Clean Room Rodless Cylinder

Series CYP

ø15, ø32

Magnetically coupled rodless cylinder for transfer in clean environments
Low particle generation: 1/20
(compared to previous series)

- High cleanliness is achieved with **non-contact construction** of the cylinder tube exterior and a **stainless steel linear guide (specially treated)**.
- Particle generation has been reduced to 1/20 compared to series 12-CY1B (previous SMC product) even without vacuum suction.

Long strokes
(Max. 700mm)

- **Stainless steel linear guide** (specially treated)
- The specially treated linear guide achieves low particulate generation, high linearity and high precision.

Note 1) This chart indicates the level of cleanliness inside the measurement chamber.
Note 2) The vertical axis shows the number of particles per unit volume (1m$^3$) of air which are no smaller than the particle size shown on the horizontal axis.
Note 4) The plots indicate the 95% upper reliability limit value for time series data up to 500 thousand operation cycles. (Cylinder: CYP32-200, Work piece weight: 5kg, Average speed: 2000mm/s)
Note 5) The data above provide a guide for selection but is not guaranteed.

Piping port variations provide a high degree of freedom

- Non-contact construction
  - There is no particulate generation from sliding, because the construction avoids contact between the cylinder tube's exterior surface and the slide table's interior surface.

Cleaned, assembled and double packaged in a clean room

<table>
<thead>
<tr>
<th>Model</th>
<th>Nil</th>
<th>L</th>
<th>R</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piping port position</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>Operating direction</td>
<td>Right</td>
<td>Left</td>
<td>Right</td>
<td>Left</td>
</tr>
</tbody>
</table>

Features 1
A magnetically coupled rodless cylinder that can be used for transfer in clean environments

**Special cylinder tube**
A special cylinder tube is employed using extruded aluminum material. Even long strokes are not subject to deflection because of direct attachment to the cylinder body, and non-contact construction is achieved through combination with a linear guide.

**Shock-free**
A **sine cushion** is used at the end of the stroke. Smooth acceleration and deceleration are possible at 0.5G or less.

**Stroke adjustment**
The **stroke adjustment screw** allows fine control of the stroke (±1mm on each side).

**Variations**

### Clean environment level
- High
- Low

### Load weight
- Light
- Heavy

### Bore size (mm)
- 6
- 10
- 15
- 20
- 25
- 32
- 40
- 50
- 63

---

Features 2
Clean Room Rodless Cylinder

Series CYP

How to Order

CYP 15 200 Z73

Clean room rodless cylinder

Cylinder bore size

15 15mm
32 32mm

Standard stroke

Bore size (mm) Standard stroke (mm)
15, 32 100, 150, 200, 250, 300, 350
400, 450, 500, 600, 700

Number of auto switches

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

Type of auto switch

- Nil: Without auto switch

Select auto switches from the table below.

Piping port position

- Nil
- a: Operating direction: Right
- b: Operating direction: Left
- c: Operating direction: Right
- d: Operating direction: Left
- e: Operating direction: Right
- f: Operating direction: Left
- g: Operating direction: Right
- h: Operating direction: Left

Applicable auto switches

<table>
<thead>
<tr>
<th>Type</th>
<th>Special function</th>
<th>Electrical entry</th>
<th>Indicator light</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch models</th>
<th>Lead wire length (mm)*</th>
<th>Applicable loads</th>
<th>Detailed specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>—</td>
<td>Grommet</td>
<td>Yes</td>
<td>3 wire — 5V</td>
<td>—</td>
<td>—</td>
<td>— IC circuit</td>
<td>—</td>
<td>— IC circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>2 wire 24V</td>
<td>12V 100V</td>
<td>—</td>
<td>— IC circuit</td>
<td>—</td>
<td>— IC circuit</td>
</tr>
<tr>
<td>Solid state switch</td>
<td>—</td>
<td>Grommet</td>
<td>Yes</td>
<td>2 wire (NPN) 5V, 12V</td>
<td>—</td>
<td>—</td>
<td>— IC circuit</td>
<td>—</td>
<td>— IC circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (PNP)</td>
<td>12V 100V</td>
<td>—</td>
<td>— IC circuit</td>
<td>—</td>
<td>— IC circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diagnostic</td>
<td>24V</td>
<td>—</td>
<td>— IC circuit</td>
<td>—</td>
<td>— IC circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>indication</td>
<td></td>
<td>—</td>
<td>— IC circuit</td>
<td>—</td>
<td>— IC circuit</td>
</tr>
</tbody>
</table>

- Lead wire length symbols: 0.5m ....... Nil (Example) Y69B
  3m ......... L                     Y69BL
  5m ......... Z                     Y69BZ

** Auto switches marked with a "0" symbol are produced upon receipt of order.

Note 1) Consult SMC if the maximum stroke is exceeded.
Note 2) Intermediate strokes are available as a special order.
## Specifications

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>15</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td>Air and inert gases</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Double acting</td>
<td></td>
</tr>
<tr>
<td>Proof pressure</td>
<td>0.5MPa</td>
<td></td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>0.05 to 0.3MPa</td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>–10 to 60°C</td>
<td></td>
</tr>
<tr>
<td>Piston speed</td>
<td>50 to 300mm/s</td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Non-lube</td>
<td></td>
</tr>
<tr>
<td>Stroke adjustment</td>
<td>±1mm on each side (±2mm total)</td>
<td></td>
</tr>
<tr>
<td>Cushion</td>
<td>Sine cushion (Air cushion)</td>
<td></td>
</tr>
<tr>
<td>Port size</td>
<td>M5 x 0.8</td>
<td>Rc 1/8</td>
</tr>
</tbody>
</table>

## Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Standard stroke (mm)</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
<th>450</th>
<th>500</th>
<th>600</th>
<th>700</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td></td>
<td>1.2</td>
<td>1.4</td>
<td>1.6</td>
<td>1.7</td>
<td>1.9</td>
<td>2.0</td>
<td>2.2</td>
<td>2.4</td>
<td>2.5</td>
<td>2.8</td>
<td>3.2</td>
</tr>
<tr>
<td>CYP32</td>
<td></td>
<td>4.2</td>
<td>4.6</td>
<td>5.0</td>
<td>5.5</td>
<td>5.9</td>
<td>6.3</td>
<td>6.7</td>
<td>7.1</td>
<td>7.5</td>
<td>8.3</td>
<td>9.1</td>
</tr>
</tbody>
</table>

## Magnet Holding Force

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Magnet holding force (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>59</td>
</tr>
<tr>
<td>32</td>
<td>268</td>
</tr>
</tbody>
</table>

## Theoretical Output

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Piston area (mm)</th>
<th>Operating pressure (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>15</td>
<td>176</td>
<td>18</td>
</tr>
<tr>
<td>32</td>
<td>804</td>
<td>80</td>
</tr>
</tbody>
</table>
# Series CYP

## Construction

### CYP15

![CYP15 Diagram]

### CYP32

![CYP32 Diagram]

### 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>Magnet A</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Piston side yoke</td>
<td>Rolled steel plate</td>
<td>Zinc chromated</td>
</tr>
<tr>
<td>3</td>
<td>Piston</td>
<td>Brass/Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Piston seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Wear ring A</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Wear ring</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Shaft</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Cushion ring</td>
<td>Stainless steel/Brass</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Magnet B</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>External slider yoke</td>
<td>Rolled steel</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>11</td>
<td>External spacer</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>12</td>
<td>Slide table</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>13</td>
<td>Insertion guide plate</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Round head Phillips screw</td>
<td>Carbon steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>15</td>
<td>Hold spacer</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>16</td>
<td>Magnet</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Side plate A</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>18</td>
<td>Side plate B</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>19</td>
<td>Hexagon socket head cap screw</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>20</td>
<td>Plate A</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>21</td>
<td>Plate B</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>22</td>
<td>Cushion seal</td>
<td>NBR</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Inner cover</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>24</td>
<td>Cylinder tube gasket</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Steel ball</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Bumper</td>
<td>Polyurethane</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Hexagon socket head set screw</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>30</td>
<td>Hexagon socket head cap screw</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>31</td>
<td>Round head Phillips screw</td>
<td>Stainless steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>32</td>
<td>Hexagon socket head plug</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>33</td>
<td>Linear guide</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Hexagon socket head cap screw</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>35</td>
<td>Body</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>36</td>
<td>Cylinder tube</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>37</td>
<td>Tube attaching bracket</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>38</td>
<td>Hexagon socket head cap screw</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>39</td>
<td>Hexagon socket head cap screw</td>
<td>Chrome molybdenum steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>40</td>
<td>Top cover</td>
<td>Aluminum alloy</td>
<td>Clear hard anodized</td>
</tr>
<tr>
<td>41</td>
<td>Cushion seal holder</td>
<td>Aluminum alloy</td>
<td>Chromated</td>
</tr>
<tr>
<td>42</td>
<td>Bumper</td>
<td>Urethane</td>
<td>CYP32 only</td>
</tr>
<tr>
<td>43</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>C type snap ring for shaft</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
</tbody>
</table>
Note 1) These dimension drawings indicate the case of piping port position “Nil”.
Note 2) These dimensions indicate the protruding portion of the bumper.
Note 3) Refer to “Specific Product Precautions [Cushion Effect (Sine Cushion) and Stroke Adjustment] on page 22.

| Model | A  | B  | C  | E  | ED | EK | F  | G  | H  | HA | HB | HG | HI  | HL  | HP  | HS  | HT  | J  | JK | K  |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|----|----|----|
| CYP15 | 8  | 9.5| 5.4| 4  | 6.5| 8.5| 8.5| 23 | 38.6| 44 | 27 | 19.5| M6 x 1| 10  | 21  |
| CYP32 | 12 | 14 | 8.6| 6  | 8.5| 25 | 39 | 39 | 64.9| 73.5| 49.5| 39  | M10 x 1.5| 12  | 20  |

| Model | L  | LD | LW | MM | M  | N  | P  | PA | PB | Q  | QW | R  | T  | TA  | TB  | W  | WA  | WB  | Y  | Z  |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----|-----|-----|----|----|
| CYP15 | 67 | 5.6| 69 | M4 x 0.7| 6  | 4.5| M5 x 0.8| 25 | 60 | 138 | 87 | 79.5| 23  | 13  | 18  | 69  | 32  | 17  | 2.5 | 118 |
| CYP32 | 90 | 8.6| 115| M6 x 1  | 8  | 7.5| Rc 1/8  | 50 | 100| 138 | 87 | 79.5| 29  | 17  | 22  | 115 | 46  | 27  | 3.5 | 155 |

Note 1) These dimension drawings indicate the case of piping port position “Nil”.
Note 2) These dimensions indicate the protruding portion of the bumper.
Note 3) Refer to “Specific Product Precautions [Cushion Effect (Sine Cushion) and Stroke Adjustment] on page 22.
Contact Protection Boxes/CD-P11, CD-P12

D-Z7 and D-Z8 type switches do not have internal contact protection circuits.

