Low Speed Cylinder

**CJ2X/CUX/CQSX/CQ2X/CM2X**

<table>
<thead>
<tr>
<th>Series</th>
<th>Bore size (mm)</th>
<th>Minimum operating pressure (MPa)</th>
<th>Minimum operating piston speed (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ2X</td>
<td>10, 16</td>
<td>0.06</td>
<td>1</td>
</tr>
<tr>
<td>CUX</td>
<td>10, 16</td>
<td>0.06</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>20, 25, 32</td>
<td>0.05</td>
<td>0.5</td>
</tr>
<tr>
<td>CQSX</td>
<td>12, 16</td>
<td>0.03</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>20, 25</td>
<td>0.025</td>
<td>0.5</td>
</tr>
<tr>
<td>CQ2X</td>
<td>32, 40</td>
<td>0.025</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>50, 63, 80, 100</td>
<td>0.01</td>
<td>0.5</td>
</tr>
<tr>
<td>CM2X</td>
<td>20, 25, 32, 40</td>
<td>0.025</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Clean Series

<table>
<thead>
<tr>
<th>Series</th>
<th>Bore size (mm)</th>
<th>Minimum operating pressure (MPa)</th>
<th>Minimum operating piston speed (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CQSX</td>
<td>10-/11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CQ2X</td>
<td>10-/11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM2X</td>
<td>10-/11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Improved low friction characteristics (CM2X, CQSX, CQ2X)
Minimum operating pressure is reduced in half (compared to previous version).
Stabilization of thrust has been realized.

Stable low speed operation even at 0.5 mm/s
(1 mm/s for ø16 or smaller) is achieved.
Operates smoothly with minimal stick-slip.

Possible to transfer a workpiece which
hates shocks at lower speeds.
Smooth start with a little ejection even after being rendered for hours.

The dimensions of all models are the same as those of standard cylinders.
Clean room specification has been added. 
(10/-11-CQSX, CQ2X, CM2X)
Particulate generation data for microspeed cylinder with clean room specifications are measured using the following test method.

[Example of test method]
The test sample is in place in an acrylic chamber. The chamber is set up on a Class 100 clean bench. The solenoid valve is operated while supplying a volume of clean air equal to the intake volume of a laser dust monitor (28.3 \( \ell \)/min). The amount of particle generation is measured for a specific number of operating cycles.

### Measuring Conditions

<table>
<thead>
<tr>
<th>Chamber volume</th>
<th>Purity of air supplied to chamber</th>
<th>Laser dust monitor</th>
<th>Laser dust monitor setting conditions</th>
<th>Cylinder operating conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 ( \ell )</td>
<td>Same quality as supply air</td>
<td>Hitachi Electroncis Engineering Corporation TS-6200 Min. measurable particle dia.: 0.1 ( \mu m ) Intake rate: 28.3 ( \ell )/min</td>
<td>Sampling time: 5 min Interval time: 55 min</td>
<td>Operating frequency: 30 cpm Average piston speed: 100 mm/s Mounting: Horizontal no-load Supply pressure: 0.5 MPa</td>
</tr>
</tbody>
</table>

### 10-CQSXB20-50D

**Evaluation of air purity inside chamber**

- Particle concentration (particles/cf) vs. Particle diameter (\( \mu m \))

### 10-CM2XB20-50

**Evaluation of air purity inside chamber**

- Particle concentration (particles/cf) vs. Particle diameter (\( \mu m \))

---

Particle generation measuring circuit
Recommended Pneumatic Circuit

**Warning**

**Horizontal Operation**

1. **Meter-in speed controllers**
   Meter-in speed controllers can reduce lurching while controlling the speed. The two knobs facilitate adjustment.

2. **Dual speed controllers**
   Velocity is controlled by meter-out circuit. Using concurrently the meter-in circuit can alleviate the stick-slip. More stable low speed operation can be achieved than meter-in circuit alone.

**Vertical Operation**

1. **Meter-in speed controllers**
   Meter-in speed controllers can reduce lurching while controlling the speed. The two knobs facilitate adjustment.

2. **Dual speed controllers**
   Velocity is controlled by meter-out circuit. Using concurrently the meter-in circuit can alleviate the stick-slip. More stable low speed operation can be achieved than meter-in circuit alone.

---

**Warning**

Since C□J2X, C□UX10 are subject to internal leakage due to their construction, the speed may not be fully controlled with the meter-out controller (+) during low speed operation.
Low Speed Cylinder
Double Acting, Single Rod
Series CJ2X
ø10, ø16

How to Order

**Bore size**
- 10 mm
- 16 mm

**Mounting style**
- Basic style
- Axial foot style
- Rod side flange style
- Double clevis style

**Standard stroke (mm)**
- 10 mm: 15, 30, 45, 60, 75, 100, 125, 150
- 16 mm: 15, 30, 45, 60, 75, 100, 125, 150, 175, 200

**Without auto switch**
- CJ2X
  - L 16 60

**With auto switch**
- CDJ2X
  - L 16 60 H78W

**Low speed cylinder**
- Built-in magnet

**Port location on head cover**
- ø10, ø16
  - Nil
  - R Perpendicular to axis

**Auto switch**
- For the applicable auto switch model, refer to the table below.
- Auto switches for rail mounting style are shipped together, (but not assembled).

**Built-in Magnet Cylinder Model**
Suffix the symbol "-A" (Rail mounting style) or "-B" (Band mounting style) to the end of part number for cylinder with auto switch.

**Example**
- Rail mounting style: CDJ2XB10-45-A
- Band mounting style: CDJ2XB16-60-B

---

**Applicable Auto Switch**
Refer to page 10-20-1 for further information on auto switches.

<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 model</th>
<th>Lead wire length (m)*</th>
<th>Pre-wire connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>Grommet</td>
<td>Yes</td>
<td>3-wire (NPN)</td>
<td>5 V, 12 V</td>
<td>H7A1 H7B F79</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>IC circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3-wire (PNP)</td>
<td>12 V</td>
<td>H72 F7PV F77</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-wire</td>
<td>24 V</td>
<td>H7A2 F7BV J79</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4-wire (NPN)</td>
<td>5 V, 12 V</td>
<td>H7C J79C</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>IC circuit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3-wire (PNP)</td>
<td>12 V</td>
<td>H7B F7BV J79</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-wire</td>
<td>24 V</td>
<td>H7C J79C</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4-wire (NPN)</td>
<td>5 V, 12 V</td>
<td>H7NF F79F</td>
<td>0.5 (L) 3 (Z)</td>
<td>L50538</td>
<td>IC circuit</td>
</tr>
</tbody>
</table>

---

* Lead wire length symbols:
  - 0.5 m ·········· Nil (Example) C73C
  - 3 m ·········· L (Example) C73CL
  - 5 m ········· Z (Example) C73CZ
  - None ········· N (Example) C73CN

* Solid state switches marked with “○” are produced upon receipt of order.

---

* Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 6 for details.
* For details about auto switches with pre-wire connector, refer to page 10-20-66.
**Specifications**

<table>
<thead>
<tr>
<th>Action</th>
<th>Double acting, Single rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td>Air</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.05 MPa</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>0.7 MPa</td>
</tr>
<tr>
<td>Minimum operating pressure</td>
<td>0.06 MPa</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>Without auto switch: –10 to 70°C (No freezing)</td>
</tr>
<tr>
<td></td>
<td>With auto switch: –10 to 60°C (No freezing)</td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper (Standard equipment)</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Not required (Non-lube)</td>
</tr>
<tr>
<td>Thread tolerance</td>
<td>JIS Class 2</td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>+1.0 mm</td>
</tr>
<tr>
<td>Piston speed</td>
<td>1 to 300 mm/s</td>
</tr>
<tr>
<td>Allowable kinetic energy</td>
<td>Ø10: 0.035 J</td>
</tr>
<tr>
<td></td>
<td>Ø16: 0.090 J</td>
</tr>
</tbody>
</table>

**Standard Stroke**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>15, 30, 45, 60, 75, 100, 125, 150</td>
</tr>
<tr>
<td>16</td>
<td>15, 30, 45, 60, 75, 100, 125, 150, 175, 200</td>
</tr>
</tbody>
</table>

**Mounting Style and Accessory**

<table>
<thead>
<tr>
<th>Mounting</th>
<th>Basic style</th>
<th>Axial foot style</th>
<th>Rod side flange style</th>
<th>Double clevis style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting nut</td>
<td>●</td>
<td>●</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Rod end nut</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Clevis pin</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Single knuckle joint</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Double knuckle joint*</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>T-bracket</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Pin and snap ring are shipped together with double clevis and double knuckle joint.

**Port Location on Head Cover**

For basic style, the port position in a head cover is available either perpendicular to the axis or in-line with the cylinder axis.

**Mounting Bracket Part No.**

<table>
<thead>
<tr>
<th>Mounting bracket</th>
<th>Bore size (mm)</th>
<th>Foot bracket</th>
<th>Flange bracket</th>
<th>T-bracket*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>CJ-L010B</td>
<td>CJ-F010B</td>
</tr>
</tbody>
</table>

* T-bracket is used with double clevis (D).

