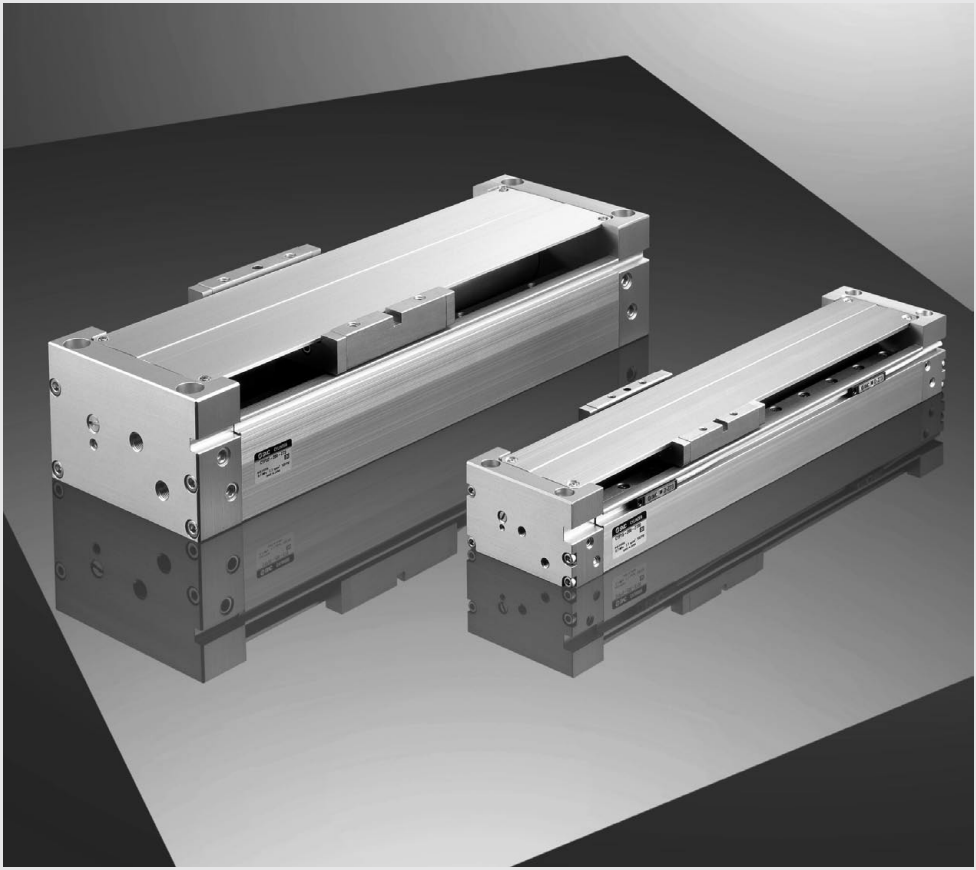
# Clean Rodless Cylinder

## *CYP* Series

### ø15, ø32

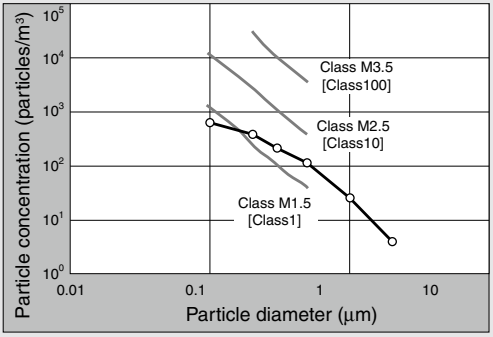


Magnetically coupled rodless cylinder for transfer in clean environments.

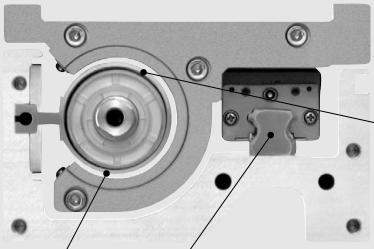
# A magnetically coupled rodless cylinder that

## Low particle generation: 1/20
(compared to previous series)

- High cleanliness is achieved with **non-contact construction** of the cylinder tube exterior and a **stainless steel linear guide (specially treated)**.
- Particle generation has been reduced to 1/20 compared to the 12-CY3B series (previous SMC product) even without vacuum suction.




Note 1) This chart indicates the level of cleanliness inside the measurement chamber.
Note 2) The vertical axis shows the number of particles per unit volume (1 m³) of air which are no smaller than the particle size shown on the horizontal axis.
Note 3) The gray lines show the upper concentration limit of the cleanliness class based on Fed.Std.209E-1992.
Note 4) The plots indicate the 95% upper reliability limit value for time series data up to 500 thousand operation cycles. (Cylinder: CYP32-200, Workpiece weight: 5 kg, Average speed: 200 mm/s)
Note 5) The data above provide a guide for selection but is not guaranteed.

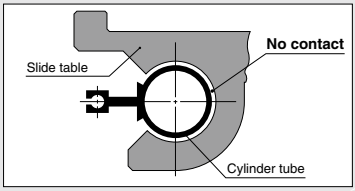


**Stainless steel linear guide** (specially treated)

The specially treated linear guide achieves low particulate generation, high linearity and high precision.

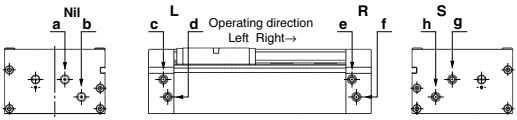
**Non-contact construction**

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




## Piping port variations provide a high degree of freedom

Piping port positions can be selected to accommodate the installation.




