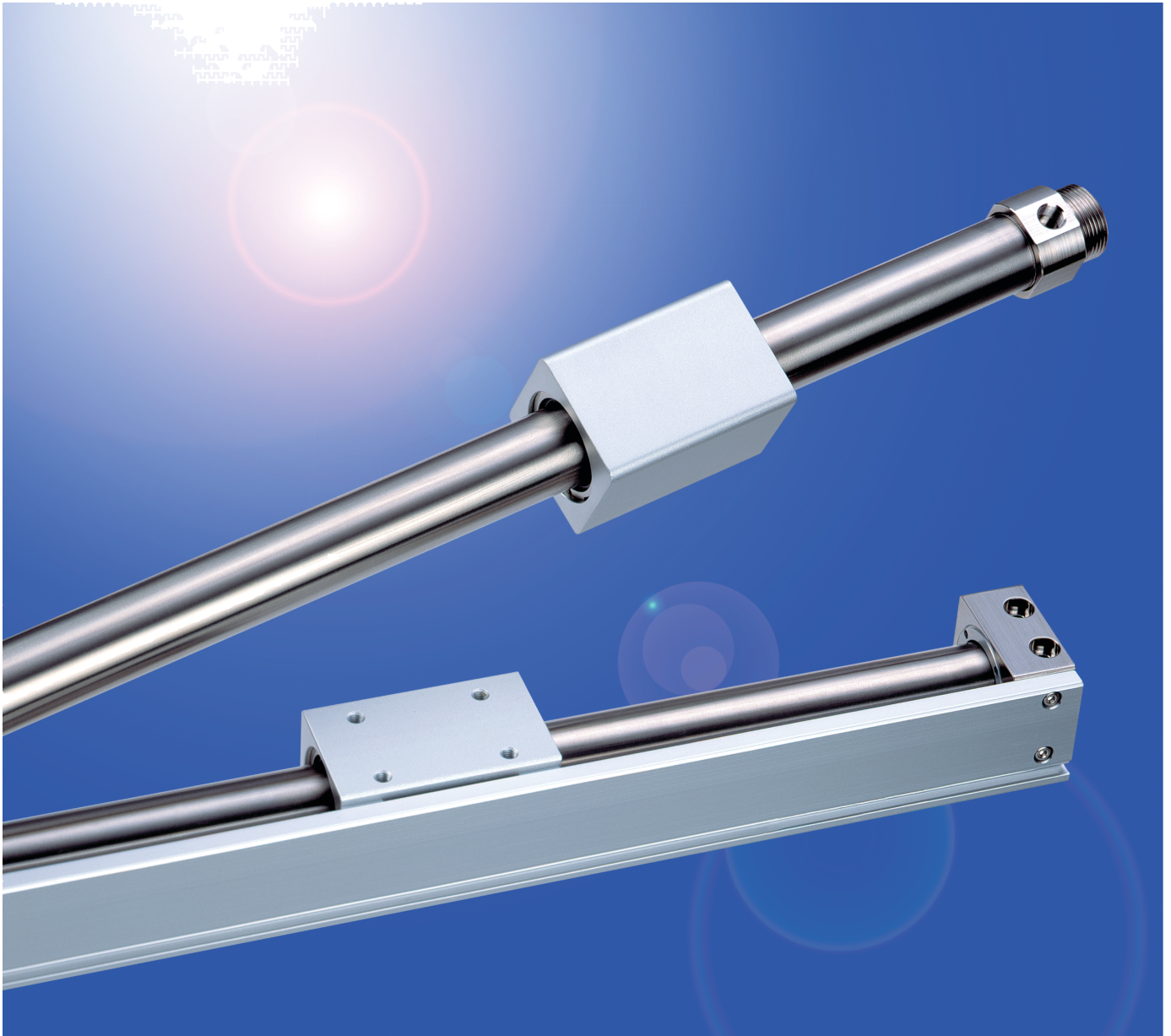




# Magnetically Coupled Rodless Cylinder



**New**

**ø6, ø10, ø50, and ø63 have been added.**

Upgraded version of space saving  
magnetically coupled rodless cylinder

Basic type

Direct mount type

**Series CY3B/CY3R**



# Series *CY3B/CY3R*

## Improved durability

### Improved bearing performance

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

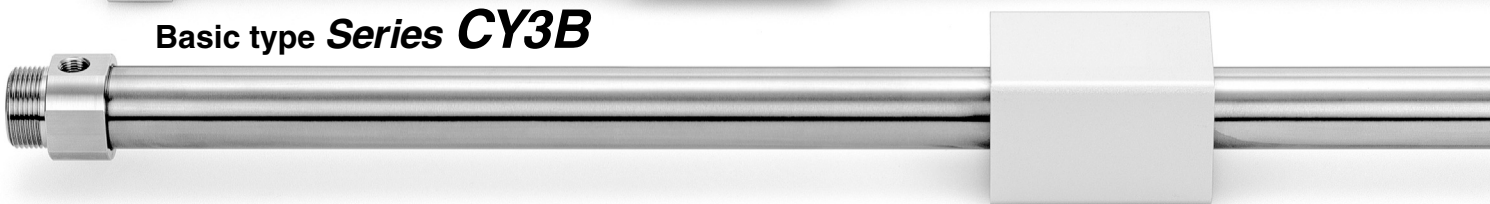
### Improved lubrication by using a lubretainer

A special resin lubretainer is installed on the dust seal to achieve ideal lubrication on the external surface of the cylinder tube.

### Direct mount type *Series CY3R*



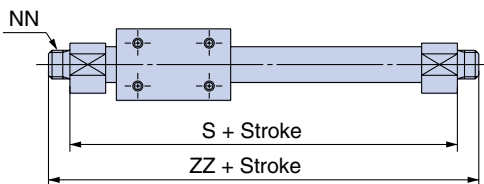
### Basic type *Series CY3B*



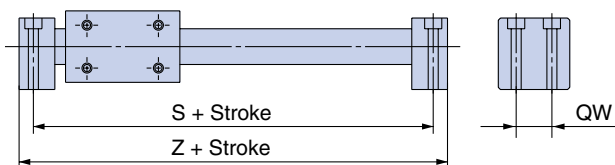
## Mounting dimensions are identical to those of series CY1.

The mounting dimensions (in the drawing below) are identical with those of existing series CY1B/CY1R, allowing easy replacement.

### Series CY3B

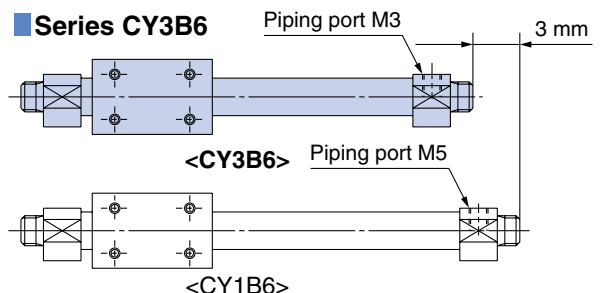


### Series CY3R

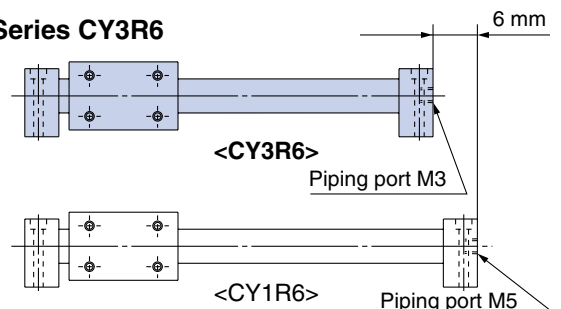


(\* For bore size of  $\phi 6$ , the mounting is not interchangeable with the CY1 series because the piping port has been reduced to a M3 size.)

### Series CY3B6

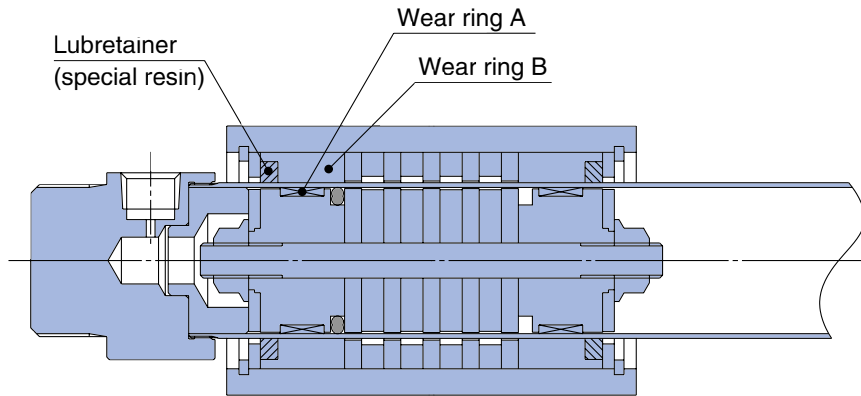


### Series CY3R6



Note) When ordering a product that is interchangeable with a CY1□6, add the suffix, X1468 to the end of the CY3□6 model number (Refer to page 27).

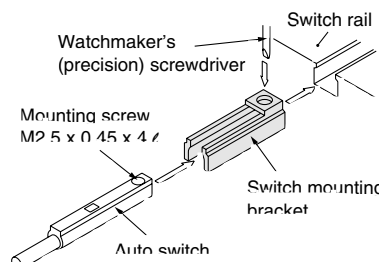
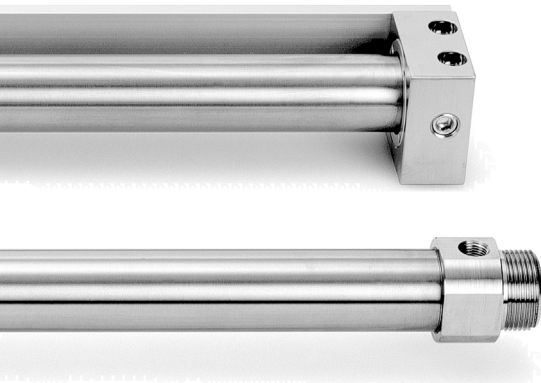
# Upgraded version of space saving magnetically rodless cylinder!



## Series CY3B

### Small auto switches are mountable.

Small auto switches can be mounted on the current auto switch mounting groove of the CY3R20 to 63. They can also be mounted to all of the cylinder sizes in the CY3R series, making inventory control of the product easy.



### Lightweight

The body weight has been reduced by approximately 10% by eliminating unnecessary body weight and by reducing the outer diameter of the cylinder tube. (Compared with previous  $\phi 50$  and  $\phi 60$  models)

## Reduction of sliding resistance

### Minimum operating pressure reduced by 30%

By using a lubretainer the minimum operating pressure is reduced by 30%. (CY3B40 compared with CY1B40)

$\phi 6$ ,  $\phi 10$ ,  $\phi 50$ , and  $\phi 63$   
Series is completed by adding the new bore sizes. ( $\phi 6$  to  $\phi 63$ )



## Series Variations

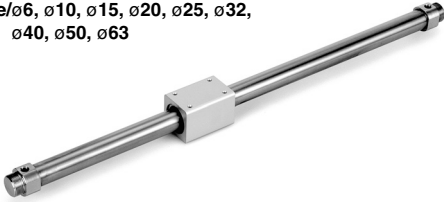

Series	Bore size	Standard stroke (mm)										Individual made-to-order products							
		50	100	150	200	250	300	350	400	450	500	600	700	800	900	1000			
CY3B	$\phi 6$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	$\phi 10$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	$\phi 15$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	$\phi 20$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	$\phi 25$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	$\phi 32$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	$\phi 40$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	$\phi 50$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CY3R	$\phi 6$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	$\phi 10$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	$\phi 15$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	$\phi 20$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	$\phi 25$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	$\phi 32$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	$\phi 40$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	$\phi 50$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
$\phi 63$	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

Note) The ● mark indicates the available combination of bore size and standard stroke.

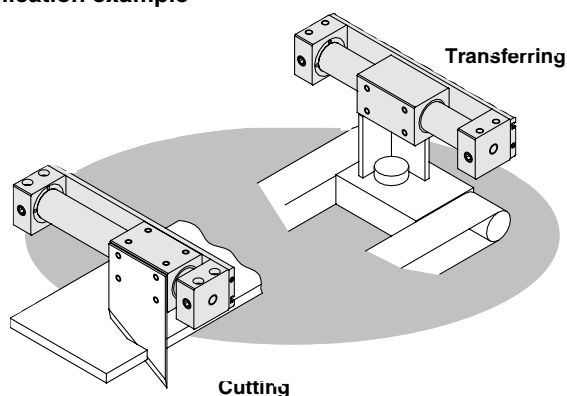
Availability of made to order products varies with the series and the bore size. For more information, please refer page 24

# Series CY3B/CY3R

## Model Selection Criteria

Model selection points	Recommended cylinder		
	Appearance	Features	
<ul style="list-style-type: none"> <li>• When used with many different types of guides.</li> <li>• When a long stroke is necessary.</li> </ul>	Types with guide	<p><b>Series CY3B</b> Size/ø6, ø10, ø15, ø20, ø25, ø32, ø40, ø50, ø63</p> 	<ul style="list-style-type: none"> <li>• A long stroke is possible.</li> </ul>
<ul style="list-style-type: none"> <li>• When used with many different types of guides.</li> <li>• When auto switches are added to the basic type.</li> <li>• When used without a guide for a light load. (See application example.)</li> <li>• When space is very limited.</li> </ul>		<p><b>Series CY3R</b> Size/ø6, ø10, ø15, ø20, ø25, ø32, ø40, ø50, ø63</p> 	<ul style="list-style-type: none"> <li>• Cylinder can be directly mounted.</li> <li>• Auto switches can be mounted, and there is no lurching from cylinder.</li> <li>• Non-rotation mechanism is available within the allowable range.</li> <li>• Piping can be concentrated with the centralized piping type.</li> <li>• External dimensions are compact.</li> <li>• Mounting can be performed on the top body surface or on one of the side surfaces.</li> </ul>

### Application example



# Series CY3B/CY3R

## Model Selection

E: Kinetic energy of load (J)

$$E = \frac{(W + W_b)}{2} \times \left(\frac{V}{1000}\right)^2$$

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

Fn: Allowable driving force (N)

Mb: Maximum allowable moment (N·m) when a connection bracket, etc. is carried directly

Ps: Operating pressure limit for intermediate stop using an external stopper, etc. (MPa)

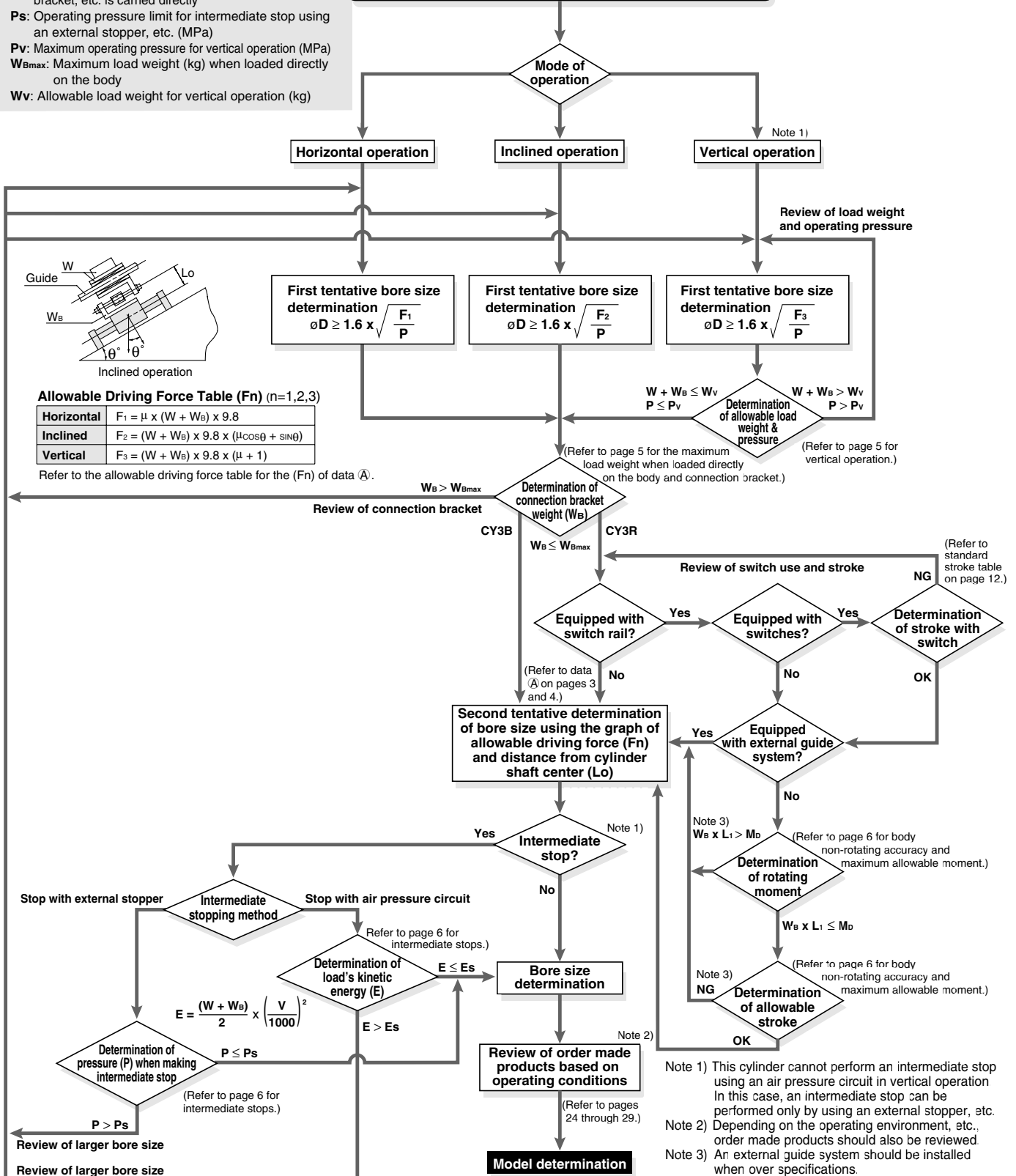
Pv: Maximum operating pressure for vertical operation (MPa)

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

Wv: Allowable load weight for vertical operation (kg)

**Operating Conditions**

- W: Load weight (kg)
- Wb: Connection bracket weight (kg)
- μ: Guide's coefficient of friction
- Lo: Distance from cylinder shaft center to workpiece point of application (cm)
- L1: Distance from cylinder shaft center to connection fitting, etc.
- Switches
- P: Operating pressure (MPa)
- V: Speed (mm/s)
- Stroke (mm)
- Mode of operation (horizontal, inclined, vertical)



# Series CY3B/CY3R

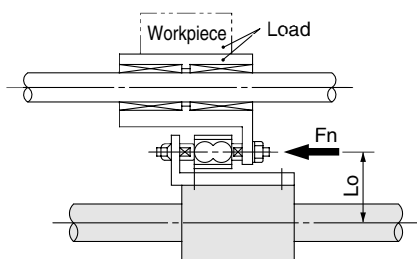
## Model Selection

### Precautions on Design 1

### Selection Procedure

#### Selection procedure

- 1 Find the drive resisting force  $F_n$  (N) when moving the load horizontally.
- 2 Find the distance  $L_o$  (cm) from the point of the load where driving force is applied, to the center of the cylinder shaft
- 3 Select the bore size from  $L_o$  and  $F_n$ , based on data (A).

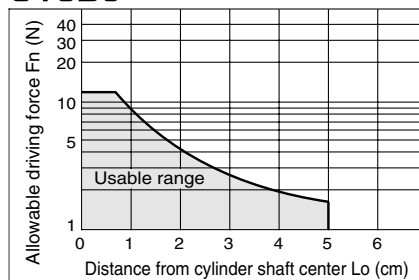


#### Selection example

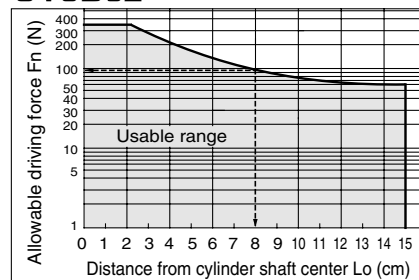
Given a load drive resisting force of  $F_n = 100$  (N) and a distance from the cylinder shaft center to the load application point of  $L_o = 8$  cm, find the intersection point by extending upward from the horizontal axis of data (A) where the distance from the shaft center is 8 cm, and then extending to the side, find the allowable driving force on the vertical axis. Models suitable in satisfying the requirement of 100 (N) are **CY3L32** or **CY3L40**.

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

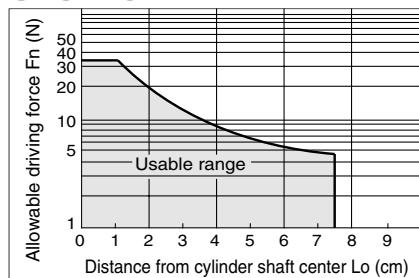
#### CY3B6



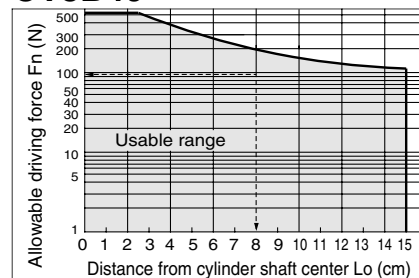
#### CY3B32



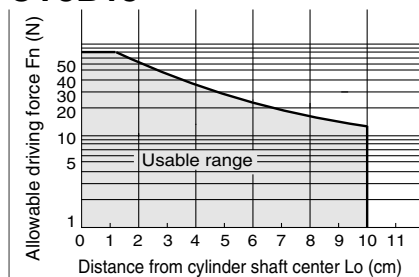
#### CY3B10



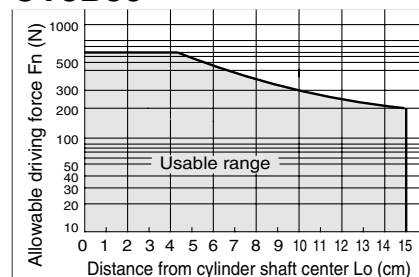
#### CY3B40



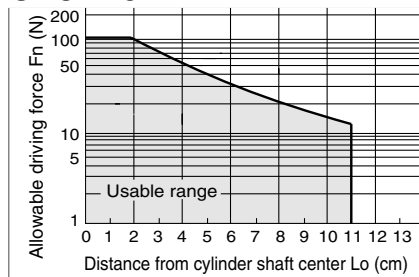
#### CY3B15



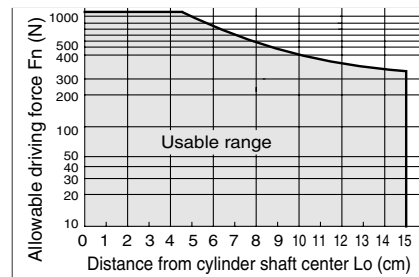
#### CY3B50



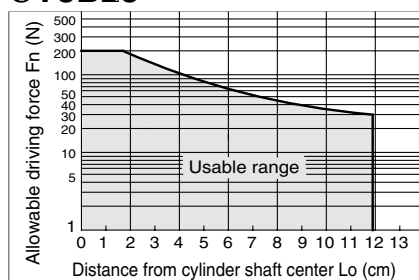
#### CY3B20



#### CY3B63



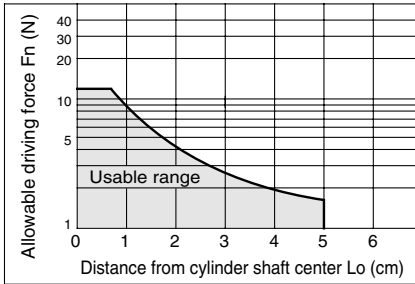
#### CY3B25



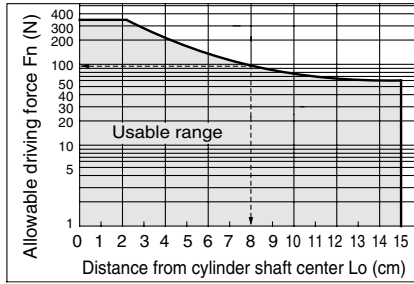
## Precautions on Design 1

<Data ① Distance from cylinder shaft center — Allowable driving capacity>

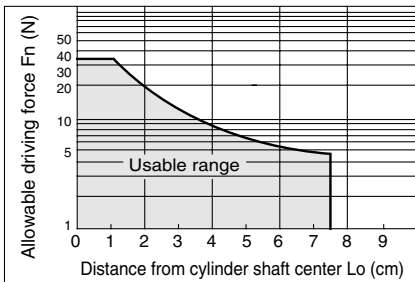
### CY3R6



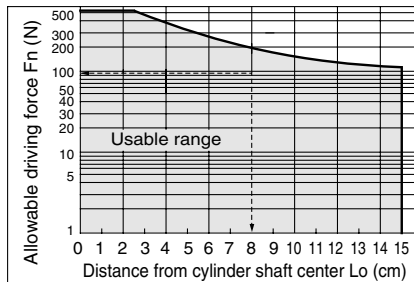
### CY3R32



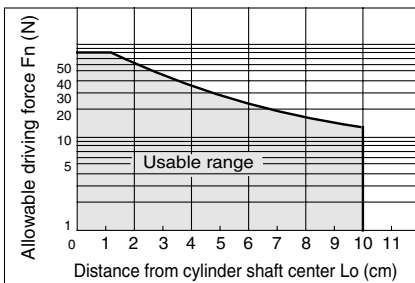
### CY3R10



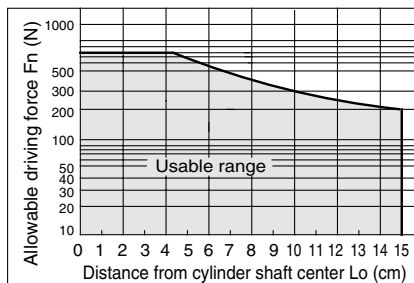
### CY3R40



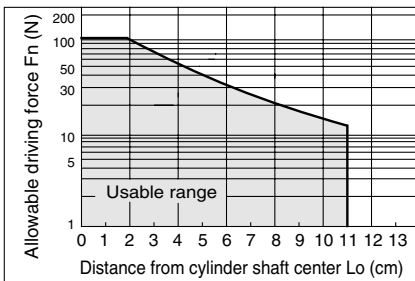
### CY3R15



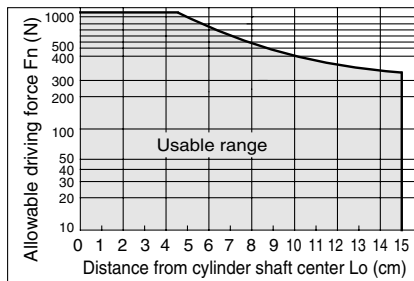
### CY3R50



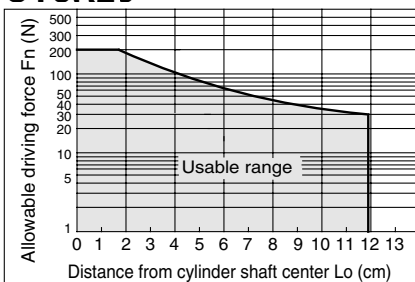
### CY3R20



### CY3R63



### CY3R25

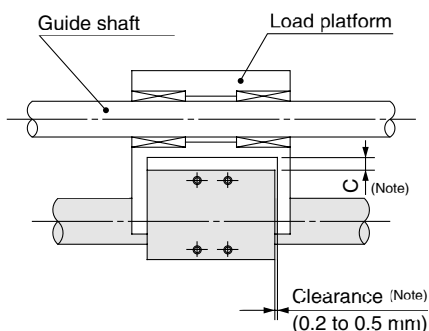


# Series CY3B/CY3R Model Selection

## Precautions on Design 2

### Cylinder Dead Weight Deflection

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

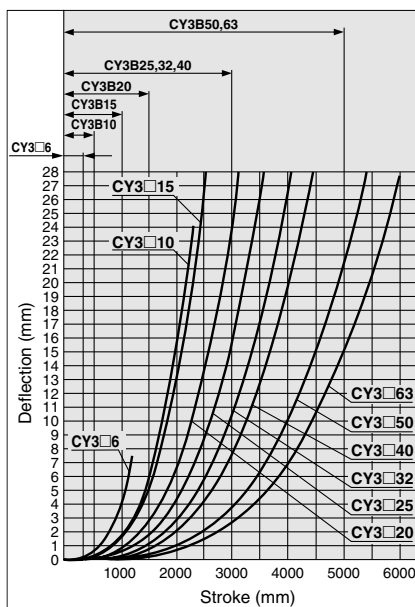
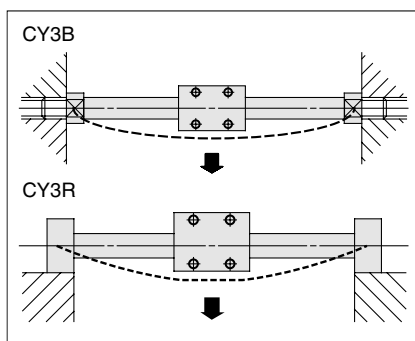


The above clearance amount is a reference value.

Note 1) According to the dead weight deflection in the figure on the right, provide clearance so that the cylinder does not touch the mounting surface or the load, etc., and is able to operate smoothly within the minimum operating pressure range for a full stroke. For more information, refer to instruction manual.

Note 2) In case of the CY3R, install a shim, etc. to eliminate clearance between the body and the switch rail. For more information, refer to the CY3R instruction manual.

Note 3) The amount of deflection differs from the CY1B/CY1R. Adjust the clearance value by referring to the dead weight deflection as shown in the table on the right.



\* The above deflection data represent values at the time when the external sliding part moves to the middle of the stroke.

### Maximum Weight of Connection Bracket to the Body

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

#### Max. Connection Bracket Weight

Model	Max. connection bracket weight ( $W_{Bmax}$ ) (kg)
CY3□6	0.2
CY3□10	0.4
CY3□15	1.0
CY3□20	1.1
CY3□25	1.2
CY3□32	1.5
CY3□40	2.0
CY3□50	2.5
CY3□63	3.0

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

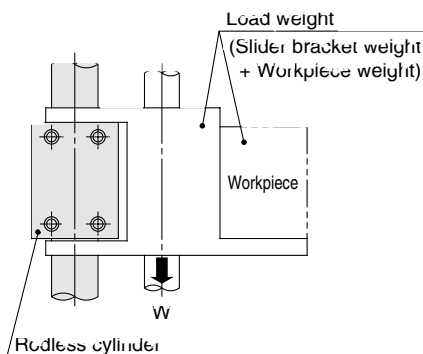
### <CY3R> Maximum Load Weight when Loaded Directly on Body

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

Model	Max. load weight ( $W_{Bmax}$ ) (kg)
CY3R6	0.2
CY3R10	0.4
CY3R15	1.0
CY3R20	1.1
CY3R25	1.2
CY3R32	1.5
CY3R40	2.0
CY3R50	2.5
CY3R63	3.0

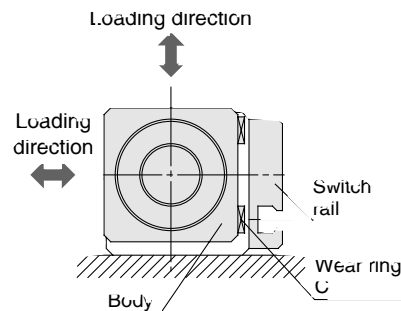
### Vertical Operation

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



Bore size (mm)	Model	Allowable load weight ( $W_v$ ) (kg)	Max. operating pressure ( $P_v$ ) (MPa)
6	CY3□6	1.0	0.55
10	CY3□10	2.7	0.55
15	CY3□15	7.0	0.65
20	CY3□20	11.0	0.65
25	CY3□25	18.5	0.65
32	CY3□32	30.0	0.65
40	CY3□40	47.0	0.65
50	CY3□50	75.0	0.65
63	CY3□63	115.0	0.65

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





## Precautions on Design 3

### Intermediate Stop

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

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

Bore size (mm)	Model	Operating pressure limit for intermediate stop (Ps) (MPa)
6	CY3□6	0.55
10	CY3□10	0.55
15	CY3□15	0.65
20	CY3□20	0.65
25	CY3□25	0.65
32	CY3□32	0.65
40	CY3□40	0.65
50	CY3□50	0.65
63	CY3□63	0.65

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

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

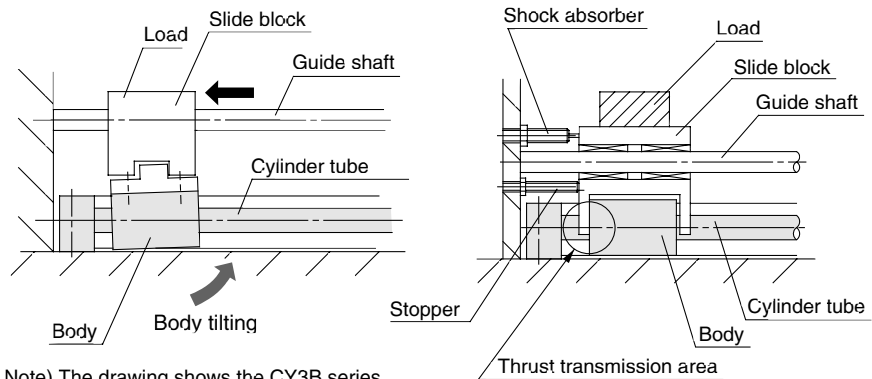
(Reference values)

Bore size (mm)	Model	Allowable kinetic energy for intermediate stop (Es) (J)
6	CY3□6	0.007
10	CY3□10	0.03
15	CY3□15	0.13
20	CY3□20	0.24
25	CY3□25	0.45
32	CY3□32	0.88
40	CY3□40	53
50	CY3□50	3.12
63	CY3□63	5.07

### Stroke End Stopping Method

When stopping a load having a large inertial force at the stroke end, tilting of the body and damage to the bearings and cylinder tube may occur. (Refer to the left hand drawing below.)

As shown in the right hand drawing below, a shock absorber should be used together with the stopper, and thrust should also be transmitted from the center of the body so that tilting will not occur.



Note) The drawing shows the CY3B series.

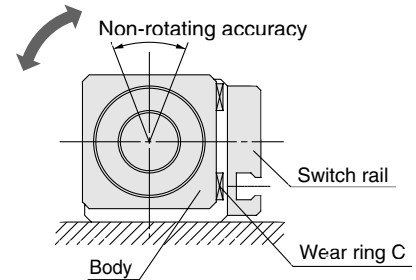
#### <CY3R>

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

(Reference values)

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

Bore size (mm)	Non-rotating accuracy (°)	Max. allowable moment (M <sub>D</sub> ) (N·m)	Allowable stroke (mm) <sup>Note 2)</sup>
6	7.3	0.02	100
10	6.0	0.05	100
15	4.5	0.15	200
20	3.7	0.20	300
25	3.7	0.25	300
32	3.1	0.40	400
40	2.8	0.62	400
50	2.4	1.00	500
63	2.2	1.37	500



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

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

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

# Magnetically Coupled Rodless Cylinder: Basic Type

## Series **CY3B**

ø6, ø10 ø15, ø20 ø25, ø32, ø40, ø50, ø63

### How to Order

**Basic type** **CY3B** **25** **300**

Basic type •

Bore size •

Bore size	Symbol
6 mm	6
10 mm	10
15 mm	15
20 mm	20
25 mm	25
32 mm	32
40 mm	40
50 mm	50
63 mm	63

Standard stroke •  
Refer to the standard stroke table shown below.

Port thread type •

Symbol	Type	Bore size
Nil	M thread	6, 10, 15
	Rc	20, 25, 32, 40
TN	NPT	50, 63
TF	G	

### Standard Stroke

Bore size (mm)	Standard stroke (mm)	Maximum available stroke (mm)
6	50, 100, 150, 200	300
10	50, 100, 150, 200, 250, 300	500
15	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	1000
20	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1500
25		3000
32		3000
40	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000	3000
50		5000
63		5000

Note 1) Long stroke specification (XB11) applies to the strokes exceeding 2000 mm. (Refer to page 25.)

Note 2) The longer the stroke, the larger the amount of deflection in a cylinder tube. Pay attention to the mounting bracket and clearance value.

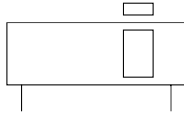
### Magnetic Holding Force

Bore size (mm)	6	10	15	20	25	32	40	50	63
Holding force (N)	19.6	53.9	137	231	363	588	922	1471	2256

### Specifications



JIS Symbol



Fluid	Air
Proof pressure	1.05 MPa
Max. operating pressure	0.7 MPa
Min. operating pressure	Refer to the minimum operating pressure table.
Ambient and fluid temperature	-10 to 60°C
Piston speed	50 to 500 mm/s
Cushion	Rubber bumper on both ends
Lubrication	Non-lube
Stroke length tolerance	0 to 250 st: $+1.0_0$ , 251 to 1000 st: $+1.4_0$ , 1001 st to: $+1.8_0$
Mounting orientation	Horizontal, Inclined, Vertical <sup>Note)</sup>
Mounting nut (2 pcs.)	Standard equipment (accessory)

Note) When vertically mounting, it is impossible to perform an intermediate stop by means of a pneumatic circuit.



**Made to Order**  
(Refer to pages 24 for details.)

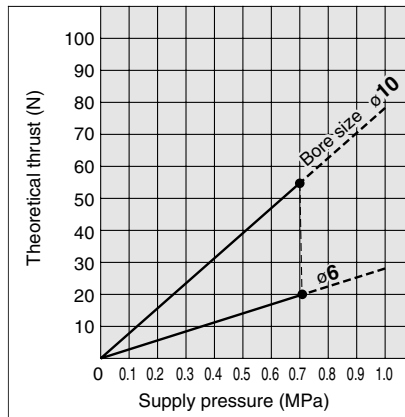
Symbol	Specifications
-XB6	Heat resistant specifications
-XB9	Low speed specifications (15 to 50 mm/s)
-XB11	Long stroke
-XB13	Low speed specifications (7 to 50 mm/s)
-X116	Hydro specifications
-X132	Axial ports
-X160	High speed specifications
-X168	Helical insert thread specifications
-X206	Added mounting tap positions for slider
-X210	Oil-free exterior specifications
-X322	Outside of cylinder tube with hard chrome plating
-X324	Oil-free exterior specifications (with dust seal)
-X1468	Interchangeable specification with CY1□6
-XC24	With magnetic shielding plate
-XC57	With floating joint

### Theoretical Cylinder Thrust

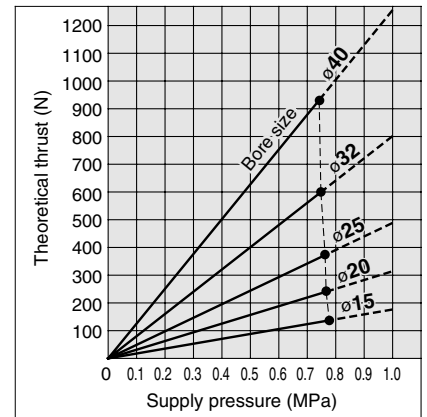


When calculating the actual thrust, design should consider the minimum actuating pressure.

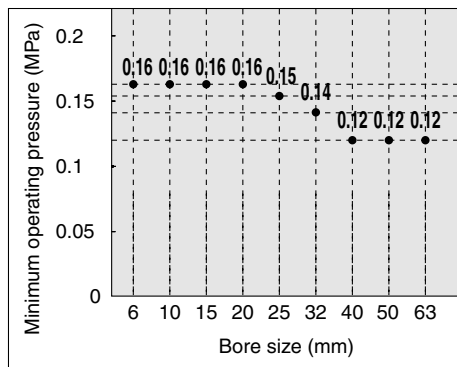
#### ø6, ø10



#### ø15, ø20, ø25, ø32, ø40

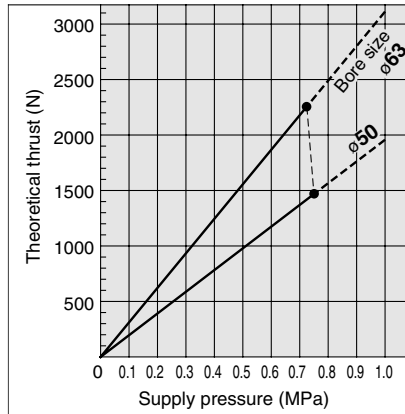


### Minimum Operating Pressure



Note) Values show when the cylinder is driving without load.

#### ø50, ø63



### Main Material

Description	Material	Note
Head cover	Aluminum alloy	Electroless nickel plated
Cylinder tube	Stainless steel	
Body	Aluminum alloy	Hard anodized
Magnet	Rare earth magnet	

Note) For details, refer to the construction drawings on page 9.

### Weight

Unit: kg

Bore size (mm)	6	10	15	20	25	32	40	50	63
Basic weight (at 0 st)	0.052	0.08	0.275	0.351	0.672	1.287	2.07	3.2	5.3
Additional weight per 50 mm of stroke	0.004	0.014	0.015	0.02	0.023	0.033	0.04	0.077	0.096

Calculation method/Example: CY3B32-500

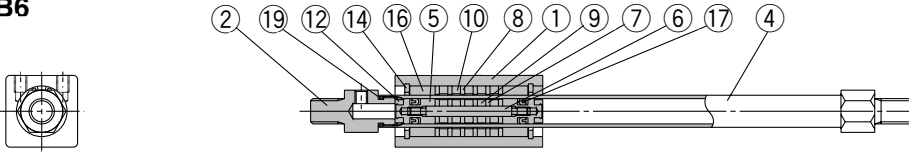
Basic weight.	287 kg	} 287 + 0.033 x 500 ÷ 50 = 617 kg
Additional weight	0.033 kg/50 st	
Cylinder stroke.	.500 st	

# Series CY3B

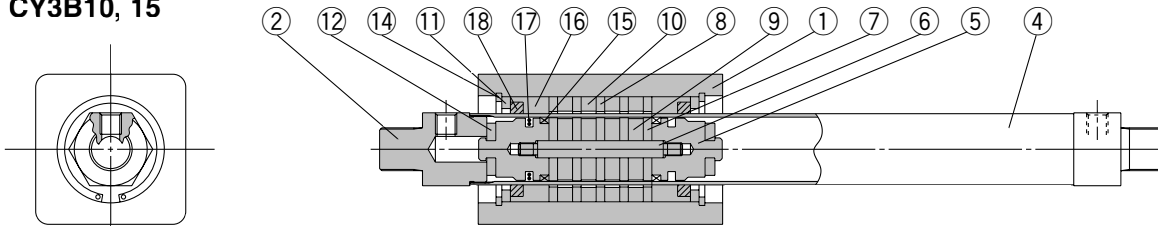
## Construction

### Basic type

#### CY3B6

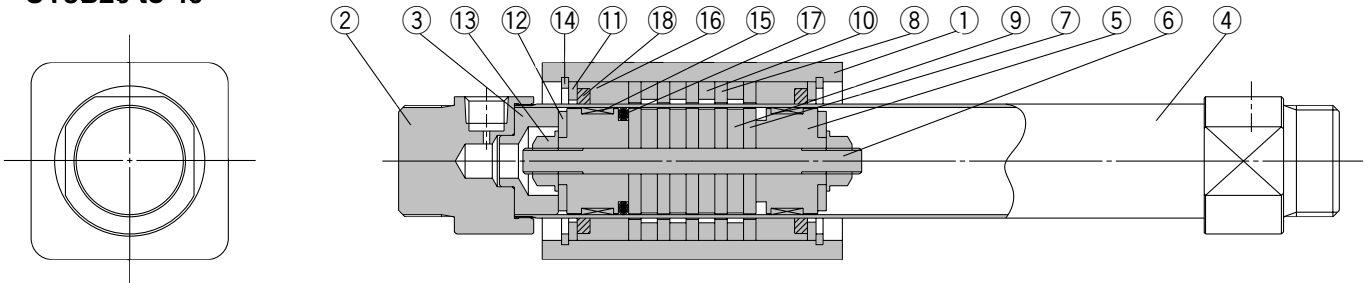


#### CY3B10, 15

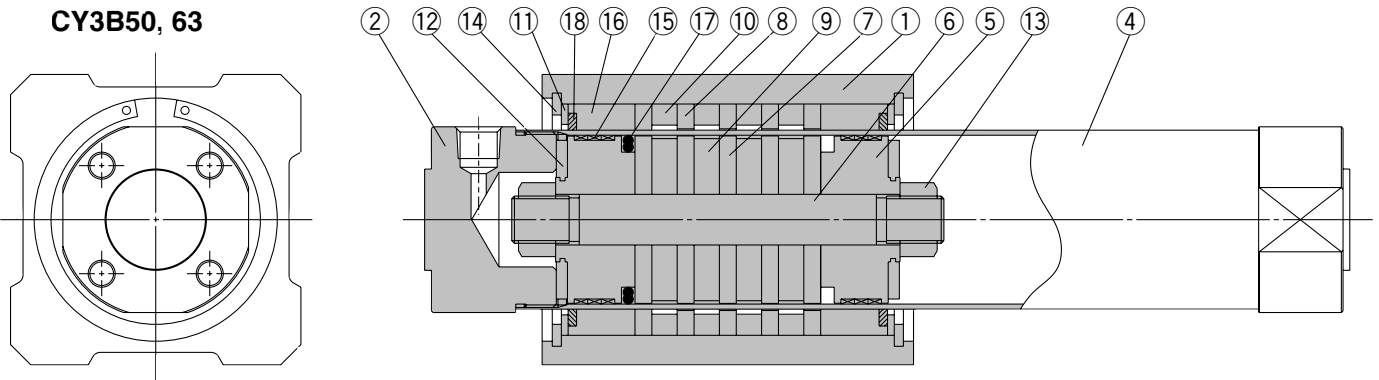


\* The above drawing is  $\phi 15$ . (3 magnets are used in  $\phi 10$ .)

#### CY3B20 to 40



#### CY3B50, 63



### Component Parts

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2	Head cover	$\phi 6, \phi 10$ Brass	Electroless Ni plated
		$\phi 15$ to $\phi 63$ Aluminum alloy	
3	End collar	Aluminum alloy	$\phi 20$ to $\phi 40$ only
4	Cylinder tube	Stainless steel	
5	Piston	$\phi 6$ to $\phi 15$ Brass	$\phi 6$ to $\phi 15$ Electroless Ni plated
		$\phi 20$ to $\phi 63$ Aluminum alloy	$\phi 20$ to $\phi 63$ Chromated
6	Shaft	Stainless steel	
7	Piston side yoke	Rolled steel	Zinc chromated
8	External slider side yoke	Rolled steel	Zinc chromated
9	Magnet A	Rare earth magnet	
10	Magnet B	Rare earth magnet	
11	Spacer	Aluminum alloy	Black anodized ( $\phi 6$ : not available)
12	Bumper	Urethane rubber	
13	Piston nut	Carbon steel	$\phi 6$ to $\phi 15$ : not available
14	C type snap ring for hole	Carbon tool steel	Nickel plated
15	Wear ring A	Special resin	
16	Wear ring B	Special resin	
17	Piston seal	NBR	
18	Lubretainer	Special resin	$\phi 6$ : not available
19	Cylinder tube gasket	NBR	$\phi 6, \phi 10$ only

### Replacement Parts: Seal Kit

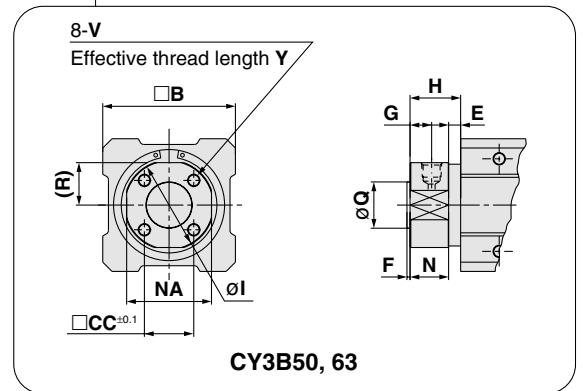
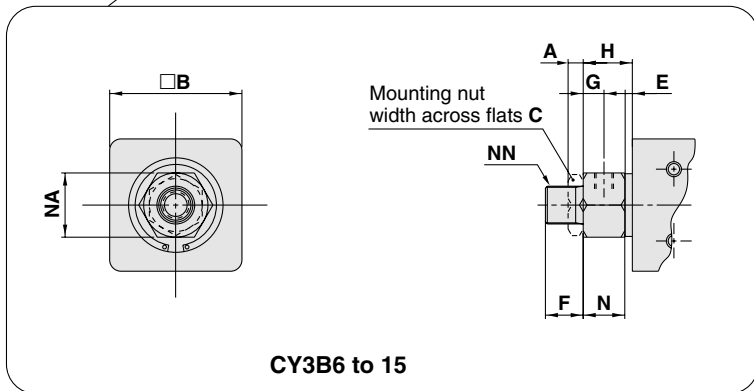
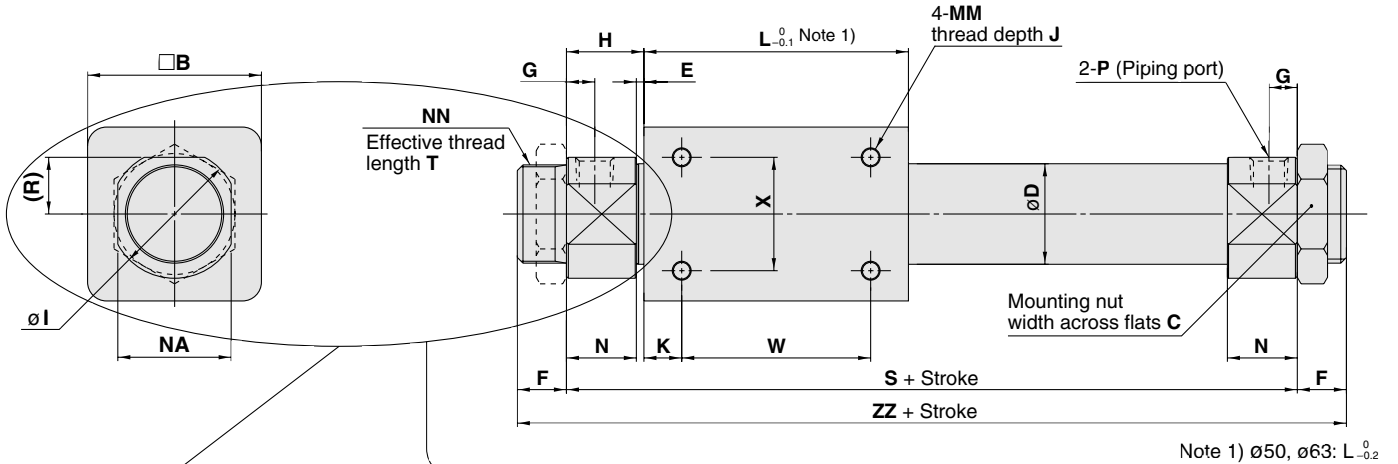
Bore size (mm)	Kit no.	Contents
6	CY3B6-PS	Numbers 15, 16, 17, 19 above
10	CY3B10-PS	Numbers 15, 16, 17, 18, 19 above
15	CY3B15-PS	Numbers 15, 16, 17, 18 above
20	CY3B20-PS	
25	CY3B25-PS	
32	CY3B32-PS	
40	CY3B40-PS	
50	CY3B50-PS	
63	CY3B63-PS	

\* Seal kits are sets consisting of numbers 15 through 19. Order using the kit number corresponding to each bore size.

**Dimensions**

**Basic type**

**CY3B6 to 63**

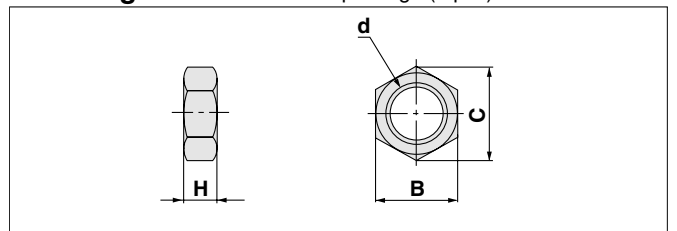


Model	A	B	C	CC	D	E	F	G	H	I	J	K	L	MM	N	NA	NN	Q	R	S	T	V
CY3B6	4	17	8*	—	7.6	4	8*	5	13.5*	—	4.5	5	35	M3 x 0.5	9.5*	10*	M6 x 1*	—	—	62*	6.5	—
CY3B10	4	25	14	—	12	1.5	9	5	12.5	—	4.5	4	38	M3 x 0.5	11	14	M10 x 1	—	—	63	7.5	—
CY3B15	4	35	14	—	16.6*	2	10	5.5	13	—	6	11	57	M4 x 0.7	11	17	M10 x 1	—	—	83	8	—
CY3B20	8	36	26	—	21.6*	2*	13	7.5*	20	28	6	8	66	M4 x 0.7	18*	24	M20 x 1.5	—	12*	106	10	—
CY3B25	8	46	32	—	26.4*	2*	13	7.5*	20.5	34	8	10	70	M5 x 0.8	18.5*	30	M26 x 1.5	—	15*	111	10	—
CY3B32	8	60	32	—	33.6*	2*	16	8*	22	40	8	15	80	M6 x 1	20*	36	M26 x 1.5	—	18*	124	13	—
CY3B40	10	70	41	—	41.6*	3*	16	11	29	50	10	16	92	M6 x 1	26*	46	M32 x 2	—	23*	150	13	—
CY3B50	—	86	—	32	52.4*	8	2	14	33	58*	12	25	110	M8 x 1.25	25	55	—	30 <sup>-0.007/-0.037</sup>	27.5*	176	—	M8 x 1.25
CY3B63	—	100	—	38	65.4*	8	2	14	33	72*	12	26	122	M8 x 1.25	25	69	—	32 <sup>-0.007/-0.043</sup>	34.5*	188	—	M10 x 1.5

Model	W	X	Y	ZZ	P (Piping port)		
					Nil	TN*	TF*
CY3B6	25	10	—	78*	M3 x 0.5*	—	—
CY3B10	30	16	—	81	M5 x 0.8	—	—
CY3B15	35	19	—	103	M5 x 0.8	—	—
CY3B20	50	25	—	132	Rc 1/8	NPT 1/8	G 1/8
CY3B25	50	30	—	137	Rc 1/8	NPT 1/8	G 1/8
CY3B32	50	40	—	156	Rc 1/8	NPT 1/8	G 1/8
CY3B40	60	40	—	182	Rc 1/4	NPT 1/4	G 1/4
CY3B50	60	60	16	180	Rc 1/4	NPT 1/4	G 1/4
CY3B63	70	70	16	192	Rc 1/4	NPT 1/4	G 1/4

Note 2) The asterisk denotes the dimensions which are different from the CY1B series

**Mounting Nut/Included in the package (2 pcs).**



Part no.	Applicable bore size (mm)	d	H	B	C
SNJ-006B	6	M6 x 1.0	4	8	9.2
SNJ-016B	10, 15	M10 x 1.0	4	14	16.2
SN-020B	20	M20 x 1.5	8	26	30
SN-032B	25, 32	M26 x 1.5	8	32	37
SN-040B	40	M32 x 2.0	10	41	47.3

# Magnetically Coupled Rodless Cylinder: Direct Mount Type

## Series **CY3R**

ø6, ø10 ø15, ø20 ø25, ø32, ø40, ø50, ø63

### How to Order

**CY3R** **25** **300** **M9B**

**Direct mount type**

**Piping type**

Nil	Both sides piping type
G	Centralized piping type

Note 1) Type G (centralized piping) is not available for ø6.

**Bore size**

6	6 mm
10	10 mm
15	15 mm
20	20 mm
25	25 mm
32	32 mm
40	40 mm
50	50 mm
63	63 mm

**Port thread type**

Symbol	Type	Bore size
Nil	M thread	6, 10, 15
	Rc	20, 25, 32, 40
TN	NPT	50, 63
TF	G	

**Number of auto switches**

Nil	2 pcs.
S	1 ps,
n	"n" pcs.

**Auto switch type**

Nil	Without auto switch
-----	---------------------

Note 1) In case of ø20 with switch rail but without switch, the cylinder construction is for reed switch.  
\* Refer to the table below for auto switch model numbers.  
\* The auto switch is shipped together, but not assembled.

**Switch rail**

Nil	With switch rail
N	Without switch rail

Note 1) A type with switch rail has built-in switch magnets.  
Note 2) ø15 has built-in switch magnets even without switch rail.

**Standard stroke**  
Refer to page 12 for standard stroke.

### Applicable Auto Switches/

The applicable auto switch is determined by the bore size. Refer to pages 21 to 23 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage		Auto switch model	Lead wire length (m)*			Pre-wired connector	Applicable load		
					DC	AC		0.5 (Nil)	3 (L)	5 (Z)		IC circuit	Relay, PLC	
Reed switch	—	Grommet	No	2-wire	24 V	5 V, 12 V	100 V or less	A90	●	●	—	—	IC circuit	Relay, PLC
						12 V	100 V	A93	●	●	—	—	—	
						5 V	—	A96	●	●	—	—	IC circuit	—
Solid state switch	Diagnostic indication (2-color display)	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9N	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				M9P	●	●	○	○	—	
				2-wire				M9B	●	●	○	○	—	
				3-wire (NPN)				F9NW	●	●	○	○	IC circuit	
				3-wire (PNP)				F9PW	●	●	○	○	—	
				2-wire				F9BW	●	●	○	○	—	
				2-wire				12 V	—	—	—	—	—	

\* Lead wire length symbols: 0.5 m..... Nil (Example) M9N  
3 m... L (Example) M9NL  
5 m... Z (Example) M9NZ

\*\* Solid state switches marked "○" are produced upon receipt of order

- For ø25, 32, 40, 50, and 63, other than the applicable auto switches listed in "How to Order" the other auto switches can be mounted. For detailed specifications, refer to page 18
- With pre-wired connector is also available in solid state auto switches. For specifications, refer to "SMC Best Pneumatics" catalog vol. 8, page 8-30-52.

