Large Bore Compact Cylinder

Series CQ2

ø180, ø200

Single or Double Rod Versions
Switch Capable
Space Saving
**Large Bore Compact Cylinder**

**Series CQ2**

ø180 and ø200 added to CQ2 compact cylinder series.

### Large bore sizes

ø180 and ø200 newly introduced

### Compact and light weight

Substantial reductions in dimensions and weight compared to tie-rod type cylinders

---

**Auto switches**

- No protrusion from cylinder body
- Can be mounted on four sides

**Variations**

<table>
<thead>
<tr>
<th>Series</th>
<th>Action</th>
<th>Type</th>
<th>Size</th>
<th>Standard strokes</th>
<th>Rod end configuration</th>
<th>Applicable auto switch models</th>
</tr>
</thead>
<tbody>
<tr>
<td>CQ2</td>
<td>Double acting</td>
<td>Single rod</td>
<td>180</td>
<td>10 20 30 40 50 75 100 125 150 175 200 250 300</td>
<td>Female threads Male threads</td>
<td>Reed switches: D-Z7, Z8 Solid state switches: D-Y5, Y6, Y7</td>
</tr>
</tbody>
</table>

Comparison with 100mm stroke and rod end male threads

**Compact cylinder variations**

A wide range of 15 sizes from ø12 to ø200

**Bore size (mm)**

- 12 16 20 25 32 40 50 63 80 100 125 140 160 180 200

---

* Refer to N320 “CQ2” and CAT.E256-A “CQS” regarding series marked with a “CQ” symbol.
## Compact Cylinder
### Double Acting: Single Rod

### Series CQ2

#### Ø180, Ø200

### How to Order

#### With Auto Switch

**CQ2B** 180 50 D C  
**CDQ2B** 180 50 D C Z76

- **Number of auto switches**
  - Nil 2 pcs.
  - S 1 pc.
  - n “n” pcs.

- **Mounting**
  - B Standard (through hole/double end tapped)

- **Bore size**
  - 180 180mm
  - 200 200mm

- **Cylinder stroke (mm)**
  - Refer to the standard stroke table on page 2.

- **Action**
  - D Double acting

- **Rod end threads**
  - Nil Standard (rod end female threads)
  - M Rod end male threads

- **Cushion**
  - C Rubber bumper

### Applicable auto switches

<table>
<thead>
<tr>
<th>Type</th>
<th>Special function</th>
<th>Electrical entry</th>
<th>Indicator light</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch models</th>
<th><em>Lead wire length (mm)</em></th>
<th>Applicable loads</th>
<th>Detailed specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>-</td>
<td>Grommet</td>
<td>Yes</td>
<td>3 wire</td>
<td>5V</td>
<td>- Z76</td>
<td>0.5 (Nil)</td>
<td>-</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>2 wire</td>
<td>24V</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>12V</td>
<td>5V, 12V</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (NPN)</td>
<td>5V, 12V</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (PNP)</td>
<td>5V, 12V</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (NPN)</td>
<td>5V, 12V</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (PNP)</td>
<td>5V, 12V</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>12V</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Solid state switch</td>
<td>-</td>
<td>Grommet</td>
<td>Yes</td>
<td>2 wire</td>
<td>5V, 12V</td>
<td>Y69A, Y79A</td>
<td>-</td>
<td>-</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (NPN)</td>
<td>5V, 12V</td>
<td>Y7PV, Y7P</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (PNP)</td>
<td>5V, 12V</td>
<td>Y69B, Y79B</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>5V, 12V</td>
<td>Y7NW, Y7NW</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>5V, 12V</td>
<td>Y7PW, Y7PW</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>5V, 12V</td>
<td>Y7BW, Y7BW</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>5V, 12V</td>
<td>Y7BA</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

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

** Auto switches marked with a “○” symbol 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>1.05MPa (150psi)</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>0.7MPa (101psi)</td>
</tr>
<tr>
<td>Minimum operating pressure</td>
<td>0.05MPa (72psi)</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>Without auto switch: -10 to 70°C (14 to 158°F) (with no freezing)</td>
</tr>
<tr>
<td></td>
<td>With auto switch: -10 to 60°C (14 to 140°F) (with no freezing)</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Non-lube</td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper</td>
</tr>
<tr>
<td>Rod end threads</td>
<td>Female threads</td>
</tr>
<tr>
<td>Thread tolerance</td>
<td>JIS class 2</td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>+1.4 (±0.06in)</td>
</tr>
<tr>
<td>Mounting brackets</td>
<td>Basic type</td>
</tr>
<tr>
<td>Mounting</td>
<td>Through hole/Double end tapped</td>
</tr>
</tbody>
</table>

**Standard Strokes**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard strokes (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>180, 200</td>
<td>10, 20, 30, 40, 50, 75, 100, 125, 150, 175, 200, 250, 300</td>
</tr>
</tbody>
</table>

* Manufacture of intermediate strokes
  Intermediate strokes in 5mm increments can be manufactured by installing spacers inside standard stroke cylinders.
  Example) CQ2B180-160DC is produced by installing a 15mm spacer in a standard stroke cylinder CQ2B180-175DC.