Note) Plugs are installed in ports other than those indicated for the model.

| Model | Nil | | L | | R | | S | |
|---|---|---|---|---|---|---|---|---|
| Piping port position | a | b | c | d | e | f | g | h |
| Operating direction | Right | Left | Right | Left | Right | Left | Right | Left |

## Cleaned, assembled and double packaged in a clean room

# can be used for transfer in clean environments

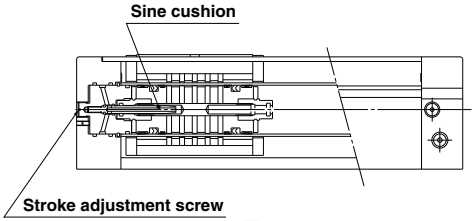
## Long stroke (Max. 700 mm)

**Special cylinder tube**

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

## Shock-free

A **sine cushion** is used at the end of the stroke. Smooth acceleration and deceleration are possible at 5 m/s² or less.

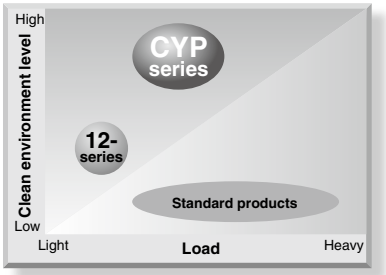



## Stroke adjustment

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



## ■ Series Variations




| Series | Guide type | Bore size (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 6 | 10 | 15 | 20 | 25 | 32 | 40 | 50 | 63 |
| Clean room rodless CYP | Linear guide | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 12-CY3B | Basic type | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 12-CY3R | Direct mount type | ● | ● | ● | ● | ● | ● | ● | ● | ● |

∗ For details about the 12-series, refer to the catalog, "Pneumatic Clean Series" (CAT.E02-23)

# *CYP Series*
# Model Selection

**Caution on Design (1)**

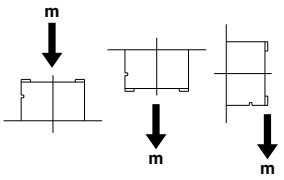
The load mass allowable moment differs depending on the workpiece mounting method, cylinder mounting orientation and piston speed.
In making a determination of usability, do not allow the sum (Σαn) of the load factors (αn) for each mass and moment to exceed "1".

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

## Load Mass

**Max. load mass** (kg)

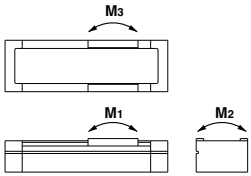
| Model | $m_{max}$ |
|---|---|
| **CYP15** | 1 |
| **CYP32** | 5 |




## Moment

**Allowable moment**

**(Static moment/Dynamic moment)**




(N·m)

| Model | $M_1$ | $M_2$ | $M_3$ |
|---|---|---|---|
| **CYP15** | 0.3 | 0.6 | 0.3 |
| **CYP32** | 3 | 4 | 3 |

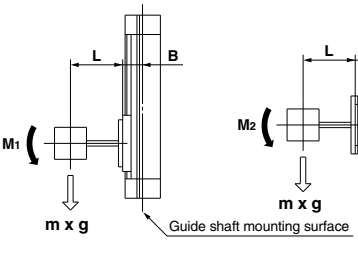
### Static Moment

Moment generated by the workpiece weight even when the cylinder is stopped

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

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

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




(mm)

| Model | A | B |
|---|---|---|
| **CYP15** | 16.5 | 25.5 |
| **CYP32** | 27.0 | 48.0 |

$M_{1, 2, 3}$ : Moment [N·m]
m : Load mass [kg]
L : Distance to load center of gravity [mm]
A, B : Distance to guide shaft [mm]
g : Gravitational acceleration [9.8 m/s²]

### Dynamic Moment

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

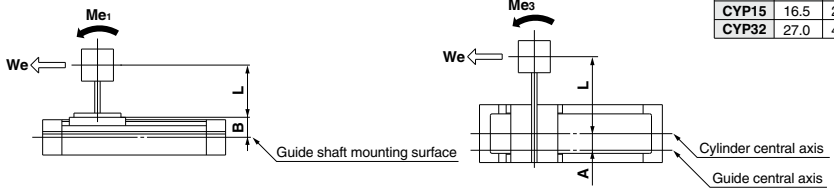
$We = 5 \times 10^{-3} \times m \times g \times U$

We: Load equivalent to impact [N]
m : Load mass [kg]
U: Max. speed [mm/s]
g: Gravitational acceleration [9.8 m/s²]

■ **Pich moment**
$Me_1 = 1/3^{*} \cdot We \, (L + B) \cdot 10^{-3}$

* **Average load coefficient**

■ **Yaw moment**
$Me_3 = 1/3^{*} \cdot We \, (L + A) \cdot 10^{-3}$




(mm)

| Model | A | B |
|---|---|---|
| **CYP15** | 16.5 | 25.5 |
| **CYP32** | 27.0 | 48.0 |

## Selection Calculation

The selection calculation finds the load factors ($\alpha n$) of the items below, where the total ($\Sigma\alpha n$) does not exceed 1.