## Specifications



Fluid	Air
Proof pressure	1.05 MPa
Max. operating pressure	0.7 MPa
Min. operating pressure	Refer to the minimum operating pressure table.
Ambient and fluid temperature	-10 to 60°C
Piston speed	50 to 500 mm/s
Cushion	Rubber bumper on both ends
Lubrication	Non-lube
Stroke length tolerance	0 to 250 st: $+1.0_0$ , 251 to 1000 st: $+1.4_0$ , 1001 st to: $+1.8_0$
Mounting	Direct mount type
Mounting orientation	Horizontal, Inclined, Vertical <small>Note 2)</small>

Note 1) When an auto switch is installed at an intermediate position of a type with auto switch, keep the maximum piston speed at 300 mm/s or below to ensure operation of relays or other devices.

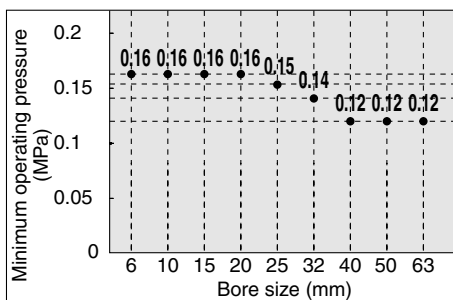
Note 2) When vertically mounting, it is impossible to perform an intermediate stop by means of a pneumatic circuit.



**Made to Order**  
(Refer to page 24 for details.)

Symbol	Specifications
-X116	Hydro specifications
-X160	High speed specifications
-X322	Outside of cylinder tube with hard chrome plating
-X1468	Interchangeable specification with CY1□6
-XC57	With floating joint

## Minimum Operating Pressure



Note) Values show when the cylinder is operating without a load.

## Standard Stroke

Bore size (mm)	Standard stroke (mm)	Max. stroke without switch (mm)	Max. stroke with switch (mm)
6	50, 100, 150, 200	300	300
10	50, 100, 150, 200, 250, 300	500	500
15	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	1000	750
20	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1500	1000
25			1200
32			
40	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000	2000	1500
50			
63			

Note) The longer the stroke, the larger the amount of deflection in a cylinder tube. Pay attention to the mounting bracket and clearance value.

## Magnetic Holding Force

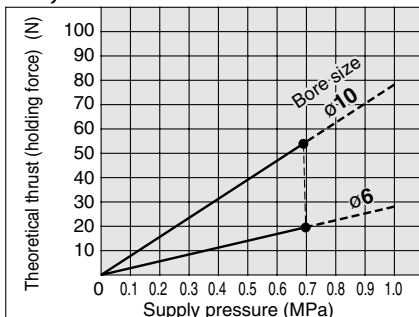
Bore size (mm)	6	10	15	20	25	32	40	50	63
Holding force (N)	19.6	53.9	137	231	363	588	922	1471	2256



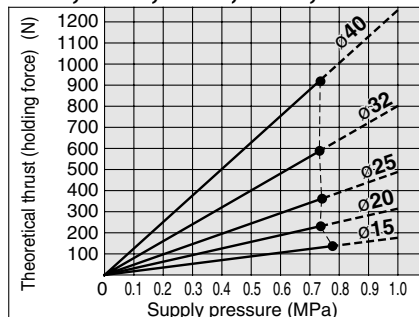
When calculating the actual thrust, design should consider the minimum actuating pressure.

## Theoretical Cylinder Thrust

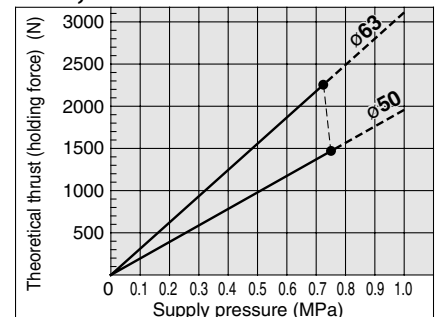
ø6, ø10



ø15, ø20, ø25, ø32, ø40



ø50, ø63



## Weight

Unit: kg

Bore size (mm)		6	10	15	20	25	32	40	50	63
Basic weight (at 0 st)	With switch rail	0.086	0.111	0.272	0.421	0.622	1.217	1.98	3.54	5.38
	Without switch rail	0.069	0.08	0.225	0.351	0.542	1.097	1.82	3.25	5.03
Additional weight per 50 mm of stroke	With switch rail	0.016	0.034	0.040	0.051	0.056	0.076	0.093	0.159	0.188
	Without switch rail	0.004	0.014	0.015	0.020	0.023	0.033	0.040	0.077	0.096

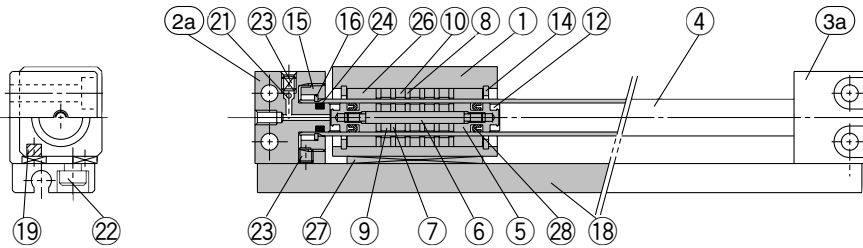
Calculation method/Example: CY3R25-500 (with switch rail) Basic weight. .0622 (kg), Additional weight. .0056 (kg/50 st), Cylinder stroke. 500 (st)  
 $0.622 + 0.056 \times 500 \div 50 = 1.182$  (kg)

# Series CY3R

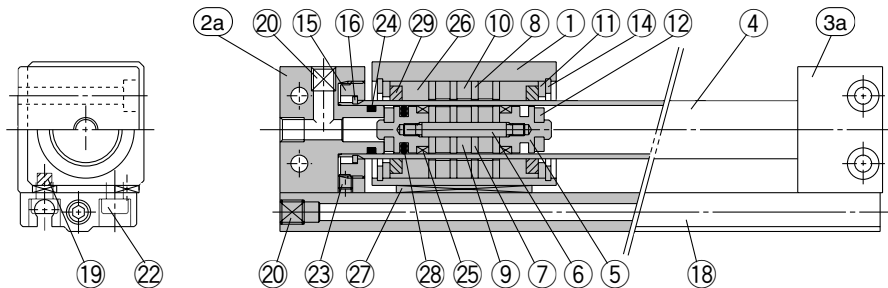
## Construction

### Both sides piping type

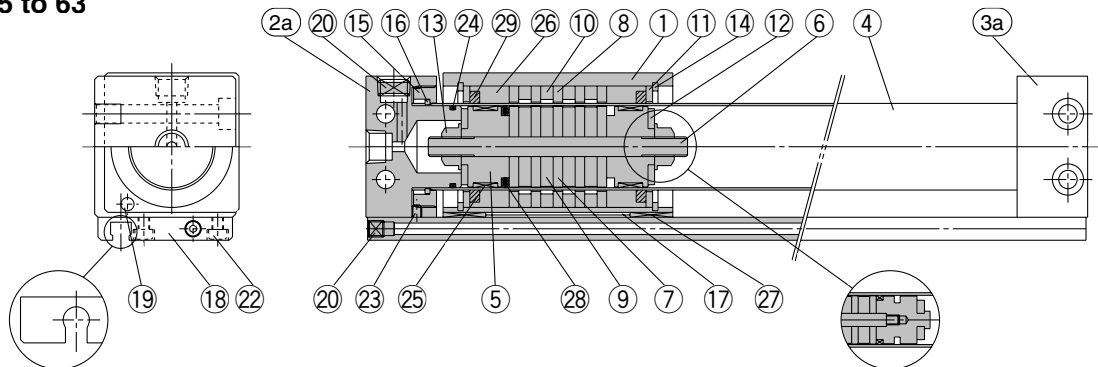
#### CY3R6



#### CY3R10



#### CY3R15 to 63



#### CY3R15, 20

#### CY3R15

### Component Parts

No.	Description	Material	Note								
1	Body	Aluminum alloy	Hard anodized								
2a	End cover A	Aluminum alloy	Electroless nickel plated								
2b	End cover C	Aluminum alloy	Electroless nickel plated								
3a	End cover B	Aluminum alloy	Electroless nickel plated								
3b	End cover D	Aluminum alloy	Electroless nickel plated								
4	Cylinder tube	Stainless steel									
5	Piston	<table border="1"> <tr> <td>ø6 to ø15</td> <td>Brass</td> <td>ø6 to ø15</td> <td>Electroless nickel plated</td> </tr> <tr> <td>ø20 to ø63</td> <td>Aluminum alloy</td> <td>ø20 to ø63</td> <td>Chromate</td> </tr> </table>	ø6 to ø15	Brass	ø6 to ø15	Electroless nickel plated	ø20 to ø63	Aluminum alloy	ø20 to ø63	Chromate	
ø6 to ø15	Brass	ø6 to ø15	Electroless nickel plated								
ø20 to ø63	Aluminum alloy	ø20 to ø63	Chromate								
6	Shaft	Stainless steel									
7	Piston side yoke	Rolled steel plate	Zinc chromated								
8	External slider side yoke	Rolled steel plate	Zinc chromated								
9	Magnet A	Rare earth magnet									
10	Magnet B	Rare earth magnet									
	Spacer	Aluminum alloy	Black anodized (ø6: not available)								
12	Bumper	Urethane rubber									
13	Piston nut	Carbon steel	Zinc chromate (ø6 to ø15: not available)								
14	C type snap ring for hole	Carbon tool steel	Nickel plated								
15	Attachment ring	Aluminum alloy	Chromate								
16	C type snap ring for shaft	Hard steel wire									
7	Magnetic shielding plate	Rolled steel plate	Chromated (ø6, ø10: not available)								
18	Switch rail	Aluminum alloy	White anodized								
19	Magnet	Rare earth magnet									
20	Hexagon socket head plug	Chromium steel	Nickel plated								

No.	Description	Material	Note				
21	Steel balls	Chromium steel	<table border="1"> <tr> <td>ø40</td> <td>Hexagon socket head plug</td> </tr> <tr> <td>ø20, ø50, ø63</td> <td>None</td> </tr> </table>	ø40	Hexagon socket head plug	ø20, ø50, ø63	None
ø40	Hexagon socket head plug						
ø20, ø50, ø63	None						
22	Hexagon socket head screw	Chromium steel	Nickel plated				
23	Hexagon socket head set screw	Chromium steel	Nickel plated				
24*	Cylinder tube Gasket	NBR					
25*	Wear ring A	Special resin					
26*	Wear ring B	Special resin					
27*	Wear ring C	Special resin					
28*	Piston seal	NBR					
29*	Lubretainer	Special resin					
30*	Switch rail gasket	NBR	Both sides piping type: None				

\* Seal kits are sets consisting of numbers 24 through 30. Order using the kit number corresponding to each bore size.

### Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
6	CY3R6-PS	Numbers 24, 26, 27, 28 above
10	CY3R10-PS	Numbers 24, 25, 26, 27, 28, 29, 30 above
15	CY3R15-PS	
20	CY3R20-PS	
25	CY3R25-PS	
32	CY3R32-PS	
40	CY3R40-PS	
50	CY3R50-PS	
63	CY3R63-PS	

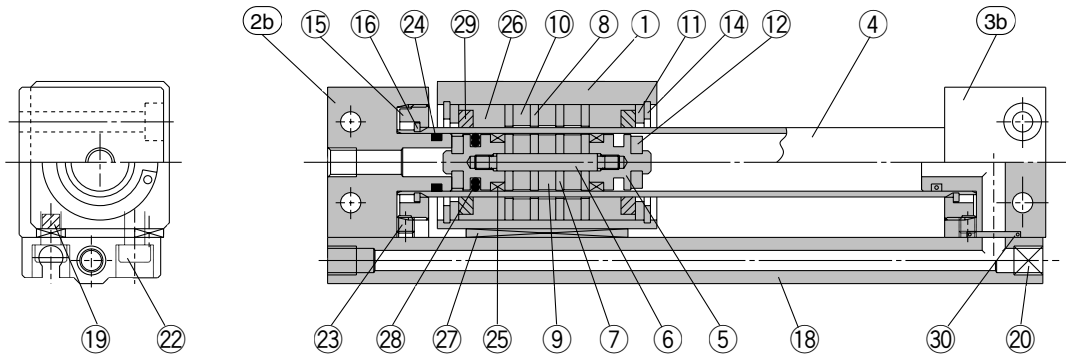
\* Seal kits are the same for both the both sides piping type and the centralized piping type.



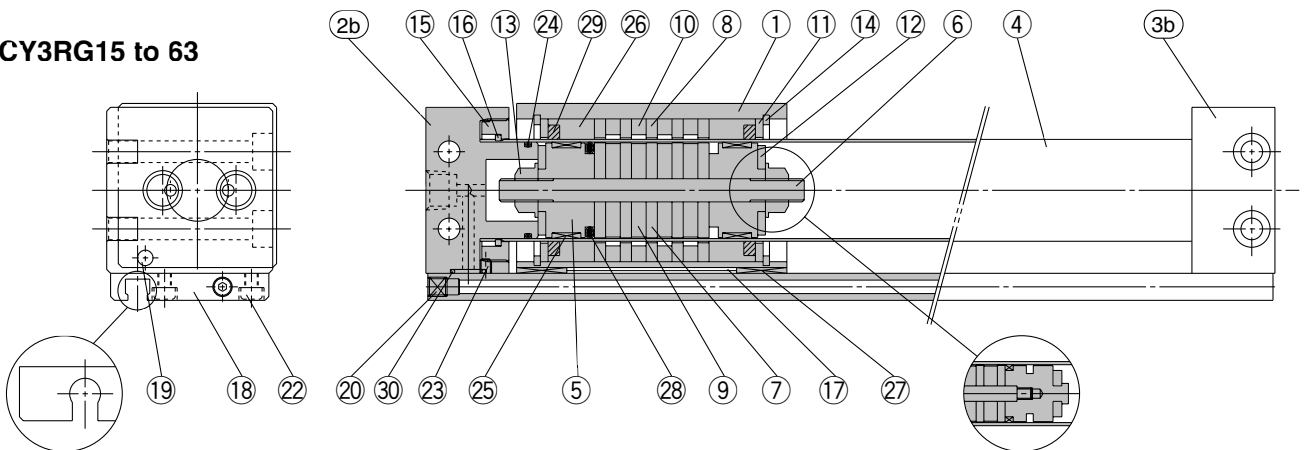
## Construction

### Centralized piping type

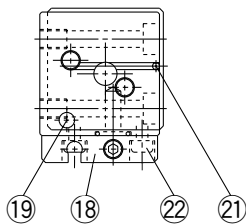
#### CY3RG10



#### CY3RG15 to 63



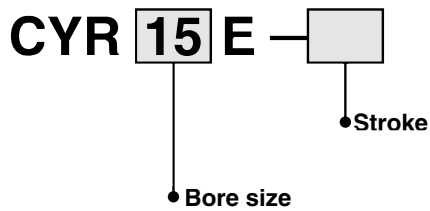
#### CY3RG15, 20



#### CY3RG15

#### CY3RG15

## Switch Rail Accessory



### Switch Rail Accessory Kit

Bore size (mm)	Kit no.	Contents
6	CYR6E-□-N	Numbers 18, 19, 22, 27 on the left
10	CYR10E-□	Numbers 18, 19, 20, 22, 27 on the left
15	CYR15E-□	Numbers 17, 18, 20, 22, 27 on the left
20	For reed switch CYR20E-□	Numbers 17, 18, 19, 20, 22, 27 on the left
	For solid state switch CYR20EN-□	
25	CYR25E-□	Numbers 17, 18, 19, 20, 22, 27 on the left
32	CYR32E-□	
40	CYR40E-□	
50	CYR50E-□	
63	CYR63E-□	

Note 1) □ indicates the stroke.

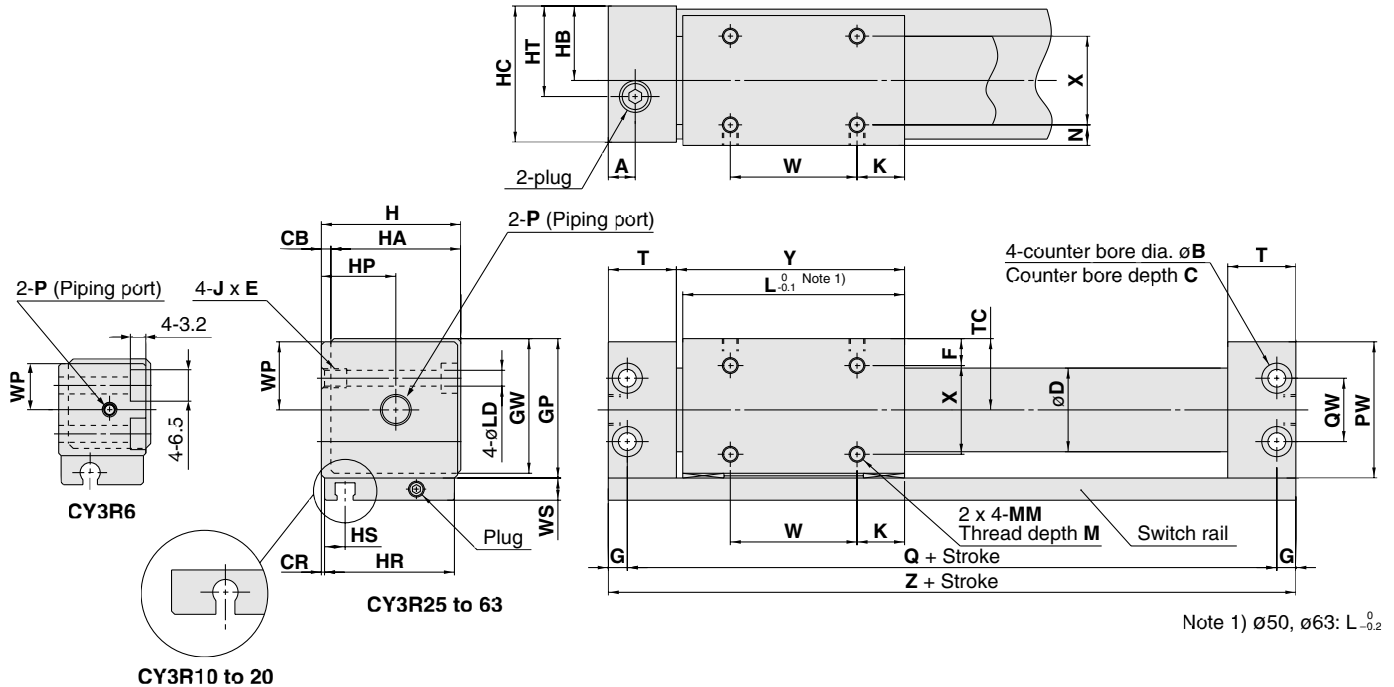
Note 2) A magnet is already built in for ø15.

# Series CY3R

## Dimensions

### Both sides piping type: $\varnothing 6$ to $\varnothing 63$

Note) This figure shows types with switch rail (Nil).



Note 1)  $\varnothing 50, \varnothing 63: L_{-0.2}^0$

Model	A	B	C	CB	CR	D	F	G	GP	GW	H	HA	HB	HC	HP	HR	HS	HT	J x E	K
CY3R6	7*	—*	—*	2	0.5	7.6	5.5	3*	20	18.5	19	17	10.5	18	10.5*	17	6	10.5*	M4 x 0.7 x 6	7
CY3R10	9	6.5	3.2	2	0.5	12	6.5	4	27	25.5	26	24	14	25	14	24	5	14	M4 x 0.7 x 6	9
CY3R15	10.5	8	4.2	2	0.5	16.6*	8	5	33	31.5	32	30	17	31	17	30	8.5	17	M5 x 0.8 x 7	14
CY3R20	9	9.5	5.2	3	1	21.6*	9	6	39	37.5	39	36	21	38	24	36	7.5	24	M6 x 1 x 8	11
CY3R25	8.5	9.5	5.2	3	1	26.4*	8.5	6	44	42.5	44	41	23.5	43	23.5	41	6.5	23.5	M6 x 1 x 8	15
CY3R32	10.5	11	6.5	3	1.5	33.6*	10.5	7	55	53.5	55	52	29	54	29	51	7	29	M8 x 1.25 x 10	13
CY3R40	10	11	6.5	5	2	41.6*	13	7	65	63.5	67	62	36	66	36	62	8	36	M8 x 1.25 x 10	15
CY3R50	14	14	8.2	5	2	52.4*	17	8.5	83	81.5	85	80	45	84	45	80	9	45	M10 x 1.5 x 15	25
CY3R63	15	14	8.2	5	3	65.4*	18	8.5	95	93.5	97	92	51	96	51	90	9.5	51	M10 x 1.5 x 15	24

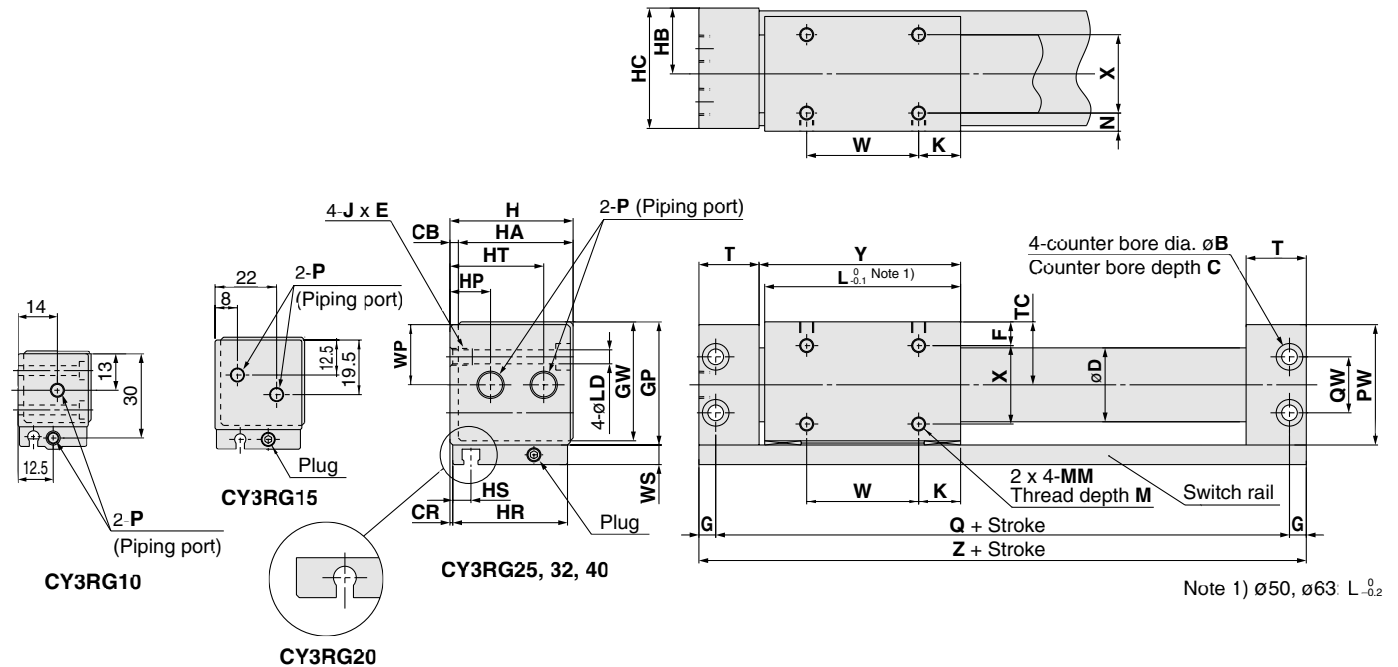
Model	L	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	WS	X	Y	Z
CY3R6	34	3.5	3.5	M3 x 0.5	3.5	19	60*	10	14.5*	10.5	20	9.5	6	10	35.5	66*
CY3R10	38	3.5	4	M3 x 0.5	4.5	26	68	14	17.5	14	20	13	8	15	39.5	76
CY3R15	53	4.3	5	M4 x 0.7	6	32	84	18	19	17	25	16	7	18	54.5	94
CY3R20	62	5.4	5	M4 x 0.7	7	38	95	17	20.5	20	40	19	7	22	64	107
CY3R25	70	5.4	6	M5 x 0.8	6.5	43	105	20	21.5	22.5	40	21.5	7	28	72	117
CY3R32	76	7	7	M6 x 1	8.5	54	116	26	24	28	50	27	7	35	79	130
CY3R40	90	7	8	M6 x 1	11	64	134	34	26	33	60	32	7	40	93	148
CY3R50	110	8.6	10	M8 x 1.25	15	82	159	48	30	42	60	41	10	50	113	176
CY3R63	118	8.6	10	M8 x 1.25	16	94	171	60	32	48	70	47	10	60	121	188

Model	P (Piping port)		
	Nil	TN*	TF*
CY3R6	M3 x 0.5*	—	—
CY3R10	M5 x 0.8	—	—
CY3R15	M5 x 0.8	—	—
CY3R20	Rc 1/8	NPT 1/8	G 1/8
CY3R25	Rc 1/8	NPT 1/8	G 1/8
CY3R32	Rc 1/8	NPT 1/8	G 1/8
CY3R40	Rc 1/4	NPT 1/4	G 1/4
CY3R50	Rc 1/4	NPT 1/4	G 1/4
CY3R63	Rc 1/4	NPT 1/4	G 1/4

Note 2) The astrisk denotes the dimensions which are different from the CY1R series.

## Dimensions

Centralized piping type:  $\varnothing 10$  to  $\varnothing 63$



Model	B	C	CB	CR	D	F	G	GP	GW	H	HA	HB	HC	HP	HR	HS	HT	J x E	K	L
CY3RG10	6.5	3.2	2	0.5	12	6.5	4	27	25.5	26	24	14	25	—	24	5	—	M4 x 0.7 x 6	9	38
CY3RG15	8	4.2	2	0.5	16.6*	8	5	33	31.5	32	30	17	31	—	30	8.5	—	M5 x 0.8 x 7	14	53
CY3RG20	9.5	5.2	3	1	21.6*	9	6	39	37.5	39	36	21	38	11	36	7.5	28	M6 x 1 x 8	11	62
CY3RG25	9.5	5.2	3	1	26.4*	8.5	6	44	42.5	44	41	23.5	43	14.5	41	6.5	33.5	M6 x 1 x 8	15	70
CY3RG32	11	6.5	3	1.5	33.6*	10.5	7	55	53.5	55	52	29	54	20	51	7	41	M8 x 1.25 x 10	13	76
CY3RG40	11	6.5	5	2	41.6*	13	7	65	63.5	67	62	36	66	25	62	8	50	M8 x 1.25 x 10	15	90
CY3RG50	14	8.2	5	2	52.4*	17	8.5	83	81.5	85	80	45	84	32	80	9	56	M10 x 1.5 x 15	25	110
CY3RG63	14	8.2	5	3	65.4*	18	8.5	95	93.5	97	92	51	96	35	90	9.5	63.5	M10 x 1.5 x 15	24	118

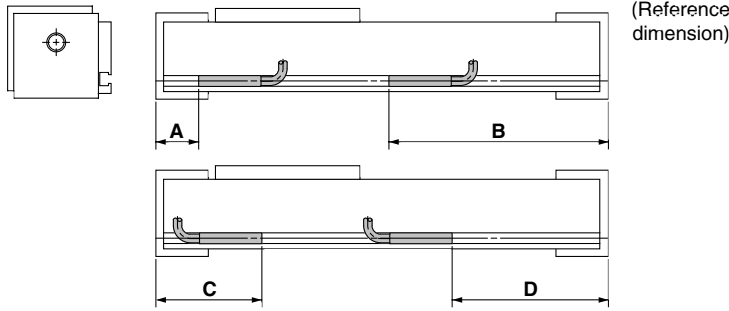
Model	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	WS	X	Y	Z
CY3RG10	3.5	4	M3 x 0.5	4.5	26	68	14	17.5	14	20	13	8	15	39.5	76
CY3RG15	4.3	5	M4 x 0.7	6	32	84	18	19	17	25	16	7	18	54.5	94
CY3RG20	5.4	5	M4 x 0.7	7	38	95	17	20.5	20	40	19	7	22	64	107
CY3RG25	5.4	6	M5 x 0.8	6.5	43	105	20	21.5	22.5	40	21.5	7	28	72	117
CY3RG32	7	7	M6 x 1	8.5	54	116	26	24	28	50	27	7	35	79	130
CY3RG40	7	8	M6 x 1	11	64	134	34	26	33	60	32	7	40	93	148
CY3RG50	8.6	10	M8 x 1.25	15	82	159	48	30	42	60	41	10	50	113	176
CY3RG63	8.6	10	M8 x 1.25	16	94	171	60	32	48	70	47	10	60	121	188

Model	P (Piping port)		
	Nil	TN*	TF*
CY3RG10	M5 x 0.8	—	—
CY3RG15	M5 x 0.8	—	—
CY3RG20	Rc 1/8	NPT 1/8	G 1/8
CY3RG25	Rc 1/8	NPT 1/8	G 1/8
CY3RG32	Rc 1/8	NPT 1/8	G 1/8
CY3RG40	Rc 1/4	NPT 1/4	G 1/4
CY3RG50	Rc 1/4	NPT 1/4	G 1/4
CY3RG63	Rc 1/4	NPT 1/4	G 1/4

Note 2) The astrisk denotes the dimensions which are different from the CY1RG series.

# Series CY3R

## Auto Switch Proper Mounting Position for Stroke End Detection



## Auto Switch Operation Range

Auto switch model	Bore size (mm)								
	6	10	15	20	25	32	40	50	63
D-A9□	8	11	8	6	6	7	9	8	8
D-M9□	3	4.5	2.5	3.5	3	3	4	3	3
D-F9□W	4	7	4	4.5	4	4.5	5.5	5	4.5
D-Z7□	—	—	—	—	9	9	11	9	10
D-Z80	—	—	—	—	—	—	—	—	—
D-Y59□	—	—	—	—	—	—	—	—	—
D-Y7□	—	—	—	—	5	5	6	6	6
D-Y7□W	—	—	—	—	—	—	—	—	—

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

### ø6, ø10, ø15, ø20

Auto switch model Bore size (mm)	A		B		C		D	
	D-A9□	D-M9□ D-F9□W	D-A9□	D-M9□ D-F9□W	D-A9□	D-M9□ D-F9□W	D-A9□	D-M9□ D-F9□W
6	26	30	46	42	46	42	26	30
10	28	32	48	44	48	44	—	32
15	17.5	21.5	76.5	72.5	—	—	56.5	60.5
20	19.5	23.5	87.5	83.5	39.5	35.5	67.5	71.5

Note 1) Auto switches cannot be installed in Area C in the case of ø15.

### ø25, ø32, ø40, ø50, ø63

Auto switch model Bore size (mm)	A				B				C				D			
	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-F9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W
25	19	23	18	—	98	94	99	—	42	38	43	—	75	79	74	—
32	22.5	26.5	21.5	—	107.5	103.5	108.5	—	45.5	41.5	46.5	—	84.5	88.5	83.5	—
40	24.5	28.5	23.5	—	123.5	119.5	124.5	—	47.5	43.5	48.5	—	100.5	104.5	99.5	—
50	28.5	32.5	27.5	—	147.5	143.5	148.5	—	51.5	47.5	52.5	—	124.5	128.5	123.5	—
63	30.5	34.5	29.5	—	157.5	153.5	158.5	—	53.5	49.5	54.5	—	134.5	138.5	133.5	—

Note 1) 50 mm is the minimum stroke available with 2 auto switches mounted.

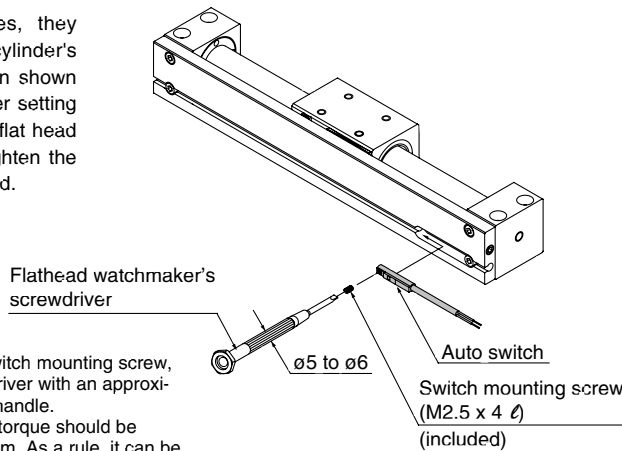
Note 2) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.

Note 3) Mounting brackets are additionally required for the D-A9□, M9□ and F9□W types. Refer to the auto switch mounting bracket part number on page 18.

## Auto Switch Mounting

### ø6 to ø20

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

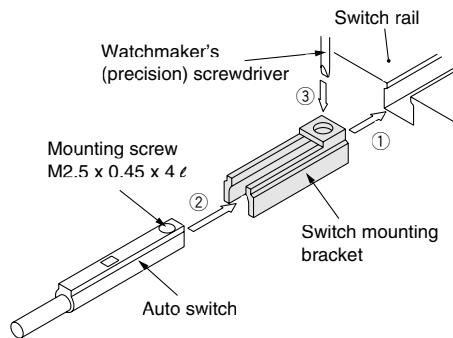


Note) When tightening the auto switch mounting screw, use a watchmaker's screwdriver with an approximately 5 to 6 mm diameter handle. Furthermore, the tightening torque should be approximately 0.1 to 0.5 N·m. As a rule, it can be turned about 90° past the point at which tightening can be felt.

### ø25 to ø63

- Insert the front side of the auto switch into the auto switch groove and slide the switch to the desired position.
- After the detection position is confirmed, securely tighten the mounting screw (M2.5) on the auto switch.
- Changes to the detection position have to be performed during process (2).

Note) When tightening the mounting screw, use a watchmaker's screwdriver with a 5 to 6 mm handle diameter and tighten with a torque of 0.10 to 0.15 N·m. As a guide, an acceptable tightening level is reached by tightening the screw an additional 90 degrees from the point at which the screw is snug.



## Auto Switch Specifications

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

### Mounting Bracket Part No.

Bore size (mm)	Mounting bracket part no.	Weight	Applicable auto switches
25	BMG2-012	3 g	Reed switch: D-A9□ Solid state switch: D-M9□ D-F9□W
32			
40			
50			
63			

Other than the applicable auto switches listed in "How to Order" the following auto switches can be mounted. For detailed specifications, refer to "SMC Best Pneumatics" catalog vol. 8, 8-30-1

Type	Model	Electrical entry	Features	Applicable bore size	
Reed switch	D-Z73	Grommet (In-line)	—	ø25 to ø63	
	D-Z76		Without indicator light		
	D-Z80		—		
Solid state switch	D-Y59A		Diagnostic indication (2-color display)		—
	D-Y59B				—
	D-Y7P				—
	D-Y7BW	—			
	D-Y7NW	—	—		
	D-Y7PW	—	—		

- \* With pre-wired connector is also available in solid state auto switches. For specifications, refer to "SMC Best Pneumatics" catalog vol. 8, page 8-30-52
- \* Normally closed (NC = b contact), solid state switch (D-F9G/F9H/Y7G/Y7H type) are also available. For details, refer to "SMC Best Pneumatics" catalog vol. 8, page 8-30-31/8-30-32

# Auto Switch Specifications

## Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3-wire: 100 $\mu$ A or less 2-wire: 0.8 mA or less
Operating time	1.2 ms	1 ms or less
Impact resistance	300 m/s <sup>2</sup>	1000 m/s <sup>2</sup>
Insulation resistance	50 M $\Omega$ or more at 500 Mega VDC (between lead wire and case)	
Withstand voltage	1000 VAC for 1 minute (between lead wire and case)	
Ambient temperature	-10 to 60°C	
Enclosure	IEC529 standard IP67, JIS C 0920 waterproof construction	

## Lead Wire Length

Lead wire length indication

(Example) D-M9P **L**

Lead wire length

Nil	0.5 m
L	3 m
Z	5 m

Note 1) Applicable auto switch with 5 m lead wire "Z"

Reed switch: None

Solid state switch: Manufactured upon receipt of order as standard.

Note 2) The standard lead wire length of solid state switch with water-resistant 2-color indication is 3 meters. (Not available 0.5 m)

Note 3) To designate solid state switches with flexible specifications, add "-61" after the lead wire length.

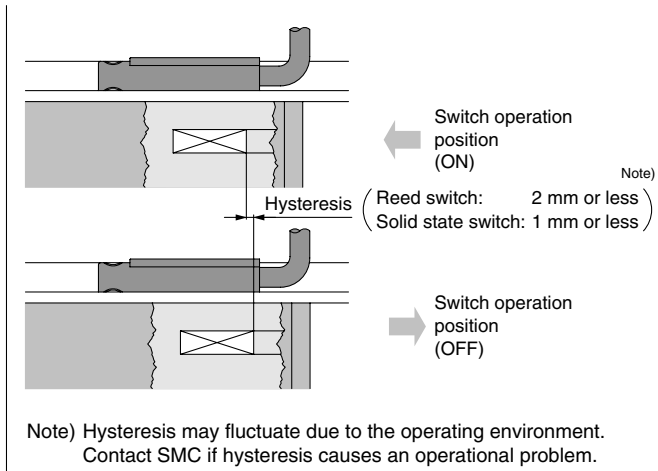
(Example) D-F9NWL- **61**

Flexible specification

Note) D-M9□ is a flexible cable specification as standard.

## Auto Switch Hysteresis

The hysteresis is the difference between the position of the auto switch as it turns "on" and as it turns "off". A part of operating range (one side) includes this hysteresis.



## Contact Protection Boxes: CD-P11, CD-P12

### <Applicable switch model>

D-A9/Z7/Z8

The auto switches above do not have a built-in contact protection circuit. Therefore, please use a contact protection box with the switch for any of the following cases

- ① Where the operation load is an inductive load.
- ② Where the wiring length to load is greater than 5 m.
- ③ Where the load voltage is 100 VAC.

The contact life may be shortened (Due to permanent energizing conditions.)

### Specifications

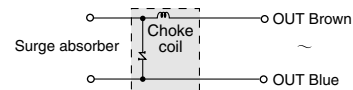
Part no.	CD-P11		CD-P12
Load voltage	100 VAC	200 VAC	24 VDC
Maximum load current	25 mA	12.5 mA	50 mA

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

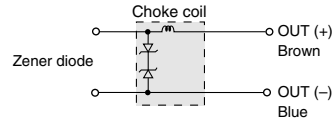


### Internal Circuit

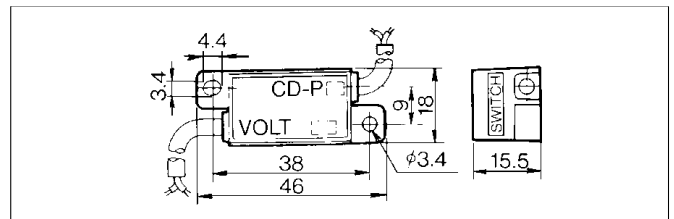
#### CD-P11



#### CD-P12



### Dimensions



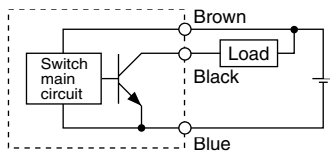
### Connection

To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit. Keep the switch as close as possible to the contact protection box, with a lead wire length of no more than 1 meter.

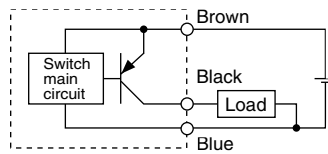
# Series CY3 Auto Switch Connections and Examples

## Basic Wiring

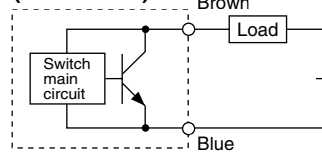
### Solid state 3-wire, NPN



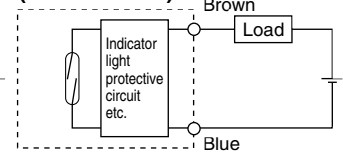
### Solid state 3-wire, PNP



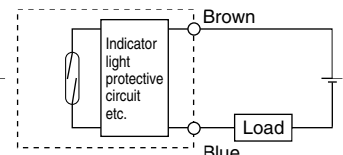
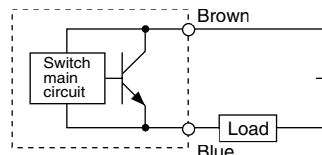
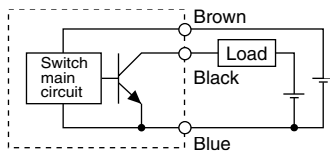
### 2-wire (Solid state)



### 2-wire (Reed switch)



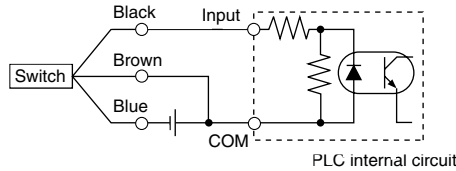
(Power supplies for switch and load are separate.)



## Example of Connection to PLC (Programmable Logic Controller)

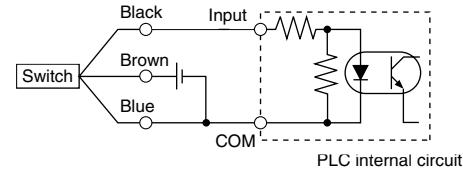
### • Sink input specifications

#### 3-wire, NPN



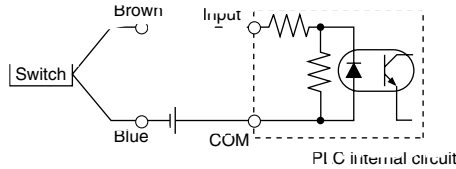
### • Source input specifications

#### 3-wire, PNP

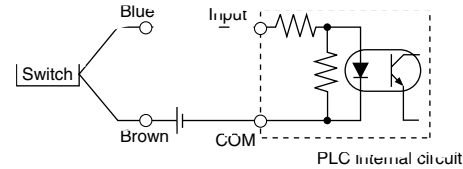


Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

#### 2-wire



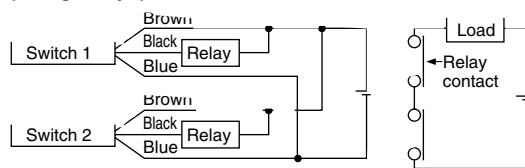
#### 2-wire



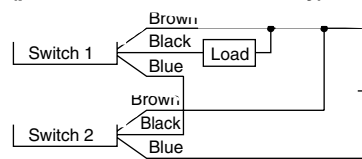
## Example of AND (Serial) and OR (Parallel) Connection

### • 3-wire

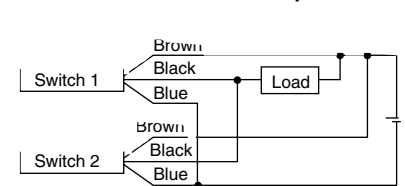
#### AND connection for NPN output (using relays)



#### AND connection for NPN output (performed with switches only)

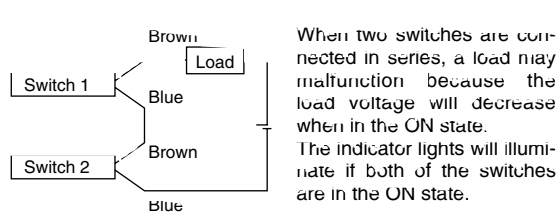


#### OR connection for NPN output



The indicator lights will illuminate when both switches are turned ON.

#### 2-wire with 2-switch AND connection

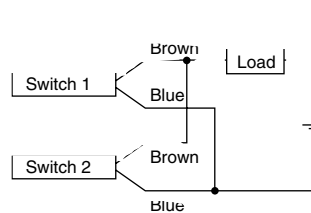


When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state. The indicator lights will illuminate if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \frac{\text{Power supply voltage}}{\text{Internal voltage drop} \times 2 \text{ pcs.}} \\ &= \frac{24 \text{ V}}{4 \text{ V} \times 2 \text{ pcs.}} \\ &= 16 \text{ V} \end{aligned}$$

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

#### 2-wire with 2-switch OR connection



#### (Solid state)

When two switches are connected in parallel, a malfunction may occur because the load voltage will increase when in the OFF state.

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \\ &\quad \times \text{Load impedance} \\ &= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega \\ &= 6 \text{ V} \end{aligned}$$

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

#### (Reed switch)

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

# Reed Switch: Direct Mounting Style D-A90/D-A93/D-A96

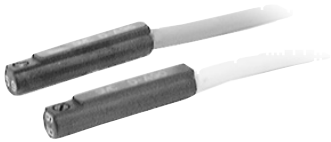


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## Auto Switch Specifications

PLC: Programmable Logic Controller

**Grommet**  
Electrical entry direction: In-line

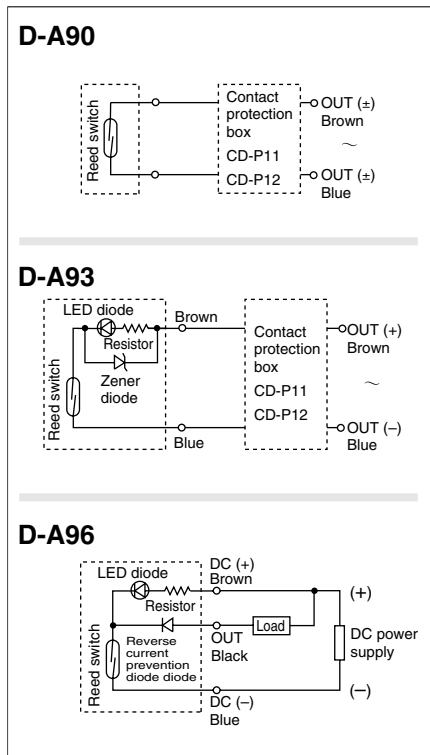


### Caution

#### Operating Precautions

Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

### Auto Switch Internal Circuit



- Note) ① In a case where the operation load is an inductive load.  
② In a case where the wiring load is greater than 5 m.  
③ In a case where the load voltage is 100 VAC.

Use the auto switch with a contact protection box in any of the above mentioned cases. (For details about the contact protection box, refer to page 19.)

D-A90 (Without indicator light)			
Auto switch part no.	D-A90		
Applicable load	IC circuit, Relay, PLC		
Load voltage	24 V AC/DC or less	48 V AC/DC or less	100 V AC/DC or less
Maximum load current	50 mA	40 mA	20 mA
Contact protection circuit	None		
Internal resistance	1 Ω or less (including lead wire length of 3 m)		
D-A93/D-A96 (With indicator light)			
Auto switch part no.	D-A93	D-A96	
Applicable load	Relay, PLC		IC circuit
Load voltage	24 VDC	100 VAC	4 to 8 VDC
Load current range and max. load current	5 to 40 mA	5 to 20 mA	20 mA
Contact protection circuit	None		
Internal voltage drop	2.4 V or less (to 20 mA)/3 V or less (to 40 mA)		0.8 V or less
Indicator light	Red LED illuminates when ON.		

#### Lead wires

D-A90/D-A93 — Oilproof heavy-duty vinyl cable:  $\phi 2.7$  0.18 mm<sup>2</sup> x 2 cores (Brown, Blue), 0.5 m  
D-A96 — Oilproof heavy-duty vinyl cable:  $\phi 2.7$  0.15 mm<sup>2</sup> x 3 cores (Brown, Black, Blue), 0.5 m

Note 1) Refer to page 19 for reed switch common specifications

Note 2) Refer to page 19 for lead wire lengths.

### Weight

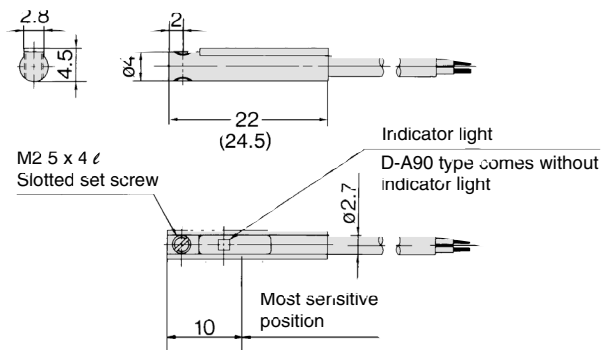
Unit: g

Auto switch part no.	D-A90	D-A93	D-A96
Lead wire length (m)	0.5	6	6
	3	30	41

### Dimensions

Unit: mm

#### D-A90/D-A93/D-A96



( ) dimensions for D-A93.



# Solid State Switch: Direct Mounting Style D-M9N/D-M9P/D-M9B



For details about certified products conforming to international standards, visit us at [www.smcworld.com](http://www.smcworld.com).

## Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□/D-M9□V (With indicator light)			
Auto switch part no.	D-M9N	D-M9P	D-M9B
Electrical entry direction	In-line		
Wiring type	3-wire		2-wire
Output type	NPN	PNP	—
Applicable load	IC circuit, Relay, PLC		24 VDC relay, PLC
Power supply voltage	5, 12, 24 VDC (4.5 to 28 V)		
Current consumption	10 mA or less		
Load voltage	28 VDC or less	—	24 VDC (10 to 28 VDC)
Load current	40 mA or less		2.5 to 40 mA
Internal voltage drop	0.8 V or less		4 V or less
Leakage current	100 μA or less at 24 VDC		0.8 mA or less
Indicator light	Red LED illuminates when ON.		

### Grommet

- 2-wire load current is reduced (2.5 to 40 mA)
- Lead free
- UL certified (style 2844) lead cable is used.



### Caution

#### Operating Precautions

Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

### Lead wires

Oilproof heavy-duty vinyl cable:  $\phi 2.7 \times 3.2$  ellipse

D-M9B 0.15 mm<sup>2</sup> x 2 cores

D-M9N, D-M9P 0.15 mm<sup>2</sup> x 3 cores

Note 1) Refer to page 19 for solid state switch common specifications.

Note 2) Refer to page 19 for lead wire lengths.

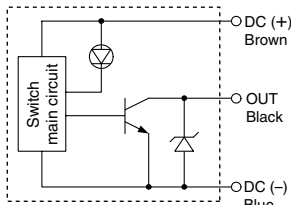
## Weight

Unit: g

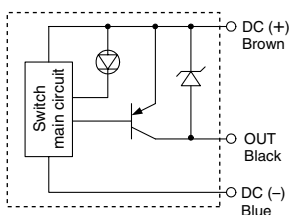
Auto switch part no.	D-M9N	D-M9P	D-M9B
Lead wire length (m)	0.5	8	7
	3	41	38
	5	68	63

## Auto Switch Internal Circuit

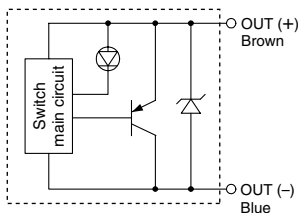
### D-M9N



### D-M9P



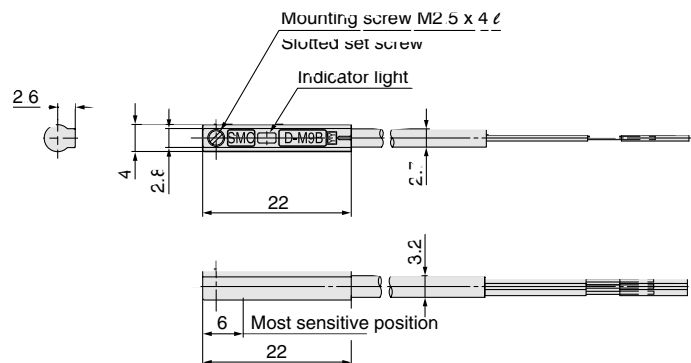
### D-M9B



## Dimensions

Unit: mm

### D-M9□



# 2-color Indication Solid State Switch: Direct Mounting Style

## D-F9NW/D-F9PW/D-F9BW



For details about certified products conforming to international standards, visit us at [www.smcworld.com](http://www.smcworld.com).

### Auto Switch Specifications

PLC: Programmable Logic Controller

D-F9□W (With indicator light)			
Auto switch part no.	D-F9NW	D-F9PW	D-F9BW
Electrical entry direction	In-line		
Wiring type	3-wire		2-wire
Output type	NPN	PNP	—
Applicable load	IC circuit, Relay IC, PLC		24 VDC relay, PLC
Power supply voltage	5, 12, 24 VDC (4.5 to 28 VDC)		—
Current consumption	10 mA or less		—
Load voltage	28 VDC or less	—	24 VDC (10 to 28 VDC)
Load current	40 mA or less	80 mA or less	5 to 40 mA
Internal voltage drop	1.5 V or less (0.8 V or less at 10 mA load current)	0.8 V or less	4 V or less
Leakage current	100 μA or less at 24 VDC		0.8 mA or less
Indicator light	Operating position ..... Red LED illuminates. Optimum operating position ..... Green LED illuminates.		

### Grommet



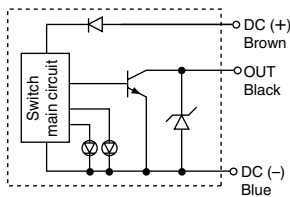
### Caution

#### Operating Precautions

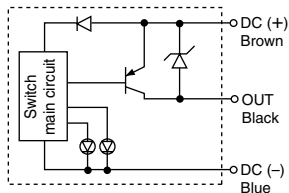
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

### Auto Switch Internal Circuit

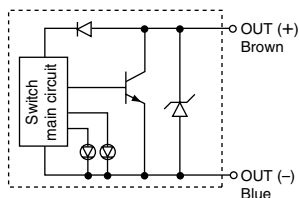
#### D-F9NW



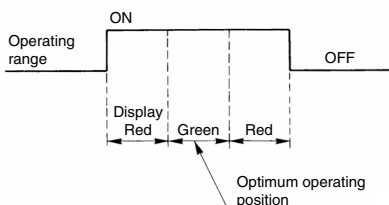
#### D-F9PW



#### D-F9BW



### Indicator light/Display method



#### Lead wires

Oilproof heavy-duty vinyl cable:  $\phi 2.7$ , 0.15 mm<sup>2</sup> x 3 cores (Brown, Black, Blue), 0.18 mm<sup>2</sup> x 2 cores (Brown, Blue), 0.5 m

Note 1) Refer to page 19 for solid state switch common specifications.

Note 2) Refer to page 19 for lead wire lengths.

### Weight

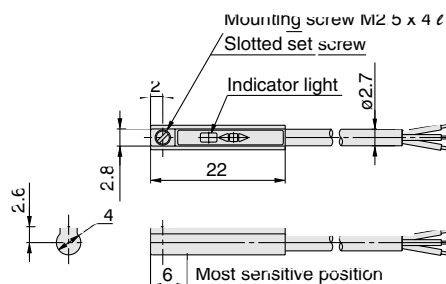
Unit: g

Auto switch part no.	D-F9NW	D-F9PW	D-F9BW
Lead wire length (m)	0.5	7	7
	3	34	32
	5	56	52

### Dimensions

Unit: mm

#### D-F9□W



# Series CY3B/CY3R

## Made to Order

Contact SMC for detailed specifications, lead times and prices.

Symbol	Contents	Model	Bore size (mm)								
			6	10	15	20	25	32	40	50	63
-XB6	Heat resistant cylinder (150°C specification)	CY3B	●	●	●	●	●	●	●	●	●
-XB11	Long stroke (2001 mm or longer)	CY3B					●	●	●	●	●
-XB13 <sup>Note 1)</sup>	Low speed cylinder (7 to 50 mm/s)	CY3B	●	●	●	●	●	●	●	●	●
-X116	Hydro specifications	CY3B					●	●	●	●	●
		CY3R					●	●	●	●	●
-X132	Axial ports	CY3B	●	●	●	●	●	●	●	●	●
-X160	High speed specifications	CY3B				●	●	●	●	●	●
		CY3R				●	●	●	●	●	●
-X168	Helical insert thread specifications	CY3B				●	●	●	●	●	●
-X206	Added mounting tap positions for slider	CY3B	●	●	●	●	●	●	●	●	●
-X210	Oil-free exterior specifications	CY3B	●	●	●	●	●	●	●	●	●
-X322	Outside of cylinder tube with hard chrome plating	CY3B			●	●	●	●	●	●	●
		CY3R			●	●	●	●	●	●	●
-X324	Oil-free exterior specifications (with dust seal)	CY3B		●	●	●	●	●	●	●	●
-X1468	Interchangeable specification with CY1□6	CY3B	●								
		CY3R	●								
-XC24	With magnetic shielding plate	CY3B	●	●	●	●	●	●	●	●	●
-XC57	With floating joint	CY3B	●	●	●	●	●	●	●	●	●
		CY3R	●	●	●	●	●	●	●	●	●

Note 1) XB9, Low speed cylinder (15 to 50 mm/s) can also be produced (CY3B6 to 63).  
 Note 2) Individual "Made to Order" is only applicable to the model as mentioned above.

