pressure to prevent dropping of the load when residual pressure is released.
# Plate Cylinder with Lock

## Series MLU

- **Cylinder can be locked at any desired position.**
  - Drop prevention for middle stroke emergency stops
  - Lock positions can be changed to accommodate the position of the external stopper and the thickness of the clamped work piece.

### Drop prevention is possible at any point of stroke.

<table>
<thead>
<tr>
<th>Drop prevention for press fitting jig</th>
<th>Drop prevention for litter</th>
<th>Holding clamped and unclamped positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension lock</td>
<td>Retraction lock</td>
<td>Extension lock</td>
</tr>
<tr>
<td>Retraction lock</td>
<td>Retraction lock</td>
<td>Retraction lock</td>
</tr>
</tbody>
</table>

**Simple construction:** Simple and reliable locking system

### Unlocking port:

1. **When air is exhausted:**
   - The brake spring force tilts the lock ring.
   - The locking is released to unlock the piston rod.

2. **When air is supplied:**
   - The lock ring becomes perpendicular to the piston, creating a gap between the piston rod and the lock ring to unlock the piston.

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**Features 1**
**Slim and compact lock unit**

- **Lock unit length**
  - 35mm to 50.5mm
- **Lock unit width**
  - 24mm to 39mm

The compact lock unit does not protrude beyond the cylinder body surface.

**Easy manual unlocking**

**Locking direction** can be selected.

**Various mounting brackets to accommodate wide range of applications.**

**Flexible mounting:** Possible to mount on all surfaces except for the one with ports.

**Series Variations**

<table>
<thead>
<tr>
<th>Series</th>
<th>Locking direction</th>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLU</td>
<td>Extension lock</td>
<td>25</td>
<td>5 10 15 20 25 30 35 40 45 50 75 100 125 150 175 200 250 300</td>
</tr>
<tr>
<td></td>
<td>Retraction lock</td>
<td>32</td>
<td>5 10 15 20 25 30 35 40 45 50 75 100 125 150 175 200 250 300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>5 10 15 20 25 30 35 40 45 50 75 100 125 150 175 200 250 300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>5 10 15 20 25 30 35 40 45 50 75 100 125 150 175 200 250 300</td>
</tr>
</tbody>
</table>
## Plate Cylinder with Lock

### Series MLU

**ø25, ø32, ø40, ø50**

#### How to Order

**Without Auto Switch**
- MLU
  - B 25 [ ] 30 D [ ] F

**With Auto Switch**
- MDLU
  - B 25 [ ] 30 D [ ] F J79W S

### Built-in magnet

- B Standard
- L Axial foot type
- F Front flange type
- G Rear flange type
- C Single clevis
- D Double clevis

### Size

<table>
<thead>
<tr>
<th>Type</th>
<th>Pressure receiving area equivalent to that of ø25 type</th>
<th>Pressure receiving area equivalent to that of ø32 type</th>
<th>Pressure receiving area equivalent to that of ø40 type</th>
<th>Pressure receiving area equivalent to that of ø50 type</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>50</td>
<td>40</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td>32</td>
<td>50</td>
<td>40</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
<td>40</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>40</td>
<td>32</td>
<td>25</td>
</tr>
</tbody>
</table>

### Mounting

<table>
<thead>
<tr>
<th>Type</th>
<th>Lead wire length symbols</th>
<th>Reed switch</th>
<th>Solid state switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5m</td>
<td>0.5m</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3m</td>
<td>3m</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5m</td>
<td>5m</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Auto switch specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Special function</th>
<th>Electrical entry</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Rail mount</th>
<th>Lead wire length (m)</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td></td>
<td></td>
<td>3-wire (NPN equiv.)</td>
<td>DC</td>
<td>AC</td>
<td>Perpendicular</td>
<td>0.5 (N)</td>
</tr>
<tr>
<td>2 wire</td>
<td>2 wire</td>
<td>Yes</td>
<td>5V</td>
<td>24V</td>
<td>12V, 100V</td>
<td>Relay, PLC</td>
<td>D</td>
</tr>
<tr>
<td>Diagnostic indication (2-color display)</td>
<td>Grommet Yes</td>
<td>3-wire (NPN)</td>
<td>5V, 12V</td>
<td>F7NV, F79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12V</td>
<td></td>
<td>J79C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid state switch</td>
<td>Grommet Yes</td>
<td>3-wire (NPN)</td>
<td>5V, 12V</td>
<td>F7NWV, F79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12V</td>
<td></td>
<td>J79C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Port thread type

- Nil (Example) S
- Rc (Example) S
- TN (Example) S
- NPT (Example) S

### Stroke (mm)

Refer to page 2 for standard strokes and intermediate strokes.

### Action

- D Double acting

### Auto switch

- Without auto switch
- With auto switch

### Number of auto switches

- Nil 2 pcs.
- S 1 pc.
- n "n" pcs.

### Locking direction

- F Extension direction
- B Retraction direction

### Rod end shape

- Nil Rod end female thread
- M Rod end male thread

### How to Order

- Load voltage
- Rail mount
- Lead wire length
- Applicable load

*Lead wire length symbols 0.5m S 3m L 5m N

*Solid state switches marked with a "∗" symbol are produced upon receipt of order.