1. The operating load is an induction load.
2. The length of wiring to the load is 5m or more.
3. The load voltage is 100VAC.

A contact protection box should be used in any of the above situations.

Contact protection box specifications

<table>
<thead>
<tr>
<th>Part no.</th>
<th>CD-P11</th>
<th>CD-P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load voltage</td>
<td>100VAC or less</td>
<td>200VAC</td>
</tr>
<tr>
<td>Maximum load current</td>
<td>25mA</td>
<td>12.5mA</td>
</tr>
</tbody>
</table>

* Lead wire length Z: 5m applicable auto switch
  
  Reed: D-Z73
  
  Solid state: All types are produced upon receipt of order (standard availability).

Auto Switch Hysteresis

Hysteresis is the distance from the position at which piston movement activates an auto switch to the position at which reverse movement turns the switch OFF. This hysteresis is included in part of the operating range (one side).

The difference between the switch operating position (ON) and the return position (OFF) is usually 2mm or less for reed switches and 1mm or less for solid state switches. However, this varies with the operating environment and is not guaranteed. Consult SMC regarding applications in which hysteresis become a problem.

Contact protection box internal circuits

Lead wire colors inside ( ) are those prior to conformity with IEC standards.

Contact protection box/Dimensions

To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit.

Furthermore, the switch unit should be kept as close as possible to the contact protection box, with a lead wire length of no more than 1 meter between them.
**Basic Wiring**

**Solid state 3 wire, NPN**

**Sink input specifications**

2 wire

2 wire with 2 switch AND connection

2 wire

**2 wire 2 wire connection**

**Solid state 3 wire, PNP**

Example: Power supply is 24VDC

Voltage decline in switch is 4V

---

**Examples of Connection to PLC**

**Sink input specifications**

3 wire, NPN

2 wire

**Source input specifications**

3 wire, PNP

2 wire

**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

2 wire with 2 switch OR connection

The indicator lights will light up when both switches are turned ON.

**Load voltage at ON**

\[
\text{Load voltage at ON} = \text{Power supply voltage} - \text{Residual voltage} \times 2 \text{ pcs.}
\]

\[
= 24V - 4V \times 2 \text{ pcs.}
\]

\[
= 16V
\]

Example: Power supply is 24VDC

Voltage decline in switch is 4V

---

**Reed switch**

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes get dark or not light up, because of dispersion and reduction of the current flowing to the switches.
Auto Switch Mounting Position for Stroke End Detection

**Proper auto switch mounting position**

<table>
<thead>
<tr>
<th>Auto switch model</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CYP15</td>
<td>24.5</td>
<td>93.5</td>
</tr>
<tr>
<td>CYP32</td>
<td>33</td>
<td>122</td>
</tr>
</tbody>
</table>

**Auto Switch Mounting**

When mounting auto switches, they should be inserted into the cylinder’s switch groove from the direction shown in the drawing on the right. After setting in the mounting position, use a flat head watchmaker's screwdriver to tighten the set screw which is included.

Note) When tightening the auto switch set screw (included with the auto switch), use a watchmaker's screwdriver with a handle about 5 to 6mm in diameter. The tightening torque should be approximately 0.05 to 0.1N·m.

**Auto Switch Operating Range**

<table>
<thead>
<tr>
<th>Auto switch model</th>
<th>D-Z7</th>
<th>D-Z80</th>
<th>D-Y7</th>
<th>D-Y7PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CYP15</td>
<td>6.5</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CYP32</td>
<td>9.5</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note) Operating ranges are standards including hysteresis, and are not guaranteed. (variations on the order of ±30%) Large variations may occur depending on the surrounding environment.
Reed Switches/Direct Mount Type
D-Z73/Z76/Z80

Auto Switch Specifications

With indicator light

<table>
<thead>
<tr>
<th>Auto switch part no.</th>
<th>D-Z73</th>
<th>D-Z76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical entry direction</td>
<td>In-line</td>
<td>In-line</td>
</tr>
<tr>
<td>Applicable loads</td>
<td>Relay, PLC</td>
<td>IC circuit</td>
</tr>
<tr>
<td>Load voltage</td>
<td>24VDC</td>
<td>100VAC</td>
</tr>
<tr>
<td>Maximum load current or current range</td>
<td>5 to 40mA</td>
<td>5 to 20mA</td>
</tr>
<tr>
<td>Contact protection circuit</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Internal voltage drop</td>
<td>2.4V or less (to 20mA) / 3V or less (to 40mA)</td>
<td>0.8V or less</td>
</tr>
<tr>
<td>Indicator light</td>
<td>Red LED lights up when ON</td>
<td></td>
</tr>
</tbody>
</table>

Without indicator light

<table>
<thead>
<tr>
<th>Auto switch part no.</th>
<th>D-Z80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical entry direction</td>
<td>In-line</td>
</tr>
<tr>
<td>Applicable load</td>
<td>Relay, PLC, IC circuit</td>
</tr>
<tr>
<td>Load voltage</td>
<td>24VDC or less</td>
</tr>
<tr>
<td>Maximum load current</td>
<td>50mA</td>
</tr>
<tr>
<td>Contact protection circuit</td>
<td>None</td>
</tr>
<tr>
<td>Internal resistance</td>
<td>1Ω or less (including lead wire length of 3m)</td>
</tr>
</tbody>
</table>

Internal circuits

D-Z73

D-Z76

D-Z80

Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length 0.5m</th>
<th>Lead wire length 3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Z73</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td>D-Z76</td>
<td>10</td>
<td>55</td>
</tr>
<tr>
<td>D-Z80</td>
<td>9</td>
<td>49</td>
</tr>
</tbody>
</table>

Dimensions

D-Z73

D-Z76, Z80

Note: 1. The load is an induction load.
2. The lead wire length to the load is 5m or more.
3. The load voltage is 100VAC.