**Auto Switch Mounting Bracket Part No. (Band mounting style)**

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Auto switch mounting bracket part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>BJ2-010</td>
</tr>
<tr>
<td>16</td>
<td>BJ2-016</td>
</tr>
</tbody>
</table>

Note: Common for the types of D-C7/C8 and D-H7.
Low Speed Cylinder
Double Acting, Single Rod

**Series CUX**
ø10, ø16, ø20, ø25, ø32

### How to Order

#### Without auto switch

- **CUX**
- **Bore size**
  - ø10: 10 mm
  - ø16: 16 mm
  - ø20: 20 mm
  - ø25: 25 mm
  - ø32: 32 mm
- **Number of auto switches**
  - Nil
- **Auto switch**
  - Nil

#### With auto switch

- **CDUX**
- **Bore size**
  - ø10: 10 mm
  - ø16: 16 mm
  - ø20: 20 mm
  - ø25: 25 mm
  - ø32: 32 mm
- **Number of auto switches**
  - S: 2 pcs.
- **Auto switch**
  - F9BW

### Standard stroke (mm)

- ø10: 5, 10, 15, 20, 25, 30
- ø16: 5, 10, 15, 20, 25, 30, 40, 50

### Applicable Auto Switch

Refer to page 10-20-1 for further information on auto switches.

<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 model</th>
<th>Lead wire length (m)</th>
<th>Pre-wire connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>—</td>
<td>Grommet</td>
<td>3-wire (NPN equiv.)</td>
<td>5 V, 12 V, 100 V</td>
<td>A96V, A96</td>
<td>0.5 (Nil)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Solid state switch</td>
<td>—</td>
<td>Grommet</td>
<td>3-wire (NPN)</td>
<td>5 V, 12 V, 24 V</td>
<td>M9L, M9N</td>
<td>3 (L)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Diagnostic indication</td>
<td>(2-color indication)</td>
<td>2-wire (P)N</td>
<td>12 V, 24 V</td>
<td>M9PV, M9P</td>
<td>5 (Z)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3-wire (NPN)</td>
<td>5 V, 12 V</td>
<td>F9NW, F9NWV</td>
<td>0.5 (Nil)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-wire (P)N</td>
<td></td>
<td>F9P, F9PW, F9BW</td>
<td>3 (L)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

- Lead wire length symbols:
  - 0.5 m: — Nil
  - 3 m: L (Example) F9L
  - 5 m: Z (Example) F9MZ

- Lead wire length symbols:
  - 0.5 m: — Nil
  - 3 m: L (Example) F9L
  - 5 m: Z (Example) F9MZ

- Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 7 for details.
- For details about auto switches with pre-wire connector, refer to page 10-20-66.
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>Maximum operating pressure</td>
<td>0.7 MPa</td>
</tr>
</tbody>
</table>

Ambient and fluid temperature: Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)

Lubrication:
- Piston speed:
  - 10, 16: 1 to 300 mm/s
  - 20 to 32: 0.5 to 300 mm/s
- Cushion:
  - Rubber bumper on both ends
- Rod end thread:
  - Male thread
- Thread tolerance:
  - JIS Class 2
- Stroke length tolerance:
  - ±0.05
- Mounting:
  - Basic style

Minimum Operating Pressure

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>10</th>
<th>16</th>
<th>20</th>
<th>25</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. operating pressure (MPa)</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Standard Stroke

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>10, 16</th>
<th>20, 25, 32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard stroke (mm)</td>
<td>5, 10, 15, 20, 25, 30</td>
<td>5, 10, 15, 20, 25, 30, 40, 50</td>
</tr>
</tbody>
</table>

**Precautions**

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

**Mounting**

**Caution**
1. Tightening the cylinder beyond the range of the indicated torque (shown in the table below) may affect operation. Apply Loctite® (no. 242, Blue) to the mounting threads.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Hexagon socket head (mm)</th>
<th>Proper tightening torque (N·m) (Cylinder body)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>M3</td>
<td>0.54 ±10%</td>
</tr>
<tr>
<td>16</td>
<td>M4</td>
<td>1.23 ±10%</td>
</tr>
<tr>
<td>20, 25</td>
<td>M5</td>
<td>2.55 ±10%</td>
</tr>
<tr>
<td>32</td>
<td>M6</td>
<td>4.02 ±10%</td>
</tr>
</tbody>
</table>

Operating Precautions

**Warning**
1. It might not be able to control CUX10 by meter-out at a low speed operation.

**Caution**
1. For Series CUX10, up to 0.1 N/min (ANR) of internal leakage is anticipated due to cylinder structure.

**Maintenance**

**Caution**
1. Replacement parts/Seal kit
   Order it in accordance with the bore size.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kit no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>CUX16-PS</td>
<td>Piston seal: 1 pc.</td>
</tr>
<tr>
<td>20</td>
<td>CUX20-PS</td>
<td>Rod seal: 1 pc.</td>
</tr>
<tr>
<td>25</td>
<td>CUX25-PS</td>
<td>Gasket: 1 pc.</td>
</tr>
<tr>
<td>32</td>
<td>CUX32-PS</td>
<td>Grease pack (10 g): 1 pc.</td>
</tr>
</tbody>
</table>

* It is impossible to replace seals in bore size 10 mm.

2. Grease pack
   When maintenance requires only grease, use the following part numbers to order.
   - GR-L-005 (5 g)
   - GR-L-010 (10 g)
   - GR-L-150 (150 g)
Low Speed Cylinder
Double Acting, Single Rod

Series CQSX
ø12, ø16, ø20, ø25

How to Order

<table>
<thead>
<tr>
<th>Without auto switch</th>
<th>CQSX</th>
<th>B</th>
<th>20</th>
<th>30</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>With auto switch</td>
<td>CDQSX</td>
<td>B</td>
<td>20</td>
<td>30</td>
<td>D</td>
</tr>
</tbody>
</table>

Built-in magnet
Low speed cylinder

Mounting style

- B: Through-hole/Both ends tapped common (Standard)
- L: Foot style
- F: Rod side flange style
- G: Head side flange style
- D: Double clevis style

Bore size

<table>
<thead>
<tr>
<th>Bore size</th>
<th>Standard stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø12</td>
<td>12 mm</td>
</tr>
<tr>
<td>Ø16</td>
<td>16 mm</td>
</tr>
<tr>
<td>Ø20</td>
<td>20 mm</td>
</tr>
<tr>
<td>Ø25</td>
<td>25 mm</td>
</tr>
</tbody>
</table>

Standard stroke

- Ø12, Ø16: 5, 10, 15, 20, 25, 30
- Ø20: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

Auto switch

- Nil: Without auto switch (Built-in magnet)
- S: 1 pc.
- n: "n" pcs.

Cushion/Rod end thread

- Nil: Standard ( Rod end female thread)
- M: Rod end male thread

Action

- D: Double acting

Applicable Auto Switch

Refer to page 10-20-1 for further information on auto switches.

<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 model</th>
<th>Lead wire length (m)</th>
<th>Pre-wire connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>—</td>
<td>Grommet</td>
<td>2-wire (NPN equivalent)</td>
<td>5 V</td>
<td>A96V A96</td>
<td>0.5 (Nil)</td>
<td>—</td>
<td>C circuit</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Grommet</td>
<td>2-wire</td>
<td>24 V</td>
<td>12 V 100 V</td>
<td>A93 V A93</td>
<td>—</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td>Solid state switch</td>
<td>—</td>
<td>Grommet</td>
<td>2-wire (NPN)</td>
<td>5 V 12 V</td>
<td>M9NV M9N</td>
<td>5 V</td>
<td>—</td>
<td>C circuit</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Grommet</td>
<td>2-wire</td>
<td>24 V</td>
<td>12 V</td>
<td>M9PV M9P</td>
<td>—</td>
<td>Relay, PLC</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Grommet</td>
<td>3-wire (PNP)</td>
<td>5 V 12 V</td>
<td>M9BV M9B</td>
<td>F9NWV F9NW</td>
<td>—</td>
<td>C circuit</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Grommet</td>
<td>3-wire (PNP)</td>
<td>24 V</td>
<td>12 V</td>
<td>F9PW F9BW</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Grommet</td>
<td>2-wire</td>
<td>12 V</td>
<td>12 V</td>
<td>F9BW F9BW</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

* Lead wire length symbols: 0.5 m--------Nil    (Example) A93
  3 m--------L       (Example) Y93BL
  5 m--------Z       (Example) F9NWZ
* Solid state switches marked with "C" are produced upon receipt of order.
* Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 7 for details.
* For details about auto switches with pre-wire connector, refer to page 10-20-66.
Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Pneumatic (Non-lube)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Double acting, Single rod</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.5 MPa</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>1.0 MPa</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>Without auto switch: –10 to 70°C (No freezing)</td>
</tr>
<tr>
<td></td>
<td>With auto switch: –10 to 60°C (No freezing)</td>
</tr>
<tr>
<td>Rubber bumper</td>
<td>None</td>
</tr>
<tr>
<td>Rod end thread</td>
<td>Female thread</td>
</tr>
<tr>
<td>Rod end thread tolerance</td>
<td>JIS Class 2</td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>Standard stroke +0.5</td>
</tr>
<tr>
<td>Mounting</td>
<td>Through-hole/Both ends tapped common</td>
</tr>
<tr>
<td>Piston speed</td>
<td>φ12, φ16: 1 to 300 mm/s</td>
</tr>
<tr>
<td></td>
<td>φ20, φ25: 0.5 to 300 mm/s</td>
</tr>
</tbody>
</table>

Minimum Stroke for Auto Switch Mounting

<table>
<thead>
<tr>
<th>No. of auto switches mounted</th>
<th>D-A9, D-F9, D-A9, D-F9, D-M9, D-M9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 pcs.</td>
<td>10</td>
</tr>
<tr>
<td>1 pcs.</td>
<td>10 (φ16)</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Note) Please consult with SMC for shorter stroke length than indicated in the table.