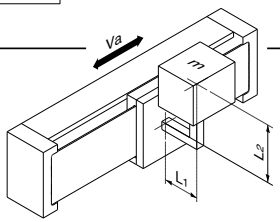
$$\Sigma\,\alpha n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$$

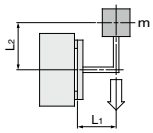
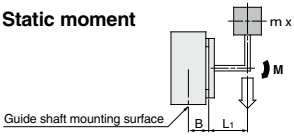
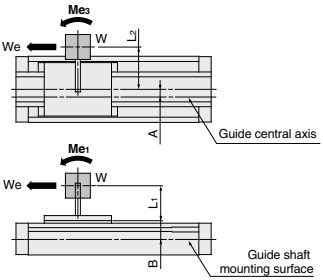
| Item | Load factor $\alpha n$ | Note |
|---|---|---|
| **1. Max. load mass** | $\alpha_1 = m/m_{max}$ | Review m<br>$m_{max}$ is the maximum load mass |
| **2. Static moment** | $\alpha_2 = M/M_{max}$ | Review $M_1$, $M_2$, $M_3$<br>Mmax is the allowable moment |
| **3. Dynamic moment** | $\alpha_3 = Me/Me_{max}$ | Review $Me_1$, $Me_3$<br>Memax is the allowable moment |

## Calculation Example

### Operating Conditions

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



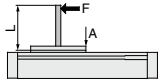

| Item | Load factor $\alpha n$ | Note |
|---|---|---|
| **1. Maximum load mass**  | $\alpha_1 = m/m_{max}$<br>$= 1/5$<br>**$= 0.20$** | Review m. |
| **2. Static moment**  | $M_2 = m \cdot g \cdot (L_1 + B) \cdot 10^{-3}$<br>$= 1 \cdot 9.8 \cdot (50 + 48) \cdot 10^{-3}$<br>$= 0.96$ [N·m]<br>$\alpha_2 = M_2/M_2$ max<br>$= 0.96/4$<br>**$= 0.24$** | Review $M_2$.<br>Since $M_1$ & $M_3$ are not generated, review is unnecessary. |
| **3. Dynamic moment**  | We $= 5 \times 10^{-3}$ m · g · U<br>$= 5 \times 10^{-3} \cdot 1 \cdot 9.8 \cdot 300$<br>$= 14.7$ [N]<br>$Me_3 = 1/3 \cdot$ We $(L_2 + A) \cdot 10^{-3}$<br>$= 1/3 \cdot 14.7 \cdot (50 + 27) \cdot 10^{-3}$<br>$= 0.38$ [N·m]<br>$\alpha_3 = Me_3/Me_3$ max<br>$= 0.38/3$<br>**$= 0.13$** | Review $Me_3$. |
| | $Me_1 = 1/3 \cdot$ We $\cdot (L_1 + B) \cdot 10^{-3}$<br>$= 1/3 \cdot 14.7 \cdot (50 + 48) \cdot 10^{-3}$<br>$= 0.48$ [N·m]<br>$\alpha_4 = Me_1/Me_1$ max<br>$= 0.48/3$<br>**$= 0.16$** | Review $Me_1$. |

$\Sigma\alpha n = \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4$
$= 0.20 + 0.24 + 0.13 + 0.16$
$= 0.73$
$\Sigma\alpha n = 0.73 \leq 1$ Therefore it can be used.

## Caution on Design (2)

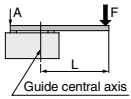
## Table Deflection Note)

**Table deflection due to pitch moment load**



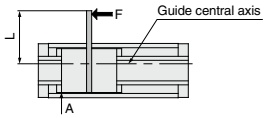

$M_1 = F \times L$

**Table deflection due to roll moment load**




$M_2 = F \times L$

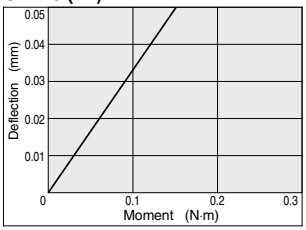
**Table deflection due to yaw moment load**



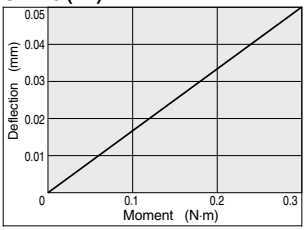

$M_3 = F \times L$

Note) Displacement of Section A when force acts on Section F

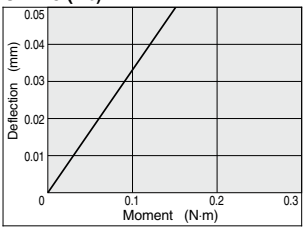
**CYP15 ($M_1$)**



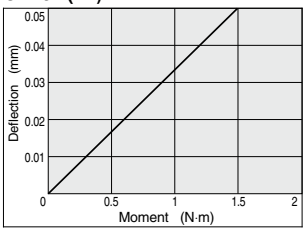

**CYP15 ($M_2$)**



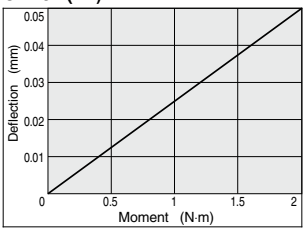

**CYP15 ($M_3$)**



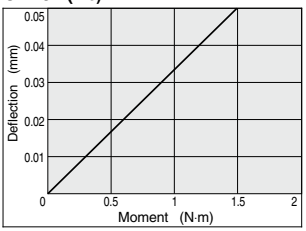

**CYP32 ($M_1$)**




**CYP32 ($M_2$)**




**CYP32 ($M_3$)**




Note) Extend lines in the graphs to indicate amount of deflection when moments larger than the above are applied.
Note) Indicates the displacement (rigidity) on the slide table from the position where the reaction force is generated when the torque is applied to the slide table.
(Reference values) Please contact SMC for the accuracy.

## Vertical Operation

When using in vertical operation, prevention of workpiece dropping due to breaking of the magnetic coupling should be considered. The allowable load mass and maximum operating pressure should be as shown in the table below.
When the cylinder is mounted vertically or sideling, a slider may move downwards due to the self-weight or workpiece mass. If an accurate stopping position is required at the stroke end or the middle of stroke, use an external stopper to secure the accurate positioning.

| Model | Allowable load mass mv (kg) | Maximum operating pressure Pv (MPa) |
|---|---|---|
| **CYP15** | 1 | 0.3 |
| **CYP32** | 5 | |

## Intermediate Stop

The cushion effect (smooth start-up, soft stop) exists only before the stroke end in the stroke ranges indicated in the table below.