*D-P5DWL type can only be mounted on the types for tubing of ø40 and ø50. Only D-P5DWL is mounted when shipped.
Plate Cylinder with Lock  
**Series MLU**

### Cylinder Specifications

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Double acting single rod</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.05MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>0.7MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum operating pressure</td>
<td>0.2MPa [Note]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>–10 to 60°C (with no freezing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Non-lube</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper (standard)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rod end thread tolerance</td>
<td>JIS class 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston speed</td>
<td>50 to 500mm/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinder port size</td>
<td>M5 x 0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Lock Specifications

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locking action</td>
<td>Spring locking (exhaust locking)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unlocking pressure</td>
<td>0.2MPa or more</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking pressure</td>
<td>0.05MPa or less</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking direction</td>
<td>One direction (extension locking, retraction locking, each type)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>0.7MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unlocking port connection size</td>
<td>M5 x 0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding force N (maximum static load)</td>
<td>245 403 629 982</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Non-rotating Rod Accuracy

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-rotating rod accuracy</td>
<td>±1°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.8°</td>
<td>±0.5°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>±0.5°</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Standard Strokes

**Size**  
25, 32, 40, 50  
Max. manufacturable stroke  
300

### Weights

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic weight</td>
<td>0.34</td>
<td>0.58</td>
<td>0.87</td>
<td>1.52</td>
</tr>
<tr>
<td>Axial foot type</td>
<td>0.41</td>
<td>0.72</td>
<td>1.08</td>
<td>1.86</td>
</tr>
<tr>
<td>Flange type/Front, rear</td>
<td>0.44</td>
<td>0.72</td>
<td>1.10</td>
<td>1.98</td>
</tr>
<tr>
<td>Single clevis</td>
<td>0.40</td>
<td>0.70</td>
<td>1.09</td>
<td>1.92</td>
</tr>
<tr>
<td>Double clevis (with pin)</td>
<td>0.41</td>
<td>0.74</td>
<td>1.13</td>
<td>1.99</td>
</tr>
<tr>
<td>Additional weight per 50mm of stroke</td>
<td>0.12</td>
<td>0.16</td>
<td>0.22</td>
<td>0.34</td>
</tr>
<tr>
<td>Attached metal weight</td>
<td>0.06</td>
<td>0.12</td>
<td>0.22</td>
<td>0.40</td>
</tr>
<tr>
<td>Single clevis (Double clevis bracket)</td>
<td>0.07</td>
<td>0.16</td>
<td>0.26</td>
<td>0.47</td>
</tr>
<tr>
<td>Double clevis (Single clevis bracket)</td>
<td>0.07</td>
<td>0.16</td>
<td>0.26</td>
<td>0.47</td>
</tr>
<tr>
<td>Single knuckle joint</td>
<td>0.03</td>
<td>0.04</td>
<td>0.07</td>
<td>0.16</td>
</tr>
<tr>
<td>Double knuckle joint (with pin)</td>
<td>0.05</td>
<td>0.09</td>
<td>0.14</td>
<td>0.29</td>
</tr>
</tbody>
</table>

### Calculation method—Example: MDLUL32-100

**Basic weight**  
0.72 (axial foot type size 32)  
**Additional weight**  
0.16/50 stroke  
**Stroke**  
100 stroke  
0.72 x 100/50 x 0.16 = 1.04kg

Note) The weights of the attached metal single clevis and double clevis include the weight of two pieces of mounting bolts.

---

*Theoretical output (N) = Pressure (MPa) x Piston area (mm²)
## Mounting Bracket Part No.

<table>
<thead>
<tr>
<th>Bracket</th>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot (Note 1)</td>
<td>MU-L02</td>
<td>MU-L03</td>
<td>MU-L04</td>
<td>MU-L05</td>
<td></td>
</tr>
<tr>
<td>Flange</td>
<td>MU-F02</td>
<td>MU-F03</td>
<td>MU-F04</td>
<td>MU-F05</td>
<td></td>
</tr>
<tr>
<td>Single clevis</td>
<td>MU-C02</td>
<td>MU-C03</td>
<td>MU-C04</td>
<td>MU-C05</td>
<td></td>
</tr>
<tr>
<td>Double clevis</td>
<td>MU-D02</td>
<td>MU-D03</td>
<td>MU-D04</td>
<td>MU-D05</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) When ordering foot brackets, order 2 pieces for each cylinder.
Note 2) The parts included with each bracket are shown below.
   Foot, Flange, Single clevis/Body mounting bolt
   Double clevis/Pins for clevis, C set ring for axis, Body mounting
Note 3) Clevis pin and snap ring are included with the double clevis type.

---

## Auto Switch Mounting Bracket Part No.

<table>
<thead>
<tr>
<th>Size</th>
<th>Bracket no.</th>
<th>Note</th>
<th>Applicable switch</th>
<th>Reed switch</th>
<th>Solid state switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>25, 32, 40, 50</td>
<td>BMU1-025</td>
<td>Auto switch mounting screw (M3 x 0.5 x 6.5l)</td>
<td>D-A7□, D-A80D-A7□H, D-A80HD-A73C, D-A80C D-A79W</td>
<td>D-F7□, D-J79 D-F7□W, D-J79CD-F7□W, D-F7□F D-F7NTL D-F7BAL, F7BAVL</td>
<td></td>
</tr>
<tr>
<td>40, 50</td>
<td>BMU2-040</td>
<td>Auto switch mounting bracket Round head Philips screw (M3 x 0.5 x 14l) Hexagon socket head cap bolt (M3 x 0.5 x 5l) Flat washer, Auto switch mounting nut</td>
<td>—</td>
<td>D-P5DWL</td>
<td></td>
</tr>
</tbody>
</table>

