Magnetically Coupled Rodless Cylinder
Low Profile Guide Type

Series **CY1F**
Size: ø10, ø15, ø25

New Series of magnetically coupled rodless cylinder featuring compact and low profile design.
New Series of magnetically coupled rodless cylinder

With reduced mounting height and overall length,

Height reduced by 29%
Compact body
Overall length reduced by 31%

Series CY1F: Ø10, Ø15, Ø25

Various concentrated piping ports are available.
Piping port position can be specified using a part number. 3 types of piping screws are available.

Magnetically coupled rodless cylinder: Low profile guide

Overall length reduced by 22% compared to Series MY2H

4 types of stroke adjustment are available.

-1mm to 0mm
-1mm to 0mm
-25mm to 0mm
-25mm to 0mm
-1mm to 0mm
-25mm to 0mm
-25mm to 0mm
-25mm to 0mm

Approved
cylinder featuring compact and low profile design. small work pieces can be transferred with high precision.

Lightweight Weight reduced by 50%

<table>
<thead>
<tr>
<th>Series</th>
<th>ø10</th>
<th>ø15</th>
<th>ø25</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1F</td>
<td>0.7</td>
<td>1.1</td>
<td>2.5</td>
</tr>
<tr>
<td>CY1H</td>
<td>1.0</td>
<td>2.2</td>
<td>4.6</td>
</tr>
<tr>
<td>MY2H</td>
<td>---</td>
<td>1.3</td>
<td>3.2</td>
</tr>
</tbody>
</table>

*For 100mm stroke cylinder

Available bore sizes ø10, 15, 25

Accumulated dust on the guide can be removed easily without an end cover.

The cylinder and guide are integrated. The cylinder portion can be replaced without interfering with the work piece.

Features 2

Approved
Series CY1F
Model Selection 1

The following are the steps for selection of the series CY1F best suited to your application.

**Standards for Tentative Model Selection**

<table>
<thead>
<tr>
<th>Cylinder model</th>
<th>Guide model</th>
<th>Standard for guide selection</th>
<th>Graph for related allowable values</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1F</td>
<td>High precision guide (Single axis)</td>
<td>Slide table accuracy approx. ±0.05mm or less</td>
<td>Refer to page 28</td>
</tr>
</tbody>
</table>

**Selection Flow Chart**

**Operating conditions**

- \( m \): Load mass (kg)
- \( \upsilon_a \): Average speed
- \( P \): Operating pressure (MPa)
- \( L \): Center of gravity of the work piece (mm)
- Mode of operation (Horizontal, Inclination, Vertical)

**Formulae**

- \( E = \frac{m \upsilon_a^2}{2 \times 1000} \)
- \( \Sigma \alpha = \frac{Load \ mass \ (m)}{Maximum \ allowable \ load \ (M_{max})} + \frac{Static \ moment \ (M)}{Allowable \ static \ moment \ (M_{max})} + \frac{Dynamic \ moment \ (M_e)}{Allowable \ dynamic \ moment \ (M_{e,max})} \)

**Note 1)** This cylinder cannot be stopped at an intermediate position by a pneumatic circuit. The only possible way in that case is the use of an external stopper.
Types of Moment Applied to Rodless Cylinders

Multiple moments may be generated depending on the mounting orientation, load and position of the center of gravity.

 Coordinates and Moments

![Diagram showing types of moments and their corresponding coordinates]

<table>
<thead>
<tr>
<th>Mounting orientation</th>
<th>Horizontal</th>
<th>Ceiling</th>
<th>Wall</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static load m</td>
<td>m1</td>
<td>m2</td>
<td>m3</td>
<td>m4</td>
</tr>
<tr>
<td>M1</td>
<td>m1 x g x X</td>
<td>m2 x g x X</td>
<td></td>
<td>m4 x g x Z</td>
</tr>
<tr>
<td>M2</td>
<td>m1 x g Y</td>
<td>m2 x g Y</td>
<td>m3 x g</td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td></td>
<td></td>
<td>m2 x g</td>
<td>m1 x g x Y</td>
</tr>
</tbody>
</table>

Dynamic moment

![Diagram showing dynamic moment calculations]

<table>
<thead>
<tr>
<th>Mounting orientation</th>
<th>Horizontal</th>
<th>Ceiling</th>
<th>Wall</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic load F_e</td>
<td>1/105 x U_a x m_n x g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M1</td>
<td>1/3 x F_e x Z</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td>Dynamic moment M2e is not generated.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td>1/3 x F_e x Y</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Regardless of the mounting orientation, dynamic moment is calculated with the formulas above.
Series CY1F

Maximum Allowable Moment/Maximum Allowable Load

<table>
<thead>
<tr>
<th>Model</th>
<th>Bore size (mm)</th>
<th>Maximum allowable moment (N·m)</th>
<th>Maximum allowable load (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>M1 1 2 1 2 2 2 1.4</td>
<td>m1 m2 m3 m4</td>
</tr>
<tr>
<td>CY1F</td>
<td>15</td>
<td>M2 1.5 3 1.5 5 5 5 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>M3 14 20 14 12 12 12</td>
<td></td>
</tr>
</tbody>
</table>

The above values are the maximum allowable values for moment and load. Refer to each graph regarding the maximum allowable moment and maximum allowable load for a particular piston speed.

**Maximum allowable moment**

Select the moment from within the range of operating limits shown in the graphs. Note that the maximum allowable load value may sometimes be exceeded even within the operating limits shown in the graphs. Therefore, also check the allowable load for the selected conditions.

**Maximum allowable load**

Select the load from within the range of limits shown in the graphs. Note that the maximum allowable moment value may sometimes be exceeded even within the operating limits shown in the graphs.

Refer to page 30 and 31 for detailed selection procedures.

---

1. Maximum allowable load (1), static moment (2), and dynamic moment (3) (at the time of impact with stopper) must be examined for the selection calculations.

   * To evaluate, use $\bar{v}$ (average speed) for (1) and (2), and $v_I$ (impact speed $v_I = 1.4 \bar{v}$) for (3).

2. Reference formulas [Dynamic moment at impact]

   Use the following formulas to calculate dynamic moment when taking stopper impact into consideration.

   \[
   \frac{\text{Load mass}}{\text{Maximum allowable moment}} + \frac{\text{Static moment}}{\text{Maximum allowable load}} + \frac{\text{Dynamic moment}}{\text{Allowed load}} \leq 1
   \]

   Note 1) Moment caused by the load, etc., with cylinder in resting condition.

   Note 2) Moment caused by the impact load equivalent at the stroke end (at the time of impact with stopper).

   Note 3) Depending on the shape of the work piece, multiple moments may occur. When this happens, the sum of the load factors ($\sum \alpha$) is the total of all such moments.

2. Reference formulas [Dynamic moment at impact]

   Use the following formulas to calculate dynamic moment when taking stopper impact into consideration.

   \[
   u = 1.4 \bar{v} a \quad (\text{mm/s})
   \]

   \[
   F_e = \frac{1.4}{100} u a g m \quad \text{Note 4)
   \]

   \[
   M_e = \frac{1}{3} F_e L_1 = 0.05 u a m L_1 \quad \text{Note 5)
   \]

   Note 4) $1.4 \bar{v} a$ is a dimensionless coefficient for calculating impact force.

