Magnetically Coupled Rodless Cylinder

Upgraded version of space saving magnetically coupled rodless cylinder

Series CY3B/CY3R
Improved durability

- Improved bearing performance
  A 70% longer wear ring length achieving an improvement in bearing performance compared to the CY1B.

- Improved lubrication by using a soft wiper
  A special resin soft wiper is installed on the dust seal to achieve an ideal lubrication on the external surface of the cylinder tube.

NPT and G thread are standardized.

- Variety of piping port thread expanded to 3 types
  Cylinders with a bore 20 or larger, are now available with 3 types of piping port threads.
  (Refer to “How to Order”: CY3B series Page 7  CY3R series Page 11)

- Mounting dimensions are identical with those of series CY1.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Thread type</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>M thread</td>
</tr>
<tr>
<td>20, 25, 32, 40</td>
<td>Rc thread</td>
</tr>
<tr>
<td></td>
<td>NPT thread</td>
</tr>
<tr>
<td></td>
<td>G thread</td>
</tr>
</tbody>
</table>

Features 1
Upgraded version of saving magnetically rodless cylinder!

**Series CY3B**

- **Soft wiper (special resin)**
- Wear ring A
- Wear ring B

**Series variations**

- **Minimum operating pressure reduced by 30%**
  By using a soft wiper the minimum operating pressure is reduced by 30%.
  (comparing CY3B40 and CY1B40)

- **Features**
  - Reduction of sliding resistance
  - Upgraded version of saving magnetically rodless cylinder!

**Series CY3R**

<table>
<thead>
<tr>
<th>Bore size</th>
<th>80</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>550</th>
<th>600</th>
<th>650</th>
<th>700</th>
<th>800</th>
<th>900</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY3B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CY3R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**

- The mark **L50098** indicates the available combination of bore size and standard stroke.

**Series CY3B/R**

- Individual made to order products
  - Long stroke (2001mm and up) (XB11)
  - Low speed specifications (7 to 50mm/s) (XB13)
  - Hydro specifications (X116)
  - Axial ports (X132)
  - High speed specifications (X160)
  - Helical insert thread specifications (X168)
  - Added mounting tap positions for slider (X206)
  - Oil-free exterior specifications (X210)
  - Outside of cylinder tube with hard chrome plating (X322)
  - Oil-free exterior specifications (with dust seal) (X324)
  - With floating joint (X357)

Availability of made to order products varies with the series (CY3B/R) and the bore size. For more information please refer page 20.
### Series CY3B/CY3R

#### Model Selection Criteria

<table>
<thead>
<tr>
<th>Model selection point</th>
<th>Recommended cylinder</th>
<th>Appearance</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Series CY3B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Size: Φ15, Φ20, Φ25, Φ32, Φ40</td>
<td>![Image of CY3B cylinder]</td>
<td>· A long stroke is possible.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>![Image of CY3B cylinder]</td>
<td></td>
</tr>
<tr>
<td>When used with many different types of guides.</td>
<td></td>
<td>![Image of CY3B cylinder]</td>
<td></td>
</tr>
<tr>
<td>When a long stroke is necessary.</td>
<td></td>
<td>![Image of CY3B cylinder]</td>
<td></td>
</tr>
<tr>
<td><strong>Series CY3R</strong></td>
<td></td>
<td>![Image of CY3R cylinder]</td>
<td></td>
</tr>
<tr>
<td>Size: Φ15, Φ20, Φ25, Φ32, Φ40</td>
<td></td>
<td>![Image of CY3R cylinder]</td>
<td></td>
</tr>
<tr>
<td>When used with many different types of guides.</td>
<td></td>
<td>![Image of CY3R cylinder]</td>
<td></td>
</tr>
<tr>
<td>When auto switches are added to the basic type.</td>
<td></td>
<td>![Image of CY3R cylinder]</td>
<td></td>
</tr>
<tr>
<td>When used without a guide for a light load. (Application Example 1)</td>
<td></td>
<td>![Image of CY3R cylinder]</td>
<td></td>
</tr>
<tr>
<td>When space is very limited.</td>
<td></td>
<td>![Image of CY3R cylinder]</td>
<td></td>
</tr>
</tbody>
</table>

**Application example**

- **Transferring**
- **Cutting**
**Series CY3B/CY3R**

**Model Selection Method**

**Operating conditions**
- **W**: Load weight (kg)
- **W_s**: Connection bracket weight (kg)
- **P**: Operating pressure (MPa)
- **V**: Speed (mm/s)
- **L_c**: Distance from cylinder center to work piece point (mm)
- **L_v**: Distance from cylinder shaft center to connection fitting, etc.

**E**: Kinetic energy of load (J)

\[ E = \frac{(W + W_s) \times V}{1000} \]

**E_s**: Allowable kinetic energy for intermediate stop using an air pressure circuit (J)

\[ E_s = \frac{W_s \times \mu \times (W + W_s)}{2} \times 1000 \]

**Ps**: Operating pressure limit for intermediate stop using an external stopper, etc.

\[ P_s = \frac{W_s \times \mu \times (W + W_s)}{2} \times 1000 \]

**E**: Maximum allowable moment (N\( \cdot \)m)

\[ E = \frac{(W + W_s) \times L_v}{P} \]

**F_n**: Allowable driving force (N)

\[ F_n = \frac{(W + W_s) \times L_v}{P} \]

**W_Bmax**: Maximum load weight (kg) when loaded directly on the body

**W_B**: Connection bracket weight (kg)

**W**: Load weight (kg)

**Es**: Allowable kinetic energy for intermediate stop using an air pressure circuit (J)

\[ E_s = \frac{W_s \times \mu \times (W + W_s)}{2} \times 1000 \]

**M_D**: Allowable driving force (N)

**M_D**: Allowable driving force (N)

**P_V**: Operating pressure limit for vertical operation (MPa)

**P_V**: Operating pressure limit for vertical operation (MPa)

**L_o**: Distance from cylinder shaft center to connection fitting, etc.

**L_o**: Distance from cylinder shaft center to connection fitting, etc.

**Note 1)** This cylinder cannot perform an intermediate stop using an air pressure circuit in vertical operation. In this case, an intermediate stop can be performed only by using an external stopper, etc.

**Note 2)** Depending on the operating environment, etc., order made products should also be reviewed.

**Note 3)** An external guide system should be installed when over specifications.
Selection procedure

1. Find the drive resisting force $F_n$ (N) when moving the load horizontally.

2. Find the distance $L_o$ (cm) from the point of the load where driving force is applied, to the center of the cylinder shaft.

3. Select the bore size and type of magnet holding force (types H, L) from $L_o$ and $F_n$ based on data $K_A$.

Selection example

Given a load drive resisting force of $F_n = 100$ (N) and a distance from the cylinder shaft center to the load application point of $L_o = 8$cm, find the intersection point by extending upward from the horizontal axis of data $K_A$ where the distance from the shaft center is 8cm, and then extending to the side. Find the allowable driving force on the vertical axis.