Stainless steel mounting screw kit
Use the following stainless steel mounting screw kit (includes nut) depending on the operating environment.
BBA2: D-A7/A8/F7/J7
The above stainless steel screw kit is used for auto switch D-F7BAL and D-F7BAVL when it is shipped mounted on a cylinder.
Also, BBA2 is included when a auto switch alone is shipped.
## Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lock body</td>
<td>Aluminium alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>2</td>
<td>Cover</td>
<td>Aluminium alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>3</td>
<td>Head cover</td>
<td>Aluminium alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>4</td>
<td>Cylinder tube</td>
<td>Aluminium alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>5</td>
<td>Lock ring</td>
<td>Carbon steel</td>
<td>Heat treatment</td>
</tr>
<tr>
<td>6</td>
<td>Brake spring</td>
<td>Steel wire</td>
<td>Zinc chromated</td>
</tr>
<tr>
<td>7</td>
<td>Piston rod</td>
<td>Carbon steel</td>
<td>Hard chromium electroplated</td>
</tr>
<tr>
<td>8</td>
<td>Pivot</td>
<td>Carbon steel</td>
<td>Heat treatment, zinc chromated</td>
</tr>
<tr>
<td>9</td>
<td>Pivot key</td>
<td>Carbon steel</td>
<td>Heat treatment, zinc chromated</td>
</tr>
<tr>
<td>10</td>
<td>Dust proof cover</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Piston</td>
<td>Aluminium alloy</td>
<td>Chromate</td>
</tr>
<tr>
<td>12</td>
<td>Release piston</td>
<td>Special steel</td>
<td>Heat treatment</td>
</tr>
<tr>
<td>13</td>
<td>Bushing</td>
<td>Stringed impregnated alloy</td>
<td>M(D)LUB25, 32</td>
</tr>
<tr>
<td>14</td>
<td>Hexagon socket head cap bolt A</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Hexagon socket head cap bolt B</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Hexagon socket head cap bolt C</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Hexagon socket head cap bolt D</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>18</td>
<td>Hexagon socket head cap bolt E</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>19</td>
<td>Spring pin</td>
<td>Carbon steel</td>
<td>JIS B2808</td>
</tr>
<tr>
<td>20</td>
<td>Parallel pin</td>
<td>Stainless steel</td>
<td>JIS B1354</td>
</tr>
<tr>
<td>21</td>
<td>Rod end nut</td>
<td>Rolling steel</td>
<td>Only for use with nickel plated rod end male thread</td>
</tr>
<tr>
<td>22</td>
<td>Wear ring</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Magnet</td>
<td>Magnet</td>
<td>Only for use with built-in magnet type</td>
</tr>
<tr>
<td>24</td>
<td>Rod seal</td>
<td>NBR</td>
<td>Use one piece with M(D)LUB25</td>
</tr>
<tr>
<td>25</td>
<td>Piston seal</td>
<td>NBR</td>
<td>Use 2 pieces with M(D)LUB32-50</td>
</tr>
<tr>
<td>26</td>
<td>Release piston seal</td>
<td>NBR</td>
<td>Only for use with M(D)LUB25</td>
</tr>
<tr>
<td>27</td>
<td>Scraper</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Bumper</td>
<td>Urethane rubber</td>
<td></td>
</tr>
</tbody>
</table>
### Series MLU

#### Dimensions

**Standard type**

M(D)LUB40, 50

- **Retraction locking**
  - BP unlocking port
  - Unlocks when pressurized

- **M(D)LUB25,32** (Extension locking)
  - BP unlocking port
  - Unlocks when pressurized

- **Rod end female thread**
  - Model
  - KA

### Table

| Model     | Stroke range | A | AL | B | Bt | BA | BB | BP | BS | BT | BY | C | D | ET | EY | GA | GA1 | GB | GC | GC1 | GW | GY | H | H1 |
|-----------|--------------|---|----|---|----|----|----|----|----|----|----|---|---|----|----|----|----|----|----|----|----|----|
| MLUB25    | 5 to 300     | 22| 19.5| 24| 17 | 9  | 9  | M5 x 0.8 | M5 x 0.8 | 7.5 | 7  | 54 | 12 | M5 x 0.8 depth 11 | 26 | 45 | 45 | 10 | 15.5 | 32.5 | 2.5 | 5 | 36 | 6  |
| MLUB32    | 5 to 300     | 26| 23.5| 28| 19 | 8  | 9  | M6 x 1 depth 12 | M6 x 1 depth 12 | 8  | 68 | 14 | M6 x 1 depth 11 | 42 | 50.5 | 51.5 | 8.5 | 17.5 | 37 | 0  | 5.5 | 40 | 7  |
| MLUB40    | 5 to 300     | 30| 27  | 32| 22 | 9  | 8  | P, NPT, 1/8 | P, NPT, 1/8 | M8 x 1.25 depth 13 | 9  | 86 | 16 | M8 x 1.25 depth 11 | 54 | 53 | 53 | 9  | 18.5 | 38.5 | 0  | 7  | 45 | 8  |
| MLUB50    | 5 to 300     | 35| 32  | 39| 27 | 12 | 10 | P, NPT, 1/8 | P, NPT, 1/8 | M10 x 1.5 depth 14.5 | 9  | 104| 20 | M10 x 1.5 depth 15 | 64 | 62 | 62 | 11.5 | 23 | 43 | 6  | 8  | 53 | 11 |