   Note 5) Average load coefficient ($\frac{1}{3}$)

   This coefficient is for averaging the maximum load moment at the time of stopper impact according to service life calculations.

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3. Refer to page 30 and 31 for detailed selection procedures.
**Series CY1F**

### Vertical Actuation

1. **Vertical operation**
   - In vertical operation, observe the maximum load mass and the maximum operating pressure shown in the table below to prevent a drop due to slipping off of magnet couplings.

### Caution

- If the maximum load mass or maximum operating pressure is exceeded, it will cause the magnet coupling to slip off.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Maximum load weight (m_v) (kg)</th>
<th>Maximum operating pressure (P_v) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.4</td>
<td>0.55</td>
</tr>
<tr>
<td>15</td>
<td>2.0</td>
<td>0.65</td>
</tr>
<tr>
<td>25</td>
<td>12</td>
<td>0.65</td>
</tr>
</tbody>
</table>

### Intermediate Stop

1. **Intermediate stop by external stopper or stroke adjustment with adjustment bolt.**
   - Observe the maximum pressure limit in the table below in case of intermediate stop by an external stopper or stroke adjustment with the attached adjustment bolt.

### Caution

- Be careful if the operating pressure limit is exceeded, it will cause the magnet coupling to slip off.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Holding force (N)</th>
<th>Operating pressure limit for intermediate stop (P_s) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>53.9</td>
<td>0.55</td>
</tr>
<tr>
<td>15</td>
<td>137</td>
<td>0.65</td>
</tr>
<tr>
<td>25</td>
<td>363</td>
<td>0.65</td>
</tr>
</tbody>
</table>

2. **The load is stopped by pneumatic circuit.**
   - Observe the maximum kinetic energy in the table below in case the load is stopped at an intermediate position by a pneumatic circuit.
   - Note that intermediate stop by a pneumatic circuit is not available in vertical operation.

### Caution

- If the allowable kinetic energy is exceeded, it will cause the magnet coupling to slip off.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Allowable kinetic energy for intermediate stop (E_s) (J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.03</td>
</tr>
<tr>
<td>15</td>
<td>0.13</td>
</tr>
<tr>
<td>25</td>
<td>0.45</td>
</tr>
</tbody>
</table>
Selection Calculation
The selection calculation finds the load factors ($\sum \alpha n$) of the items below, where the total ($\alpha n$) 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>Maximum load mass</td>
<td>$\alpha_1 = m/m_{max}$</td>
<td>Review $m$ is the maximum load mass at $\nu a$</td>
</tr>
<tr>
<td>Static moment</td>
<td>$\alpha_2 = M/M_{max}$</td>
<td>Review $M_1, M_2, M_3$ M_{max} is the allowable moment at $\nu a$</td>
</tr>
<tr>
<td>Dynamic moment</td>
<td>$\alpha_3 = M_{E}/M_{E \max}$</td>
<td>Review $M_{E1}, M_{E2}, M_{E3}$ $M_{E \max}$ is the allowable moment at $\nu a$</td>
</tr>
</tbody>
</table>

From above, $\sum \alpha n = \alpha_1 + \alpha_2 + \alpha_3 = 0.1 + 0.082 + 0.35 + 0.28 = 0.812$. From $\sum \alpha n = 0.812 \leq 1$, it is applicable.

Calculation example 1

**Operating conditions**
- **Cylinder:** CY1F15
- **Terminal butter mechanism:** Standard (shock absorber)
- **Mounting:** Wall mounting
- **Speed (average):** $\nu a = 300$ [mm/s]
- **Load mass:** $m = 0.5$ [kg] (excluding weight of arm section)
- **$L_1 = 50$ [mm]  
  **$L_2 = 40$ [mm]  

<table>
<thead>
<tr>
<th>Item</th>
<th>Load factor $\alpha n$</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Load mass</strong></td>
<td>$\alpha_1 = m/m_{max}$</td>
<td>Investigate $m$. Find the value of $m_{max}$ at $300$mm/s in Graph 6 for $m_3$ on page 28.</td>
</tr>
</tbody>
</table>
| **2 Static moment**   | $M_2 = m \times g \times L_1$  
  $= 0.5 \times 9.8 \times 0.05$  
  $= 0.245$ [N m]  
  $\alpha_2 = M_2/M_{2 \max}$  
  $= 0.245/3$  
  $= 0.082$ | Investigate $M_2$. $M_1$ and $M_3$ are not required because they are not generated. Find the value of $M_2_{max}$ at $300$mm/s in Graph 2. |
| **3 Dynamic moment**  | $M_{E1} = 1/3 \times F_E \times L_1$  
  $(F_E = 1.4/100 \times \nu a \times g \times m)$  
  $= 0.05 \times \nu a \times m \times L_1$  
  $= 0.05 \times 300 \times 0.5 \times 0.05$  
  $= 0.375$ [N m]  
  $\alpha_{E1} = M_{E1}/M_{E1 \max}$  
  $= 0.375/1.07$  
  $= 0.350$ | Investigate $M_{E1}$. Find the collision speed $\nu$. $\nu = 1.4 \times \nu a$  
  $= 1.4 \times 300$  
  $= 420$ [mm/s] 
  Find the value of $M_{E1 \max}$ at $420$mm/s in Graph 1. |
| **4 Dynamic moment**  | $M_{E2} = 1/3 \times F_E \times L_2$  
  $(F_E = 1.4/100 \times \nu a \times g \times m)$  
  $= 0.05 \times \nu a \times m \times L_2$  
  $= 0.05 \times 300 \times 0.5 \times 0.04$  
  $= 0.3$ [N m]  
  $\alpha_{E2} = M_{E2}/M_{E2 \max}$  
  $= 0.3/1.07$  
  $= 0.28$ | Investigate $M_{E2}$. From above, find the value of $M_{E2 \max}$ at $420$mm/s in Graph 3. |
### Calculation example 2

#### Operating conditions

- **Cylinder**: CY1F25
- **Terminal buffer mechanism**: Standard (shock absorber)
- **Mounting**: Vertical mounting
- **Speed (average)**: $\upsilon_a = 300$ [mm/s]
- **Load mass**: $m = 3$ [kg] (excluding weight of arm section)
- $L_1 = 50$ [mm]
- $L_2 = 40$ [mm]

#### Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Load factor $\alpha_n$</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Load mass</strong></td>
<td></td>
<td>$\alpha_1 = \frac{m}{m_{\text{max}}} = \frac{3}{12} = 0.25$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate $m$. Find the value of $m_{\text{max}}$ at 300mm/s in Graph 7 for $m_3$.</td>
</tr>
<tr>
<td><strong>Static moment</strong></td>
<td></td>
<td>$M_1 = m \times g \times L_1$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 3 \times 9.8 \times 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 1.47$ [N m]</td>
</tr>
<tr>
<td></td>
<td>$\alpha_{2a} = \frac{M_1}{M_1_{\text{max}}}$</td>
<td>$= 0.105$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate $M_1$. Find the value of $M_2_{\text{max}}$ at 300mm/s in Graph 1.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$M_3 = m \times g \times L_2$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 3 \times 9.8 \times 0.04$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 1.176$ [N m]</td>
</tr>
<tr>
<td></td>
<td>$\alpha_{2b} = \frac{M_3}{M_3_{\text{max}}}$</td>
<td>$= 0.084$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate $M_3$. Find the value of $M_3_{\text{max}}$ at 300mm/s in Graph 3.</td>
</tr>
<tr>
<td><strong>Dynamic moment</strong></td>
<td></td>
<td>$M_{1E} = \frac{1}{3} \times F_E \times L_1$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>($F_E = 1.4/100 \times \upsilon_a \times g \times m$)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 0.05 \times \upsilon_a \times m \times L_1$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 0.05 \times 300 \times 3 \times 0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 2.25$ [N m]</td>
</tr>
<tr>
<td></td>
<td>$\alpha_{3a} = \frac{M_{1E}}{M_{1E_{\text{max}}}}$</td>
<td>$= 0.225$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate $M_{1E}$. Find the collision speed $\upsilon$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 1.4 \times \upsilon_a$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 1.4 \times 300$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 420$ [mm/s]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Find the value of $M_{1E_{\text{max}}}$ at 420mm/s in Graph 1.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$M_{3E} = 0.05 \times \upsilon_a \times m \times L_2$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>($F_E = 1.4/100 \times \upsilon_a \times g \times m$)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 0.05 \times 300 \times 3 \times 0.04$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 1.8$ [N m]</td>
</tr>
<tr>
<td></td>
<td>$\alpha_{3b} = \frac{M_{3E}}{M_{3E_{\text{max}}}}$</td>
<td>$= 0.18$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investigate $M_{3E}$. From above, find the value of $M_{3E_{\text{max}}}$ at 420mm/s in Graph 3.</td>
</tr>
</tbody>
</table>

From above,

$$\Sigma \alpha_n = \alpha_1 + \alpha_{2a} + \alpha_{2b} + \alpha_{3a} + \alpha_{3b} = 0.25 + 0.105 + 0.084 + 0.225 + 0.18 = 0.844$$

From $\Sigma \alpha_n = 0.844 \leq 1$, it is applicable.
# Magnetically Coupled Rodless Cylinder

## Series CY1F

### How to order

**CY1F** 10 **R** 300 **F9BW**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>10</th>
<th>15</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nil</strong></td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td><strong>AL</strong></td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td><strong>AR</strong></td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
</tbody>
</table>

**Piping thread type**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Type</th>
<th>Bore size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nil</strong></td>
<td>M</td>
<td>10, 15</td>
</tr>
<tr>
<td><strong>TN</strong></td>
<td>NPT</td>
<td>25</td>
</tr>
<tr>
<td><strong>TF</strong></td>
<td>G</td>
<td>25</td>
</tr>
</tbody>
</table>

**Adjustment bolt suffix**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nil</strong></td>
<td>Both sides are standard</td>
</tr>
<tr>
<td><strong>AL</strong></td>
<td>Right: Standard</td>
</tr>
<tr>
<td><strong>AR</strong></td>
<td>For 25 mm adjustment on right</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>For 25 mm adjustment on both sides</td>
</tr>
</tbody>
</table>

**Auto switch**

- **Nil**: Without auto switch
- Refer to the table below for auto switch model numbers.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nil</strong></td>
<td>2 pcs.</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>1 pc.</td>
</tr>
<tr>
<td><strong>n</strong></td>
<td>&quot;n&quot; pcs.</td>
</tr>
</tbody>
</table>

**Piping direction**

- **R**: Concentrated piping on right
- **L**: Concentrated piping on left

### Applicable auto switches

Refer to pages 14 through 19 for detailed auto switch specifications.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Electrical entry</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch models</th>
<th>Lead wire length (m)</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nil</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>n</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Load wire length symbols**
  - 0.5m
  - 3m
  - 5m
  - L
  - Z

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

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*Approved*
Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>10</th>
<th>15</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore size (mm)</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Non-lube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuation</td>
<td>Double acting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum operating pressure (MPa)</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum operating pressure (MPa)</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proof pressure (MPa)</td>
<td>1.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature (°C)</td>
<td>-10 to 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston speed (mm/s)</td>
<td>50 to 500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cushion</td>
<td>Built-in shock absorber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke length tolerance (mm)</td>
<td>0 to 250</td>
<td>251 to 1000</td>
<td>1001st to 13,600</td>
</tr>
<tr>
<td>Stroke adjustment movable range (mm)</td>
<td>-1.2 to 0.8</td>
<td>-1.4 to 0.6</td>
<td></td>
</tr>
<tr>
<td>Piping type</td>
<td>Centralized piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port size</td>
<td>M5 x 0.8</td>
<td>1/8</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1)** The stroke adjustment movable range in the above table is that for the standard adjustment bolt. For more information, please refer to page 31.

**Note 2)** With ø25, piping screws can be selected by the customer. (Refer to How to Order.)

Shock Absorber Specifications

<table>
<thead>
<tr>
<th>Applicable bore size (mm)</th>
<th>10, 15</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock absorber model</td>
<td>RB0805- X552</td>
<td>RB1006- X552</td>
</tr>
<tr>
<td>Max. energy absorption (J)</td>
<td>0.98</td>
<td>3.92</td>
</tr>
<tr>
<td>Stroke absorption (mm)</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Max. impact speed (m/s)</td>
<td>0.05 to 5</td>
<td></td>
</tr>
<tr>
<td>Max. operating frequency (cycle/min)</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>Spring force (N)</td>
<td>When expanded: 1.96</td>
<td>4.22</td>
</tr>
<tr>
<td></td>
<td>When compressed: 3.83</td>
<td>6.18</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>15</td>
<td>25</td>
</tr>
</tbody>
</table>

**Note)** Represents the maximum absorption energy per cycle. Thus, the operation frequency can be increased with the absorption energy.

Standard Stroke

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
<th>Maximum stroke available (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50, 100, 150, 200, 250, 300</td>
<td>500</td>
</tr>
<tr>
<td>15</td>
<td>50, 100, 150, 200, 250, 300, 350, 400, 450, 500</td>
<td>750</td>
</tr>
<tr>
<td>25</td>
<td>100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600</td>
<td>1200</td>
</tr>
</tbody>
</table>

*The stroke is available in 1 mm increments with the maximum stroke as the upper limit. For a stroke in the standard stroke range, suffix the part number with-XB10. If the stroke does not fall within the standard stroke range, suffix the part No. with XB11. Refer to the Made to Order Specifications on page 20.