**Minimum Strokes for Mounting of Auto Switches**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>D-Z7, Z8</th>
<th>D-Y5, Y6, Y7</th>
<th>DD-Y7/W, D-Y7BAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>180, 200</td>
<td>2 pcs. (different sides, same side)</td>
<td>10 (0.4)</td>
<td>5 (0.2)</td>
</tr>
<tr>
<td></td>
<td>1 pc.</td>
<td>5 (0.2)</td>
<td>5 (0.2)</td>
</tr>
</tbody>
</table>

**Theoretical Output/Double Acting Type**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Operating direction</th>
<th>Operating Pressure MPa (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IN</td>
<td>OUT</td>
</tr>
<tr>
<td>180</td>
<td>4838</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>7257</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>9676</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>12095</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>14514</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>16933</td>
<td>25.41</td>
</tr>
<tr>
<td>200</td>
<td>5089</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>7634</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>10179</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>12724</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>15268</td>
<td>25.41</td>
</tr>
<tr>
<td></td>
<td>17812</td>
<td>25.41</td>
</tr>
<tr>
<td>1N = 0.2248lbf</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Weight Table**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard strokes (mm)</th>
<th>With magnet</th>
<th>Rod end male threads</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>10 20 30 40 50 75 100 125 150 175</td>
<td>Additional weight</td>
<td>0.08</td>
</tr>
<tr>
<td>200</td>
<td>15.30 15.87 16.35 16.84 17.33 18.55 19.77 20.99 22.21 23.43 24.74 27.08 29.52</td>
<td>Additional weight</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Example) CQ2B180-100DCM
  Basic weight: CQ2B180-100DC 15.80kg
  Additional weight: Built-in magnet 0.08kg
  Rod end male threads: 0.74kg
  Total: 16.62kg

1in = 25.4mm
1kg = 2.2248lb
Compact Cylinder
Series CQ2
Double Acting: Single Rod

Construction

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>Cylinder tube</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>2</td>
<td>Head cover</td>
<td>Cast iron</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>3</td>
<td>Piston</td>
<td>Aluminum alloy casting</td>
<td>Chromated</td>
</tr>
<tr>
<td>4</td>
<td>Piston rod</td>
<td>Carbon steel</td>
<td>Hard chrome plated</td>
</tr>
<tr>
<td>5</td>
<td>Rod cover</td>
<td>Cast iron</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>6</td>
<td>Snap ring</td>
<td>Carbon tool steel</td>
<td>Phosphate coated</td>
</tr>
<tr>
<td>7</td>
<td>Bumper</td>
<td>Polyurethane</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bushing</td>
<td>Lead-bronze casting</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Wear ring</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Magnet</td>
<td>–</td>
<td>CDQ2B only</td>
</tr>
</tbody>
</table>

Rod end male threads

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Rod end nut</td>
<td>Rolled steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>12</td>
<td>Piston seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Rod seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Tube gasket</td>
<td>NBR</td>
<td></td>
</tr>
</tbody>
</table>

Replacement parts: Seal kits

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Seal kit No.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>CQ2B180-PS</td>
<td>A set of Nos.12, 13 and 14 from the table above</td>
</tr>
<tr>
<td>200</td>
<td>CQ2B200-PS</td>
<td></td>
</tr>
</tbody>
</table>

Mounting

Mounting/Through hole type mounting bolts are available.
How to order: Add "Bolt" in front of the bolts to be used.
(Example) Bolt M18 x 125

Note 1) When mounting with through hole type mounting bolts, be sure to use the flat washers which are included.
Note 2) When mounting a cylinder with a stroke over 100mm, use the section A mounting threads.

Model | C | D  | Mounting bolt (mm) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C (D) CQ2180-10DC</td>
<td>125</td>
<td>M18 x 125</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2180-20DC</td>
<td>135</td>
<td>M18 x 135</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2180-30DC</td>
<td>145</td>
<td>M18 x 145</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2180-40DC</td>
<td>155</td>
<td>M18 x 155</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2180-50DC</td>
<td>165</td>
<td>M18 x 165</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2180-75DC</td>
<td>190</td>
<td>M18 x 190</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2180-100DC</td>
<td>215</td>
<td>M18 x 215</td>
<td></td>
</tr>
</tbody>
</table>

Model | C | D | Mounting bolt (mm) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C (D) CQ2B200-10DC</td>
<td>135</td>
<td>M18 x 135</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2B200-20DC</td>
<td>145</td>
<td>M18 x 145</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2B200-30DC</td>
<td>155</td>
<td>M18 x 155</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2B200-40DC</td>
<td>165</td>
<td>M18 x 165</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2B200-50DC</td>
<td>175</td>
<td>M18 x 175</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2B200-75DC</td>
<td>200</td>
<td>M18 x 200</td>
<td></td>
</tr>
<tr>
<td>C (D) CQ2B200-100DC</td>
<td>225</td>
<td>M18 x 225</td>
<td></td>
</tr>
</tbody>
</table>

1in = 25.4mm
Series CQ2
Compact Cylinder
Double Acting: Single Rod

Dimensions (mm)

Dimensions are the same with and without auto switches.