The cushion effect (smooth start-up, soft stop) cannot be obtained in an intermediate stop or return from an intermediate stop using an external stopper, etc.

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

**Cushion Stroke**

| Model | Stroke (mm) |
|---|---|
| **CYP15** | 25 |
| **CYP32** | 30 |

# Clean Rodless Cylinder
# *CYP* Series
## ø15, ø32

## How to Order

**CYP 15 – 200 [ ] – Y7BW [ ]**

**Clean room rodless cylinder**

**Bore size**

| | |
|---|---|
| **15** | 15 mm |
| **32** | 32 mm |

**Standard stroke**

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

Note 1) Please consult with SMC if the maximum stroke is exceeded.
Note 2) Intermediate strokes are available as a special order.

**Piping port location**

| | | |
|---|---|---|
| **Nil** | a | Operating direction: Right |
| | b | Operating direction: Left |
| **L** | c | Operating direction: Right |
| | d | Operating direction: Left |
| **R** | e | Operating direction: Right |
| | f | Operating direction: Left |
| **S** | g | Operating direction: Right |
| | h | Operating direction: Left |

**Auto switch**

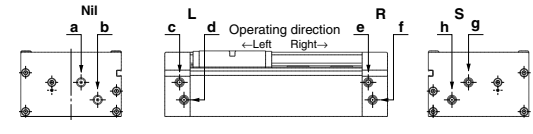
| | |
|---|---|
| **Nil** | Without auto switch (Built-in magnet) |

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

**Number of auto switches**

| | |
|---|---|
| **Nil** | 2 pcs. |
| **S** | 1 pc. |
| **n** | "n" pcs. |

### Piping Port Locaition




Note) Plugs are installed in ports other than those indicated for the model.

### Applicable Auto Switches/Refer to pages 1575 to 1701 for further information on auto switches.

| Type | Special function | Electrical entry | Indicator light | Wiring (Output) | Load voltage DC | Load voltage AC | Auto switch model: Electrical entry direction: Perpendicular | Auto switch model: Electrical entry direction: In-line | Lead wire length (mm)* 0.5 (Nil) | 3 (L) | 5 (Z) | Pre-wired connector | Applicable load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Solid state auto switch** | — | Grommet | Yes | 3-wire (NPN) | 5 V, 12 V | — | **Y69A** | **Y59A** | ● | ● | ○ | ○ | IC circuit | Relay, PLC |
| | | | | 3-wire (PNP) | | | **Y7PV** | **Y7P** | ● | ● | ○ | ○ | | |
| | | | | 2-wire | 12 V | | **Y69B** | **Y59B** | ● | ● | ○ | ○ | — | |
| | Diagnostic indication (2-color indicator) | | | 3-wire (NPN) | 5 V, 12 V | | **Y7NWV** | **Y7NW** | ● | ● | ○ | ○ | IC circuit | |
| | | | | 3-wire (PNP) | | | **Y7PWV** | **Y7PW** | ● | ● | ○ | ○ | | |
| | | | | 2-wire | 12 V | | **Y7BWV** | **Y7BW** | ● | ● | ○ | ○ | — | |
| **Reed auto switch** | — | Grommet | Yes | 3-wire | 5 V | — | — | **Z76** | ● | ● | — | — | IC circuit | — |
| | | | | 2-wire | 12 V | 100 V | — | **Z73** | ● | ● | ● | — | — | Relay, PLC |
| | | | No | | 5 V, 12 V | 100 V or less | — | **Z80** | ● | ● | — | — | IC circuit | |

∗ Lead wire length symbols: 0.5 m ····· Nil (Example) Y7BW
3 m ····· L Y7BWL
5 m ····· Z Y7BWZ

∗ Auto switches marked with a "○" symbol are produced upon receipt of order.

• Refer to pages 1648 and 1649 for the details of auto switches with a pre-wired connector.
• Normally closed (NC = b contact) solid state auto switches (D-Y7G/Y7H types) are also available. Refer to page 1595 for details.
∗ Auto switches are shipped together, (but not assembled).

## Specifications

| Bore size (mm) | 15 | 32 |
|---|---|---|
| **Fluid** Note 1) | Air/Inert gas | |
| **Action** | Double acting | |
| **Proof pressure** | 0.5 MPa | |
| **Operating pressure range** | 0.05 to 0.3 MPa | |
| **Ambient and fluid temperature** | –10 to 60°C (No freezing) | |
| **Piston speed (Max.)** Note 2) | 50 to 300 mm/s | |
| **Lubrication** | Not required (Non-lube) | |
| **Stroke adjustment** | ±1 mm on each side (±2 mm total) | |
| **Cushion** | Sine cushion (Air cushion) | |
| **Port size** | M5 x 0.8 | Rc (PT) 1/8 |
| **Magnet holding force (N)** | 59 | 268 |

Note 1) Air is recommended for the operating environmental atmosphere and operating fluid. When using other fluids and inert gas, contact SMC for the product service life since it may vary.
Note 2) The piston speed above indicates the maximum speed. It takes approx. 0.5 seconds for a single side and approx. 1 second for both sides for a sliding table to move through the cushion stroke starting from the stroke end.