Models suitable to satisfy the requirement of 100 (N) are CY3B32 or CY3B40.
Precautions on Design

<Data A : Distance from cylinder shaft center —— Allowable driving capacity>

CY3R15

<table>
<thead>
<tr>
<th>Allowable driving force $F_n$ (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10 11</td>
</tr>
</tbody>
</table>

Distance from cylinder shaft center $Lo$ (cm)

Useable range

CY3R32

<table>
<thead>
<tr>
<th>Allowable driving force $F_n$ (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

Distance from cylinder shaft center $Lo$ (cm)

Useable range

CY3R20

<table>
<thead>
<tr>
<th>Allowable driving force $F_n$ (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13</td>
</tr>
</tbody>
</table>

Distance from cylinder shaft center $Lo$ (cm)

Useable range

CY3R40

<table>
<thead>
<tr>
<th>Allowable driving force $F_n$ (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
</tr>
</tbody>
</table>

Distance from cylinder shaft center $Lo$ (cm)

Useable range
Series CY3B/CY3R
Model Selection Method

Precautions on Design

Cylinder Dead Weight Deflection

When the cylinder is mounted horizontally, deflection appears due to its own weight as shown in the data, and the longer the stroke is, the greater the amount of variation in the shaft center. Therefore, a connection method should be considered which can assimilate this deflection.

The load should be guided by a ball type bearing (LM guide, etc.). If a slide bearing is used, sliding resistance increases due to the load weight and load moment, which can cause malfunction.

Max. Weight of Connection Bracket to the Body

Series CY3 is guided by an external axis (such as a linear guide) without directly mounting the load. When designing a metal bracket to connect the load, see to it that its weight will not exceed the value in the table below. Basically, guide the CY3R direct mounting type also with an external axis. (For connection methods, refer to Instruction Manual.)

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. connection bracket weight (W B max) (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY3_15</td>
<td>1.0</td>
</tr>
<tr>
<td>CY3_20</td>
<td>1.1</td>
</tr>
<tr>
<td>CY3_25</td>
<td>1.2</td>
</tr>
<tr>
<td>CY3_32</td>
<td>1.5</td>
</tr>
<tr>
<td>CY3_40</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Consult SMC in case a bracket with weight exceeding the above value is to be mounted.

Vertical Operation

The load should be guided by a ball type bearing (LM guide, etc.). If a slide bearing is used, sliding resistance increases due to the load weight and load moment, which can cause malfunction.

Max. Load Weight when Loaded Directly on Body

When the load is applied directly to the body, it should be no greater than the maximum values shown in the table below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. load weight (W max) (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY3R15</td>
<td>1.0</td>
</tr>
<tr>
<td>CY3R20</td>
<td>1.1</td>
</tr>
<tr>
<td>CY3R25</td>
<td>1.2</td>
</tr>
<tr>
<td>CY3R32</td>
<td>1.5</td>
</tr>
<tr>
<td>CY3R40</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Use caution, as there is a danger of breaking the magnetic coupling if operated above the maximum operating pressure.
Intermediate Stop

(1) Intermediate stopping of load with an external stopper, etc.

When stopping a load in mid-stroke using an external stopper, etc., operate within the operating pressure limits shown in the table below. Use caution, as operation at a pressure exceeding these limits can result in breaking of the magnetic coupling.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Model</th>
<th>Operating pressure limit for intermediate stop (Ps) (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CY3L15</td>
<td>0.65</td>
</tr>
<tr>
<td>20</td>
<td>CY3L20</td>
<td>0.65</td>
</tr>
<tr>
<td>25</td>
<td>CY3L25</td>
<td>0.65</td>
</tr>
<tr>
<td>32</td>
<td>CY3L32</td>
<td>0.65</td>
</tr>
<tr>
<td>40</td>
<td>CY3L40</td>
<td>0.65</td>
</tr>
</tbody>
</table>

(2) Intermediate stopping of load with an air pressure circuit

When performing an intermediate stop of a load using an air pressure circuit, operate at or below the kinetic energy shown in the table below. Use caution, as operation when exceeding the allowable value can result in breaking of the magnetic coupling.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Model</th>
<th>Allowable kinetic energy for intermediate stop (Es) (J)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CY3R15</td>
<td>0.13</td>
</tr>
<tr>
<td>20</td>
<td>CY3R20</td>
<td>0.24</td>
</tr>
<tr>
<td>25</td>
<td>CY3R25</td>
<td>0.45</td>
</tr>
<tr>
<td>32</td>
<td>CY3R32</td>
<td>0.88</td>
</tr>
<tr>
<td>40</td>
<td>CY3R40</td>
<td>1.53</td>
</tr>
</tbody>
</table>

Stroke End Stopping Method

When stopping a load having a large inertial force at the stroke end, tilting of the body and damage to the bearings and cylinder tube may occur. (Refer to the left hand drawing below.) As shown in the right hand drawing below, a shock absorber should be used together with the stopper, and thrust should also be transmitted from the center of the body so that tilting will not occur.

Body Non-rotating Accuracy and Maximum Allowable Moment (with Switch Rail)  

Reference values for non-rotating accuracy and maximum allowable moment at stroke end are indicated below.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Non-rotating accuracy (β)</th>
<th>Max. allowable moment (Mn) (N·m)</th>
<th>Allowable stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4.5</td>
<td>0.15</td>
<td>200</td>
</tr>
<tr>
<td>20</td>
<td>3.7</td>
<td>0.20</td>
<td>300</td>
</tr>
<tr>
<td>25</td>
<td>3.7</td>
<td>0.25</td>
<td>300</td>
</tr>
<tr>
<td>32</td>
<td>3.1</td>
<td>0.40</td>
<td>400</td>
</tr>
<tr>
<td>40</td>
<td>2.8</td>
<td>0.62</td>
<td>400</td>
</tr>
</tbody>
</table>

Note 1) Avoid operations where rotational torque (moment) is applied. In such a case, the use of an external guide is recommended.

Note 2) The above reference values will be satisfied within the allowable stroke ranges, but caution is necessary, because as the stroke becomes longer, the inclination (rotation angle) within the stroke can be expected to increase.

Note 3) When a load is applied directly to the body, the loaded weight should be no greater than the allowable load weights on page 5.
Series CY3B
Basic Type

How to Order

**Basic type** CY3B 25 300

**Bore size**
- 15 15mm
- 20 20mm
- 25 25mm
- 32 32mm
- 40 40mm

**Port thread type**
- Refer to the standard strokes table below.

**Standard stroke**
Refer to the standard strokes table below.

<table>
<thead>
<tr>
<th>Bore size</th>
<th>Maximum stroke available (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1000</td>
</tr>
<tr>
<td>20, 25, 32</td>
<td>1500 Note 2)</td>
</tr>
<tr>
<td>40</td>
<td>3000</td>
</tr>
</tbody>
</table>

Note 1) Contact SMC if the maximum stroke will be exceeded.
Note 2) Use series CY1B if the stroke exceeds 1500 mm with a tube inside diameter of 20 mm.