Use a contact protection box in any of the above situations, as the life of the contacts may otherwise be reduced. (Refer to page 5 for detailed specifications of the contact protection boxes.)
Auto Switch Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical entry direction</td>
<td>In-line</td>
<td>Perpendicular</td>
<td>In-line</td>
<td>Perpendicular</td>
<td>In-line</td>
<td>Perpendicular</td>
</tr>
<tr>
<td>Wiring type</td>
<td>3 wire</td>
<td>2 wire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output type</td>
<td>NPN</td>
<td>PNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable loads</td>
<td>IC circuit, Relay, PLC</td>
<td>24VDC Relay, PLC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>5, 12, 24VDC (4.5 to 28VDC)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>10mA or less</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load voltage</td>
<td>28VDC or less</td>
<td>–</td>
<td>24VDC (10 to 28VDC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load current</td>
<td>40mA or less</td>
<td>80mA or less</td>
<td>5 to 40mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal voltage drop</td>
<td>1.5V or less</td>
<td>0.8V or less</td>
<td>4V or less</td>
<td>0.8V or less at 10mA load current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage current</td>
<td>100μA or less at 24VDC</td>
<td>0.8mA or less at 24VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator light</td>
<td>Red LED lights up when ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note) Lead wires—Oil resistant, flexible vinyl heavy duty cord, ø3.4, 0.15mm², 3 wire [Brown, Black, Blue (Red, White, Black)], 2 wire [Brown, Blue (Red, Black)], 0.5m

Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5m</td>
</tr>
<tr>
<td>D-Y59A, Y69A, Y7P</td>
<td>10</td>
</tr>
<tr>
<td>D-Y59B, Y69B, Y7PV</td>
<td>9</td>
</tr>
</tbody>
</table>

Dimensions

D-Y59A, Y59B

D-Y7P

D-Y69A, Y69B

D-Y7PV

Note) Refer to page 5 for auto switch common specifications and lead wire lengths.
2 Color Indication Solid State Switches
Direct Mount Type
D-Y7NW (V)/Y7PW (V)/D-Y7BW (V)

Auto Switch Specifications

<table>
<thead>
<tr>
<th>Auto switch part no.</th>
<th>D-Y7NW</th>
<th>D-Y7NWV</th>
<th>D-Y7PW</th>
<th>D-Y7PWV</th>
<th>D-Y7BW</th>
<th>D-Y7BWV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical entry direction</td>
<td>In-line</td>
<td>Perpendicular</td>
<td>In-line</td>
<td>Perpendicular</td>
<td>In-line</td>
<td>Perpendicular</td>
</tr>
<tr>
<td>Wiring type</td>
<td>3 wire</td>
<td>2 wire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output type</td>
<td>NPN</td>
<td>PNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable loads</td>
<td>IC circuit, Relay, PLC</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>5, 12, 24VDC (4.5 to 28VDC)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>10mA or less</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load voltage</td>
<td>28VDC or less</td>
<td>24VDC (10 to 28VDC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load current</td>
<td>40mA or less</td>
<td>80mA or less</td>
<td>2.5 to 40mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal voltage drop</td>
<td>1.5V or less</td>
<td>(0.8V or less at 10mA load current)</td>
<td>0.8V or less</td>
<td>4V or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage current</td>
<td>100µA or less at 24VDC</td>
<td>0.8mA or less at 24VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator light</td>
<td>Operating position ——— Red LED lights up</td>
<td>Optimum operating position ——— Green LED lights up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Internal circuits

D-Y7NW(V)/3 wire   NPN output

D-Y7PW(V)/3 wire   PNP output

D-Y7BW(V)/2 wire

Indicator light/Display method

Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Y7NW, Y7P</td>
<td>0.5m: 10</td>
</tr>
<tr>
<td>D-Y7BW</td>
<td>0.5m: 9</td>
</tr>
<tr>
<td></td>
<td>3m: 53</td>
</tr>
<tr>
<td></td>
<td>3m: 50</td>
</tr>
</tbody>
</table>

Dimensions

D-Y7NW

D-Y7NWV

Lead wires — Oil resistant, flexible vinyl heavy duty cord, ø3.4, 0.15mm²,
3 wire [Brown, Black, Blue (Red, White, Black)], 2 wire [Brown, Blue (Red, Black)], 0.5m

Note) Refer to page 5 for auto switch common specifications and lead wire lengths.
Series CYP
Model Selection 1

Design Precautions (1)

The load mass allowable moment differs depending on the work piece mounting method, cylinder mounting orientation and piston speed. In making a determination of usability, do not allow the sum ($\Sigma \alpha n$) of the load factors ($\alpha n$) for each mass and moment to exceed "1".

$$\Sigma \alpha n = \frac{\text{Load mass (m)}}{\text{Max. load mass (m max)}} + \frac{\text{Static moment (M)}}{\text{Allowable static moment (M max)}} + \frac{\text{Dynamic moment (Me)}}{\text{Allowable dynamic moment (Me max)}} \leq 1$$