Minimum Operating Pressure

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. operating pressure (MPa)</td>
<td>0.03</td>
<td>0.03</td>
<td>0.025</td>
<td>0.025</td>
</tr>
</tbody>
</table>

Body Option

<table>
<thead>
<tr>
<th>Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rod end male thread</td>
<td>Available for all standard models of double acting, single rod.</td>
</tr>
<tr>
<td>Rubber bumper</td>
<td>Double acting, Single rod</td>
</tr>
</tbody>
</table>

Precautions

Caution
1. For installation and removal, use an appropriate pair of pliers (tool for installing a type C snap ring).
2. Even if a proper plier (tool for installing type C snap ring) is used, it is likely to inflict damage to a human body or peripheral equipment, as a snap ring may be flown out of the tip of a plier (tool for installing a type C snap ring). Be much careful with the popping of a snap ring. Besides, be certain that a snap ring is placed firmly into the groove of rod cover before supplying air at the time of installment.

Snap Ring Installation/Removal

1. Replacement parts/Seal kit
- Order it in accordance with the bore size.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kit no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>CGSX12-PS</td>
<td>Piston seal: 1 pc.</td>
</tr>
<tr>
<td>16</td>
<td>CGSX16-PS</td>
<td>Rod seal: 1 pc.</td>
</tr>
<tr>
<td>20</td>
<td>CGSX20-PS</td>
<td>Tube gasket: 1 pc.</td>
</tr>
<tr>
<td>25</td>
<td>CGSX25-PS</td>
<td>Grease pack (10 g): 1 pc.</td>
</tr>
</tbody>
</table>

2. Grease pack
- When maintenance requires only grease, use the following part numbers to order.
  - Grease pack: GR-L-005 (5 g) GR-L-010 (10 g) GR-L-150 (150 g)

Maintenance

Dear Customer,

Thank you for choosing SMC products. To ensure that your Low Speed Cylinder, Double Acting, Single Rod Series CQSX operates reliably and efficiently, we recommend regular maintenance. This document provides essential information to help you maintain your equipment.

1. **Snap Ring Installation/Removal**
   - **Caution:** Always use an appropriate pair of pliers for installing a type C snap ring to avoid damaging human body or peripheral equipment.
   - **Precaution:** Be cautious when removing snap rings to prevent injury or equipment damage.

2. **Minimum Stroke for Auto Switch Mounting**
   - Ensure the snap ring is properly seated to avoid misalignment.

3. **Minimum Operating Pressure**
   - Refer to the table for the minimum operating pressure based on bore size.

4. **Body Option**
   - **Available:** For all standard models of double acting, single rod.

5. **Precautions:**
   - Read all safety instructions and actuator precautions before handling your equipment.
   - Contact SMC for advice on any specific maintenance requirements.

We hope this information helps ensure the longevity and performance of your Low Speed Cylinder, Double Acting, Single Rod Series CQSX. If you have any questions or require further assistance, please contact your local SMC representative.

Thank you for choosing SMC products.

SMC Corporation

---

*Footnotes:* 1) When ordering foot bracket, order 2 pieces per cylinder. 2) Parts belonging to each bracket are as follows:
- Foot or Flange: Body mounting bolts
- Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts

---

*SMC Low Speed Cylinder Double Acting, Single Rod Series CQSX*

*Data*
**Low Speed Cylinder**
**Double Acting, Single Rod**

**Series CQ2X**
ø32, ø40, ø50, ø63, ø80, ø100

How to Order

<table>
<thead>
<tr>
<th>Without auto switch</th>
<th>CQ2X</th>
<th>B</th>
<th>40</th>
<th>30</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>With auto switch</td>
<td>CDQ2X</td>
<td>B</td>
<td>40</td>
<td>30</td>
<td>D</td>
</tr>
</tbody>
</table>

- **Mounting style**
  - B: Through-hole (Standard)
  - A: Both ends tapped style
  - L: Foot style
  - F: Rod side flange style
  - G: Head side flange style
  - D: Double clevis style

- **Bore size**
  - ø32: 32 mm
  - ø40: 40 mm
  - ø50: 50 mm
  - ø63: 63 mm
  - ø80: 80 mm
  - ø100: 100 mm

- **Number of auto switches**
  - Nil
  - Without auto switch (Built-in magnet)
  - S: 2 pcs.
  - N: 1 pc.

- **Auto switch**
  - For the applicable auto switch model, refer to the table below.
  - Auto switches are shipped together, (but not assembled).

- **Action**
  - D: Double acting

- **Cushion/Rod end thread**
  - Nil
  - Standard (Rod end female thread)
  - C: With rubber bumper
  - M: Rod end male thread

- **Standard stroke**
  - Refer to “Standard Stroke” on page 10-3-13.

---

### Applicable Auto Switch

- **Type**
  - Reed switch
  - Diagnostic indication (2-color indication)
  - Solid state switch
  - Diagnostic indication (2-color indication)
  - With diagnostic output (2-color indication)

- **Special function**
  - Yes

- **Electrical entry**
  - Grommet

- **Wiring**
  - 2-wire
  - 3-wire (NPN, PNP)
  - 4-wire (NPN, PNP)

- **Load voltage**
  - DC 5 V
  - AC 12 V

- **Rail mounting style**
  - 32 to ø100

- **Direct mounting style**
  - Ø32 ø100

- **Lead wire length (m)**
  - 0.5 m
  - 3 m
  - 5 m

- **Pre-wire connector**
  - Yes
  - No

- **Applicable load**
  - IC circuit
  - Relay, PLC

---

- **Notes**
  - Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 7 for details.
  - For details about auto switches with pre-wire connector, refer to page 10-20-66.
  - Solid state switches marked with “◊” are produced upon receipt of order.

---

![Diagram](image-url)
Low Speed Cylinder
Double Acting, Single Rod Series CQ2X

Specifications

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>32</th>
<th>40</th>
<th>50</th>
<th>63</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Pneumatic (Non-lube)</td>
<td>Air</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
<td>Air</td>
<td>Air</td>
<td>Air</td>
<td>Air</td>
<td>Air</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.5 MPa</td>
<td>1.5 MPa</td>
<td>1.5 MPa</td>
<td>1.5 MPa</td>
<td>1.5 MPa</td>
<td>1.5 MPa</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
<td>1.0 MPa</td>
</tr>
<tr>
<td>Piping</td>
<td>Without auto switch: –10 to 70°C (No freezing)</td>
<td>With auto switch: –10 to 60°C (No freezing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screw-in type</td>
<td>M5 x 0.8</td>
<td>Rc 1/4</td>
<td>Rc 1/4</td>
<td>Rc 1/4</td>
<td>Rc 1/4</td>
<td>Rc 1/4</td>
</tr>
</tbody>
</table>

Minimum Operating Pressure

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>32</th>
<th>40</th>
<th>50</th>
<th>63</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. operating pressure (MPa)</td>
<td>0.025</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Standard Stroke

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32, 40</td>
<td>5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100</td>
</tr>
<tr>
<td>50, 63</td>
<td>10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100</td>
</tr>
</tbody>
</table>

Snap Ring Installation/Removal

Caution
1. For installation and removal, use an appropriate pair of pliers (tool for installing a type C snap ring).
2. If a proper plier (tool for installing type C snap ring) is used, it is likely to inflict damage to a human body or peripheral equipment, as a snap ring may be flown out of the tip of a plier (tool for installing a type C snap ring). Be much careful with the popping of a snap ring. Besides, be certain that a snap ring is placed firmly into the groove of rod cover before supplying air at the time of installation.

Pneumatic Circuit

1. Pressure supplied to cylinder should be set affordably. When the operating pressure is low, low speed operation may not be stable depending on a load condition. Besides, the maximum speed may be restricted depending on a pneumatic circuit, or operating pressure.

Maintenance

Caution
1. Replacement parts/Seal kit
   Order it in accordance with the bore size.

Snap Ring Installation/Removal

- Manufacturing of Intermediate stroke
  Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. But, as for ø40 to ø100 with damper, please consult with SMC separately.

Example) 18 mm width spacer is installed in the standard cylinder CQ2XB40-75D to make CQ2XB40-57D.