**Magnetic Holding Force (N)**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding force (N)</td>
<td>137</td>
<td>231</td>
<td>363</td>
<td>588</td>
<td>922</td>
</tr>
</tbody>
</table>
**Specifications**

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proof pressure</td>
<td>1.05 MPa</td>
</tr>
<tr>
<td>Max. operating pressure</td>
<td>0.7 MPa</td>
</tr>
<tr>
<td>Min. operating pressure</td>
<td>Refer to the minimum operating pressure table.</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>−10 to 60°C</td>
</tr>
<tr>
<td>Piston speed</td>
<td>50 to 400 mm/s</td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper at both ends</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Non-lube</td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>0 to 250st: +1.0, 251 to 1000st: +1.4, 1001st to: +1.8</td>
</tr>
<tr>
<td>Mounting orientation</td>
<td>Unrestricted</td>
</tr>
<tr>
<td>Mounting nut (2 pcs.)</td>
<td>Standard equipment (accessory)</td>
</tr>
</tbody>
</table>

**Theoretical Cylinder Thrust**

When calculating the actual thrust, design should consider the minimum actuating pressure.

**Minimum Operating Pressure**

![Graph showing minimum operating pressure vs. bore size]

**Main Material**

<table>
<thead>
<tr>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head cover</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>Cylinder tube</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>Magnet</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
</tbody>
</table>

**Weights**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic weight</td>
<td>0.275</td>
<td>0.351</td>
<td>0.672</td>
<td>1.287</td>
<td>2.070</td>
</tr>
<tr>
<td>Additional weight per 50 mm of stroke</td>
<td>0.015</td>
<td>0.02</td>
<td>0.023</td>
<td>0.033</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Calculation method:
- Basic weight: 1.287 kg
- Additional weight: 0.033 kg
- Cylinder stroke: 500 st

- Example: CY3B32-500

**Approval**

Approved
Series CY3B

Construction

Basic type

CY3B15

CY3B20 to 40

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</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>2</td>
<td>Head cover</td>
<td>Aluminum alloy</td>
<td>Electroless Ni plated</td>
</tr>
<tr>
<td>3</td>
<td>End collar</td>
<td>Aluminum alloy</td>
<td>Chromate (ø15 is not available.)</td>
</tr>
<tr>
<td>4</td>
<td>Cylinder tube</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Piston</td>
<td>Aluminum alloy</td>
<td>Chromate</td>
</tr>
<tr>
<td>6</td>
<td>Shaft</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Piston side yoke</td>
<td>Rolled steel</td>
<td>Zinc chromate</td>
</tr>
<tr>
<td>8</td>
<td>External slider side yoke</td>
<td>Rolled steel</td>
<td>Zinc chromate</td>
</tr>
<tr>
<td>9</td>
<td>Magnet A</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Magnet B</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Spacer</td>
<td>Aluminum alloy</td>
<td>Chromate</td>
</tr>
<tr>
<td>12</td>
<td>Bumper</td>
<td>Urethane rubber</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Hexagon nut with flange</td>
<td>Carbon steel</td>
<td>Zinc chromate (ø15 not available, ø20 hexagon nut)</td>
</tr>
<tr>
<td>14</td>
<td>C type snap ring for hole</td>
<td>Carbon tool steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>15</td>
<td>Wear ring A</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Wear ring B</td>
<td>Special resin</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Piston seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Soft wiper</td>
<td>Special resin</td>
<td></td>
</tr>
</tbody>
</table>

Replacement parts: Seal kits

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kits no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CY3B15-PS</td>
</tr>
<tr>
<td>20</td>
<td>CY3B20-PS</td>
</tr>
<tr>
<td>25</td>
<td>CY3B25-PS</td>
</tr>
<tr>
<td>32</td>
<td>CY3B32-PS</td>
</tr>
<tr>
<td>40</td>
<td>CY3B40-PS</td>
</tr>
</tbody>
</table>

*Seal kits are sets consisting of numbers 15 through 18, and may be ordered using the order number to each bore size.
Magentically Coupled Rodless Cylinder
Basic Type  Series CY3B

Dimensions

Basic type

CY3B15 to 40

Model  B  D  E  F  G  H  I  J  K  L  MM  N  NA  NN  R  S  W  X  ZZ
CY3B15  35  16.6  3  10  5.5  13  —  6  11  57  M4 x 0.7  11  17  M10 x 1  —  83  35  19  103
CY3B20  36  21.6  2  13  7.5  20  12  6  8  66  M4 x 0.7  18  24  M20 x 1.5  28  106  50  25  132
CY3B25  46  26.4  2  13  7.5  20.5  15  8  10  70  M5 x 0.8  18.5  30  M26 x 1.5  34  111  50  30  137
CY3B32  60  33.6  2  16  8  22  18  8  15  80  M6 x 1  20  36  M26 x 1.5  40  124  50  40  156
CY3B40  70  41.6  3  16  11  29  23  10  16  92  M6 x 1  26  46  M32 x 2  50  150  60  40  182

Part No.  Applicable bore size (mm)  d  H  B  C
SNJ-016B  15  M10 x 1.0  4  14  16.2
SNJ-020B  20  M20 x 1.5  8  26  30
SNJ-032B  25, 32  M26 x 1.5  8  32  37
SNJ-040B  40  M32 x 2.0  10  41  47.3

Mounting nut / included in the package (2 pcs.)
Series CY3R
Direct Mount Type

How to Order

<table>
<thead>
<tr>
<th>CY3R</th>
<th>25</th>
<th>300</th>
<th>Y7BW</th>
</tr>
</thead>
</table>

Direct mount type
Piping type
Nil Both sides piping type
G Centralized piping type

Bore size
- 15mm
- 20mm
- 25mm
- 32mm
- 40mm

Port thread type
Nil M thread
TN NPT
TF G

Number of auto switches
Nil 2 pcs.
S 1 pc.
n "n" pcs.

Auto switch type
Nil Without auto switch
Note 1) In case of ø20 with switch rail but without switch, the cylinder construction is for reed switch.

Switch rail
Nil With switch rail
N Without switch rail
Note 1) A type with switch rail has built-in switch magnets.

Note 2) ø15 has built-in switch magnets even without switch rail.

Standard stroke
Refer to page 12 for standard stroke.

Applicable auto switches
The applicable auto switch is determined by the tube inside diameter. Refer to Best Pneumatics for the detailed specifications of auto switches. Refer to page 18 for auto switch circuit diagrams.