## Weight

(kg)

| Model | Standard stroke (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 600 | 700 |
| **CYP15** | 1.2 | 1.4 | 1.6 | 1.7 | 1.9 | 2.0 | 2.2 | 2.4 | 2.5 | 2.8 | 3.2 |
| **CYP32** | 4.2 | 4.6 | 5.0 | 5.5 | 5.9 | 6.3 | 6.7 | 7.1 | 7.5 | 8.3 | 9.1 |

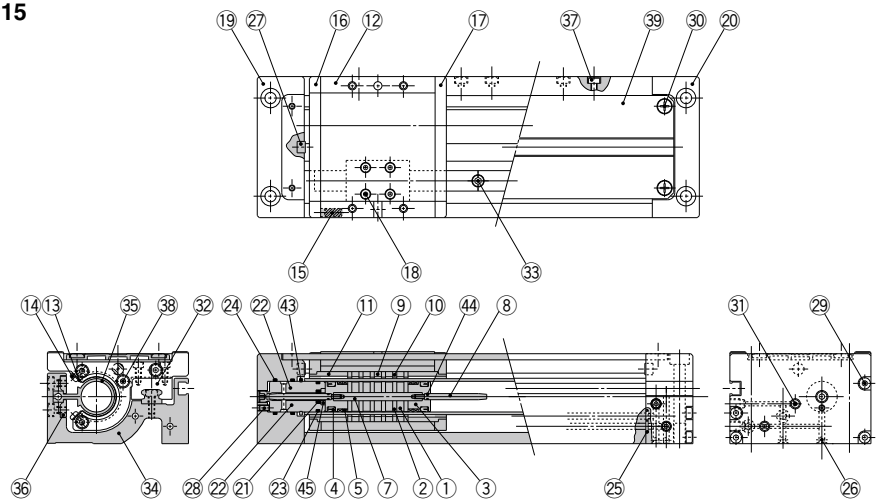
## Theoretical Output

(N)

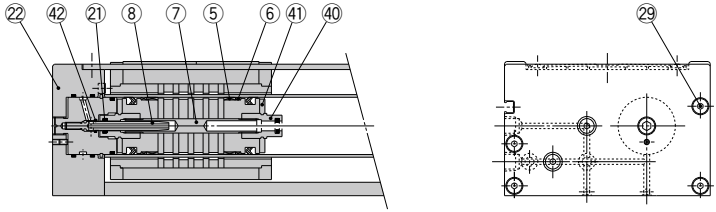
| Bore size (mm) | Piston area (mm) | Operating pressure (MPa) | | |
|---|---|---|---|---|
| | | 0.1 | 0.2 | 0.3 |
| **15** | 176 | 18 | 35 | 53 |
| **32** | 804 | 80 | 161 | 241 |