## 1 Heat resistant cylinder (150°C specification)

Symbol

-XB6

CY3B Bore size Port thread type Stroke -XB6

Heat resistant cylinder

### Specifications

Applicable series	CY3B
Bore size	ø6 to ø63
Ambient and fluid temperature	50 to 150°C*
Max. operating pressure	0.5 MPa
Piston speed	50 to 400 mm/s*

\* When using in less than 100°C range, since it could make a difference in the maintenance cycle, depending on the operating speed, use it at 200 mm/s or less.

### Operating Pressure Limit for Intermediate Stop and Vertical Operation

Max. operating pressure for intermediate stop	0.4 MPa*
---	----------

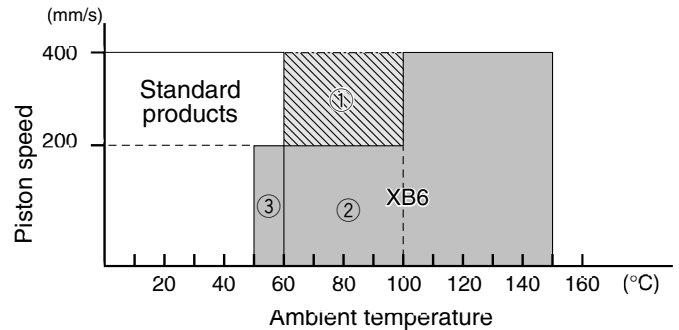
\* Use caution that the magnet coupling will be removed, if it is used to stop in an intermediate stroke by an external stopper with the operating pressure over 0.4 MPa.

### Magnetic Holding Force

Bore size (mm)	6	10	15	20	25	32	40	50	63	(N)
Holding force (at 150°C)	14.4	40.0	90.1	160	250	410	641	1000	1590	
Holding force (at 100°C)	17.2	47.9	107	192	299	490	766	1190	1900	

### Temperature range for operating cylinder and piston speed

- (1) When using with an operating temperature from 60°C to 100°C, and a piston speed of more than 200 mm/s, please consult with SMC separately.
- (2) When using with an operating temperature from 50° to 100°C, and a piston speed of less than 200 mm/s, the XB6 specifications can be used
- (3) As for XB6, regarding the temperature range (over 50°C to 60°C) which overlaps the one of standard products, consider the tendency of operating temperature (upper, lower limits), then choose a model.



When using with the operating temperature fluctuated between 50°C or less and 100°C or more, the operating speed, etc. will be largely restricted by the durability. Prior to use, please contact SMC.

### <Reference>

Maintenance cycle for XB6 could vary substantially, depending on the operating condition and the ambient temperature. Even if using in our recommended range, as a guide, conduct it in around 1/2 intervals, compared to the standard products.

## 2 Long stroke (2001 mm or longer)

Symbol

-XB11

CY3B Bore size Port thread type Stroke -XB11

Long stroke (2001 mm to Max. manufacturable stroke)

### Specifications

Applicable series	CY3B
Bore size	ø25 to ø63
Applicable stroke	Max. manufacturable strokes from 2001 mm to standard type

Note) Please contact SMC for the delivery

## 3 Low speed (7 to 50 mm/s) specifications

Symbol

-XB13

CY3B Bore size Port thread type Stroke -XB13

Low speed (7 to 50 mm/s) specifications

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

### Specifications

Applicable series	CY3B
Bore size	ø6 to ø63
Piston speed	7 to 50 mm/s

# Series CY3

## Made to Order 2

Contact SMC for detailed specifications, lead times and prices.

### 4 Hydro specifications Symbol -X116

CY3B Bore size Port thread type Stroke -X116  
 CY3R

Hydro specifications

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

#### Specifications

Applicable series	CY3B/CY3R
Bore size	ø25 to ø63
Fluid	Turbine oil
Piston speed	15 to 300 mm/s

Note 1) Only piping on both sides is available with the CY3R series.

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

### 5 Axial ports Symbol -X132

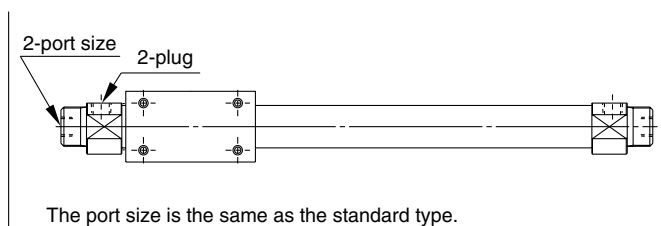
CY3B Bore size Port thread type Stroke -X132  
 CY3R

Axial ports

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

#### Specifications

Applicable series	CY3B
Bore size	ø6 to ø63



### 7 Helical insert thread specifications Symbol -X168

CY3B Bore size Port thread type Stroke -X168  
 CY3R

Helical insert thread specifications

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

#### Specifications

Applicable series	CY3B
Bore size	ø20 to ø63

### 8 Added mounting tap positions for slider Symbol -X206

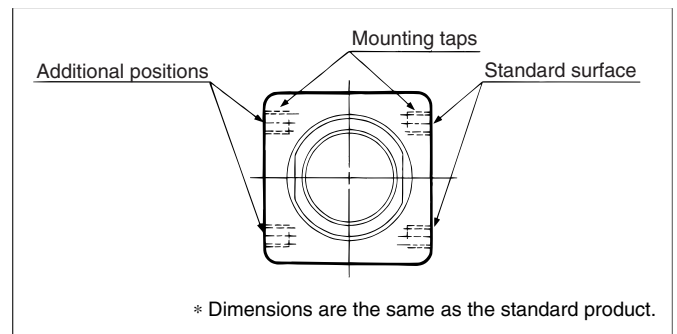
CY3B Bore size Port thread type Stroke -X206  
 CY3R

Added mounting tap positions for slider

Mounting taps have been added on the surface opposite the standard positions.

#### Specifications

Applicable series	CY3B
Bore size	ø6 to ø63



### 6 High speed specifications Symbol -X160

CY3B Bore size Port thread type Stroke -X160  
 CY3R

High speed specifications

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

#### Specifications

Applicable series	CY3B/CY3R
Bore size	ø20 to ø63
Piston speed (no load)	1500 mm/s

Note 1) When operating this cylinder at high speed, a shock absorber must be provided.

Note 2) Only piping on both sides is available with the CY3R series.

# Series CY3

# Made to Order 3

Contact SMC for detailed specifications, lead times and prices.

## 9 Oil-free exterior specifications Symbol -X210

CY3B Bore size Port thread type Stroke -X210

Oil-free exterior specifications

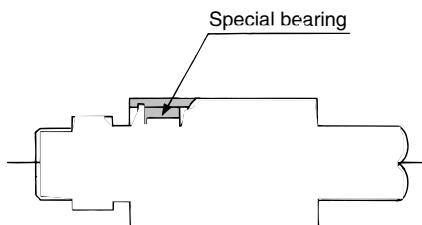
Suitable for environments where oil is not tolerated. A lubretainer is not installed. A separate version -X324 (with dust seal) is available in cases in which dust, etc. is dispersed throughout the environment.

### Specifications

Applicable series	<b>CY3B</b>
Bore size	ø6 to ø63

### Construction

CY3B



## 11 Oil-free exterior specifications (with dust seal) Symbol -X324

CY3B Bore size Port thread type Stroke -X324

Oil-free exterior specifications (with dust seal)

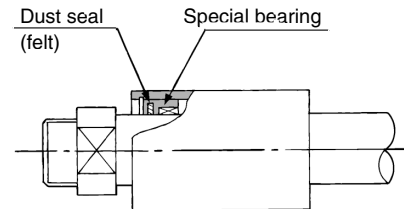
This unit has oil-free exterior specifications, with a dust seal provided on the cylinder body.

### Specifications

Applicable series	<b>CY3B</b>
Bore size	ø10 to ø63

### Construction

CY3B



## 12 Interchangeable specification with CY1□6 Symbol -X1468

CY3B Bore size Port thread type Stroke -X1468  
CY3R

Interchangeable specification with CY1□6

Mounting dimensions are interchangeable with CY1□6.

## 13 With magnetic shielding plate Symbol -XC24

CY3B Bore size Port thread type Stroke -XC24

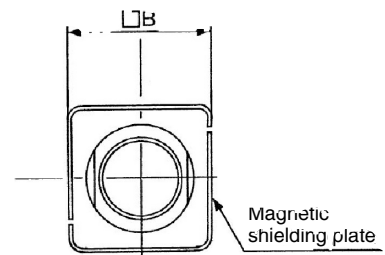
With magnetic shielding plate

Shields against the magnetic leakage from an external slider.

### Specifications

Applicable series	<b>CY3B</b>
Bore size	ø6 to ø63

### Dimensions



Dimensions	Bore size (mm)								
	ø6	ø10	ø15	ø20	ø25	ø32	ø40	ø50	ø63
□B	19	27	37	38	48	62	72	88	102
Standard external (□B)	17	25	35	36	46	60	70	86	100

\* Dimensions other than above are the same as the basic type.

## 10 Outside of cylinder tube with hard chrome plating Symbol -X322

CY3B Bore size Port thread type Stroke -X322  
CY3R(G)

Outside of cylinder tube with hard chrome plating

The outside of the cylinder tube has been plated with hard chromium for reducing wear on the bearings.

### Specifications

Applicable series	<b>CY3B/CY3R</b>
Bore size	ø15 to ø63

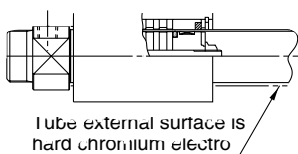
\* Be sure to provide shock absorption measures at the stroke end.

Note 1) The maximum manufacturable strokes are same as the maximum manufacturable strokes of the standard products. As for ø50, ø63 of the CY3B series, the maximum manufacturable strokes are available up to 4000 mm.

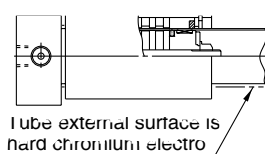
Note 2) When ordering a cylinder with a stroke of 2001 mm or longer, place an order by adding the suffix -XB11X322 to the end of the part number.

### Construction

CY3B



CY3R



# Series CY3

# Made to Order 4

Contact SMC for detailed specifications, lead times and prices.

## 14 With floating joint (CY3B)

Symbol  
**-XC57**

**CY3B** Bore size Port thread type Stroke **-XC57**  
 With floating joint

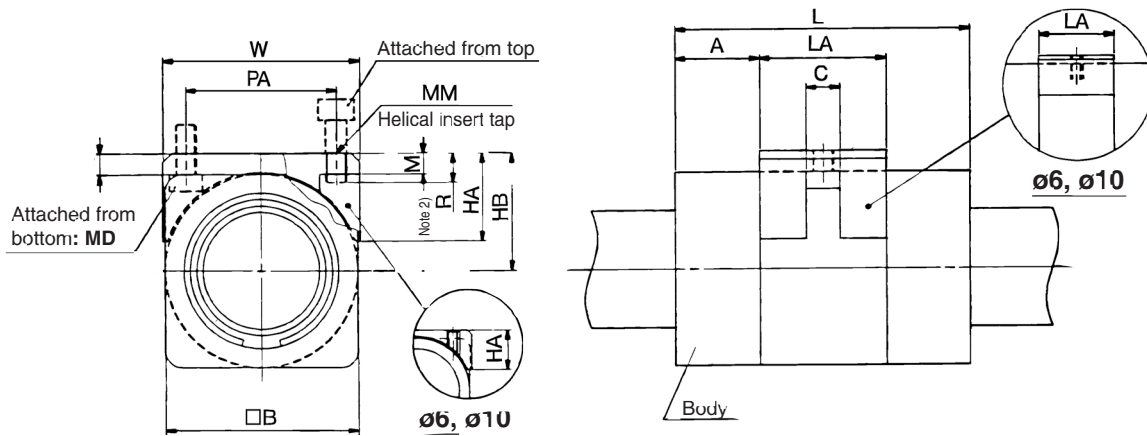
### Specifications

Bore size	ø6 to ø63
-----------	-----------

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

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

### Dimensions



(mm)

Model	A	□B	C	F <sup>Note 1)</sup>	HA	HB	L	LA	MM	MD	M	PA	R <sup>Note 2)</sup>	W
<b>6</b>	10	17	—	2.5	6.3	11	35	15	M3 x 0.5 x 3 ℓ	—	—	12	—	18
<b>10</b>	10	25	—	2.5	9.5	15	38	18	M3 x 0.5 x 3 ℓ	—	—	17	—	26
<b>15</b>	16	35	6.5	5.5	16.5	23	57	25	M4 x 0.7	M3	4	25	6	36
<b>20</b>	18	36	6.5	5.5	17	23.5	66	30	M5 x 0.8	M3	4	27	6	37
<b>25</b>	20	46	8.0	5.5	21	28.5	70	30	M6 x 1.0	M4	5	36	7	47
<b>32</b>	22.5	60	9.5	6.0	27.5	36	80	35	M6 x 1.0	M5	6	47	8	61
<b>40</b>	26	70	9.5	6.0	28.5	41	92	40	M6 x 1.0	M5	6	55	8	71
<b>50</b>	35	86	11	6.0	35	49	110	40	M8 x 1.25	M6	8	65	11	87
<b>63</b>	36	100	18	7.0	42	57	122	50	M8 x 1.25	M6	10	80	11	101

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

Note 2) Use caution when attached from the top and operated at or above dimension H (3 mm or more for ø6 and ø10), because the end of the screw will contact the body, and floating cannot be maintained in some cases.

# Series CY3

# Made to Order 5

Contact SMC for detailed specifications, lead times and prices.

## 15 With floating joint (CY3R)

Symbol  
**-XC57**

CY3R(G) Bore size Port thread type Stroke -XC57  
With floating joint

### Specifications

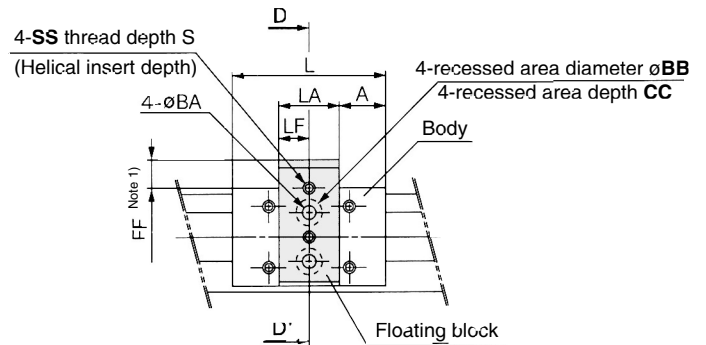
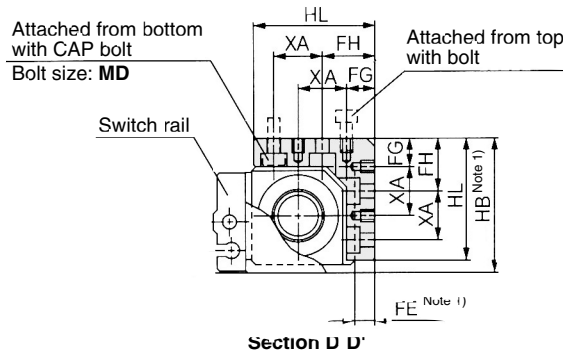
Bore size	ø6 to ø63
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Note) Since the body of this cylinder is designed for connection with a floating joint, and cannot be connected to the bodies of standard products, contact SMC if necessary

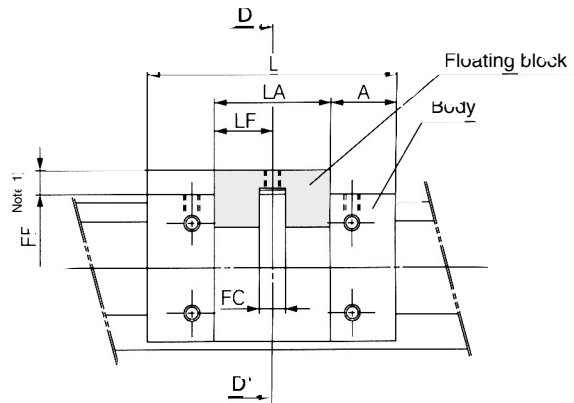
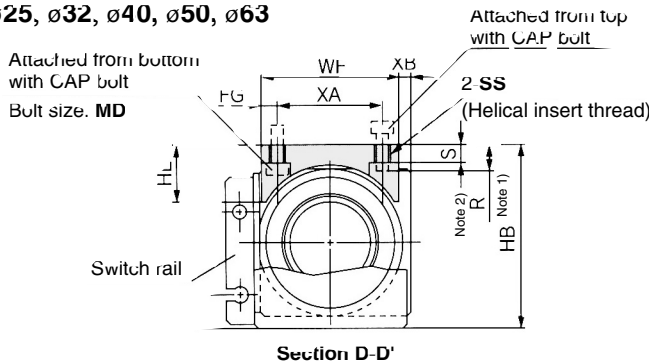
A special floating joint is added to the CY3R series, and the number of connections to the guide on the other axis (the load side) is reduced. The attachment of the bolt to the floating joint and the load is not limited to the top or bottom.

### Dimensions

ø6, ø10, ø15



ø20, ø25, ø32, ø40, ø50, ø63



Bore size	A	BA	BB	CC	FC	FE <sup>Note 1)</sup>	FF <sup>Note 1)</sup>	FG	FH	HB <sup>Note 1)</sup>	HL	L	LA	LF	MD	R <sup>Note 2)</sup>	S	SS	WF	XA	XB
6	9.5	3.4	6.5	3.3	—	5	7	5.5	10.5	26	23	34	15	7.5	M3	—	3.5	M3 x 0.5	—	10	—
10	11.5	3.4	6.5	3.3	—	5	7	7	13	33	30	38	15	7.5	M3	—	3.5	M3 x 0.5	—	12	—
15	18	4.5	8	4.4	—	4.5	6.5	7.5	14.5	38.5	35.5	53	17	8.5	M4	—	4.5	M4 x 0.7	—	14	—
20	16.5	—	—	—	6.5	—	6	4	—	45	14	62	29	14.5	M3	7	4.5	M4 x 0.7	34	26	3
25	20.5	—	—	—	8	—	7	4	—	51	17	70	29	14.5	M4	8	5.5	M5 x 0.8	39	31	3
32	21	—	—	—	9.5	—	7.5	4.5	—	62.5	22	76	34	17	M5	10	6.5	M6 x 1	50	41	3
40	25.5	—	—	—	9.5	—	7.5	7.5	—	74.5	28	90	39	19.5	M5	10	6.5	M6 x 1	60	45	3
50	35.5	—	—	—	11	—	7.5	9	—	92.5	38	110	39	19.5	M6	15	10	M8 x 1.25	78	60	3
63	34.5	—	—	—	18	—	7.5	10	—	104.5	39	118	49	24.5	M6	15	10	M8 x 1.25	90	70	3

Note 1) FE, FF and HB provide a clearance of 0.1 mm between the body and the floating joint, but do not consider dead weight deflection of the cylinder tube, etc. When put into operation, an appropriate value should be set which considers dead weight deflection and alignment variations with respect to the other axis. (Refer to the dead weight deflection table on page 5.)

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








Series **CY3B/CY3R**

# Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 <sup>Note 1)</sup>, JIS B 8370 <sup>Note 2)</sup> and other safety practices.

## ■ Explanation of the Labels

Labels	Explanation of the labels
 <b>Danger</b>	In extreme conditions, there is a possible result of serious injury or loss of life.
 <b>Warning</b>	Operator error could result in serious injury or loss of life.
 <b>Caution</b>	Operator error could result in injury or equipment damage.

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems

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

Note 3) Injury indicates light wounds, burns and electrical shocks that do not require hospitalization or hospital visits for long-term medical treatment.

Note 4) Equipment damage refers to extensive damage to the equipment and surrounding devices.

## ■ Selection/Handling/Applications

### 1. The compatibility of the pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or post analysis and/or tests to meet the specific requirements. The expected performance and safety assurance are the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

### 2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

### 3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driver objects have been confirmed.
2. When equipment is removed, confirm that safety process as mentioned above. Turn off the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc.

### 4. Contact SMC if the product will be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.
4. If the products are used in an interlock circuit, prepare a double interlock style circuit with a mechanical protection function for the prevention of a breakdown. And, examine the devices periodically if they function normally or not.

## ■ Exemption from Liability

1. SMC, its officers and employees shall be exempted from liability for any loss or damage arising out of earthquakes or fire, action by a third person, accidents, customer error with or without intention, product misuse, and any other damages caused by abnormal operating conditions.

2. SMC, its officers and employees shall be exempted from liability for any direct or indirect loss or damage, including consequential loss or damage, loss of profits, or loss of chance, claims, demands, proceedings, costs, expenses, awards, judgments and any other liability whatsoever including legal costs and expenses, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.

3. SMC is exempted from liability for any damages caused by operations not contained in the catalogs and/or instruction manuals, and operations outside of the specification range.

4. SMC is exempted from liability for any loss or damage whatsoever caused by malfunctions of its products when combined with other devices or software.



# Series CY3 Auto Switch Precautions 1

Be sure to read this before handling.

## Design & Selection

### Warning

#### 1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications of current load, voltage, temperature or impact. We do not guarantee any damage in any case the product is used outside of the specification range.

#### 2. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Time load applied (ms)}} \times 1000$$

#### 3. Keep wiring as short as possible.

##### <Reed switch>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.) Use a contact protection box when the wire length is 5 m or longer.

##### <Solid state switch>

Although wire length should not affect switch function, use a wire 100 m or shorter.

#### 4. Do not use a load that generates surge voltage. If a surge voltage is generated, the discharge occurs at the contact, possibly resulting in the shortening of product life.

##### <Reed switch>

If driving a load such as a relay that generates a surge voltage, use a switch with a built-in contact protection circuit or use a contact protection box.

##### <Solid state switch>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

#### 5. Cautions for use in an interlock circuit

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

#### 6. Do not make any modifications to the product.

Do not take the product apart. It may cause human injuries and accidents.

### Caution

#### 1. Use caution when multiple actuators are used and close to each other.

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

#### 2. Take note of the internal voltage drop of the switch.

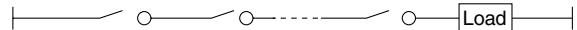
##### <Reed switch>

##### 1) Switches with an indicator light (Except D-A96, Z76)

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



- In the same way, when operating under a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

##### 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model D-A90, 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, note that a 12 VDC relay is not applicable.

#### 3. Pay attention to leakage current.

##### <Solid state switch>

With a 2 wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\text{Operating current of load (OFF condition)} > \text{Leakage current}$$

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

#### 4. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.



# Series CY3 Auto Switch Precautions 2

Be sure to read this before handling.

## Mounting & Adjustment

### Warning

#### 1. 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.

#### 2. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300 m/s<sup>2</sup> or more for reed switches and 1000 m/s<sup>2</sup> 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.

#### 3. Mount switches using the proper fastening torque.

When a switch is tightened beyond the range of fastening torque, the mounting screws, mounting bracket or switch may be damaged. On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position. (Refer to switch mounting for each series regarding switch mounting, moving, and fastening torque, etc.)

#### 4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON).

(The mounting position shown in a catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable.

#### <D-M9□>

When the D-M9 auto switch is used to replace old series auto switch, it may not activate depending on operating condition because of its shorter operating range.

Such as

- Application where the stop position of actuator may vary and exceed the operating range of the auto switch, for example, pushing, pressing, clamping operation, etc.
- Application where the auto switch is used for detecting an intermediate stop position of the actuator. (In this case the detecting time will be reduced.)

In these applications, set the auto switch to the center of the required detecting range.

#### 5. Securing the space for maintenance

When installing the products, please allow access for maintenance.

## Mounting & Adjustment

### Caution

#### 1. Do not carry an actuator by the auto switch lead wires.

Never carry a cylinder (actuator) 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.

#### 2. Fix the switch with appropriate screw installed on the switch body. If using other screws, switch may be damaged.

## Wiring

### Warning

#### 1. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

#### 2. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits, including auto switches, may malfunction due to noise from these other lines.

### Caution

#### 1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from applying bending stress or stretching force to the lead wires.

#### 2. Be sure to connect the load before power is applied.

##### <2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

#### 3. Do not allow short circuit 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>

Model D-M9□, F9□W and all models of PNP output type switches do not have built-in short circuit prevention circuits. If loads are short circuited, the switches will be instantly damaged, as in the case of reed switches.

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



# Series CY3 Auto Switch Precautions 3

Be sure to read this before handling.

## Wiring

### ⚠ Caution

#### 4. Avoid incorrect wiring.

##### <Reed switch>

A 24 VDC switch with indicator light has polarity. The brown lead wire is (+) and the blue lead wire is (-).

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

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models:

D-A93, D-Z73

##### <Solid state switch>

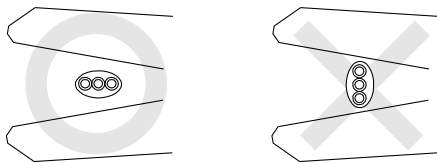
1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this 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-M9□>

D-M9□ does not have built-in short circuit protection circuit. Be aware that if the power supply connection is reversed (e.g. (+) power supply wire and (-) power supply wire connection is reversed), the switch will be damaged.

#### 5. When the cable sheath is stripped, confirm the stripping direction. The insulator may be split or damaged depending on the direction. (D-M9□ only)



#### Recommended Tool

Model name	Model no.
Wire stripper	D-M9N-SWY

\* Stripper for a round cable (ø2.0) can be used for a 2-wire type cable.

## Operating Environment

### ⚠ Warning

#### 1. Never use in an atmosphere of explosive gases.

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

#### 2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside actuators will become demagnetized.

#### 3. Do not use in an environment where the auto switch will be continually exposed to water.

Although switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction), do not use switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

#### 4. Do not use in an environment with oil or chemicals.

Consult with SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

#### 5. Do not use in an environment with temperature cycles.

Consult with SMC if switches are used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

#### 6. Do not use in an environment where there is excessive impact shock.

##### <Reed switch>

When excessive impact (300 m/s<sup>2</sup> or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1 ms or less). Consult with SMC regarding the need to use a solid state switch depending upon the environment.

#### 7. Do not use in an area where surges are generated.

##### <Solid state switch>

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around actuators with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.



# Series CY3 Auto Switch Precautions 4

Be sure to read this before handling.

## Operating Environment

### Caution

**1 Avoid accumulation of iron debris or close contact with magnetic substances.**

When a large amount of ferrous debris such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch actuator, it may cause the auto switch (actuator) to malfunction due to a loss of the magnetic force inside the actuator.

**2. Consult with SMC concerning water resistance, elasticity of lead wires, usage at welding sites, etc.**

**3. Do not use in direct sunlight.**

**4. Do not mount the product in locations where it is exposed to radiant heat.**

## Maintenance

### Warning

**1 Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.**

**1 Securely tighten switch mounting screws.**

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

**2) Confirm that there is no damage to lead wires.**

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

**3) Confirm the lighting of the green light on the 2-color indicator type switch.**

Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

**2. Maintenance procedures are outlined in the operation manual.**

Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

**3. 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 reduce the pressure in the system to zero. Only then should you proceed with the removal of any machinery and equipment.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent actuators from sudden movement.



# Series CY3B/CY3R Specific Product Precautions

Be sure to read this before handling. For Safety Instructions, Actuator Precautions, refer to "Precautions for Handling Pneumatic Devices" (M-03-E3A).

## Mounting

### ⚠ Caution

1. Take care to avoid nicks or other damage on the outside surface of the cylinder tube.

This can lead to damage of the scraper and wear ring, which in turn can cause malfunction.

2. Take care regarding rotation of the external slider.

Rotation should be controlled by connecting it to another shaft (linear guide, etc.).

3. Do not operate with the magnetic coupling out of position.

In case the magnetic coupling is out of position, push the external slider back into the correct position by hand at the end of the stroke (or correct the piston slider with air pressure).

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

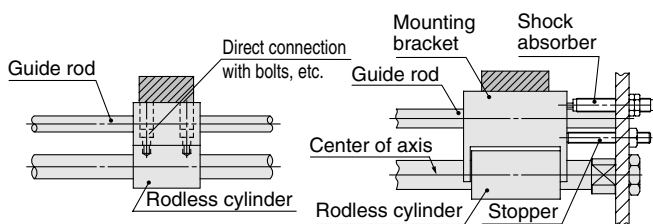
5. If gaps occur between the mounting surface and the end covers when mounting with bolts, perform shim adjustment using spacers, etc. so that there is no unreasonable stress. (CY3R)

6. Be sure that both end covers are secured to the mounting surface before operating the cylinder.

Avoid operation with the external slider secured to the surface.

7. Do not apply a lateral load to the external slider.

When a load is mounted directly to the cylinder, variations in the alignment of each shaft center cannot be assimilated, which results in the generation of a lateral load that can cause malfunction. (Figure 1) The cylinder should be operated using a connection method which allows for assimilation of shaft alignment variations and deflection due to the cylinder's own weight. A drawing of a recommended mounting is shown in Figure 2.



Variations in the load and cylinder shaft alignment cannot be assimilated, resulting in malfunction.

Shaft alignment variations are assimilated by providing clearance for the mounting bracket and cylinder. Moreover, the mounting bracket is extended above the cylinder shaft center, so that the cylinder is not subjected to moment.

Figure 1. Incorrect mounting

Figure 2. Recommended mounting

Note) The drawing shows the CY3B series.

8. Use caution regarding the allowable load weight when operating in a vertical direction.

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

## Mounting

### ⚠ Caution

9. Careful alignment is necessary when connecting to a load having an external guide mechanism.

As the stroke becomes longer, variations in the center axis become larger. Consider using a connection method (floating mechanism) that is able to absorb these variations. Furthermore, use the special floating brackets (XC57) which have been provided for the CY3B and CY3R series (pages 28 to 29).

## Disassembly & Maintenance

### ⚠ Warning

1. Use caution as the attractive power of the magnets is very strong.

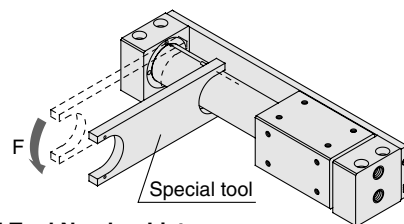
When removing the external slider and piston slider from the cylinder tube for maintenance, etc., handle with caution, since the magnets installed in each slider have very strong attractive power.

### ⚠ Caution

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

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

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



#### Special Tool Number List

Part no.	Applicable bore size (mm)
CYRZ-V	6, 10, 15, 20
CYRZ-W	25, 32, 40
CYRZ-X	50
CYRZ-Y	63

3. Use caution when taking off the external slider, as the piston slider will be directly attracted to it.

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

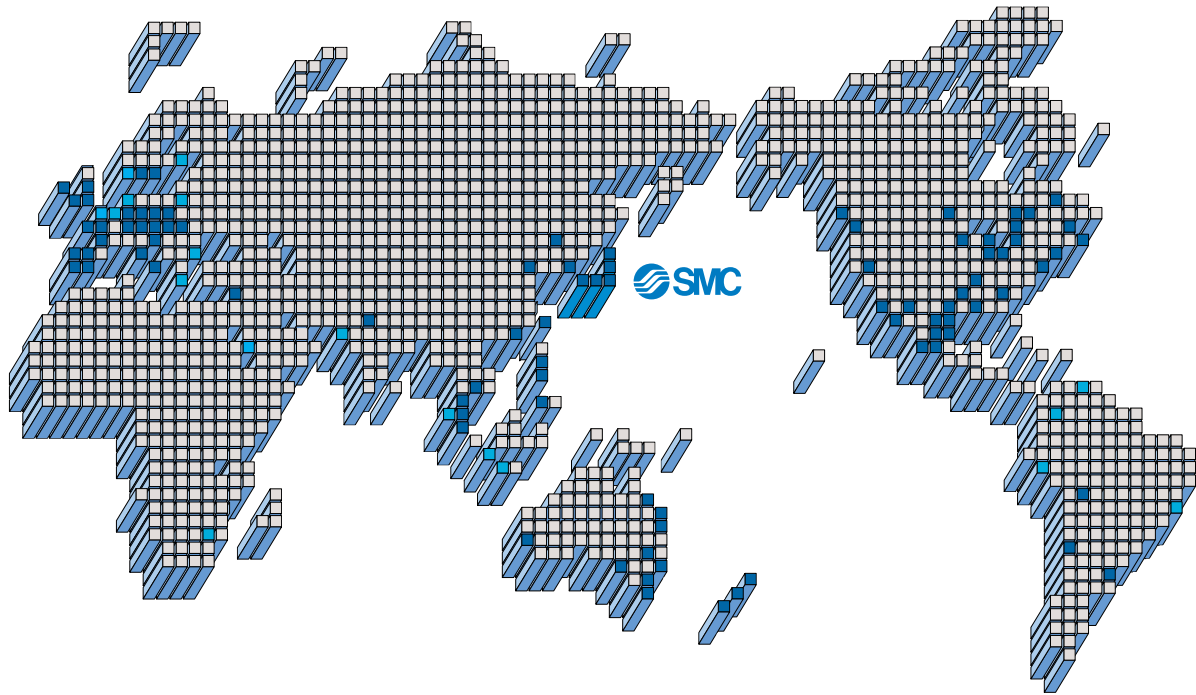
4. Do not disassemble the magnetic components (piston slider, external slider).

This can cause a loss of holding force and malfunction.

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



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### Safety Instructions

Be sure to read Precautions for Handling Pneumatic Devices (M-03-E3A) before using.

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D-DN

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# Series 12-CY3B Magnetic rodless cylinder

ø15, ø20, ø25, ø32, ø40

## How to Order



Clean series

12 — Special treatment on sliding part

Bore size (mm)

12 - CY3B

15

300

Cylinder stroke (mm)

### Port type

Symbol	Type	Bore size
Nil	M5 x 0.8	15
	Rc	
TN	NPT	20, 25, 32, 40
TF	G	

## Model

Model	Bore size (mm)	Port size	Lubrication	Standard stroke (mm)	Maximum manufacturable stroke	Cushion	
						Rubber	Air
12-CY3B15	15	M5 x 0.8	Non-lube	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	1000	○ (Both sides)	—
12-CY3B20	20	Rc1/8		100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1300		
12-CY3B25	25	NPT1/8					
12-CY3B32	32	G1/8					
12-CY3B40	40	Rc1/4 NPT1/4 G1/4		100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000			

Note 1) Stroke exceeding the standard stroke but below the maximum possible stroke is available for special order upon request.

Note 2) Intermediate stroke is available by the 1 mm interval.

Note 3) Please contact SMC if the maximum manufacturable stroke is exceeded.

## Specifications

Item	Bore size (mm)
	15/20/25/32/40
Proof pressure	1.05MPa
Max. operating pressure	0.7MPa
Min. operating pressure	ø15, ø20: 0.16MPa, ø25: 0.15MPa, ø32: 0.14MPa, ø40: 0.12MPa
Ambient and fluid temperature	-10°C to 60°C (With no freezing)
Piston speed	50 to 400 mm/s
Stroke length tolerance	0 to 250 st: $^{+1.0}_0$ , 251 to 1000 st: $^{+1.4}_0$ , 1001 st to: $^{+1.8}_0$
Mounting bracket	2 mounting nuts (Standard)
Grease	Fluorine grease
Particle generation grade (Refer to front matter pages 13 to 22 for details.)	Grade 3

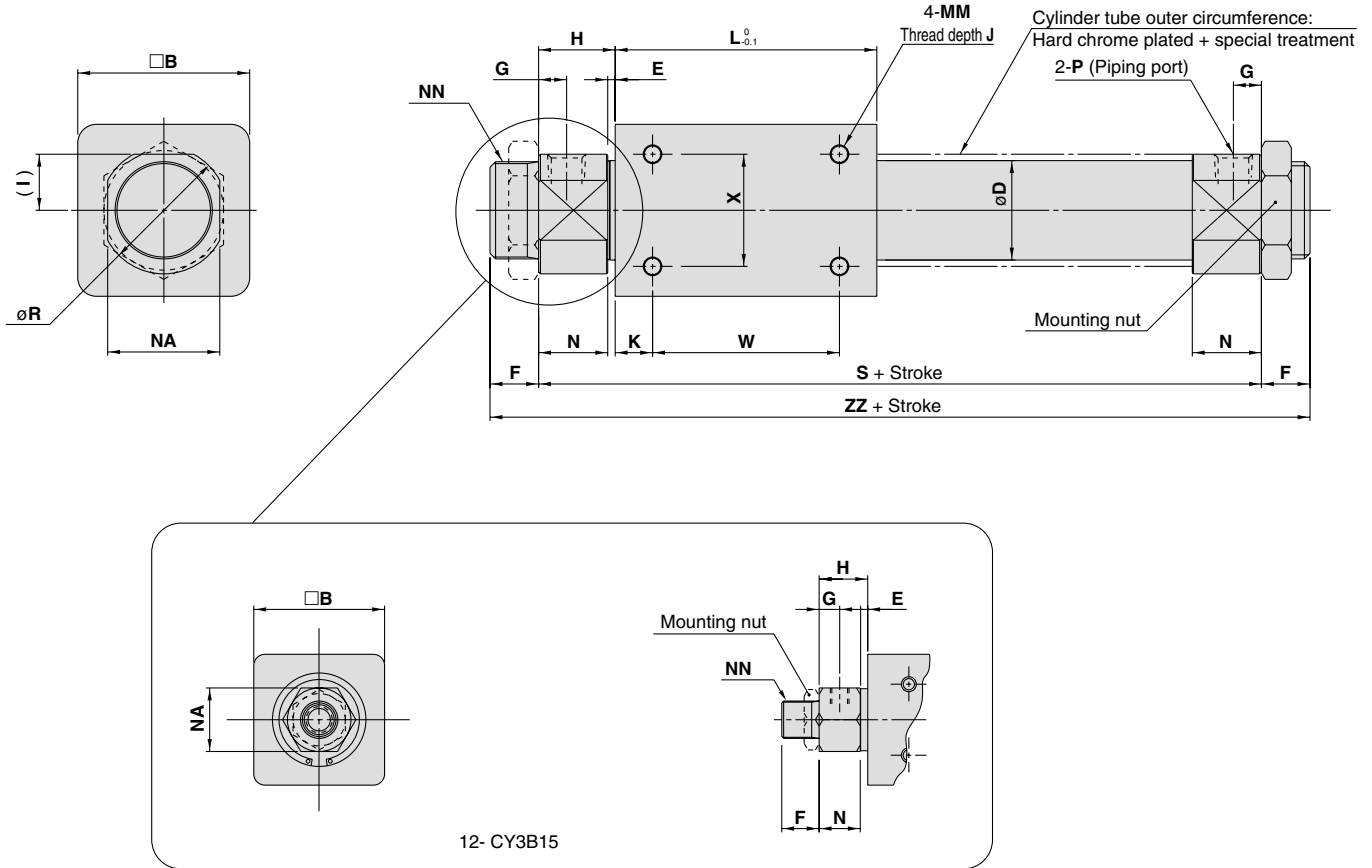
## Magnetic holding force (N)

Bore size (mm)	15	20	25	32	40
Holding force	137	231	363	588	922



Dimensions

12-CY3B15 to 40



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

Model	P (Piping port)		
	Nil	TN	TF
12-CY3B15	M5 x 0.8	—	—
12-CY3B20	Rc1/8	NPT1/8	G1/8
12-CY3B25	Rc1/8	NPT1/8	G1/8
12-CY3B32	Rc1/8	NPT1/8	G1/8
12-CY3B40	Rc1/4	NPT1/4	G1/4

Mounting nuts (2 pcs.) are shipped together.

Part number	Applicable bore size (mm)	d	H	B	C
SNJ-016B	15	M10 x 1.0	4	14	16.2
SN-020B	20	M20 x 1.5	8	26	30
SN-032B	25, 32	M26 x 1.5	8	32	37
SN-040B	40	M32 x 2.0	10	41	47.3



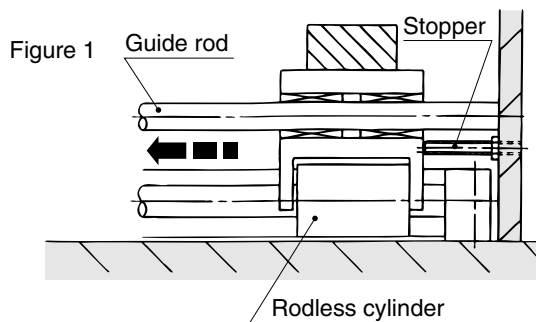
# Specific Product Precautions

Be sure to read before handling.

## 12-CY1B/3B/1R/3R/REA. Common Precautions

### ⚠ Caution

- 1. Use caution to the rotation of the external slider.**  
Rotation should be controlled by connecting the external slider to another shaft (linear guide, etc.).
- 2. 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 position slider with air pressure) back to the proper position at the stroke end.
- 3. Do not apply a lateral load to the external slider.**  
When a load is mounted directly to the cylinder, variations in the alignment of each shaft center cannot be offset, which results in the generation of a lateral load that can cause malfunction. The cylinder should be operated using a connection method which allows for shaft alignment variations and deflection due to the cylinder's own weight. A drawing of a recommended mounting method is shown in Figure 1.



- 4. When used for vertical operation, use caution regarding allowable load.**  
When used for vertical operation, use caution as there is a possibility of dropping due to separation of the magnetic coupling if a load greater than the allowable value is added. When used for vertical operation, contact SMC for the operating conditions (pressure, load, speed, stroke, frequency, etc.). Refer to Best Pneumatics vol.8 (CY1 series model selection method) for details.
- 5. Do not scratch or gouge the external surface of the cylinder.**  
It can damage the wear ring, increase particle generation and cause malfunction.
- 6. Do not use the cylinder with its body fixed.**  
Be sure to secure both head covers (or end covers in case of CY1R) before using the cylinder. Operation of the cylinder with its body fixed will damage the wear ring, resulting in increase of particle generation or malfunction.

## 12- CY1R/3R

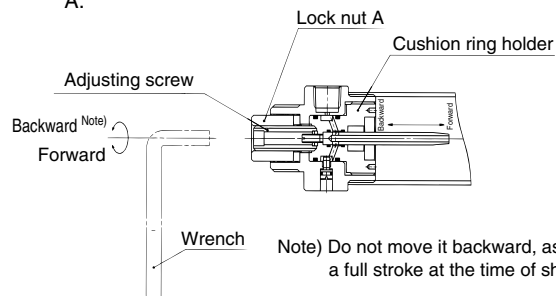
### ⚠ Caution

- 1. Pay attention to the cylinder mounting surface.**  
If there is any clearance between the end covers on both ends and the mounting surfaces, adjust the shim with a spacer for secure installation.

## 12- REA

### ⚠ Caution

- 1. Stroke adjustment is provided for position adjustment.**  
This mechanism is not intended for adjustment of the cushion effect (smooth start-up, soft stop). This mechanism is for matching of the cylinder's stroke end position to the mechanical stopper, etc., of a machine.
- 2. Stroke adjustment should be conducted with no pressure supply.**  
To ensure safety, stroke adjustment should be conducted with no pressure supply. Before adjustment is performed, shut off the drive air, release any residual pressure and implement measures to prevent dropping of workpieces, etc. Adjustment procedure is shown below.
  - 1) Insert a wrench into the hexagon hole of the adjustment screw to loosen lock nut A.
  - 2) Rotate the adjustment screw to right and left and move the cushion ring holder (stroke end) forward and backward to align the position with that of the external stopper.
  - 3) After the stroke end adjustment is completed, retighten lock nut A.



### •Adjusting screw width across flats •Lock nut A tightening torque

Model	Width across flats (mm)	Model	Tightening torque (N·m)
12-REA25	5	12-REA25	1.2
12-REA32	5	12-REA32	1.2
12-REA40	6	12-REA40	2.1
12-REA50	8	12-REA50	3.4
12-REA63	8	12-REA63	3.4

### 3. Throttle type speed controllers are recommended for speed adjustment, as shown in the table below.

#### •Recommended speed controller

Model	Model		
	Elbow type	Straight type	In-line type
12-REA25	10-AS2201F-01-06-X214	10-AS2301F-01-06-X214	10-AS2001F-06-X214
12-REA32	10-AS2201F-02-06-X214	10-AS2301F-02-06-X214	10-AS2001F-06-X214
12-REA40	10-AS2201F-02-06-X214	10-AS2301F-02-06-X214	10-AS2001F-06-X214
12-REA50	10-AS3201F-02-08-X214	10-AS3301F-02-08-X214	10-AS3001F-08-X214
12-REA63	10-AS3201F-02-08-X214	10-AS3301F-02-08-X214	10-AS3001F-08-X214

Although speed adjustment is possible with meter-in and meter-out speed controllers, smooth start-up and soft stop may not be achieved.

In case the mounting orientation is not horizontal, a system with a pressure regulating circuit on the lower side is recommended. (It is also effective to shorten start-up delay in rising and for energy conservation.)

#### 4. Cushion adjustment is not necessary.

The fixed cushion mechanism does not require the conventional cushion adjustment.

12-CY1B/3B

12- CY1R/3R

## Warning

**1. Use caution as the attractive power of the magnets is very strong.**

When removing the external slider and piston slider from the cylinder tube for maintenance, etc., handle with caution, since the magnets installed in each slider have a very strong attractive force.

## Caution

**1. Use caution when taking off the external slider, as the piston slider will be directly attracted to it.**

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

**2. Use caution to the direction of the external slider and the piston slider.**

Since the external slider and piston slider are directional for  $\phi 6$ ,  $\phi 10$  and holding type L, refer to the figures below when performing disassembly or maintenance. Put the external slider and piston slider together, and insert the piston slider into the cylinder tube so that they will have the correct positional relationship as shown in Fig. (2). If they align as shown in Fig. (3), insert the piston slider after turning it around  $180^\circ$ .

If the direction is not correct, it will be impossible to obtain the specified holding force.

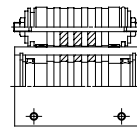


Figure 2. Correct positioning

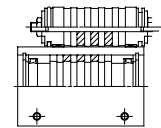


Figure 3. Positioning in incorrect direction

Example :  $\phi 20$  to  $\phi 63$  with L type holding force

**3. Do not disassemble the magnetic components (piston slider and external slider).**

This can cause a loss of holding force and malfunction.

**4. Since it is possible to change the magnetic holding force (from H type to L type), please contact SMC if this is necessary.**

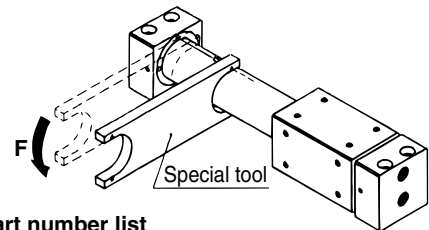
**5. When disassembling to replace the seals and wear ring, refer to the separate disassembly instructions.**

## Caution

**6. Apply additional tightening when remounting the head cover after disassembly.**

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

**6. Special tools are necessary for disassembly.**



**Special tool part number list**

Part no.	Applicable bore size (mm)
<b>CYRZ-V</b>	6, 10, 15, 20
<b>CYRZ-W</b>	25, 32, 40
<b>CYRZ-X</b>	50
<b>CYRZ-Y</b>	63

12- REA

## Warning

**1. Do not disassemble the product because it may damage the air cushion mechanism.**

Contact SMC when disassembly or maintenance is necessary .

Air cylinder

Rotary actuator

Air gripper

Directional control valve

Flow control equipment

Filter, Pressure control equipment

Fittings & Tubing

Air preparation equipment

Pressure switch

Clean gas filter

# Series 12-CY3R

Magnetic rodless cylinder (Direct mount type)  
 ø15, ø20, ø25, ø32, ø40

## How to Order



**Clean series**  
 12 — Special treatment on sliding part

**Bore size (mm)**

### Port thread type

Symbol	Type	Bore size
Nil	M5 x 0.8	15
	Rc	
TN	NPT	20, 25, 32, 40
TF	G	

**12 - CY3R 25 [ ] - 300 N**

Standard stroke |

N — Without switch rail |

\* Switch rail is not available for 12- series.

## Model

Model	Bore size (mm)	Port size	Lubrication	Standard stroke (mm)	Maximum manufacturable stroke (mm)	Cushion	
						Rubber	Air
12-CY3R15	15	M5 x 0.8	Non-lube	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	1000	○ (Both sides)	—
12-CY3R20	20	Rc1/8		100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1300		
12-CY3R25	25	NPT1/8					
12-CY3R32	32	G1/8					
12-CY3R40	40	Rc1/4 NPT1/4 G1/4					

Note 1) Stroke exceeding the standard stroke will be available upon request as special product.

Note 2) Intermediate stroke is available by the 1 mm interval.

Note 3) Please contact SMC if the maximum manufacturable stroke is exceeded.

## Specifications

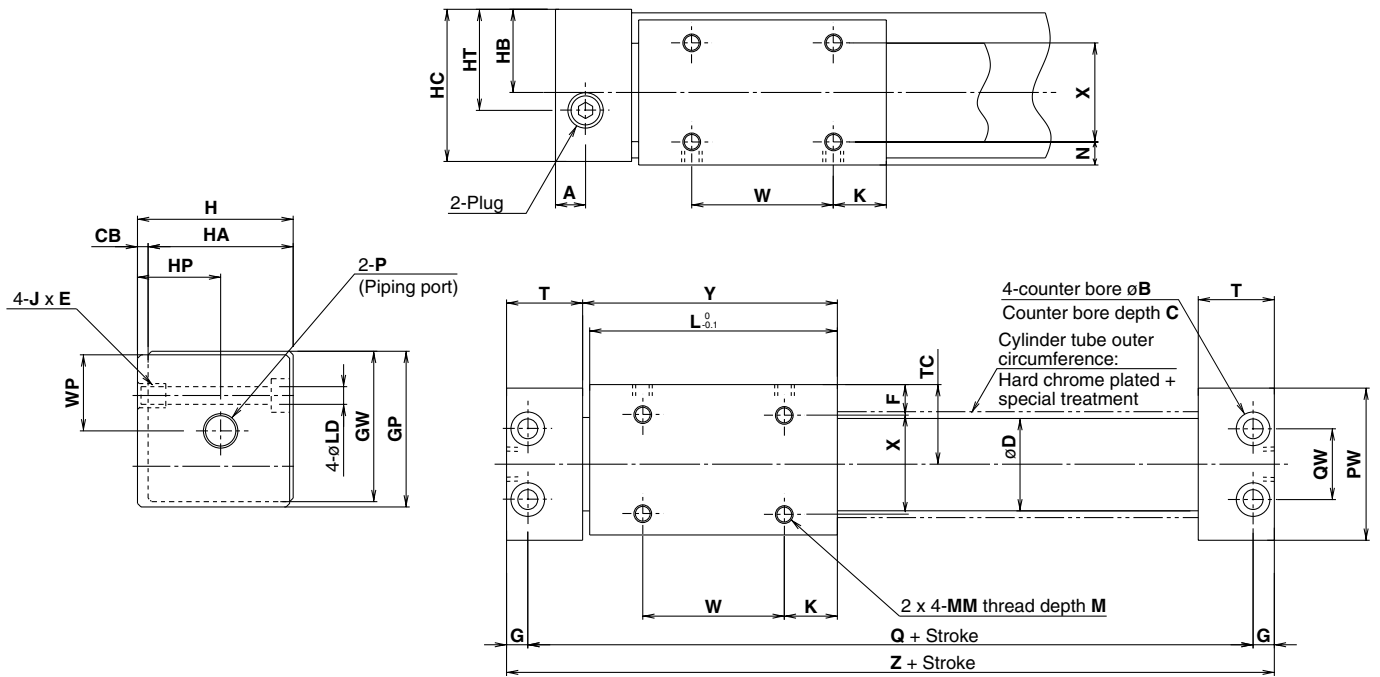
Item	Bore size (mm)
	15/20/25/32/40
<b>Proof pressure</b>	1.05MPa
<b>Max. operating pressure</b>	0.7MPa
<b>Min. operating pressure</b>	ø15, ø20: 0.16MPa, ø25: 0.15MPa, ø32: 0.14MPa, ø40: 0.12MPa
<b>Ambient and fluid temperature</b>	-10°C to 60°C (With no freezing)
<b>Piston speed</b>	50 to 400 mm/s
<b>Stroke length tolerance</b>	0 to 250 st: $^{+1.0}_0$ , 251 to 1000 st: $^{+1.4}_0$ , 1001 st to $^{+1.8}_0$
<b>Mounting</b>	Direct mount type
<b>Grease</b>	Fluorine grease
<b>Particle generation grade</b> (Refer to front matter pages 13 to 22 for details.)	Grade 3

## Magnetic holding force (N)

Bore size (mm)	15	20	25	32	40
Holding force	137	231	363	588	922

Dimensions

12-CY3R15 to 40



(mm)

Model	A	B	C	CB	D	F	G	GP	GW	H	HA	HB	HC	HP	HT	J x E	K
12-CY3R15	10.5	8	4.2	2	16.6	8	5	33	31.5	32	30	17	31	17	17	M5 x 0.8 x 7	14
12-CY3R20	9	9.5	5.2	3	21.6	9	6	39	37.5	39	36	21	38	24	24	M6 x 1 x 8	11
12-CY3R25	8.5	9.5	5.2	3	26.4	8.5	6	44	42.5	44	41	23.5	43	23.5	23.5	M6 x 1 x 8	15
12-CY3R32	10.5	11	6.5	3	33.6	10.5	7	55	53.5	55	52	29	54	29	29	M8 x 1.25 x 10	13
12-CY3R40	10	11	6.5	5	41.6	13	7	65	63.5	67	62	36	66	36	36	M8 x 1.25 x 10	15

Model	L	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	X	Y	Z
12-CY3R15	53	4.3	5	M4 x 0.7	6	32	84	18	19	17	25	16	18	54.5	94
12-CY3R20	62	5.6	5	M4 x 0.7	7	38	95	17	20.5	20	40	19	22	64	107
12-CY3R25	70	5.6	6	M5 x 0.8	6.5	43	105	20	21.5	22.5	40	21.5	28	72	117
12-CY3R32	76	7	7	M6 x 1	8.5	54	116	26	24	28	50	27	35	79	130
12-CY3R40	90	7	8	M6 x 1	11	64	134	34	26	33	60	32	40	93	148



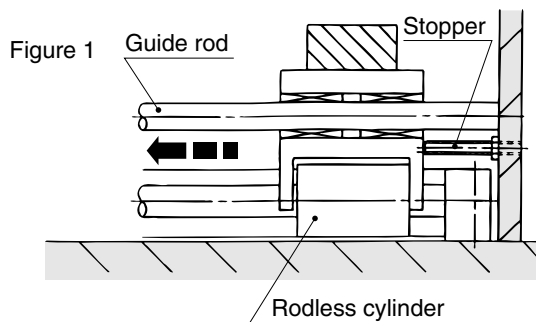
# Specific Product Precautions

Be sure to read before handling.

## 12-CY1B/3B/1R/3R/REA. Common Precautions

### ⚠ Caution

- Use caution to the rotation of the external slider.**  
Rotation should be controlled by connecting the external slider to another shaft (linear guide, etc.).
- 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 position slider with air pressure) back to the proper position at the stroke end.
- Do not apply a lateral load to the external slider.**  
When a load is mounted directly to the cylinder, variations in the alignment of each shaft center cannot be offset, which results in the generation of a lateral load that can cause malfunction. The cylinder should be operated using a connection method which allows for shaft alignment variations and deflection due to the cylinder's own weight. A drawing of a recommended mounting method is shown in Figure 1.



- When used for vertical operation, use caution regarding allowable load.**  
When used for vertical operation, use caution as there is a possibility of dropping due to separation of the magnetic coupling if a load greater than the allowable value is added. When used for vertical operation, contact SMC for the operating conditions (pressure, load, speed, stroke, frequency, etc.). Refer to Best Pneumatics vol.8 (CY1 series model selection method) for details.
- Do not scratch or gouge the external surface of the cylinder.**  
It can damage the wear ring, increase particle generation and cause malfunction.
- Do not use the cylinder with its body fixed.**  
Be sure to secure both head covers (or end covers in case of CY1R) before using the cylinder. Operation of the cylinder with its body fixed will damage the wear ring, resulting in increase of particle generation or malfunction.

## 12- CY1R/3R

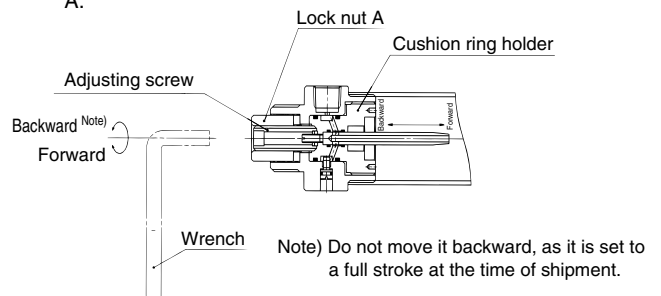
### ⚠ Caution

- Pay attention to the cylinder mounting surface.**  
If there is any clearance between the end covers on both ends and the mounting surfaces, adjust the shim with a spacer for secure installation.

## 12- REA

### ⚠ Caution

- Stroke adjustment is provided for position adjustment.**  
This mechanism is not intended for adjustment of the cushion effect (smooth start-up, soft stop). This mechanism is for matching of the cylinder's stroke end position to the mechanical stopper, etc., of a machine.
- Stroke adjustment should be conducted with no pressure supply.**  
To ensure safety, stroke adjustment should be conducted with no pressure supply. Before adjustment is performed, shut off the drive air, release any residual pressure and implement measures to prevent dropping of workpieces, etc. Adjustment procedure is shown below.
  - 1) Insert a wrench into the hexagon hole of the adjustment screw to loosen lock nut A.
  - 2) Rotate the adjustment screw to right and left and move the cushion ring holder (stroke end) forward and backward to align the position with that of the external stopper.
  - 3) After the stroke end adjustment is completed, retighten lock nut A.