Note 1) When ordering foot bracket, order 2 pieces per cylinder.
Note 2) Parts belonging to each bracket are as follows.
Foot or Flange: Body mounting bolts
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts
Note 3) For double clevis style, clevis pin and snap ring are shipped together.

Mounting Bracket Part No.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Foot (1)</th>
<th>Flange</th>
<th>Double clevis (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>CQ-L032</td>
<td>CQ-F032</td>
<td>CQ-D032</td>
</tr>
<tr>
<td>40</td>
<td>CQ-L040</td>
<td>CQ-F040</td>
<td>CQ-D040</td>
</tr>
<tr>
<td>50</td>
<td>CQ-L050</td>
<td>CQ-F050</td>
<td>CQ-D050</td>
</tr>
<tr>
<td>63</td>
<td>CQ-L063</td>
<td>CQ-F063</td>
<td>CQ-D063</td>
</tr>
<tr>
<td>80</td>
<td>CQ-L080</td>
<td>CQ-F080</td>
<td>CQ-D080</td>
</tr>
<tr>
<td>100</td>
<td>CQ-L100</td>
<td>CQ-F100</td>
<td>CQ-D100</td>
</tr>
</tbody>
</table>

Note 1) When ordering foot bracket, order 2 pieces per cylinder.
Note 2) Parts belonging to each bracket are as follows.
Foot or Flange: Body mounting bolts
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts
Note 3) For double clevis style, clevis pin and snap ring are shipped together.

Precautions

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

1. For installation and removal, use an appropriate pair of pliers (tool for installing a type C snap ring).
2. Even if a proper plier (tool for installing type C snap ring) is used, it is likely to inflict damage to a human body or peripheral equipment, as a snap ring may be flown out of the tip of a plier (tool for installing a type C snap ring). Be much careful with the popping of a snap ring. Besides, be certain that a snap ring is placed firmly into the groove of rod cover before supplying air at the time of installation.

Pneumatic Circuit

1. Pressure supplied to cylinder should be set affordably. When the operating pressure is low, low speed operation may not be stable depending on a load condition. Besides, the maximum speed may be restricted depending on a pneumatic circuit, or operating pressure.

Maintenance

Caution
1. Replacement parts/Seal kit
   Order it in accordance with the bore size.

Snap Ring Installation/Removal

- Manufacturing of Intermediate stroke
  Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. But, as for ø40 to ø100 with damper, please consult with SMC separately.

Example) 18 mm width spacer is installed in the standard cylinder CQ2XB40-75D to make CQ2XB40-57D.

Note 1) When ordering foot bracket, order 2 pieces per cylinder.
Note 2) Parts belonging to each bracket are as follows.
Foot or Flange: Body mounting bolts
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts
Note 3) For double clevis style, clevis pin and snap ring are shipped together.

Mounting Bracket Part No.

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Foot (1)</th>
<th>Flange</th>
<th>Double clevis (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>CQ-L032</td>
<td>CQ-F032</td>
<td>CQ-D032</td>
</tr>
<tr>
<td>40</td>
<td>CQ-L040</td>
<td>CQ-F040</td>
<td>CQ-D040</td>
</tr>
<tr>
<td>50</td>
<td>CQ-L050</td>
<td>CQ-F050</td>
<td>CQ-D050</td>
</tr>
<tr>
<td>63</td>
<td>CQ-L063</td>
<td>CQ-F063</td>
<td>CQ-D063</td>
</tr>
<tr>
<td>80</td>
<td>CQ-L080</td>
<td>CQ-F080</td>
<td>CQ-D080</td>
</tr>
<tr>
<td>100</td>
<td>CQ-L100</td>
<td>CQ-F100</td>
<td>CQ-D100</td>
</tr>
</tbody>
</table>

Note 1) When ordering foot bracket, order 2 pieces per cylinder.
Note 2) Parts belonging to each bracket are as follows.
Foot or Flange: Body mounting bolts
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts
Note 3) For double clevis style, clevis pin and snap ring are shipped together.

Precautions

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

Snap Ring Installation/Removal

- Manufacturing of Intermediate stroke
  Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. But, as for ø40 to ø100 with damper, please consult with SMC separately.

Example) 18 mm width spacer is installed in the standard cylinder CQ2XB40-75D to make CQ2XB40-57D.

Note 1) When ordering foot bracket, order 2 pieces per cylinder.
Note 2) Parts belonging to each bracket are as follows.
Foot or Flange: Body mounting bolts
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts
Note 3) For double clevis style, clevis pin and snap ring are shipped together.
Low Speed Cylinder
Double Acting, Single Rod
**Series CM2X**
Ø20, Ø25, Ø32, Ø40

### How to Order

<table>
<thead>
<tr>
<th>Mounting style</th>
<th>T</th>
<th>Head side trunnion style</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>HEAD SIDE TRUNNION STYLE</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>AXIAL FOOT STYLE</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>ROD SIDE FLANGE STYLE</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>HEAD SIDE FLANGE STYLE</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>SINGLE CLEVIS STYLE</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>DOUBLE CLEVIS STYLE</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>ROD SIDE TRUNNION STYLE</td>
<td></td>
</tr>
</tbody>
</table>

**Standard stroke**
Refer to "Standard Stroke" on page 10-3-15.

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

**Auto switch**
- Nil: Without auto switch (Built-in magnet)

**Applicable Auto Switch**
Refer to page 10-20-1 for further information on auto switches.

<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 model</th>
<th>Lead wire length (m)*</th>
<th>Pre-wire connector</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed switch</td>
<td>Grommet</td>
<td>Yes</td>
<td>3-wire (NPN equivalent)</td>
<td>5 V</td>
<td>C76</td>
<td>0.5 (N), 3 (L), 5 (Z), None (N)</td>
<td>IC circuit, Relay, PLC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connector</td>
<td>Terminal conduit</td>
<td>2-wire</td>
<td>12 V</td>
<td>B59W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid state switch</td>
<td>Grommet</td>
<td>Yes</td>
<td>3-wire (NPN)</td>
<td>5 V, 12 V</td>
<td>H7A1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connector</td>
<td>Terminal conduit</td>
<td>2-wire</td>
<td>12 V</td>
<td>H7B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H7C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>G39A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>K39A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H7NW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H7PW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H7BW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H7BA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* *For the applicable auto switch model, refer to the table below.

**Applicable load**
- IC circuit, Relay, PLC
- PLC

**Post wire length symbols:**
- 0.5 m .... Nil
- 3 m .... L
- 5 m .... Z
- None .... N

* *Solid state switches marked with "○" are produced upon receipt of order.
* Do not indicate suffix "N" for no lead wire on D-A3/A/G39A/K39A models.

**Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 6 for details.
**For details about auto switches with pre-wire connector, refer to page 10-20-68.
Low Speed Cylinder
Double Acting, Single Rod
Series CM2X

Specifications

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>20, 25, 32, 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Pneumatic</td>
</tr>
<tr>
<td>Action</td>
<td>Double acting, Single rod</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.5 MPa</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>1.0 MPa</td>
</tr>
<tr>
<td>Minimum operating pressure</td>
<td>0.025 MPa</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>Without auto switch: –10 to 70°C (No freezing)</td>
</tr>
<tr>
<td></td>
<td>With auto switch: –10 to 60°C (No freezing)</td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper</td>
</tr>
<tr>
<td>Piping</td>
<td>Screw-in type</td>
</tr>
<tr>
<td></td>
<td>ø20 to ø32: Rc 1/8 ø40: Rc 1/4</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Not required (Non-lube)</td>
</tr>
<tr>
<td>Thread tolerance</td>
<td>JIS Class 2</td>
</tr>
<tr>
<td>Stroke length tolerance</td>
<td>0</td>
</tr>
</tbody>
</table>

Piston Speed

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston speed (mm/s)</td>
<td>0.5 to 300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable kinetic energy (J)</td>
<td>0.27</td>
<td>0.4</td>
<td>0.65</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Mounting Bracket Part No.

<table>
<thead>
<tr>
<th>Auto switch model</th>
<th>D-C7/C8, D-H7</th>
<th>D-B5/B6, D-G5</th>
<th>D-A3/A4/A44, D-G39A/K39A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore size (mm)</td>
<td>20 25 32 40</td>
<td>20 25 32 40</td>
<td>20 25 32 40</td>
</tr>
<tr>
<td></td>
<td>CM2X20-PS</td>
<td>CM2X25-PS</td>
<td>CM2X32-PS</td>
</tr>
<tr>
<td></td>
<td>CM2X40-PS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Auto Switch Mounting Bracket Part No.