Magnetic Holding Force

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>10</th>
<th>15</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding force</td>
<td>53.9</td>
<td>137</td>
<td>363</td>
</tr>
</tbody>
</table>

Made to order Specifications

(Refer to page 20 regarding Made to Order Specifications for series CY1F)
Series CY1F

Theoretical Output

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Piston area (mm²)</th>
<th>Operating pressure [MPa]</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>78</td>
<td>15</td>
<td>23</td>
<td>31</td>
<td>39</td>
<td>46</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>176</td>
<td>35</td>
<td>52</td>
<td>70</td>
<td>88</td>
<td>105</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>490</td>
<td>98</td>
<td>147</td>
<td>196</td>
<td>245</td>
<td>294</td>
<td>343</td>
<td></td>
</tr>
</tbody>
</table>

Note: Theoretical output (N) = Pressure (MPa) x Piston area (mm²)

Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Basic weight</th>
<th>Additional weight per 50 mm stroke</th>
<th>Standard adjustment bolt weight</th>
<th>Weight of adjustment bolt for 25 mm adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1F10</td>
<td>0.520</td>
<td>0.095</td>
<td>0.004</td>
<td>0.012</td>
</tr>
<tr>
<td>CY1F15</td>
<td>0.815</td>
<td>0.133</td>
<td>0.004</td>
<td>0.012</td>
</tr>
<tr>
<td>CY1F25</td>
<td>1.970</td>
<td>0.262</td>
<td>0.007</td>
<td>0.021</td>
</tr>
</tbody>
</table>

Calculation method example: CY1F15-150AL
Basic weight          = 0.815kg
Additional weight     = 0.133kg/50st
Standard adjustment bolt weight = 0.004kg
Weight of adjustment bolt for 25 mm adjustment = 0.012kg

0.815 + 0.133 x 150 + 0.004 + 0.012 = 1.23 (kg)

Option

<table>
<thead>
<tr>
<th>Adjustment bolt</th>
<th>Standard adjustment bolt</th>
<th>25 mm adjustment bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td>10, 15</td>
<td>CYF-S10</td>
<td>CYF-L10</td>
</tr>
<tr>
<td>25</td>
<td>CYF-S25</td>
<td>CYF-L25</td>
</tr>
</tbody>
</table>

Replacement Parts

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Shock absorber model no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10, 15</td>
<td>RB0805- X552</td>
</tr>
<tr>
<td>25</td>
<td>RB1006- X552</td>
</tr>
</tbody>
</table>

Note: Order 2 units for each unit of cylinder.

Replacement Actuator (Cylinder)

CY1F B 10 R Stroke

Cylinder identification symbol

Piping direction suffix
R Centralized piping on right
L Centralized piping on left

Piping thread type
Symbol | Thread type | Bore size (mm) |
-------|-------------|----------------|
NII    | M           | 10, 15         |
PN     | NPT         | 25             |
TY     | G           | 25             |
### Construction

**Section A-A**

#### CY1F15 Detailed view of driving cylinder

#### CY1F25 Detailed view of driving cylinder

---

## 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>Body (rodless cylinder)</td>
<td>Aluminum alloy</td>
<td>Anodized</td>
</tr>
<tr>
<td>2</td>
<td>Body</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>3</td>
<td>End cover A</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>4</td>
<td>End cover B</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>5</td>
<td>Cylinder tube</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Piston</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Piston nut</td>
<td>Carbon steel</td>
<td>(Only for ø25)</td>
</tr>
<tr>
<td>8</td>
<td>Shaft</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Piston side yoke</td>
<td>Rolled steel plate</td>
<td>Zinc chromated (ø15, ø25)</td>
</tr>
<tr>
<td>10</td>
<td>External slider side yoke</td>
<td>Rolled steel plate</td>
<td>Zinc chromated (ø15, ø25)</td>
</tr>
<tr>
<td>11</td>
<td>Magnet A</td>
<td>Rare earth magnet</td>
<td>(ø15, ø25)</td>
</tr>
<tr>
<td>12</td>
<td>Magnet B</td>
<td>Rare earth magnet</td>
<td>(ø15, ø25)</td>
</tr>
<tr>
<td>13</td>
<td>Piston spacer</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Spacer</td>
<td>Rolled steel plate</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>15</td>
<td>Bumper</td>
<td>Urethane rubber</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Attachment ring</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>17</td>
<td>Wear ring A</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Wear ring B</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Wear ring C</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Slide table</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>21</td>
<td>Adjuster holder</td>
<td>Carbon steel</td>
<td>Electroless nickel plated</td>
</tr>
</tbody>
</table>
**Series CY1F**

### Dimensions

**CY1F**

**Concentrated piping on right (CY1F10 to 25□□□□□□□□□)**

**Concentrated piping on left (CY1F10 to 25□□□□□□□□□)**

---

<table>
<thead>
<tr>
<th>Model</th>
<th>Standard stroke</th>
<th>A</th>
<th>EA</th>
<th>EB</th>
<th>EH</th>
<th>ES</th>
<th>EW</th>
<th>EY</th>
<th>G</th>
<th>QA</th>
<th>GB</th>
<th>GC</th>
<th>GD</th>
<th>H</th>
<th>HA</th>
<th>HB</th>
<th>HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1F10</td>
<td>50,100,150,200,250,300</td>
<td>49</td>
<td>10</td>
<td>16</td>
<td>7</td>
<td>6.5</td>
<td>16</td>
<td>27</td>
<td>9</td>
<td>7</td>
<td>19.5</td>
<td>14</td>
<td>6</td>
<td>28</td>
<td>26</td>
<td>14</td>
<td>35.5</td>
</tr>
<tr>
<td>CY1F15</td>
<td>50,100,150,200,250,300,350,400,450,500</td>
<td>52.5</td>
<td>10</td>
<td>16</td>
<td>7</td>
<td>6.5</td>
<td>16</td>
<td>29</td>
<td>9</td>
<td>8</td>
<td>23</td>
<td>17</td>
<td>9</td>
<td>34</td>
<td>32</td>
<td>17</td>
<td>41.5</td>
</tr>
<tr>
<td>CY1F25</td>
<td>50,100,150,200,250,300,350,400,450,500,600</td>
<td>70</td>
<td>13</td>
<td>17</td>
<td>10.5</td>
<td>8</td>
<td>22</td>
<td>40</td>
<td>10</td>
<td>12</td>
<td>33.5</td>
<td>22.5</td>
<td>12</td>
<td>46</td>
<td>44</td>
<td>23.5</td>
<td>55</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Model</th>
<th>KA</th>
<th>KB</th>
<th>KC</th>
<th>KW</th>
<th>L</th>
<th>LA</th>
<th>LL</th>
<th>LW</th>
<th>LZ</th>
<th>ML</th>
<th>MM</th>
<th>N</th>
<th>PA</th>
<th>PB</th>
<th>PC</th>
<th>Q</th>
<th>QA</th>
<th>GB</th>
<th>QW</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1F10</td>
<td>6.5</td>
<td>44</td>
<td>8</td>
<td>19</td>
<td>59</td>
<td>38</td>
<td>58</td>
<td>20</td>
<td>86</td>
<td>19</td>
<td>5</td>
<td>M3 x 0.5</td>
<td>16.5</td>
<td>40</td>
<td>40</td>
<td>8.5</td>
<td>90</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>CY1F15</td>
<td>6.5</td>
<td>51</td>
<td>10</td>
<td>19</td>
<td>66</td>
<td>53</td>
<td>65</td>
<td>20</td>
<td>99</td>
<td>19</td>
<td>5</td>
<td>M3 x 0.5</td>
<td>18.5</td>
<td>50</td>
<td>50</td>
<td>7</td>
<td>97</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>CY1F25</td>
<td>7.5</td>
<td>66</td>
<td>13</td>
<td>27</td>
<td>84.5</td>
<td>70</td>
<td>89</td>
<td>25.5</td>
<td>18.5</td>
<td>17</td>
<td>9</td>
<td>M5 x 0.8</td>
<td>24</td>
<td>65</td>
<td>65</td>
<td>8</td>
<td>129</td>
<td>5.5</td>
<td>14.5</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Model</th>
<th>T</th>
<th>XA</th>
<th>XL</th>
<th>XY</th>
<th>YA</th>
<th>YB</th>
<th>Z</th>
<th>Shock absorber</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY1F10</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>6.5 depth 3.4</td>
<td>3.4</td>
<td>98</td>
<td>RB8085- X552</td>
</tr>
<tr>
<td>CY1F15</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>6.5 depth 3.4</td>
<td>3.4</td>
<td>105</td>
<td>RB8085- X552</td>
</tr>
<tr>
<td>CY1F25</td>
<td>1</td>
<td>5</td>
<td>7.5</td>
<td>7.5</td>
<td>9.5 depth 5.4</td>
<td>5.5</td>
<td>140</td>
<td>RB1006- X552</td>
</tr>
</tbody>
</table>