### Load mass

<table>
<thead>
<tr>
<th>Model</th>
<th>m</th>
<th>Max. load mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CYP32</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### Moment

#### Allowable moment

(Static moment/Dynamic moment)

<table>
<thead>
<tr>
<th>Model</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>CYP32</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Static moment

Moment generated by the work piece weight even when the cylinder is stopped

- **Pich moment**
  $$M_1 = m \times g \times (L + B) \times 10^{-3}$$

- **Roll moment**
  $$M_2 = m \times g \times (L + B) \times 10^{-3}$$

- **Yaw moment**
  $$M_3 = m \times g \times (L + A) \times 10^{-3}$$

### Dynamic moment

Moment generated by the load equivalent to impact at the stroke end

- **Pich moment**
  $$M_{e1} = \frac{1}{3} \times \frac{W_e}{L + B} \times 10^{-3}$$

- **Yaw moment**
  $$M_{e3} = \frac{1}{3} \times \frac{W_e}{L + A} \times 10^{-3}$$

Where:
- $W_e$ is the load equivalent to impact [N]
- $L$, $B$, $A$ are distances in millimeters
- $m$ is load mass [kg]
- $U$ is max. speed [mm/s]
- $g$ is gravitational acceleration [9.8m/s²]

The load mass allowable moment differs depending on the work piece mounting method, cylinder mounting orientation and piston speed. In making a determination of usability, do not allow the sum ($\Sigma \alpha n$) of the load factors ($\alpha n$) for each mass and moment to exceed "1".
**Selection Calculation**

The selection calculation finds the load factors (\( \alpha_n \)) of the items below, where the total (\( \sum \alpha_n \)) does not exceed 1.

\[ \sum \alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1 \]

<table>
<thead>
<tr>
<th>Item</th>
<th>Load factor ( \alpha_n )</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Max. load mass</td>
<td>( \alpha_1 = m/m_{\text{max}} )</td>
<td>Review m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( m_{\text{max}} ) is the maximum load mass</td>
</tr>
<tr>
<td>2. Static moment</td>
<td>( \alpha_2 = M/M_{\text{max}} )</td>
<td>Review M1, M2, M3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( M_{\text{max}} ) is the allowable moment</td>
</tr>
<tr>
<td>3. Dynamic moment</td>
<td>( \alpha_3 = M_e/M_{\text{e max}} )</td>
<td>Review M1, M3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( M_{\text{e max}} ) is the allowable moment</td>
</tr>
</tbody>
</table>

**Calculation example**

**Operating conditions**
- Cylinder: CYP32
- Mounting: Horizontal wall mounting
- Maximum speed: \( U = 300 \) [mm/s]
- Load mass: \( m = 1 \) [kg] (excluding mass of arm section)
- \( L_1 = 50 \) [mm]
- \( L_2 = 50 \) [mm]

<table>
<thead>
<tr>
<th>Item</th>
<th>Load factor ( \alpha_n )</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maximum load mass</td>
<td>( \alpha_1 = m/m_{\text{max}} )</td>
<td>Review m.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( m_{\text{max}} ) is the maximum load mass</td>
</tr>
<tr>
<td>2. Static moment</td>
<td>( \alpha_2 = M_2/M_{\text{max}} )</td>
<td>Review M2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Since ( M_1 ) &amp; ( M_3 ) are not generated, review is unnecessary.</td>
</tr>
<tr>
<td>3. Dynamic moment</td>
<td>We = ( 5 \times 10^{-3} m \cdot g \cdot U )</td>
<td>Review Me3.</td>
</tr>
<tr>
<td></td>
<td>( 5 \times 10^{-3} \cdot 1 \cdot 9.8 \cdot 300 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 14.7 [N]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Me1 = ( 1/3 \cdot W_e (L_2 + A) \cdot 10^{-3} )</td>
<td>Review Me1.</td>
</tr>
<tr>
<td></td>
<td>= ( 1/3 \cdot 14.7 \cdot (50 + 27) \cdot 10^{-3} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 0.38 [N.m]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \alpha_4 = M_4/M_{\text{e max}} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 0.48/3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 0.16</td>
<td></td>
</tr>
</tbody>
</table>

\[ \sum \alpha_n = \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 \]
\[ = 0.20 + 0.24 + 0.13 + 0.16 \]
\[ = 0.73 \]
\[ \sum \alpha_n = 0.73 \leq 1 \] Therefore it can be used.
Table Deflection

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement of table due to pitch moment load</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td><img src="image" alt="Diagram of CYP15 (M1)" /></td>
</tr>
<tr>
<td>CYP32</td>
<td><img src="image" alt="Diagram of CYP32 (M1)" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement of table due to roll moment load</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td><img src="image" alt="Diagram of CYP15 (M2)" /></td>
</tr>
<tr>
<td>CYP32</td>
<td><img src="image" alt="Diagram of CYP32 (M2)" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement of table due to yaw moment load</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td><img src="image" alt="Diagram of CYP15 (M3)" /></td>
</tr>
<tr>
<td>CYP32</td>
<td><img src="image" alt="Diagram of CYP32 (M3)" /></td>
</tr>
</tbody>
</table>

Vertical Operation

When using in vertical operation, prevention of work piece dropping due to breaking of the magnetic coupling should be considered. The allowable load mass and maximum operating pressure should be as shown in the table below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Allowable load mass (mg)</th>
<th>Maximum operating pressure (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>CYP32</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Intermediate Stops

The cushion effect (smooth start-up, soft stop) exists only before the stroke end in the stroke ranges indicated in the table below.
The cushion effect (smooth start-up, soft stop) cannot be obtained in an intermediate stop or return from an intermediate stop using an external stopper, etc.