Adjusting screw width across flats		Lock nut A tightening torque	
Model	Width across flats (mm)	Model	Tightening torque (N·m)
12-REA25	5	12-REA25	1.2
12-REA32	5	12-REA32	1.2
12-REA40	6	12-REA40	2.1
12-REA50	8	12-REA50	3.4
12-REA63	8	12-REA63	3.4

- Throttle type speed controllers are recommended for speed adjustment, as shown in the table below.**

#### Recommended speed controller

Model	Model		
	Elbow type	Straight type	In-line type
12-REA25	10-AS2201F-01-06-X214	10-AS2301F-01-06-X214	10-AS2001F-06-X214
12-REA32	10-AS2201F-02-06-X214	10-AS2301F-02-06-X214	10-AS2001F-06-X214
12-REA40	10-AS2201F-02-06-X214	10-AS2301F-02-06-X214	10-AS2001F-06-X214
12-REA50	10-AS3201F-02-08-X214	10-AS3301F-02-08-X214	10-AS3001F-08-X214
12-REA63	10-AS3201F-02-08-X214	10-AS3301F-02-08-X214	10-AS3001F-08-X214

Although speed adjustment is possible with meter-in and meter-out speed controllers, smooth start-up and soft stop may not be achieved.

In case the mounting orientation is not horizontal, a system with a pressure regulating circuit on the lower side is recommended. (It is also effective to shorten start-up delay in rising and for energy conservation.)

- Cushion adjustment is not necessary.**

The fixed cushion mechanism does not require the conventional cushion adjustment.

12-CY1B/3B

12- CY1R/3R

## ⚠ Warning

**1. Use caution as the attractive power of the magnets is very strong.**

When removing the external slider and piston slider from the cylinder tube for maintenance, etc., handle with caution, since the magnets installed in each slider have a very strong attractive force.

## ⚠ Caution

**1. Use caution when taking off the external slider, as the piston slider will be directly attracted to it.**

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

**2. Use caution to the direction of the external slider and the piston slider.**

Since the external slider and piston slider are directional for  $\phi 6$ ,  $\phi 10$  and holding type L, refer to the figures below when performing disassembly or maintenance. Put the external slider and piston slider together, and insert the piston slider into the cylinder tube so that they will have the correct positional relationship as shown in Fig. (2). If they align as shown in Fig. (3), insert the piston slider after turning it around  $180^\circ$ .

If the direction is not correct, it will be impossible to obtain the specified holding force.

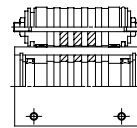


Figure 2. Correct positioning

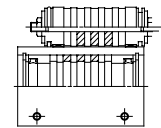


Figure 3. Positioning in incorrect direction

Example :  $\phi 20$  to  $\phi 63$  with L type holding force

**3. Do not disassemble the magnetic components (piston slider and external slider).**

This can cause a loss of holding force and malfunction.

**4. Since it is possible to change the magnetic holding force (from H type to L type), please contact SMC if this is necessary.**

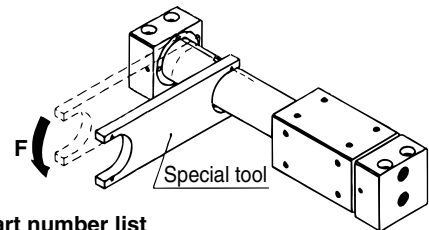
**5. When disassembling to replace the seals and wear ring, refer to the separate disassembly instructions.**

## ⚠ Caution

**6. Apply additional tightening when remounting the head cover after disassembly.**

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

**6. Special tools are necessary for disassembly.**



**Special tool part number list**

Part no.	Applicable bore size (mm)
<b>CYRZ-V</b>	6, 10, 15, 20
<b>CYRZ-W</b>	25, 32, 40
<b>CYRZ-X</b>	50
<b>CYRZ-Y</b>	63

12- REA

## ⚠ Warning

**1. Do not disassemble the product because it may damage the air cushion mechanism.**

Contact SMC when disassembly or maintenance is necessary .

Air cylinder

Rotary actuator

Air gripper

Directional control valve

Flow control equipment

Filter, Pressure control equipment

Fittings & Tubing

Air preparation equipment

Pressure switch

Clean gas filter

# Magnetically Coupled Rodless Cylinder

ø6, ø10, ø15, ø20, ø25, ø32, ø40

New

RoHS

## Weight

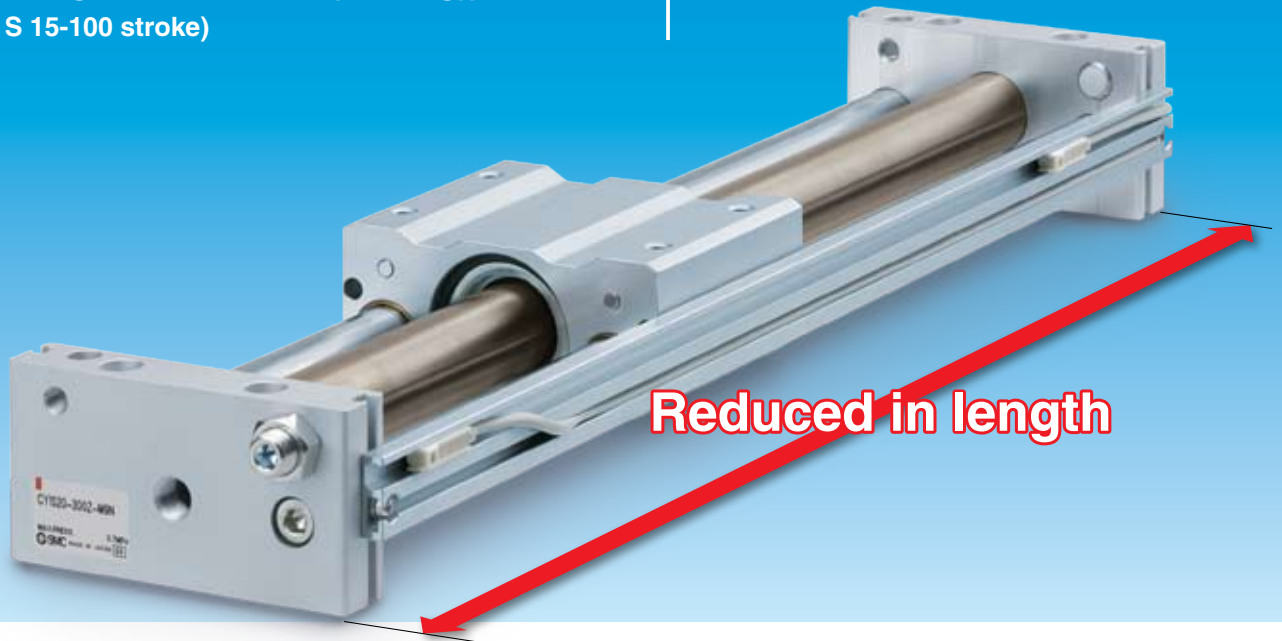
Max. **15% reduced**

2.12 lbs (0.96 kg)  
(Existing model 2.5 lbs (1.13 kg))  
(CY1S 15-100 stroke)

## Overall length

Max. **15 mm shortened**

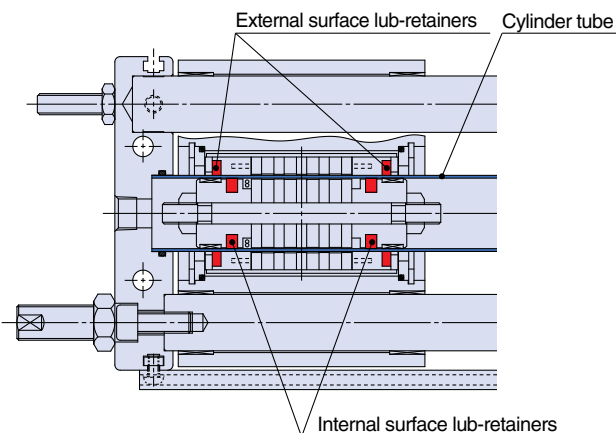
240 mm (Existing model 255 mm)  
(CY1S 40-100 stroke)



Reduced in length

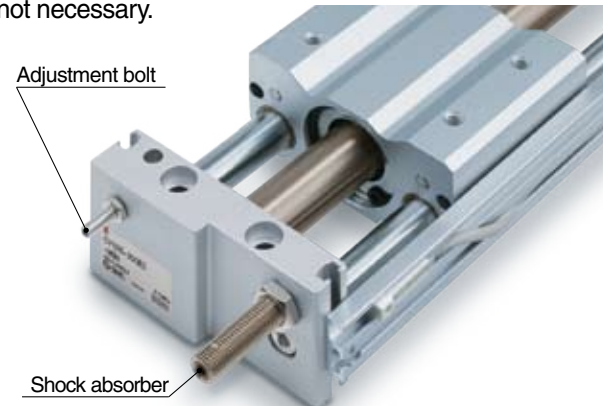
## Improved durability

Lub-retainers are mounted on the internal and external surfaces of the cylinder tube to maintain the lubrication.



## Adjustment bolt improves stroke accuracy/repeatability.

Stroke position can be maintained with the adjustment bolt positioned next to the shock absorber, so stroke adjustment is not necessary.



Series **CY1S**

**SMC**  
CAT.NAS20-227A



# Series CY1S

## Reduced in weight

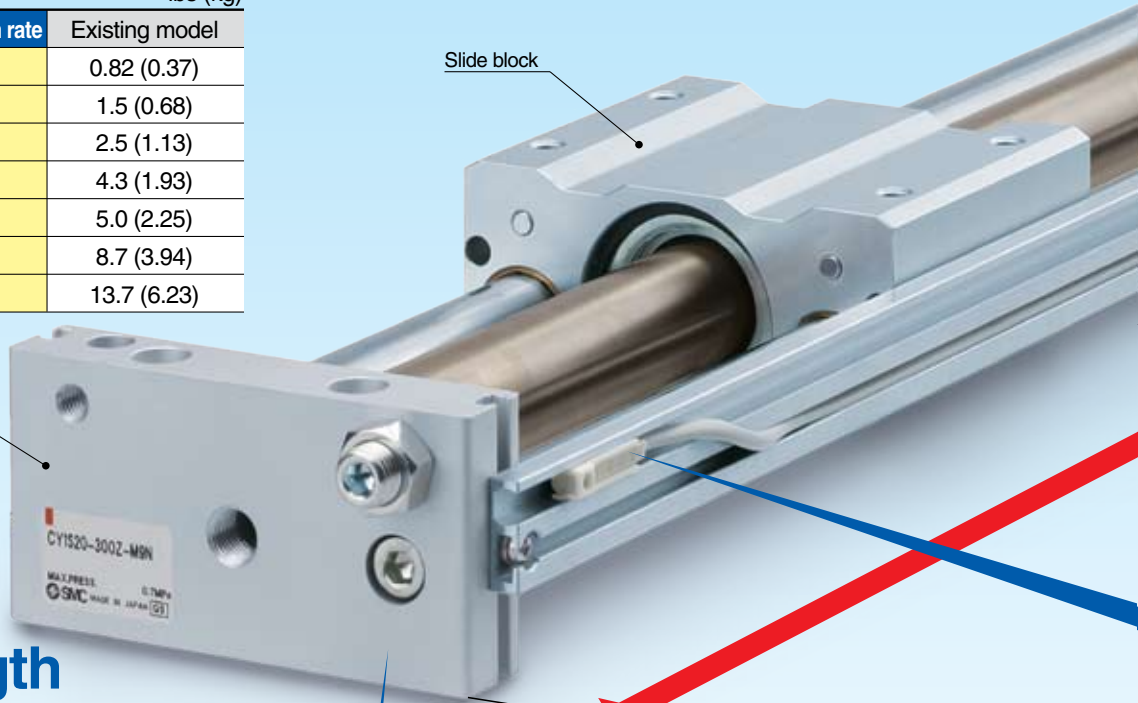
Weight is reduced with the redesign of the slide block and reducing the thickness of the plate.

Bore size (mm)	New CY1S	Reduction rate	Existing model
6	0.34	8%	0.82 (0.37)
10	0.59	13%	1.5 (0.68)
15	0.96	15%	2.5 (1.13)
20	1.68	13%	4.3 (1.93)
25	2.02	10%	5.0 (2.25)
32	3.45	12%	8.7 (3.94)
40	5.36	14%	13.7 (6.23)

\* At 100 stroke

Slide block

Plate

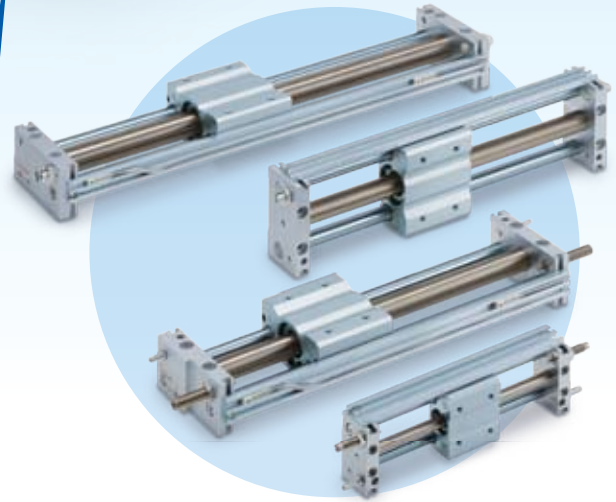


## Reduced in length

Overall length is reduced, but interchangeable with the existing model.

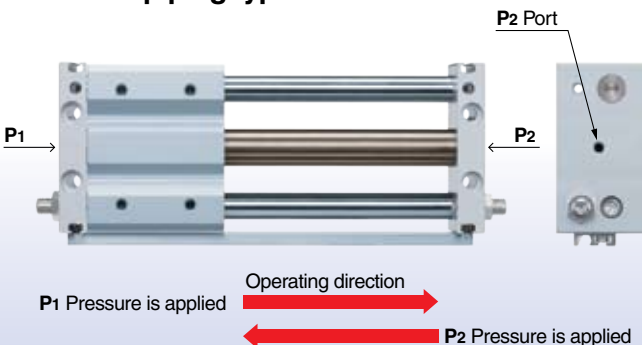
Bore size (mm)	New CY1S				Existing model
	Bilateral piping type		Centralized piping type		
	Overall length	Length reduction	Overall length	Length reduction	
6	162	6	166	2	168
10	172	8	176	4	180
15	187	10	192	5	197
20	206	9	211	4	215
25	206	9	211	4	215
32	228	10	234	4	238
40	240	15	246	9	255

\* At 100 stroke

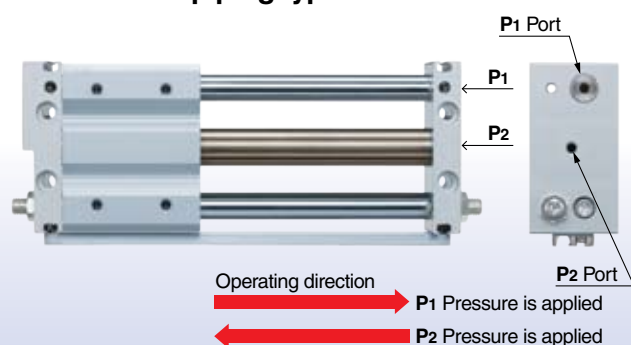


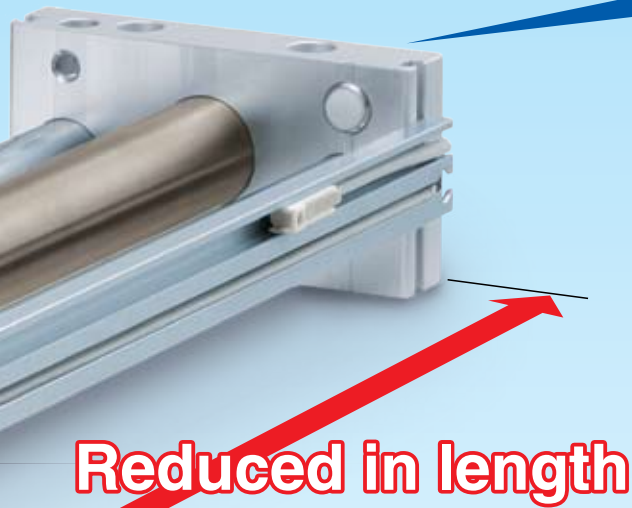
## Bilateral piping and centralized piping versions available

### • Bilateral piping type



### • Centralized piping type



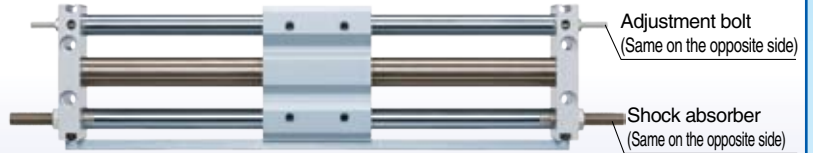


### 3-Options available for stroke adjustment

- Bumper bolt (resin tipped)

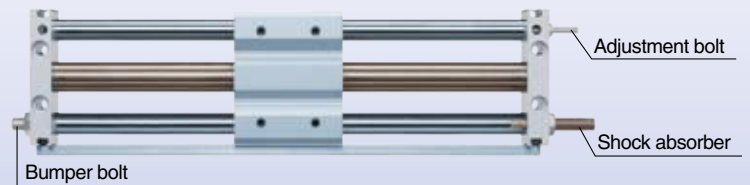


- Shock absorber + Adjustment bolt (metal ended)



- Shock absorber + Adjustment bolt (metal ended) on one side

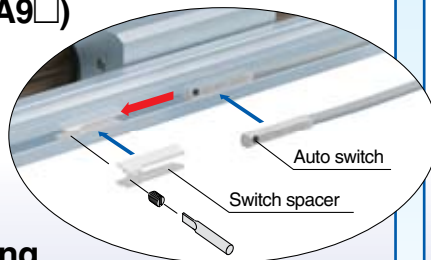
- Bumper bolt (resin tipped) on one side



### **New** Improved auto switch mounting

#### 1 Auto switch can be mounted in any desired position. (D-M9□, D-A9□)

- The auto switch can be fixed in any desired position with a switch spacer.
- This reduces man-hours for mounting.

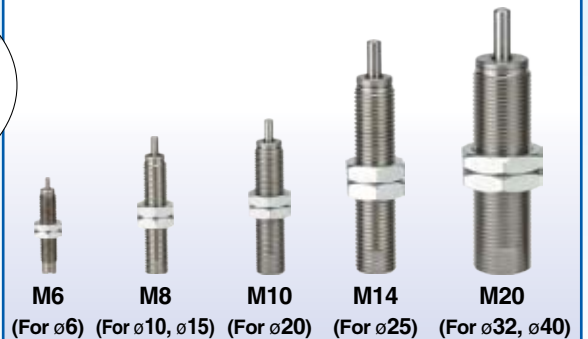


#### 2 Auto switch mounting rail fitted as standard

Auto switch rail is suitable for various switch specifications. Refer to page 1 for applicable auto switches.

### **New** Shock absorber

The RJ series soft stop shock absorbers fitted as standard



### Magnetically Coupled Rodless Cylinder Series Variations

★: **New** Series CY1S

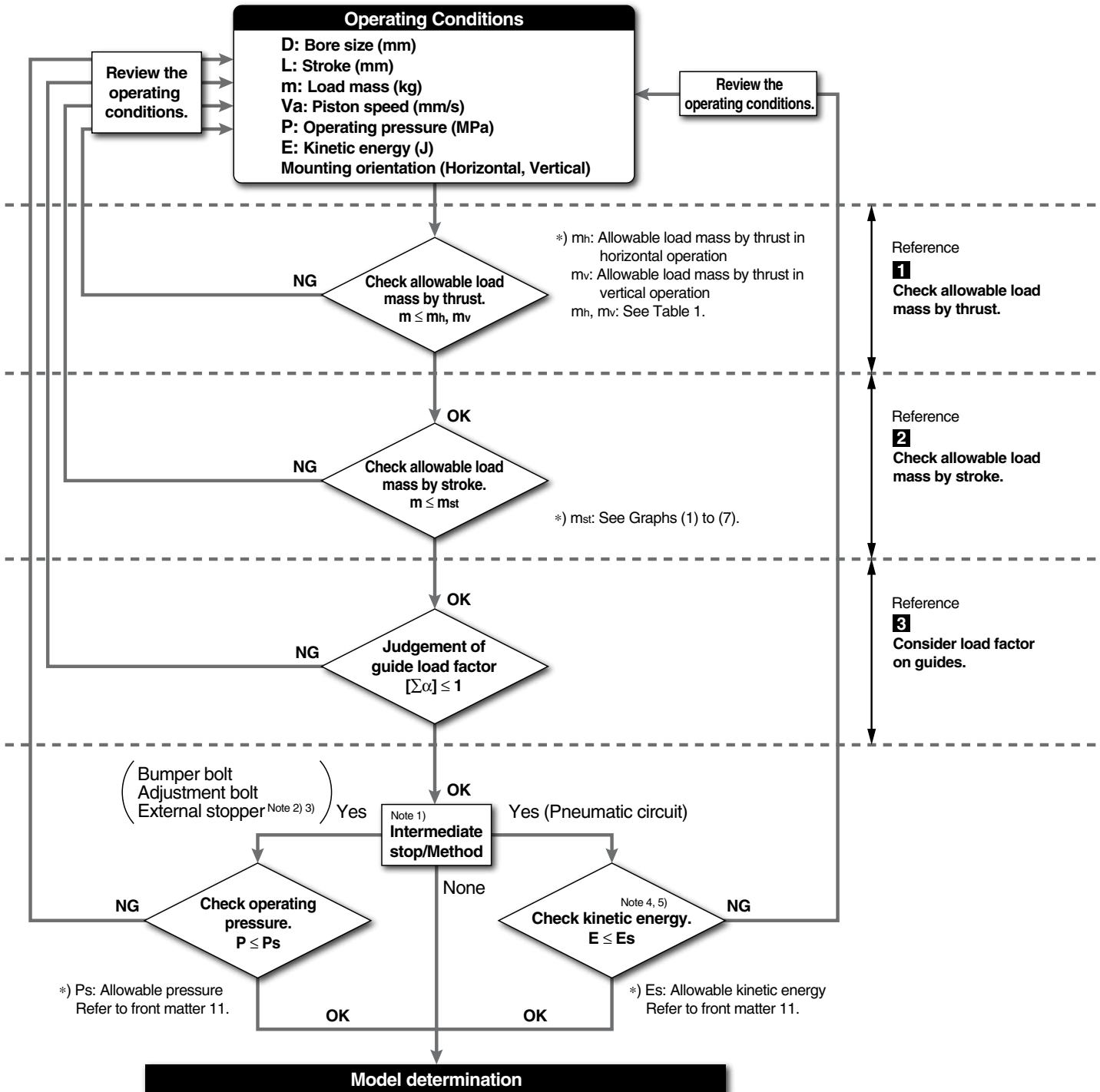
Series	Bearing	Piping type		Bore size (mm)								Note 2) Made to Order	Page	
		Bilateral piping	Centralized piping	6	10	15	20	25	32	40	50			63
CY3B	Basic type	●	●	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1174
CY3R	Basic type Direct mount	●	● Note 1)	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1178
<b>New</b> CY1S	Slide bearing	★	★	★	★	★	★	★	★	★	★	★	★	Page 1 of this catalog
CY1L	Ball bushing	●	●	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1206
CY1H	Linear guide type	●	●	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1218
CY1HT		●	●	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1218
CY1F		●	●	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1239
CYP		●	●	●	●	●	●	●	●	●	●	●	●	Best Pneumatics Page 1255

Note 1) Except ø6 Note 2) Refer to pages 9 and 10 for made to order specifications.



# Series CY1S Model Selection

## Selection Flow Chart



Note 1) Stroke adjustment with either a bumper bolt or adjustment bolt is considered as an intermediate stop.

Note 2) When an intermediate stop is performed with an external stopper, consider the dynamic load as shown below.

- Bumper bolt:  $\delta = 4/100$
- Shock absorber and air cushion:  $\delta = 1/100$

In addition to this, check the judgement results of the guide load factor. ( $\delta$ : Bumper coefficient)

Note 3) When an external stopper is used in conjunction with a shock absorber, check the model selection of shock absorber separately.

Note 4) This cylinder cannot perform an intermediate stop with the pneumatic circuit in vertical operation.

The intermediate stop is only performed with a bumper bolt, adjustment bolt or external stopper.

Note 5) When an intermediate stop is performed with the pneumatic circuit, the stopping accuracy may vary significantly.

If accuracy is required, be sure to perform the intermediate stop with a bumper bolt, adjustment bolt or external stopper.

## 1 Check allowable load mass by thrust.

In this series, the work load and the maximum operating pressure are restricted to prevent the magnetic coupling from being separated. Ensure that the work load mass and operating pressure are within the values in Table 1.

**Table 1. Allowable load mass by thrust and maximum operating pressure**

Bore size (mm)	Horizontal operation $m_h$ [kg]	Horizontal operation Max. operating pressure $P_h$ [MPa] <sup>Note)</sup>	Vertical operation $m_v$ [kg]	Vertical operation Max. operating pressure $P_v$ [MPa]
6	1.8	0.70	1.0	0.55
10	3.0		2.7	
15	7.0		7.0	0.65
20	12		11	
25	20		18.5	
32	30		30	
40	50		47	

Note) Without stroke adjustment

(1 MPa = 145 psi, 1 Kg = 2.2 lbs)

When stroke adjustment is performed with bumper bolt, adjustment bolt, or intermediate stop is performed with an external stopper, the maximum operating pressure should be as shown in the front matter 11.

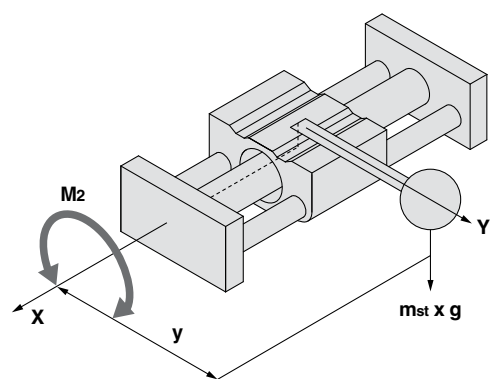
## 2 Check allowable load mass by stroke.

In this series, guide shafts are assembled to support the load.

Deflection of the guide shaft increases due to work load mass and rolling moment ( $M_2$ ), so the work load mass and stroke is restricted. Check that the load mass is within the allowable load mass by stroke:  $m_{st}$  from Graphs (1) to (7) for each bore size.

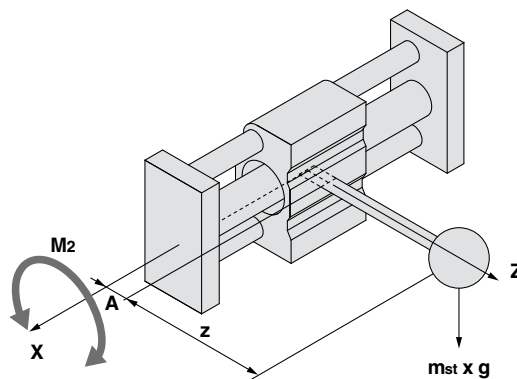
### [Horizontal mounting and Ceiling mounting]

The allowable load mass by stroke range varies depending on the y direction of the loads center of gravity.



### [Wall mounting]

The allowable load mass by stroke range varies depending on the z direction of the loads center of gravity.



### [Vertical mounting]

Load mass is not restricted by stroke.

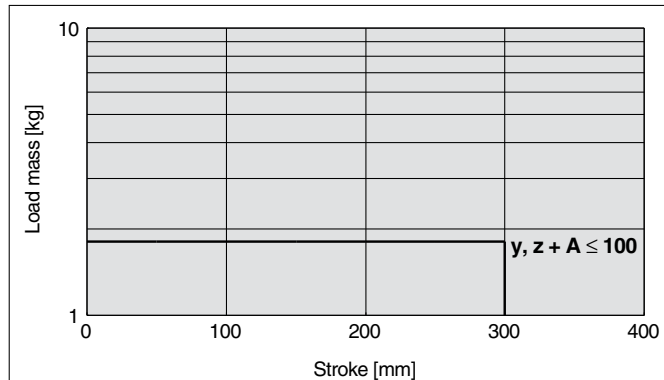
A: Distance between the center of the guide shaft and the upper surface of the slide block

## 2 Check allowable load mass by stroke.

### Selection Graph

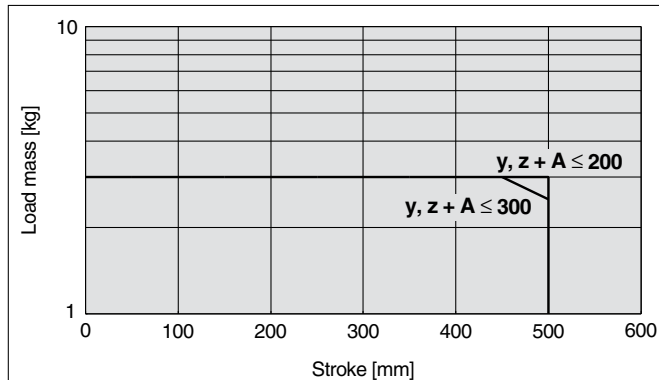
[Graph 1] Allowable load mass by stroke

ø6



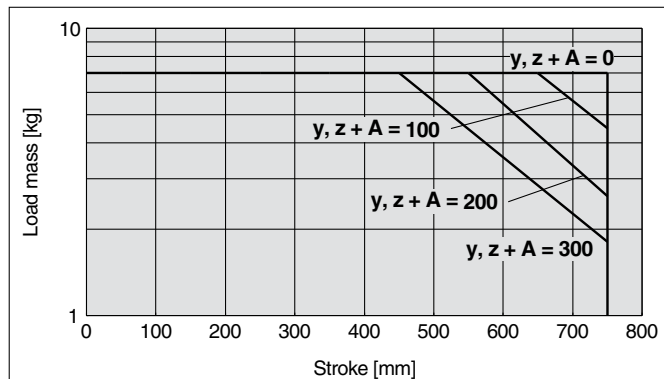
[Graph 2] Allowable load mass by stroke

ø10



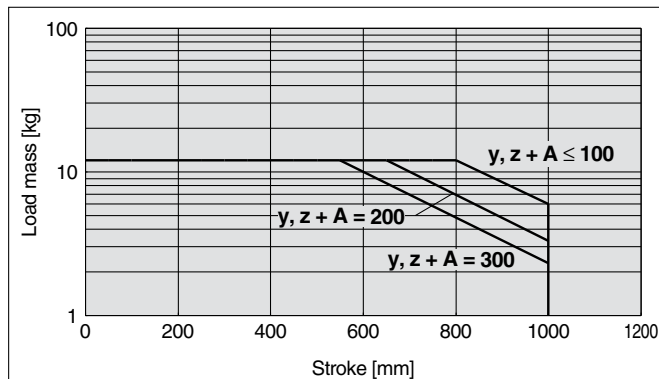
[Graph 3] Allowable load mass by stroke

ø15



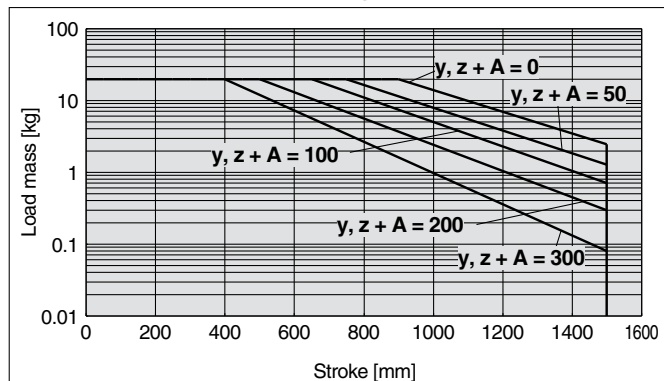
[Graph 4] Allowable load mass by stroke

ø20



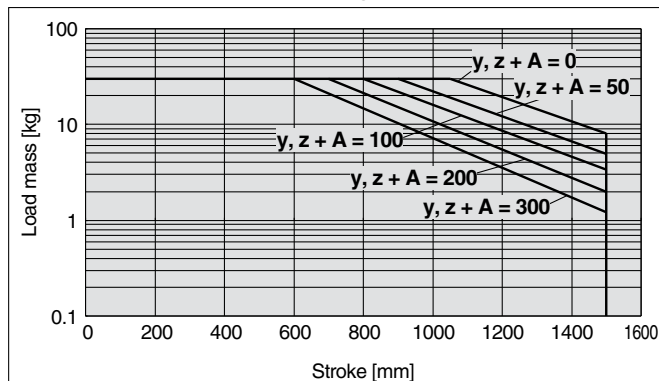
[Graph 5] Allowable load mass by stroke

ø25



[Graph 6] Allowable load mass by stroke

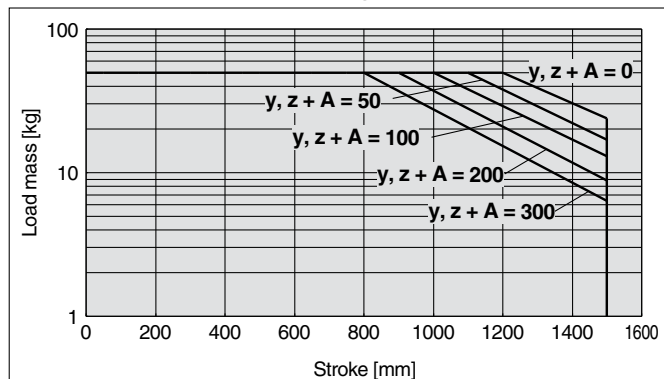
ø32



(1 Kg = 2.2 lbs)

[Graph 7] Allowable load mass by stroke

ø40



\* If load center of gravity exceeds the value of  $y, z + A$  on the graph, please consult SMC.

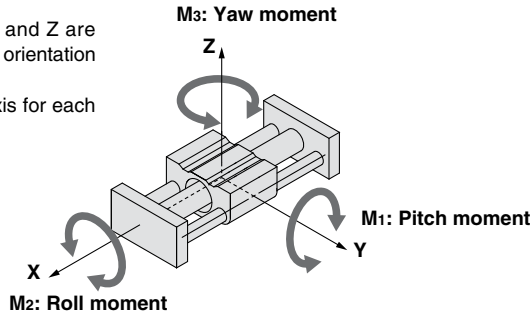
**3 Consider load factor on guides.**

**3-① Types of moment applied to rodless cylinders**

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

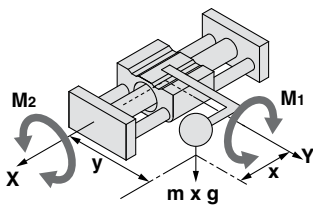
**Coordinates and Moments**

\* The direction of the axis, X, Y and Z are based on the cylinder mounting orientation shown on the right. Consider the direction of the axis for each mounting direction.

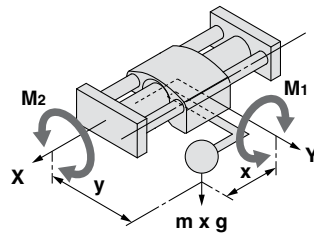


**Static moment calculation by mounting style**

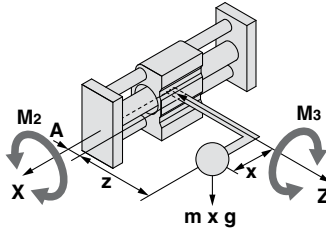
**[Horizontal mounting]**



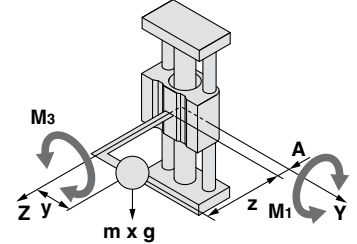
**[Ceiling mounting]**



**[Wall mounting]**



**[Vertical mounting]**



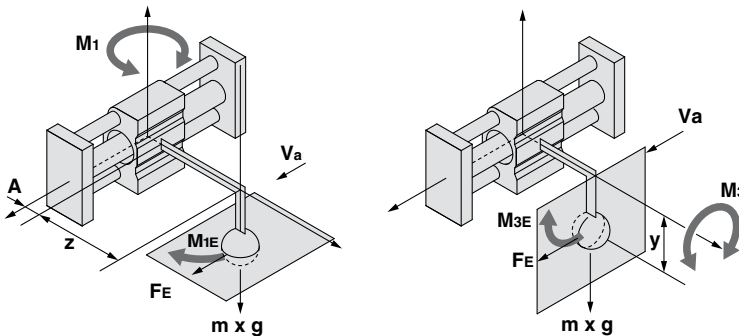
**Table 2. Mounting orientation and static moment**

Mounting orientation	Horizontal mounting	Ceiling mounting	Wall mounting	Vertical mounting
Static load	m			
Static moment	M1	$m \times g \times x$	$m \times g \times x$	$m \times g \times (z + A)$
	M2	$m \times g \times y$	$m \times g \times y$	—
	M3	—	—	$m \times g \times x$

\* A: Distance between the center of the guide shaft and the upper surface of the slide block (See the table on the right.)

Bore size (mm)	A [mm]
6	19
10	21
15	25
20	27
25	33
32	40
40	49

**Dynamic moment calculation by mounting style**



**Table 3. Mounting orientation and static moment**

Mounting orientation	Horizontal mounting	Ceiling mounting	Wall mounting	Vertical mounting
Dynamic load FE	$\delta \times 1.4 \times Va \times m \times g$		Bumper bolt: $\delta = 4/100$ Shock absorber: $\delta = 1/100$	
Static moment	M1E	$1/3 \times FE \times (z + A)$		
	M2E	Dynamic moment does not occur.		
	M3E	$1/3 \times FE \times x$		

Regardless of the mounting orientation, dynamic moment is calculated with the formulas above.

# Series CY1S

## 3 Consider load factor on guides.

### 3-② Allowable load mass on guides/Allowable moment

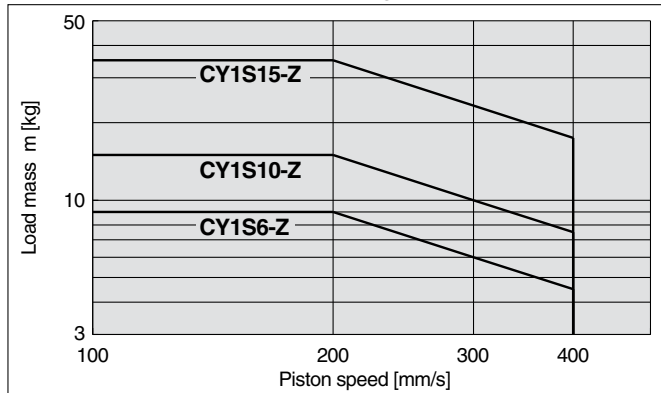
Table 4. Allowable load mass on guides and moment

Bore size (mm)	Allowable load mass on guides m [kg]	Allowable moment [N·m]		
		M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>
6	9	1.3	1.4	1.3
10	15	2.6	2.9	2.6
15	35	8.6	8.9	8.6
20	60	17	18	17
25	104	30	35	30
32	195	67	82	67
40	244	96	124	96

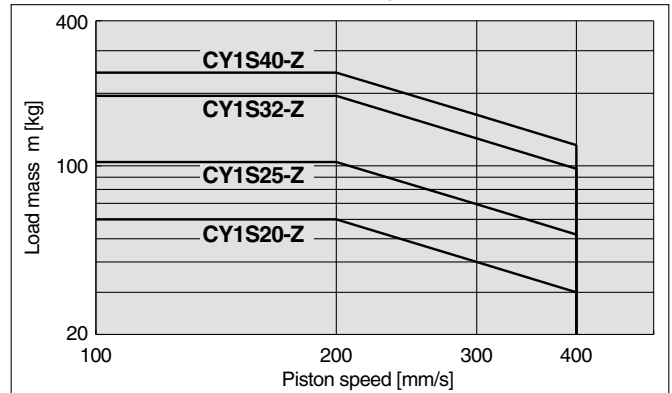
The table above indicates the maximum performance of the guide, but does not show the actual allowable work load mass.

Refer to Graphs (8) to (13) for correct allowable mass by piston speed.

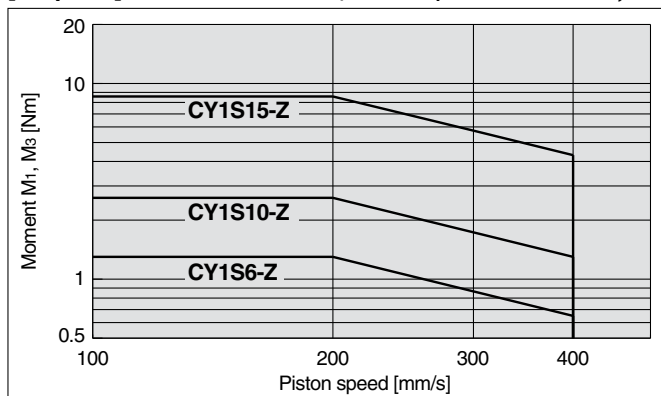
[Graph 8] Allowable load mass on guides (ø6 to ø15) **m**



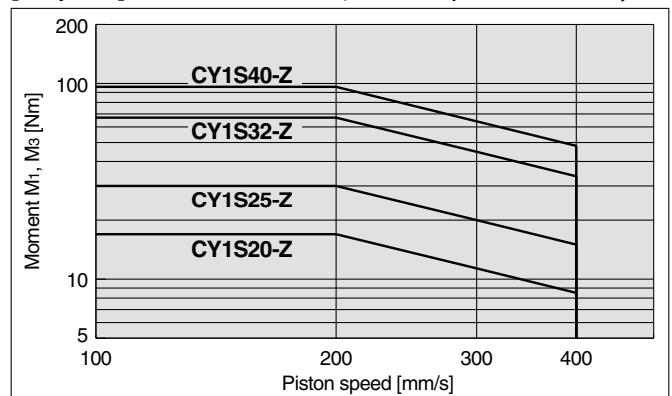
[Graph 9] Allowable load mass on guides (ø20 to ø40) **m**



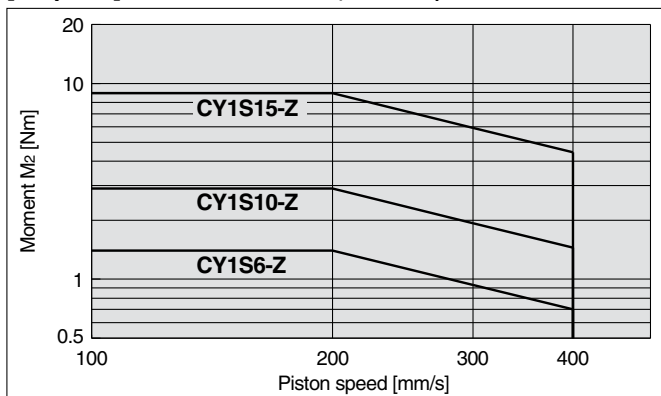
[Graph 10] Allowable moment (ø6 to ø15) **M<sub>1</sub>, M<sub>3</sub>**



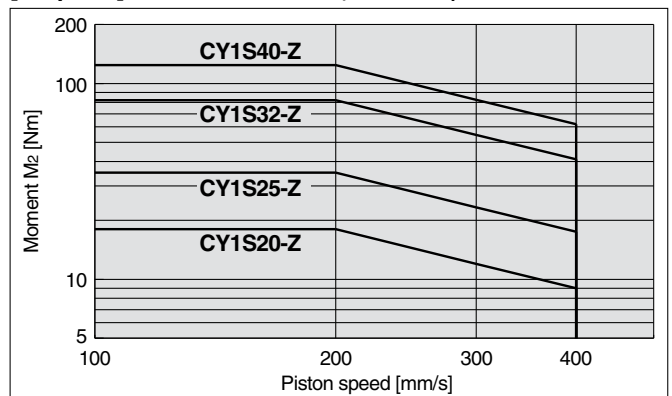
[Graph 11] Allowable moment (ø20 to ø40) **M<sub>1</sub>, M<sub>3</sub>**



[Graph 12] Allowable moment (ø6 to ø15) **M<sub>2</sub>**



[Graph 13] Allowable moment (ø20 to ø40) **M<sub>2</sub>**



**3-③ Consideration of guide load factor**

Work load mass and allowable moment varies depending on the load mounting method, stroke, cylinder mounting orientation and piston speed.

Whether the cylinder is suitable or not is decided by the allowable load mass on guides in the graphs.

**The selection calculation is shown below.**

It is necessary to consider i) allowable load mass on guides, ii) static moment and iii) dynamic moment (when the slide block collides with the stopper).

\* i) - ii) is calculated with Va (average speed) and iii) is calculated with V (collision speed  $V = 1.4Va$ ).

Calculate  $m_{max}$  of i) from the allowable load mass on guides in Graphs (8) and (9), and calculate  $M_{max}$  of ii) and iii) from the allowable moment ( $M_1, M_2, M_3$ ) in Graphs (10), (11), (12) and (13).

**Sum of guide load factors**  $\sum \alpha = \frac{\text{Load mass (m)}}{\text{Allowable load mass on guides (m}_{max})} + \frac{\text{Static moment (M) }^{Note\ 1}}{\text{Allowable static moment (M}_{max})} + \frac{\text{Dynamic moment (ME) }^{Note\ 2}}{\text{Allowable dynamic moment (ME}_{max})} \leq 1$

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

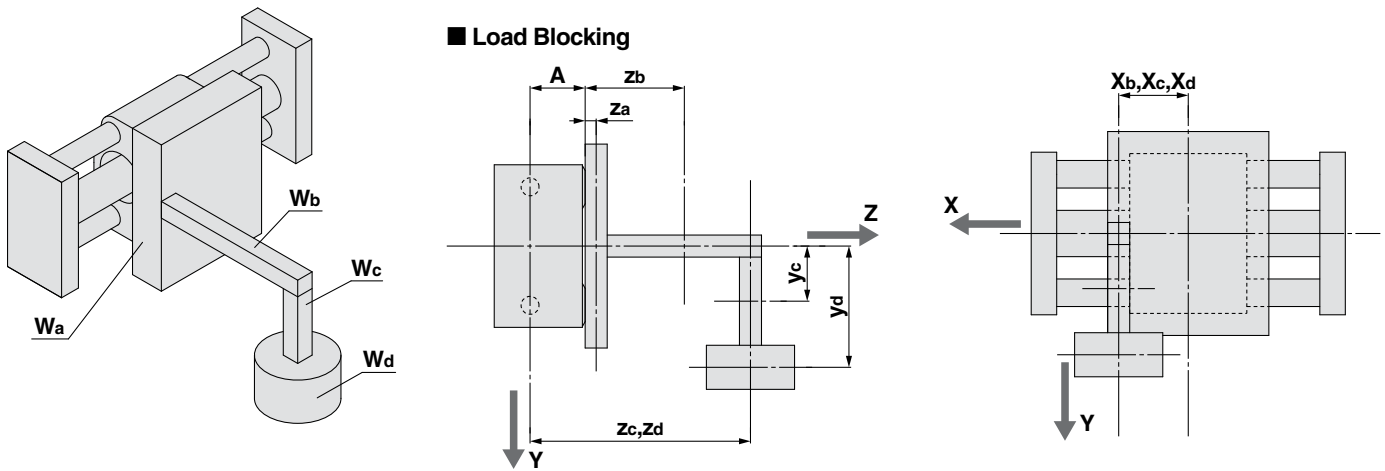
Note 2) Moment caused by the load equivalent to impact at the stroke end (at the time of impact with stopper)

Note 3) Several moments might be generated depending on the cylinder mounting orientation or the load center of gravity, so the sum of the allowable load mass on guides, allowable static moment and allowable dynamic moment will be the sum of all these guide load factors.

**Calculation method to determine the center of gravity when several loads are mounted on the cylinder**

When several loads are mounted on the cylinder, it is difficult to calculate the center of gravity.

As shown in the figure below, the center of gravity of the load is calculated from the total load mass and of center of gravity for all the loads.



**Mass and center of gravity of the load**

Load no. $W_n$	Mass $m_n$	Center of gravity		
		X-axis $x_n$	Y-axis $y_n$	Z-axis $z_n$
$W_a$	$m_a$	$x_a$	$y_a$	$z_a$
$W_b$	$m_b$	$x_b$	$y_b$	$z_b$
$W_c$	$m_c$	$x_c$	$y_c$	$z_c$
$W_d$	$m_d$	$x_d$	$y_d$	$z_d$

**Calculation for Overall Center of Gravity**

$m_t = \sum m_n \dots ①$

$X = \frac{1}{m_t} \times \sum (m_n \times x_n) \dots \dots \dots ②$

$Y = \frac{1}{m_t} \times \sum (m_n \times y_n) \dots \dots \dots ③$

$Z = \frac{1}{m_t} \times \sum \{m_n \times (A + z_n)\} \dots \dots ④$

(n = a,b,c,d)

Refer to the following sections 1 to 4 to calculate the center of gravity and the total load.

Refer to front matter 7 for detailed selection procedure.





## Calculation of Guide Load Factor

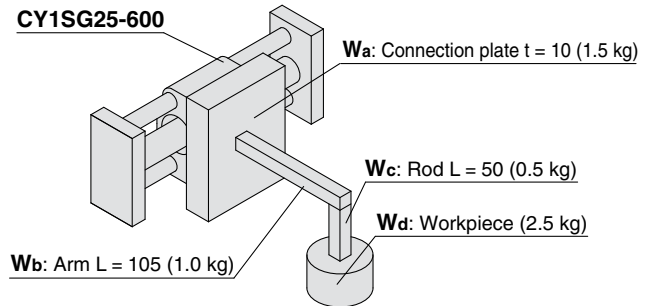
The selection calculation finds the load factors ( $\alpha_n$ ) of the items below, where the total does not exceed 1.

Item	Load factor $\alpha_n$	Note
1: Maximum load mass	$\alpha_1 = m/m_{max}$	Examine $m$ . $m_{max}$ is the max. load mass for $V_a$ .
2: Static moment	$\alpha_2 = M/M_{max}$	Examine $M_1, M_2, M_3$ . $M_{max}$ is the allowable moment for $V_a$ .
3: Dynamic moment	$\alpha_3 = M_E/M_{E_{max}}$	Examine $M_{1E}, M_{3E}$ . $M_{E_{max}}$ is the allowable moment for $V$ .

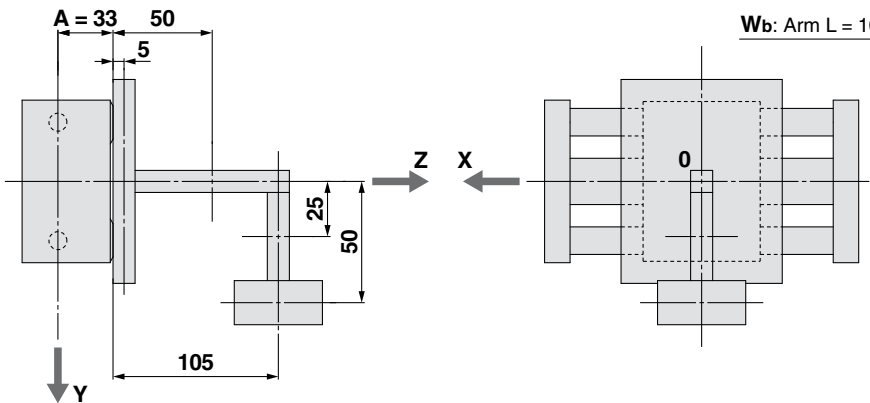
### Calculation example 1 Mounting on horizontal wall

#### [1] Operating Conditions

Cylinder: **CY1SG25-600**  
 Cushion: Shock absorber  
 Mounting: Horizontal wall mounting  
 Speed:  $V_a = 250$  [mm/s]



#### [2] Load Blocking



#### Mass and center of gravity of the load

Load no. $W_n$	Mass $m_n$	Center of gravity		
		X-axis $X_n$	Y-axis $Y_n$	Z-axis $Z_n$
<b>Wa</b>	1.5 kg	0 mm	0 mm	5 mm
<b>Wb</b>	1.0 kg	0 mm	0 mm	50 mm
<b>Wc</b>	0.5 kg	0 mm	25 mm	105 mm
<b>Wd</b>	2.5 kg	0 mm	50 mm	105 mm

(1 Kg = 2.2 lbs) n = a,b,c,d

#### [3] Calculation for Overall Center of Gravity

$$m_t = \sum m_n$$

$$= 1.5 + 1.0 + 0.5 + 2.5$$

$$= 5.5 \text{ kg}$$

$$X = 0 \text{ mm}$$

(The center of gravity in the x direction of all work pieces is 0, so  $X = 0$  mm.)

$$Y = \frac{1}{m_t} \times \sum (m_n \times y_n)$$

$$= \frac{1}{5.5} \times (1.5 \times 0 + 1.0 \times 0 + 0.5 \times 25 + 2.5 \times 50)$$

$$= 25 \text{ mm}$$

$$Z = \frac{1}{m_t} \times \sum \{m_n \times (A + z_n)\}$$

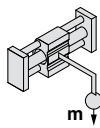
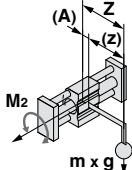
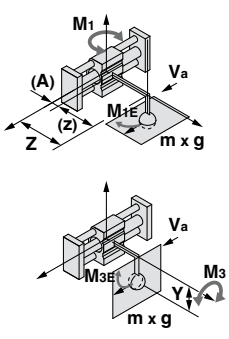
$$= \frac{1}{5.5} \times \{1.5 \times (33 + 5) + 1.0 \times (33 + 50) + 0.5 \times (33 + 105) + 2.5 \times (33 + 105)\}$$

$$= 100 \text{ mm}$$

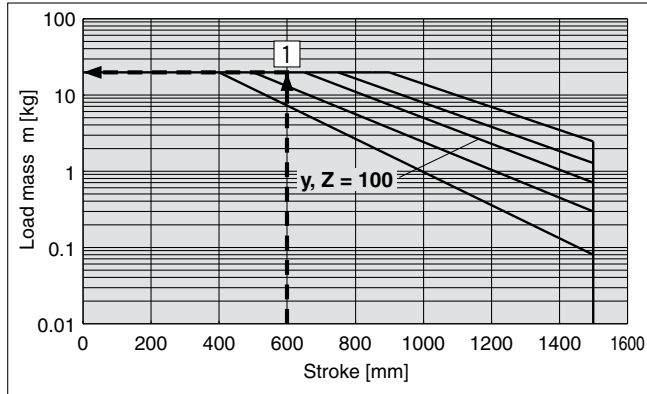
#### [4] Check the allowable load.

Item	Result	Note
(1) Check allowable load mass by thrust.	Work load is 5.5 kg < 20 kg. OK	Check allowable load by thrust. The bore size is $\phi 25$ , so the allowable load by thrust will be 20 kg.
(2) Allowable load by stroke	Work load is 5.5 kg < 20 kg. OK	The load is restricted to 20 kg when the stroke is 600 mm and $Z = 100$ mm taken from Graph (5) 1 (See the next page).

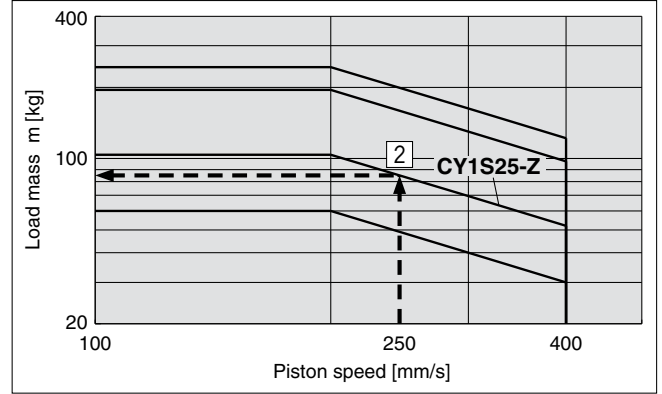
[5] Judgement of Guide Load Factor

Item	Load factor $\alpha_n$	Note
<b>1 Load mass</b> 	$\alpha_1 = m/m_{max}$ $= 5.5/83.2$ $= 0.07$	Examine m. Find the value of $m_{max}$ when $V_a = 250$ mm/s from Graph (9) <b>2</b> .
<b>2 Static moment</b> 	$M_2 = m \times g \times Z$ $= 5.5 \times 9.8 \times 100/1000$ $= 5.4$ [N·m] $\alpha_2 = M_2/M_{2max}$ $= 5.4/28.0$ $= 0.19$	Examine $M_2$ . $M_1, M_3$ values do not apply to this example.  Refer to [3] Calculation for Overall Center of Gravity in the Z-axis on front matter 7.  Find the value $M_{2max}$ when $V_a = 250$ mm/s from Graph (13) <b>3</b> .
<b>3 Dynamic moment</b> 	$F_E = 1.4 \times V_a \times m \times g \times \delta$ $= 1.4 \times 250 \times 5.5 \times 9.8 \times 1/100$ $= 188.7$ [N]  $M_{1E} = 1/3 \times F_E \times Z$ $= 1/3 \times 188.7 \times 100/1000$ $= 6.3$ [N·m]  $\alpha_{3A} = M_{1E}/M_{1max}$ $= 6.3/17.1$ $= 0.37$	Calculate for the impact load. Since the impact is absorbed by shock absorber, the bumper coefficient $\delta = 1/100$  Examine $M_{1E}$ . Calculate the collision speed V. $V = 1.4 \times V_a$ $V = 1.4 \times 250$ $V = 350$ mm/s  Find the value $M_{1Emax}$ when $V_a = 350$ mm/s from Graph (11) <b>4</b> .
	$M_{3E} = 1/3 \times F_E \times Y$ $= 1/3 \times 188.7 \times 25/1000$ $= 1.6$ [N·m] $\alpha_{3B} = M_{3E}/M_{3max}$ $= 1.6/17.1$ $= 0.09$	Examine $M_{3E}$ .  Refer to [3] Calculation for Overall Center of Gravity in the Y-axis on front matter 7.  From the results above, Find the value $M_{3Emax}$ when $V_a = 350$ mm/s from Graph (11) <b>5</b> .
<b>4 Judgement</b>	$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_{3A} + \alpha_{3B}$ $= 0.07 + 0.19 + 0.37 + 0.09$ $= 0.72$	$\Sigma\alpha_n = 0.72 \leq 1$ , so the cylinder can be used.