---

Note 1) When adjusting the stroke, keep the T dimension within a 0 to 2 mm range. However, with the 25 mm adjustment bolt, an adjustment range of 0 to 26 mm is available.

Note 2) There are four øYA and øYB dimensions with a 50 mm stroke.

Approved
Proper Mounting Position for Stroke End Detection

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>38</td>
<td>60</td>
<td>18</td>
<td>80</td>
<td>38</td>
</tr>
<tr>
<td>15</td>
<td>39</td>
<td>66</td>
<td>19</td>
<td>86</td>
<td>39</td>
</tr>
<tr>
<td>25</td>
<td>44.5</td>
<td>95.5</td>
<td>24.5</td>
<td>115.5</td>
<td>44.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>34</td>
<td>64</td>
<td>22</td>
<td>76</td>
<td>34</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
<td>70</td>
<td>23</td>
<td>82</td>
<td>35</td>
</tr>
<tr>
<td>25</td>
<td>40.5</td>
<td>99.5</td>
<td>28.5</td>
<td>111.5</td>
<td>40.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
<th>Mounting pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>34</td>
<td>64</td>
<td>22</td>
<td>76</td>
<td>34</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
<td>70</td>
<td>23</td>
<td>82</td>
<td>35</td>
</tr>
<tr>
<td>25</td>
<td>40.5</td>
<td>99.5</td>
<td>28.5</td>
<td>111.5</td>
<td>40.5</td>
</tr>
</tbody>
</table>

*These values are given as a guideline including the hysteresis and are not guaranteed. They may vary significantly depending on the ambient environment (with ±30% variation).

Caution

1. When adjusting the stroke, confirm the minimum stroke for auto switch mounting.

See the table below for the minimum stroke for auto switch mounting.

Minimum stroke for auto switch mounting (1pc.) (mm)

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>D-A9, D-A9V</th>
<th>D-F9, D-F9V</th>
<th>D-F9, D-F9W, D-F9WV</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minimum stroke for auto switch mounting (2pcs.) (mm)

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>D-A90, D-A96, D-A93, D-A90V, D-A96V, D-A93V</th>
<th>D-F9, D-F9W, D-F9WV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting pattern</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>Mounting pattern</td>
<td>35</td>
<td>12</td>
</tr>
<tr>
<td>Mounting pattern</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

Auto Switch Mounting

As shown below, there are 3 ways to mount the auto switch according to 3 types of electrical entries. Insert the auto switch into the switch groove. Then use a flat head watchmaker’s screw driver to tighten the included fixing screws.

Note) When tightening the holding screw (included with the auto switch), use a watchmaker’s screwdriver with a handle 5 to 6mm in diameter. The tightening torque should be 0.1 to 0.2N m.
Series CY1F
Auto Switch Specifications

Auto Switch Common Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Reed switch</th>
<th>Solid state switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage current</td>
<td>None</td>
<td>3wire: 100µA or less, 2-wire: 0.8mA or less</td>
</tr>
<tr>
<td>Operating time</td>
<td>1.2ms</td>
<td>1ms or less</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>300m/s²</td>
<td>1000m/s²</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>50MΩ or more at 500VDC (between lead wire and case)</td>
<td>500VDC for 1min. (between lead wire and case)</td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>1500VAC for 1min. (between lead wire and case)</td>
<td>1000VAC for 1min. (between lead wire and case)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-10 to 60°C</td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>IEC529 standard IP67, JISC0920 watertight construction</td>
<td></td>
</tr>
</tbody>
</table>

Lead Wire Length

Lead wire length indication

(Example) D-F9P L

| Lead wire length | Nil | 0.5m | L | 3m | Z | 5m |

Note 1) Lead wire length Z: 5m applicable auto switches
Solid state: All types are produced upon receipt of order (standard availability)

Note 2) For solid state switches with flexible lead wire specification, add "-61" at the end of the lead wire length.

(Example) D-F9PL- 61 Flexible specification

Contact Protection Boxes/CD-P11, CD-P12

<Applicable switches>
D-ASABC4V

The above auto switches do not have internal contact protection circuits.

1. The operating load is an induction load.
2. The length of wiring to load is 5m or more.
3. The load voltage is 100 or 200 VAC.

Use a contact protection box in any of the above situations.
The life of the contacts may otherwise be reduced. (The may stay ON all the time.)

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</td>
<td>200VAC</td>
</tr>
<tr>
<td>Maximum load current</td>
<td>25mA</td>
<td>12.5mA</td>
</tr>
</tbody>
</table>

*Lead wire length — Switch connection side 0.5m
Load connection side 0.5m

Internal circuits

CD-P11
Surge absorber
Choke coil
OUT Brown
OUT Blue

CD-P12
Choke coil
Zener diodes
Brown
Blue

Dimensions

Connection

To connect a switch 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. 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**

- Main switch circuit: Brown, Black, Blue
- Load: Brown

**Solid state 3-wire, PNP**

- Main switch circuit: Brown, Black, Blue
- Load: Brown

**2-wire OR connection for NPN output**

- Switch 1: Brown
- Switch 2: Black
- Load: Brown

**2-wire OR connection for PNP output**

- Switch 1: Brown
- Switch 2: Black
- Load: Brown

**3-wire AND connection for NPN output (Using relays)**

- Switch 1: Brown
- Switch 2: Blue
- Relay: Brown
- Load: Blue

**3-wire AND connection for PNP output (Perform with switches only)**

- Switch 1: Brown
- Switch 2: Black
- Load: Brown

**2-wire with 2 switch AND connection**

- Switch 1: Brown
- Switch 2: Blue
- Load: Brown

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.