When using an intermediate stop considering the above information, implement measures to prevent particulate generation and set the operating pressure to no more than 0.3MPa.

<table>
<thead>
<tr>
<th>CUSHION STROKE</th>
<th>PROTECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td>25</td>
</tr>
<tr>
<td>CYP32</td>
<td>30</td>
</tr>
</tbody>
</table>
Series CYP
Safety Instructions

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.

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 handled incorrectly. 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.

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
Precautions on Design

⚠️ 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. Install a protective cover when there is a 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 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 to relieve the impact. In this case, the rigidity of the machinery should also be examined.

5. Consider a possible drop in operating 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

⚠️ Warning

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.

2. Intermediate stops
   When intermediate stopping of a cylinder piston is performed with a 3 position closed center type directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure due to the compressibility of air.
   Furthermore, since zero air leakages is not guaranteed, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

⚠️ Caution

1. Operate within the limits of the maximum usable stroke.
   Refer to the standard strokes for the maximum usable stroke.

2. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.
Series CYP
Actuator Precautions 2
Be sure to read before handling.

Mounting

⚠️ Caution
1. Align carefully when connecting to a load having an external guide mechanism.
   Since alignment variations increase as the stroke becomes longer, a connection method (floating mechanism) should be considered which can absorb these variations.

2. When an external guide is used, connect the external slider 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 by striking or grasping them with other objects.
   Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction.

4. Do not use until you verify that the equipment can operate properly.
   After mounting, repair or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak tests.

5. Instruction manual
   Mount and operate the product after thoroughly reading the manual and understanding its contents.
   Keep the instruction manual where it can be referred to as needed.

Air Supply

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

⚠️ 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 Drain Catch, 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 Drain Catch, etc.

3. Use the product within the specified range of fluid and ambient temperature.
   Take measures to prevent freezing, since moisture in circuits will be frozen under 5°C, and this can cause damage to seals and malfunction.
   Refer to SMC's clean pneumatic series “Air Cleaning Equipment” catalog for further details on compressed air quality.

Operating Environment

⚠️ Warning
1. Do not use in environments where there is a danger of corrosion.
   Refer to the construction drawings regarding cylinder materials.

Maintenance

⚠️ Warning
1. Perform maintenance according to the procedure indicated in the instruction manual.
   Improper handling can cause malfunction and damage of machinery or equipment.

2. Removal of equipment and supply/exhaust of compressed air.
   When machinery is serviced, 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 lurching of actuators.

⚠️ Caution
1. Drain flushing.
   Remove drainage from air filters regularly. (Refer to specifications.)

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.
Series CYP
Auto Switch Precautions 1
Be sure to read before handling.

### Design & Selection

#### 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 of current load, 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. (When the allowable separation is indicated for each cylinder series, use the specified value.)

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:
   
   \[ V(\text{mm/s}) = \frac{\text{Auto switch operating range (mm)}}{\text{Time load applied (ms)}} \times 1000 \]

4. Keep wiring as short as possible.
   
   - **Reed switch**
     
     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.)
     
     1) Use a contact protection box when the wire length is 5m or longer.
   
   - **Solid state switch**
     
     2) Although wire length should not affect switch function, use wiring 100m or shorter.

5. Take precautions for the internal voltage drop of the switch.
   
   - **Reed switch**
     
     1) Switches with an indicator light (Except D-Z76)
     
     - 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.

### Warning

- In the same way, when operating at or 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.

   \[
   \text{Supply voltage} - \text{Internal voltage drop} - \text{Minimum operating voltage of load} \\
   = \text{Operating current of load (OFF condition)} \times \text{Leakage current}
   \]

   2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model D-Z80).

   - **Solid state switch**

   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 switch**

   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.

   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 switch**

   If driving a load such as a relay that generates a surge voltage, use a contact protection box.

   - **Solid state switch**

   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 valve, 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.
   When a switch is tightened beyond the range of tightening torque, the mounting screws, mounting bracket 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 switch mounting for each series regarding switch mounting, moving, and tightening torque, etc.)

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 positions shown in the catalog indicate the optimum positions at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation may be unstable.

Warning

1. Avoid repeated application of bending or stretching force to lead wires.
   Broken lead wires will result from repeatedly applying bending stress or stretching force to the lead wires.

2. Be sure to connect the load before power is applied.
   <2 wire type>
   If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

3. Confirm proper insulation of wiring.
   Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire with power lines or high voltage lines.
   Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

Warning

5. Do not allow short circuit of loads.
   <Reed switch>
   If the power is turned ON with a load in a short circuit condition, the switch will be instantly damaged because of excess current flow into the switch.

   <Solid state switch>
   All models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged, as in the case of reed switches.
   * Take special care to avoid reverse wiring with the brown (red) power supply line and the black (white) output line on 3 wire type switches.

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

   <Solid state switch>
   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, note that the switch will be damaged if reversed connections are made while the load is in a short circuited 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.