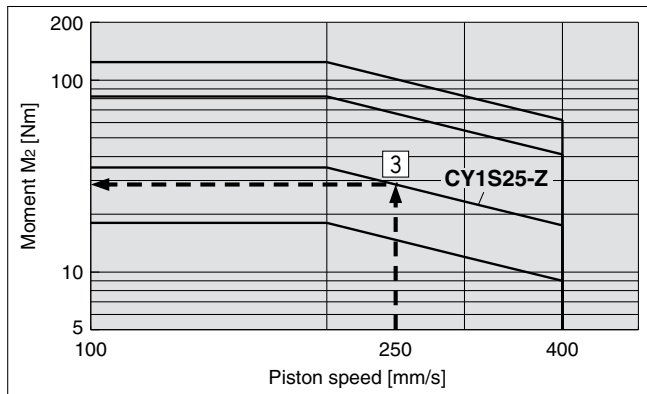
[Graph 5] Allowable load mass by stroke  $\phi 25$



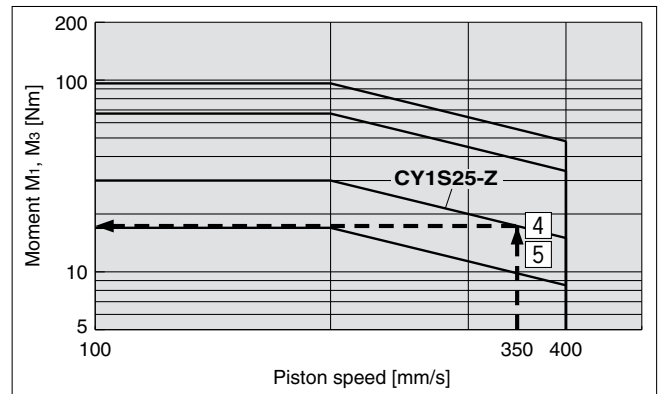
[Graph 9] Allowable load mass on guides  $m$



[Graph 13] Allowable moment  $M_2$



[Graph 11] Allowable moment  $M_1, M_3$

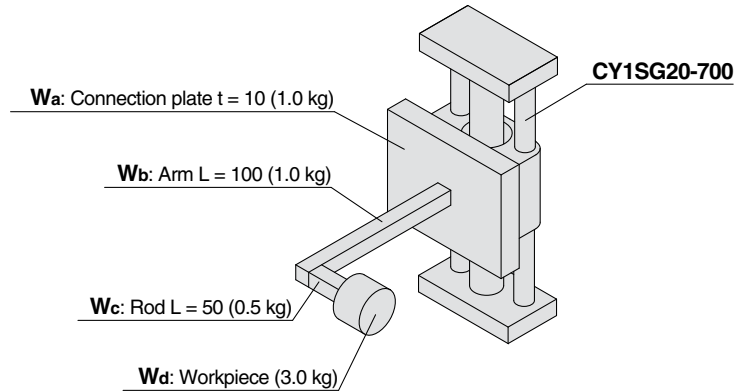


## Calculation of Guide Load Factor

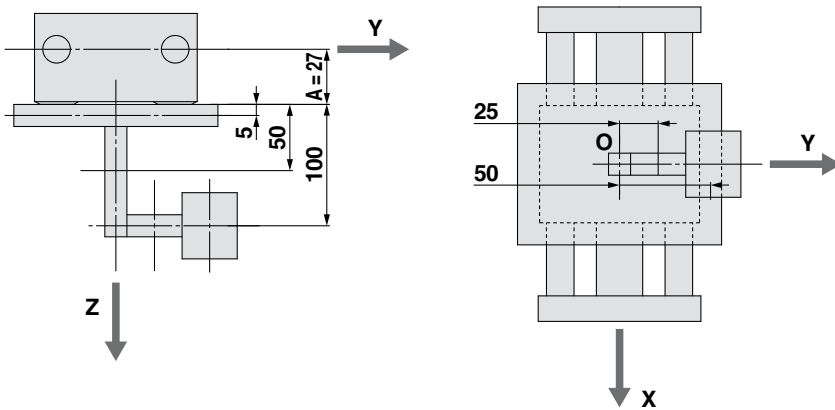
### Calculation example 2 Vertical mounting

#### [1] Operating Conditions

Cylinder: **CY1SG20-700**  
 Cushion: Shock absorber  
 Mounting: Vertical mounting  
 Speed:  $V_a = 200$  [mm/s]



#### [2] Load Blocking



#### Mass and center of gravity of the load

Load no. $W_n$	Mass $m_n$	Center of gravity		
		X-axis $X_n$	Y-axis $Y_n$	Z-axis $Z_n$
<b>Wa</b>	1.0 kg	0 mm	0 mm	5 mm
<b>Wb</b>	1.0 kg	0 mm	0 mm	50 mm
<b>Wc</b>	0.5 kg	0 mm	25 mm	100 mm
<b>Wd</b>	3.0 kg	0 mm	50 mm	100 mm

(1 Kg = 2.2 lbs)

$n = a, b, c, d$

#### [3] Calculation for Overall Center of Gravity

$$m_t = \sum m_n$$

$$= 1.0 + 1.0 + 0.5 + 3.0$$

$$= 5.5 \text{ kg}$$

$$X = 0 \text{ mm}$$

(The center of gravity in the x direction of all work pieces is 0, so  $X = 0$  mm.)

$$Y = \frac{1}{m_t} \times \sum (m_n \times y_n)$$

$$= \frac{1}{5.5} \times (1.0 \times 0 + 1.0 \times 0 + 0.5 \times 25 + 3.0 \times 50)$$

$$= 30 \text{ mm}$$

$$Z = \frac{1}{m_t} \times \sum \{m_n \times (A + z_n)\}$$

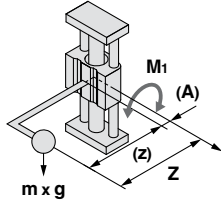
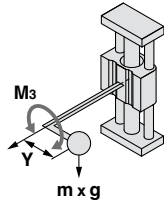
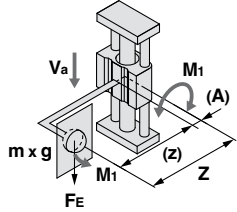
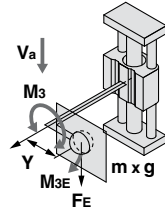
$$= \frac{1}{5.5} \times \{1.0 \times (27 + 5) + 1.0 \times (27 + 50) + 0.5 \times (27 + 100) + 3.0 \times (27 + 100)\}$$

$$= 101 \text{ mm}$$

#### [4] Check the allowable load.

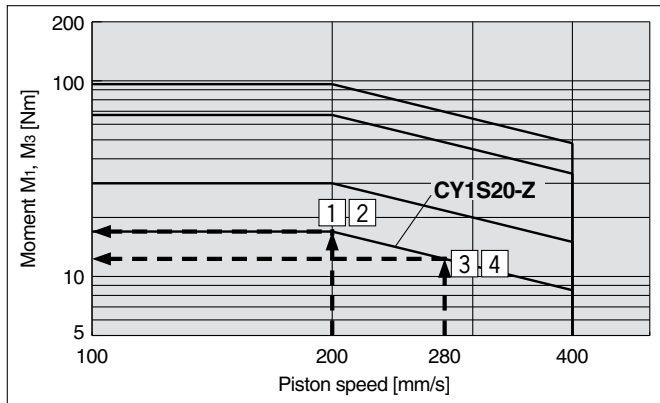
Item	Result	Note
(1) Check allowable load mass by thrust.	Work load is 5.5 kg < 11 kg. OK	Check the allowable load for vertical mounting. The bore size is $\phi 20$ , so the maximum load for vertical mounting will be 11 kg.
(2) Allowable load by stroke	No restriction	The cylinder is mounted in the vertical direction, and the load generates no rolling moment, so there is not restriction.

**[5] Judgement of Guide Load Factor**

Item	Load factor $\alpha_n$	Note
<b>1 Load mass</b>	$\alpha_1 = 0$	In case of vertical mounting, no static load is applied.
<b>2 Static moment</b> 	$M_1 = m \times g \times Z$ $= 5.5 \times 9.8 \times 101/1000$ $= 5.4 \text{ [N}\cdot\text{m]}$ $\alpha_{2A} = M_1/M_{1\max}$ $= 5.4/17.0$ $= 0.32$	Examine $M_1$ .  Refer to [3] Calculation for Overall Center of Gravity in the Z-axis on front matter 7.  Find the value of $M_{1\max}$ when $V_a = 200 \text{ mm/s}$ from Graph (11) <b>1</b> .
		$M_3 = m \times g \times Y$ $= 5.5 \times 9.8 \times 30/1000$ $= 1.6 \text{ [N}\cdot\text{m]}$ $\alpha_{2B} = M_3/M_{3\max}$ $= 1.6/17.0$ $= 0.10$
<b>3 Dynamic moment</b> 	$F_E = 1.4 \times V_a \times m \times g \times \delta$ $= 1.4 \times 200 \times 5.5 \times 9.8 \times 1/100$ $= 150.9 \text{ [N]}$  $M_{1E} = 1/3 \times F_E \times Z$ $= 1/3 \times 150.9 \times 101/1000$ $= 5.1 \text{ [N}\cdot\text{m]}$  $\alpha_{3A} = M_{1E}/M_{1\max}$ $= 5.1/12.1$ $= 0.42$	Calculate the impact load. Since the impact is absorbed by shock absorber, the bumper coefficient $\delta = 1/100$  Examine $M_{1E}$ . Calculate the collision speed $V$ . $V = 1.4 \times V_a$ $V = 1.4 \times 200$ $V = 280 \text{ mm/s}$  Find the value of $M_{1E\max}$ when $V_a = 280 \text{ mm/s}$ from Graph (11) <b>3</b> .
		$M_{3E} = 1/3 \times F_E \times Y$ $= 1/3 \times 150.9 \times 30/1000$ $= 1.5 \text{ [N}\cdot\text{m]}$ $\alpha_{3B} = M_{3E}/M_{3\max}$ $= 1.5/12.1$ $= 0.12$
<b>4 Judgement</b>	$\Sigma\alpha_n = \alpha_1 + \alpha_{2A} + \alpha_{2B} + \alpha_{3A} + \alpha_{3B}$ $= 0 + 0.32 + 0.10 + 0.42 + 0.12$ $= 0.96$	$\Sigma\alpha_n = 0.96 \leq 1$ , so the cylinder can be used.

**[Graph 11] Allowable moment**

**M1, M3**



(1 N·m = 0.74 lbf·ft)

Load factors on the guides can be calculated with the SMC Pneumatic CAD system.



## Caution on Design

### Vertical Operation

When operating a load vertically, it should be operated within the allowable load mass and allowable pressure as shown in the table below.

Operating the cylinder above the specified values may lead to the load dropping. If accurate stopping position is required, consider using a metal-ended external stopper.

Bore size (mm)	Allowable load mass (mv) (kg)	Allowable pressure (Pv) (MPa)
6	1.0	0.55
10	2.7	
15	7.0	0.65
20	11.0	
25	18.5	
32	30.0	
40	47.0	

(1 MPa = 145 psi, 1 Kg = 2.2 lbs)

Note 1) Use caution, as operating the cylinder above the allowable pressure may lead to the magnetic coupling separating and allowing the load to fall.

Note 2) The allowable load mass above indicates the allowable load mass in the vertical operation. The actual load mass must be determined by referring to the model selection flow chart on front matter 1.

Note 3) As a guide, the load mass should be approximately 60% of the thrust load factor.

### Intermediate Stop

#### 1. When an intermediate stop is performed with an external stopper etc.

When stopping a load in mid-stroke using an external stopper, adjustment bolt or bumper bolt, operate within operating pressure limits shown in the table below. Use caution, as operating the cylinder above these pressures may lead to the breaking of the magnetic coupling.

(The piston speed should be the allowable value or less.)

Bore size (mm)	Allowable pressure for the intermediate stop with an external stopper (Ps) (MPa)
6	0.55
10	
15	0.65
20	
25	
32	
40	

Note 1) Exceeding the allowable pressure will lead to the breaking of the magnetic coupling and cause the piston slider and external slider becoming separated.

Note 2) Fine stroke adjustment for the external slider is also considered as an intermediate stop, so pay attention to the operating pressure.

#### 2. When an intermediate stop is performed with the pneumatic circuit.

When an intermediate stop is performed with the pneumatic circuit with 3-position solenoid valve, the kinetic energy should be as stated or less than the values in the table below.

(The piston speed should be the allowable value or less.)

Bore size (mm)	Allowable kinetic energy for the intermediate stop with the pneumatic circuit (Es) (J)
6	0.007
10	0.03
15	0.13
20	0.24
25	0.45
32	0.88
40	1.53

(1 J = 0.74 lbf-ft)

Note 1) Exceeding the allowable kinetic energy will lead to the breaking of the magnetic coupling and cause the piston slider and external slider becoming separated.

# Magnetically Coupled Rodless Cylinder Slider Type: Slide Bearing

## Series **CY1S**

∅6, ∅10, ∅15, ∅20, ∅25, ∅32, ∅40

RoHS

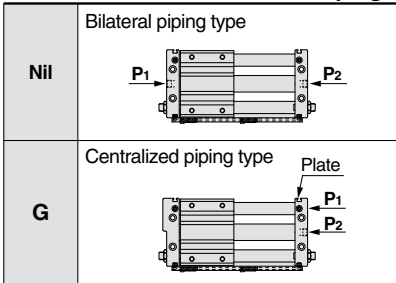
### How to Order

Slide bearing

**CY1S** 25 - 300 **Z** - M9BW -  

**Slider type**  
(Slide bearing type)

**Piping**



Note) For centralized piping, the port will be placed on the plate A side.

**Bore size**

6	6 mm
10	10 mm
15	15 mm
20	20 mm
25	25 mm
32	32 mm
40	40 mm

**Port thread type**

Symbol	Type	Bore size (mm)
Nil	M thread	6,10,15
	Rc	
TN	NPT	20, 25, 32, 40
TF	G	

**Standard stroke**

Refer to the next page for the standard strokes.

**Made to Order**  
Refer to page 2 for details.

**Number of auto switches**

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

**Auto switch**

Nil	Without auto switch
-----	---------------------

\* Refer to the table below for the applicable auto switch model.

Note) Auto switch rail and magnet for auto switch included as standard.

**Stopper type**

Nil	Bumper bolt (resin tipped): Mounted on both sides	 Bumper bolt (Same as the opposite side)
B	Shock absorber/ Adjustment bolt (metal ended): Mounted on both sides	 Adjustment bolt (Same as the opposite side) Shock absorber (Same as the opposite side)
BS	Shock absorber/ Adjustment bolt (metal ended): Plate A side  Bumper bolt (resin tipped): Plate B side or C side	 Bumper bolt Adjustment bolt Shock absorber

**Applicable Auto Switches**/Refer to pages 1263 to 1371 in Best Pneumatics No. 2 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load			
					DC	AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)					
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit	Relay, PLC	
				3-wire (PNP)				M9PV	M9P	●	●	●	○	○			
				2-wire	M9BV	M9B	●	●	●	○	○						
				3-wire (NPN)	M9NWV	M9NW	●	●	●	○	○						
	Diagnostic indication (2-color indication)			3-wire (PNP)	M9PWV	M9PW	●	●	●	○	○						
				2-wire	M9BWV	M9BW	●	●	●	○	○						
	Water resistant (2-color indication)			3-wire (NPN)	M9NAV**	M9NA**	○	○	●	○	○						
				3-wire (PNP)	M9PAV**	M9PA**	○	○	●	○	○						
				2-wire	M9BAV**	M9BA**	○	○	●	○	○						
				—	—	—	—	—	—	—	—						
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	—	●	—	—	IC circuit	—	
				2-wire	24 V	12 V	100 V	A93V	A93	●	—	●	●	—	—	—	Relay, PLC
							100 V or less	A90V	A90	●	—	●	—	—	—	IC circuit	

\*\* Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance. Please consult with SMC regarding water resistant types with the above model numbers.

\* Lead wire length symbols: 0.5 m ..... Nil (Example) M9NW      \* Solid state auto switches marked with "○" are produced upon receipt of order.  
1 m ..... M (Example) M9NWM  
3 m ..... L (Example) M9NWL  
5 m ..... Z (Example) M9NWZ

\* There are other applicable auto switches other than listed above. For details, refer to page 7.

\* For details about auto switches with pre-wired connector, refer to pages 1328 and 1329 in Best Pneumatics No. 2.

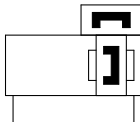
\* Auto switches are shipped together, (but not assembled).

# Magnetically Coupled Rodless Cylinder Slider Type: Slide Bearing *Series CY1S*

## Specifications



**JIS Symbol**  
Rubber bumper  
(Magnet type)



Bore size (mm)	6	10	15	20	25	32	40
<b>Fluid</b>	Air						
<b>Proof pressure</b>	152 psi (1.05 MPa)						
<b>Maximum operating pressure</b>	102 psi (0.7 MPa)						
<b>Minimum operating pressure</b>	26 psi (0.18 MPa)						
<b>Ambient and fluid temperature</b>	14 to 140°F (-10 to 60°C) (No freezing)						
<b>Piston speed*</b>	50 to 400 mm/s						
<b>Cushion</b>	Rubber bumper/Shock absorber						
<b>Lubrication</b>	Non-lube						
<b>Stroke length tolerance (mm)</b>	0 to 250 st: <sup>+1.0</sup> <sub>0</sub> , 251 to 1000 st: <sup>+1.4</sup> <sub>0</sub> , 1001st or longer: <sup>+1.8</sup> <sub>0</sub>						
<b>Magnetic holding force lbf (N)</b>	4.4 (19.6)	12.1 (53.9)	30.8 (137)	51.9 (231)	81.6 (363)	132 (588)	207 (922)

\* In the case of setting an auto switch at the intermediate position, the maximum piston speed is subject to restrict for detection upon the response time of a load (relays, sequence controller, etc.).

## Standard Strokes

Bore size (mm)	Standard stroke (mm)	Maximum manufacturable stroke (mm)
<b>6</b>	50, 100, 150, 200	300
<b>10</b>	50, 100, 150, 200, 250, 300	500
<b>15</b>	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	750
<b>20</b>	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1000
<b>25</b>		1500
<b>32</b>		1500
<b>40</b>	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000	1500

Note 1) Intermediate stroke is available by the 1 mm interval. (Produced upon receipt of order)

Note 2) Minimum stroke available without auto switch or with one auto switch is 15 mm and minimum 25 mm for with 2 auto switches.

Note 3) For 2 or more auto switches with stroke less than 25 mm (minimum 15 mm), consider "-X431" (2 switch rails).

## Weights

Bore size (mm)		6	10	15	20	25	32	40
<b>CY1S□</b>	<b>Basic weight</b>	0.51 (0.231)	0.94 (0.428)	1.64 (0.743)	2.90 (1.317)	3.62 (1.641)	6.33 (2.870)	9.94 (4.508)
	<b>Additional weight for 50 stroke</b>	0.12 (0.053)	0.18 (0.082)	0.24 (0.111)	0.41 (0.184)	0.41 (0.186)	0.63 (0.284)	0.95 (0.430)
<b>CY1SG□</b>	<b>Basic weight</b>	0.52 (0.236)	0.96 (0.435)	1.64 (0.743)	2.93 (1.331)	3.66 (1.662)	6.40 (2.903)	10.0 (4.534)
	<b>Additional weight for 50 stroke</b>	0.11 (0.050)	0.17 (0.079)	0.24 (0.108)	0.39 (0.176)	0.39 (0.178)	0.60 (0.273)	0.91 (0.411)

Calculation: (Example) CY1SG25-500Z

Basic weight (At 0 stroke) ... 1.662 kg Additional weight for 50 stroke ... 0.178 kg

Cylinder stroke ... 500 st

1.662 + 0.178 x 500 ÷ 50 = 3.442 kg

(1 Kg = 2.2 lbs)

## Shock Absorber Specifications

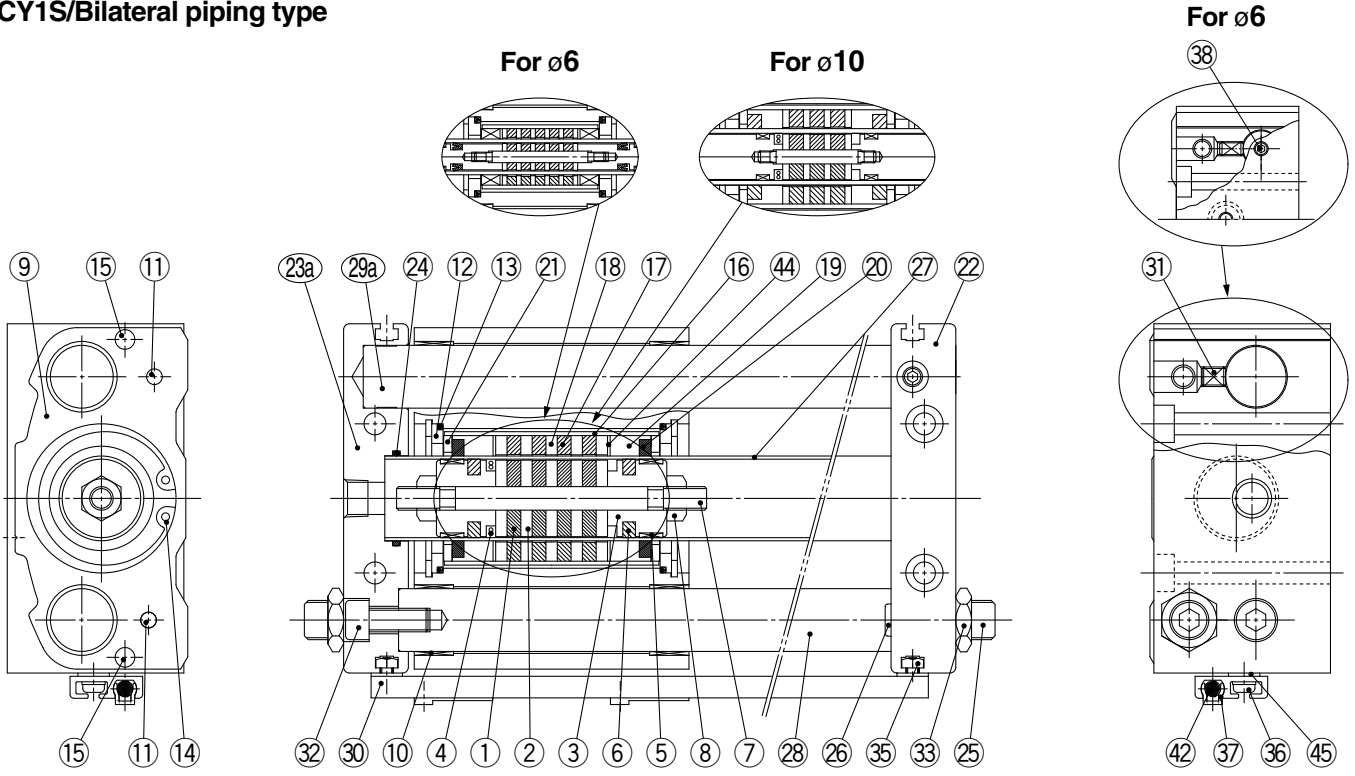
Applicable cylinder	CY1S□6	CY1S□10	CY1S□15	CY1S□20	CY1S□25	CY1S□32	CY1S□40
<b>Shock absorber model</b>	RJ0604	RJ0806H	RJ0806L	RJ1007L	RJ1412L	RJ2015H	RJ2015L
<b>Max. absorbed energy (J)</b>	0.5	1		3	10	30	
<b>Stroke absorption (mm)</b>	4	6		7	12	15	
<b>Collision speed (m/s)</b>	0.05 to 1	0.05 to 2	0.05 to 1	0.05 to 1	0.05 to 1	0.05 to 2	0.05 to 1
<b>Max. operating frequency (cycle/min)</b>	80	80		70	45	25	
<b>Max. allowable thrust lbf (N)</b>	33.7 (150)	55.1 (245)		94.9 (422)	183.0 (814)	440.9 (1961)	
<b>Ambient temperature</b>	14 to 140 °F (-10 to 60°C) (No freezing)						

Note) The maximum absorbed energy and maximum operating frequency was measured at ordinary temperature (approximately 68 to 77°F (20 to 25°C).)

# Series CY1S

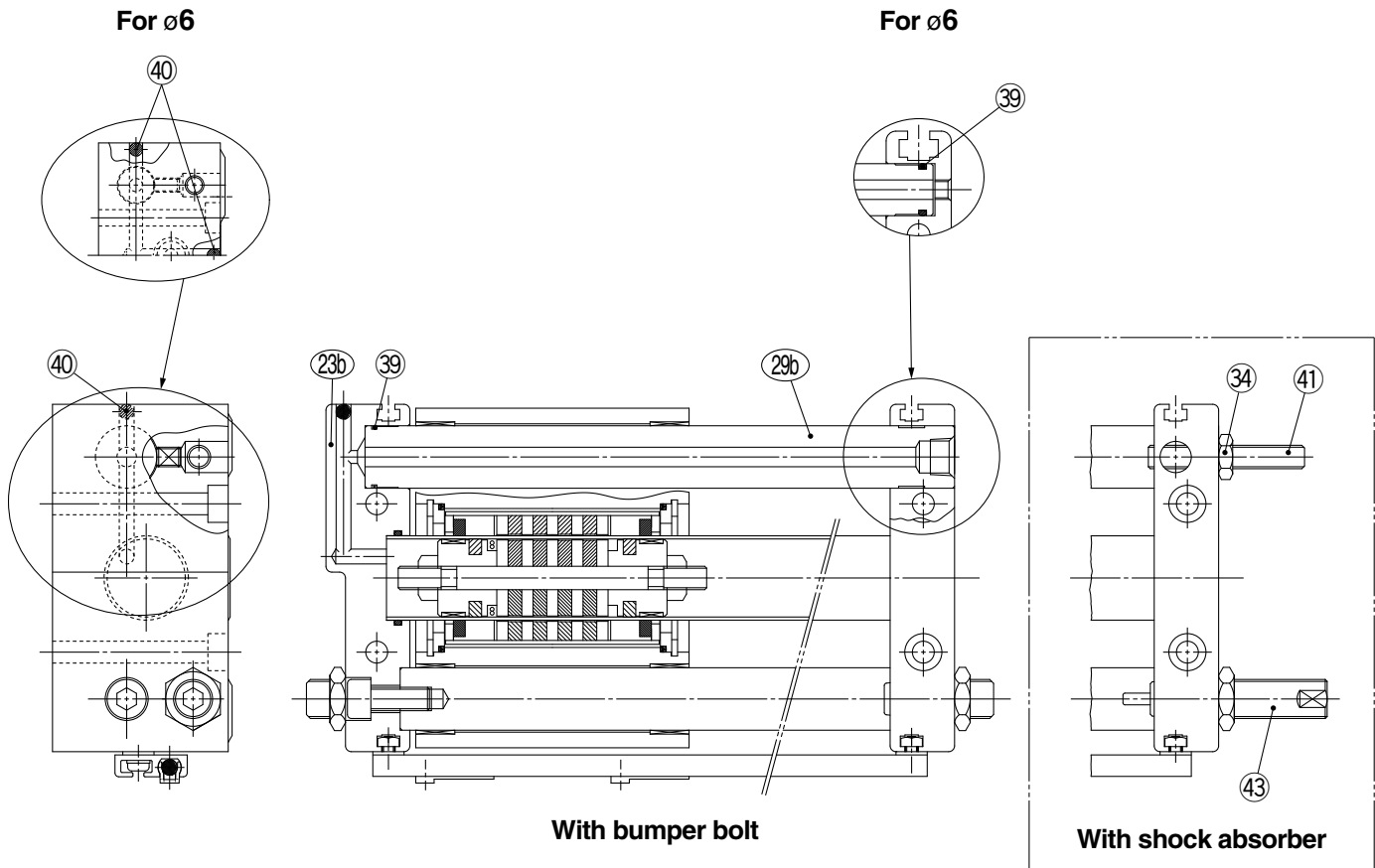
## Construction

### CY1S/Bilateral piping type



With bumper bolt

### CY1SG/Centralized piping type



With bumper bolt

With shock absorber



**Component Parts**

No.	Description	Material	Note
1	Magnet A	—	
2	Piston side yoke	Rolled steel	
3	Piston	Aluminum alloy	
4*	Piston seal	NBR	
5*	Wear ring A	Special resin	
6*	Lub-retainer A	Special resin	Except ø6, ø10
7	Shaft	Stainless steel	
8	Piston nut	Carbon steel	Except ø6 to ø15
9	Slide block	Aluminum alloy	
10	Bushing	Bearing alloy	
11	Parallel pin	Carbon steel	
12	Slider spacer	Rolled steel	
13*	Slider gasket	NBR	
14	Retaining ring	Carbon tool steel	
15	Magnet for switch	—	
16	External slider tube	Aluminum alloy	
17	Magnet B	—	
18	External slider side yoke	Rolled steel	
19*	Wear ring B	Special resin	
20*	Lube-retainer B	Special resin	Except ø6
21	Spacer	Rolled steel	Except ø6
22	Plate A	Aluminum alloy	
23a	Plate C	Aluminum alloy	Bilateral piping
23b	Plate B	Aluminum alloy	Centralized piping

No.	Description	Material	Note
24*	Cylinder tube gasket	NBR	
25	Bumper bolt	Chromium molybdenum steel	
26	Bumper	Urethane rubber	
27	Cylinder tube	Stainless steel	
28	Guide shaft B	Carbon steel	Hard chrome plated
29a	Guide shaft C	Carbon steel	Hard chrome plated
29b	Guide shaft A	Carbon steel	Hard chrome plated
30	Switch rail	Aluminum alloy	
31	Hexagon socket head set screw	Chromium molybdenum steel	
32	Hexagon socket head cap screw	Chromium molybdenum steel	
33	Hexagon nut	Chromium molybdenum steel	
34	Hexagon nut	Chromium molybdenum steel	
35	Square nut	Chromium molybdenum steel	
36	Cross-recessed head machine screw with SW	Chromium molybdenum steel	
37	Switch spacer	Special resin	
38	Port plug	Chromium molybdenum steel	ø6, Bilateral piping only
39*	Guide shaft gasket	NBR	Centralized piping
40	Steel ball	Bearing steel	Centralized piping
41	Adjustment bolt	Chromium molybdenum steel	
42	Auto switch	—	
43	Shock absorber	—	
44	Liner	Aluminum alloy	
45	Washer	Rolled steel	

Note 1) \* denotes parts that are included in the seal kit.  
 Note 2) Auto switch and switch spacer are shipped together with the product, but not assembled.

**Replacement Parts/Seal Kit**

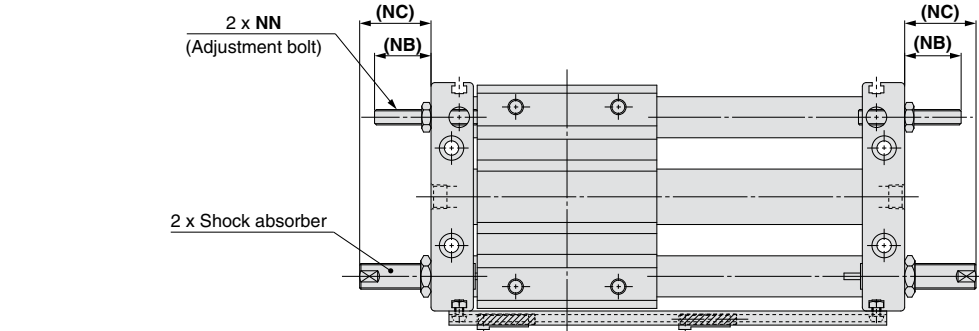
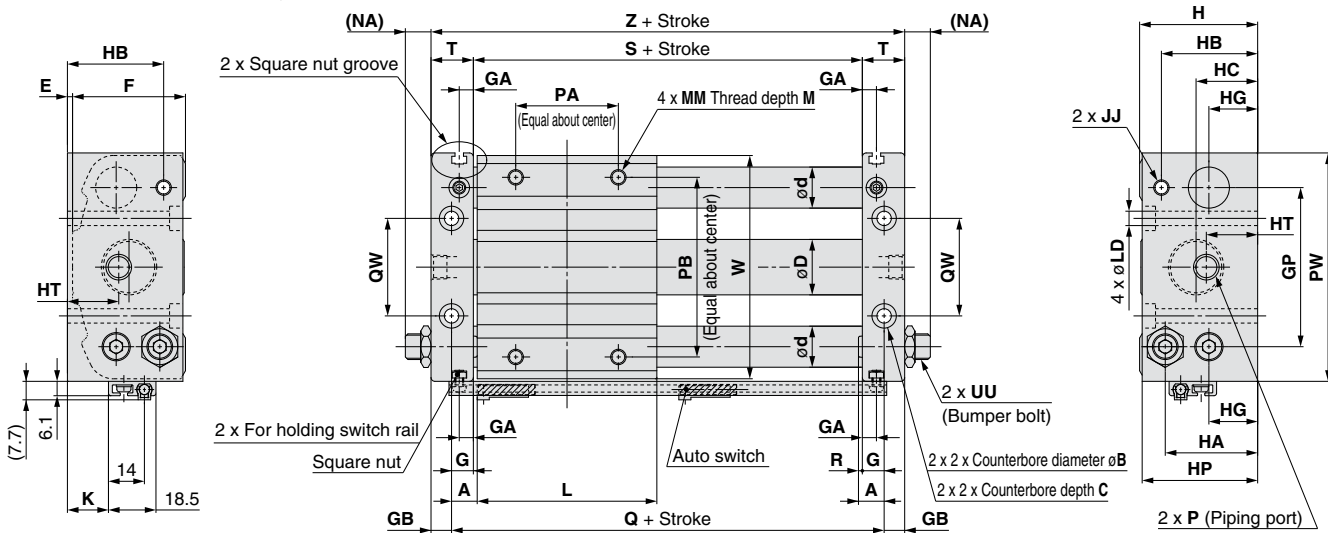
Bore size (mm)	Seal kit		Bumper bolt assembly		Switch spacer	
	Kit no.	Contents	Kit no.	Contents	Kit no.	Contents
6	CY1S6-Z-PS	Set of the nos. 4, 5, 13, 19, 24, 39	CYS06-37-AJ024-R	Set of the nos. 25, 26, 33	BMY3-016	Set of the nos. 37
10	CY1S10-Z-PS	Set of the nos. 4, 13, 19, 20, 24, 39	CYS10-37-AJ025-R			
15	CY1S15-Z-PS	Set of the nos. 4, 5, 6, 13, 19, 20, 24, 39	CYS20-37-AJ027-R			
20	CY1S20-Z-PS		CYS25-37-AJ028-R			
25	CY1S25-Z-PS		CYS32-37-AJ029-R			
32	CY1S32-Z-PS					
40	CY1S40-Z-PS					

Note 1) Seal kit includes 4, 5, 13, 19, 24, 39 for ø6. 4, 13, 19, 20, 24, 39 for ø10. 4, 5, 6, 13, 19, 20, 24, 39 are for ø15 to ø40.  
 Order the seal kit, based on each bore size.  
 Note 2) Seal kit includes a grease pack (10 g).  
 Order with the following part number when only the grease pack is needed.  
**Grease pack part number: GR-S-010**  
 Note 3) A switch spacer, as specified in the table above will be required if an auto switch is mounted afterward.  
 When ordering an additional auto switch, also order an additional switch spacer.  
 (Refer to "Auto Switch Mounting" on page 7 for details.)

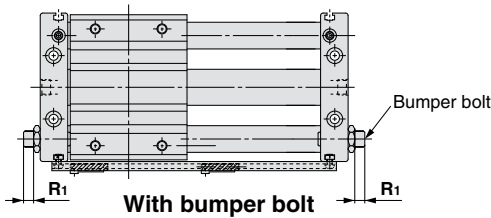
# Series CY1S

## Dimensions

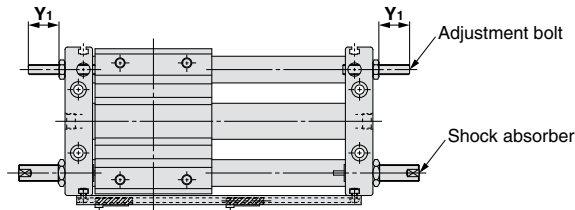
### CY1S/Bilateral piping type



### Amount of stroke adjustment



With bumper bolt



With shock absorber

### Dimensions

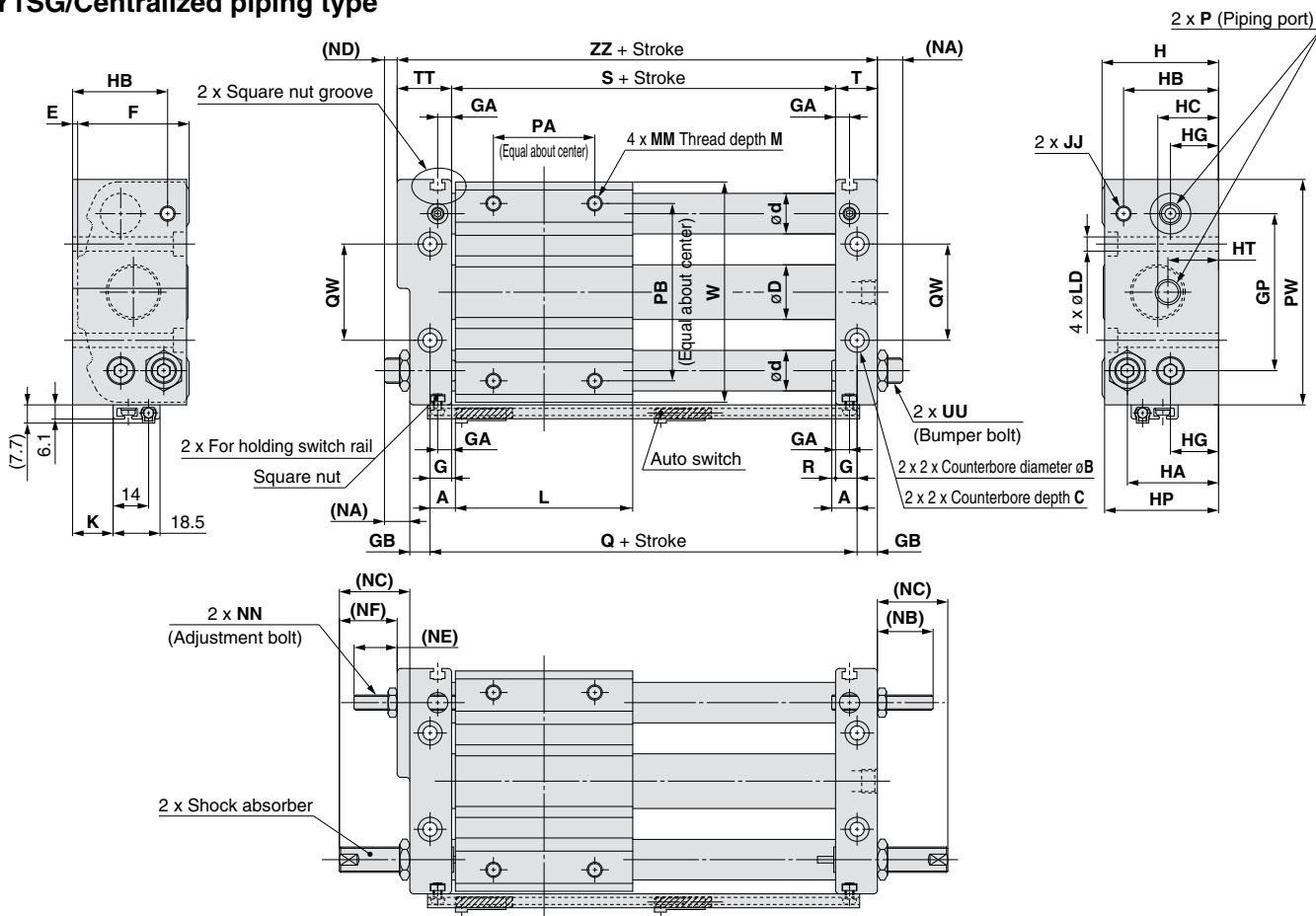
Model	A	B	C	D	d	E	F	G	GA	GB	GP	H	HA	HB	HC	HG	HP	HT	JJ	K	L	LD	M	MM	NA	NB	NC
CY1S6-Z	6	6.5	3.3	7.6	8	2	25	5	5	5	30	27	20.5	20.5	15.5	8	26	15.5	M4 x 0.7	3	40	3.5	6	M4 x 0.7	11	14	19
CY1S10-Z	7.5	8	4.4	12	10	2.5	31.5	6.5	5	6	40	34	25	27	17	13.5	33	17	M4 x 0.7	6	45	4.6	6	M4 x 0.7	10.5	16.5	28
CY1S15-Z	7.5	9.5	5.4	16.6	12	2	38	6.5	5	6	52	40	28	29.5	20.5	15	39	20.5	M4 x 0.7	11	60	5.8	8	M5 x 0.8	10.5	16.5	28
CY1S20-Z	10	9.5	5.4	21.6	16	2	44	8.5	5.5	8	62	46	36	37.5	24	19	45	20	M6 x 1	16	70	5.8	10	M6 x 1	10.5	22	28
CY1S25-Z	10	11	6.5	26.4	16	2	52	8.5	5.5	8	70	54	40.5	40.5	27.5	21.5	53	21	M6 x 1	20	70	7	10	M6 x 1	12.5	22	49
CY1S32-Z	12.5	14	8.6	33.6	20	2	64	9.5	5.5	9	86	66	50	50	33	26	64	24	M8 x 1.25	26	85	9	12	M8 x 1.25	11.5	23.5	52
CY1S40-Z	12.5	14	8.6	41.6	25	2	74	10.5	5.5	10	104	76	55.5	55.5	38	27	74	27	M8 x 1.25	28	95	9	12	M8 x 1.25	10.5	22.5	51

Model	NN	P			PA	PB	PW	Q	QW	R	R1	Bumper bolt adjustable range (Both sides: R1 x 2)	S	T	UU	W	Y1	Adjustment bolt adjustable range (Both sides: Y1 x 2)	Z	Shock absorber
		Nll	TN	TF																
CY1S6-Z	M4 x 0.7	M3x0.5	—	—	25	25	48	52	16	1	7.5	15	42	10	M6 x 0.75	46	11.5	23	62	RJ0604N
CY1S10-Z	M4 x 0.7	M5x0.8	—	—	25	38	60	60	24	1	5.5	11	47	12.5	M8 x 1	58	14	28	72	RJ0806HN
CY1S15-Z	M4 x 0.7	M5x0.8	—	—	30	50	75	75	30	1	5.5	11	62	12.5	M8 x 1	73	14	28	87	RJ0806LN
CY1S20-Z	M6 x 1	Rc1/8	NPT1/8	G1/8	40	70	89	90	38	1.5	4.5	9	73	16.5	M10 x 1	87	18.5	37	106	RJ1007LN
CY1S25-Z	M6 x 1	Rc1/8	NPT1/8	G1/8	40	70	98	90	42	1.5	4.5	9	73	16.5	M14 x 1.5	96	18.5	37	106	RJ1412LN
CY1S32-Z	M8 x 1.25	Rc1/8	NPT1/8	G1/8	40	75	118	110	50	3	5.5	11	91	18.5	M20 x 1.5	116	18.5	37	128	RJ2015HN
CY1S40-Z	M8 x 1.25	Rc1/4	NPT1/4	G1/4	65	105	141	120	64	2	4.5	9	99	20.5	M20 x 1.5	139	17.5	35	140	RJ2015LN

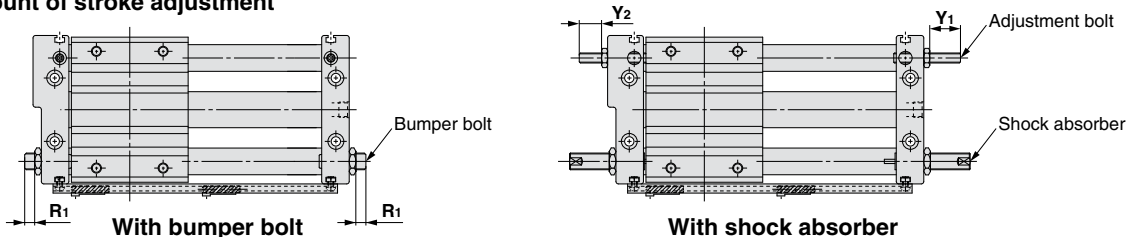
Note) The above figures show the product with auto switches. Auto switch and switch spacer are shipped together with the product, but not assembled.

**Dimensions**

**CY1SG/Centralized piping type**



**Amount of stroke adjustment**



**Dimensions**

Model	A	B	C	D	d	E	F	G	GA	GB	GP	H	HA	HB	HC	HG	HP	HT	JJ	K	L	LD	M	MM	NA	NB	NC	ND	NE
CY1SG6-Z	6	6.5	3.3	7.6	8	2	25	5	5	5	30	27	20.5	20.5	15.5	8	26	15.5	M4 x 0.7	3	40	3.5	6	M4 x 0.7	11	14	19	7	10
CY1SG10-Z	7.5	8	4.4	12	10	2.5	31.5	6.5	5	6	40	34	25	27	17	13.5	33	17	M4 x 0.7	6	45	4.6	6	M4 x 0.7	10.5	16.5	28	6.5	12.5
CY1SG15-Z	7.5	9.5	5.4	16.6	12	2	38	6.5	5	6	52	40	28	29.5	20.5	15	39	20.5	M4 x 0.7	11	60	5.8	8	M5 x 0.8	10.5	16.5	28	5.5	11.5
CY1SG20-Z	10	9.5	5.4	21.6	16	2	44	8.5	5.5	8	62	46	36	37.5	24	19	45	20	M6 x 1	16	70	5.8	10	M6 x 1	10.5	22	28	5.5	17
CY1SG25-Z	10	11	6.5	26.4	16	2	52	8.5	5.5	8	70	54	40.5	40.5	27.5	21.5	53	21	M6 x 1	20	70	7	10	M6 x 1	12.5	22	49	7.5	17
CY1SG32-Z	12.5	14	8.6	33.6	20	2	64	9.5	5.5	9	86	66	50	50	33	26	64	24	M8 x 1.25	26	85	9	12	M8 x 1.25	11.5	23.5	52	5.5	17.5
CY1SG40-Z	12.5	14	8.6	41.6	25	2	74	10.5	5.5	10	104	76	55.5	55.5	38	27	74	27	M8 x 1.25	28	95	9	12	M8 x 1.25	10.5	22.5	51	4.5	16.5

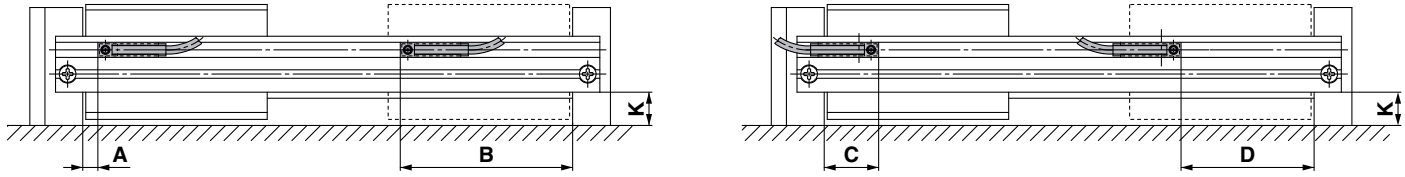
Model	NF	NN	P			PA	PB	PW	Q	QW	R	R1	Bumper bolt adjustable range (Both sides: R1 x 2)	S	T	TT	UU	W	Y1	Y2	Adjustment bolt adjustable range (Both sides: Y1 + Y2)	ZZ	Shock absorber
			NII	TN	TF																		
CY1SG6-Z	15	M4 x 0.7	M3 x 0.5	—	—	25	25	48	52	16	1	7.5	15	42	10	14	M6 x 0.75	46	11.5	7.5	19	66	RJ0604N
CY1SG10-Z	24	M4 x 0.7	M5 x 0.8	—	—	25	38	60	60	24	1	5.5	11	47	12.5	16.5	M8 x 1	58	14	10	24	76	RJ0806HN
CY1SG15-Z	23	M4 x 0.7	M5 x 0.8	—	—	30	50	75	75	30	1	5.5	11	62	12.5	17.5	M8 x 1	73	14	9	23	92	RJ0806LN
CY1SG20-Z	23	M6 x 1	Rc1/8	NPT1/8	G1/8	40	70	89	90	38	1.5	4.5	9	73	16.5	21.5	M10 x 1	87	18.5	13.5	32	111	RJ1007LN
CY1SG25-Z	44	M6 x 1	Rc1/8	NPT1/8	G1/8	40	70	98	90	42	1.5	4.5	9	73	16.5	21.5	M14 x 1.5	96	18.5	13.5	32	111	RJ1412LN
CY1SG32-Z	46	M8 x 1.25	Rc1/8	NPT1/8	G1/8	40	75	118	110	50	3	5.5	11	91	18.5	24.5	M20 x 1.5	116	18.5	12.5	31	134	RJ2015HN
CY1SG40-Z	45	M8 x 1.25	Rc1/4	NPT1/4	G1/4	65	105	141	120	64	2	4.5	9	99	20.5	26.5	M20 x 1.5	139	17.5	11.5	29	146	RJ2015LN

Note) The above figures show the product with auto switches. Auto switch and switch spacer are shipped together with the product, but not assembled.

# Series CY1S

# Auto Switch Mounting

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



- Note 1) The minimum stroke when 2 in-line auto switches are mounted as shown above is 50 mm.  
 The minimum stroke when the mounting screws of the auto switches face each other is 25 mm.  
 Note 2) The minimum stroke when no auto switch is mounted is 15 mm.

## Auto Switch Proper Mounting Position

Auto switch model	K dimension (Switch rail height)	A		B		C		D	
		D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V
Bore size 6	3	5.5	1.5	36.5	40.5	17.5	21.5	24.5	20.5
10	6	5.5	1.5	41.5	45.5	17.5	21.5	29.5	25.5
15	11	5.5	1.5	56.5	60.5	17.5	21.5	44.5	40.5
20	16	6	2	67	71	18	22	55	51
25	20	6	2	67	71	18	22	55	51
32	26	7.5	3.5	83.5	87.5	19.5	23.5	71.5	67.5
40	28	6.5	2.5	92.5	96.5	18.5	22.5	80.5	76.5

- Note 1) The values in the above list are used as a guide for the auto switch mounting position for end of stroke detection.  
 Adjust the auto switch after confirming the operating conditions in the actual setting.  
 Note 2) If the switch rail is reassembled or mounted on the other side of the cylinder, maintain the K dimension (switch rail height) in the table above.  
 The switch rail is secured by screwing the cross-recessed round head screw into a square nut in the T-slots of the end plates. Care must be taken when removing the switch rail so that the washers, screws or nuts are not lost.

## Operating Range

Auto switch model	Bore size (mm)						
	6	10	15	20	25	32	40
D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	3	3	2.5	2.5	3	2.5	3
D-A9□ D-A9□V	5.5	5.5	5.5	5.5	5.5	5.5	6

- Note) Values which include hysteresis are for guideline purposes only, they are not a guarantee (assuming approximately ±30% dispersion) and may change substantially depending on the ambient environment.

## Auto Switch Mounting

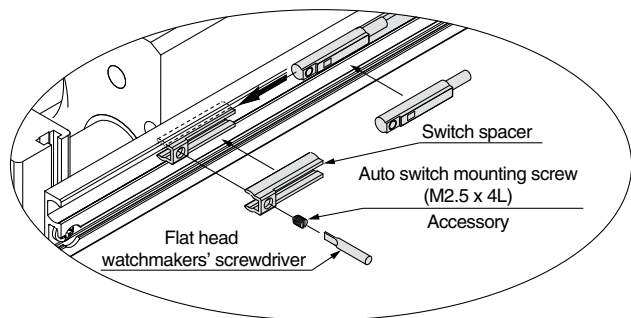
As shown in the figure to the right, combine the auto switch with the switch spacer (BM Y3-016) to secure the auto switch in the mounting groove of the switch rail. Combine the auto switch with the switch spacer and secure into position by tightening the auto switch mounting screw with a flat blade watchmakers' screwdriver.

- Note) When tightening the auto switch mounting screw, use watchmakers' screwdriver with a handle diameter of 5 to 6 mm.  
 Set the tightening torque to 0.07 to 0.11 lbf-ft (0.1 to 0.15 N-m). As a guide, turn 90° from when the mounting screw starts to become tight.

## Auto Switch Mounting Bracket (Switch spacer)

Auto switch model	Bore size (mm)	
	6 to 40	
D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	BM Y3-016	
D-A9□ D-A9□V		

- Note) The part number above is the order number for the switch spacer.



**Other than the applicable auto switches listed in "How to Order", the following auto switches are mountable.**

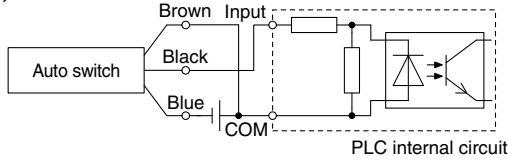
- \* Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H) are also available. For details, refer to page 1290 in Best Pneumatics No. 2.
- \* With pre-wired connector is also available for solid state auto switches. For details, refer to pages 1328 and 1329 in Best Pneumatics No. 2.

# Prior to Use

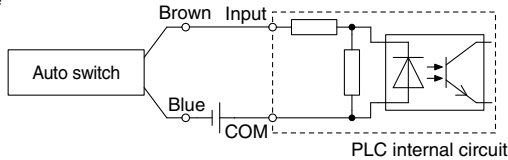
## Auto Switch Connection and Example

### Sink Input Specifications

#### 3-wire, NPN

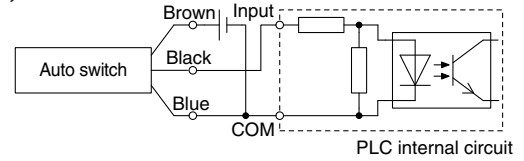


#### 2-wire

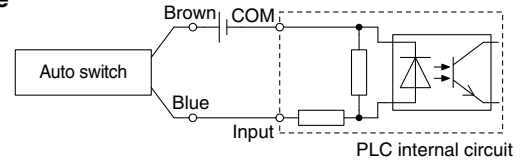


### Source Input Specifications

#### 3-wire, PNP



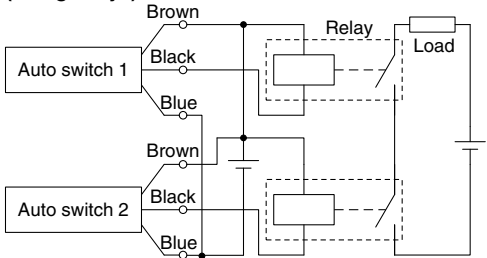
#### 2-wire



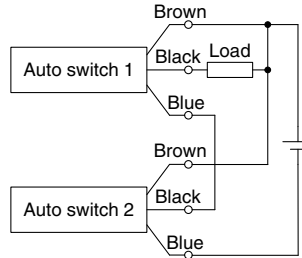
Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

### Example of AND (Series) and OR (Parallel) Connection

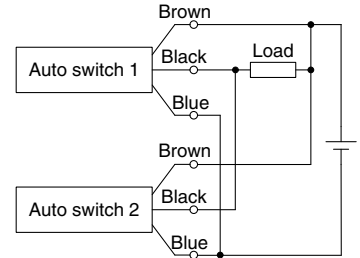
#### 3-wire, AND connection for NPN output (Using relays)



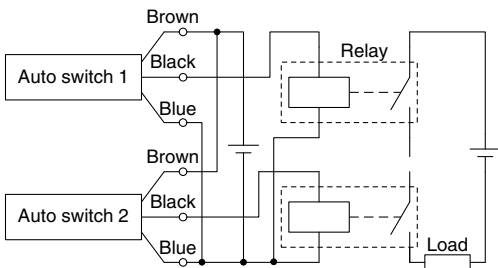
#### (Performed with auto switches only)



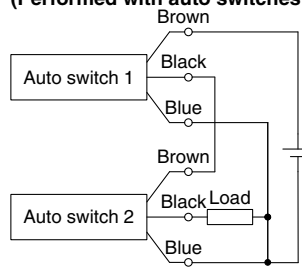
#### 3-wire, OR connection for NPN output



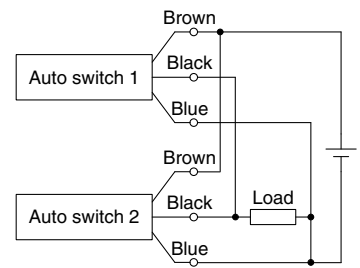
#### 3-wire, AND connection for PNP output (Using relays)



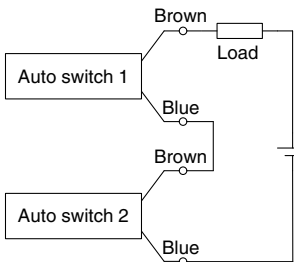
#### (Performed with auto switches only)



#### 3-wire, OR connection for PNP output



#### 2-wire, AND connection

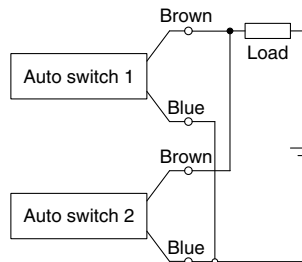


When two auto switches are connected in series, malfunction may occur because the load voltage will decrease in the ON state. The indicator lights will light up when both of the auto switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \text{Residual voltage} \times 2 \text{ pcs.} \\ &= 24 \text{ V} - 4 \text{ V} \times 2 \text{ pcs.} \\ &= 16 \text{ V} \end{aligned}$$

Example: Power supply voltage 24 VDC  
Auto switch internal voltage drop 4 V

#### 2-wire, OR connection



(Solid state)

When two auto switches are connected in parallel, malfunction may occur because the load voltage will increase in the OFF state.