<table>
<thead>
<tr>
<th>Model</th>
<th>H2</th>
<th>K</th>
<th>KA</th>
<th>MM</th>
<th>MM1</th>
<th>NA</th>
<th>NB</th>
<th>NC</th>
<th>ND</th>
<th>NE</th>
<th>NF</th>
<th>NG</th>
<th>NH1</th>
<th>NI</th>
<th>NJ</th>
<th>NS</th>
<th>NY</th>
<th>P</th>
<th>S</th>
<th>ZZ</th>
<th>ZZ1</th>
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<tbody>
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<td>10</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>7.5 depth 4.5</td>
<td>M5 x 0.8</td>
<td>4.3</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>30</td>
<td>26</td>
<td>M5 x 0.8</td>
<td>90</td>
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<td>12</td>
<td>M12 x 1.25</td>
<td>14</td>
<td>M6 x 1</td>
<td>5.5</td>
<td>M6 x 1</td>
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<td>6.5</td>
<td>6.5</td>
<td>55.5</td>
<td>22</td>
<td>3.5</td>
<td>6</td>
<td>87</td>
<td>28</td>
<td>P, NPT, 1/8</td>
<td>100</td>
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<tr>
<td>MLUB40</td>
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<td>6</td>
<td>14</td>
<td>M14 x 1.5</td>
<td>M8 x 1.25</td>
<td>16</td>
<td>M10 x 1.25</td>
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<td>6.9</td>
<td>9</td>
<td>8</td>
<td>37.5</td>
<td>22.5</td>
<td>3.5</td>
<td>9</td>
<td>87</td>
<td>36</td>
<td>P, NPT, 1/8</td>
<td>104</td>
<td>40</td>
</tr>
<tr>
<td>MLUB50</td>
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<td>7</td>
<td>18</td>
<td>M18 x 1.5</td>
<td>M10 x 1.5</td>
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<td>8.7</td>
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<td>10</td>
<td>12</td>
<td>57</td>
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<td>3.5</td>
<td>9</td>
<td>102</td>
<td>42</td>
<td>P, NPT, 1/8</td>
<td>124.5</td>
<td>77.5</td>
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</table>

*Note: The table and diagrams provide detailed specifications for the Series MLU components, including dimensions, thread types, and unlocking mechanisms. The table lists various models with their corresponding stroke range, thread specifications, and other technical details.*
Dimensions

Axial foot type

Front flange type

Rear flange

Single clevis
Double clevis

<table>
<thead>
<tr>
<th>Model</th>
<th>LD</th>
<th>LH</th>
<th>LS</th>
<th>LT</th>
<th>LX</th>
<th>LY</th>
<th>LZ</th>
<th>X</th>
<th>Y</th>
<th>ZZ</th>
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<tr>
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<td>29</td>
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<td>11</td>
<td>56</td>
<td>23</td>
<td>12</td>
<td>6</td>
<td>144</td>
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<tr>
<td>MLUL32</td>
<td>6.6</td>
<td>37</td>
<td>12</td>
<td>12</td>
<td>45</td>
<td>18</td>
<td>16</td>
<td>8</td>
<td>164</td>
<td></td>
</tr>
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<td>9</td>
<td>46</td>
<td>140</td>
<td>15</td>
<td>89</td>
<td>31</td>
<td>18</td>
<td>10</td>
<td>177</td>
<td></td>
</tr>
<tr>
<td>MLUL50</td>
<td>11</td>
<td>57</td>
<td>166.5</td>
<td>18</td>
<td>109</td>
<td>37</td>
<td>21</td>
<td>11</td>
<td>209.5</td>
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<table>
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<tr>
<th>Model (mm)</th>
<th>FT</th>
<th>FX</th>
<th>FY</th>
<th>FV</th>
<th>FZ</th>
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</thead>
<tbody>
<tr>
<td>MLUF25, MLUG25</td>
<td>5.5</td>
<td>8</td>
<td>14</td>
<td>66</td>
<td>24</td>
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<tr>
<td>MLUF32, MLUG32</td>
<td>7</td>
<td>8</td>
<td>16</td>
<td>82</td>
<td>28</td>
</tr>
<tr>
<td>MLUF40, MLUG40</td>
<td>9</td>
<td>9</td>
<td>18</td>
<td>102</td>
<td>32</td>
</tr>
<tr>
<td>MLUF50, MLUG50</td>
<td>11</td>
<td>12</td>
<td>22</td>
<td>126</td>
<td>39</td>
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<tr>
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<th>CDh10</th>
<th>CX</th>
<th>CZ</th>
<th>L</th>
<th>Q</th>
<th>Z</th>
<th>ZZ</th>
<th>Rotation angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLUC25, MLUD25</td>
<td>10°</td>
<td>11</td>
<td>22</td>
<td>184</td>
<td>10</td>
<td>162</td>
<td>72</td>
<td>90</td>
</tr>
<tr>
<td>MLUC32, MLUD32</td>
<td>10°</td>
<td>18</td>
<td>27</td>
<td>233</td>
<td>10</td>
<td>176</td>
<td>86</td>
<td>80</td>
</tr>
<tr>
<td>MLUC40, MLUD40</td>
<td>10°</td>
<td>26</td>
<td>27</td>
<td>233</td>
<td>10</td>
<td>176</td>
<td>86</td>
<td>80</td>
</tr>
<tr>
<td>MLUC50, MLUD50</td>
<td>14°</td>
<td>32</td>
<td>32</td>
<td>241.5</td>
<td>14</td>
<td>209.5</td>
<td>233</td>
<td>80</td>
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</tbody>
</table>
Accessories

Single knuckle joint

The L, Z and ZZ dimensions are reference dimensions when mounting a single knuckle joint. Please use them as guidelines.

Double knuckle joint

The L, Z and ZZ dimensions are reference dimensions when mounting a double knuckle joint. Please use them as guidelines.

Single clevis (Double clevis bracket)

Double clevis (Single clevis bracket)

Clevis pins and snap rings are included with the double clevis type.
### Single knuckle joint

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Size</th>
<th>A₁</th>
<th>E₁</th>
<th>L₁</th>
<th>MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-MU02</td>
<td>25</td>
<td>10.5</td>
<td>16</td>
<td>27</td>
<td>M10 x 1.25</td>
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<tr>
<td>I-MU03</td>
<td>32</td>
<td>12</td>
<td>18</td>
<td>31</td>
<td>M12 x 1.25</td>
</tr>
<tr>
<td>I-MU04</td>
<td>40</td>
<td>14</td>
<td>20</td>
<td>36</td>
<td>M14 x 1.5</td>
</tr>
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<td>I-MU05</td>
<td>50</td>
<td>18</td>
<td>28</td>
<td>46</td>
<td>M18 x 1.5</td>
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### Double knuckle joint