ø180

Dimensions (mm)

ø200

Note 1) 2 x 4-M22 x 2.5 threads through for strokes of 20mm or less.
### How to Order

#### Compact Cylinder/Double Acting: Double Rod

**Series CQ2W**

**ø180, ø200**

#### CQ2WB

**With Auto Switch**

- **Number of auto switches**
  - Nil
  - S
  - n

- **Auto switch type**
  - Nil
  - Without auto switch (built-in magnet cylinder)

- **Mounting**
  - B: Standard (through hole/double end tapped)

- **Bore size**
  - ø180
  - ø200

- **Cylinder stroke (mm)**
  - Refer to the standard stroke table on page 6.

- **Rear end threads**
  - Nil
  - Standard (rod end female threads)
  - M: Rod end male threads

- **Cushion**
  - C: Rubber bumper

- **Action**
  - D: Double acting

#### CDQ2WB

- **Number of auto switches**
  - Nil
  - 2 pcs.

- **Auto switch type**
  - Nil
  - Without auto switch (built-in magnet cylinder)

- **Mounting**
  - B: Standard (through hole/double end tapped)

- **Bore size**
  - ø180
  - ø200

- **Cylinder stroke (mm)**
  - Refer to the standard stroke table on page 6.

- **Rear end threads**
  - Nil
  - Standard (rod end female threads)
  - M: Rod end male threads

- **Cushion**
  - C: Rubber bumper

- **Action**
  - D: Double acting

#### Applicable auto switches

<table>
<thead>
<tr>
<th>Type</th>
<th>Special function</th>
<th>Electrical entry</th>
<th>Indicator light</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch models</th>
<th>Lead wire length (mm)</th>
<th>Applicable loads</th>
<th>Detailed specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>—</td>
<td>Grommet</td>
<td>Yes</td>
<td>3 wire</td>
<td>5V</td>
<td>Z76</td>
<td>—</td>
<td>—</td>
<td>P.9</td>
</tr>
<tr>
<td>Solid state switch</td>
<td>—</td>
<td>Grommet</td>
<td>Yes</td>
<td>3 wire (NPN)</td>
<td>5V, 12V</td>
<td>Y69A Y79A</td>
<td>—</td>
<td>—</td>
<td>P.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 wire (PNP)</td>
<td>12V</td>
<td>Y7PV Y79B</td>
<td>—</td>
<td>—</td>
<td>P.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 wire</td>
<td>5V, 12V</td>
<td>Y69B Y79B</td>
<td>—</td>
<td>—</td>
<td>P.12</td>
</tr>
</tbody>
</table>

- Load voltage: DC, AC
- Auto switch models: Relay, PLC
- Lead wire length: 0.5 (Nil), 3 (L), 5 (Z)
- Applicable loads: Y69A, Y79A, Y7PV, Y79B, Y69B, Y79B, Y7PV, Y79B
- Detailed specifications: P.9, P.10, P.11, P.12

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

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

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fluid</strong></td>
<td>Air</td>
</tr>
<tr>
<td><strong>Proof pressure</strong></td>
<td>1.05MPa (152psi)</td>
</tr>
<tr>
<td><strong>Maximum operating pressure</strong></td>
<td>0.7MPa (101psi)</td>
</tr>
<tr>
<td><strong>Minimum operating pressure</strong></td>
<td>0.05MPa (7psi)</td>
</tr>
</tbody>
</table>
| **Ambient and fluid temperature** | Without auto switch: -10°C to 70°C (with no freezing) (14° to 158°F)  
With auto switch: -10°C to 60°C (with no freezing) (14° to 140°F) |
| **Lubrication**      | Non-lube type |
| **Cushion**          | Rubber bumper |
| **Rod end threads**  | Female thread |
| **Thread tolerance** | JIS class 2 |
| **Stroke length tolerance** | +0.06in |
| **Mounting brackets**| Basic type |
| **Mounting**         | Through hole/Double end tapped |

**Standard Strokes**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard strokes (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>180, 200</td>
<td>10, 20, 30, 40, 50, 75, 100, 125, 150, 175, 200, 250, 300</td>
</tr>
</tbody>
</table>

**Minimum Strokes for Auto Switch Mounting**

<table>
<thead>
<tr>
<th></th>
<th>D-Z7, Z8</th>
<th>D-Y5, Y6, Y7</th>
<th>D-Y7, W, D-Y7B/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>bore size (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180, 200</td>
<td>10 (0.4)</td>
<td>5 (0.2)</td>
<td>15 (0.6)</td>
</tr>
<tr>
<td></td>
<td>2 pcs. (different sides, same side)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 pc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Theoretical Output/Double Acting**

<table>
<thead>
<tr>
<th>Bore Size (mm)</th>
<th>Operating pressure MPa (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>0.2 (29) 0.3 (43.5) 0.4 (58) 0.5 (72.5) 0.6 (87) 0.7 (101.5)</td>
</tr>
<tr>
<td>200</td>
<td>4.514 (3263)</td>
</tr>
<tr>
<td></td>
<td>16,933 (3807)</td>
</tr>
</tbody>
</table>