For ø15, ø20

<table>
<thead>
<tr>
<th>Type</th>
<th>Special function</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>Red switch</td>
<td>Reed switch</td>
<td>——</td>
<td>Grommet</td>
<td>No</td>
<td>2-wire</td>
<td>24V</td>
<td>5V, 12V</td>
</tr>
<tr>
<td>Solid state switch</td>
<td>Diagnostic indication (2-color display)</td>
<td>——</td>
<td>Grommet</td>
<td>Yes</td>
<td>2-wire</td>
<td>24V</td>
<td>5V, 12V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid state switch</td>
<td>Diagnostic indication (2-color display)</td>
<td>——</td>
<td>Grommet</td>
<td>Yes</td>
<td>3-wire (PNP)</td>
<td>24V</td>
<td>5V, 12V</td>
</tr>
</tbody>
</table>

For ø25, ø32, ø40

<table>
<thead>
<tr>
<th>Type</th>
<th>Special function</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>Red switch</td>
<td>Reed switch</td>
<td>——</td>
<td>Grommet</td>
<td>Yes</td>
<td>2-wire</td>
<td>24V</td>
<td>5V</td>
</tr>
<tr>
<td>Solid state switch</td>
<td>Diagnostic indication (2-color display)</td>
<td>——</td>
<td>Grommet</td>
<td>Yes</td>
<td>3-wire (PNP)</td>
<td>24V</td>
<td>5V, 12V</td>
</tr>
</tbody>
</table>

*Lead wire length symbols: 0.5m (Example) Y59B 3m (Example) Y59BL 5m (Example) Y59BZ
**Solid state switches marked “O” are produced upon receipt of order.
### Specifications

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proof pressure</td>
<td>1.05 MPa</td>
</tr>
<tr>
<td>Max. operating pressure</td>
<td>0.7 MPa</td>
</tr>
<tr>
<td>Min. operating pressure</td>
<td>Refer to the minimum operating pressure table.</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>−10 to 60°C</td>
</tr>
<tr>
<td>Piston speed</td>
<td>50 to 500 mm/s</td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper at both ends</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Non-lube</td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>0 to 250 st: +1.0, 251 to 1000 st: +1.4, 1001 st to: +1.8</td>
</tr>
<tr>
<td>Mounting</td>
<td>Direct mount type</td>
</tr>
</tbody>
</table>

### Standard Strokes

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
<th>Max. stroke &lt;sup&gt;Note 1)&lt;/sup&gt; without switch (mm)</th>
<th>Max. stroke &lt;sup&gt;Note 1)&lt;/sup&gt; with switch (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>50, 100, 150, 200, 250, 300, 350, 400, 450, 500</td>
<td>1000</td>
<td>750</td>
</tr>
<tr>
<td>20</td>
<td>100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800</td>
<td>1500</td>
<td>1000</td>
</tr>
<tr>
<td>25</td>
<td>100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800</td>
<td>1500</td>
<td>1200</td>
</tr>
<tr>
<td>32</td>
<td>100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000</td>
<td>2000</td>
<td>1500</td>
</tr>
</tbody>
</table>

<sup>Note 1)</sup> Max. stroke with switch (mm)

### Magnetic Holding Force (N)

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding force (N)</td>
<td>137</td>
<td>231</td>
<td>363</td>
<td>588</td>
<td>922</td>
</tr>
</tbody>
</table>

### Weights

<table>
<thead>
<tr>
<th>Item</th>
<th>Bore size (mm)</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic weight</td>
<td>CY3R CY3RG</td>
<td>0.272</td>
<td>0.421</td>
<td>0.622</td>
<td>1.217</td>
<td>1.980</td>
</tr>
<tr>
<td>(at 5 st)</td>
<td></td>
<td>0.225</td>
<td>0.351</td>
<td>0.542</td>
<td>1.097</td>
<td>1.820</td>
</tr>
<tr>
<td>Additional weight per 50mm of stroke (with switch rail)</td>
<td>0.04</td>
<td>0.051</td>
<td>0.096</td>
<td>0.076</td>
<td>0.093</td>
<td></td>
</tr>
<tr>
<td>Additional weight per 50mm of stroke (without switch rail)</td>
<td>0.015</td>
<td>0.02</td>
<td>0.023</td>
<td>0.033</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>

Calculation method

\[
\text{Basic weight} = 0.622 \text{kg} \\
\text{Additional weight} = 0.056 \text{kg/50s} \\
\text{Cylinder stroke} = 0.056 \times 500 = 1.162 (\text{kg})
\]

### Theoretical Cylinder Thrust

When calculating the actual thrust, design should consider the 12 minimum actuating pressure.
Series CY3R

Construction

Both sides piping type

CY3R15 to 40

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</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>2a</td>
<td>End cover A</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>2b</td>
<td>End cover C</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>3a</td>
<td>End cover B</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>3b</td>
<td>End cover D</td>
<td>Aluminum alloy</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>4</td>
<td>Cylinder tube</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Piston</td>
<td>ø15: Brass</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ø20 to ø40: Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Shaft</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Piston side yoke</td>
<td>Rolled steel plate</td>
<td>Zinc chromated</td>
</tr>
<tr>
<td>8</td>
<td>External slider side yoke</td>
<td>Rolled steel plate</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Magnet A</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Magnet B</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Spacer</td>
<td>Aluminum alloy</td>
<td>Black anodized</td>
</tr>
<tr>
<td>12</td>
<td>Bumper</td>
<td>Urethane rubber</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Piston nut</td>
<td>Carbon steel</td>
<td>ø20 to ø40</td>
</tr>
<tr>
<td>14</td>
<td>Snap ring</td>
<td>Carbon tool steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>15</td>
<td>C type snap ring for shaft</td>
<td>Aluminum alloy</td>
<td>Chromate</td>
</tr>
<tr>
<td>16</td>
<td>Magnets shielding plate</td>
<td>Rolled steel plate</td>
<td>Chromated</td>
</tr>
<tr>
<td>17</td>
<td>Switch rail</td>
<td>Aluminum alloy</td>
<td>White anodized</td>
</tr>
<tr>
<td>18</td>
<td>Magnets</td>
<td>Rare earth magnet</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Hexagon socket head plug</td>
<td>Chromium steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>20</td>
<td>Hexagon socket head plug</td>
<td>Chromium steel</td>
<td>Nickel plated</td>
</tr>
</tbody>
</table>

Replacement parts: Seal kits

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kits no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CY3R15-PS</td>
<td>Numbers</td>
</tr>
<tr>
<td>20</td>
<td>CY3R20-PS</td>
<td>2, 3, 4, 6, 7 above</td>
</tr>
<tr>
<td>25</td>
<td>CY3R25-PS</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>CY3R32-PS</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CY3R40-PS</td>
<td></td>
</tr>
</tbody>
</table>

*Seal kits are sets consisting of numbers 24 through 30, and may be ordered using the order number to each bore size.

*Seal kits are the same for both the both sides piping type and the centralized piping type.
Magnetically Coupled Rodless Cylinder  
**Series CY3B**

### Dimensions

**Centralized piping type**

CY3RG15 to 40

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kits no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CY3R15-PS</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CY3R20-PS</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>CY3R25-PS</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>CY3R32-PS</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CY3R40-PS</td>
<td></td>
</tr>
</tbody>
</table>

*Seal kits are the same for both the both sides piping type and the centralized piping type.