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega \\ &= 6 \text{ V} \end{aligned}$$

Example: Load impedance 3 kΩ  
Auto switch leakage current 1 mA

(Reed)

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

# Series CY1S

## Made to Order

Please contact SMC for detailed dimensions, specifications and lead times.



### Made-to-Order List

Bore size (mm)	Low speed	Ultra low speed	Air-hydro	Helical insert thread	Non-lubricated exterior (without dust seal)	Outside of cylinder tube with hard chrome plated	Non-lubricated exterior (with dust seal)	Auto switch rails on both sides	Mounting surface tapped hole type
	-XB9	-XB13	-X116	-X168	-X210	-X322	-X324	-X431	-X2423
6	●	●			●			●	●
10	●	●			●		●	●	●
15	●	●			●	●	●	●	●
20	●	●		●	●	●	●	●	●
25	●	●	●	●	●	●	●	●	●
32	●	●	●	●	●	●	●	●	●
40	●	●	●	●	●	●	●	●	●

Note) ● indicates "applicable" and blank indicates "not applicable".

### 1 Low speed (15 to 50 mm/s) Symbol -XB9

Even if driving at lower speeds 15 to 50 mm/s, there would be no stick-slip phenomenon and it can run smoothly.

Standard model no. - **XB9**  
● Low speed (15 to 50 mm/s)

**Dimensions: Same as standard type**

Note 1) The operating performance may vary depending on the operating conditions.  
Note 2) Do not operate the product with speeds exceeding the maximum operating speed as it may lead to failure.

### 2 Ultra low speed (7 to 50 mm/s) Symbol -XB13

Even if driving at lower speeds 7 to 50 mm/s, there would be no stick-slip phenomenon and it can run smoothly.

Standard model no. - **XB13**  
● Ultra low speed (7 to 50 mm/s)

**Dimensions: Same as standard type**

Note 1) The operating performance may vary depending on the operating conditions.  
Note 2) Do not operate the product with speeds exceeding the maximum operating speed as it may lead to failure.

## Warning

### Precautions

Be aware that smoking cigarettes etc. after your hands have come into contact with the grease used in this cylinder can create a gas that is hazardous to humans.

### 3 Air-hydro Symbol -X116

Air-hydro type is suitable for precise low speed feeding, intermediate stop and skip feeding.

Standard model no. - **X116**  
● Air-hydro

### Specifications

Bore size (mm)	25	32	40
Orifice diameter (mm)	8	8	11
Fluid	Turbine oil class 1 (ISO VG32)		
Piston speed (mm/s)	15 to 300		
Dimensions	The same dimensions as the bilateral piping type		

Note 1) This product is only applicable to the bilateral piping type.  
Note 2) When an intermediate stop is performed in the air-hydro circuit, the kinetic energy of the load should be the allowable value or less.  
(Refer to "When an intermediate stop is performed with the pneumatic circuit" for the allowable values.)  
Note 3) Do not use machine oil or spindle oil.

### 4 Helical insert thread Symbol -X168

Change mounting thread on the external slider to helical insert thread.

Standard model no. - **X168**  
● Helical insert thread

**Dimensions: Same as standard type**

**5** Non-lubricated exterior (without dust seal) **Symbol -X210**

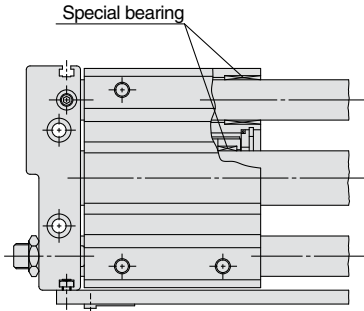
Suitable for environments where oil is not tolerated. It is recommended to use this type in a special environment where standard product causes lubrication failure.

Standard model no. - **X210**

- Non-lubricated exterior (without dust seal)

**Dimensions: Same as standard type**

Note) Consider installing a protective cover if the product is used in an environment where foreign matter such as paper powder might be caught in the sliding parts of the cylinder.



**7** Non-lubricated exterior (with dust seal) **Symbol -X324**

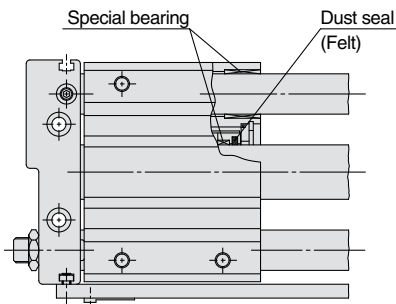
No grease is applied to the external surface of the cylinder. Suitable for environments where oil is not tolerated. A felt dust seal is mounted to the external sliding part of the cylinder tube.

Standard model no. - **X324**

- Non-lubricated exterior (with dust seal)

**Dimensions: Same as standard type**

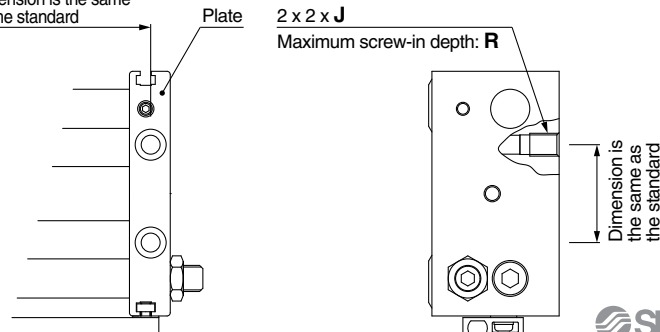
Note) Although a felt dust seal is installed, foreign matter might be caught in the sliding parts of the cylinder. In that instance, consider installing a protective cover.



**9** Mounting surface tapped hole type **Symbol -X2423**

The through hole mounting holes on both plates are tapped to allow the cylinders to also be mounted from the equipment side (cylinder mounted surface).

Dimension is the same as the standard



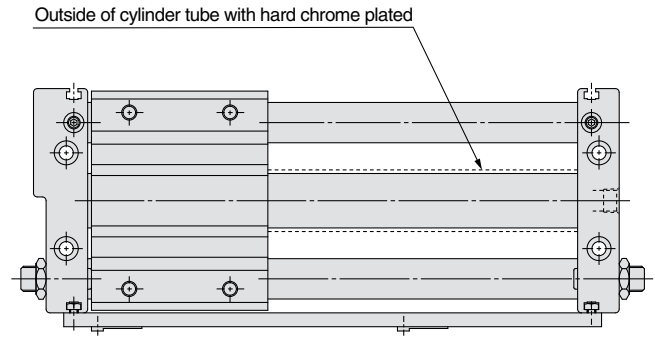
**6** Outside of cylinder tube with hard chrome plated **Symbol -X322**

The cylinder tube outer circumference is plated with hard chrome, which further reduces bearing abrasion.

Standard model no. - **X322**

- Outside of cylinder tube with hard chrome plated

**Dimensions: Same as standard type**

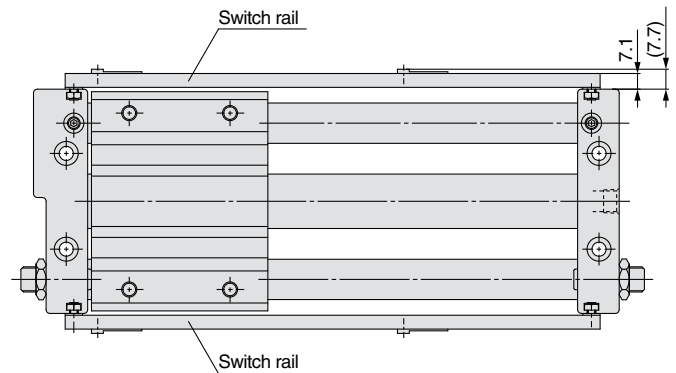


**8** Switch rails on both sides (with 2 pcs.) **Symbol -X431**

Applicable for short stroke with auto switch.

Standard model no. - **X431**

- Switch rails on both sides (with 2 pcs.)



Bore size (mm)	J (Thread size)	R (Maximum screw-in depth)
6	M4 x 0.7	6.5
10	M5 x 0.8	9.5
15	M6 x 1	9.5
20	M6 x 1	9.5
25	M8 x 1.25	10
32	M10 x 1.5	15
40	M10 x 1.5	15



# Series CY1S Specific Product Precautions 1

Be sure to read the below before handling. Refer to back cover for Safety Instructions. For Actuator and Auto Switch Precautions, refer to "Handling Precautions for SMC Products" (M-E03-3) and Operation Manual.

## Operating Precautions

### ⚠ Warning

1. Be careful to the space between the plates and the slide block.

Take sufficient care to avoid getting your hands or fingers caught when the cylinder is operated.

2. Do not apply a load to a cylinder which is greater than the allowable value stated in the "Model Selection" pages.

This can cause a malfunction.

3. Be careful to the supply pressure and kinetic energy when performing an intermediate stop.

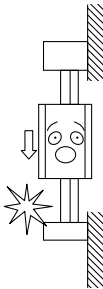
Fine end stroke adjustment is considered as an intermediate stop, so the considerations for an intermediate stop must be observed when making any fine adjustments.

#### When stopping the external slider in an intermediate position with an external stopper.

If the allowable pressure values are exceeded, the stopper position might be displaced or the external slider may become detached from the magnetic coupling and drop.

#### When stopping the piston slider in an intermediate position with the pneumatic circuit.

If the allowable kinetic energy values are exceeded, the stopper position might be displaced or the external slider may become detached from the magnetic coupling and drop.



### ⚠ Caution

1. Do not use the cylinder in an environment where the cylinder is exposed to moisture, adhesive foreign matter, dust or liquid such as water or cutting fluid.

If the cylinder is used in an environment where the lubrication of the cylinders sliding parts is compromised, please consult SMC.

## Mounting

### ⚠ Caution

1. Avoid operation with the external slider secured to the surface.

Secure the cylinder with the plates on both sides.

2. Make sure that the cylinder mounting surface has a flatness of 0.2 mm or less.

If the flatness of the mounting surface is not appropriate, the 2 guide shafts will become twisted and have an adverse effect to the performance of the product. This results in reduction of product life due to the increase in sliding resistance and premature wearing of the bushing.

The flatness of the cylinder mounting surface should be 0.2 mm or less, and the product should be mounted so that it can operate smoothly over the full stroke with the minimum operating pressure (26 psi (0.18 MPa) or less).

## Disassembly and Maintenance

### ⚠ Warning

1. Use caution as the attractive power of the magnets is very strong.

When removing the external slider and piston slider from the cylinder tube for maintenance etc., handle with caution, since the magnets installed in each slider have a very strong attractive force.

### ⚠ Caution

1. Use caution when taking off the external slider, as the piston slider will be directly attracted to it.

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

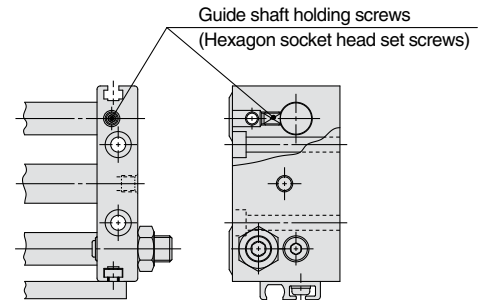
2. Do not disassemble the magnetic components (piston slider, external slider).

This can cause a loss of holding force and malfunction.

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

4. The set screws in the figure below are for securing the guide shaft, so do not loosen them except for the purposes of replacing the seals.

This can cause a malfunction.



5. Use caution to the direction of the external slider and the piston slider.

There are an odd number of magnets for  $\phi 6$  and  $\phi 10$  ( $\phi 6$ : 5 pcs,  $\phi 10$ : 3 pcs), so the assembly direction is important. Refer to the figure below when performing disassembly or maintenance. Put the external slider and the internal slider together and insert the piston slider into the cylinder tube ensuring the positional relationship is correct as shown in Fig.1.

If assembled incorrectly as shown in Fig. 2, remove and rotate the piston slider by  $180^\circ$ , then re-insert in the correct position. If the direction is not correct, it will be impossible to obtain the specified holding force.

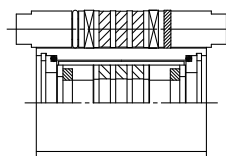


Fig. 1 Correct position

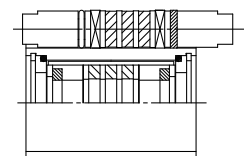


Fig. 2 Incorrect position





# Series CY1S Specific Product Precautions 2

Be sure to read the below before handling. Refer to back cover for Safety Instructions. For Actuator and Auto Switch Precautions, refer to "Handling Precautions for SMCProducts" (M-E03-3) and Operation Manual.

## Stroke Setting

### ⚠ Caution

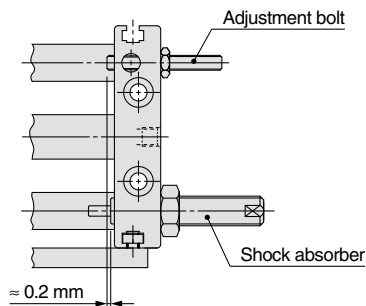
#### With bumper bolt

Loosen the hexagon nut, and move the bumper bolt to the set stroke position with a hexagon wrench or by hand. Tighten the hexagon nut to the torque values shown in the table below.

#### With shock absorber

The cylinder stroke is controlled by the position of the adjustment bolt. Parallel pins of smaller size to the rod diameter of the shock absorber are mounted on the slide block, and these pins collide with the adjustment bolt and shock absorber. Therefore, the stopper of the shock absorber should not come into contact with the slide block directly. (See the figure below.)

It is possible to adjust the stroke time of the shock absorber by adjusting the position of the shock absorber and adjustment bolt. However, if the effective stroke of the shock absorber is extremely short, the ability to absorb the impact will be reduced, leading to failure. Therefore, the position of the shock absorber is recommended to be approximately 0.2 mm behind the contact surface of the adjustment bolt (See figure below).



Bore size (mm)	Nut for bumper bolt		Nut for shock absorber		Nut for adjustment bolt	
	Thread size	Tightening torque lbf-ft (N·m)	Thread size	Tightening torque lbf-ft (N·m)	Thread size	Tightening torque lbf-ft (N·m)
6	M6 x 0.75	3.84 (5.2)	M6 x 0.75	0.63 (0.85)	M4 x 0.7	1.10 (1.5)
10	M8 x 1	9.22 (12.5)	M8 x 1	1.23 (1.67)		
15						
20	M10 x 1	18.1 (24.5)	M10 x 1	2.32 (3.14)	M6 x 1	3.68 (5.2)
25	M14 x 1.5	50.2 (68.0)	M14 x 1.5	7.96 (10.80)		
32	M20 x 1.5	150 (204.0)	M20 x 1.5	17.3 (23.50)	M8 x 1.25	9.22 (12.5)
40						

## Caution when Replacing Shock Absorber

### ⚠ Caution

For the cylinder specification of shock absorber with adjustment bolt, the stroke will be maintained even when the shock absorber is replaced. However, if the position of the adjustment bolt is also changed, it will be necessary to reset the stroke position of the cylinder and shock absorber.


## Service Life and Replacement Period of Shock Absorber


### ⚠ Caution


1. If the shock absorbing ability of the shock absorber is insufficient at the end of stroke, the cylinder, equipment or workpiece maybe damaged.
2. Perform maintenance for the shock absorber (RJ series) setting approximately 3 million operating cycles as a guide.
  - Note 1) The performance may vary depending on the operating conditions of the shock absorber.
  - Note 2) As a guide, the maintenance check for the shock absorber (RJ series) should be carried out after approximately 3 million operating cycles, and replace if necessary.
3. Refer to the RJ series catalog for Specific Product Precautions of the shock absorber.

## Safety Instructions

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)\*1), and other safety regulations.

 **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

 **Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

 **Danger :** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

\*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)  
ISO 10218-1: Manipulating industrial robots – Safety.  
etc.

### Warning

**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

**1. 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, whichever is first.\*2)

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.

\*2) **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

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

 **Safety Instructions** Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.



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**(800) SMC.SMC1 (762-7621)**

**e-mail: [sales@smcusa.com](mailto:sales@smcusa.com)**

**For International inquiries: [www.smcworld.com](http://www.smcworld.com)**

# Slider Type/Ball Bushing Bearing

## Series *CY1L*

ø6, ø10, ø15, ø20, ø25, ø32, ø40



CY3B  
CY3R

CY1S

**CY1L**

CY1H

CY1F

CYP

D-□

-X□

Individual  
-X□

Technical  
data

# Series CY1L

## Model Selection 1

E: Kinetic energy of load (J)

$$E = \frac{W}{2} \cdot \left(\frac{V}{1000}\right)^2$$

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

Ps: Operating pressure limit for intermediate stop using an external stopper, etc. (MPa)

Pv: Maximum operating pressure for vertical operation (MPa)

Wa: Allowable load mass based on these operating conditions (kg)

Wv: Allowable load mass for vertical operation (kg)

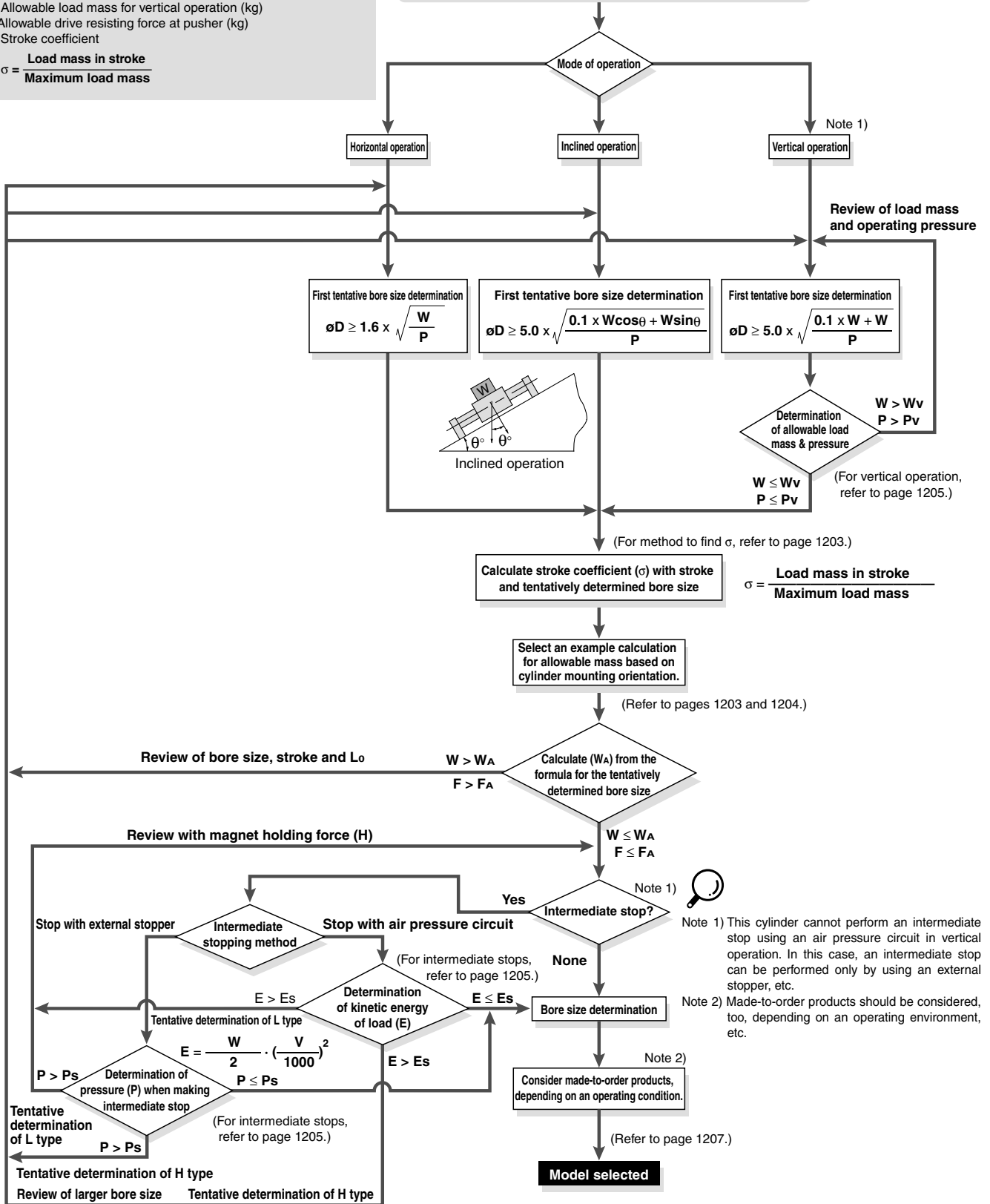
Fa: Allowable drive resisting force at pusher (kg)

σ: Stroke coefficient

$$\sigma = \frac{\text{Load mass in stroke}}{\text{Maximum load mass}}$$

**Operating Conditions**

- W: Load mass (kg)
- P: Operating pressure (MPa)
- Lo: Distance from slide block mounting surface to workpiece center of gravity (cm)
- Mode of operation (Horizontal, Inclined, Vertical)
- F: Drive resisting force (kg)
- V: Speed (mm/s)
- Stroke (mm)



## Caution on Design (1)

### How to Find $\sigma$ when Selecting the Allowable Load Mass

Since the maximum load mass with respect to the cylinder stroke changes as shown in the table below,  $\sigma$  should be considered as a coefficient determined in accordance with each stroke.

Example) CY1L25□-650

- (1) Maximum load mass = 20 kg
- (2) Load mass for 650 st = 13.6 kg
- (3)  $\sigma = \frac{13.6}{20} = 0.68$  is the result.

### Calculation Formula for $\sigma$ ( $\sigma \leq 1$ )

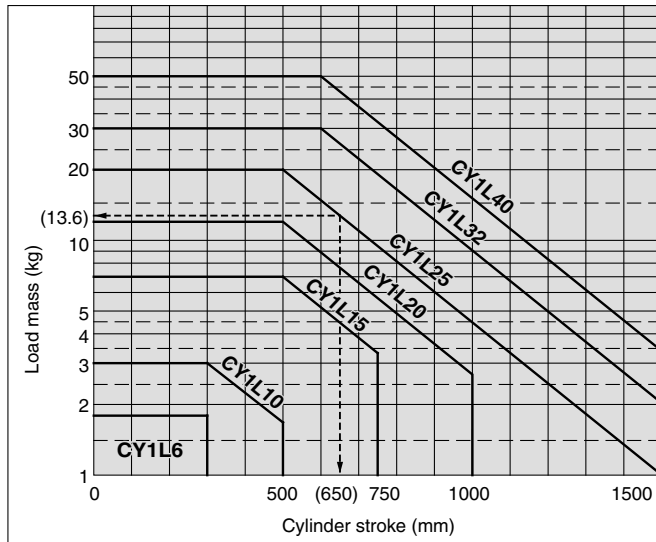
ST: Stroke (mm)

Model	CY1L6	CY1L10	CY1L15
$\sigma =$	1	$10^{\frac{(0.86 - 1.3 \times 10^{-3} \times \text{ST})}{3}}$	$10^{\frac{(1.5 - 1.3 \times 10^{-3} \times \text{ST})}{7}}$

Model	CY1L20	CY1L25	CY1L32
$\sigma =$	$10^{\frac{(1.71 - 1.3 \times 10^{-3} \times \text{ST})}{12}}$	$10^{\frac{(1.98 - 1.3 \times 10^{-3} \times \text{ST})}{20}}$	$10^{\frac{(2.26 - 1.3 \times 10^{-3} \times \text{ST})}{30}}$

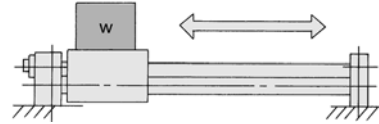
Model	CY1L40
$\sigma =$	$10^{\frac{(2.48 - 1.3 \times 10^{-3} \times \text{ST})}{50}}$

Note) Calculate with  $\sigma = 1$  for all applications up to  $\phi 10 - 300$  mmST,  $\phi 15 - 500$  mmST,  $\phi 20 - 500$  mmST,  $\phi 25 - 500$  mmST,  $\phi 32 - 600$  mmST and  $\phi 40 - 600$  mmST.



### Examples of Allowable Load Mass Calculation Based on Cylinder Mounting Orientation

#### 1. Horizontal Operation (Floor mounting)



Maximum Load Mass (Center of slide block)

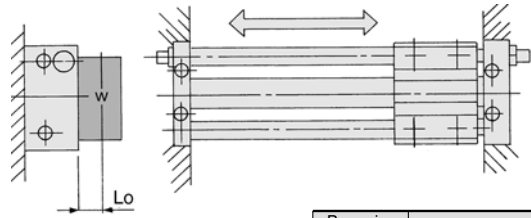
(kg)

Bore size (mm)	6	10	15	20	25	32	40
Max. load mass (kg)	1.8	3	7	12	20	30	50
Stroke (Max)	Up to 300 st	Up to 300 st	Up to 500 st	Up to 500 st	Up to 500 st	Up to 600 st	Up to 600 st

The above maximum load mass values will change with the stroke length for each cylinder size, due to limitation from warping of the guide shafts. (Take note of the coefficient  $\sigma$ .)

Moreover, depending on the operating direction, the allowable load mass may be different

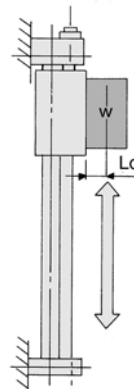
#### 2. Horizontal Operation (Wall mounting)



Lo: Distance from mounting surface to load center of gravity (cm)

Bore size (mm)	Allowable load mass (W <sub>a</sub> ) (kg)
6	$\frac{\sigma \cdot 6.48}{6.8 + 2Lo}$
10	$\frac{\sigma \cdot 15.0}{8.9 + 2Lo}$
15	$\frac{\sigma \cdot 45.5}{11.3 + 2Lo}$
20	$\frac{\sigma \cdot 101}{13.6 + 2Lo}$
25	$\frac{\sigma \cdot 180}{15.2 + 2Lo}$
32	$\frac{\sigma \cdot 330}{18.9 + 2Lo}$
40	$\frac{\sigma \cdot 624}{22.5 + 2Lo}$

#### 3. Vertical Operation



Bore size (mm)	Allowable load mass (W <sub>v</sub> ) (kg)
6	$\frac{\sigma \cdot 1.53}{1.6 + Lo}$
10	$\frac{\sigma \cdot 5.00}{1.95 + Lo}$
15	$\frac{\sigma \cdot 15.96}{2.4 + Lo}$
20	$\frac{\sigma \cdot 31.1}{2.8 + Lo}$
25	$\frac{\sigma \cdot 54.48}{3.1 + Lo}$
32	$\frac{\sigma \cdot 112.57}{3.95 + Lo}$
40	$\frac{\sigma \cdot 212.09}{4.75 + Lo}$

Lo: Distance from mounting surface to load center of gravity (cm)

Note) Operating pressure should be equal to or less than the maximum operating pressure in the article, "Vertical Operation" listed on page 1205.

CY3B  
CY3R

CY1S

CY1L

CY1H

CY1F

CYP

D-□

-X□

Individual

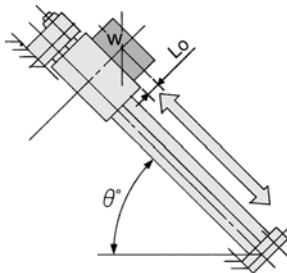
-X□

Technical data

## Caution on Design (2)

### Example of Allowable Load Mass Calculation Based on Cylinder Mounting Orientation

#### 4. Inclined Operation (In operating direction)



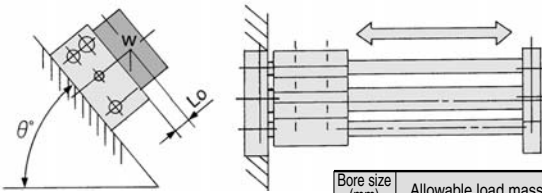
Angle	up to 45°	up to 60°	up to 75°	up to 90°
<b>k</b>	1	0.9	0.8	0.7

Angle coefficient (**k**) :  $k = [\text{to } 45^\circ (= \theta)] = 1$ ,  
 [to  $60^\circ$ ] = 0.9, [to  $75^\circ$ ] = 0.8,  
 [to  $90^\circ$ ] = 0.7

**Lo**: Distance from mounting surface to load center of gravity (cm)

Bore size (mm)	Allowable load mass ( <b>WA</b> ) (kg)
<b>6</b>	$\sigma \cdot 4.05 \cdot K$ $1.7 \cos \theta + 2 (1.6 + Lo) \sin \theta$
<b>10</b>	$\sigma \cdot 10.2 \cdot K$ $2.8 \cos \theta + 2 (1.95 + Lo) \sin \theta$
<b>15</b>	$\sigma \cdot 31.1 \cdot K$ $2.9 \cos \theta + 2 (2.4 + Lo) \sin \theta$
<b>20</b>	$\sigma \cdot 86.4 \cdot K$ $6 \cos \theta + 2 (2.8 + Lo) \sin \theta$
<b>25</b>	$\sigma \cdot 105.4 \cdot K$ $3.55 \cos \theta + 2 (3.1 + Lo) \sin \theta$
<b>32</b>	$\sigma \cdot 178 \cdot K$ $4 \cos \theta + 2 (3.95 + Lo) \sin \theta$
<b>40</b>	$\sigma \cdot 361.9 \cdot K$ $5.7 \cos \theta + 2 (4.75 + Lo) \sin \theta$

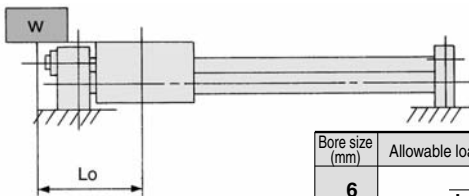
#### 5. Inclined Operation (At a right angle to operating direction)



**Lo**: Distance from mounting surface to load center of gravity (cm)

Bore size (mm)	Allowable load mass ( <b>WA</b> ) (kg)
<b>6</b>	$\sigma \cdot 6.48$ $3.6 + 2 (1.6 + Lo) \sin \theta$
<b>10</b>	$\sigma \cdot 15$ $5 + 2 (1.95 + Lo) \sin \theta$
<b>15</b>	$\sigma \cdot 45.5$ $6.5 + 2 (2.4 + Lo) \sin \theta$
<b>20</b>	$\sigma \cdot 115$ $8 + 2 (2.8 + Lo) \sin \theta$
<b>25</b>	$\sigma \cdot 180$ $9 + 2 (3.1 + Lo) \sin \theta$
<b>32</b>	$\sigma \cdot 330$ $11 + 2 (3.95 + Lo) \sin \theta$
<b>40</b>	$\sigma \cdot 624$ $13 + 2 (4.75 + Lo) \sin \theta$

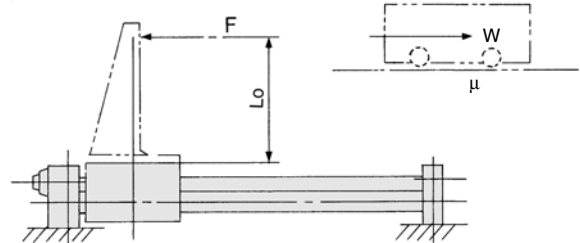
#### 6. Load Center Offset in Operating Direction (Lo)



**Lo**: Distance from center of slide block to load's center of gravity (cm)

Bore size (mm)	Allowable load mass ( <b>WA</b> ) (kg)
<b>6</b>	$\frac{\sigma \cdot 2}{Lo + 1.7}$
<b>10</b>	$\frac{\sigma \cdot 5.6}{Lo + 2.8}$
<b>15</b>	$\frac{\sigma \cdot 13.34}{Lo + 2.9}$
<b>20</b>	$\frac{\sigma \cdot 43.2}{Lo + 6}$
<b>25</b>	$\frac{\sigma \cdot 46.15}{Lo + 3.55}$
<b>32</b>	$\frac{\sigma \cdot 80}{Lo + 4}$
<b>40</b>	$\frac{\sigma \cdot 188.1}{Lo + 5.7}$

#### 7. Horizontal Operation (Pushing load, Pusher)



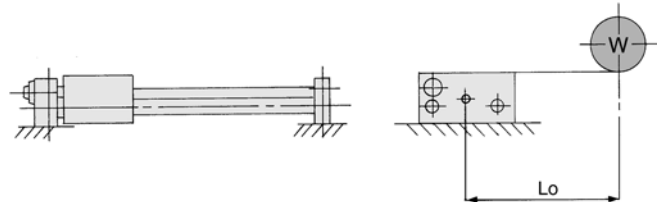
**F**: Drive (from slide block to position **Lo**) resistance force  $W \times \mu$  (kg)  
**Lo**: Distance from mounting surface to load center of gravity (cm)  
 $\mu$ : Friction coefficient

Bore size (mm)	<b>6</b>	<b>10</b>	<b>15</b>	<b>20</b>
Allowable drive resisting force ( <b>FA</b> ) (kg)	$\frac{\sigma \cdot 2.72}{1.6 + Lo}$	$\frac{\sigma \cdot 5.55}{1.95 + Lo}$	$\frac{\sigma \cdot 15.96}{2.4 + Lo}$	$\frac{\sigma \cdot 41.7}{2.8 + Lo}$

Bore size (mm)	<b>25</b>	<b>32</b>	<b>40</b>
Allowable drive resisting force ( <b>FA</b> ) (kg)	$\frac{\sigma \cdot 58.9}{3.1 + Lo}$	$\frac{\sigma \cdot 106.65}{3.95 + Lo}$	$\frac{\sigma \cdot 228}{4.75 + Lo}$

#### 8. Horizontal Operation (Load, Lateral offset Lo)



**Lo**: Distance from center of side block to load's center of gravity (cm)

Bore size (mm)	<b>6</b>	<b>10</b>	<b>15</b>	<b>20</b>
Allowable load mass ( <b>WA</b> ) (kg)	$\frac{\sigma \cdot 6.48}{3.6 + Lo}$	$\frac{\sigma \cdot 15}{5 + Lo}$	$\frac{\sigma \cdot 45.5}{6.5 + Lo}$	$\frac{\sigma \cdot 80.7}{8 + Lo}$

Bore size (mm)	<b>25</b>	<b>32</b>	<b>40</b>
Allowable load mass ( <b>WA</b> ) (kg)	$\frac{\sigma \cdot 144}{9 + Lo}$	$\frac{\sigma \cdot 275}{11 + Lo}$	$\frac{\sigma \cdot 520}{13 + Lo}$

## Caution on Design (3)

### Vertical Operation

When operating a load vertically, it should be operated within the allowable load mass and maximum operating pressures shown in the table below. Use caution, as operating above the prescribed values may lead to dropping of the load.

When the cylinder is mounted vertically or sidelong, sliders 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-stroke, use an external stopper to secure accurate positioning.

Bore size (mm)	Model	Allowable load mass (Wv) (kg)	Maximum operating pressure (Pv) (MPa)
6	CY1L 6H	1.0	0.55
10	CY1L10H	2.7	0.55
15	CY1L15H	7.0	0.65
	CY1L15L	4.1	0.40
20	CY1L20H	11.0	0.65
	CY1L20L	7.0	0.40
25	CY1L25H	18.5	0.65
	CY1L25L	11.2	0.40
32	CY1L32H	30.0	0.65
	CY1L32L	18.2	0.40
40	CY1L40H	47.0	0.65
	CY1L40L	29.0	0.40

Note 1) Use caution, since the magnetic coupling may be dislocated if it is used over the maximum operating pressure.

Note 2) Allowable load mass above indicates the maximum load mass when loaded. The actual loadable mass must be determined referring to the flow chart in the Model Selection 1.

### Intermediate Stop

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

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

Bore size (mm)	Model	Operating pressure limit for intermediate stop (Ps) (MPa)
6	CY1L 6H	0.55
10	CY1L10H	0.55
15	CY1L15H	0.65
	CY1L15L	0.40
20	CY1L20H	0.65
	CY1L20L	0.40
25	CY1L25H	0.65
	CY1L25L	0.40
32	CY1L32H	0.65
	CY1L32L	0.40
40	CY1L40H	0.65
	CY1L40L	0.40

#### 2. Intermediate stopping of load with an air pressure circuit

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

(Reference values)

Bore size (mm)	Model	Allowable kinetic energy for intermediate stop (Es) (J)
6	CY1L 6H	0.007
10	CY1L10H	0.03
15	CY1L15H	0.13
	CY1L15L	0.076
20	CY1L20H	0.24
	CY1L20L	0.16
25	CY1L25H	0.45
	CY1L25L	0.27
32	CY1L32H	0.88
	CY1L32L	0.53
40	CY1L40H	1.53
	CY1L40L	0.95

CY3B  
CY3R

CY1S

CY1L

CY1H

CY1F

CYP

D-□

-X□

Individual  
-X□

Technical  
data

# Magnetically Coupled Rodless Cylinder Slider Type: Ball Bushing Bearing

## Series *CY1L*

ø6, ø10, ø15, ø20, ø25, ø32, ø40

### How to Order

**Ball Bushing Bearing** **CY1L** **25** **H** - **300** - **J79W** - **—** - **—**

• **Slider type**  
(Ball bushing bearing)

• **Bore size**

6	6 mm	25	25 mm
10	10 mm	32	32 mm
15	15 mm	40	40 mm
20	20 mm		

• **Port thread type**

Symbol	Type	Bore size
Nil	M thread	ø6, ø10, ø15
	Rc	ø20, ø25, ø32, ø40
TN	NPT	
TF	G	

• **Magnetic holding force**  
Refer to page 1207 for specifications.

• **Standard stroke**  
Refer to "Standard Stroke" on page 1207.

• **Made to Order**  
Refer to page 1207 for details.

• **Number of auto switches**

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

• **Auto switch**

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

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

• **Adjustment type**

Nil	With adjusting bolt
B	With shock absorbers (2 pcs.)
BS	With shock absorber (With plate A) * Installed on side A at time of shipment.

### Applicable Auto Switch/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m) *				Pre-wired connector	Applicable load				
					DC	AC	Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)	None (N)		IC circuit	Relay, PLC			
Solid state switch	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	F7NV	F79	●	●	○	—	○	IC circuit	Relay, PLC			
				3-wire (PNP)			F7PV	F7P	●	●	○	—	○					
		Connector		2-wire	12 V		F7BV	J79	●	●	○	—	○			—		
	Diagnostic indication (2-color indication)	Grommet		3-wire (NPN)	24 V		5 V, 12 V	F7NWV	F79W	●	●	○	—	○		IC circuit		
				3-wire (PNP)				—	F7PW	●	●	○	—	○		IC circuit		
		Connector		2-wire	12 V		F7BWV	J79W	●	●	○	—	○	—				
Water resistant (2-color indication)	Grommet	No	2-wire	12 V	5 V, 12 V	F7BAV	F7BA	—	●	○	—	○	—					
						Connector	4-wire (NPN)	5 V, 12 V	—	F79F	●	●	○	—	○	IC circuit		
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	—	A76H	●	●	—	—	IC circuit	—			
				Connector	2-wire	24 V	12 V	100 V	A72	A72H	●	●	—	—	—	—		
									No	5 V, 12 V	100 V or less	A73	A73H	●	●	●	—	—
		Yes										12 V	—	A80	A80H	●	●	—
				No	5 V, 12 V	—	A73C	—	●	●	●			●	—	—	—	
		Yes					5 V, 12 V	—	A80C	—	●	●	●	●	—	—	IC circuit	

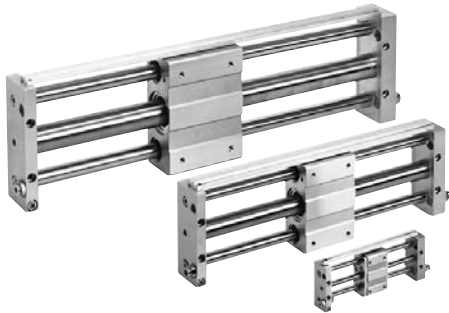
\* Lead wire length symbols: 0.5 m..... Nil (Example) J79W  
 3 m..... L (Example) J79WL  
 5 m..... Z (Example) J79WZ  
 None..... N (Example) J79CN

\* Solid state auto switches marked with "○" are produced upon receipt of order.

- Since there are other applicable auto switches than listed, refer to page 1210 for details.
- For details about auto switches with pre-wired connector, refer to pages 1328 and 1329.
- \* Auto switches are shipped together, (but not assembled).



# Magnetically Coupled Rodless Cylinder Slider Type: Ball Bushing Bearing **Series CY1L**



## Easy piping and wiring

Hollow shafts are used, and centralization of ports on one side makes piping easy. Auto switches can be mounted through the use of special switch rails.

## Shock absorbers and adjusting bolt are standard equipment

Impacts at stroke end due to high speed use can be absorbed, and fine adjustment of the stroke is possible.

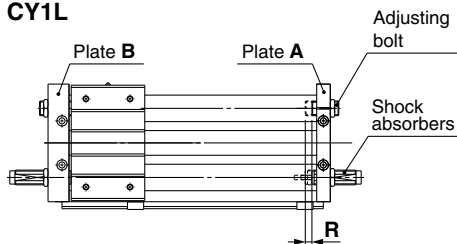


**Made to Order Specifications**  
(For details, refer to pages 1395 to 1565.)

Symbol	Specifications
—XB9	Low speed cylinder (15 to 50 mm/s)
—XB13	Low speed cylinder (7 to 50 mm/s)
—X116	Hydro specifications rodless cylinder
—X168	Helical insert thread specifications
—X322	Outside of cylinder tube with hard chrome plated

## Amount of Adjustment by Adjusting Bolt

### CY1L



Bore size (mm)	Amount of adjustment by adjusting bolt: R(mm)	
	Single side	Both sides
6	6	12
10	5.5	11
15	3.5	7
20	5.5	11
25	5	10
32	5.5	11
40	4.5	9

\* Since the cylinder is in an intermediate stop condition when stroke adjustment is performed, use caution regarding the operating pressure and the kinetic energy of the load.

\* The amount of adjustment for adjustment bolts is the total amount when adjusted on both plate ends. For the adjustment on a single plate end, the amount of adjustment is half of the figures in the table above.

\* Adjust the stroke adjustment with an adjustment bolt. It cannot be adjusted by a shock absorber.

## Specifications

Bore size (mm)	6	10	15	20	25	32	40	
Fluid	Air							
Proof pressure	1.05 MPa							
Maximum operating pressure	0.7 MPa							
Minimum operating pressure	0.18 MPa							
Ambient and fluid temperature	-10 to 60°C							
Piston speed *	50 to 500 mm/s							
Cushion	Rubber bumper/Shock absorber							
Lubrication	Not required (Non-lube)							
Stroke length tolerance	0 to 250 st: ${}^{+1.0}_0$ , 251 to 1000 st: ${}^{+1.4}_0$ , 1001 st and up: ${}^{+1.8}_0$							
Holding force	Type H	19.6	53.9	137	231	363	588	922
	Type L	—	—	81.4	154	221	358	569
Standard equipment	Auto switch mounting rail							

\* In the case of setting an auto switch at the intermediate position, the maximum piston speed is subject to restrict for detection upon the response time of a load (Relays, Sequence controller, etc.).

## Standard Stroke

Bore size (mm)	Standard stroke (mm)	Maximum available stroke (mm)
6	50, 100, 150, 200	300
10	50, 100, 150, 200, 250, 300	500
15	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	750
20	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1000
25		1500
32		1500
40	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000	1500

Note) Intermediate stroke is available by the 1 mm interval.

## Mass

Number of magnets	Bore size (mm)	(kg)						
		6	10	15	20	25	32	40
Basic mass	CY1L□H	0.324	0.580	1.10	1.85	2.21	4.36	4.83
	CY1L□L	—	—	1.02	1.66	2.04	4.18	4.61
Additional mass per each 50mm of stroke		0.044	0.077	0.104	0.138	0.172	0.267	0.406

Calculation

(Example) CY1L32H-500

• Basic mass ..... 4.36 kg • Additional mass ..... 0.267/50 st • Cylinder stroke ..... 500 st  
4.36 + 0.267 x 500 ÷ 50 = 7.03 kg

## Shock Absorber Specifications

Refer to the Series RB in Best Pneumatics No. 3 for the details on shock absorbers.

Applicable rodless cylinder	6 CY1L10 15	CY1L20	CY1L25	32 40 CY1L	
Shock absorber model	RB0805	RB1006	RB1411	RB2015	
Maximum energy absorption: (J)	0.98	3.92	14.7	58.8	
Stroke absorption: (mm)	5	6	11	15	
Collision speed: (m/s)	0.05 to 5				
Max. operating frequency: (cycle/min) *	80	70	45	25	
Ambient temperature range	-10 to 80 °C				
Spring force: (N)	Extended	1.96	4.22	6.86	8.34
	Retracted	3.83	6.18	15.3	20.50

\* It denotes the values at the maximum energy absorption per one cycle. Therefore, the operating frequency can be increased according to the energy absorption.

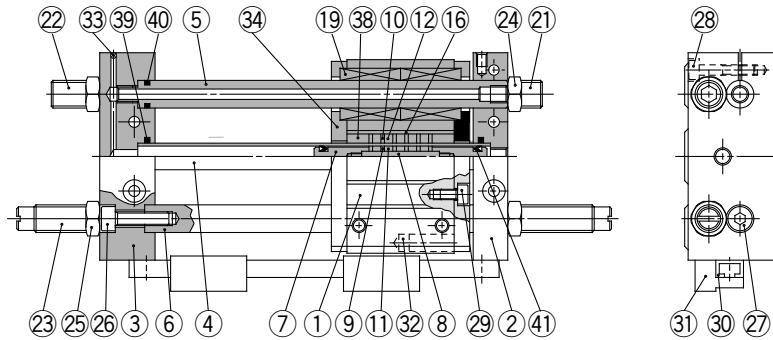
The shock absorber service life is different from that of the CY1L cylinder. Refer to the Specific Product Precautions for the replacement period.

# Series CY1L

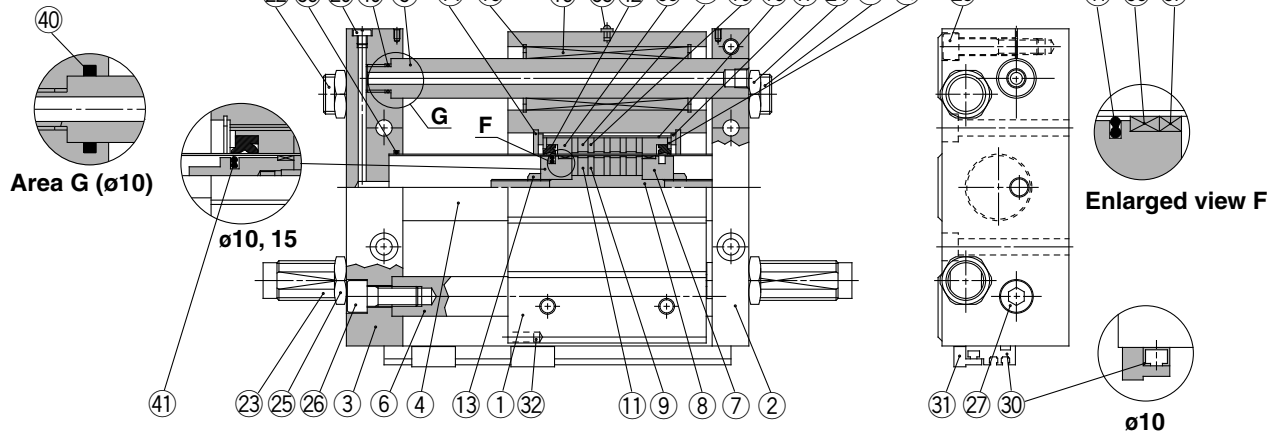
## Construction

### Slider type/Ball bushing bearing

#### CY1L6



#### CY1L10 to 40



### Component Parts

No.	Description	Material	Note
1	Slide block	Aluminum alloy	Anodized
2	Plate A	Aluminum alloy	Anodized
3	Plate B	Aluminum alloy	Anodized
4	Cylinder tube	Stainless steel	
5	Guide shaft A	Carbon steel	Hard chrome plated
6	Guide shaft B	Carbon steel	Hard chrome plated
7	Piston	Aluminum alloy <sup>Note 1)</sup>	Chromated
8	Shaft	Stainless steel	
9	Piston side yoke	Rolled steel	Zinc chromated
10	External slider side yoke	Rolled steel	Zinc chromated
11	Magnet A	—	
12	Magnet B	—	
13	Piston nut	Carbon steel	Zinc chromated ø25 to ø40
14	Retaining ring	Carbon tool steel	Nickel plated
15	Retaining ring	Carbon tool steel	Nickel plated
16	External slider tube	Aluminum alloy	
17	Slider spacer	Rolled steel	Nickel plated
18	Spacer	Rolled steel	Nickel plated
19	Ball bushing	—	
20	Plug	Brass	ø25, ø32, ø40 only
21	Adjusting bolt A	Chromium molybdenum steel	Nickel plated
22	Adjusting bolt B	Chromium molybdenum steel	Nickel plated
23	Shock absorber	—	
24	Hexagon nut	Carbon steel	Nickel plated
25	Hexagon nut	Carbon steel	Nickel plated
26	Hexagon socket head cap screw	Chromium molybdenum steel	Nickel plated
27	Hexagon socket head cap screw	Chromium molybdenum steel	Nickel plated
28	Hexagon socket head cap screw	Chromium molybdenum steel	Nickel plated

Note 1) Brass for ø6, ø10 and ø15

No.	Description	Material	Note
29	Hexagon socket head cap screw	Chromium molybdenum steel	Nickel plated
30	Switch mounting rail	Aluminum alloy	
31	Auto switch	—	
32	Magnet for auto switch	—	
33	Steel ball	—	ø6, ø10, ø15 only
34	Side cover	Carbon steel	ø6 only
35	Grease cup	Carbon steel	ø15 or larger
36*	Wear ring A	Special resin	
37*	Wear ring	Special resin	
38*	Wear ring B	Special resin	
39*	Cylinder tube gasket	NBR	
40*	Guide shaft gasket	NBR	
41*	Piston seal	NBR	
42*	Scraper	NBR	

### Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
6	CY1S6-PS-N	Set of nos. above 38, 39, 40, 41
10	CY1L10-PS-N	Set of nos. above 36, 38, 39, 40, 41, 42
15	CY1L15-PS-N	
20	CY1L20-PS-N	Set of nos. above 36, 37, 38, 39, 40, 41, 42
25	CY1L25-PS-N	
32	CY1L32-PS-N	
40	CY1L40-PS-N	

\* Seal kit includes 38, 39, 40, 41 for ø6. 36, 38 to 42 are for ø10, ø15. 36 to 42 are for ø20 to ø40. Order the seal kit, based on each bore size.

\* ø6: Same for CY1S6

\* Seal kit includes a grease pack (ø6, ø10: 5 and 10 g, ø15 to ø40: 10 g). Order with the following part number when only the grease pack is needed.

**Grease pack part no. for ø6, ø10: GR-F-005 (5 g) for external sliding parts,**

**GR-S-010 (10 g) for tube interior**

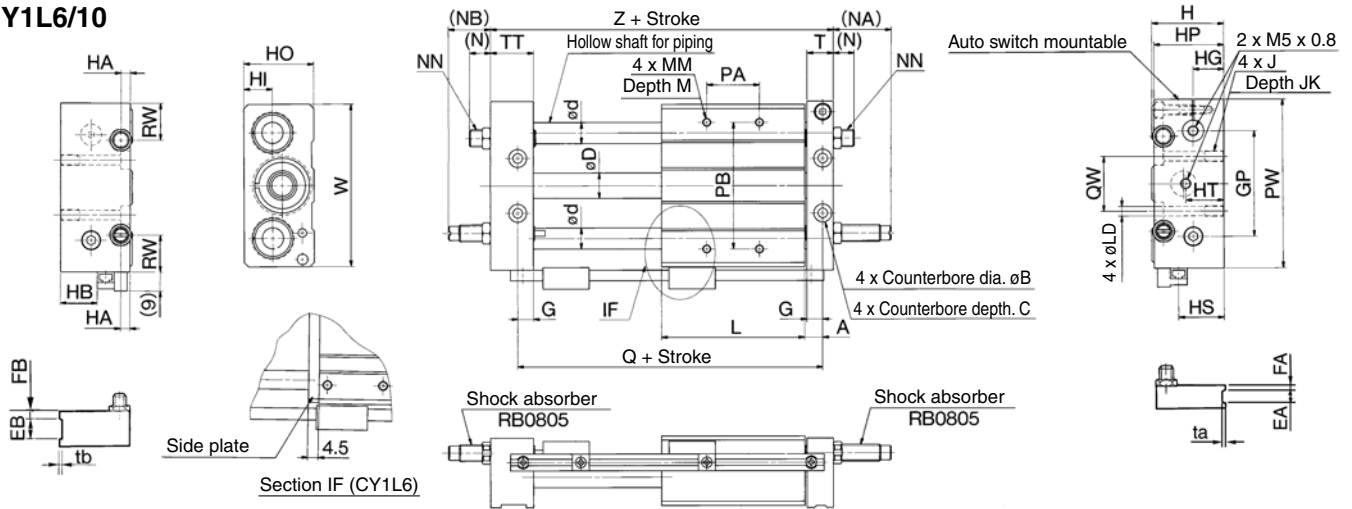
**Grease pack part no. for ø15 to ø40: GR-S-010 (10 g)**

# Magnetically Coupled Rodless Cylinder Slider Type: Ball Bushing Bearing **Series CY1L**

## Dimensions

### Slider type/Ball bushing bearing

#### CY1L6/10



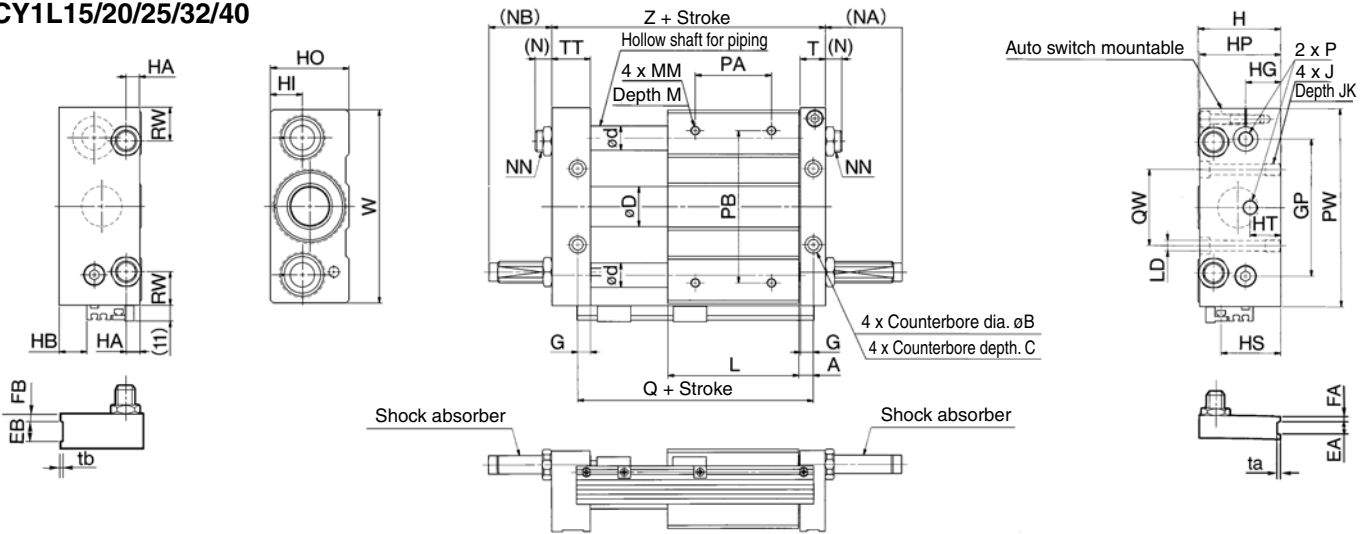
Model	A	B	C	D	d	EA	EB	FA	FB	G	GP	H	HA	HB	HG	HI	HO	HP	HS	HT	J	JK
<b>CY1L6</b>	7	6.5	3	7.6	8	—	—	—	—	6	36	27	6	10	11	9	25	26	14	16	M4 x 0.7	6.5
<b>CY1L10</b>	8.5	8	4	12	10	6	12	3	5	7.5	50	34	6	17.5	14.5	13.5	33	33	21.5	18	M5 x 0.8	9.5

Model	L	LD	M	MM	(N)	(NA)	(NB)	NN	PA*	PB	PW	Q	QW	RW	T	TT	ta	tb	W	Z
<b>CY1L6</b>	40	3.5	6	M4 x 0.7	11	30	24	M8 x 1.0	24	40	60	54	20	12	10	16	—	—	56	68
<b>CY1L10</b>	68	4.3	8	M4 x 0.7	10.5	27	19	M8 x 1.0	30	60	80	85	26	17.5	12.5	20.5	0.5	1.0	77	103

\* PA dimensions are for split from center.