**Load voltage at ON =**

- Power supply voltage = 24V
- Internal voltage drop x 2 pcs. = 4V

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

**Load voltage at OFF =**

- Leakage current x 2 pcs. x Load impedance = 1mA x 2 pcs. x 3kΩ = 6V

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

---

### Examples of Connection to PLC

#### Sink input specifications

**3-wire, NPN**

- Switch: Brown, Black, Blue
- COM: Brown
- Load: Brown

#### Source input specifications

**3-wire, PNP**

- Switch: Brown, Black, Blue
- COM: Brown
- Load: Brown

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

**3-wire AND connection for NPN output**

- Switch 1: Brown
- Switch 2: Black
- Relay: Brown
- Load: Blue

**2-wire with 2 switch AND connection**

- Switch 1: Brown
- Switch 2: Blue
- Load: Brown

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

**2-wire with 2 switch OR connection**

- Switch 1: Brown
- Switch 2: Black
- Load: Brown

<Reed switch>

- Indicator light, protection circuit, etc.

**OR connection for NPN output**

- Switch 1: Brown
- Switch 2: Black
- Load: Brown

<Reed switch>

- Indicator light, protection circuit, etc.

Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

---

Approved
Reed Switches/Direct Mount Type
D-A90(V), D-A93(V), D-A96(V)

Auto Switch Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>D-A90</th>
<th>D-A90V</th>
<th>D-A93</th>
<th>D-A93V</th>
<th>D-A96</th>
<th>D-A96V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead wire length 0.5m</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Lead wire length 3m</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>41</td>
<td>41</td>
</tr>
</tbody>
</table>

Auto Switch Dimensions

D-A90

---

Type D-A90 is without indicator light

Note: 1. The operating load is inductive load.
2. The wiring to the load is 5 m or longer.
3. The load voltage is 100VAC.

If any of the above conditions is applicable, the life time of the contact may be shortened. Use a contact protection box. (Refer to page 15 about the contact protection box.)

Precautions

1. Be sure to use fixing screws attached to the auto switch to secure the switch. Use of screws out of the specifications can damage the switch.

Caution

• Lead wire
  - D-A90(V), D-A93(V), D-A96(V) — Oil resistant vinyl heavy duty cable ø2.7, 0.18mm² x 2-wire (brown, blue), 0.5m
  - D-A96(V) — Oil resistant vinyl heavy duty cable ø2.7, 0.15mm² x 3-wire (brown, black, blue), 0.5m

Note 1) Refer to page 15 for reed state switch common specifications.
Note 2) Refer to page 15 for lead wire length.
Solid State Switches/Direct Mount Type  
D-F9N(V), D-F9P(V), D-F9B(V)

Auto Switch Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>D-F9N(V)</th>
<th>D-F9P(V)</th>
<th>D-F9B(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto switch part no.</td>
<td>D-F9N</td>
<td>D-F9NV</td>
<td>D-F9P</td>
</tr>
<tr>
<td>Electrical entry direction</td>
<td>In-line</td>
<td>In-line</td>
<td>Perpendicular</td>
</tr>
<tr>
<td>Wiring type</td>
<td>3-wire</td>
<td>2-wire</td>
<td>—</td>
</tr>
<tr>
<td>Output type</td>
<td>NPN</td>
<td>PNP</td>
<td>—</td>
</tr>
<tr>
<td>Applicable load</td>
<td>IC circuit, Relay, PLC</td>
<td>24VDC relay, PLC</td>
<td>—</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>5, 12, 24VDC (4.5 to 28V)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Current consumption</td>
<td>10mA or less</td>
<td>—</td>
<td>80mA or less</td>
</tr>
<tr>
<td>Load voltage</td>
<td>28VDC or less</td>
<td>—</td>
<td>24VDC (10 to 8V)</td>
</tr>
<tr>
<td>Load current</td>
<td>40mA or less</td>
<td>80mA or less</td>
<td>40mA or less</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>
</tr>
<tr>
<td>Internal voltage drop (0.8V or less at 10mA load current)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Leakage current</td>
<td>100µA or less at 24VDC</td>
<td>—</td>
<td>0.8mA or less</td>
</tr>
<tr>
<td>Indicator light</td>
<td>Red LED lights when ON</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1) Refer to page 15 for solid state switch common specifications.
Note 2) Refer to page 15 for lead wire length.

Auto Switch Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>D-F9N(V)</th>
<th>D-F9P(V)</th>
<th>D-F9B(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead wire length m</td>
<td>0.5</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>37</td>
<td>37</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>61</td>
<td>61</td>
<td>51</td>
</tr>
</tbody>
</table>

Auto Switch Dimensions

D-F9N

- Mounting screw M2.5 x 4
- Slotted set screw
- Indicator light
- Most sensitive position

D-F9P

- Mounting screw M2.5 x 4
- Slotted set screw
- Indicator light
- Most sensitive position

D-F9B

- Mounting screw M2.5 x 4
- Slotted set screw
- Indicator light
- Most sensitive position

Caution

Be sure to use fixing screws attached to the auto switch to secure the switch. Use of screws out of the specifications can damage the switch.

Precautions

- Lead wire — Oil proof heavy duty vinyl cord, ø2.7, 3 cores (brown, black, blue), 0.15mm², 2 cores (brown, blue), 0.18 mm², 0.5m
- Note 1) Refer to page 15 for solid state switch common specifications.
- Note 2) Refer to page 15 for lead wire length.
2-Color Display Solid State Switches/Direct Mount Type
D-F9NW(V), D-F9PW(V), D-F9BW(V)

Auto Switch Specifications

### D-F9 NW, D-F9 NVW (with Indicator light)

<table>
<thead>
<tr>
<th>Auto switch part no.</th>
<th>D-F9NW</th>
<th>D-F9NWV</th>
<th>D-F9PW</th>
<th>D-F9PWV</th>
<th>D-F9BW</th>
<th>D-F9BWV</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>2-wire</td>
<td>2-wire</td>
<td>2-wire</td>
<td>2-wire</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 load</td>
<td>IC circuit, Relay IC, 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 28V)</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>—</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>5 to 40mA</td>
<td>5 to 40mA</td>
<td>5 to 40mA</td>
</tr>
<tr>
<td>Internal voltage drop</td>
<td>2V or less</td>
<td>0.8V or less</td>
<td>2V or less</td>
<td>4V or less</td>
<td>4V or less</td>
<td>4V or less</td>
</tr>
<tr>
<td>Leakage current</td>
<td>100µA or less at 24VDC</td>
<td>0.8mA or less</td>
<td>40mA or less</td>
<td>0.8mA or less</td>
<td>40mA or less</td>
<td>0.8mA or less</td>
</tr>
<tr>
<td>Indicator light</td>
<td>Actuated position</td>
<td>Red LED lights up</td>
<td>Optimum operating position</td>
<td>Green LED lights up</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Lead wire — Oil proof heavy duty vinyl cord, ø2.7, 3 cores (brown, black, blue), 0.15mm², 2 cores (brown, blue), 0.18mm², 0.5m

Note 1) Refer to page 15 for solid state switch common specifications.