### Replacement parts: Seal kits

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kits no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CY3R15-PS</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CY3R20-PS</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>CY3R25-PS</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>CY3R32-PS</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CY3R40-PS</td>
<td></td>
</tr>
</tbody>
</table>

Numbers 0, 0, 0, 0, 0, 0, 0 at the left

### Switch Rail Accessory

**CYR 15 E**

- Bore size
- Stroke

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kits no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>CYR15E</td>
<td>Numbers 0, 0, 0, 0, 0, 0, 0 at the left</td>
</tr>
<tr>
<td>20</td>
<td>CYR20E</td>
<td>Numbers 0, 0, 0, 0, 0, 0, 0 at the left</td>
</tr>
<tr>
<td>25</td>
<td>CYR25E</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>CYR32E</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CYR40E</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) □ indicates to the stroke.
Note 2) A magnet is already built in for 15.
Series CY3R

Dimensions

Both sides piping type: ø15 to ø40

Note 1) This figure shows types with switch rail (no symbol).

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>CB</th>
<th>CR D</th>
<th>F</th>
<th>G</th>
<th>GP</th>
<th>GW</th>
<th>H</th>
<th>HA</th>
<th>HB</th>
<th>HC</th>
<th>HP</th>
<th>HR</th>
<th>HS</th>
<th>HT</th>
<th>J x E</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY3R15</td>
<td>10.5</td>
<td>8</td>
<td>4.2</td>
<td>2</td>
<td>0.5</td>
<td>16.6</td>
<td>8</td>
<td>5</td>
<td>33</td>
<td>31.5</td>
<td>32</td>
<td>30</td>
<td>17</td>
<td>31</td>
<td>17</td>
<td>30</td>
<td>8.5</td>
<td>17</td>
<td>M8 x 0.8 x 7</td>
</tr>
<tr>
<td>CY3R20</td>
<td>9</td>
<td>9.5</td>
<td>5.2</td>
<td>3</td>
<td>1</td>
<td>21.6</td>
<td>9</td>
<td>6</td>
<td>38</td>
<td>37.5</td>
<td>39</td>
<td>38</td>
<td>21</td>
<td>38</td>
<td>24</td>
<td>36</td>
<td>7.5</td>
<td>24</td>
<td>M6 x 1 x 8</td>
</tr>
<tr>
<td>CY3R25</td>
<td>8.5</td>
<td>9.5</td>
<td>5.2</td>
<td>3</td>
<td>1</td>
<td>26.4</td>
<td>8.5</td>
<td>6</td>
<td>44</td>
<td>42.5</td>
<td>44</td>
<td>41</td>
<td>23.5</td>
<td>43</td>
<td>41</td>
<td>23.5</td>
<td>6.5</td>
<td>23.5</td>
<td>M6 x 1 x 8</td>
</tr>
<tr>
<td>CY3R32</td>
<td>10.5</td>
<td>11</td>
<td>6.5</td>
<td>3</td>
<td>1.5</td>
<td>33.6</td>
<td>10.5</td>
<td>7</td>
<td>55</td>
<td>53.5</td>
<td>55</td>
<td>52</td>
<td>29</td>
<td>54</td>
<td>29</td>
<td>51</td>
<td>7</td>
<td>29</td>
<td>M8 x 1.25 x 10</td>
</tr>
<tr>
<td>CY3R40</td>
<td>10</td>
<td>11</td>
<td>6.5</td>
<td>5</td>
<td>2</td>
<td>41.6</td>
<td>13</td>
<td>7</td>
<td>65</td>
<td>63.5</td>
<td>67</td>
<td>62</td>
<td>36</td>
<td>66</td>
<td>62</td>
<td>38</td>
<td>8</td>
<td>36</td>
<td>M8 x 1.25 x 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>L</th>
<th>LD</th>
<th>M</th>
<th>MM</th>
<th>N</th>
<th>PW</th>
<th>Q</th>
<th>GW</th>
<th>T</th>
<th>TC</th>
<th>W</th>
<th>WP</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY3R15</td>
<td>53</td>
<td>4.3</td>
<td>5</td>
<td>M4 x 0.7</td>
<td>6</td>
<td>32</td>
<td>84</td>
<td>18</td>
<td>19</td>
<td>17</td>
<td>25</td>
<td>16</td>
<td>18</td>
<td>54.5</td>
<td>94</td>
</tr>
<tr>
<td>CY3R20</td>
<td>62</td>
<td>5.6</td>
<td>5</td>
<td>M4 x 0.7</td>
<td>7</td>
<td>38</td>
<td>95</td>
<td>17</td>
<td>20.5</td>
<td>20</td>
<td>40</td>
<td>19</td>
<td>22</td>
<td>64</td>
<td>107</td>
</tr>
<tr>
<td>CY3R25</td>
<td>70</td>
<td>5.6</td>
<td>6</td>
<td>M5 x 0.8</td>
<td>8.5</td>
<td>43</td>
<td>105</td>
<td>20</td>
<td>21.5</td>
<td>22.5</td>
<td>40</td>
<td>21.5</td>
<td>28</td>
<td>72</td>
<td>117</td>
</tr>
<tr>
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<td>76</td>
<td>7</td>
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<td>M6 x 1</td>
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<td>CY3R40</td>
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<td>7</td>
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<td>M6 x 1</td>
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<td>26</td>
<td>33</td>
<td>60</td>
<td>32</td>
<td>40</td>
<td>93</td>
<td>148</td>
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</table>

Model P (Piping port)

<table>
<thead>
<tr>
<th>Model</th>
<th>Nil</th>
<th>TN</th>
<th>TF</th>
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<tbody>
<tr>
<td>CY3R15</td>
<td>M5 x 0.8</td>
<td>—</td>
<td>—</td>
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<tr>
<td>CY3R20</td>
<td>Rc 1/8</td>
<td>NPT 1/8</td>
<td>G 1/8</td>
</tr>
<tr>
<td>CY3R25</td>
<td>Rc 1/8</td>
<td>NPT 1/8</td>
<td>G 1/8</td>
</tr>
<tr>
<td>CY3R32</td>
<td>Rc 1/8</td>
<td>NPT 1/8</td>
<td>G 1/8</td>
</tr>
<tr>
<td>CY3R40</td>
<td>Rc 1/4</td>
<td>NPT 1/4</td>
<td>G 1/4</td>
</tr>
</tbody>
</table>

Dimensions (mm)