#### CY1L15/20/25/32/40



Model	A	B	C	D	d	EA	EB	FA	FB	G	GP	H	HA	HB	HG	HI	HO	HP	HS	HT	J	JK	L	LD
<b>CY1L15</b>	7.5	9.5	5	16.6	12	6	13	3	6	6.5	65	40	6.5	4	16	14	38	39	25	16	M6 x 1.0	9.5	75	5.6
<b>CY1L20</b>	9.5	9.5	5.2	21.6	16	—	—	—	—	8.5	80	46	9	10	18	16	44	45	31	20	M6 x 1.0	10	86	5.6
<b>CY1L25</b>	9.5	11	6.5	26.4	16	8	14	4	7	8.5	90	54	9	18	23	21	52	53	39	20	M8 x 1.25	10	86	7
<b>CY1L32</b>	10.5	14	8	33.6	20	8	16	5	7	9.5	110	66	12	26.5	26.5	24.5	64	64	47.5	25	M10 x 1.5	15	100	9.2
<b>CY1L40</b>	11.5	14	8	41.6	25	10	20	5	10	10.5	130	78	12	35	30.5	28.5	76	74	56	30	M10 x 1.5	15	136	9.2

Model	M	MM	(N)	(NA)	(NB)	NN	P	PA*	PB	PW	Q	QW	RW	T	ta	tb	TT	W	Z	Shock absorber
<b>CY1L15</b>	8	M5 x 0.8	8.5	27	17	M8 x 1.0	M5 x 0.8	45	70	95	90	30	15	12.5	0.5	1.0	22.5	92	112	RB0805
<b>CY1L20</b>	10	M6 x 1.0	10.5	29	20	M10 x 1.0	Rc 1/8	50	90	120	105	40	28	16.5	—	—	25.5	117	130	RB1006
<b>CY1L25</b>	10	M6 x 1.0	12.5	49	40	M14 x 1.5	Rc 1/8	60	100	130	105	50	22	16.5	0.5	1.0	25.5	127	130	RB1411
<b>CY1L32</b>	12	M8 x 1.25	13.5	52	42	M20 x 1.5	Rc 1/8	70	120	160	121	60	33	18.5	0.5	1.0	28.5	157	149	RB2015
<b>CY1L40</b>	12	M8 x 1.25	12.5	51	36	M20 x 1.5	Rc 1/4	90	140	190	159	84	35	20.5	1.0	1.0	35.5	187	194	RB2015

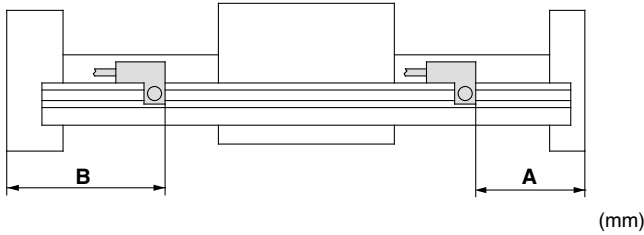
\* PA dimensions are for split from center.

- CY3B**
- CY3R**
- CY1S**
- CY1L**
- CY1H**
- CY1F**
- CYP**

- D-□**
- X□**
- Individual
- X□**
- Technical data

# Series CY1L

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



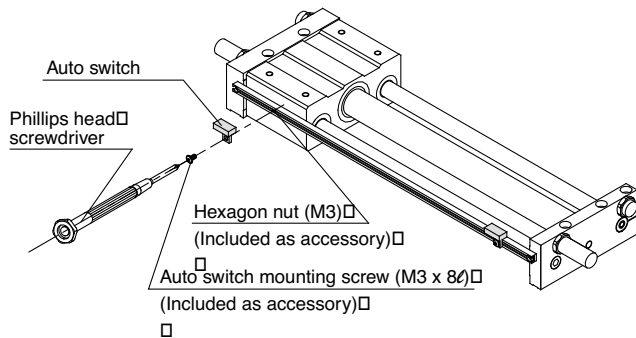
Bore size (mm)	Applicable auto switch					
	D-A73/A80		D-A72 □ D-A7□H/A80H D-A73C/A80C D-F7□/J79 D-F7□V/J79C D-F7□W/J79W D-F7□WV D-F7BAL/F7BAVL D-F79F		D-F7NTL	
	A	B	A	B	A	B
6	23□	45□	23.5□	44.5□	28.5□	39.5□
10	58□	45□	58.5□	44.5□	63.5□	39.5□
15	65□	47□	65.5□	46.5□	70.5□	41.5□
20	76□	54□	76.5□	53.5□	81.5□	48.5□
25	76□	54□	76.5□	53.5□	81.5□	48.5□
32	92□	57□	92.5□	56.5□	97.5□	51.5□
40	130	64	130.5	63.5	135.5	58.5

Note 1) 50 mm is the minimum stroke available with 2 auto switches mounted.  
In the case of a stroke less than this, please contact SMC.□

Note 2) Adjust the auto switch after confirming the operating conditions in the actual setting.

## Mounting of Auto Switch

When mounting an auto switch, the auto switch mounting screw should be screwed into a hexagon nut (M3 x 0.5) which has been inserted into the groove of the switch mounting rail. (Tightening torque: Approx. 0.5 to 0.7 N·m)



## Operating Range

Auto switch model□	Bore size (mm)						
	6	10	15	20	25	32	40
D-A7□/A8□	6□	6□	6□	6□	6□	6□	6□
D-F7□/J7□	3□	3□	4□	3□	3□	3□	3.5□
D-F79F	4.5	4.5	4.5	4.5	4.5	4.5	4.5

\* Since this is a guideline including hysteresis, not meant to be guaranteed. (Assuming approximately ±30% dispersion)□  
There may be the case it will vary substantially depending on an ambient environment.□

Other than the models listed in “How to Order”, the following auto switches are applicable.□  
For detailed specifications, refer to page 1314.

Type□	Model□	Electrical entry□ (Fetching direction)□	Features□
Solid state auto switch□	D-F7NTL□	Grommet □ (In-line)□	With timer□

\* With pre-wired connector is available for D-F7NTL type, too. □  
For details, refer to pages 1328 and 1329.□



# Series CY1L Specific Product Precautions

Be sure to read before handling. Refer to front matters 54 and 55 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

## Operation

### Warning

- 1. Be aware of the space between the plates and the slide block.**  
Take sufficient care to avoid getting your hands or fingers caught when the cylinder is operated.
- 2. Do not apply a load to a cylinder which is greater than the allowable value stated in the "Model Selection" pages.**  
This may cause malfunctions.
- 3. When the cylinder is used in a place where water or cutting oil may splash or the lubrication condition on the cylinder sliding parts would be deteriorated, please consult with SMC.**
- 4. When applying grease to the cylinder, use the grease that has already been applied to the product. Contact SMC for available grease packs.**

## Mounting

### Caution

- 1. Avoid operation with the external slider fixed to the mounting surface.**  
The cylinder should be operated with the plates fixed to the mounting surface.
- 2. Make sure that the cylinder mounting surface is a flatness of 0.2 mm or less.**  
If the flatness of the cylinder mounting surface is not appropriate, 2 guide shafts may be twisted. This may adversely affect the operating conditions and shorten the service life due to the increase of sliding resistance and the early abrasion of bearings.  
The cylinder mounting surface must be a flatness of 0.2 mm or less, and the cylinder must be mounted as it smoothly operates through the full stroke at the minimum operating pressure (0.18 MPa or less).

## Service Life and Replacement Period of Shock Absorber

### Caution

- 1. Allowable operating cycle under the specifications set in this catalog is shown below.**  
1.2 million times RB08□□  
2 million times RB10□□ to RB2725  
Note) Specified service life (suitable replacement period) is the value at room temperature (20 to 25°C).  
The period may vary depending on the temperature and other conditions. In some cases the absorber may need to be replaced before the allowable operating cycle above.

## Disassembly and Maintenance

### Warning

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

### Caution

- 1. Use caution when removing the external slider, as the piston slider will be directly attracted to it.**  
When removing the external slider or piston slider from the cylinder tube, first force the sliders out of their magnetically coupled positions, and then remove them individually when there is no longer any holding force. If they are removed while still magnetically coupled, they will be directly attracted to one another and will not come apart.
- 2. Since the magnetic holding force can be changed (for example, from CY1L25L to CY1L25H), please contact SMC if this is necessary.**
- 3. Do not disassemble the magnetic components (piston slider, external slider).**  
This can cause a loss of holding force and malfunction.
- 4. When disassembling to replace the seals and wear ring, refer to the separate disassembly instructions.**
- 5. Use caution to the direction of the external slider and the piston slider.**  
Since the external slider and piston slider are directional for  $\phi 6$ ,  $\phi 10$  and holding force type L, refer to the figures below when performing disassembly or maintenance. Put the external slider and piston slider together, and insert the piston slider into the cylinder tube so that they will have the correct positional relationship as shown in Fig. (1). If they align as shown in Fig. (2), insert the piston slider after turning it around 180°. If the direction is not correct, it will be impossible to obtain the specified holding force.

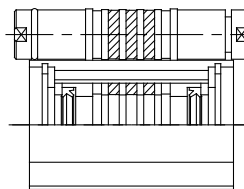


Fig. (1) Correct position

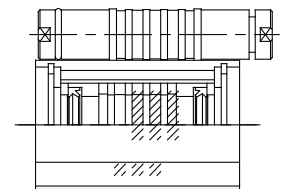


Fig. (2) Incorrect position

Example of  $\phi 15$  with holding force type L

CY3B  
CY3R

CY1S

CY1L

CY1H

CY1F

CYP

D-□

-X□

Individual  
-X□

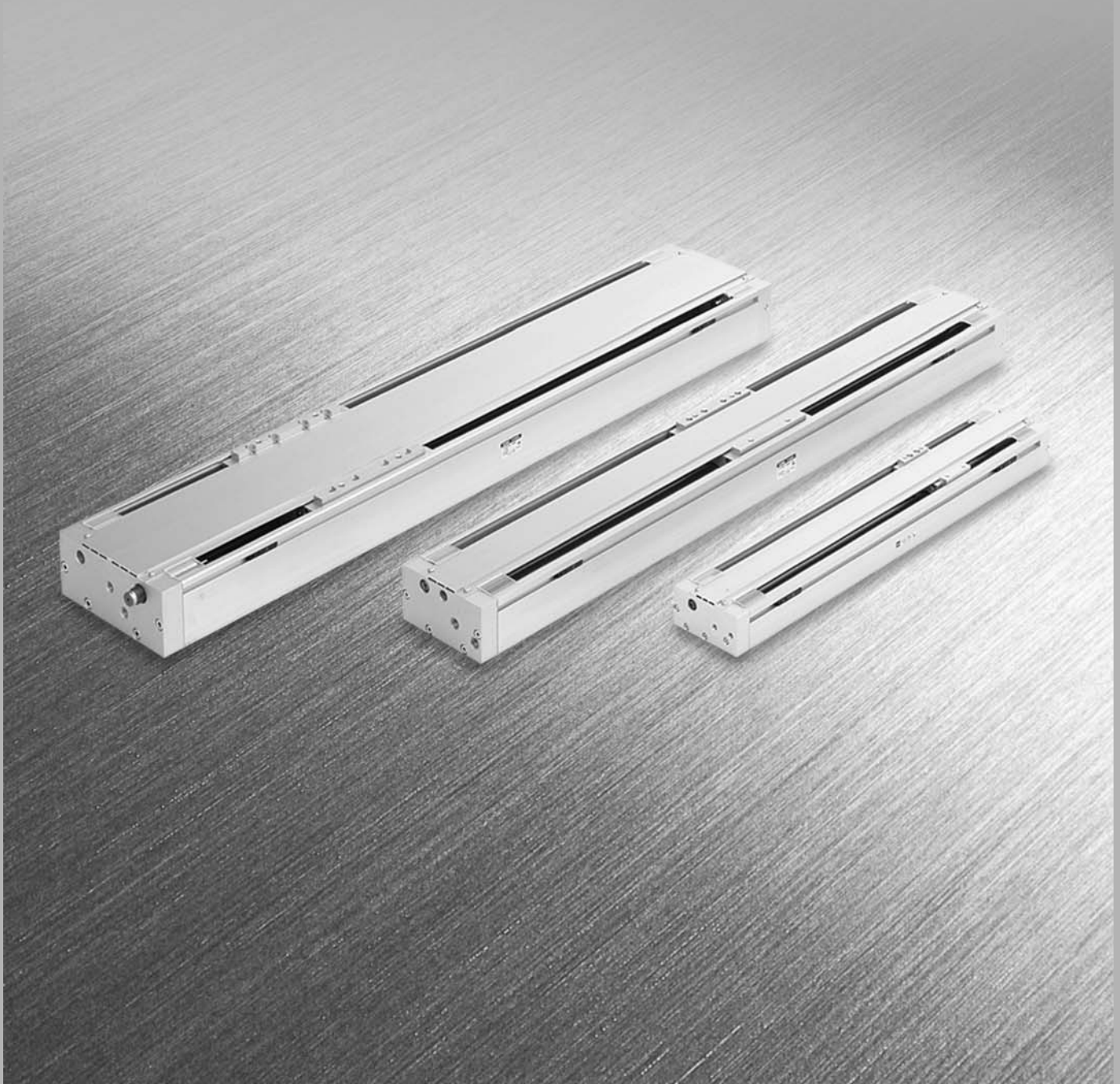
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# Linear Guide Type

## Series *CY1H*

Single axis type:  $\varnothing 10$ ,  $\varnothing 15$ ,  $\varnothing 20$ ,  $\varnothing 25$

Double axes type:  $\varnothing 25$ ,  $\varnothing 32$



CY3B  
CY3R

CY1S

CY1L

**CY1H**

CY1F

CYP

D-□

-X□

Individual  
-X□

Technical  
data

# Series CY1H Model Selection 1

E: Kinetic energy of load (J)

$$E = \frac{W}{2} \cdot \left( \frac{V}{1000} \right)^2$$

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

Ps: Operating pressure limit for intermediate stop using an external stopper, etc. (MPa)

Pv: Maximum operating pressure for vertical operation (MPa)

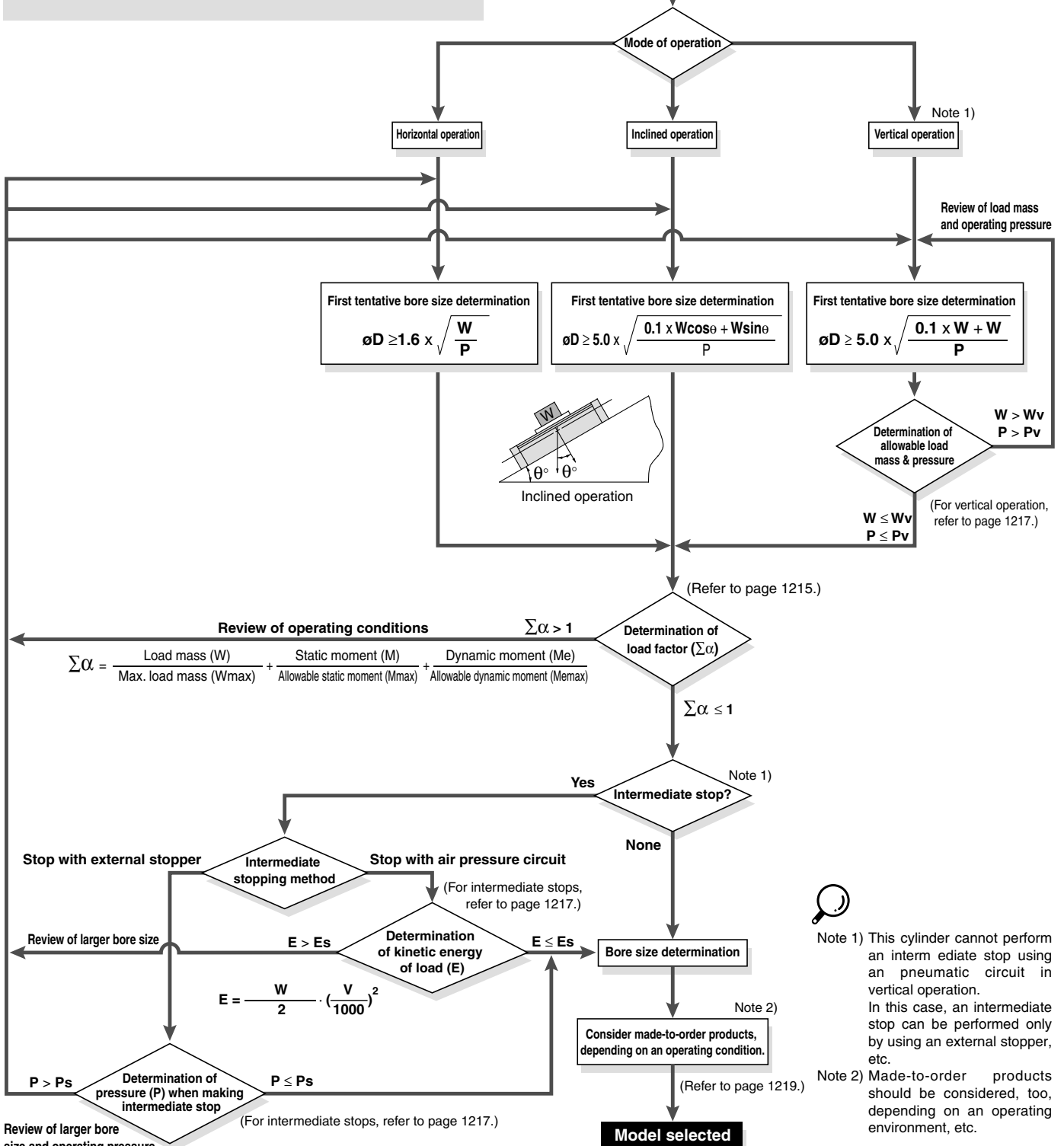
Wv: Allowable load mass for vertical operation (kg)

α: Load factor

$$\sum \alpha = \frac{\text{Load mass (W)}}{\text{Max. load mass (Wmax)}} + \frac{\text{Static moment (M)}}{\text{Allowable static moment (Mmax)}} + \frac{\text{Dynamic moment (Me)}}{\text{Allowable dynamic moment (Memax)}}$$

**Operating Conditions**

- W: Load mass (kg)
- V: Speed (mm/s)
- P: Operating pressure (MPa)
- Stroke (mm)
- Position of workpiece center of gravity (m)
- Mode of operation (Horizontal, Inclined, Vertical)



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

Note 2) Made-to-order products should be considered, too, depending on an operating environment, etc.

Review of larger bore size and operating pressure

# Series CY1H

## Model Selection 2

### Caution on Design (1)

The maximum load mass and allowable moment will differ depending on the workpiece mounting method, cylinder mounting orientation and piston speed. A determination of usability is performed based on the operating limit values in the graphs with respect to operating conditions, but the total ( $\Sigma \alpha_n$ ) of the load factors ( $\alpha_n$ ) for each mass and moment should not exceed 1.

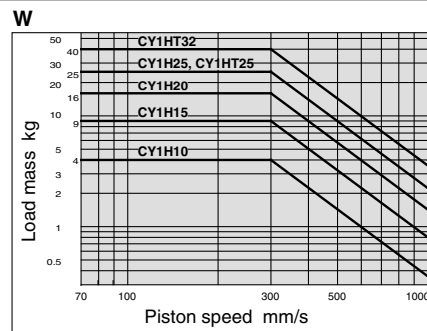
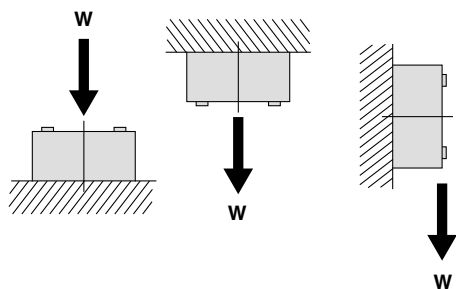
$$\Sigma \alpha_n = \frac{\text{Load mass (W)}}{\text{Maximum load mass (W max)}} + \frac{\text{Static moment (M)}}{\text{Allowable static moment (M max)}} + \frac{\text{Dynamic moment (Me)}}{\text{Allowable dynamic moment (Me max)}} \leq 1$$

Wmax, Mmax and Me max values are according to graph (1), (2) and (3) below.

### Load Mass

#### Maximum Load Mass

Model	W <sub>max</sub> (kg)
CY1H10	4.0
CY1H15	9.0
CY1H20	16.0
CY1H25	25.0
CY1HT25	
CY1HT32	40.0



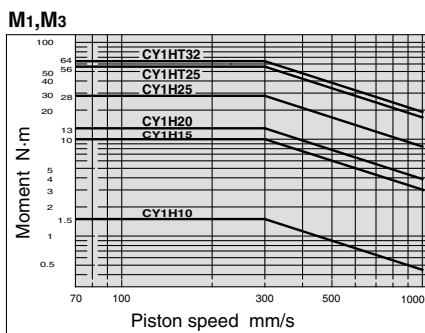
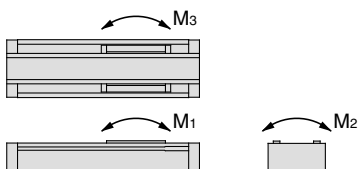
Graph (1)

### Moment

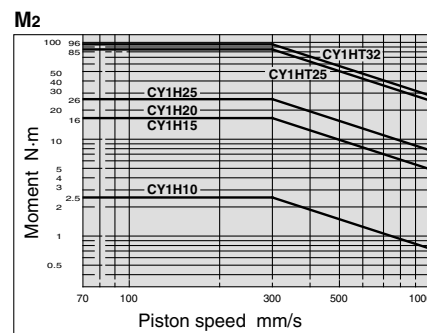
#### Allowable Moment (Static moment/Dynamic moment)

Model	M1	M2	M3
CY1H10	1.5	2.5	1.5
CY1H15	10	16	10
CY1H20	13	16	13

Model	M1	M2	M3
CY1H25	28	26	28
CY1HT25	56	85	56
CY1HT32	64	96	64



Graph (2)

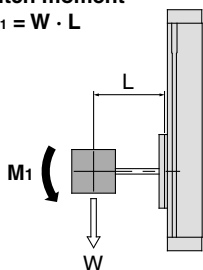


Graph (3)

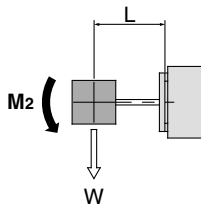
### Static Moment

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

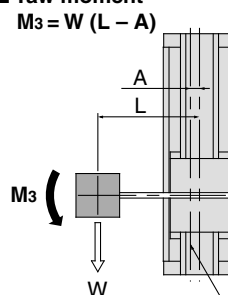
■ Pitch moment  
M<sub>1</sub> = W · L



■ Roll moment  
M<sub>2</sub> = W · L



■ Yaw moment  
M<sub>3</sub> = W (L - A)



(mm)

Model	A
CY1H10	15
CY1H15	17.5
CY1H20	19.5
CY1H25	23.5
CY1HT25	0*
CY1HT32	0*

\* Since there are 2 guides, the guides' central axis and the cylinder's central axis are the same.

### Dynamic Moment

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

$$We = \delta \cdot W \cdot V$$

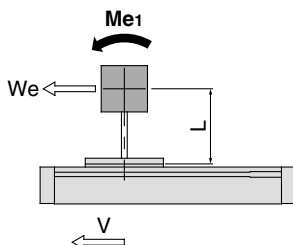
$$V = 1.4 Va$$

We: Load equivalent to impact [N]  
 $\delta$ : Bumper coefficient  
 With adjusting bolt (standard) = 4/100  
 With shock absorber = 1/100

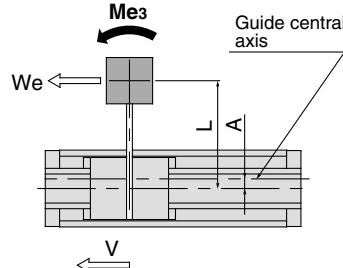
W: Load mass [kg]  
 V: Collision speed [mm/s]  
 Va: Average speed [mm/s]

■ Pitch moment  
Me<sub>1</sub> = 1/3\* · We · L

\* Average load coefficient



■ Yaw moment  
Me<sub>3</sub> = 1/3\* · We (L - A)



(mm)

Model	A
CY1H10	15
CY1H15	17.5
CY1H20	19.5
CY1H25	23.5
CY1HT25	0*
CY1HT32	0*

\* Since there are 2 guides, the guides' central axis and the cylinder's central axis are the same.

CY3B  
CY3R  
CY1S  
CY1L  
CY1H  
CY1F  
CYP

D-□  
-X□  
Individual  
-X□  
Technical  
data



# Series CY1H

## Model Selection 3

### 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.

$$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$$

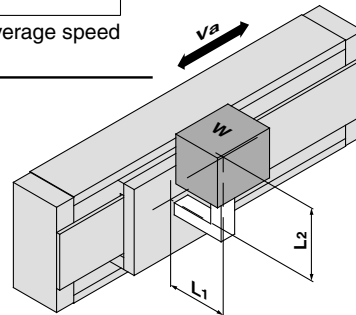
Item	Load factor $\alpha_n$	Note
1. Max. load mass	$\alpha_1 = W/W_{max}$	Examine <b>W</b> . <b>W<sub>max</sub></b> is the max. load mass for <b>V<sub>a</sub></b> .
2. Static moment	$\alpha_2 = M/M_{max}$	Examine <b>M<sub>1</sub></b> , <b>M<sub>2</sub></b> , <b>M<sub>3</sub></b> . <b>M<sub>max</sub></b> is the allowable moment for <b>V<sub>a</sub></b> .
3. Dynamic moment	$\alpha_3 = Me/M_{e_{max}}$	Examine <b>Me<sub>1</sub></b> , <b>Me<sub>3</sub></b> . <b>Me<sub>max</sub></b> is the allowable moment for <b>V</b> .

V : Collision speed    V<sub>a</sub> : Average speed

### Calculation Example

#### Operating Conditions

Cylinder: **CY1H15**  
 Cushion: Standard (Adjusting bolt)  
 Mounting: Horizontal wall mounting  
 Speed (average): **V<sub>a</sub> = 300 [mm/s]**  
 Load mass: **W = 1 [kg]** (excluding mass of arm section)  
**L<sub>1</sub> = 50 [mm]**  
**L<sub>2</sub> = 50 [mm]**



Item	Load factor $\alpha_n$	Note
<b>1 Maximum load mass</b> 	$\alpha_1 = W/W_{max}$ $= 1/9$ $= 0.111$	Examine <b>W</b> . Find the value of <b>W<sub>max</sub></b> when <b>V<sub>a</sub> = 300 mm/s</b> from Graph (1).
<b>2 Static moment</b> 	$M_2 = W \cdot L_1$ $= 10 \cdot 0.05$ $= 0.5 [N \cdot m]$ $\alpha_2 = M_2/M_2 \text{ max}$ $= 0.5/16$ $= 0.031$	Examine <b>M<sub>2</sub></b> . Since <b>M<sub>1</sub></b> & <b>M<sub>3</sub></b> are not generated, investigation is unnecessary. Find the value <b>M<sub>2</sub> max</b> when <b>V<sub>a</sub> = 300 mm/s</b> from Graph (3).
<b>3 Dynamic moment</b> 	From <b>V = 1.4 V<sub>a</sub></b> $We = \delta \cdot W \cdot V$ $= 4/100 \cdot 10 \cdot 1.4 \cdot 300$ $= 168 [N]$ $Me_3 = 1/3 \cdot We (L_2 - A)$ $= 1/3 \cdot 168 \cdot 0.032$ $= 1.8 [N \cdot m]$ $\alpha_3 = Me_3/Me_3 \text{ max}$ $= 1.8/7.2$ $= 0.250$	Examine <b>Me<sub>3</sub></b> . Find the load equivalent to impact <b>We</b> . Damper coefficient $\delta = 4/100$ (urethane damper) Find the value of <b>Me<sub>3</sub> max</b> when <b>V = 1.4</b> and <b>V<sub>a</sub> = 420 mm/s</b> from Graph (2).
	$Me_1 = 1/3 \cdot We \cdot L_1$ $= 1/3 \cdot 168 \cdot 0.05$ $= 2.8 [N \cdot m]$ $\alpha_4 = Me_1/Me_1 \text{ max}$ $= 2.8/7.2$ $= 0.389$	Examine <b>Me<sub>1</sub></b> . From above, <b>We = 168</b> Find the value of <b>Me<sub>3</sub> max</b> when <b>V = 1.4</b> and <b>V<sub>a</sub> = 420 mm/s</b> from Graph (2).

$$\begin{aligned} \Sigma\alpha_n &= \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 \\ &= 0.111 + 0.031 + 0.250 + 0.389 \\ &= 0.781 \end{aligned}$$

Can be used based on  $\Sigma\alpha_n = 0.781 \leq 1$

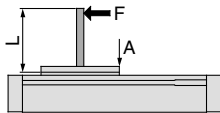
# Series CY1H Model Selection 4

## Caution on Design (2)

### Table Deflection

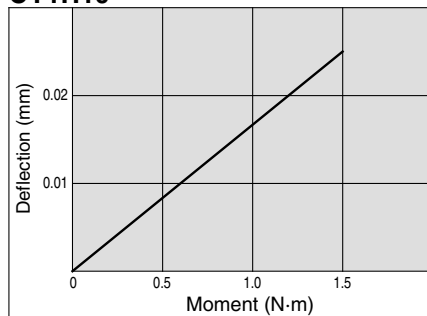
#### Table Displacement due to Pitch Moment Load

Displacement of Section A when force acts on Section F

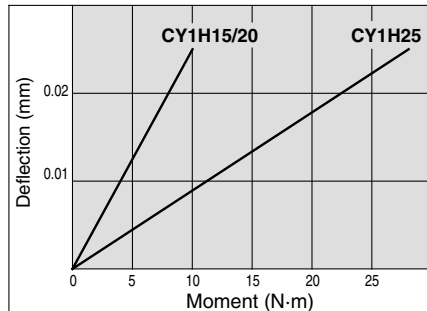


$$M1 = F \times L$$

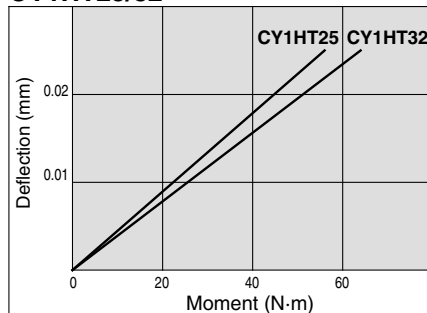
#### CY1H10



#### CY1H15/20/25

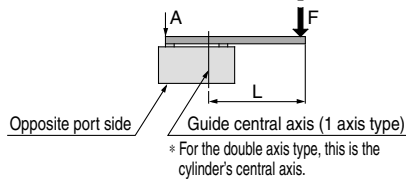


#### CY1HT25/32



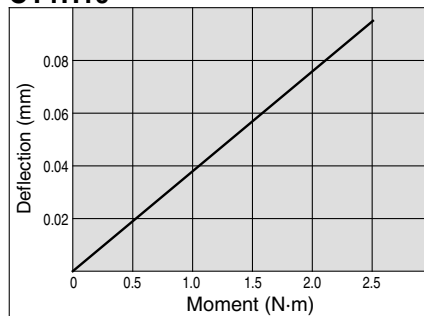
#### Table Displacement due to Roll Moment Load

Displacement of Section A when force acts on Section F

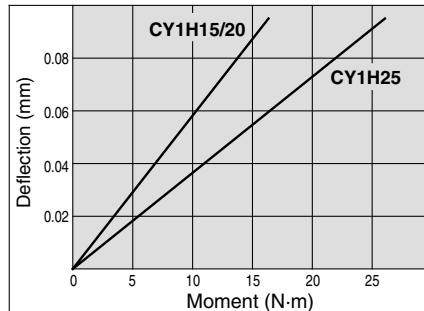


$$M2 = F \times L$$

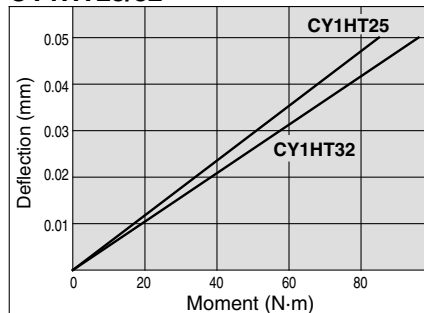
#### CY1H10



#### CY1H15/20/25

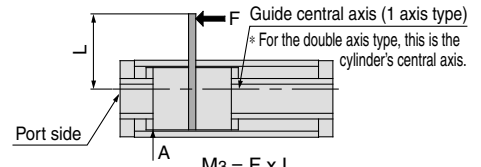


#### CY1HT25/32



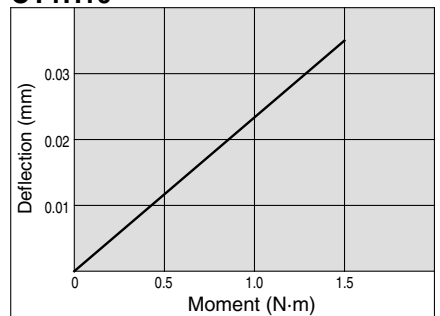
#### Table Displacement due to Yaw Moment Load

Displacement of Section A when force acts on Section F

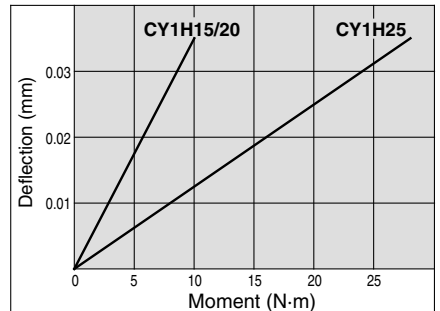


$$M3 = F \times L$$

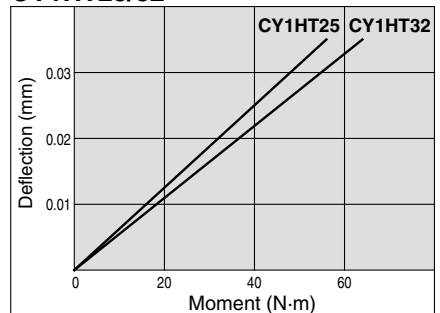
#### CY1H10



#### CY1H15/20/25



#### CY1HT25/32



### 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 sidelong, sliders 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-stroke, use an external stopper to secure accurate positioning.

Model	Allowable load mass (Wv) (kg)	Maximum operating pressure Pv (MPa)
CY1H10	2.7	0.55
CY1H15	7.0	0.65
CY1H20	11.0	0.65
CY1H25	18.5	0.65
CY1HT25	18.5	0.65
CY1HT32	30.0	0.65

### Intermediate Stop

(1) Intermediate Stopping of Load with External Stopper, etc.  
When stopping a load in mid-stroke using an external stopper, etc., operate within the operating pressure limits shown in the table below. The magnetic coupling will break if operated at a pressure exceeding these limits.

Model	Operating pressure limit for intermediate stop Ps (MPa)
CY1H10	0.55
CY1H15	0.65
CY1H20	0.65
CY1H25	0.65
CY1HT25	0.65
CY1HT32	0.65

(2) Intermediate Stopping of Load with Air Pressure Circuit  
When stopping a load using an air pressure circuit, operate at or below the kinetic energy shown in the table below. The magnetic coupling will break if the allowable value is exceeded.

Model	Allowable kinetic energy for intermediate stop Es (J)
CY1H10	0.03
CY1H15	0.13
CY1H20	0.24
CY1H25	0.45
CY1HT25	0.45
CY1HT32	0.88

CY3B  
CY3R

CY1S

CY1L

CY1H

CY1F

CYP

D-□

-X□

Individual

-X□

Technical data

# Magnetically Coupled Rodless Cylinder Linear Guide Type

## Series *CY1H*

Single axis:  $\phi 10$ ,  $\phi 15$ ,  $\phi 20$ ,  $\phi 25$ /Double axes:  $\phi 25$ ,  $\phi 32$

### How to Order

**CY1H**   **25**   - **300**   - **Y7BW**   -  

**Linear guide type** •

**Guide** •

Bore size (mm)		10	15	20	25	32
Symbol		●	●	●	●	—
Nil	1 axis	●	●	●	●	—
T	2 axes	—	—	—	●	●

**Bore size** •

10	10 mm
15	15 mm
20	20 mm
25	25 mm
32	32 mm

**Port thread type** •

Symbol	Type	Bore size
Nil	M thread	$\phi 10$ , $\phi 15$
	Rc	
TN	NPT	$\phi 20$ , $\phi 25$ , $\phi 32$
TF	G	

**Standard stroke (mm)** •  
Refer to "Standard Stroke" on page 1219.

**Made to Order**  
Refer to page 1219 for details.

**Number of auto switches**

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

**Auto switch**

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

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

**Adjustment type**

Nil	With adjusting bolt
B	With shock absorbers (2 pcs.)
BS	With shock absorber (1 pc. on port side)

\* The adjusting bolt is installed even when B or BS is selected. (Except  $\phi 10$ )

### Applicable Auto Switch/Refer to pages 1263 to 1371 for further information on auto switches.

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)*			Pre-wired connector	Applicable load			
					DC	AC	Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)		IC circuit	Relay, PLC		
							Perpendicular	In-line								
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	Y69A	Y59A	●	●	○	○	IC circuit	Relay, PLC	
				3-wire (PNP)				Y7PV	Y7P	●	●	○				
				2-wire	24 V	5 V, 12 V	—	Y69B	Y59B	●	●	○	○	○		—
				3-wire (NPN)				Y7NWV	Y7NW	●	●	○	○	○		IC circuit
				3-wire (PNP)				Y7PWV	Y7PW	●	●	○	○	○		—
				2-wire				Y7BWV	Y7BW	●	●	○	○	○		—
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	—	Z76	●	●	—	—	IC circuit	—	
				2-wire	24 V	12 V	100 V	—	Z73	●	●	●	—	—	Relay, PLC	
								5 V, 12 V	100 V or less	—	Z80	●	●	—		—

\* Lead wire length symbols: 0.5 m..... Nil (Example) Y7BW  
3 m..... L (Example) Y7BWL  
5 m..... Z (Example) Y7BWZ

\* Solid state auto switches marked with "○" are produced upon receipt of order.

• For details about auto switches with pre-wired connector, refer to pages 1328 and 1329.

• Normally closed (NC = b contact) solid state auto switches (D-Y7G/Y7H types) are also available. Refer to page 1292 for details.

\* Auto switches are shipped together, (but not assembled).

# Magnetically Coupled Rodless Cylinder Linear Guide Type **Series CY1H**

## Specifications



**Made to Order Specifications**  
(For details, refer to pages 1401, 1405 and 1549.)

Symbol	Specifications
—XB10	Intermediate stroke (Using exclusive body)
—XB11	Long stroke
—X168	Helical insert thread specifications

Bore size (mm)	10	15	20	25	32
<b>Fluid</b>	Air				
<b>Action</b>	Double acting				
<b>Maximum operating pressure</b>	0.7 MPa				
<b>Minimum operating pressure</b>	0.2 MPa				
<b>Proof pressure</b>	1.05 MPa				
<b>Ambient and fluid temperature</b>	-10 to 60°C				
<b>Piston speed</b>	70 to 1000 mm/s				
<b>Cushion (External stopper)</b>	Urethane bumpers on both ends (Standard), Shock absorber (Option)				
<b>Lubrication</b>	Not required (Non-lube)				
<b>Stroke length tolerance</b>	0 to 1.8 mm				
<b>Holding force N</b>	53.9	137	231	363	588
<b>Piping</b>	Centralized piping type				
<b>Piping port size</b>	M5 x 0.8		Rc 1/8		

## Theoretical Output

(N)

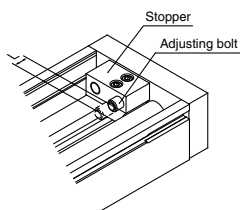
Bore size (mm)	Piston area (mm <sup>2</sup> )	Operating pressure (MPa)					
		0.2	0.3	0.4	0.5	0.6	0.7
10	78	15	23	31	39	46	54
15	176	35	52	70	88	105	123
20	314	62	94	125	157	188	219
25	490	98	147	196	245	294	343
32	804	161	241	322	402	483	563

Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm<sup>2</sup>)

## Amount of Adjustment by Adjusting Bolt

Stroke adjustment on one side of 15 mm (CY1H10/15/20) or 30 mm (CY1H25, CY1HT25, CY1HT32) can be performed with the adjustment bolt, but when the amount of adjustment exceeds 3 mm, the magnetic coupling may be broken depending on the operating conditions. Therefore, operation should conform to the intermediate stop conditions on page 1217.

Do not adjust strokes by moving the stopper, as this can cause cylinder damage.



Model	Stroke adjustment range L (mm)
CY1H10, CY1H15, CY1H20	0 to 15
CY1H25, CY1HT25, CY1HT32	0 to 30

## Standard Stroke

Bore size (mm)	Number of axes	Standard stroke (mm) <sup>Note)</sup>	Maximum available stroke (mm)
10	1 axis	100, 200, 300	500
15		100, 200, 300, 400, 500	750
20		100, 200, 300, 400, 500, 600	1000
25		100, 200, 300, 400, 500, 600, 800	1200
25	2 axes	100, 200, 300, 400, 500, 600, 800, 1000	

Note) Strokes are manufacturable in 1 mm increments up to the maximum strokes. Suffix “-XB10” to the end of the part number for intermediate strokes excluding standard strokes and “XB11” for strokes exceeding standard strokes up to the manufacturable maximum strokes.

## Mass

(kg)

Model	Standard stroke (mm)							
	100	200	300	400	500	600	800	1000
CY1H10	1.0	1.3	1.6	—	—	—	—	—
CY1H15	2.2	2.7	3.2	3.6	4.1	—	—	—
CY1H20	3.0	3.5	4.0	4.4	4.9	5.4	—	—
CY1H25	4.6	5.3	6.0	6.6	7.3	8.0	9.4	—
CY1HT25	5.1	6.2	7.3	8.3	9.4	10.4	12.5	14.6
CY1HT32	8.4	9.6	10.7	11.9	13.0	14.2	16.5	18.8

## Shock Absorber Specifications

Refer to the Series RB in Best Pneumatics No. 3 for the details on shock absorbers.

Applicable cylinder size (mm)	10	15	20	25	32	
<b>Shock absorber model</b>	RB0805	RB0806	RB1006	RB1411	RB2015	
<b>Maximum energy absorption (J)</b>	0.98	2.94	3.92	14.7	58.8	
<b>Stroke absorption (mm)</b>	5	6	6	11	15	
<b>Collision speed (m/s) *</b>	0.05 to 5					
<b>Max. operating frequency (cycle/min)</b>	80		70	45	25	
<b>Spring force (N)</b>	<b>Extended</b>		1.96	4.22	6.86	8.34
	<b>Retracted</b>		3.83	22	6.18	15.30
<b>Mass (g)</b>	15		25	65	150	

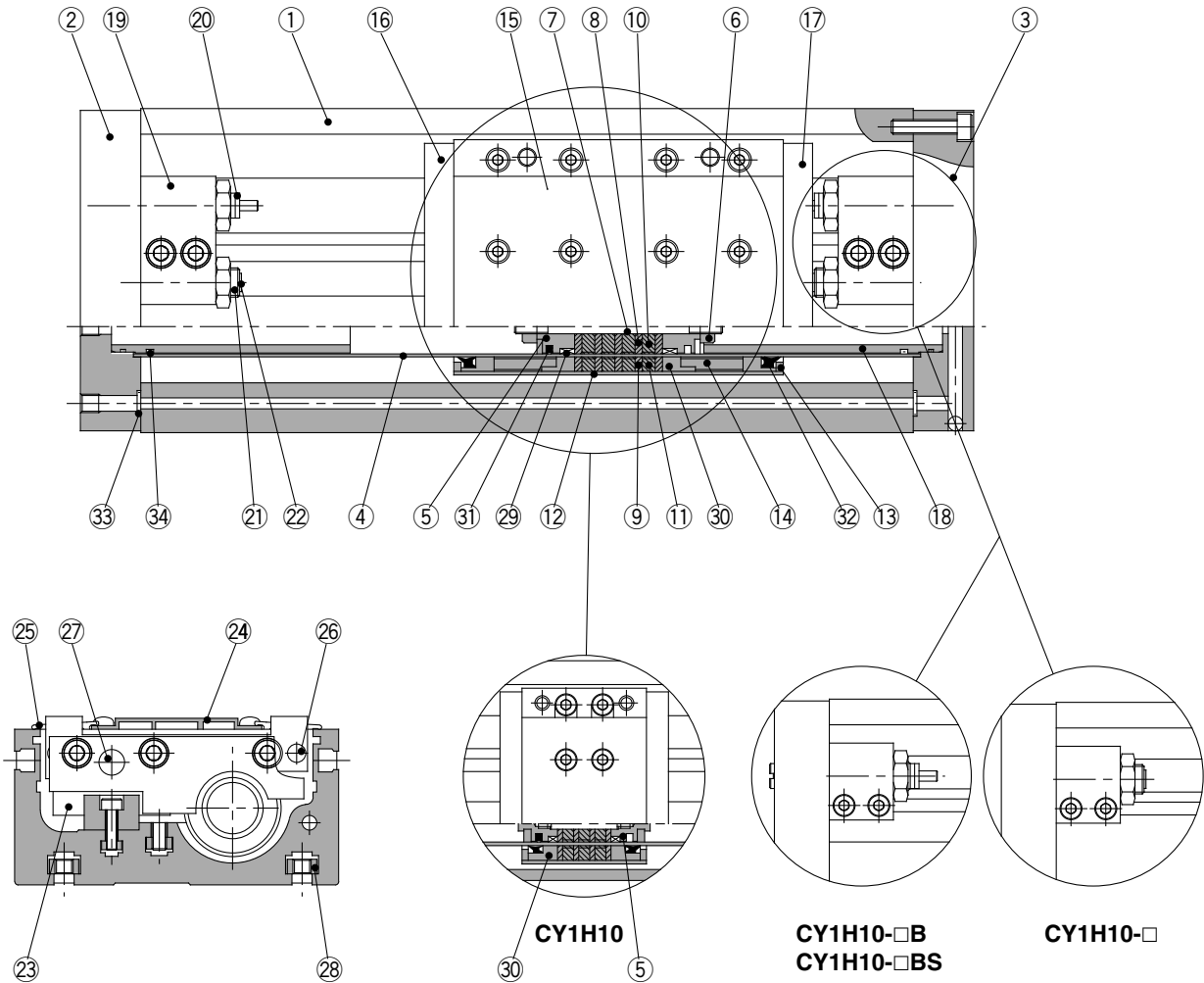
\* It denotes the values at the maximum energy absorption per one cycle. Therefore, the operating frequency can be increased according to the energy absorption.

The shock absorber service life is different from that of the CY1H cylinder. Refer to the Specific Product Precautions for the replacement period.

# Series CY1H

## Construction

### Single axis type / CY1H



#### Component Parts

No.	Description	Material	Note
1	Body	Aluminum alloy	Anodized
2	Plate A	Aluminum alloy	Anodized
3	Plate B	Aluminum alloy	Anodized
4	Cylinder tube	Stainless steel	
5	Piston	Brass	Electroless nickel plated (CY1H10/15)
		Aluminum alloy	Chromated (CY1H20/25)
6	Piston nut	Carbon steel	Zinc chromated (Except CY1H10/15)
7	Shaft	Stainless steel	
8	Piston side yoke	Rolled steel plate	Zinc chromated
9	External slider side yoke	Rolled steel plate	Zinc chromated
10	Magnet A	—	
11	Magnet B	—	
12	External slider tube	Aluminum alloy	
13	Spacer	Rolled steel plate	Nickel plated
14	Space ring	Aluminum alloy	Chromated (Except CY1H10)
15	Slide table	Aluminum alloy	Anodized
16	Side plate A	Aluminum alloy	Anodized
17	Side plate B	Aluminum alloy	Anodized
18	Internal stopper	Aluminum alloy	Anodized
19	Stopper	Aluminum alloy	Anodized
20	Shock absorber	—	Series RB
21	Adjusting bolt	Chrome molybdenum steel	Nickel plated
22	Adjusting bumper	Urethane rubber	
23	Linear guide	—	
24	Top cover	Aluminum alloy	Anodized
25	Dust cover	Special resin	

No.	Description	Material	Note
26	Magnet (For auto switch)	—	
27	Parallel pin	Carbon steel	Nickel plated
28	Square nut for body mounting	Carbon steel	Nickel plated
29*	Wear ring A	Special resin	
30*	Wear ring B	Special resin	
31*	Piston seal	NBR	
32*	Scraper	NBR	
33*	O-ring	NBR	
34*	O-ring	NBR	

Note) 4 square nuts for body mounting are included regardless of strokes.

#### Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
10	CY1H10-PS	Set of the above nos. 29, 30, 31, 32, 33, 34
15	CY1H15-PS	
20	CY1H20-PS	
25	CY1H25-PS	

\* Seal kit includes 29 to 34. Order the seal kit, based on each bore size.

\* Seal kit includes a grease pack (ø10: 5 and 10 g, ø15 to ø25: 10 g).

Order with the following part number when only the grease pack is needed.

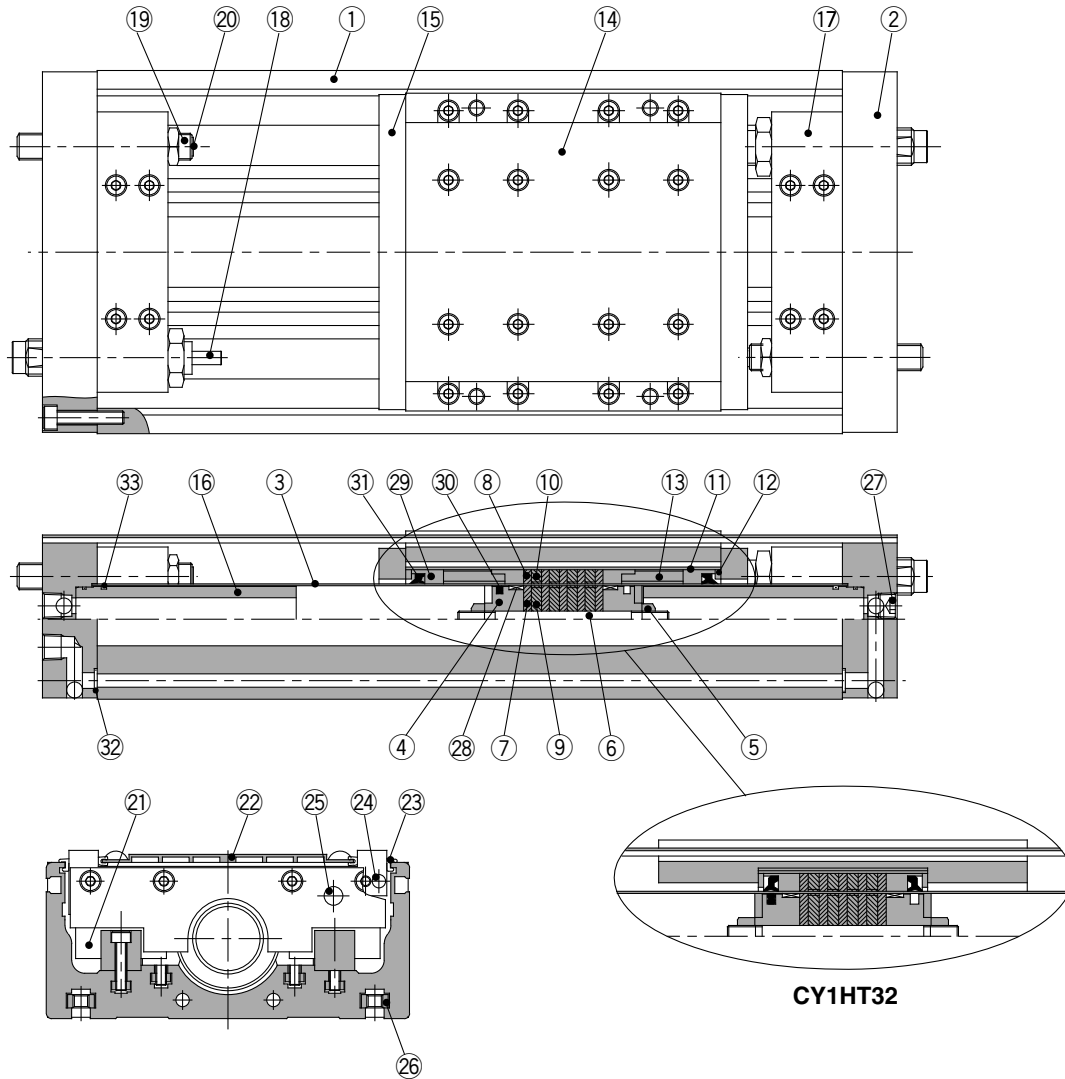
**Grease pack part no. for ø10: GR-F-005** (5 g) for external sliding parts,

**GR-S-010** (10 g) for tube interior

**Grease pack part no. for ø15 to ø25: GR-S-010** (10 g)

Construction

Double axes type / CY1HT



Component Parts

No.	Description	Material	Material
1	Body	Aluminum alloy	Anodized
2	Plate	Aluminum alloy	Anodized
3	Cylinder tube	Stainless steel	
4	Piston	Aluminum alloy	Chromated
5	Piston nut	Carbon steel	Zinc chromated
6	Shaft	Stainless steel	
7	Piston side yoke	Rolled steel plate	Zinc chromated
8	External slider side yoke	Rolled steel plate	Zinc chromated
9	Magnet A	—	
10	Magnet B	—	
11	External slider tube	Aluminum alloy	
12	Spacer	Rolled steel plate	Nickel plated
13	Space ring	Aluminum alloy	Chromated (Except CY1HT32)
14	Slide table	Aluminum alloy	Anodized
15	Side plate	Aluminum alloy	Anodized (Except CY1HT32)
16	Internal stopper	Aluminum alloy	Anodized
17	Stopper	Aluminum alloy	Anodized
18	Shock absorber	—	Series RB
19	Adjusting bolt	Chrome molybdenum steel	Nickel plated
20	Adjusting bumper	Urethane rubber	
21	Linear guide	—	
22	Top cover	Aluminum alloy	Anodized
23	Dust cover	Special resin	
24	Magnet (For auto switch)	—	
25	Parallel pin	Stainless steel	

No.	Description	Material	Material
26	Square nut for body mounting	Carbon steel	Nickel plated
27	Hexagon socket head taper plug	Carbon steel	Nickel plated
28*	Wear ring A	Special resin	
29*	Wear ring B	Special resin	
30*	Piston seal	NBR	
31*	Scraper	NBR	
32*	O-ring	NBR	
33*	O-ring	NBR	

Note) 4 square nuts for body mounting are included regardless of strokes.

Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
25	CY1HT25-PS	Set of the above nos.
32	CY1HT32-PS	28, 29, 30, 31, 32, 33

\* Seal kit includes 28 to 33. Order the seal kit, based on each bore size.

\* Seal kit includes a grease pack (10 g).

Order with the following part number when only the grease pack is needed.