Note 2) Refer to page 15 for lead wire length.

### Auto Switch Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>D-F9NW(V)</th>
<th>D-F9PW(V)</th>
<th>D-F9BW(V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead wire length m</td>
<td>0.5</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>34</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>56</td>
<td>56</td>
<td>62</td>
</tr>
</tbody>
</table>

### Auto Switch Dimensions

#### D-F9 NVW

- Mounting screw M2.5 x 4
- Slotted set screw
- Indicator light
- Most sensitive position
- Lead wire length: 0.5 m
- Lead wire: Oil proof heavy duty vinyl cord, ø2.7, 3 cores (brown, black, blue), 0.15mm²

#### D-F9 NVW

- Mounting screw M2.5 x 4
- Slotted set screw
- Indicator light
- Most sensitive position
- Lead wire length: 0.5 m
- Lead wire: Oil proof heavy duty vinyl cord, ø2.7, 3 cores (brown, black, blue), 0.15mm²
Series CY1F
Made to Order Specifications
Contact SMC for detailed specifications, lead times and prices.

1 Intermediate stroke

Intermediate strokes are available within the standard stroke range. The stroke can be set in 1mm increments.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Stroke range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>51 to 299</td>
</tr>
<tr>
<td>15</td>
<td>51 to 499</td>
</tr>
<tr>
<td>25</td>
<td>101 to 599</td>
</tr>
</tbody>
</table>

Example CY1F 10R-237AL-A93-XB10

2 Long stroke

Available with long strokes exceeding the standard strokes. The stroke can be set in 1mm increments.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Stroke range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>301 to 500</td>
</tr>
<tr>
<td>15</td>
<td>501 to 750</td>
</tr>
<tr>
<td>25</td>
<td>601 to 1200</td>
</tr>
</tbody>
</table>

Example CY1F 25L-777A-A93-XB11
Series CY1F
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.

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 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.
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 mounting parts and connecting 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 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. 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, equipment should be selected and circuits designed to prevent sudden lurching.

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 valves and cylinders, etc., are not guaranteed for zero air leakage, and it is not possible to hold a stopped position, do not use for this purpose. In case it is necessary to hold a stopped position, select equipment and design circuits to prevent movement.

⚠️ Caution

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

Refer to the air cylinder model selection procedure 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.

4. Provide intermediate supports for long stroke cylinders.

Provide intermediate supports for cylinders with long strokes to prevent bending of the tube, and deflection due to vibration and external loads, etc.
Series CY1F Actuator Precautions 2
Be sure to read before handling.

Mounting

⚠️ Caution
1. Do not apply strong impacts or excessive moment to the slide table (slider).
   The slide table (slider) is supported by precision bearings. Therefore, do not apply strong impacts or excessive moment, etc., when mounting work pieces.
2. Align carefully when connecting to a load having an external guide mechanism.
   Magnetically coupled rodless cylinders (series CY1F) can be used with a direct load within the allowable range for each type of guide, but careful alignment is necessary when connecting to a load having an external guide mechanism.
   As the stroke becomes longer, variations in the center axis become larger. Consider using a connection method (floating mechanism) that is able to absorb these variations.
3. Do not scratch or gouge the cylinder tube by striking or grasping it 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 can verify that equipment can operate properly.
   Verify correct mounting by suitable function and leakage inspections after compressed air and power are connected following mounting, maintenance or conversions.
5. 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.

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. However, in the event that it will be lubricated, use class 1 turbine oil (without additives) ISO VG32.
   Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

Air Supply

⚠️ Warning
1. Use clean air.
   Do not use compressed air which includes 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 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 under 5°C, and this may cause damage to seals and lead to malfunction.
   Refer to SMC’s “Best Pneumatics vol.4” 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.

2. Provide a cover or other protection in dusty locations or where water, oil, etc., splash on the equipment.
   The cylinder may malfunction if operated in a location with a lot of dirt, water droplets, coolant or paper dust, etc. Provide a cover or other protective measure.

Maintenance

⚠️ Warning

1. Maintenance should be performed 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.)
## 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:

   $V(\text{mm/s}) = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time}} \times 1000$

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 does 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-A96, A96V)
       - 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.
   - **Solid state switch**
     - 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model A90, A90V).

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.
     - Operating current of load (OFF condition) > 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 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 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.

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.

### Wiring

#### 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 power supply line and the black output line on 3-wire type switches.

6. Avoid incorrect wiring.
   
   - **<Reed switch>**
     
     A 24VDC switch with indicator light has polarity. The brown lead wire or terminal no. 1 is (+), and the blue lead wire or terminal no. 2 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-A93, A93V

   - **<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 wire and the power supply line (–) is connected to the black 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.

<table>
<thead>
<tr>
<th>2-wire</th>
<th>3-wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output (+)</td>
<td>Old New</td>
</tr>
<tr>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>Output (–)</td>
<td>Black Blue</td>
</tr>
<tr>
<td>Output</td>
<td>White Black</td>
</tr>
</tbody>
</table>

### Mounting and Adjustment

#### Warning

1. Avoid repeatedly bending or stretching 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.
### 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. (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), do not use 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 they may be adversely affected internally.

6. **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.

7. **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 switch. Avoid sources of surge generation and crossed lines.

8. **Avoid accumulation of iron debris or close contact with magnetic substances.**
   When a large amount of ferrous debris such as machining chips or welding 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 a 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.
1. Do not apply a large impact or excessive moment to the slide table (slider).
Because the slide table (slider) is supported by a precision bearing, do not apply a large impact or excessive moment when mounting a work piece.

2. Align carefully when connecting to a load with an external guide mechanism.
Although a magnetic rodless cylinder (series CY1F) can directly receive a load within the allowable range of the guide, it is necessary to align sufficiently when connecting to a load with an external guide mechanism.
The longer the stroke is, the greater the displacement of the shaft center becomes. Therefore, adopt a connection method (floating mechanism) that can ensure absorption of the displacement.

3. Be sure to use the 4 mounting holes on both ends of the guide body when mounting the product on equipment.
The mounting hole at the center of the guide body is used to mount an intermediate support. Be sure to use the 4 mounting holes at both ends to secure the product.

4. When a 25 mm adjustment bolt is selected, the mounting holes will be hidden behind it. Adjust the adjustment bolt after the cylinder is installed.
According to (2) "Adjusting bolt adjustment" on page 31, move the adjustment bolt to a position where it does not interfere with any of the mounting holes and secure the cylinder with mounting screws. After securing the cylinder, readjust the stroke with the adjustment bolt.

5. Long stroke operation causes deflection of the path table or cylinder tube. In such a case, provide an intermediate support.
Provide an intermediate support with the mounting holes on the center of the path table so that the distance between supports given as L in the figure will not exceed the value shown in the graph.
If the counter surface lacks precision, malfunction may result so adjust the level at the same time.
In an environment where vibration or impact occurs, provide an intermediate support even if the distance is within the allowable range in the graph.