7. Perform work on terminals before bringing them into a clean room.
   Some lead wires contain white powder to prevent fusion of the sheath (covering) and core wire. In cases where this powder will be a problem, perform cutting of lead wires, etc., before bringing switches into a clean room. After removing powder which has adhered to the insulating material, take steps to prevent dust from escaping, such as wrapping the area near the cut in the sheath with insulation tape, etc.
Series CYP
Auto Switch Precautions 3
Be sure to read before handling.

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 will malfunction or magnets inside cylinders will become demagnetized.

3. Do not use in an environment with temperature cycles.
Consult SMC if switches are used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

4. Do not use in an environment where there is excessive impact shock.
   <Reed switch>
   When excessive impact (300m/s² or more) is applied to a reed switch during operation, the contact 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.

5. Do not use in an area where surges are generated.
   <Solid state switch>
   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 internal circuit elements of the switches. Avoid sources of surge generation and disorganized lines.

6. Avoid accumulation of iron debris or close contact with magnetic substances.
Note that if 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 a 2 color indication 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 elasticity of lead wires and usage at welding sites, etc.

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

<table>
<thead>
<tr>
<th>2 wire</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output (+)</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>Output (-)</td>
<td>Black</td>
<td>Blue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 wire</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>GND</td>
<td>Black</td>
<td>Blue</td>
</tr>
<tr>
<td>Output</td>
<td>White</td>
<td>Black</td>
</tr>
</tbody>
</table>
**Series CYP**

**Specific Product Precautions 1**

Be sure to read before handling.

---

## Handling

### Caution

1. Open the inner package of the double packaged clean series inside a clean room or other clean environment.
2. Perform parts replacement and disassembly work in a clean room after exhausting compressed air in the piping outside the clean room.

---

## Mounting

### Caution

1. Take care to avoid striking the cylinder tube with other objects or handling it in a way that could cause deformation.
   
   The cylinder tube and slider units have a non-contact construction. For this reason, even a slight deformation or slippage of position can cause malfunction and loss of durability, as well as a danger of degrading the particulate generation characteristics.

2. Do not scratch or gouge the linear guide by striking it with other objects.
   
   Since the linear guide is specially treated for maximum suppression of particulate generation due to sliding, even a slight scratch can cause malfunction and loss of durability, as well as a danger of degrading the particulate generation characteristics.

3. Since the slide table is supported by precision bearings, do not apply strong impacts or excessive moment when mounting work pieces.

4. Be sure to operate the cylinder with the plates on both sides secured.
   
   Avoid applications in which the slide table or only one plate is secured.

5. When changing the ports to be used, be sure that unused ports are securely sealed.
   
   Take sufficient care in sealing unused ports, because if ports are not properly sealed air can leak from the ports and particulate generation characteristics can be degraded.

---

## Operation

### Caution

3. When used for vertical operation, use caution regarding possible dropping due to separation of the magnetic coupling.

   When used for vertical operation, use caution as there is a possibility of dropping due to separation of the magnetic coupling if a load (pressure) greater than the allowable value is applied.

4. Do not operate with the magnetic coupling out of position.

   If the magnetic coupling is out of position, push the external slider by hand (or the piston slider with air pressure) back to the proper position at the stroke end.

5. Do not supply lubrication, as this is a non-lube product.

   The interior of the cylinder is lubricated at the factory, and lubrication with turbine oil, etc., will not satisfy the product’s specifications.


   Never reapply lubricant, as there may be a degradation of particulate generation or operation characteristics.

---

## Speed Adjustment

### Caution

1. A throttle valve for clean room use is recommended for speed adjustment. (Consult SMC regarding equipment and methods to be used.)

   Speed adjustment can also be performed with a meter-in or meter-out type speed controller for clean room use, but it may not be possible to obtain smooth starting and stopping operation.

Throttle valves and dual speed controllers for recommended speed adjustment of CYP cylinders

<table>
<thead>
<tr>
<th>Throttle valve</th>
<th>Series</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal body piping type</td>
<td>CYP15</td>
<td>10-AS2000-M5-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2000-M5-X209</td>
</tr>
<tr>
<td></td>
<td>CYP32</td>
<td>10-AS2001F-04-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2001F-04-X214</td>
</tr>
<tr>
<td>Resin body with One-touch fitting</td>
<td>CYP15</td>
<td>10-AS2010F-M5-04-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-M5-04-X214</td>
</tr>
<tr>
<td></td>
<td>CYP32</td>
<td>10-AS2010F-M5-04-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-M5-04-X214</td>
</tr>
<tr>
<td>In-line type (throttle valve)</td>
<td>CYP15</td>
<td>10-AS2010F-M5-06-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-M5-06-X214</td>
</tr>
<tr>
<td></td>
<td>CYP32</td>
<td>10-AS2010F-M5-06-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-M5-06-X214</td>
</tr>
<tr>
<td>Universal type (throttle valve)</td>
<td>CYP15</td>
<td>10-AS2010F-04-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-04-X214</td>
</tr>
<tr>
<td></td>
<td>CYP32</td>
<td>10-AS2010F-04-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-04-X214</td>
</tr>
<tr>
<td>In-line type (throttle valve)</td>
<td>CYP15</td>
<td>10-AS2010F-06-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-06-X214</td>
</tr>
<tr>
<td></td>
<td>CYP32</td>
<td>10-AS2010F-06-X214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-06-X214</td>
</tr>
<tr>
<td>Dual type (speed controller)</td>
<td>CYP15</td>
<td>10-AS2010F-05-04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-05-04</td>
</tr>
<tr>
<td></td>
<td>CYP32</td>
<td>10-AS2010F-05-04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-AS2010F-05-04</td>
</tr>
</tbody>
</table>

2. In case of vertical mounting, a system with a reduced pressure supply circuit installed on the down side is recommended. (This is effective against upward starting delays and for conservation of air.)
Cushion Effect (Sine Cushion) and Stroke Adjustment

**Caution**

1. A sine cushion (smooth start, soft stop) function is included in the standard specifications. Due to the nature of a sine cushion, adjustment of the cushion effect is not possible. There is no cushion needle adjustment as in the case of conventional cushion mechanisms.