## Construction

### CYP15




### CYP32

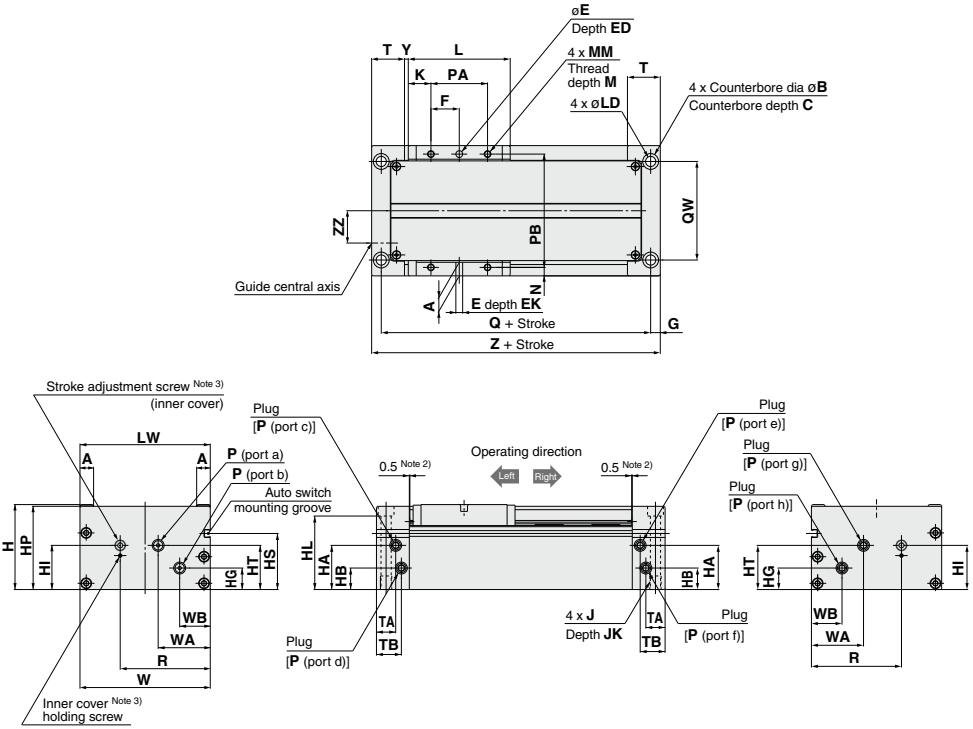



**Component Parts**

| No. | Description | Material | Note |
|---|---|---|---|
| 1 | **Magnet A** | — | |
| 2 | **Piston side yoke** | Rolled steel plate | Zinc chromated |
| 3 | **Piston** | Brass/Aluminum alloy | ø15: Electroless nickel plated, ø32: Chromated |
| 4 | **Piston seal** | NBR | |
| 5 | **Wear ring A** | Special resin | |
| 6 | **Wear ring** | Special resin | |
| 7 | **Shaft** | Stainless steel | |
| 8 | **Cushion ring** | Stainless steel/Brass | ø15: Electroless nickel plated |
| 9 | **Magnet B** | — | |
| 10 | **External slider side yoke** | Rolled steel | Electroless nickel plated |
| 11 | **Hold spacer** | Aluminum alloy | Electroless nickel plated |
| 12 | **Slide table** | Aluminum alloy | Electroless nickel plated |
| 13 | **Insertion guide plate** | Stainless steel | |
| 14 | **Round head Phillips screw** | Carbon steel | Nickel plated |
| 15 | **Magnet** | — | |
| 16 | **Side plate A** | Aluminum alloy | Electroless nickel plated |
| 17 | **Side plate B** | Aluminum alloy | Electroless nickel plated |
| 18 | **Hexagon socket head cap screw** | Chrome molybdenum steel | Nickel plated |
| 19 | **Plate A** | Aluminum alloy | Clear hard anodized |
| 20 | **Plate B** | Aluminum alloy | Clear hard anodized |
| 21 | **Cushion seal** | NBR | |
| 22 | **Inner cover** | Aluminum alloy | Clear hard anodized |

| No. | Description | Material | Note |
|---|---|---|---|
| 23 | **Cylinder tube gasket** | NBR | |
| 24 | **O-ring** | NBR | |
| 25 | **O-ring** | NBR | |
| 26 | **Steel ball** | Carbon steel | |
| 27 | **Bumper** | Polyurethane | |
| 28 | **Hexagon socket head set screw** | Chrome molybdenum steel | Nickel plated |
| 29 | **Hexagon socket head cap screw** | Chrome molybdenum steel | Nickel plated |
| 30 | **Round head Phillips screw** | Stainless steel | Nickel plated |
| 31 | **Hexagon socket head plug** | Chrome molybdenum steel | Nickel plated |
| 32 | **Linear guide** | Stainless steel | |
| 33 | **Hexagon socket head cap screw** | Chrome molybdenum steel | Nickel plated |
| 34 | **Body** | Aluminum alloy | Clear hard anodized |
| 35 | **Cylinder tube** | Aluminum alloy | Hard anodized |
| 36 | **Tube attaching bracket** | Aluminum alloy | Clear hard anodized |
| 37 | **Hexagon socket head cap screw** | Chrome molybdenum steel | Nickel plated |
| 38 | **Hexagon socket head cap screw** | Chrome molybdenum steel | Nickel plated |
| 39 | **Top cover** | Aluminum alloy | Clear hard anodized |
| 40 | **Cushion seal holder** | Aluminum alloy | Chromated |
| 41 | **Bumper** | Urethane | CYP32 only |
| 42 | **O-ring** | NBR | |
| 43 | **Type C retaining ring for axis** | Carbon tool steel | |
| 44 | **O-ring** | NBR | |
| 45 | **Retaining plate** | Aluminum alloy | CYP15 only |

## Dimensions




(mm)

| Model | A | B | C | E | ED | EK | F | G | H | HA | HB | HG | HI | HL | HP | HS | HT | J | JK | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CYP15** | 8 | 9.5 | 5.4 | 4H9 $^{+0.030}_{0}$ | 9.5 | 4 | 12.5 | 6.5 | 45 | 19.5 | 8.5 | 8.5 | 23 | 38.6 | 44 | 27 | 19.5 | M6 x 1 | 10 | 21 | 67 |
| **CYP32** | 12 | 14 | 8.6 | 6H9 $^{+0.030}_{0}$ | 13 | 6 | 25 | 8.5 | 75 | 39 | 19 | 19 | 39 | 64.9 | 73.5 | 49.5 | 39 | M10 x 1.5 | 12 | 20 | 90 |

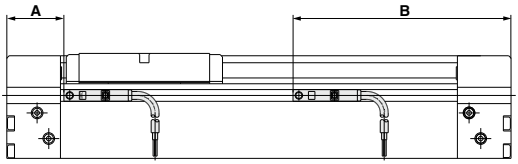
| Model | LD | LW | MM | M | N | P | PA | PB | Q | QW | R | T | TA | TB | W | WA | WB | Y | Z | ZZ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CYP15** | 5.6 | 69 | M4 x 0.7 | 6 | 4.5 | M5 x 0.8 | 25 | 60 | 105 | 48 | 45 | 23 | 13 | 18 | 69 | 32 | 17 | 2.5 | 118 | 16.5 |
| **CYP32** | 9.2 | 115 | M6 x 1 | 8 | 7.5 | Rc (PT) 1/8 | 50 | 100 | 138 | 87 | 79.5 | 29 | 17 | 22 | 115 | 46 | 27 | 3.5 | 155 | 29 |

Note 1) These dimension drawings indicate the case of piping port location "Nil".
Note 2) These dimensions indicate the protruding portion of the bumper.
Note 3) Refer to "Specific Product Precautions" [Cushion Effect (Sine Cushion) and Stroke Adjustment] on page 1573.

| Model | Nil | | L | | R | | S | |
|---|---|---|---|---|---|---|---|---|
| Piping port location | a | b | c | d | e | f | g | h |
| Operating direction | Right | Left | Right | Left | Right | Left | Right | Left |

# Auto Switch Mounting

## Proper Auto Switch Mounting Position Detection (Detection at stroke end)




### Proper Auto Switch Mounting Position

| Cylinder model \ Auto switch model | A | | | B | | |
|---|---|---|---|---|---|---|
| | D-Z7□<br>D-Z80 | D-Y7□W<br>D-Y7□WV | D-Y5□<br>D-Y6□<br>D-Y7P<br>D-Y7PV | D-Z7□<br>D-Z80 | D-Y7□W<br>D-Y7□WV | D-Y5□<br>D-Y6□<br>D-Y7P<br>D-Y7PV |
| **CYP15** | 24.5 | | | 93.5 | | |
| **CYP32** | 33 | | | 122 | | |