Both sides piping type: ø15 to ø40

Note 1) This figure shows types with switch rail (no symbol).
Dimensions

Centralized piping type: ø15 to ø40

| Model    | B  | C  | CB | CR | D  | F  | G  | GP | GW | H  | HA | HB | HC | HP | HR | HS | HT | J x E | K | L     |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|---|-------|
| CY3RG15  | 8  | 4.2| 2  | 0.5| 16.6| 8  | 5  | 33 | 31.5| 32  | 30  | 17  | 31  | —  | —  | —  | 8.5  | —  | 14   |
| CY3RG20  | 9.5| 5.2| 3  | 1  | 21.6| 9  | 6  | 39 | 37.5| 39  | 36  | 21  | 38  | 11 | 36 | 7.5 | 28   | 11  | 52   |
| CY3RG25  | 9.5| 5.2| 3  | 1  | 26.4| 8.5| 6  | 44 | 42.5| 44  | 41  | 23.5| 43  | 43  | 41 | 6.5 | 33.5 | M6  | 1 x 8| 11  | 62   |
| CY3RG32  | 11 | 6.5| 3  | 1.5| 33.6| 10.5| 7  | 55 | 53.5| 55  | 52  | 29  | 54  | 20 | 51 | 7   | 41   | M6  | 1.25 x 10| 13  | 76   |
| CY3RG40  | 11 | 6.5| 3  | 2  | 41.6| 13  | 7  | 65 | 63.5| 67  | 62  | 36  | 66  | 25 | 62 | 8   | 50   | M8  | 1.25 x 10| 15  | 90   |

<table>
<thead>
<tr>
<th>Model</th>
<th>LD</th>
<th>M</th>
<th>MM</th>
<th>N</th>
<th>PW</th>
<th>Q</th>
<th>GW</th>
<th>H</th>
<th>HA</th>
<th>HB</th>
<th>HC</th>
<th>HP</th>
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<th>HS</th>
<th>HT</th>
<th>J x E</th>
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<td>M4 x 0.7</td>
<td>7</td>
<td>38</td>
<td>95</td>
<td>20.5</td>
<td>20.5</td>
<td>20</td>
<td>40</td>
<td>19</td>
<td>22</td>
<td>64</td>
<td>107</td>
<td>—</td>
<td>—</td>
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</tr>
<tr>
<td>CY3RG25</td>
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<td>6</td>
<td>M5 x 0.8</td>
<td>6.5</td>
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<td>105</td>
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<tr>
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<td>7</td>
<td>7</td>
<td>M6 x 1</td>
<td>8.5</td>
<td>54</td>
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<td>24</td>
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<tr>
<td>CY3RG40</td>
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<td>8</td>
<td>M6 x 1</td>
<td>11</td>
<td>64</td>
<td>134</td>
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<td>26</td>
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<td>148</td>
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<table>
<thead>
<tr>
<th>Model</th>
<th>P (Piping port)</th>
<th>Nil</th>
<th>TN</th>
<th>TF</th>
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<tbody>
<tr>
<td>CY3RG15</td>
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<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>CY3RG20</td>
<td>Rc 1/8</td>
<td>NPT 1/8</td>
<td>G 1/8</td>
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<tr>
<td>CY3RG25</td>
<td>Rc 1/8</td>
<td>NPT 1/8</td>
<td>G 1/8</td>
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<td>CY3RG32</td>
<td>Rc 1/8</td>
<td>NPT 1/8</td>
<td>G 1/8</td>
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<td>CY3RG40</td>
<td>Rc 1/4</td>
<td>NPT 1/4</td>
<td>G 1/4</td>
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</tr>
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</table>
Series CY3R

Auto Switch Proper Mounting Position for Stroke End Detection

(Reference dimension)

<table>
<thead>
<tr>
<th>ø15, ø20</th>
<th>Applicable switch model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore size (mm)</td>
<td>D-A9/L50482</td>
</tr>
<tr>
<td>15</td>
<td>17.5</td>
</tr>
<tr>
<td>20</td>
<td>19.5</td>
</tr>
</tbody>
</table>

Note 1) Auto switches cannot be installed in Area C in the case of ø15.
Note 2) Only non-magnetic material is permitted as the mounting surface of a ø20 cylinder.

<table>
<thead>
<tr>
<th>ø25, ø32, ø40</th>
<th>Applicable switch model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore size (mm)</td>
<td>D-Z7/L50482, Z80, Y59/L50482, Y7P/L50482, Y7/L50482W</td>
</tr>
<tr>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>32</td>
<td>21.5</td>
</tr>
<tr>
<td>40</td>
<td>23.5</td>
</tr>
</tbody>
</table>

Note 1) 50mm is the minimum stroke available with 2 auto switches mounted.
Note 2) The above dimensions are given as reference dimensions. Confirm installation with actual equipment.

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 watchmakers screwdriver to tighten the mounting screw which is included.

Note) When tightening the auto switch mounting screw, use a watchmakers screwdriver with a handle about 5 to 6mm in diameter. Furthermore, the tightening torque should be approximately 0.05 to 0.1N·m (0.51 to 1.02kgf·cm). As a rule, it can be turned about 90° past the point at which tightening can be felt.

Flat head watchmakers screw driver

Auto switch

Switch mounting screw (M2.5 x 4) (included)

Auto Switch Specifications

(1) Switches (switch rail) can be added to the standard type (without switch rail). The switch rail accessory type is mentioned on page 14, and can be ordered together with auto switches.
(2) Refer to the separate disassembly instructions for switch magnet installation procedures.

Auto Switch Operation Range

<table>
<thead>
<tr>
<th>Auto switch model</th>
<th>Bore size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td>D-A9/L50482</td>
<td>8</td>
</tr>
<tr>
<td>D-F9/L50482, D-A9/L50482W</td>
<td>5</td>
</tr>
<tr>
<td>D-Z7/L50482, Z80</td>
<td>—</td>
</tr>
<tr>
<td>D-Y59/L50482, Y7P/L50482, Y7/L50482W</td>
<td>—</td>
</tr>
</tbody>
</table>

*Switches cannot be mounted in some cases.
*Operating ranges are standards including hysteresis, and are not guaranteed. (Variation on the order of ±30%)
*Large variations may occur depending on the surrounding environment.
Reed Switch Internal Circuit

Solid State Switch Internal Circuit

Contact Protection Box/CD-P11, CD-P12

<Applicable switches>
D-A9, Z7, Z8
The above auto switches do not have built-in 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 conditions.

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>Max. load current</td>
<td>25mA</td>
<td>12.5mA</td>
</tr>
</tbody>
</table>

- Lead wire length: Switch contacts side 0.5m, Load connection side 0.5m

Connection
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. The switch unit should be kept as close as possible to the contact protection box with a lead wire that is no more than 1 meter in length.
Auto Switch Connections and Examples

Basic Wiring

Solid state 3-wire, NPN

2-wire

Solid state 3-wire, PNP

2-wire

<Solid state>

<Reed switch>

Examples of Connection to PLC

Sink input specifications
3-wire, NPN

Source input specifications
3-wire, PNP

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

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

3-wire

AND connection for NPN output (using relays)

AND connection for NPN output (performed with switches only)

OR connection for NPN output

2-wire with 2 switch AND connection

2-wire with 2 switch OR connection

Load voltage at ON = 24V – 4V x 2 pcs.