2. The stroke end adjustment is a mechanism to adapt the slide table’s stroke end position to a mechanical stopper on other equipment, etc.

   (Adjustment range: Total of both sides ±2mm)

   To ensure safety, perform adjustment after shutting off the drive air, releasing the residual pressure and implementing drop prevention measures, etc.

   1) Loosen the inner cover holding screw with a hexagon wrench, etc.

   2) To match the position with a mechanical stopper on other equipment, etc., rotate the stroke adjustment screw (inner cover) to the left or right with a flat head screw driver to move the inner stopper back and forth. Approximately 1mm of adjustment is possible with one rotation.

   3) The maximum adjustment on one side is ±1mm. A total adjustment of approximately ±2mm is possible using both sides.

   4) After completing the stroke end adjustment, tighten the inner cover holding screw with a hexagon wrench, etc.

**Inner cover holding screw tightening torque [N·m]**

<table>
<thead>
<tr>
<th>Model</th>
<th>Screw size</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP15</td>
<td>M3 x 0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>CYP32</td>
<td>M6 x 1</td>
<td>2.45</td>
</tr>
</tbody>
</table>

Particulate Generation Characteristics

**Caution**

1. In order to maintain the particulate generation grade, use operation of 500 thousand cycles or travel distance of about 400km as a standard. (Table 1 below)

   If operation is continued beyond the recommended values, lubrication failure of the linear guide and loss of particulate generation characteristics may occur.

   **Table 1**

   ![Graph of Particulate Concentration vs. Stroke]

   **Table 2**

   ![Graph of Particle Diameter vs. Concentration]

   **Note**

   1) This chart indicates the level of cleanliness inside the measurement chamber.

   2) The vertical axis shows the number of particles per unit volume (1m³) of air which are no smaller than the particle size shown on the horizontal axis.


   4) The plots indicate the 95% upper reliability limit value for time series data up to 500 thousand operation cycles. (Cylinder: CYP32-200, Work piece weight: 5kg, Average speed: 200mm/s)

   5) The data above provides a guide for selection but is not guaranteed.

Maintenance

**Caution**

1. Never disassemble the cylinder tube or linear guide, etc.

   If disassembled, the slide table may touch the outside surface of the cylinder tube resulting in a degradation of particulate generation characteristics.

2. Consult SMC when replacing seals and bearings (wear rings).
SMC'S GLOBAL MANUFACTURING, DISTRIBUTION AND SERVICE NETWORK

EUROPE
AUSTRIA
SMC Pneumatik GmbH
CZECH
SMC Czech s.r.o.
DENMARK
SMC Pneumatik A/S
FINLAND
SMC Pneumatikka OY
FRANCE
SMC Pneumaleque SA
GERMANY
SMC Pneumatik GmbH
HUNGARY
SMC Hungary Kft.
IRELAND
SMC Pneumatics (Ireland) Ltd.
ITALY
SMC Italia S.p.A.
NETHERLANDS
SMC Pneumatics BV.
NORWAY
SMC Pneumatics Norway A/S
ROMANIA
SMC Romania s.r.l.
RUSSIA
SMC Pneumatik LLC.
SLOVAKIA
SMC Slovakia s.r.o.
SLOVENIA
SMC Slovenia d.o.o.

EUROPE
SPAIN/PORTUGAL
SMC España, S.A.
SWEDEN
SMC Pneumatics Sweden AB
SWITZERLAND
SMC Pneumatik AG.
UK
SMC Pneumatics (U.K.) Ltd.

ASIA
CHINA
SMC (China) Co., Ltd.
HONG KONG
SMC Pneumatics (Hong Kong) Ltd.
INDIA
SMC Pneumatics (India) Pvt. Ltd.
MALAYSIA
PHILIPPINES
SMC Pneumatics (Philippines), Inc.
SINGAPORE
SMC Pneumatics (S.E.A.) Pte. Ltd.
SOUTH KOREA
SMC Pneumatics Korea Co., Ltd.
TAIWAN
SMC Pneumatics (Taiwan) Co., Ltd.
THAILAND
SMC Thailand Ltd.

NORTH AMERICA
CANADA
SMC Pneumatics (Canada) Ltd.
MEXICO
SMC Corporation (Mexico) S.A. de C.V.
USA
SMC Pneumatics, Inc.

SOUTH AMERICA
ARGENTINA
SMC Argentina S.A.
BOLIVIA
SMC Pneumatics Bolivia S.R.L.
BRAZIL
SMC Pneumatics Do Brazil Ltda.
CHILE
SMC Pneumatics (Chile) S.A.
VENEZUELA
SMC Neumatica Venezuela S.A.

OCEANIA
AUSTRALIA
SMC Pneumatics (Australia) Pty. Ltd.
NEW ZEALAND
SMC Pneumatics (N.Z.) Ltd.

Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

Printed in Japan.
1st printing December, 1999 D-SMC.L.A. P-80 (D)