**Weight Table**

<table>
<thead>
<tr>
<th></th>
<th>Standard strokes (mm)</th>
<th>With magnet</th>
<th>Rod end male threads</th>
</tr>
</thead>
<tbody>
<tr>
<td>bore size (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>10 20 30 40 50 75 100 125 150 200 250 300</td>
<td>With magnet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional weight</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>12.18 12.70 13.23 13.75 14.28 15.59 16.90 18.21 19.52 20.83 22.14 24.76 27.39</td>
<td>0.08</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional weight</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>15.63 16.22 16.80 17.39 17.97 19.44 20.91 22.37 23.84 25.30 26.77 28.70 32.63</td>
<td>0.09</td>
<td>1.48</td>
</tr>
</tbody>
</table>

Example) CDQ2WB200-100DCM  
Basic weight 20.91kg  
Additional weight 0.09kg  
Built-in magnet 1.48kg  
Rod end male threads 1.48kg  
Total 22.48kg  

Unit: 1kg  
1in = 25.4mm  
1kg = 2.2248lb
Compact Cylinder Series CQ2

Double Acting: Single Rod

Construction

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>Cylinder tube</td>
<td>Aluminum alloy</td>
<td>Hard anodized</td>
</tr>
<tr>
<td>2</td>
<td>Piston</td>
<td>Aluminum alloy casting</td>
<td>Chromated</td>
</tr>
<tr>
<td>3</td>
<td>Piston rod A</td>
<td>Carbon steel</td>
<td>Hard chrome plated</td>
</tr>
<tr>
<td>4</td>
<td>Piston rod B</td>
<td>Carbon steel</td>
<td>Hard chrome plated</td>
</tr>
<tr>
<td>5</td>
<td>Rod cover</td>
<td>Cast iron</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>6</td>
<td>Snap ring</td>
<td>Carbon tool steel</td>
<td>Phosphate coated</td>
</tr>
<tr>
<td>7</td>
<td>Bumper</td>
<td>Polyurethane</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bushing</td>
<td>Lead-bronze casting</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Magnet</td>
<td></td>
<td>CDQ2B only</td>
</tr>
<tr>
<td>10</td>
<td>Rod end nut</td>
<td>Rolled steel</td>
<td>Nickel plated</td>
</tr>
</tbody>
</table>

Material

- Aluminum alloy
- Aluminum alloy casting
- Carbon steel
- Carbon steel
- Cast iron
- Carbon tool steel
- Polyurethane
- Lead-bronze casting

Note

- Hard anodized
- Chromated
- Hard chrome plated
- Nickel plated
- Phosphate coated
- CDQ2B only
- Rolled steel

Replacement parts: Seal kits

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Seal kit No.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>CQ2WB180-PS</td>
<td>A set of Nos.11, 12 and 13 from the table above</td>
</tr>
<tr>
<td>200</td>
<td>CQ2WB200-PS</td>
<td></td>
</tr>
</tbody>
</table>

Material

- NBR

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Piston seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Rod seal</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Tube gasket</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Piston gasket</td>
<td>NBR</td>
<td></td>
</tr>
</tbody>
</table>

Mounting

Mounting/Through hole type mounting bolts are available.

How to order: Add "Bolt" in front of the bolts to be used.

(Example) Bolt M18 x 125

1in = 25.4mm

<table>
<thead>
<tr>
<th>Model</th>
<th>C</th>
<th>D</th>
<th>Mounting bolt (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C (D) Q2WB180-10DC</td>
<td>125</td>
<td>M18 x 125</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB180-20DC</td>
<td>135</td>
<td>M18 x 135</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB180-30DC</td>
<td>145</td>
<td>M18 x 145</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB180-40DC</td>
<td>155</td>
<td>M18 x 155</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB180-50DC</td>
<td>165</td>
<td>M18 x 165</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB180-75DC</td>
<td>190</td>
<td>M18 x 190</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB180-100DC</td>
<td>215</td>
<td>M18 x 215</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>C</th>
<th>D</th>
<th>Mounting bolt (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C (D) Q2WB200-10DC</td>
<td>135</td>
<td>M18 x 135</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB200-20DC</td>
<td>145</td>
<td>M18 x 145</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB200-30DC</td>
<td>155</td>
<td>M18 x 155</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB200-40DC</td>
<td>165</td>
<td>M18 x 165</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB200-50DC</td>
<td>175</td>
<td>M18 x 175</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB200-75DC</td>
<td>200</td>
<td>M18 x 200</td>
<td></td>
</tr>
<tr>
<td>C (D) Q2WB200-100DC</td>
<td>225</td>
<td>M18 x 225</td>
<td></td>
</tr>
</tbody>
</table>

1) When mounting with through hole type mounting bolts, be sure to use the flat washers which are included.