Load voltage drop = 24V – 16V

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

Load voltage at OFF = Leakage current x 2 pcs. x 3kΩ

Load current = 1mA x 2 pcs. x 3kΩ

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

<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 dim or not light up, because of dispersion and reduction of the current flowing to the switches.
## Series CY3B/CY3R

**Made to Order Specifications**

Contact SMC for detailed specifications, lead times and prices.

### Contents

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Contents</th>
<th>Model</th>
<th>Bore size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-XB11</td>
<td>Long stroke (2001mm and up)</td>
<td>CY3B</td>
<td>15 20 25 32 40</td>
</tr>
<tr>
<td>-XB13</td>
<td>Low speed cylinder (7 to 50mm/s)</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X116</td>
<td>Hydro specifications</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X132</td>
<td>Axial ports</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X160</td>
<td>High speed specifications</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X168</td>
<td>Helical insert thread specs</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X206</td>
<td>Added mounting tap positions</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X210</td>
<td>Oil-free exterior specs</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X322</td>
<td>Outside of cylinder tube with hard chrome plating</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-X324</td>
<td>Oil-free exterior specs (with dust seal)</td>
<td>CY3B</td>
<td></td>
</tr>
<tr>
<td>-XC57</td>
<td>With floating joint</td>
<td>CY3R</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Notes
- **Hydro specifications**
- **Axial ports**
- **High speed specifications**
- **Helical insert thread specifications**
- **Added mounting tap positions for slider**
- **Oil-free exterior specifications**
- **Outside of cylinder tube with hard chrome plating**
- **Oil-free exterior specifications (with dust seal)**
- **With floating joint**
Series CY3B/CY3R
Made to Order Specifications 1

Contact SMC for detailed specifications, lead times and prices.

1. Long stroke (2001mm and up) - XB11

CY3B Bore size | Port thread type | Stroke | XB11

Specifications

Applicable series | CY3B
Bore size | ø25 to ø40
Applicable stroke | 2001st to 3000st

Note 1) If the stroke exceeds 3000 mm, use XB11 specification of series CY1B.

2. Low speed (7 to 50mm/s) specifications - XB13

CY3B Bore size | Port thread type | Stroke | XB13

Very low speed (7 to 50mm/s) specifications

There is no sticking and slipping even at very low drive speeds of 7 to 50mm/s. Furthermore, there is no lurching at start up, allowing smooth drive through the entire stroke.

Specifications

Applicable series | CY3B
Bore size | ø15 to ø40
Piston speed | 7 to 50 mm/s

3. Hydro specifications - X116

CY3B Bore size | Port thread type | Stroke | X116

Hydro specifications

Suitable for precision low speed feeding, intermediate stopping and skip feeding of the cylinder.

Specifications

Applicable series | CY3B/CY3R
Bore size | ø25 to ø40
Fluid | Turbine oil
Piston speed | 15 to 300mm/s

Note 1) Only piping on both sides is available with CY3R.
Note 2) When performing intermediate stops with an air-hydro circuit, set the kinetic energy of the load so that it does not exceed the allowable value. (Regarding the allowable value, refer to the section "Intermediate stops" for each series.)

4. Axial ports - X132

CY3B Bore size | Port thread type | Stroke | X132

The air supply port has been changed to an axial position on the head cover.

Specifications

Applicable series | CY3B
Bore size | ø15 to ø40

5. High speed specifications - X160

CY3B Bore size | Port thread type | Stroke | X160

High speed specifications

Makes possible high speed piston drive of 1500mm/s (without load).

Specifications

Applicable series | CY3B/CY3R
Bore size | ø20 to ø40
Piston speed (no load) | 1500mm/s

Note 1) When operating this cylinder at high speed, a shock absorber must be provided.
Note 2) Only piping on both sides is available with CY3R.

6. Helical insert thread specifications - X168

CY3B Bore size | Port thread type | Stroke | X168

Helical insert thread specifications

The standard mounting threads have been changed to helical insert thread specifications.

Specifications

Applicable series | CY3B/CY3R
Bore size | ø20 to ø40
Series CY3B/CY3R
Made to Order Specifications 2

7 Added mounting tap positions for slider -X206
Mounting taps have been added on the surface opposite the standard positions.

Specifications
Applicable series | CY3B
--- | ---
Bore size | ø15 to ø40

8 Oil-free exterior specifications -X210
Suitable for environments where oils are not tolerated. A scraper is not installed. A separate version -X324 (with felt) has been prepared for cases in which dust, etc. is scattered throughout the environment.

Specifications
Applicable series | CY3B
--- | ---
Bore size | ø15 to ø40

9 Outside of cylinder tube with hard chrome plating -X322
The outside of the cylinder tube has been plated with hard chromium, reducing wear on the bearings.

Specifications
Applicable series | CY3B/CY3R
--- | ---
Bore size | ø15 to ø40

10 Oil-free exterior specifications (with dust seal) -X324
This unit has oil-free exterior specifications, with a felt dust seal provided on the cylinder body.

Specifications
Applicable series | CY3B
--- | ---
Bore size | ø15 to ø40

Contact SMC for detailed specifications, lead times and prices.
With floating joint (CY3B)

A special floating joint is added to the Series CY3B, and the number of connections to the guide on the other axis (the load side) is reduced. The attachment of the bolt to the floating joint and the load is not limited to the top or bottom.

**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>F (mm)</th>
<th>HA</th>
<th>HB</th>
<th>L</th>
<th>LA</th>
<th>MM</th>
<th>MD</th>
<th>M</th>
<th>PA</th>
<th>R (mm)</th>
<th>W</th>
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</thead>
<tbody>
<tr>
<td>CY3B15</td>
<td>16</td>
<td>35</td>
<td>6.5</td>
<td>5.5</td>
<td>16.5</td>
<td>23</td>
<td>57</td>
<td>25</td>
<td>M4 x 0.7</td>
<td>M3</td>
<td>4</td>
<td>25</td>
<td>6</td>
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<td>M4 x 0.7</td>
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<td>6</td>
<td>37</td>
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<td>M5 x 0.8</td>
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<td>7</td>
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<tr>
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<td>8</td>
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<td>6</td>
<td>55</td>
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</table>

Note 1) Dimension F provides a clearance of 1mm between the body and the floating joint, but does not consider dead weight deflection of the cylinder tube, etc. When put into operation, an appropriate value should be set which considers dead weight deflection and alignment variations with respect to the other axis. (Refer to the dead weight deflection table on page 5.)

Note 2) Use caution when attached from the top and operated at or above dimension R, because the end of the screw will contact the body, and floating cannot be maintained in some cases.
**Series CY3B/CY3R**

**Made to Order Specifications 4**

Contact SMC for detailed specifications, lead times and prices.

---

**With floating joint (CY3R)**

CY3R  | Bore size | Port thread type | Stroke | XC57

A special floating joint is added to the Series CY3R, and the number of connections to the guide on the other axis (the load side) is reduced.