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

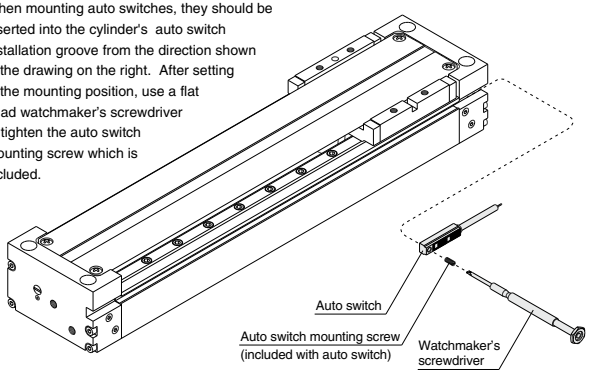
## Operating Range

| Cylinder model \ Auto switch model | D-Z7□<br>D-Z80 | D-Y7□W<br>D-Y7□WV<br>D-Y5□<br>D-Y6□<br>D-Y7P<br>D-Y7PV |
|---|---|---|
| **CYP15** | 6.5 | 2.5 |
| **CYP32** | 9.5 | 3 |

Note) Operating ranges are standards including hysteresis, and are not guaranteed. (variations on the order of ±30%)
Large variations may occur depending on the surrounding environment.

## Mounting of Auto Switch

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




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

# *CYP Series*
# Specific Product Precautions 1

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.**

## Handling

### ⚠ Caution

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

## Mounting

### ⚠ Caution

1. **Take care to avoid striking the cylinder tube with other objects or handling it in a way that could cause deformation.**
   The cylinder tube and slider units have a non-contact construction. For this reason, even a slight deformation or slippage of position can cause malfunction and loss of durability, as well as a danger of degrading the particulate generation characteristics.
2. **Do not scratch or gouge the linear guide by striking it with other objects.**
   Since the linear guide is specially treated for maximum suppression of particulate generation due to sliding, even a slight scratch can cause malfunction and loss of durability, as well as a danger of degrading the particulate generation characteristics.
3. **Since the slide table is supported by precision bearings, do not apply strong impacts or excessive moment when mounting workpieces.**
   The slide table may contact with the cylinder tube.
4. **Be sure to operate the cylinder with the plates on both sides secured.**
   Avoid applications in which the slide table or only one plate is secured.
5. **When changing the ports to be used, be sure that unused ports are securely sealed.**
   Take sufficient care in sealing unused ports, because if ports are not properly sealed air can leak from the ports and particulate generation characteristics can be degraded.
6. **Do not loosen the bolts that fix the block of the linear guide and slide table.**
   The slide table may contact with the cylinder tube.
7. **It is recommended to place the load's center of gravity on the cylinder linear guide.**
   The linear guide position is off-set from the cylinder center axis, so it is recommended to place the load's center of gravity on the linear guide.

## Operation

### ⚠ Caution

1. **The maximum operating pressure for the clean rodless cylinder is 0.3 MPa.**
   If the maximum operating pressure of 0.3 MPa for the clean rodless cylinder is exceeded, the magnetic coupling can be broken, causing a danger of malfunction or degradation of particulate generation characteristics, etc.
2. **The product can be used with a direct load applied within the allowable range, but careful alignment is necessary when connecting to a load having an external guide mechanism.**
   Since alignment variations increase as the stroke gets longer, use a connection method which can absorb these variations and consider measures to control particulate generation.
3. **When used for vertical operation, use caution regarding possible dropping due to separation of the magnetic coupling.**
   When used for vertical operation, use caution as there is a possibility of dropping due to separation of the magnetic coupling if a load (pressure) greater than the allowable value is applied.
4. **Do not operate with the magnetic coupling out of position.**
   If the magnetic coupling is out of position, push the external slider by hand (or the piston slider with air pressure) back to the proper position at the stroke end.
5. **Do not supply lubrication, as this is a non-lube product.**
   The interior of the cylinder is lubricated at the factory, and lubrication with turbine oil, etc., will not satisfy the product's specifications.

# *CYP Series*
# Specific Product Precautions 2

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.**

## Speed Adjustment

### ⚠ Caution

**1. A throttle valve for clean room use is recommended for speed adjustment. (Please consult with SMC regarding equipment and methods to be used.)**
Speed adjustment can also be performed with a meter-in or meter-out type speed controller for clean room use, but it may not be possible to obtain smooth starting and stopping operation.

**Throttle Valves and Dual Speed Controllers for Recommended Speed Adjustment of CYP Cylinders**

| Throttle valve \ Series | | Model | |
|---|---|---|---|
| | | CYP15 | CYP32 |
| Metal body piping type | Elbow type | 10-AS1200-M5-X216 | 10-AS2200-01-X214 |
| | In-line type | 10-AS1000-M5-X214 | 10-AS2000-01-X209 |
| Resin body with One-touch fitting | Elbow type (throttle valve) | 10-AS1201F-M5-04-X214 | 10-AS2201F-01-04-X214 |
| | | 10-AS1201F-M5-06-X214 | 10-AS2201F-01-06-X214 |
| | | | 10-AS2201F-01-08-X214 |
| | Universal type (throttle valve) | 10-AS1301F-M5-04-X214 | 10-AS2301F-01-04-X214 |
| | | 10-AS1301F-M5-06-X214 | 10-AS2301F-01-06-X214 |
| | | | 10-AS2301F-01-08-X214 |
| | In-line type (throttle valve) | 10-AS1001F-04-X214 | 10-AS2001F-04-X214 |
| | | 10-AS1001F-06-X214 | 10-AS2001F-06-X214 |
| | Dual type (speed controller) | 10-ASD230F-M5-04 | 10-ASD330F-01-06 |
| | | 10-ASD230F-M5-06 | 10-ASD330F-01-08 |
| With clean One-touch fitting | Elbow type/Brass (throttle valve) | AS1201FPQ-M5-04-X214 | AS2201FPQ-01-04-X214 |
| | | AS1201FPQ-M5-06-X214 | AS2201FPQ-01-06-X214 |
| | | — | AS2201FPQ-01-08-X214 |
| | Elbow type/ Stainless steel 304 (throttle valve) | AS1201FPG-M5-04-X214 | AS2201FPG-01-04-X214 |
| | | AS1201FPG-M5-06-X214 | AS2201FPG-01-06-X214 |
| | | — | AS2201FPG-01-08-X214 |