2) When mounting a cylinder with a stroke over 100mm, use the section A mounting threads.
### Dimensions (mm)

**Series CQ2 Compact Cylinder**

**Double Acting: Single Rod**

**Dimensions are the same with and without auto switches.**

1in = 25.4mm

<table>
<thead>
<tr>
<th>ø180</th>
<th>ø200</th>
</tr>
</thead>
</table>

#### ø180

- **2 x 4-ø31.5 depth of counter bore 26**
- **2-M24 x 3 effective thread depth 33**
- **Width across flats 36**
- **Width across flats 55**
- **M36 x 1.5**
- **Flat washer 4 pcs.**

#### ø200

- **2 x 4-ø31.5 depth of counter bore 26**
- **2-M24 x 3 effective thread depth 33**
- **Width across flats 36**
- **Width across flats 55**
- **M36 x 1.5**

**Note 1)** 2 x 4-M22 x 2.5 threads through for strokes of 20mm or less.
Auto Switch Specifications

### With indicator light

<table>
<thead>
<tr>
<th>Auto switch part no.</th>
<th>D-Z73</th>
<th>D-Z76</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical entry direction</strong></td>
<td>In-line</td>
<td>In-line</td>
</tr>
<tr>
<td><strong>Applicable loads</strong></td>
<td>Relay, PLC</td>
<td>IC circuit</td>
</tr>
<tr>
<td><strong>Load voltage</strong></td>
<td>24VDC</td>
<td>100VAC</td>
</tr>
<tr>
<td><strong>Load voltage</strong></td>
<td>4 to 8VDC</td>
<td>4 to 8VDC</td>
</tr>
<tr>
<td><strong>Maximum load current</strong></td>
<td>5 to 40mA</td>
<td>5 to 20mA</td>
</tr>
<tr>
<td><strong>Maximum load current</strong></td>
<td>20mA</td>
<td>20mA</td>
</tr>
<tr>
<td><strong>Contact protection circuit</strong></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Internal voltage drop</strong></td>
<td>2.4V or less (to 20mA/3V or less (to 40mA))</td>
<td>0.8V or less</td>
</tr>
<tr>
<td><strong>Indicator light</strong></td>
<td>Red LED lights up when ON</td>
<td>Red LED lights up when ON</td>
</tr>
</tbody>
</table>

### Without indicator light

<table>
<thead>
<tr>
<th>Auto switch part no.</th>
<th>D-Z80</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical entry direction</strong></td>
<td>In-line</td>
</tr>
<tr>
<td><strong>Applicable load</strong></td>
<td>Relay, PLC, IC circuit</td>
</tr>
<tr>
<td><strong>Load voltage</strong></td>
<td>24VDC or less</td>
</tr>
<tr>
<td><strong>Load voltage</strong></td>
<td>48VDC or 100VDC</td>
</tr>
<tr>
<td><strong>Maximum load current</strong></td>
<td>50mA</td>
</tr>
<tr>
<td><strong>Maximum load current</strong></td>
<td>40mA</td>
</tr>
<tr>
<td><strong>Contact protection circuit</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Internal resistance</strong></td>
<td>1Ω or less (including lead wire length of 3m)</td>
</tr>
</tbody>
</table>

### Internal circuits

- **D-Z73**
  - Reed switch
  - Resistor
  - Zener diode
  - Contact protection box
  - LED (Brown [Red], Blue [Black])
  - OUT (+) Brown [Red]
  - OUT (-) Blue [Black]

- **D-Z76**
  - Reed switch
  - Resistor
  - Zener diode
  - Contact protection box
  - LED (Brown [Red], Blue [Black])
  - OUT (+) Brown [Red]
  - OUT (-) Blue [Black]

- **D-Z80**
  - Reed switch
  - Resistor
  - Reverse current prevention diode
  - Contact protection box
  - LED (Brown [Red], Blue [Black])
  - OUT (+) Brown [Red]
  - OUT (-) Blue [Black]

### Weight Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length 0.5m (~1 1/2ft)</th>
<th>Lead wire length 3m (~9ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Z73</td>
<td>9 (0.3)</td>
<td>49 (1.7)</td>
</tr>
<tr>
<td>D-Z76</td>
<td>10 (0.35)</td>
<td>55 (1.9)</td>
</tr>
<tr>
<td>D-Z80</td>
<td>9 (0.3)</td>
<td>49 (1.7)</td>
</tr>
</tbody>
</table>

### Dimensions (mm)

- **D-Z73**
  - 1in = 25.4mm
  - 30.5
  - Switch mounting screw
  - Slotted head set screw (M2.5 x 4)
  - Operating range
  - 180
  - 200
  - Operating range 1 (mm) 15 (0.6) 15 (0.6)

- **D-Z76, Z80**
  - 27.6
  - Switch mounting screw
  - Slotted head set screw (M2.5 x 4)
  - Operating range
  - Type D-Z80 without indicator light
  - 1.5
  - Operating range
  - Type D-Z80 without indicator light
  - Operating range
  - 1.5
  - Most sensitive position

---

**Note:** This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).

---

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

Use a contact protection box in any of the above situations, as the life of the contacts may otherwise be reduced. (Refer to page 14 for detailed specifications of the contact protection boxes.)
Auto Switch Specifications