The attachment of the bolt to the floating joint and the load is not limited to the top or bottom.

**Specifications**

<table>
<thead>
<tr>
<th>Bore size</th>
<th>ø15, ø20, ø25, ø32, ø40</th>
</tr>
</thead>
</table>

Note: Since the body of this cylinder is designed for connection with a floating joint, and cannot be connected to the bodies of standard products, contact SMC if necessary.

**Dimensions**

- **ø15**

- **ø20, ø25, ø32, ø40**

**Note 1:** FE, FF and HB provide a clearance of 1mm between the body and the floating joint, but do not consider dead weight deflection of the cylinder tube, etc. When put into operation, an appropriate value should be set which considers dead weight deflection an alignment variations with respect to the other axis. (Refer to the dead weight deflection table on page 5.)

**Note 2:** Use caution when attached from the top and operated at or above dimension R, because the end of the screw will contact the body, and floating cannot be maintained in some cases.
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. **A protective cover is recommended to minimize the risk of personal injury.**
   
   If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. 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 shock. 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, 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 selection procedures for the type of air cylinder to be used 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.**
## Series CY3B/CY3R
### Actuator Precautions 2

Be sure to read before handling.

### Mounting

**Caution**

1. **Align carefully 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.
   - Moreover, consideration should be given to the exclusive floating joint (XC 57), which has been created for series CY3B and CY3R. (pages 23 and 24)

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 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 cutting 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 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

**Caution**

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.

**Warning**

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

2. **Install an air dryer, after cooler or water separator, etc.**
   - Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after cooler 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.**
   - Contact SMC in cases where dust or water, etc., will be scattered throughout the area.
Series CY3B/CY3R
Actuator Precautions 3
Be sure to read before handling.

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

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) For an auto switch without a contact protection circuit, 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-A96 and 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.

   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.

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.
**Auto Switch Precautions 2**

**Mounting and Adjustment**

**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 fastening 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 a 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**

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.

5. **Do not allow short circuit of loads.**
   - **Reed switch**
     If a 2-wire type switch is connected to a load, 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 model: D-A93
   - **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 NEC2 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:**

<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>

**Solid state with diagnostic output**

<table>
<thead>
<tr>
<th>2-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>
<tr>
<td>Diagnostic Output</td>
<td>Yellow</td>
<td>Orange</td>
</tr>
</tbody>
</table>

**3-wire**

<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>
<tr>
<td>Solid state with latch type diagnostic output</td>
<td>Yellow</td>
<td>Orange</td>
</tr>
</tbody>
</table>
Operating Environment

**Warning**

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

2. **Do not use in an area where a magnetic field is generated.**
   Auto switches will malfunction or magnets inside cylinders will become demagnetized.

3. **Do not use in an environment where the auto switch will be continually exposed to water.**
   Although switches satisfy the 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 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 the 2-color display type switch.
      Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

Other

**Warning**

1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.
**Series CY3B/CY3R**

**Specific Product Precautions 1**

Be sure to read before handling.

Refer to pages 25 through 31 for safety instructions, actuator precautions and auto switch precautions.

---

**Mounting**

**Caution**

1. Take care to avoid nicks or other damage on the outside surface of the cylinder tube. This can lead to damage of the scraper and wear ring, which in turn can cause malfunction.

2. Take care regarding rotation of the external slider. Rotation should be controlled by connecting it to another shaft (linear guide, etc.).

3. Do not operate with the magnetic coupling out of position. In case the magnetic coupling is out of position, push the external slider back into the correct position by hand at the end of the stroke (or correct the piston slider with air pressure).

4. The cylinder is mounted with bolts through the mounting holes in the end covers. Be sure they are tightened securely. (CY3R)

5. If gaps occur between the mounting surface and the end covers when mounting with bolts, perform shim adjustment using spacers, etc. so that there is no unreasonable stress. (CY3R)

6. Be sure that both end covers are secured to the mounting surface before operating the cylinder. Avoid operation with the external slider secured to the surface.

7. Do not apply a lateral load to the external slider. When a load is mounted directly to the cylinder, variations in the alignment of each shaft center cannot be assimilated, which results in the generation of a lateral load that can cause malfunction. The cylinder should be operated using a connection method which allows for assimilation of shaft alignment variations and deflection due to the cylinder’s own weight. A drawing of a recommended mounting is shown in Figure 2.

---

**Disassembly and Maintenance**

**Caution**

8. Use caution regarding the allowable load weight when operating in a vertical direction. The allowable load weight when operating in a vertical direction (reference values on page 5) is determined by the model selection method, however, if a load greater than the allowable value is applied, the magnetic coupling may break and there is a possibility of dropping the load. When using this type of application, contact SMC regarding the operating conditions (pressure, load, speed, stroke, frequency, etc.).

---

**Warning**

1. Use caution as the attractive power of the magnets is very strong. When removing the external slider and piston slider from the cylinder tube for maintenance, etc., handle with caution, since the magnets installed in each slider have very strong attractive power.

---

**Caution**

1. When reattaching the head covers after disassembly, confirm that they are tightened securely. (CY3B)

When disassembling, hold the wrench flat section of one head cover with a vise, and remove the other cover using a spanner or adjustable angle wrench on its wrench flat section. When retightening, first coat with Locktight (No. 542 red), and retighten 3 to 5° past the original position prior to removal.

2. Special tools are necessary for disassembly. (CY3R)

---

**Special tool number list**

<table>
<thead>
<tr>
<th>No.</th>
<th>Applicable bore size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYRZ-V</td>
<td>15, 20</td>
</tr>
<tr>
<td>CYRZ-W</td>
<td>25, 32, 40</td>
</tr>
</tbody>
</table>

---

3. Use caution when taking off the external slider, as the piston slider will be directly attracted to it. When removing the external slider or piston slider from the cylinder tube, first force the sliders out of their magnetically coupled positions and then remove them individually while there is no longer any holding force. If they are removed when still magnetically coupled, they will be directly attracted to one another and will not come apart.

4. Do not disassemble the magnetic components (piston slider, external slider). This can cause a loss of holding force and malfunction.

5. When disassembling to replace the seals and wear ring, refer to the separate disassembly instructions.

---

**Figure 1. Incorrect mounting**

Note) The drawing shows CY3B.

**Figure 2. Recommended mounting**

---

**SMC**

32
SMC'S GLOBAL MANUFACTURING, DISTRIBUTION AND SERVICE NETWORK

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SMC Pneumatik GmbH
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SMC Hungary Ipari Automatizálási Kft.
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SMC Pneumatics Latvia SIA
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SMC Pneumatics (India) Pvt. Ltd.
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SOUTH KOREA
SMC Pneumatics Korea Co., Ltd.
TAIWAN
SMC Pneumatics (Taiwan) Co., Ltd.

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NORTH AMERICA
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SMC Pneumatics (Canada) Ltd.
MEXICO
SMC Corporation (Mexico) S.A. de C.V.
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SMC Corporation of America
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