Note 1) Refer to Back Page 8 (How to Use Clean Series) for the selection of the metal body piping type and the cylinders with a resin-body One-touch fitting.
Note 2) Refer to the Pneumatic Clean Series (fittings for air line equipment) for the fittings used for the metal body piping type.

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

## Cushion Effect (Sine Cushion) and Stroke Adjustment

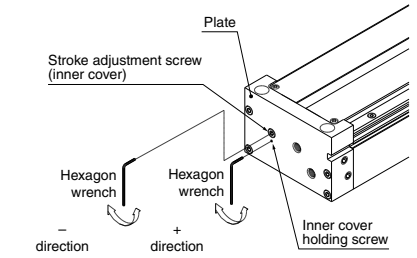
### ⚠ Caution

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

**2. The stroke end adjustment is a mechanism to adapt the slide table's stroke end position to a mechanical stopper on other equipment, etc.**
**(Adjustment range: Total of both sides ±2 mm) To ensure safety, perform adjustment after shutting off the drive air, releasing the residual pressure and implementing drop prevention measures, etc.**
1) Loosen the inner cover holding screw with a hexagon wrench. (When adjusting strokes, be sure to adjust after loosening set screws. If rotating stroke adjustment screws without loosening them, hexagon holes for adjustment screws may deform and stroke adjustment cannot be performed.)
2) To match the position with a mechanical stopper on other equipment, etc., rotate the stroke adjustment screws of the inner cover with a hexagon wrench and move the inner cover back and forth in the axial direction. Approximately 1 mm of adjustment is possible with one rotation. (Stroke adjustment screw rotational direction: Left rotation → +stroke, Right rotation → –stroke)
3) The maximum adjustment on one side is ±1 mm. A total adjustment of approximately ±2 mm is possible using both sides.
4) After adjusting the set stroke, tighten the inner cover holding screw with a hexagon wrench.

**Inner Cover Holding Screw Tightening Torque [N·m] and Hexagon Wrench**

| Model | Inner cover holding screw | | | Stroke adjustment screw |
|---|---|---|---|---|
| | Screw size | Tightening torque | Hexagon wrench (Nominal size) | Hexagon wrench (Nominal size) |
| CYP15 | M3 x 0.5 | 0.3 | 1.5 | 2.5 |
| CYP32 | M6 x 1 | 2.45 | 3 | 4 |



# *CYP Series*
# Specific Product Precautions 3

**Be sure to read this before handling the products.**
**Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.**

## Maintenance

### ⚠ Caution

**1. Never disassemble the cylinder tube or linear guide, etc.**
If disassembled, the slide table may touch the outside surface of the cylinder tube resulting in a degradation of particulate generation characteristics.

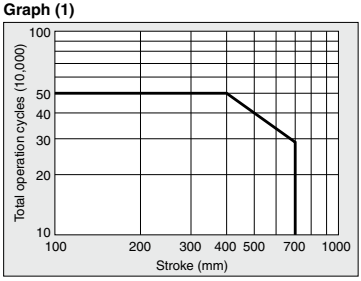
**2. Cylinder maintenance should be performed roughly at the operating cycle of 500 thousand or operating distance of 400 km.**

## Particulate Generation Characteristics

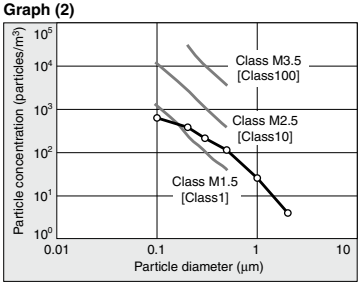
### ⚠ Caution

**1. In order to maintain the particulate generation grade, use operation of 500 thousand cycles or travel distance of about 400 km as a standard. (Graph (1) below)**
If operation is continued beyond the recommended values, lubrication failure of the linear guide and loss of particulate generation characteristics may occur.

**Graph (1)**




**Graph (2)**




Note 1) This chart indicates the level of cleanliness inside the measurement chamber.
Note 2) The vertical axis shows the number of particles per unit volume (1 m³) of air which are no smaller than the particle size shown on the horizontal axis.
Note 3) The gray lines show the upper concentration limit of the cleanliness class based on Fed. Std. 209E-1992.
Note 4) The plots indicate the 95% upper reliability limit value for time series data up to 500 thousand operation cycles. (Cylinder: CYP32-200, Workpiece weight: 5 kg, Average speed: 200 mm/s)
Note 5) The data above provides a guide for selection but is not guaranteed.

**2. When the amount of grease at the linear guide is insufficient depending on the operating conditions, regular application of grease is recommended.**
In such cases, the amount of dust may temporarily increase. After operating the cylinder for a short period of time, increased dust gradually decreases.