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Size</th>
<th>A₁</th>
<th>E₁</th>
<th>L₁</th>
<th>MM</th>
<th>NDH₁₀</th>
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<tbody>
<tr>
<td>Y-MU02</td>
<td>25</td>
<td>10.5</td>
<td>14</td>
<td>27</td>
<td>M10 x 1.25</td>
<td>8 + 0.058</td>
</tr>
<tr>
<td>Y-MU03</td>
<td>32</td>
<td>12</td>
<td>18</td>
<td>31</td>
<td>M12 x 1.25</td>
<td>10 + 0.070</td>
</tr>
<tr>
<td>Y-MU04</td>
<td>40</td>
<td>14</td>
<td>20</td>
<td>36</td>
<td>M14 x 1.5</td>
<td>10 + 0.070</td>
</tr>
<tr>
<td>Y-MU05</td>
<td>50</td>
<td>18</td>
<td>28</td>
<td>46</td>
<td>M18 x 1.5</td>
<td>14 + 0.070</td>
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</table>

### Clevis pin and knuckle pin

- Sphere, ball R (R₁)

### Rod end nut

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Size</th>
<th>d</th>
<th>H</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<td>17</td>
<td>19.6</td>
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<tr>
<td>NT-MU03</td>
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<td>M12 x 1.25</td>
<td>7</td>
<td>19</td>
<td>21.9</td>
<td>18</td>
</tr>
<tr>
<td>NT-04</td>
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<td>M14 x 1.5</td>
<td>8</td>
<td>22</td>
<td>25.4</td>
<td>21</td>
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<tr>
<td>NT-05</td>
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<td>M18 x 1.5</td>
<td>11</td>
<td>27</td>
<td>31.2</td>
<td>26</td>
</tr>
</tbody>
</table>

*One piece is included with the rod end male thread as standard.

---

*Knuckle pin and snap ring are included.

---

*Included with the double clevis and double knuckle joint as standard.
Auto Switches/Proper Mounting Positions and Height for Stroke End Detection

Series MLU

D-A7\(\square\)  ø25, ø32
D-A80  ø40, ø50

D-A7\(\square\)H  ø25, ø32
D-A80H  ø40, ø50
D-F7\(\square\)  ø25, ø32
D-J79  ø40, ø50
D-F7\(\square\)W  ø25, ø32
D-J79W  ø40, ø50
D-F7\(\square\)F  ø25, ø32
D-F7NT  ø40, ø50
D-F7BAL  ø25, ø32

D-A73C  ø25, ø32
D-A80C  ø40, ø50
D-J79C  ø25, ø32

D-A79W  ø25, ø32
D-F7\(\square\)WV  ø40, ø50
D-F7\(\square\)V  ø25, ø32
D-F7BAVL  ø31, ø32

D-P5DW  ø40, ø50
### Proper auto switch mounting position

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.5</td>
<td>4.5</td>
<td>5</td>
<td>6.5</td>
</tr>
<tr>
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</tr>
<tr>
<td>A</td>
<td>2</td>
<td>2</td>
<td>2.5</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
<td>9</td>
<td>9.5</td>
<td>11</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
<td>10</td>
<td>10.5</td>
<td>12</td>
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</tbody>
</table>

### Auto switch mounting height

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
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<tbody>
<tr>
<td>Hs</td>
<td>32</td>
<td>32</td>
<td>39</td>
<td>47</td>
</tr>
<tr>
<td>Hs</td>
<td>33</td>
<td>33</td>
<td>40</td>
<td>56</td>
</tr>
<tr>
<td>Hs</td>
<td>35.5</td>
<td>39</td>
<td>47</td>
<td>63</td>
</tr>
<tr>
<td>Hs</td>
<td>37.5</td>
<td>42.5</td>
<td>50.5</td>
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### Operating range

<table>
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<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-A7, A80</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>D-A73C, A80C</td>
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<td>13</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>D-F7LF, F79F</td>
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<td>7</td>
<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>D-P5DNL</td>
<td>—</td>
<td>—</td>
<td>5</td>
<td>5</td>
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</table>

### Minimum strokes for auto switch mounting

<table>
<thead>
<tr>
<th>Number of auto switches</th>
<th>D-F7/ F79C</th>
<th>D-F7/ F79W</th>
<th>D-F7/ F79V</th>
<th>D-F7/ F79D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 pcs.</td>
<td>5, 10</td>
<td>15</td>
<td>15</td>
<td>20, 75</td>
</tr>
<tr>
<td>1 pcs.</td>
<td>5, 5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

*Only size 40 and 50 can be mounted.

### Auto Switch Mounting

#### Except for D-P5DWL

- Auto switch mounting nut
- Auto switch mounting screw
- Auto switch

#### D-P5DNL

- Hexagon socket head cap bolt
  - With SW M3 x 0.5 x 5
  - Flat washer ø8 x ø3.3 x 10.8
- Switch mounting bracket
- Auto switch
- Round head Phillips screw
  - With SW M3 x 0.5 x 14

*Hysteresis specifications are given as a guide, it is not a guaranteed range.
(Tolerance ±30%)
Hysteresis may fluctuate due to the operating environment.
Basic Wiring

Solid state 3-wire, NPN

Solid state 3-wire, PNP

2-wire (Solid state)

2-wire (Reed switch)

Examples of Connection to PLC

Sink input specifications

3-wire, NPN

Source input specifications

3-wire, PNP

Connection Examples for AND (Series) and OR (Parallel)

3-wire

AND connection for NPN output

(using relays)

OR connection for NPN output

2-wire with 2 switch AND connection

When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up if both of the switches are in the ON state.

2-wire with 2 switch OR connection

When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

Load voltage at ON = Power supply voltage x Internal voltage drop x 2 pcs.

= 24V x 4V x 2 pcs.