D-Y5, D-Y6, D-Y7P, D-Y7PV (with indicator light)

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

- Operating time ............ 1ms or less
- Lead wires ............... Heavy duty oil resistant flexible vinyl cord, ø3.4 , 0.15mm², 3 wire (brown, black, blue [red, white, black]), 2 wire (brown, blue [red, black]), 0.5m
- For a lead wire length of 3m, “L” is shown at the end of the part number. (Example) D-Y59AL
- Insulation resistance ... 50MΩ or more at 500VDC (between lead wire and case)
- Withstand voltage ......... 1000VAC for 1 min. (between lead wire and case)
- Ambient temperature ...... -10 to 60°C (14 to 140°F)
- Enclosure .......... IEC529 standard IP67, watertight (JISC0920)

**Weight Table**

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Y59A, Y69A, Y7P</td>
<td>0.5m (~1 /2ft)</td>
</tr>
<tr>
<td>D-Y59B, Y69B, Y7PV</td>
<td>0.5m (~1 /2ft)</td>
</tr>
<tr>
<td>D-Y59AL</td>
<td>3m (~9ft)</td>
</tr>
<tr>
<td>D-Y69AL</td>
<td>3m (~9ft)</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>D-Y59A, Y59B</th>
<th>D-Y7P</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Y7P (V)</td>
<td>10 (0.35)</td>
</tr>
<tr>
<td>D-Y7PV</td>
<td>9 (0.3)</td>
</tr>
</tbody>
</table>

**Note** This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).
Auto Switch Specifications

**D-Y7□W, D-Y7□WV (with indicator light)**

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

**Weight Table**

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Y7N, Y7P</td>
<td>0.5m (~1 1/2ft) 3m (~9ft)</td>
</tr>
<tr>
<td>D-Y7B</td>
<td>9 (0.3) 50 (1.8)</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

**D-Y7□W**

- Mounting screw M2.5 x 4
- Slotted head set screw
- Indicator light
- Operating range (see table below)
- Most sensitive position
- 1 in = 25.4mm

**D-Y7□WV**

- Mounting screw M2.5 x 4
- Slotted head set screw
- Indicator light
- Operating range (see table below)
- Most sensitive position
- 1 in = 25.4mm

<table>
<thead>
<tr>
<th>Model</th>
<th>Bore size</th>
<th>Bore size mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Y7N</td>
<td>180</td>
<td>0.071</td>
</tr>
<tr>
<td>D-Y7P</td>
<td>200</td>
<td>0.079</td>
</tr>
<tr>
<td>D-Y7B</td>
<td>8 (0.3)</td>
<td>8.5 (0.3)</td>
</tr>
</tbody>
</table>

**Note** This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).
Auto Switch Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Lead wire length</th>
<th>Unit: g (oz.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Y7BAL</td>
<td>3m (~9ft)</td>
<td>51 (1.8)</td>
</tr>
</tbody>
</table>

Indicated light/Display method

1. Contact SMC if a solution other than water is to be used.

Operating Precautions

**Caution**

- Operating time: 1ms or less
- Lead wires: Heavy duty oil resistant flexible vinyl cord, ø3.4, 0.15mm², 2 wire (brown, blue [red, black]), 3m
- Impact resistance: 1,000m/s² (102G)
- Insulation resistance: 50MΩ or more at 500VDC (between lead wire and case)
- Withstand voltage: 1000VAC for 1 min. (between lead wire and case)
- Ambient temperature: -10 to 60°C (14 to 140°F)
- Enclosure: IEC529 standard IP67, watertight (JISC0920)

Weight Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Bore size</th>
<th>Bore size mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operating range</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>Operating range</td>
<td>7 (0.3)</td>
</tr>
</tbody>
</table>

Note: This is a standard including hysteresis, and is not guaranteed. There may be large variations depending on the surrounding environment (variations as much as ±30%).
Auto Switches/Proper Mounting Position for Stroke End Detection

<table>
<thead>
<tr>
<th>Proper mounting position mm (in)</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore size (mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>38.5 (1.5)</td>
<td>38.5 (1.5)</td>
</tr>
<tr>
<td>200</td>
<td>42 (1.7)</td>
<td>42 (1.7)</td>
</tr>
</tbody>
</table>

* Dimensions are the same for single rod and double rod.

Minimum Strokes for Mounting of Auto Switches

<table>
<thead>
<tr>
<th></th>
<th>D-Z7, Z8</th>
<th>D-Y5, Y6, Y7</th>
<th>D-Y7, W</th>
</tr>
</thead>
<tbody>
<tr>
<td>180, 200</td>
<td>10 (0.4)</td>
<td>5 (0.2)</td>
<td>15 (0.6)</td>
</tr>
<tr>
<td>1mm (in)</td>
<td>5 (0.2)</td>
<td>5 (0.2)</td>
<td>10 (0.4)</td>
</tr>
</tbody>
</table>

Auto Switch Mounting

When mounting an auto switch, insert it into the cylinder's switch mounting groove from the direction shown in the drawing below. After setting it in the desired mounting position, tighten the switch mounting screw which is included using a flat head watchmakers screw driver.