<table>
<thead>
<tr>
<th>Mounting Style and Accessory</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting nut</td>
<td>Rod end nut</td>
</tr>
<tr>
<td>Basic style</td>
<td>(1 pc.)</td>
</tr>
<tr>
<td>Axial foot style</td>
<td>(2)</td>
</tr>
<tr>
<td>Rod side flange style</td>
<td>(1)</td>
</tr>
<tr>
<td>Head side flange style</td>
<td>(1)</td>
</tr>
<tr>
<td>Clevis integrated style</td>
<td>(1)</td>
</tr>
<tr>
<td>Single clevis style</td>
<td>(1)</td>
</tr>
<tr>
<td>Double clevis style (1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Rod side trunnion style</td>
<td>(1)</td>
</tr>
<tr>
<td>Head side trunnion style</td>
<td>(1)</td>
</tr>
<tr>
<td>Boss-cut basic style</td>
<td>(1)</td>
</tr>
<tr>
<td>Boss-cut flange style</td>
<td>(1)</td>
</tr>
<tr>
<td>Boss-cut trunnion style</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Note

1. Replacement parts/Seal kit
   Order it in accordance with the bore size.
<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Kit no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>CM2X20-PS</td>
<td>Rod seal: 1 pc.</td>
</tr>
<tr>
<td>25</td>
<td>CM2X25-PS</td>
<td>Grease pack (10 g): 1 pc.</td>
</tr>
<tr>
<td>32</td>
<td>CM2X32-PS</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CM2X40-PS</td>
<td></td>
</tr>
</tbody>
</table>

2. Grease pack
   When maintenance requires only grease, use the following part numbers to order.
<table>
<thead>
<tr>
<th>Kit no.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR-L-005</td>
<td>(5 g)</td>
</tr>
<tr>
<td>GR-L-010</td>
<td>(10 g)</td>
</tr>
<tr>
<td>GR-L-150</td>
<td>(150 g)</td>
</tr>
</tbody>
</table>

Note 1) Mounting nut is not equipped with clevis integrated style, single clevis style and double clevis style.
Note 2) Trunnion nuts are attached for rod side trunnion and head side trunnion styles.
Note 3) Pin and snap ring are shipped together with double clevis and double knuckle joint. (ø40 is cotter pin.)
Clean Series Low Speed Cylinder Series 10-, 11-

The type which is applicable for using inside the clean room graded Class 100 by making an actuator’s rod section a double seal construction and discharging by relief port directly to the outside of clean room.

Since the external dimensions and applicable auto switches are the same as standard type, refer to the separate catalog of “Pneumatic Clean Series”.

### Specifications

#### Specifications

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
<th>10- (Relief type)</th>
<th>11- (Vacuum type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>5, 10, 15, 20, 25, 30</td>
<td>12 mm</td>
<td>20 mm</td>
</tr>
<tr>
<td>16</td>
<td>5, 10, 15, 20, 25, 30</td>
<td>16 mm</td>
<td>20 mm</td>
</tr>
<tr>
<td>20</td>
<td>5, 10, 15, 20, 25</td>
<td>20 mm</td>
<td>20 mm</td>
</tr>
<tr>
<td>25</td>
<td>30, 35, 40, 45, 50</td>
<td>25 mm</td>
<td>25 mm</td>
</tr>
</tbody>
</table>

#### Standard Stroke

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
<th>10- (Relief type)</th>
<th>11- (Vacuum type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>5, 10, 15, 20, 25, 30</td>
<td>32 mm</td>
<td>32 mm</td>
</tr>
<tr>
<td>40</td>
<td>10, 15, 20, 25, 30</td>
<td>40 mm</td>
<td>40 mm</td>
</tr>
<tr>
<td>50</td>
<td>10, 15, 20, 25, 30</td>
<td>50 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>63</td>
<td>10, 15, 20, 25, 30, 40, 45, 50, 75, 100</td>
<td>63 mm</td>
<td>63 mm</td>
</tr>
</tbody>
</table>

#### Manufacturing of Intermediate stroke

Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. The overall length of cylinder will be the same as the standard stroke with a longer one. Example) 3 mm width spacer is installed in the standard cylinder 10-CQ2XB40-75D to make 10-CQ2XB40-80D.

#### Action

D Double acting

#### Fluid

- Air

#### Proof pressure

- 1.5 MPa for M5 x 0.8
- 1.0 MPa for M5 x 0.8

#### Minimum operating pressure

- 0.035 MPa for M5 x 0.8
- 0.02 MPa for M5 x 0.8

#### Ambient and fluid temperature

- Without auto switch: –10 to 70°C (No freezing)
- With auto switch: –10 to 60°C (No freezing)

#### Piston speed

- 1 to 200 mm/s
- 0.5 to 200 mm/s

#### Piston rod size

- 6
- 8
- 10
- 12

#### Rod end thread

- Female thread: M3 x 0.5
- Male thread: M6 x 0.8
- M6 x 1.0

#### Stroke tolerance

- JIS Class 2

#### Rod end thread tolerance

- Standard: M6 x 1.0
- M6 x 1.25
- M10 x 1.25

#### Port size

- M5 x 0.8

#### Vacuum port, Relief port

- M5 x 0.8

#### Specifications

<table>
<thead>
<tr>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
<th>10- (Relief type)</th>
<th>11- (Vacuum type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>10, 15, 20, 25, 30</td>
<td>32 mm</td>
<td>32 mm</td>
</tr>
<tr>
<td>40</td>
<td>10, 15, 20, 25, 30</td>
<td>40 mm</td>
<td>40 mm</td>
</tr>
<tr>
<td>50</td>
<td>10, 15, 20, 25, 30, 40, 45, 50, 75, 100</td>
<td>50 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>63</td>
<td>10, 15, 20, 25, 30, 40, 45, 50, 75, 100</td>
<td>63 mm</td>
<td>63 mm</td>
</tr>
</tbody>
</table>

#### Fluid

- Air

#### Proof pressure

- 1.5 MPa

#### Minimum operating pressure

- 0.035 MPa for M5 x 0.8
- 0.02 MPa for M5 x 0.8

#### Ambient and fluid temperature

- Without auto switch: –10 to 70°C (No freezing)
- With auto switch: –10 to 60°C (No freezing)

#### Piston speed

- 1 to 200 mm/s
- 0.5 to 200 mm/s

#### Piston rod size

- 16
- 20

#### Rod end thread

- Female thread: M8 x 1.25
- Male thread: M14 x 1.5

#### Rod end thread tolerance

- JIS Class 2

#### Port size

- M5 x 0.8

#### Vacuum port, Relief port

- M5 x 0.8

Note) Only 5 stroke comes with M5 x 0.8 in the case of no auto switch on ø40.
### How to Order

- **Clean Series**
  - 10: Relief type
  - 11: Vacuum type

- **Built-in magnet**
- **Low speed cylinder**

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

- **Cylinder stroke (mm)**
  - Refer to “Standard Stroke” below.

### Specifications

<table>
<thead>
<tr>
<th>Clean series</th>
<th>Bore size (mm)</th>
<th>Standard stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10- (Relief type)</td>
<td>20</td>
<td>25, 50, 75, 100, 125, 150, 175, 200, 250, 300</td>
</tr>
<tr>
<td>11- (Vacuum type)</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

### Operating Precautions

**Warning**

1. Do not rotate the cover.
   - When installing a cylinder or screwing a pipe fitting into the port, the coupling portion of the cover could break if the cover rotated.

**Caution**

1. Be careful of the snap ring to pop out.
   - When replacing the rod seal, take care that the snap ring does not spring out while you are removing it.

### Maintenance

**Caution**

1. Grease pack
   - When maintenance requires only grease, use the following part numbers to order.
   - GR-X-005 (5 g)
## Made to Order Specifications:

**-XB13: Low Speed Cylinder**

5 to 50 mm/s (CY1: 7 to 50 mm/s)

### Low Speed Cylinder

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Series</th>
<th>Standard model no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>XB13</td>
<td>CJ2</td>
<td>Standard model no.</td>
</tr>
<tr>
<td>XB13</td>
<td>CM2</td>
<td>Mounting style</td>
</tr>
<tr>
<td>XB13</td>
<td>CG1</td>
<td>Standard model no.</td>
</tr>
<tr>
<td>XB13</td>
<td>MB</td>
<td>Standard model no.</td>
</tr>
<tr>
<td>XB13</td>
<td>CU</td>
<td>Standard model no.</td>
</tr>
<tr>
<td>XB13</td>
<td>CQ2</td>
<td>Standard model no.</td>
</tr>
<tr>
<td>XB13</td>
<td>CQS</td>
<td>Standard model no.</td>
</tr>
</tbody>
</table>

Note: Operate without lubrication from a pneumatic system lubricator.