= 16V

Example: Power supply is 24VDC Internal voltage drop in switch is 4V

Load voltage at OFF = Leakage current x Load impedance x 2 pcs.

= 1mA x 2 pcs. x 3kΩ

= 6V

Example: Load impedance is 3kΩ Leakage current from switch is 1mA

Series MLU
Auto Switch
Connections and Examples

(Load voltage at ON = Power supply voltage x 2 pcs.)

(Load voltage at OFF = Leakage current x Load impedance x 2 pcs.)
These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO 4414 Note 1, JIS B 8370 Note 2 and other safety practices.

⚠️ Caution : Operator error could result in injury or equipment damage.
⚠️ Warning : Operator error could result in serious injury or loss of life.
⚠️ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.
Note 2) JIS B 8370: General Rules for Pneumatic Equipment

---

**Warning**

1. **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**
   
   Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. **Only trained personnel should operate pneumatically operated machinery and equipment.**
   
   Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
   
   1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
   2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
   3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. **Contact SMC if the product is to be used in any of the following conditions:**
   
   1. Conditions and environments beyond the given specifications, or if product is used outdoors.
   2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
   3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.
Warning

1. There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc., and changes in forces occur. In such cases, human injury may occur, e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

2. Attach a protective cover to minimize the risk of human injury.

If a driven object and moving parts of a cylinder pose a danger of human injury, design the structure to avoid contact with the human body.

3. Securely tighten all stationary parts and connected parts so that they will not become loose.

Especially when a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

4. A deceleration circuit or shock absorber, etc., may be required.

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact. In this case, the rigidity of the machinery should also be examined.

5. Consider a possible drop in circuit pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and/or human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

6. Consider a possible loss of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

7. Design circuitry to prevent sudden lurching of driven objects.

When a cylinder is driven by an exhaust center type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching because there is a danger of human injury and/or damage to equipment when this occurs.

8. Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9. Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install safe manual control equipment.

Selection

1. Confirm the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.) Consult SMC if you use a fluid other than compressed air.

Caution

1. Operate within the limits of the maximum usable stroke.

The piston rod will be damaged if operated beyond the maximum stroke. Refer to the air cylinder model selection procedures for the maximum usable stroke.

2. Operate the piston within a range such that collision damage will not occur at the stroke end.

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the range within which damage will not occur.

3. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

Mounting

1. Be certain to align the rod axis with the load and direction of movement when connecting.

When not properly aligned, twisting may occur in the rod and tube, and damage may be caused due to wear on the inner tube surface, bushings, rod surface and seals, etc.

2. When an external guide is used, connect the rod end and the load in such a way that there is no interference at any point within the stroke.

3. Do not scratch or gouge the sliding parts of the cylinder tube or piston rod, etc., by striking or grasping them with other objects.

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction. Also, scratches or gouges, etc., in the piston rod may lead to damaged seals and cause air leakage.

4. Prevent the seizure of rotating parts.

Prevent the seizure of rotating parts (pins, etc.) by applying grease.

5. Do not use until you can verify that equipment can operate properly.

Following mounting, maintenance or conversions, verify correct mounting by suitable function and leakage tests after compressed air and power are connected.

6. Instruction manual

The product should be mounted and operated after thoroughly reading the manual and understanding its contents. Keep the instruction manual where it can be referred to as needed.
Series MLU
Actuator Precautions 2
Be sure to read before handling.

Piping

⚠️ Caution

1. Preparation before piping
   Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

2. Wrapping of pipe tape
   When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping.
   Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.

Lubrication

⚠️ Caution

1. Lubrication of non-lube type cylinder
   The cylinder is lubricated at the factory and can be used without any further lubrication.

⚠️ Warning

1. Use clean air.
   Do not use compressed air that includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

Air Supply

⚠️ Caution

1. Install air filters.
   Install air filters at the upstream side of valves. The filtration degree should be 5μm or finer.

2. Install an after-cooler, air dryer or water separator, etc.
   Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after-cooler, air dryer or water separator, etc.

3. Use the product within the specified range of fluid and ambient temperature.
   Take measures to prevent freezing, since moisture in circuits can be frozen below 5°C, and this may cause damage to seals and lead to malfunction.
   Refer to SMC’s “Best Pneumatics vol. 4” for further details on compressed air quality.

Operating Environment

⚠️ Warning

1. Do not use in environments where there is a danger of corrosion.

2. In dusty locations or where water, oil, etc., splash on the equipment, take suitable measures to protect rod.

3. When using auto switches, do not operate in an environment with strong magnetic fields.

Maintenance

⚠️ Warning

1. Perform maintenance according to the procedure indicated in the instruction manual.
   If handled improperly, malfunction and damage of machinery or equipment may occur.

2. Removal of equipment, and supply/exhaust of compressed air.
   When equipment is removed, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.
   When machinery is restarted, proceed with caution after confirming measures to prevent cylinder lurching.

⚠️ Caution

1. Drain flushing
   Remove drainage from air filters regularly.
   (Refer to specifications.)
Series MLU
Auto Switch Precautions 1
Be sure to read before handling.

⚠️ Warning

1. Confirm the specifications.
   Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for load current, voltage, temperature or impact.

2. Take precautions when multiple cylinders are used close together.
   When multiple auto switch cylinders are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm.

3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.
   When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

   \[ V = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000 \]

   In case of high piston speed, the operating time of the load can be extended by using an auto switch (D-F7NT) with built-in OFF delay timer (approx. 200ms).

4. Keep wiring as short as possible.
   <Reed switches>
   As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product’s life. (The switch will stay ON all the time.)
   Use a contact protection box when the wire length is 5m or longer.
   <Solid state switches>
   Although wire length should not affect switch function, use a wire 100m or shorter.

5. Pay attention to the internal voltage drop of the switch.
   <Reed switches>
   1) Switches with an indicator light (except D-A76H)
      • If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)
      [The voltage drop will be “n” times larger when “n” auto switches are connected.]
      Even though an auto switch operates normally, the load may not operate.