Note) When tightening the auto switch mounting screw (included with auto switch), use a watchmakers screw driver with a handle about 5 to 6mm in diameter. Also tighten with a torque of 0.05 to 0.1N·m. As a rule, it should be turned about 90° past the point at which tightening can be felt.

Contact Protection Boxes/CD-P11, CD-P12

D-Z7 and D-Z8 type switches do not have internal contact protection circuits. A contact protection box should be used in any of the following cases.
1. The operated load is an induction load.
2. The length of wiring to the load is 5m or more.
3. The load voltage is 100VAC.

Contact protection box specifications

<table>
<thead>
<tr>
<th>Load voltage</th>
<th>CD-P11</th>
<th>CD-P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>100VAC or less</td>
<td>25mA</td>
<td>12.5mA</td>
</tr>
<tr>
<td>200VAC</td>
<td>25mA</td>
<td>50mA</td>
</tr>
<tr>
<td>24VDC</td>
<td>50mA</td>
<td></td>
</tr>
</tbody>
</table>

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

Contact protection box internal circuits

<table>
<thead>
<tr>
<th>CD-P11</th>
<th>CD-P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge absorber</td>
<td>OUT Brown [Red]</td>
</tr>
<tr>
<td>Choke coil</td>
<td>~</td>
</tr>
<tr>
<td>Choke coil</td>
<td>OUT (+) Brown [Red]</td>
</tr>
<tr>
<td>Zener diode</td>
<td>OUT (-)</td>
</tr>
</tbody>
</table>

Contact Protection Box Connection

To connect a switch unit to a contact protection box, connect the lead wires from the side of the contact protection box marked SWITCH to the lead wires coming out of the switch unit. Further, the switch unit and contact protection box should be placed as close together as possible with a lead wire length no greater than 1 meter.
Basic Wiring

Solid state 3 wire, NPN

Solid state 3 wire, PNP

2 wire (Solid state)

2 wire (Reed switch)

Examples of Connection to PLC

Sink input specifications

Source input specifications

3 wire, NPN

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)

Load

Relay contact

2 wire with 2 switch AND connection

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

2 wire with 2 switch OR connection

(Reed switch)

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

Load voltage at ON = Power supply voltage – Residual voltage $\times$ 2 pcs.

Example: Power supply is 24VDC Voltage decline in switch is 4V

Load voltage at OFF = Leakage current $\times$ 2 pcs. $\times$ Load impedance

Example: Load impedance is 3kΩ Leakage current from switch is 1mA
These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠️ **Caution** : Operator error could result in injury or equipment damage.

⚠️ **Warning** : Operator error could result in serious injury or loss of life.

⚠️ **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

---

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

---

⚠️ **Warning**

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

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

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

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

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

2. **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 stationary parts and connected parts so that they will not become loose.**
   
   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 pressure inside the cylinder. Therefore, equipment should be selected and circuits designed to prevent sudden lurching because, there is a danger of human injury and/or damage to equipment when this occurs.

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

9. **Consider the action when operation is restarted after an emergency stop or abnormal stop.**
   
   Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install manual safety equipment.

## Caution

1. **Operate within the limits of the maximum usable stroke.**
   
   The piston rod will be damaged if operated beyond the maximum stroke. Refer to the air cylinder model selection 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.**

## Selection

1. **Confirm the specifications.**
   
   The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specifications, 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. **Be certain to match the rod shaft center with the load and direction of movement when connecting.**
   
   When not properly matched, problems may arise with the rod and tube, and damage may be caused due to friction on areas such as the inner tube surface, bushings, rod surface and seals.

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

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

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

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

   Wrapping direction

   Expose Approx. 2 threads

1. Lubrication of lube type cylinders
   Install a lubricator in the circuit and supply with class 1 turbine oil
   (without additives) ISO VG32.
   Do not use machine oil or spindle oil.

2. 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.

1. Use clean air.
   If compressed air includes chemicals, synthetic oils containing
   organic solvents, salt or corrosive gases, etc., it can cause dam-
   age or malfunction.

   Warning

   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 for 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.

3. **Pay attention to the length of time that a switch is ON at an intermediate stroke position.**
   When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:
   \[ V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Time load applied (ms)}} \times 1000 \]

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

5. **Pay attention to the internal voltage drop of the switch.**
   <Reed switches>
   1) Switches with an indicator light (Except D-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.

   ![Diagram of wiring connection]

6. **Pay attention to leakage current.**
   <Solid state switches>
   With a 2 wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.
   \[ \text{Operating current of load (OFF condition)} > \text{Leakage current} \]
   If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3 wire switch if this specification will not be satisfied.
   Moreover, leakage current flow to the load will be “n” times larger when “n” auto switches are connected in parallel.

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

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

9. **Ensure sufficient clearance for maintenance activities.**
   When designing an application, be sure to allow sufficient clearance for maintenance and inspections.
**Mounting & 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 may cause internal elements of the switch to be damaged by the stress.