### Specifications

<table>
<thead>
<tr>
<th>Applicable cylinder</th>
<th>Air cylinder/Standard</th>
<th>Free mount cylinder</th>
<th>Compact cylinder</th>
<th>Magnetic coupling</th>
<th>Compact guide cylinder</th>
<th>Guide cylinder</th>
<th>Slide unit</th>
<th>Dual rod cylinder</th>
<th>Compact slide</th>
<th>Platform cylinder</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ2</td>
<td>CM2</td>
<td>CG1</td>
<td>MB</td>
<td>CU</td>
<td>CQ2</td>
<td>CQS</td>
<td>CY1</td>
<td>MGPL</td>
<td>MGGM</td>
<td>MGCM</td>
</tr>
</tbody>
</table>

#### Action
- Double acting, Single rod
- Double acting

#### Bore size (mm)
- 6, 10, 16
- 20, 25, 32, 40
- 32, 40, 50, 63
- 50, 63, 80, 100

#### Piston speed
- 5 to 50 mm/s
- 7 to 50 mm/s
- 5 to 50 mm/s

#### Cushion
- Rubber bumper
- Air cushion on both ends
- Rubber bumper on both ends
- No rubber bumper
- Rubber bumper (Basic cylinder)
- Rubber bumper (Basic cylinder)
- Shock absorber (CX2: Option)
- Rubber bumper

#### Auto switch
- Mountable

#### Mounting
- Basic
- Basic Foot Flange
- Trunnion
- Clevis

#### Dimensions
- Dimensions and specifications are the same as standard products of double acting. Refer to Best Pneumatics Vol. 6, 7 and 8.

* No shock absorber is available for the Series MGGM.
Related Products:
Speed Controller for Low Speed Operation
The effective area of controlled flow is approximately 1/10 of the standard type.
These controllers are suitable for controlling the speed of microspeed cylinders.
The dual type speed controller is especially suitable for cylinders with a small bore size.

### Elbow/Universal Type

<table>
<thead>
<tr>
<th>Model</th>
<th>AS121FM-M5</th>
<th>AS131FM-M5</th>
<th>AS221FM-C01</th>
<th>AS231FM-C01</th>
<th>AS221FM-C02</th>
<th>AS231FM-C02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing O.D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric size</td>
<td>Ø3.2, Ø4, Ø6</td>
<td>Ø3.2, Ø4</td>
<td>Ø6, Ø8</td>
<td>Ø4, Ø6</td>
<td>Ø8, Ø10</td>
<td></td>
</tr>
<tr>
<td>Controlled flow</td>
<td>7</td>
<td>12</td>
<td>38</td>
<td>0.2</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Free flow</td>
<td>100</td>
<td>180</td>
<td>230</td>
<td>260</td>
<td>390</td>
<td>460</td>
</tr>
</tbody>
</table>

Note: Supply pressure: 0.5 MPa, Temperature: 20°C

### In-line Type

<table>
<thead>
<tr>
<th>Model</th>
<th>AS1001FM</th>
<th>AS2001FM</th>
<th>AS2051FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing O.D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric size</td>
<td>Ø3.2, Ø4, Ø6</td>
<td>Ø4, Ø6</td>
<td>Ø6, Ø8</td>
</tr>
<tr>
<td>Inch size</td>
<td>Ø1/8&quot;, Ø5/32&quot;, Ø3/16&quot;</td>
<td>Ø3/16&quot;, Ø1/4&quot;</td>
<td>Ø3/16&quot;, Ø1/4&quot;</td>
</tr>
<tr>
<td>Controlled flow</td>
<td>7</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Free flow</td>
<td>100</td>
<td>130</td>
<td>230</td>
</tr>
</tbody>
</table>

Note: Supply pressure: 0.5 MPa, Temperature: 20°C

### Elbow Type (Metal body)

<table>
<thead>
<tr>
<th>Model</th>
<th>AS121FM-M5</th>
<th>AS221FM-C01</th>
<th>AS221FM-C02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port size</td>
<td>M5 x 0.8, 10-32 UNF, R 1/8, R 1/4, NPT 1/8, NPT 1/4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube side</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controlled flow</td>
<td>7</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Free flow</td>
<td>105</td>
<td>280</td>
<td>420</td>
</tr>
</tbody>
</table>

Note: Supply pressure: 0.5 MPa, Temperature: 20°C

### Dual Type

<table>
<thead>
<tr>
<th>Model</th>
<th>ASD230FM-M5</th>
<th>ASD330FM-C01</th>
<th>ASD430FM-C02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing O.D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric size</td>
<td>Ø4, Ø6</td>
<td>Ø6, Ø8</td>
<td>Ø6, Ø10</td>
</tr>
<tr>
<td>Controlled flow</td>
<td>7</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Free flow</td>
<td>75</td>
<td>175</td>
<td>295</td>
</tr>
</tbody>
</table>

Note: Supply pressure: 0.5 MPa, Temperature: 20°C
**How to Order**

**Clean series**
- Relief type: 10
- Vacuum suction type: 11

**Mounting style**
- B: Basic style
- L: Axial foot style
- F: Rod side flange style
- G: Head side flange style
- BZ: Boss-cut basic style
- FZ: Boss-cut rod side flange style

**Port thread type**
- Nil
- Rc
- TN
- NPT
- TF
- G

**Built-in magnet**
- Nil
- D: With auto switch (Built-in magnet)

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

**Cylinder stroke (mm)**
Refer to the standard stroke table below.

**Model**

| Model       | Bore size (mm) | Port size | Lubrication | Action                      | Standard stroke (mm) | Auto switch mounting | Cushion | | | |
|-------------|----------------|-----------|-------------|-----------------------------|----------------------|----------------------|---------| | | |
| 10-CM2X20   | 20             | 1/8       | Non-lube    | Double acting single rod    | 25, 50, 75, 100, 125 | ○                    | ○       | — | |
| 10-CM2X25   | 25             | 1/8       | Non-lube    | Double acting single rod    | 150, 200, 250, 300   | ○                    | ○       | — | |
| 10-CM2X32   | 32             | 1/4       | Non-lube    | Double acting single rod    |                      |                      | ○       | — | |
| 10-CM2X40   | 40             | 1/4       | Non-lube    | Double acting single rod    |                      |                      | ○       | — | |
| 11-CM2X20   | 20             | 1/8       | Non-lube    | Double acting single rod    |                      |                      | ○       | — | |
| 11-CM2X25   | 25             | 1/8       | Non-lube    | Double acting single rod    |                      |                      | ○       | — | |
| 11-CM2X32   | 32             | 1/4       | Non-lube    | Double acting single rod    |                      |                      | ○       | — | |
| 11-CM2X40   | 40             | 1/4       | Non-lube    | Double acting single rod    |                      |                      | ○       | — | |
### Specifications

<table>
<thead>
<tr>
<th>Fluid</th>
<th>10- (Relief type)</th>
<th>11- (Vacuum suction type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proof pressure</td>
<td>1.5 MPa</td>
<td>1.0 MPa</td>
</tr>
<tr>
<td>Max. operating pressure</td>
<td>1.0 MPa</td>
<td>0.025 MPa</td>
</tr>
<tr>
<td>Min. operating pressure</td>
<td>0.035 MPa</td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>Without switch: -10°C to 70°C (With no freezing)</td>
<td>With switch: -10°C to 60°C (With no freezing)</td>
</tr>
<tr>
<td>Cushion</td>
<td>Rubber bumper</td>
<td></td>
</tr>
<tr>
<td>Rod end thread</td>
<td>M8 x 1.25</td>
<td>M10 x 1.25</td>
</tr>
<tr>
<td>Piston rod diameter</td>
<td>ø8</td>
<td>ø10, ø12</td>
</tr>
<tr>
<td>Piston speed</td>
<td>1 to 200 mm/s</td>
<td>0.5 to 200 mm/s</td>
</tr>
<tr>
<td>Stroke tolerance</td>
<td>1/8</td>
<td>1/4</td>
</tr>
<tr>
<td>Port size</td>
<td>1/8</td>
<td>1/4</td>
</tr>
<tr>
<td>Grease</td>
<td>Fluorine grease</td>
<td></td>
</tr>
<tr>
<td>Particle generation grade</td>
<td>Grade 2</td>
<td>Grade 1</td>
</tr>
<tr>
<td>Suction flow rate (Reference values)</td>
<td>2 mm/min (ANR)</td>
<td></td>
</tr>
</tbody>
</table>

External dimensions and applicable auto switches are the same as 10-/11-CM2. Please refer to pages 15 to 20.

### Specific Product Precautions

Be sure to read before handling.

<table>
<thead>
<tr>
<th>Precautions</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warning</strong></td>
<td><strong>Caution</strong></td>
</tr>
<tr>
<td>1. Do not rotate the cover.</td>
<td>1. Grease pack</td>
</tr>
<tr>
<td>When installing a cylinder or screwing a pipe fitting into the port, the coupling portion of the cover could break if the cover is rotated.</td>
<td>Use the following part number to order grease for maintenance.</td>
</tr>
<tr>
<td>Grease pack</td>
<td>GR-X-005 (5g)</td>
</tr>
<tr>
<td><strong>Caution</strong></td>
<td></td>
</tr>
<tr>
<td>1. Be careful of the snap ring to pop out.</td>
<td></td>
</tr>
<tr>
<td>When replacing the rod seal, take care that the snap ring does not spring out while you are removing it.</td>
<td></td>
</tr>
</tbody>
</table>
Actuator / Common Precautions 1

Be sure to read before handling. Refer to the main text for precautions for each series.

Precaution on designing

⚠️ Warning

1. There is a possibility of dangerous sudden action by air cylinders if sliding parts of machinery are twisted due to external forces, etc.
   In such cases, personal injury by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be adjusted to operate smoothly and designed to avoid such dangers.