   • In the same way, when operating below a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

   \[ \text{Supply voltage} - \text{Internal voltage drop of switch} \geq \text{Minimum operating voltage of load} \]

   2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (model D-A80/A80H).
   <Solid state switches>
   3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).
   Also, note that a 12VDC relay is not applicable.

6. Pay attention to leakage current.
   <Solid state switches>
   With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

   \[ \text{Operating current of load (OFF condition)} > \text{Leakage current} \]

   If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

   Moreover, leakage current flow to the load will be “n” times larger when “n” auto switches are connected in parallel.

7. Do not use a load that generates surge voltage.
   <Reed switches>
   If driving a load such as a relay that generates a surge voltage, use a contact protection box.
   <Solid state switches>
   Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load such as a relay or solenoid which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

8. Cautions for use in an interlock circuit
   When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.
   Also perform periodic maintenance and confirm proper operation.

9. Ensure sufficient clearance for maintenance activities.
   When designing an application, be sure to allow sufficient clearance for maintenance and inspections.
**Warning**

1. **Do not drop or bump.**
   Do not drop, bump or apply excessive impacts (300m/s² or more for reed switches and 1000m/s² or more for solid state switches) while handling. Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

2. **Do not carry a cylinder by the auto switch lead wires.**
   Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

3. **Mount switches using the proper tightening torque.**
   If a switch is tightened beyond the range of tightening torque, the mounting screws, mounting brackets or switch may be damaged. On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position. (Refer to page 10 for switch mounting instructions and tightening torque.)

4. **Mount a switch at the center of the operating range.**
   Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting position shown in the catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation may be unstable.

**Wiring**

**Warning**

5. **Do not allow short circuit of loads.**
   < Reed switches >
   If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.
   
   < Solid state switches >
   All models of PNP output type switches do not have built-in short circuit protection circuits.
   Note that if a load is short circuited, the switch will be instantly damaged as in the case of reed switches.
   Take special care to avoid reverse wiring of the brown [red] power supply line and the black [white] output line on 3-wire type switches.

6. **Avoid incorrect wiring.**
   < Reed switches >
   A 24VDC switch with indicator light has polarity. The brown [red] lead wire is (+), and the blue [black] lead wire is (–).

   1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up. Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.
   Applicable models: D-A73/A73H/A73C
   2) Note however, that in the case of 2-color display auto switches (D-A79W), the switch will be in a normally ON condition if the wiring is reversed.

   < Solid state switches >
   1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will be in a normally ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.
   2) If connections are reversed (power supply line + and power supply line –) on a 3-wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue [black] wire and the power supply line (–) is connected to the black [white] wire, the switch will be damaged.

### Lead wire color changes

Lead wire colors of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided. Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

#### 2-wire

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output (+)</td>
<td>Red</td>
</tr>
<tr>
<td>Output (–)</td>
<td>Black</td>
</tr>
</tbody>
</table>

#### Solid state with diagnostic output

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>Red</td>
</tr>
<tr>
<td>GND</td>
<td>Black</td>
</tr>
<tr>
<td>Output</td>
<td>White</td>
</tr>
<tr>
<td>Diagnostic output</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

#### 3-wire

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>Red</td>
</tr>
<tr>
<td>GND</td>
<td>Black</td>
</tr>
<tr>
<td>Output</td>
<td>White</td>
</tr>
<tr>
<td>Latch type diagnostic output</td>
<td>Yellow</td>
</tr>
</tbody>
</table>
Operating Environment

⚠️ Warning

1. Never use in an atmosphere of explosive gases.
   The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.
   Auto switches can malfunction or magnets inside cylinders can become demagnetized. (Consult SMC regarding the availability of a magnetic field resistant auto switch.)

3. Do not use in an environment where the auto switch will be continually exposed to water.
   Although switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction), avoid using switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.
   Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.
   Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as there may be adverse effects inside the switches.

6. Do not use in an environment where there is excessive impact shock.
   <Reed switches>
   When excessive impact (300m/s² or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment.

7. Do not use in an area where surges are generated.
   <Solid state switches>
   When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

8. Avoid accumulation of iron waste or close contact with magnetic substances.
   When a large amount of iron waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

Maintenance

⚠️ Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.
   1) Securely tighten switch mounting screws.
      If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.
   2) Confirm that there is no damage to lead wires.
      To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.
   3) Confirm the lighting of the green light on the 2-color display type switch.
      Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

Other

⚠️ Warning

1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.
Warning

1. Do not use for intermediate cylinder stops.
This cylinder is designed for locking against inadvertent movement from a stationary condition. Do not perform intermediate stops while the cylinder is operating, as this will shorten its service life.

2. Select the correct locking direction, as this cylinder does not generate holding force opposite to the locking direction.
The extension locking direction does not generate holding force in the cylinder’s retracting direction, and the retraction locking direction does not generate holding force in the cylinder’s extending direction (free).

3. Even when locked, there may be stroke movement of about 1mm in the locking direction due to external forces such as the weight of the work piece.
Even when locked, if air pressure drops, stroke movement of about 1mm may be generated in the locking direction of the lock mechanism due to external forces such as the work piece weight.

4. When locked, do not apply impact loads, strong vibration or rotational force, etc.
This will lead to lock mechanism damage and reduced service life, etc.

5. Operate so that load weight, maximum speed and eccentric distance are within the limiting ranges in the graphs below.
Operation beyond the limiting range will lead to cylinder damage and reduced service life, etc.