6. There are limitations on the load mass and operating pressure in case the product is used in the vertical direction.
When using the product in the vertical direction, confirm the allowable values in "Vertical Operation" in Model Selection (1). If the allowable value is exceeded, the magnet coupling may slip off, causing the work piece to drop down.
**Handling**

**Caution**

1. Do not inadvertently move the guide adjusting unit.
   The guide is installed at the proper tightening torque. Do not loosen the mounting bolts of the guide.

2. Do not operate the magnetic rodless cylinder if the magnet couplings on the actuator are displaced.
   If the magnet couplings are displaced by an external force beyond the holding force, supply an air pressure of 0.7MPa to the cylinder port to return the external slider to the right position of the stroke end.

3. Take precautions to avoid getting your hands caught in the unit.
   Be careful not to let your hand caught between the slide table and adjuster holder at the stroke end. Install a protective cover or take some other measures to keep any part of the human body from directly touching the place.

4. Never disassemble the magnetic component parts (external slider, internal slider) of the actuator (cylinder).
   If will cause decline of the holding force, etc.

**Piping**

**Caution**

1. Be careful about the direction of the piping port and that of the slide table movement.
   The direction of the piping port and that of the slide table movement differ between the right side centralized piping and left side centralized piping.

2. The plug position of the piping port can be changed to suit the operating conditions.
   When screwing in the plug for the second time, wrap a sealant tape around the plug to prevent leakage.
   (1) M5
      First tighten lightly until the rotation stops. Then tighten an additional 1/6 to 1/4 turn.
   (2) Rc1/8
      Tighten with a 7 to 9N m torque using tightening tools.
**Series CY1F**

**Specific Product Precautions 3**

Be sure to read before handling.

---

### Caution

**1. Stroke adjustable range**

The stroke of series CY1F can be controlled by adjusting the attached adjustment bolt.

For stroke adjustment amount, please refer to the table below.

**Adjustment**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard adjustment bolt</th>
<th>25mm adjustment bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>-1.2 to 0.8</td>
<td>-25.2 to 0.8</td>
</tr>
<tr>
<td>15</td>
<td>-1.4 to 0.6</td>
<td>-25.4 to 0.6</td>
</tr>
</tbody>
</table>

The adjustment values above are those for one side.

**2. Adjusting bolt adjustment**

1) Loosen the adjustment bolt fixing bolts.
2) Insert a hexagon wrench into a hexagon hole at the end of the adjustment bolt to adjust the adjustment bolt.
3) After adjustment, tighten the adjustment bolt fixing bolts.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Adjustment bolt fixing bolts</th>
<th>Tightening torque</th>
<th>Adjustment width across flats</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>M3</td>
<td>1.0 to 1.3N m</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>M5</td>
<td>4.6 to 6.2N m</td>
<td>5</td>
</tr>
</tbody>
</table>

---

### Caution

1. **When adjusting the stroke, be careful about the operating pressure limits.**

When making the stroke smaller than the reference stroke with the adjustment bolt, operate at a pressure below the operating pressure limit in (1) “Intermediate stop by external stopper or stroke adjustment with adjustment bolt.” on page 5. If the operating pressure limit is exceeded, the magnet coupling on the actuator (cylinder) will slip off.

2. **When adjusting the stroke, use the distance from the end of the adjustment bolt to the end of the adjuster holder as a guideline.**

If dimension A is made smaller than 0, the slide table and adjuster holder will collide, resulting in damage to the slide table such as scratches or gouges.

---

**Bore size (mm)**

<table>
<thead>
<tr>
<th></th>
<th>At the minimum stroke of standard adjustment bolt</th>
<th>At the minimum stroke of 25 mm adjustment bolt</th>
<th>Basic stroke</th>
<th>At maximum stroke adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>A &lt; 2</td>
<td>A &lt; 26</td>
<td>A = 0.8</td>
<td>A ≥ 0</td>
</tr>
<tr>
<td>15</td>
<td>A &lt; 2</td>
<td>A &lt; 26</td>
<td>A = 0.6</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>A &lt; 2</td>
<td>A &lt; 26</td>
<td>A = 0.6</td>
<td></td>
</tr>
</tbody>
</table>
**Maintenance and Replacement**

---

### Caution

**Replacement of actuator**

1. The actuator (cylinder) of series CY1F can be replaced.
   
   Refer to “Replacement Actuator (Cylinder)” on page 11 about how to order.

2. Replacement of actuator (cylinder) of series CY1F.
   
   1) Remove the 4 cylinder fixing bolts and pull out the actuator from the guide.
   
   2) Apply grease to the gaskets attached to the replacement actuator (cylinder) and replace the installed gaskets with the new ones.
   
   3) Fit the slider of the replacement actuator into the recessed part of the slide table. Align the surface C (on the side with round mounting holes) of the end cover of the replacement actuator and surface D of the stepped part on the guide.
   
   4) In the condition described in (3), put surface A and surface B in close contact with each other. Tighten the 4 cylinder fixing bolts evenly.

- **Bore size (mm)** | **Cylinder fixing bolt** | **Tightening torque**
  | 10 | M3 | 0.55 to 0.72N·m |
  | 15 | M5 | 2.6 to 3.5N·m |

---

### Caution

**Replacement of shock absorber**

1. The shock absorber of series CY1F can be replaced.
   
   The shock absorber should be replaced as a spare part if a decline in the energy absorption capacity is observed.

   Refer to the table below about how to order a replacement shock absorber.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>RB0805-X552</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>RB1000-X552</td>
</tr>
</tbody>
</table>

2. Replacement of shock absorber

Follow the steps below to replace the shock absorber.

1) Remove the work piece from the slide table.

2) Loosen the 4 hexagon socket head screws on the top of the slide table and pull out the shock absorber.

3) Insert the replacement shock absorber into the slide table until it reaches the rear end and tighten 4 hexagon socket head screws.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Hexagon socket head set screw</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>M3</td>
<td>0.37 to 0.45N·m</td>
</tr>
<tr>
<td>15</td>
<td>M5</td>
<td>0.54 to 0.64N·m</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Be careful about the tightening torque of the hexagon socket head screws.

Be careful excessive tightening may cause damage or malfunction of the shock absorber.

---

3. Be sure to fasten the cylinder fixing bolts.

Fasten the cylinder fixing bolts firmly. If they become loose, damage or malfunction may result. After replacing the actuator, be sure to conduct a test run before actually using the product.
EUROPE

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CZECH
SMC Industrial Automation CZ s.r.o.

DENMARK
SMC Pneumatik A/S

FINLAND
SMC Pneumatics Finland Oy

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SMC Priemyselná Automatizáci, s.r.o.

SLOVENIA
SMC Industrijska Avtomatika d.o.o.

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SWITZERLAND
SMC Pneumatik AG.

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SMC Pneumatics (U.K.) Ltd.

ASIA

CHINA
SMC (China) Co., Ltd.

HONG KONG
SMC Pneumatics (Hong Kong) Ltd.

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SMC Pneumatics (India) Pvt. Ltd.

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