2. A protective cover is recommended to minimize the risk of personal injury.
   If a driven 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.
   Particularly when a cylinder operates at a high frequency or is installed in a place where there is a lot of vibration, ensure that all parts remain secure.

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

5. Consider a possible drop in circuit pressure due to a power outage, etc.
   When a cylinder is used in a clamping mechanism, there is a danger of workpiece 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 personal 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 avoid personal injury and equipment damage in the event that there is a loss of power to equipment controlled by pneumatics, electricity, or hydraulics.

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

8. Consider emergency stops.
   Design the machinery so that personal injury and/or damage to machinery and equipment will not occur when the machinery is stopped by a safety device under abnormal conditions, such as 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 personal injury or equipment damage will not occur upon restart of operation.
   When the cylinder has to be reset at the start position, install safety manual control equipment.

Selection

⚠️ Warning

1. Confirm the specifications.
   The products featured in this catalog are designed for use in industrial compressed air systems. If the products are used in conditions where pressure and/or temperature are outside the range of specifications, damage and/or malfunctions may occur. Do not use in these conditions. (Refer to the specifications). Please consult with SMC if you use a fluid other than compressed air.

2. Intermediate Stops
   With a 3-position closed center type valve, it is difficult to accurately and precisely stop a piston at the required position in the same way as can be done 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. Please contact with SMC when it is necessary to hold a stopped position for an extended period of time.

⚠️ Caution

1. Operate within the limits of the maximum feasible stroke.
   Operation that exceeds the maximum stroke may damage a piston rod. Refer to the air cylinder model selection procedures for the maximum feasible strokes.

2. Operate a cylinder within a range where collision damage will not occur to a piston at the stroke end.
   Operation that exceeds the maximum stroke may damage a piston rod. Refer to the air cylinder model selection procedures for the maximum feasible strokes.

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

4. Provide intermediate supports for long stroke cylinders.
   An intermediate support should be provided in order to prevent damage to a long stroke cylinder, due to problems such as sagging of the rod, deflection of the cylinder tube, vibration and external load.
### Mounting

**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 using an external guide, 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 portion of the cylinder tube or the piston rod by striking it with an object, or squeezing it. The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction. Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.

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

5. **Instruction manual**
   - Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

### Air Supply

**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 using an external guide, 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 portion of the cylinder tube or the piston rod by striking it with an object, or squeezing it. The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction. Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.

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

5. **Instruction manual**
   - Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

### Warning

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

### Cushion

**Caution**

1. **Readjust with a cushion needle.** Cushions are adjusted at the time of shipment; however, the cushion needle on the cover should be readjusted, when the product is put into service based on factors such as the size of the load and the operating speed. When the cushion needle is turned clockwise, the restriction becomes smaller and the cushion’s effectiveness is increased. Tighten the lock nut securely after adjustment is performed.

2. **Do not operate the actuator with the cushion needle fully closed.** This could damage the seals.
**Operating Environment**

⚠️ **Warning**
1. Do not use in atmospheres or locations where corrosion hazards exist.
   Refer to the construction drawings regarding cylinder materials.
2. In locations where ultrapure water or cleaning solvent, etc. splashes on the equipment, take suitable measures to protect the rod.

**Maintenance**

⚠️ **Warning**
1. Perform maintenance procedures as shown in the instruction manual.
   Improper handling may result in malfunction and damage of machinery or equipment.
2. Removal of equipment, and supply / exhaust of compressed air
   Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and release the compressed air in the system.
   When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.

⚠️ **Caution**
1. Drain flushing
   Remove drainage from air filters regularly.
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 specifications of current voltage, temperature or impact.

2. Use caution when multiple cylinders are used in close proximity to each other.
   When two or more auto switch cylinders are lined up in close proximity to each other, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm. (When the allowable interval is specified for each cylinder series, use the indicated value.)

3. Use caution to the ON time of a switch at the intermediate position of stroke.
   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 fast, the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

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

   In cases of high piston speed, the use of an auto switch (D-F5NT, F7NT, G5NT and M5□T) with a built-in OFF delay timer (approx. 200ms) makes it possible to extend the load operating time.

4. Wiring should be kept 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.
   2) Even if an auto switch has a built-in contact protection circuit, when the wiring is more than 30m long, it is not able to adequately absorb the rush current and its life may be reduced. It is again necessary to connect a contact protection box in order to extend its life. Please contact SMC in this case. <Solid state switch>
   3) Although wire length should not affect switch function, use a wire 100m or shorter.

5. Use caution to internal voltage drop of a switch.
   <Reed switch>
   1. Switches with an indicator light (except D-A56/A76H/ A96/A96 V/C76/E76A/Z76)
      * If auto switches are connected in series as shown below, please 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.]
         The load may be ineffective even though the auto switch function is normal.
   2) Even if an auto switch has a built-in contact protection circuit, the voltage drop will be "n" times larger when "n" auto switches are connected.
      The load may be ineffective even though the auto switch function is normal.

   3. Similarly, when operating below a specified voltage, it is possible that the load may be ineffective even though the auto switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

   \[ \text{Power voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load} \]

   2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (D-A6□, A80, A80H, A90, A90V, C80, R80, 90, E80A, Z80).
      <Solid state switch>
   3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).
      Also please note that a 12VDC relay is not applicable.

6. Use caution to the 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.
   Current to operate load (OFF condition) > Leakage current
   If the condition given in the above formula is not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification cannot 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>
   When driving a load such as a relay that generates a surge voltage, use a switch with a built-in contact protection circuit or a contact protection box.
   <Solid state switch>
   Although a zener diode for surge protection is connected to 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 driven directly, 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 inspections and confirm proper operation.

9. Ensure sufficient space for maintenance activities.
   When designing an application, be sure to allow sufficient space for maintenance and inspection.
Auto switch / Common Precautions 2
Be sure to read before handling. Refer to the main text for precautions for each series.

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 it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper tightening torque.
   When a switch is tightened beyond the range of tightening torque, the mounting screws or switch may be damaged. On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position.

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

   If this auto switch replaces the conventional model, it may not function depending on the application (shown below) because its operation range is shorter.

   • Applications where at the end, the stopping position shifting range is larger than the operation range
   e.g. Workpiece pushing, pressing into a hole, or clamping
   • Applications where an auto switch is used to detect intermediate stopping positions (Detecting time is shortened).

   As indicated above, mount a switch at the center of the operating range.

Wiring

⚠️ Warning

5. Do not allow short circuiting of loads.

   <Reed switch>
   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 switch>
   Models M-F9(V), F9W(V), J51, G5NB and all models of PNP output switches do not have built-in short circuit prevention circuits. If loads are short circuited, the switches will be instantly damaged.

   Use caution 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 (–).

   [In the case of model D-97, the side without indicator is (+) and the blue line side is (–).]

   1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.

   Also please note that a current greater than the maximum specified one will damage a light emitting diode and make it inoperable.

   Applicable models:
   D-A73, A73H, A73C, C73, C73C, E73A, Z73, R73
   D-97, 93A, A93, A93V
   D-A33, A33A, A34A, A44, A44A
   D-A53, A54, B53, B54

   2) However, when using a 2 color indication auto switch (D-A79W, A59W, B59W), be aware that the switch will constantly remain ON if the connections are reversed.

   <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 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 wire and the power supply line (–) is connected to the black wire, the switch will be damaged.

   <D-M9L> D-M9L does not have built-in short-circuit prevention circuits. Reverse connection of power supply line (+) and (–) may damage the switch.
Auto switch / Common Precautions 3
Be sure to read before handling. Refer to the main text for precautions for each series.

⚠️ Warning

1. Never use in the presence of explosive gases.
   Our auto switches are not explosion proof. Never use them in the presence of explosive gas, as 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. (Please consult with SMC regarding the availability of a magnetic field resistant auto switch.)

3. Do not use in environments where the auto switches will be constantly exposed to water.
   Although switches except D-A3□/A44□/G39□/K39□ satisfy the IEC standard IP67 structure (JIS C 0920: anti-immersion 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 environments with oil or chemicals.
   Please consult with SMC if auto switches will be used in an environment with coolants, cleaning solvents, 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, a malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in environments with temperature cycles.
   Please consult with SMC if switches are to be used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

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

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

8. Avoid close contact with magnetic substances.
   When a magnetic substance (substance attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause the auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

⚠️ Maintenance

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 screws securely 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 if damage is discovered.
   3) Confirm that the green light on the 2-color indicator type switch lights up.
      Confirm that the green LED is ON when stopped at the set position. If the red LED is ON when stopped at the set position, the mounting position is not correct. Readjust the mounting position until the green LED lights up.