Allowable kinetic energy

<table>
<thead>
<tr>
<th>Extension locking direction</th>
<th>Retraction locking direction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Load weight kg</strong></td>
<td><strong>Load weight kg</strong></td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.5MPa</td>
<td>0.5MPa</td>
</tr>
<tr>
<td>0.4MPa</td>
<td>0.4MPa</td>
</tr>
</tbody>
</table>

Pneumatic Circuits

Warning

1. Do not use 3 position valves.
The lock may be released due to inflow of the unlocking pressure.

2. Install speed controllers for meter-out control.
Malfunction may occur if meter-in control is used.

3. Be careful of reverse exhaust pressure flow from a common exhaust type manifold.
Since the lock may be released due to reverse exhaust pressure flow, use an individual exhaust type manifold or single type valve.

4. Branch off the compressed air piping for the lock unit between the cylinder and the speed controller.
Use of an external branch may cause a reduction in service life.

5. Perform piping so that the side going from the piping junction to the lock unit is short.
If it is long, this may cause unlocking malfunction and reduce the lock’s service life, etc.

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Series MLU
Specific Product Precautions 1
Be sure to read before handling.
Refer to pages 12 through 17 for safety instructions, actuator precautions and auto switch precautions.
**Warning**

1. When starting operation from the locked position, be sure to restore air pressure to the B line in the pneumatic circuit. It is very dangerous to apply pressure to the A line with the B line in an unpressurized state, because the cylinder will move suddenly when unlocked.

2. When fixing a work piece at the end of the piston rod, first retract the piston rod to the back end. Use the spanner hook at the end of the rod to keep the torque below the allowable tightening torque.

3. Always apply the piston rod load in the axial direction. Avoid operation where rotational torque is applied. If it is the only possible way, be sure to use it within the allowable range shown in the table below.

<table>
<thead>
<tr>
<th>Allowable rotational torque (N m)</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable rotational torque</td>
<td>0.25</td>
<td>0.25</td>
<td>0.55</td>
<td>1.25</td>
</tr>
<tr>
<td>Allowable torque for work piece mounting</td>
<td>1.7</td>
<td>1.9</td>
<td>2.0</td>
<td>4.9</td>
</tr>
</tbody>
</table>

4. The piston speed may exceed the maximum operating speed of 500mm/s if the piping is directedly connected to the cylinder. Please use speed controllers by SMC to adjust the piston speed so that it will not exceed 500mm/s.

**Mounting**

**Caution**

1. Be sure to connect the load to the rod end with the cylinder in an unlocked condition. If this is done when in a locked condition, it may cause damage to the lock mechanism.

2. When fixing a work piece at the end of the piston rod, first retract the piston rod to the back end. Use the spanner hook at the end of the rod to keep the torque below the allowable tightening torque.

3. Always apply the piston rod load in the axial direction. Avoid operation where rotational torque is applied. If it is the only possible way, be sure to use it within the allowable range shown in the table below.

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4. The piston speed may exceed the maximum operating speed of 500mm/s if the piping is directedly connected to the cylinder. Please use speed controllers by SMC to adjust the piston speed so that it will not exceed 500mm/s.

**Preparatory for Operation**

**Warning**

1. When starting operation from the locked position, be sure to restore air pressure to the B line in the pneumatic circuit. It is very dangerous to apply pressure to the A line with the B line in an unpressurized state, because the cylinder will move suddenly when unlocked.

2. When fixing a work piece at the end of the piston rod, first retract the piston rod to the back end. Use the spanner hook at the end of the rod to keep the torque below the allowable tightening torque.

**Manual Unlocking**

**Warning**

1. Do not perform unlocking when an external force such as a load or spring force is being applied. This is very dangerous because the cylinder will move suddenly. Follow the following steps.

   1) The lock after restoring the air pressure in the B line of the pneumatic circuit to operating pressure, and then reduce the pressure gradually.
   2) In case air pressure cannot be used, release the lock after preventing cylinder movement with a lifting device such as a jack.

2. After confirming safety, operate the manual release following the steps shown below. Carefully confirm that no one is inside the load movement range, etc., and that there is no danger even if the load moves suddenly.

**Maintenance**

**Caution**

1. In order to maintain good performance, operate with clean unlubricated air. If lubricated air, compressor oil or drainage, etc., enters the cylinder, there is a danger of sharply reducing the locking performance.

2. Do not apply grease to the piston rod. There is a danger of sharply reducing the locking performance.

3. Never disassemble the lock unit. It contains a heavy duty spring which is dangerous. There is also a danger of reducing the locking performance.
**Series MLU**

**Specific Product Precautions 3**

Be sure to read before handling.

Refer to pages 12 through 17 for safety instructions, actuator precautions and auto switch precautions.

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**Holding the Unlocked Condition**

**⚠️ Warning**

**1. Sizes MLU can hold the unlocked condition.**

   <Holding the unlocked condition>
   
   1) Remove the dust cover.
   
   2) Supply air pressure of 0.2MPa or more to the unlocking port, and set the lock ring to the perpendicular position.
   
   3) Screw the unlocking bolt which is included (hexagon socket head screw ø25, ø32: M3 x 12, ø40, ø50: M4 x 16) into the lock ring to hold the unlocked condition.

   ![Unlocking bolt and Dust cover diagram]

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**Auto Switch Handling Precautions**

**⚠️ Warning**

**1. If two or more cylinders are used in close proximity, the auto switches may malfunction affected by the magnets built in the nearby cylinder.**

   Please keep the cylinder mounting pitch larger than the values in the table below.

   Minimum cylinder mounting pitch

   ![Minimum cylinder mounting pitch diagram]

<table>
<thead>
<tr>
<th>Size</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (d)</td>
<td>33 (10)</td>
<td>32 (5)</td>
<td>36 (5)</td>
<td>38 (0)</td>
</tr>
</tbody>
</table>

   When the mounting pitch is equal to or smaller than the value shown above, it has to be shielded by an iron plate or a magnetic shielding plate (Part No. MU-S025) purchased separately. Please contact SMC for more information.