3. **Mount switches using the proper tightening torque.**
   If a switch is tightened beyond the range of tightening torque, the mounting screws 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 instructions for each series for 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 position shown in the catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will 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.

---

**Warning**

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

   **<Solid state switches>**
   All models of PNP output type switches do not have built-in short circuit protection circuits. Note that if a load is short circuited, the switch will be instantly damaged as in the case of reed switches.

   *Take special care to avoid reverse wiring with the brown (red) power supply line and the black (white) output line on 3 wire type switches.

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

   1) If connections are reversed on a 2 wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.

   2) If connections are reversed (power supply line + and power supply line –) on a 3 wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue (black) wire and the power supply line (–) is connected to the black (white) wire, the switch will be damaged.

---

**Lead wire color changes**

Lead wire colors of SMC switches and related products have been changed in order to meet NECA (Nippon Electric Control Equipment Industries Association) Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided.

Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

### 2 wire

<table>
<thead>
<tr>
<th></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></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></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>Latch type diagnostic output</td>
<td>Yellow</td>
<td>Orange</td>
</tr>
</tbody>
</table>
### Operating Environment

<table>
<thead>
<tr>
<th>Warning</th>
</tr>
</thead>
</table>
| 1. **Never use in an atmosphere of explosive gases.**  
The structure 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 structure), 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 there may be adverse effects inside the switches. |
| 6. **Do not use in an environment where there is excessive impact shock.**  
**<Reed switches>**  
When excessive impact (300m/s² or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment. |
| 7. **Do not use in an area where surges are generated.**  
**<Solid state switches>**  
When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to the switch. Avoid sources of surge generation and disorganized lines. |
| 8. **Avoid accumulation of iron waste or close contact with magnetic substances.**  
When a large amount of iron waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the cylinder. |

### Maintenance

<table>
<thead>
<tr>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.</strong></td>
</tr>
</tbody>
</table>
| 1) Secure and 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 indicator 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

<table>
<thead>
<tr>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.</td>
</tr>
</tbody>
</table>
Compact Cylinder

Specific Product Precautions
Be sure to read before handling
Refer to pages 15 through 20 for safety instructions, actuator precautions and auto switch precautions

Installation and Removal of Snap Rings

\[ \text{Caution} \]

1. Use appropriate pliers (C type snap ring installing tool) for installation and removal.
2. Even when using appropriate pliers (C type snap ring installing tool), proceed with caution as there is a danger of the snap ring flying off the end of the pliers (C type snap ring installing tool) and causing human injury or damage to nearby equipment. After installation, confirm that the snap ring is securely seated into the snap ring groove before supplying air.

Mounting (for Double Rod End)

\[ \text{Caution} \]

1. When removing the load, be sure that the load side piston rod wrench flat section is secured to prevent turning.
2. Note that if this is done without securing the load side piston rod, the piston rod connection (screwed-

Selection

\[ \text{Caution} \]

1. Large bore compact cylinders have a shorter overall length and are lighter in weight than conventional tie-rod type large bore cylinders. However, covers secured with snap rings, and rubber bumpers, etc., have operational design values lower than the tie-rod type. Be sure to consider factors such as the allowable kinetic energy and allowable lateral load, and operate within the specified ranges.

Allowable kinetic energy

<table>
<thead>
<tr>
<th>Piston speed</th>
<th>180</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston speed</td>
<td>20 to 400mm/s</td>
<td></td>
</tr>
<tr>
<td>Allowable kinetic energy</td>
<td>12.4J</td>
<td></td>
</tr>
</tbody>
</table>

Kinetic energy \( E (J) = \frac{(m_1 + m_2) V^2}{2} \)

m1: Weight of moving cylinder parts kg
m2: Load weight kg
V: Piston speed m/s

Example: Cylinder CDQ2B180-100DCM
Load weight 10kg
Piston speed 100mm/s = 0.1m/s

Computation of m2
Basic weight CQ2B180-100DC 3.48kg
Additional weight Built-in magnet 0.08kg
Rod end male threads 0.74kg

Computation of E
\[ E = \frac{(4.3 + 10) \times (0.1)^2}{2} = 0.0715J \]

Allowable lateral load at rod end

Use the graph as a guide and operate at no more than the allowable lateral load.

Note:
1in = 25.4mm
1N = 0.2248lbf
1kg = 2.2046lb
1J = 0.7375ft.lbf
SMC offers the same quality and engineering expertise in many other pneumatic components

Valves
- Directional Control Valves
- Manual Valves
- Mufflers
- Exhaust Cleaners
- Quick Exhaust Valves

Valves
- Proportional Valves
- Mechanical Valves
- Miniature Valves
- Fluid Valves

Cylinders/Actuators
- Compact Cylinders
- Miniature Cylinders
- Rodless Cylinders
- Rotary Actuators
- Pneumatic Grippers

Vacuum
- Vacuum Ejectors
- Vacuum Accessories

Instrumentation
- Pneumatic Positioners
- Pneumatic Transducers

Air Preparation Equipment
- Filters-Regulators-Lubricators
- Coalescing Filters
- Micro Mist Separators

Fittings
- Air Fittings