⚠️ Other

1. Please consult with SMC concerning water resistance, elasticity of lead wires, etc.

*Lead wire color changes

<table>
<thead>
<tr>
<th>2-wire system</th>
<th>3-wire system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output (+) Old</td>
<td>Power supply + Old</td>
</tr>
<tr>
<td>Old</td>
<td>Power supply – Red</td>
</tr>
<tr>
<td>Output (+) Red</td>
<td>Brown</td>
</tr>
<tr>
<td>Output (-) Blue</td>
<td>Power supply GND Black</td>
</tr>
<tr>
<td>Old</td>
<td>Blue</td>
</tr>
<tr>
<td>Power supply + Red</td>
<td>Brown</td>
</tr>
<tr>
<td>Blue</td>
<td>Power supply GND Black</td>
</tr>
<tr>
<td>Output White</td>
<td>Blue</td>
</tr>
<tr>
<td>Solid state with diagnostic output</td>
<td>Solid state with latch type diagnostic output</td>
</tr>
<tr>
<td>Old</td>
<td>Old</td>
</tr>
<tr>
<td>Power supply + Red</td>
<td>Power supply + Red</td>
</tr>
<tr>
<td>Power supply GND Black</td>
<td>Power supply GND Black</td>
</tr>
<tr>
<td>Output White</td>
<td>White</td>
</tr>
<tr>
<td>Diagnostic output Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Black</td>
<td>Orange</td>
</tr>
</tbody>
</table>

⚠️ Caution

1. When stripping the cable clad, take care with the orientation of the cable being stripped. The insulator may accidentally be torn or damaged depending on the orientation.(D-M9□ only)

Recommended tools are shown below.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model name</th>
<th>Model no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VESSEL</td>
<td>Wire stripper</td>
<td>No 3000G</td>
</tr>
<tr>
<td>TOKYO IDEAL</td>
<td>Strip master</td>
<td>45-089</td>
</tr>
</tbody>
</table>

*Stripper for round cable (ø2.0) can be used for a 2-wire type cable.
### Applicable auto switch list


| Bore size | ø6 | ø6 to ø10 | ø10 to ø16 | ø20 to ø40 | ø40 to ø63 | ø63 to ø100 | ø100 to ø250 | ø250 to ø500 | ø500 to ø1000 | ø1000 to ø1500

Please refer to the next page for applicable auto switches and cylinders in the fields marked with asterisks (*).
Compact auto switch mounting bracket

Mounting brackets used for installing the compact auto switches D-A9/M9/F9 onto band mounting / tie-rod mounting / groove mounting style cylinders are available.

**Band mounting**

- **Applicable auto switch**
  - Solid state switch
    - D-M9
    - D-F9\(\square\)W (2-color indication)
  - Reed switch
    - D-A9
  - Perpendicular entry is unavailable.

- **Applicable cylinder**
  - 10-/11-/21-/22-CDJ2 Series
  - 10-/11-/21-/22-CDM2 Series
  - 10-/11-/21-/22-CDG1 Series
  - 10-/11-REC Series
  - 10-/11-CDM2X Series

**Tie-rod mounting**

- **Applicable cylinder**
  - 10-/11-/21-/22-CDA2 Series

**Groove mounting**

- **Applicable cylinder**
  - 12-/13-/21-/22-MGP Series

**Applicable auto switch**

- Solid state switch
  - D-M9
  - D-F9\(\square\)W (2-color indication)
- Reed switch
  - D-A9/D-A9\(\square\)V

Air cylinder

Rotary actuator

Air gripper

Directional control valve

Fittings & Tubing

Pressure switch

Air preparation equipment

Clean gas filter
These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC), Japan Industrial Standards (JIS)*1 and other safety regulations*2.

*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
JIS B 8370: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
etc.

*2) Labor Safety and Sanitation Law, etc.

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

! **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 possibility of serious injury or loss of life.
Safety Instructions

⚠️ Caution

The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

Limited Warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited Warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited Warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\(^3\)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.
   \(^3\) Vacuum pads are excluded from this 1 year warranty.
   A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
   Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).
Piping
1. Provide an inclination of 1cm per meter in the direction of the air flow to the main piping.
2. If there is a line branching from the main piping, provide an outlet of compressed air on top using a tee so that drainage accumulated in the piping will not flow out.
3. Provide a drainage mechanism at every recessed point or dead end to prevent drain accumulation.
4. For future piping extensions, plug the end of the piping with a tee.
5. Before piping
   Before piping, the piping should be thoroughly blown out with air (flushed) or washed to remove chips, cutting oil and other debris from inside the pipe.
6. Wrapping of pipe tape
   When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not get inside the valve. Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.
7. If air with a low dew point (−40°C or less) is required, do not use nylon tube or resin fitting (except for fluorine resin) for the outlet side of the membrane air dryer or heatless air dryer. Nylon tubing could be affected by the ambient air and it thus might not be possible to achieve the prescribed low dew point at the end of the tube. Therefore, for low dew point air, use stainless steel or fluorine tube.

Maintenance
1. If the heatless air dryer Series ID is left unused for a long period, the absorbent may be moistened. Prior to use, close the valve on the outlet side of the dryer for regeneration and drying.

Caution on Design
Employ a safe design, so that the following unexpected conditions will not occur.

⚠️ Warning
1. Provide a design that prevents high-temperature compressed air from flowing into the outlet side of the cooling equipment. If the flow of the coolant water in a water-cooled aftercooler is stopped or if the fan motor of an air cooled aftercooler is stopped, the high-temperature compressed air will flow to the outlet side of the cooling equipment, causing the equipment on the outlet side (such as the AFF, AM, AD, or IDF series) to be damaged or to malfunction.
2. Provide a design in which interruptions in the supply of compressed air are taken into consideration.
3. Design a layout in which the leakage of the coolant water and the dripping of condensation are taken into consideration. A water-cooled aftercooler that uses coolant water could lead to water leakage due to freezing. Depending on the operating conditions, the refrigerated air dryer and its downstream pipes could create a dripping of water droplets due to condensation formed by supercooling.

4. Provide a design that prevents back pressure and backflow. The generation of back pressure and backflow could lead to equipment damage. Take appropriate safety measures, including the proper installation methods.

5. Depending on the model and operating conditions, the life span of air cylinders may be shortened when they are used in an environment of super dry air (atmospheric pressure dew point: -50°C) or high-purity nitrogen gas or when such super dry air or high-purity nitrogen gas is used as the fluid. Please contact with SMC for further details on applicable series, models, operating conditions and life spans.

6. Blowing system
Even a small amount of dust can be a problem for blowing systems. Install Clean Gas Filter Series SF to the end of the blowing line.
Clean series: Common Precautions 2

Be sure to read before handling.
Refer to the main text for detailed precautions on every series.

Piping: Inside of Clean Room

⚠️ Caution

1. Do not make the piping for the air cylinder relief port and regulator breathing vent piping common with solenoid valve exhaust piping.
   This can cause malfunctions in the air cylinder or regulator pressure change.

2. Arrange the piping so that the exhaust air of the solenoid valves is exhausted outside of the clean room.

3. Air filter drain piping
   Exhaust drainage outside the clean room through piping from the drain guide of the air filter.

4. Arrange the membrane dryer air purge piping using a standard size tubing so that air is exhausted outside the clean room.

5. Take precautions so that the threaded portion of the piping connection or the tubing connection will not be loosened.
   Take sufficient precautions against the piping shaking along with the vibration of the equipment.

6. Use polyurethane tubing containing no plasticizer.

Handling

⚠️ Caution

1. The inner bag of a double-packed clean series package should be opened in a clean room or clean environment.

2. When standard pneumatic equipment is brought into a clean room, spray high-purity air upon it and remove dust thoroughly by wiping the external surfaces of the cylinder tube, solenoid valves and air line equipment with alcohol.

3. To replace parts or disassemble the product in a clean room, first exhaust the compressed air inside the piping to the outside of the clean room before the work.

4. Do not use rotation type mounting brackets such as clevises, trunnions, etc.. They will generate a considerable amount of particulate matter due to the sliding friction between the metal parts.

Lubrication / In the Case of Actuator

⚠️ Caution

1. Do not use any greases but those specified by SMC.
   Use of greases not specified will cause malfunctions or particle generation.

2. Do not lubricate the products since they are of a nonlubricant type.
   As the clean series actuators are lubricated at the factory with fluororesin grease, the product specifications may not be satisfied if turbine oil or other such lubricants are applied.

Caution

The cylinder speed upper limit that retains the particle generation grade is 400 mm/s.

Be sure to wash your hands after handling fluororesin grease.
The grease itself is not hazardous but it can produce a hazardous gas at temperatures exceeding 260°C.

Warning

1. Do not use rotation type mounting brackets such as clevises, trunnions, etc.. They will generate a considerable amount of particulate matter due to the sliding friction between the metal parts.

Back matter 5
Clean series: Common Precautions 3
Be sure to read before handling. Refer to the main text for detailed precautions for every series.

**Caution**
For the vacuum suction types (Series 11-/13-/22-), perform vacuum suction at the vacuum port to retain the particle generation grade.
The optimum suction flow rate varies depending on series and sizes. Refer to "Suction flow rate of vacuum suction type (Reference values)" for each series. (The vacuum pressure will be approximately -27 kPa at around 1 m from the vacuum suction port.) Please consult SMC for further details.

---

**Suction flow rate of vacuum suction types**

Adjust the measured vacuum pressure using a regulator to be the value in the graphs below.