Grease pack part no.: GR-S-010 (10 g)

CY3B  
CY3R  
CY1S  
CY1L  
CY1H  
CY1F  
CYP

D-□

-X□

Individual

-X□

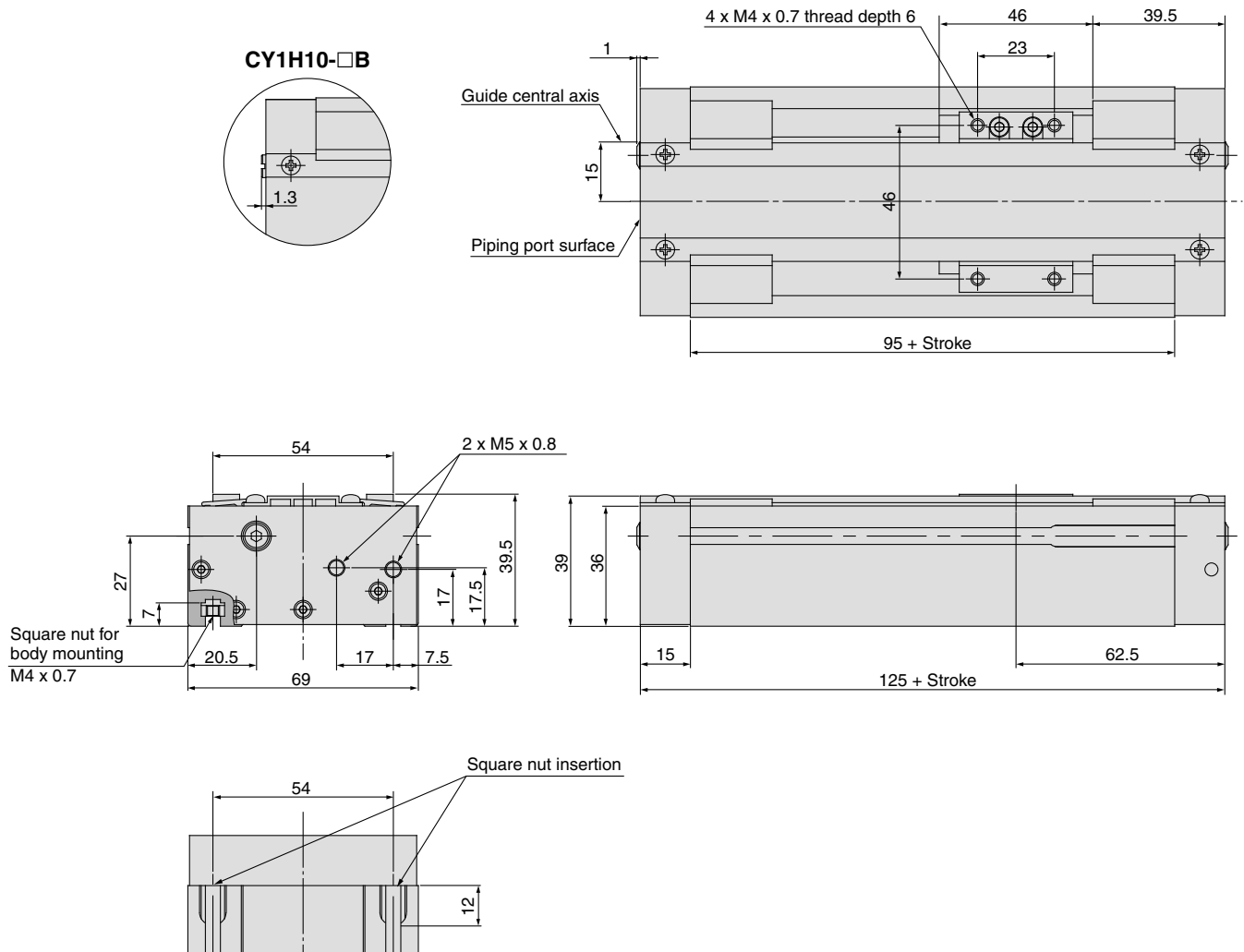
Technical data

# Series CY1H

## Dimensions

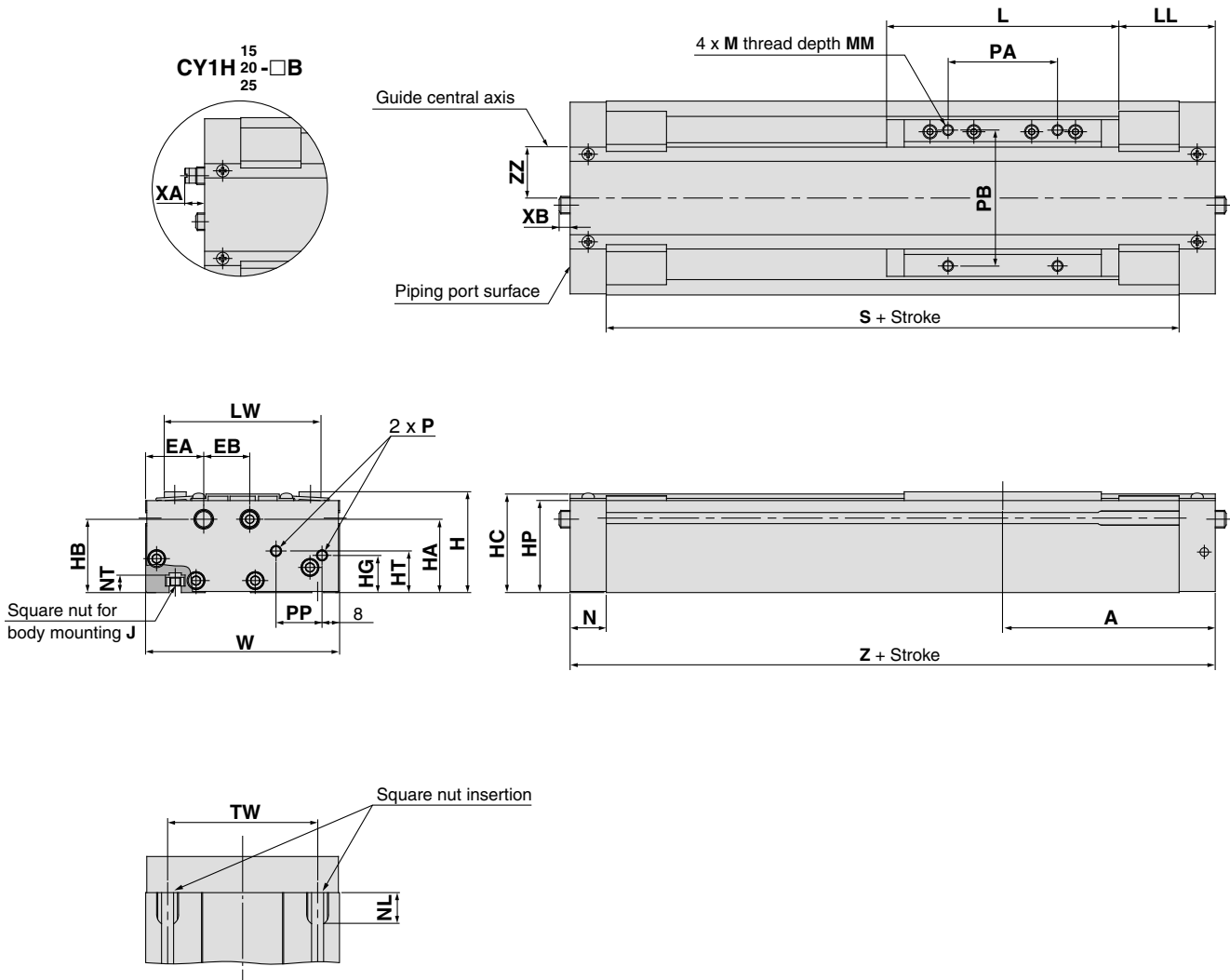
### Single axis type / $\varnothing 10$

#### CY1H10



**Dimensions**

**Single axis type /  $\varnothing 15, \varnothing 20, \varnothing 25$   
CY1H15/20/25**



- CY3B
- CY3R
- CY1S
- CY1L
- CY1H
- CY1F
- CYP

(mm)

Model	A	EA	EB	H	HA	HB	HC	HG	HP	HT	J	L	LL	LW	M	MM	N	NL	NT
<b>CY1H15</b>	97	26.5	21	46	33.5	33.5	45	17	42	19	M5 x 0.8	106	44	71.5	M5 x 0.8	8	16.5	15	8
<b>CY1H20</b>	102.5	26.5	22	54	42.5	41.5	53	16	50	23.5	M5 x 0.8	108	48.5	75.5	M5 x 0.8	8	18	15	8
<b>CY1H25</b>	125	29	24	63	46	46	61.5	25	58.5	28	M6 x 1.0	138	56	86	M6 x 1.0	10	20.5	18	9

Model	P	PA	PB	PP	S	TW	W	XA	XB	Z	ZZ
<b>CY1H15</b>	M5 x 0.8	50	62	21	161	65	88.5	—	—	194	17.5
<b>CY1H20</b>	Rc1/8	50	65	23	169	70	92.5	—	—	205	19.5
<b>CY1H25</b>	Rc1/8	65	75	27	209	75	103	11.3	9.5	250	23.5

- D-□
- X□
- Individual  
 -X□
- Technical  
data

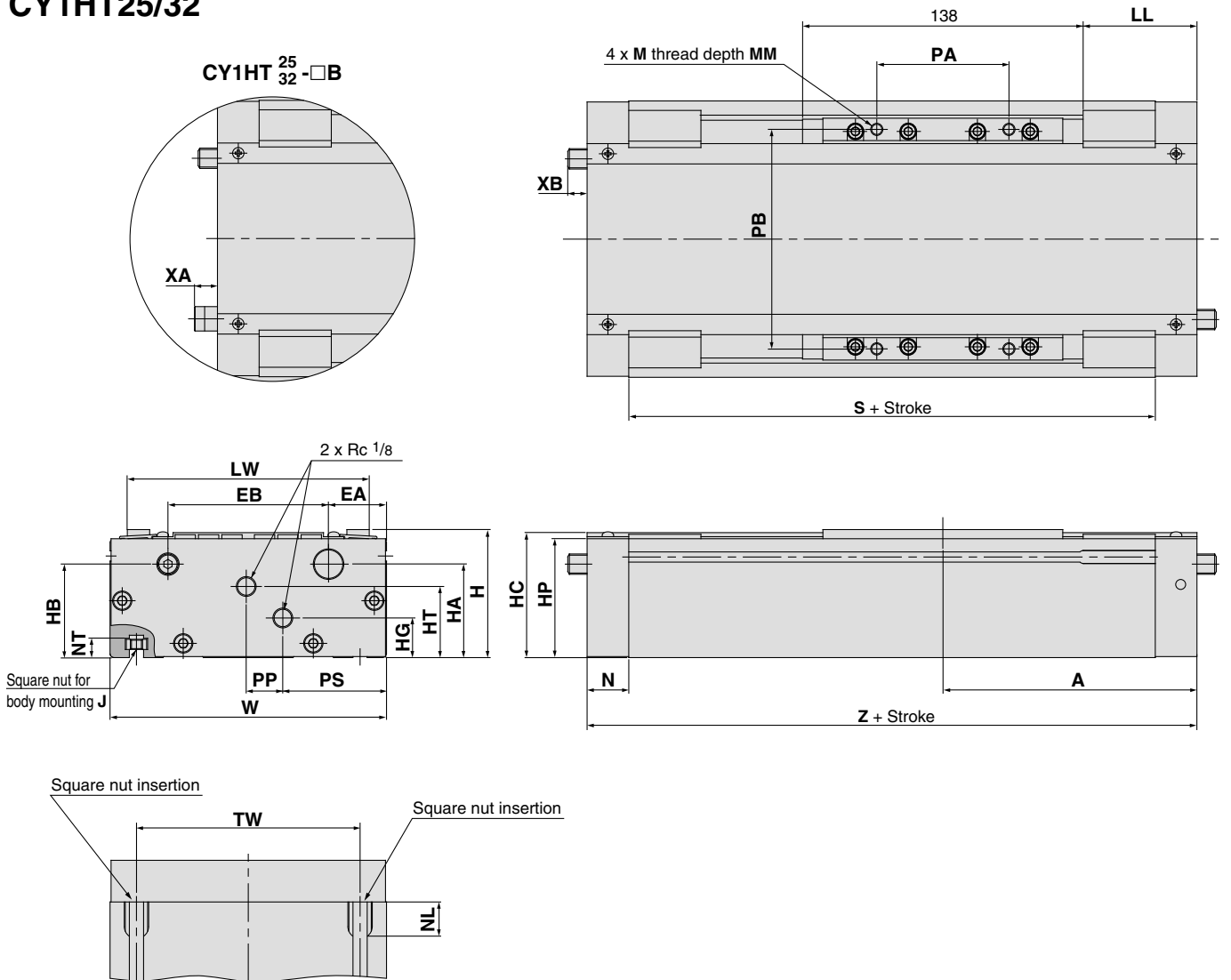


# Series CY1H

## Dimensions

### Double axes type: / $\varnothing 25$ , $\varnothing 32$

#### CY1HT25/32

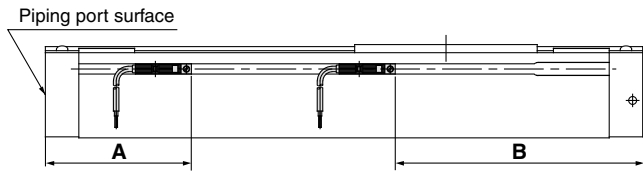


Model	A	EA	EB	H	HA	HB	HC	HG	HP	HT	J	LL	LW	M	MM	N	NL	NT	PA
CY1HT25	125	28.5	79	63	46	46	61.5	19.5	58.5	35	M6 x 1.0	56	119	M6 x 1.0	10	20.5	18	9	65
CY1HT32	132.5	30	90	75	52.5	57.5	72.5	25	69.5	43	M8 x 1.25	63.5	130	M8 x 1.25	12	23	22.5	12	66

Model	PB	PP	PS	S	TW	W	XA	XB	Z
CY1HT25	108	18	51	209	110	136	11.3	9.5	250
CY1HT32	115	14	61	219	124	150	9.7	2	265

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



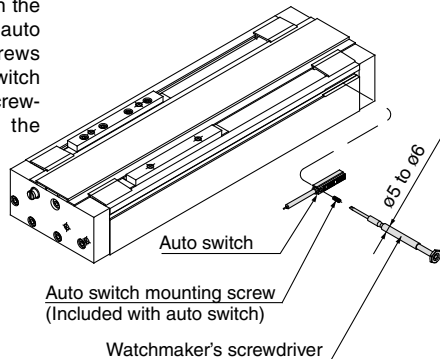
Cylinder model	Applicable auto switch	
	D-Z7□/ Z80/ Y5□/ Y6□/ Y7□	
	A	B
CY1H10	65.5	59.5
CY1H15	72	122
CY1H20	77.5	127.5
CY1H25	86	164
CY1HT25	86	164
CY1HT32	82	183

\* 50 mm is the minimum stroke available with 2 auto switches mounted. Please contact SMC in the case of a stroke less than this.

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

## Mounting of Auto Switch

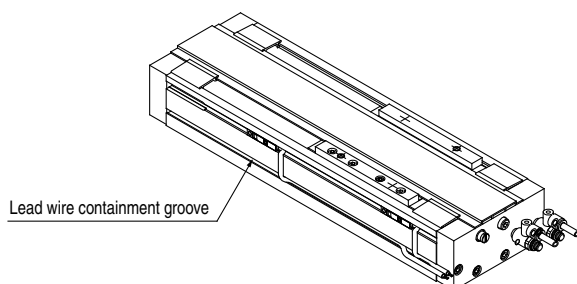
To install the auto switch, insert the auto switch into the installation groove of the cylinder from the direction shown in the drawing on the right, and tighten the auto switch mounting screws attached to the auto switch with a watchmaker's screwdriver after setting the mounting position.



Note) Use a watchmaker's screwdriver with a grip diameter of 5 to 6 mm to tighten the auto switch mounting screws (attached to the auto switch).  
The tightening torque should be 0.05 to 0.1 N•m.

## Auto Switch Lead Wire Containment Groove

On models CY1H20 and CY1H25 a groove is provided on the side of the body (one side only) to contain auto switch lead wires. This should be used for management of wiring.



## Operating Range

Cylinder model	Auto switch model	Bore size (mm)				
		10	15	20	25	32
CY1H	D-Z7□/ Z80	8	6	6	6	—
	D-Y5□/ Y6□/ Y7□	6	5	5	5	—
CY1HT	D-Z7□/ Z80	—	—	—	6	9
	D-Y5□/ Y6□/ Y7□	—	—	—	5	6

\* Some auto switches cannot be mounted.

\* Since this is a guideline including hysteresis, not meant to be guaranteed. (Assuming approximately  $\pm 30\%$  dispersion)  
There may be the case it will vary substantially depending on an ambient environment.

CY3B  
CY3R

CY1S

CY1L

**CY1H**

CY1F

CYP

D-□

-X□

Individual  
-X□

Technical  
data



# Series CY1H Specific Product Precautions 1

Be sure to read before handling. Refer to front matters 54 and 55 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

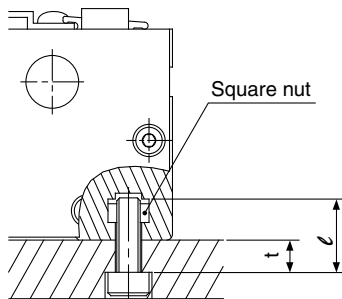
## Mounting

### ⚠ Caution

1. The interior is protected to a certain extent by the top cover, however, when performing maintenance, etc., take care not to cause scratches or other damage to the cylinder tube, slide table or linear guide by striking them or placing objects on them. Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause faulty operation.
2. Because the slider is supported by precision bearings, take care not to apply strong impacts or excessive moments to the table when loading a workpiece.
3. Mounting of the cylinder body

The body is mounted using the square nuts, which are included, in the two T-slots on the bottom of the body. Refer to the table below for mounting bolt dimensions and tightening torque.

Model		CY1H10	CY1H15	CY1H20	CY1H25	CY1HT25	CY1HT32
Bolt dimensions	Thread size	M4 x 0.7	M5 x 0.8		M6 x 1.0		M8 x 1.25
	Dimension t	ℓ-7	ℓ-8	ℓ-8	ℓ-9		ℓ-12
Tightening torque	N · m	1.37	2.65		4.4		13.2



## Operation

### ⚠ Warning

1. Be aware of the space between the plates and the slide block.  
Take sufficient care to avoid getting your hands or fingers caught when the cylinder is operated.
2. Do not apply a load to a cylinder which is greater than the allowable value stated in the “Model Selection” pages.  
This may cause malfunctions.
3. When the cylinder is used in a place where water or cutting oil may splash or the lubrication condition on the cylinder sliding parts would be deteriorated, please consult with SMC.
4. When applying grease to the cylinder, use the grease that has already been applied to the product. Contact SMC for available grease packs.

### ⚠ Caution

1. The unit can be used with a direct load within the allowable range, but when connecting to a load which has an external guide mechanism, careful alignment is necessary.  
Since variation of the shaft center increases as the stroke becomes longer, a connection method should be devised which allows for this displacement.
2. Since the guide is adjusted at the time of shipment, unintentional movement of the adjustment setting should be avoided.
3. This unit can be operated without lubrication. If lubrication is performed, use turbine oil Class 1 (with no additives), ISO VG32. (Machine oil and spindle oil cannot be used.)
4. Please contact SMC before operating in an environment where there will be contact with cutting chips, dust (paper debris, lint, etc.) or cutting oil (gas oil, water, warm water, etc.).
5. Do not operate with the magnetic coupling out of position.  
In case the magnetic coupling is out of position, push the external slider back into the correct position by hand at the end of the stroke (or correct the piston slider with air pressure).
6. Do not disassemble the magnetic components (piston slider, external slider).  
This can cause a loss of holding power and malfunction.

## Service Life and Replacement Period of Shock Absorber

### ⚠ Caution

1. Allowable operating cycle under the specifications set in this catalog is shown below.
  - 1.2 million times RB08□□
  - 2 million times RB10□□ to RB2725

Note) Specified service life (suitable replacement period) is the value at room temperature (20 to 25°C).  
The period may vary depending on the temperature and other conditions. In some cases the absorber may need to be replaced before the allowable operating cycle above.

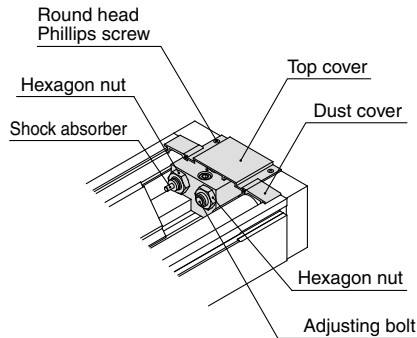


# Series CY1H Specific Product Precautions 2

Be sure to read before handling. Refer to front matters 54 and 55 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

## Stroke Adjustment Method

Loosen the round head Phillips Screws, and remove the top cover and dust covers (4 pcs.).



Loosen the hexagon nut, adjust the stroke with a hexagon wrench from the plate side, and secure by retightening the hexagon nut. When there is a shock absorber, loosen the hexagon nut, adjust the stroke, and then retighten the hexagon nut.

Adjustment should be performed to make effective use of the shock absorber's absorption capacity, with its position relative to the adjustment bolt as shown in the figure to the right.

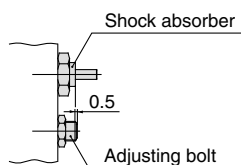
## ⚠ Caution

1. If the effective stroke of the shock absorber is shortened by the stroke adjustment, its absorption capacity will be drastically reduced. Therefore, the adjusting bolt should be secured at a position where it projects about 0.5 mm farther than the shock absorber.

### Lock Nut Tightening Torque

N·m

Model	For shock absorber	For adjusting bolt
CY1H10	1.67	1.67
CY1H15		
CY1H20	3.14	3.14
CY1H25	10.8	
CY1HT25	23.5	
CY1HT32		



After completing the above adjustment, replace the top cover and dust covers back into place.

The round head Phillips screws for securing the top cover should be tightened with a torque of 0.58 N·m.

CY3B  
CY3R

CY1S

CY1L

**CY1H**

CY1F

CYP

D-□

-X□

Individual  
-X□

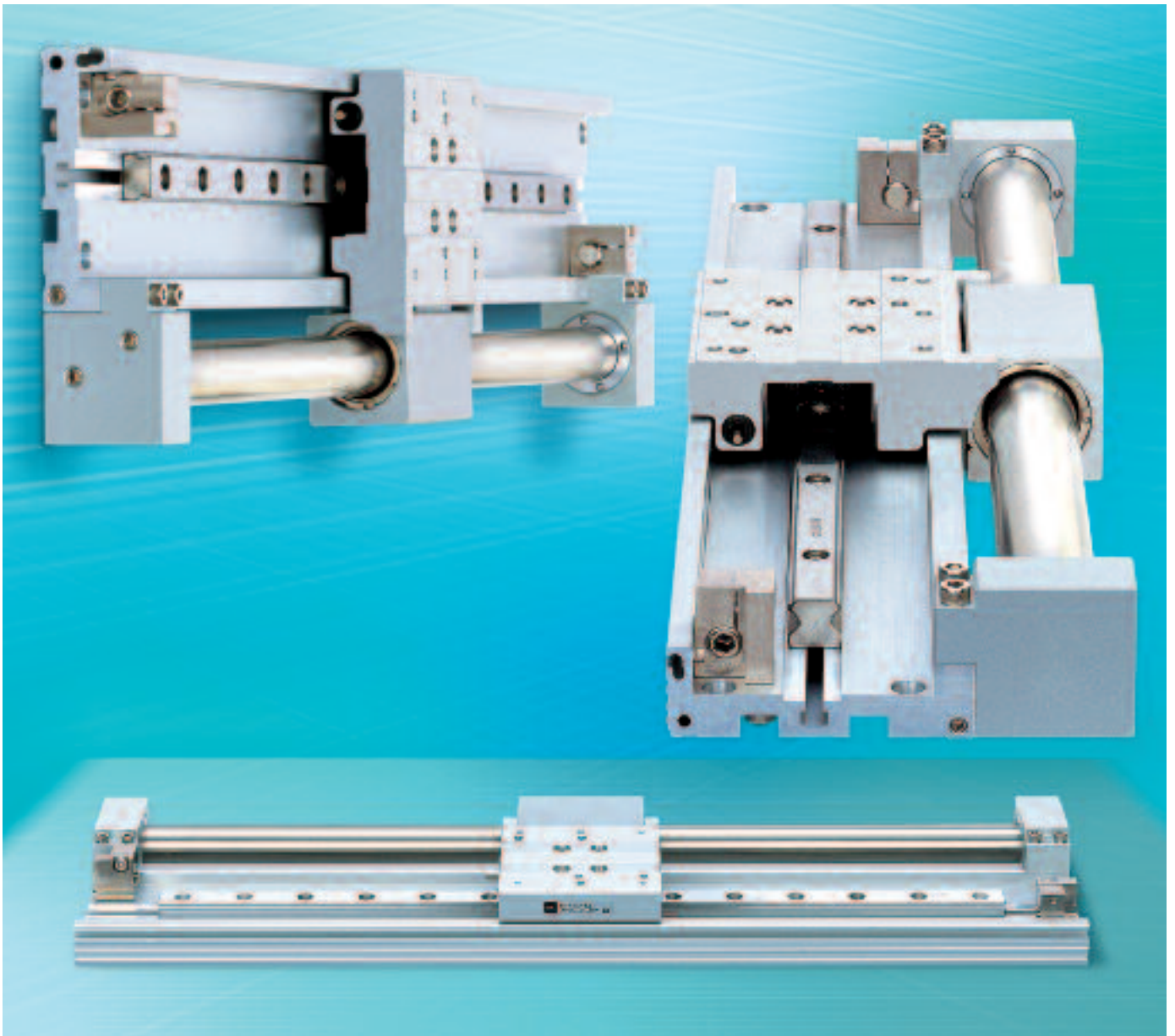
Technical  
data



Magnetically Coupled Rodless Cylinder  
Low Profile Guide Type

**Series** ***CY1F***

Size:  $\varnothing 10$ ,  $\varnothing 15$ ,  $\varnothing 25$

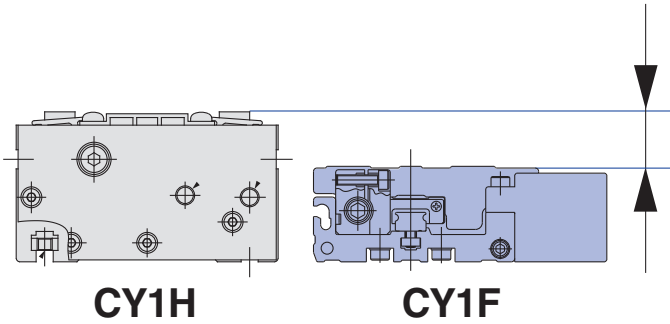


**Magnetically coupled rodless cylinder featuring compact and low profile design.**

# Magnetically coupled rodless cylinder

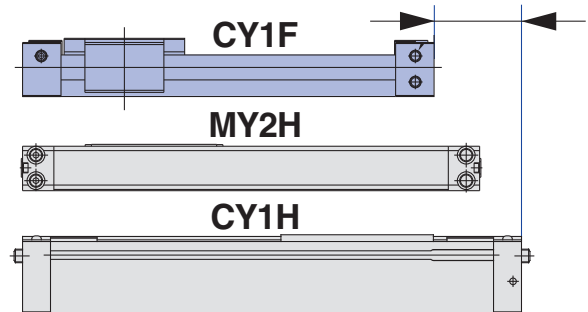
## With reduced mounting height and overall length,

Low profile **Height reduced by 29%**



Height			
Series	ø10	ø15	ø25
CY1F	28	34	46
CY1H	39.5	46	63

Compact body **Overall length reduced by 31%**



Overall length			
Series	ø10	ø15	ø25
CY1F	198	205	240
CY1H	225	294	350
MY2H	—	260	310

\*For 100mm stroke cylinder

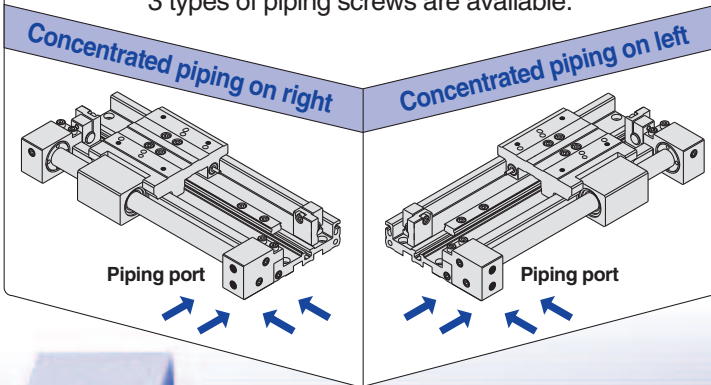
Overall length reduced by 22% compared to Series MY2H

Magnetically coupled rodless cylinder: Low profile guide

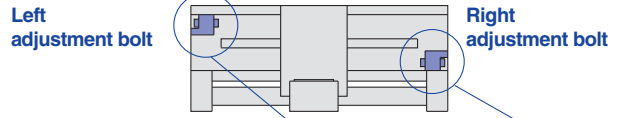
**Series CY1F: ø10, ø15, ø25**

Various concentrated piping ports are available.

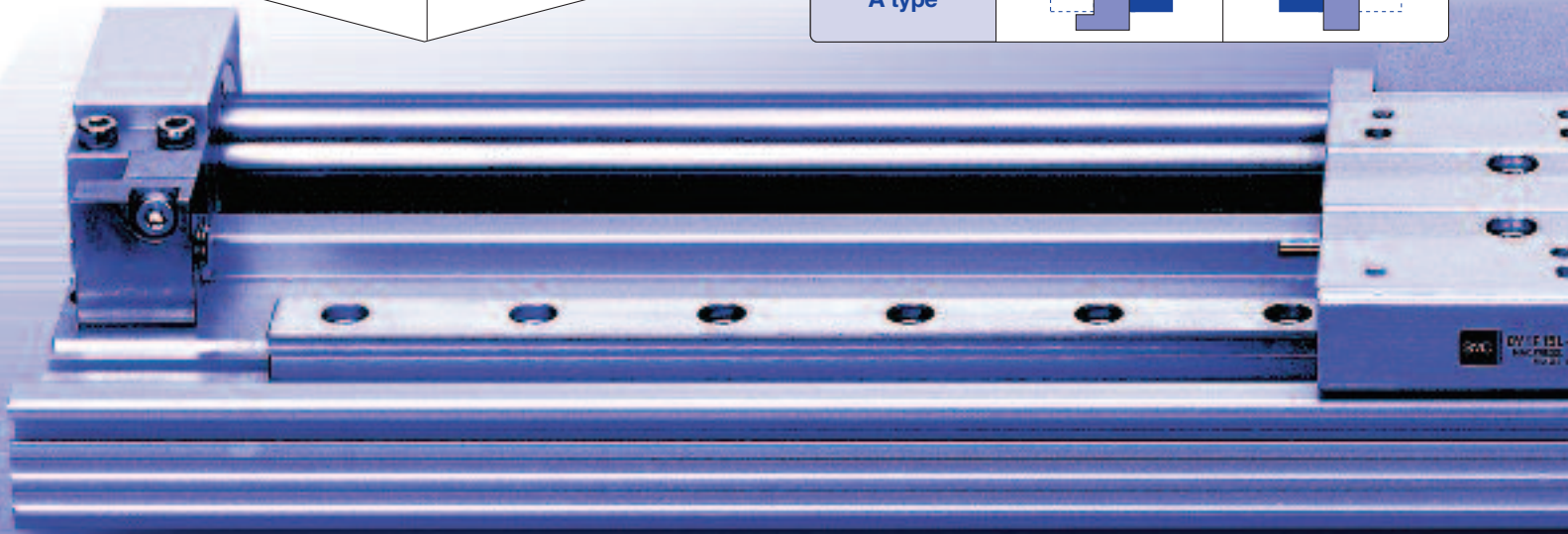
Piping port position can be specified using a part number.  
3 types of piping screws are available.



4 types of stroke adjustment are available.



	Left adjustment bolt	Right adjustment bolt
Both sides standard type	-1mm to 0mm	-1mm to 0mm
AL type	-25mm to 0mm	-1mm to 0mm
AR type	-1mm to 0mm	-25mm to 0mm
A type	-25mm to 0mm	-25mm to 0mm



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

Lightweight **Weight reduced by 50%**

Series	ø10	ø15	ø25
CY1F	0.7	1.1	2.5
CY1H	1.0	2.2	4.6
MY2H	—	1.3	3.2

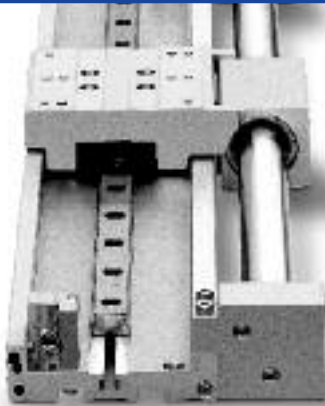
kg

\*For 100mm stroke cylinder

## Available bore sizes ø10, 15, 25

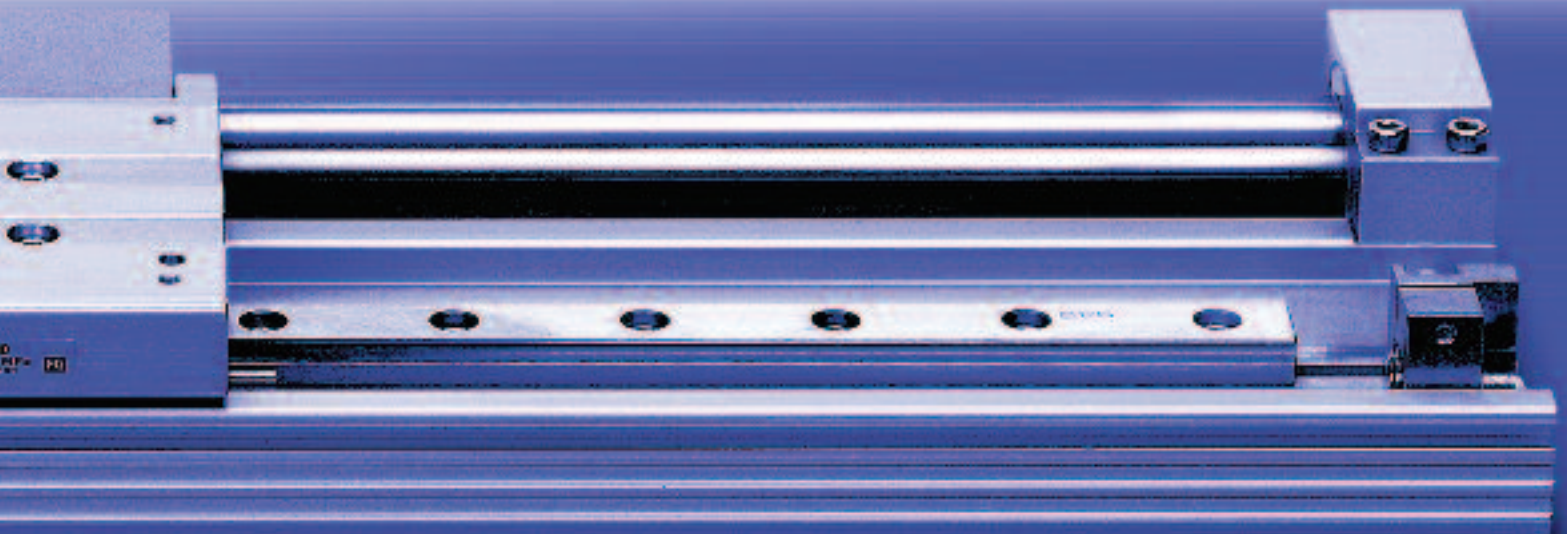
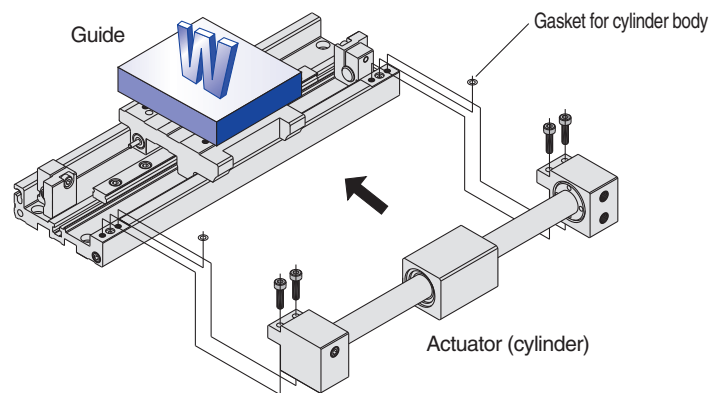
Model	Bore size (mm)	Standard stroke (mm)											Maximum stroke	Cushion	Piping directions			
		50	100	150	200	250	300	350	400	450	500	550				600		
CY1F	10	●	●	●	●	●	●	●	●	●	●	●	●	●	●	500	Built-in shock absorber	Concentrated piping on right Concentrated piping on left
	15	●	●	●	●	●	●	●	●	●	●	●	●	●	●	750		
	25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1200		

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



**The cylinder and guide are integrated.**

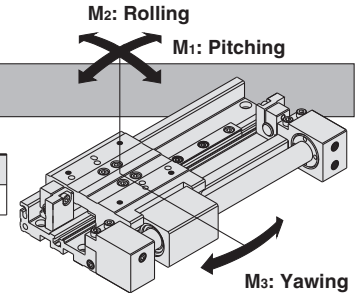
The cylinder portion can be replaced without interfering with the work piece.



# Series CY1F Model Selection 1

## Standards for Tentative Model Selection

Cylinder model	Guide model	Standard for guide selection	Graph for related allowable values
CY1F	High precision guide (Single axis)	Slide table accuracy approx. $\pm 0.05\text{mm}$ or less	Refer to page 28



## Selection Flow Chart

**Es:** Allowable kinetic energy for intermediate stop by pneumatic circuit (J)  
**Ps:** Operating pressure limit for intermediate stop by external stopper, etc.  
 Limit value(MPa)  
**Pv:** Maximum operating pressure in vertical operation (MPa)  
**mv:** Maximum allowable load mass in vertical operation (kg)  
 $\alpha$ : Load factor

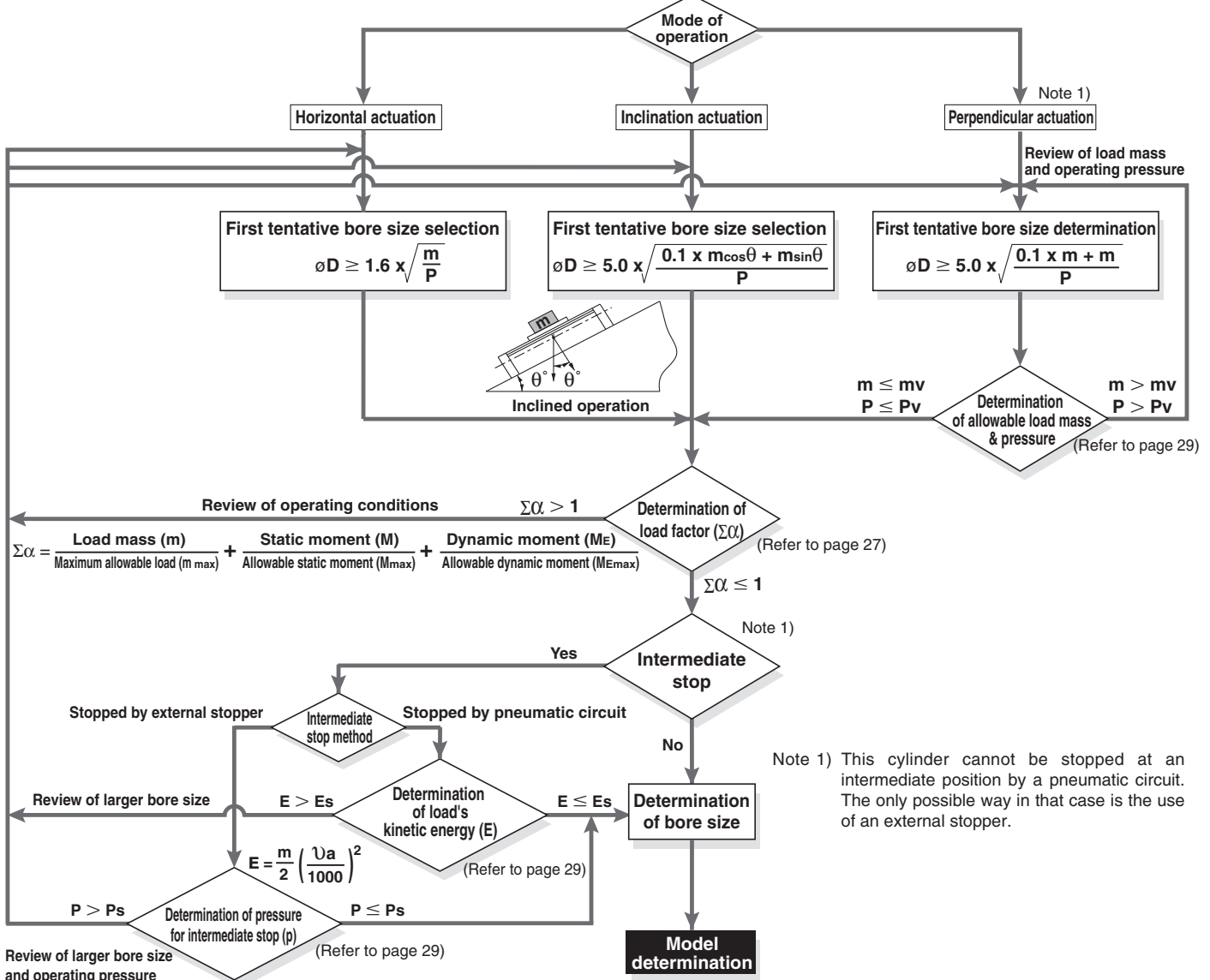
$$\Sigma\alpha = \frac{\text{Load mass (m)}}{\text{Maximum allowable load (m}_{\text{max}})} + \frac{\text{Static moment (M)}}{\text{Allowable static moment (M}_{\text{max}})} + \frac{\text{Dynamic moment (ME)}}{\text{Allowable dynamic moment (ME}_{\text{max}})}$$

E: Load kinetic energy (J)

$$E = \frac{m}{2} \left( \frac{Va}{1000} \right)^2$$

**Operating conditions**

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



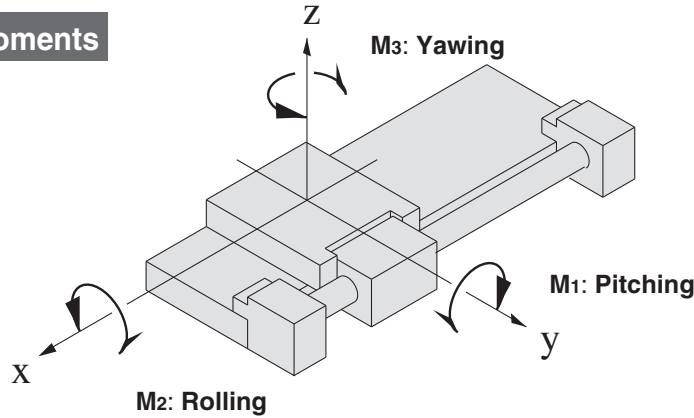
Note 1) This cylinder cannot be stopped at an intermediate position by a pneumatic circuit. The only possible way in that case is the use of an external stopper.



### Types of Moment Applied to Rodless Cylinders

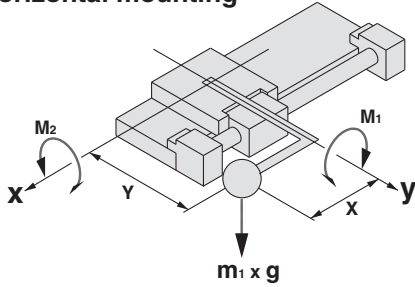
Multiple moments may be generated depending on the mounting orientation load and position of the center of gravity.

#### Coordinates and Moments

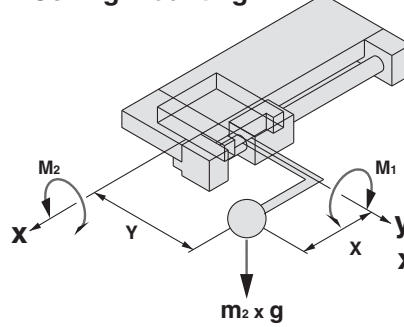


#### Static moment

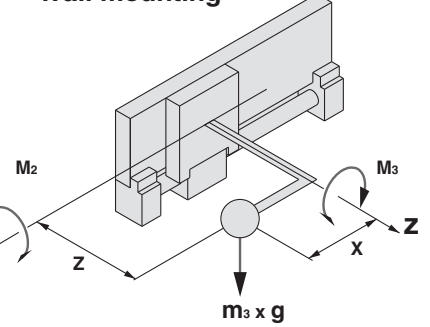
##### Horizontal mounting



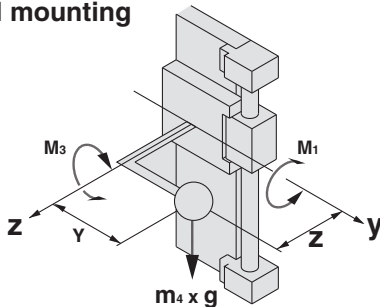
##### Ceiling mounting



##### Wall mounting



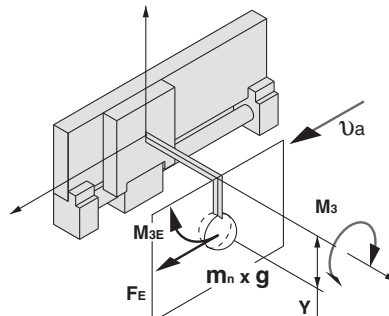
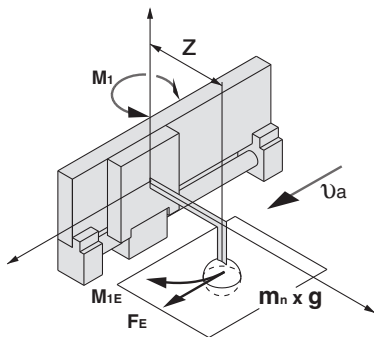
##### Vertical mounting



**g:** Gravitational acceleration

Mounting orientation	Horizontal	Ceiling	Wall	Vertical
Static load $m$	$m_1$	$m_2$	$m_3$	$m_4$
Static moment	$M_1$	$m_1 \times g \times X$	$m_2 \times g \times X$	—
	$M_2$	$m_1 \times g \times Y$	$m_2 \times g \times Y$	$m_3 \times g \times Z$
	$M_3$	—	—	$m_3 \times g \times X$

#### Dynamic moment



**g:** Gravitational acceleration, **Ua:** Average speed

Mounting orientation	Horizontal	Ceiling	Wall	Vertical
Dynamic load $F_E$	$\frac{1.4}{100} \times U_a \times m_n \times g$			
Dynamic moment	$M_{1E}$	$\frac{1}{3} \times F_E \times Z$		
	$M_{2E}$	Dynamic moment $M_{2E}$ is not generated.		
	$M_{3E}$	$\frac{1}{3} \times F_E \times Y$		

Note) Regardless of the mounting orientation, dynamic moment is calculated with the formulas above.

## Maximum Allowable Moment/Maximum Allowable Load

(1kg = 2.2lbs)

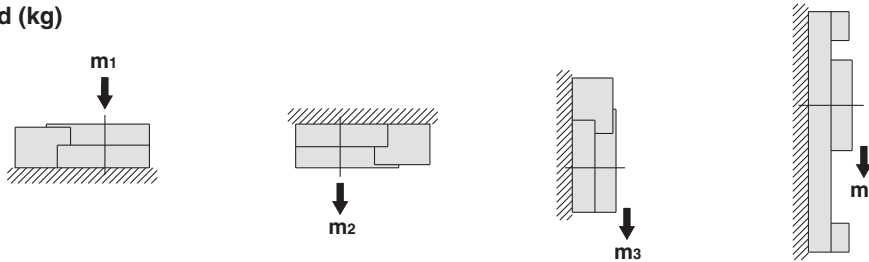
Model	Bore size (mm)	Maximum allowable moment (N·m)			Maximum allowable load (kg)			
		M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	m <sub>1</sub>	m <sub>2</sub>	m <sub>3</sub>	m <sub>4</sub>
CY1F	10	1	2	1	2	2	2	1.4
	15	1.5	3	1.5	5	5	5	2
	25	14	20	14	12	12	12	12

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

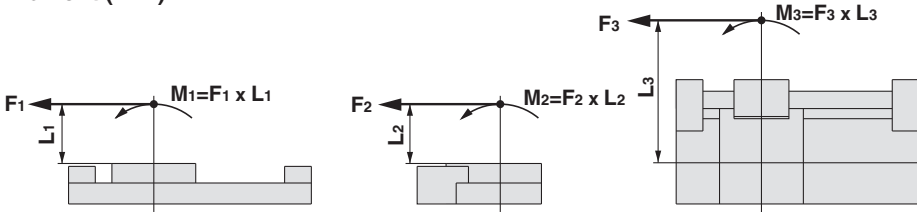
## Maximum allowable moment

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

### Load (kg)



### Moment (N·m)



### <Calculation guide load factor>

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

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

Calculate  $m_{max}$  for (1) from the maximum allowable load graph ( $m_1, m_2, m_3$ ) and  $M_{max}$  for (2) and (3) from the maximum allowable moment graph ( $M_1, M_2, M_3$ ).

$$\text{Sum of guide load factors } \Sigma \alpha = \frac{\text{Load mass [m]}}{\text{Maximum allowable load [m}_{max}]}} + \frac{\text{Static moment [M] }^{Note 1}}{\text{Allowable static moment [M}_{max}]}} + \frac{\text{Dynamic moment [ME] }^{Note 2}}{\text{Allowable dynamic moment [ME}_{max}]}} \leq 1$$

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

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

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

2. Reference formulas [Dynamic moment at impact]

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

$m$  : Load mass (kg) (1kg = 2.2 lbs)

$F$  : Load (N) (1N = 0.225 lbf)

$F_E$  : Load equivalent to impact (at impact with stopper) (N)

$\bar{v}_a$  : Average speed (mm/s)

$M$  : Static moment (N·m) (1N·m = 0.74 ft·lb)

$v$  : Impact speed (mm/s)

$L_1$  : Distance to the load's center of gravity (m)

$ME$  : Dynamic moment (N·m)

$g$  : Gravitational acceleration (9.8m/s<sup>2</sup>)

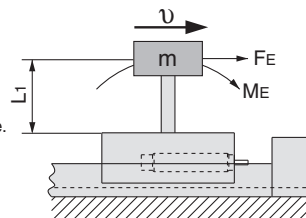
$$v = 1.4\bar{v}_a \text{ (mm/s)} \quad F_E = \frac{1.4}{100} \bar{v}_a \cdot g \cdot m \text{ }^{Note 4}$$

$$\therefore ME = \frac{1}{3} \cdot F_E \cdot L_1 = 0.05\bar{v}_a m L_1 \text{ (N·m) }^{Note 5}$$

Note 4)  $\frac{1.4}{100} \bar{v}_a$  is a dimensionless coefficient for calculating impact force.

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

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

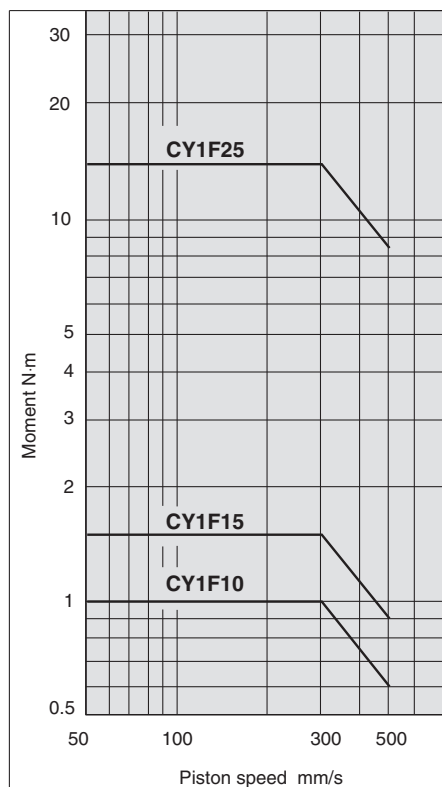


3. Refer to page 30 and 31 for detailed selection procedures.

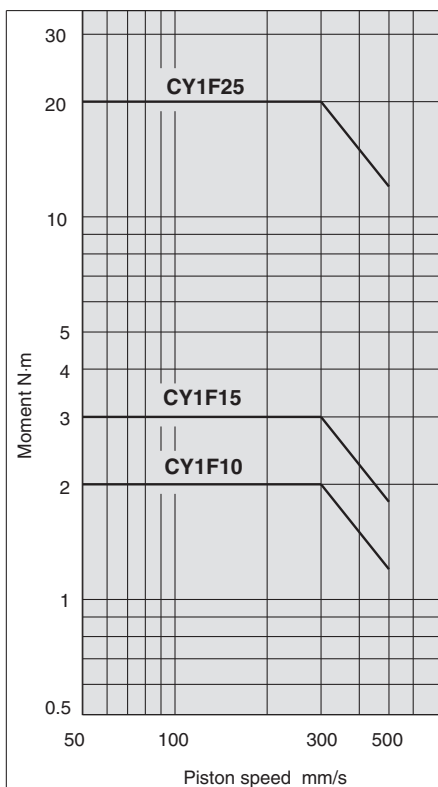
## Maximum allowable load

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

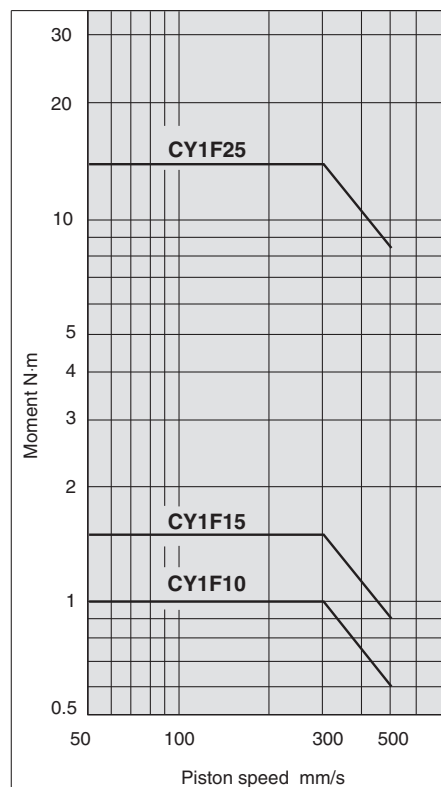
1 CY1F/M<sub>1</sub>



2 CY1F/M<sub>2</sub>

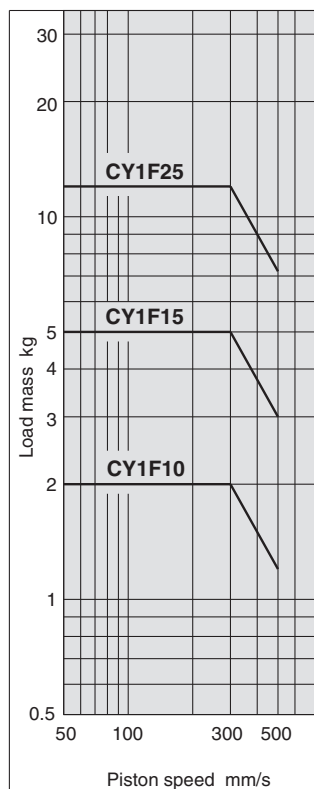


3 CY1F/M<sub>3</sub>

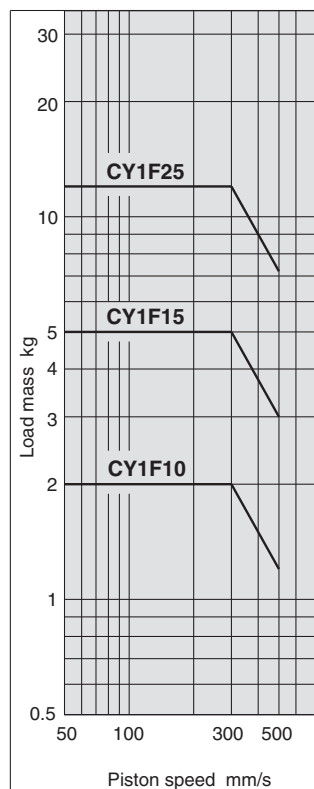


(1N·m = 0.74 ft·lb)

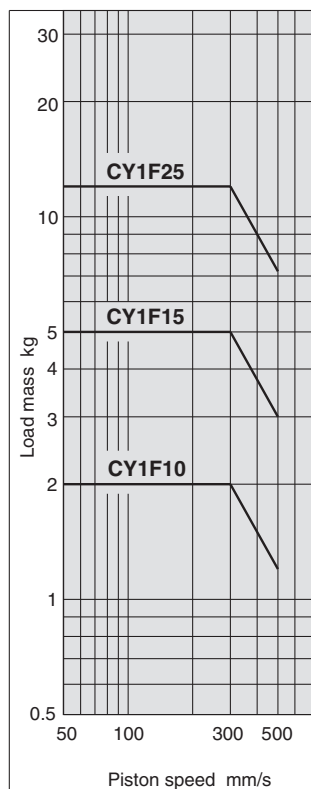
4 CY1F/m<sub>1</sub>



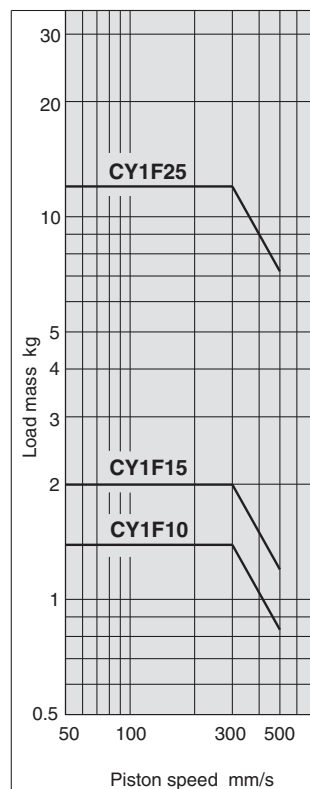
5 CY1F/m<sub>2</sub>



6 CY1F/m<sub>3</sub>



7 CY1F/m<sub>4</sub>



(1 kg = 2.2 lbs)

## Vertical Actuation

### ① Vertical operation

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

### Caution

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

Bore size (mm)	Maximum load weight mv lb (kg)	Maximum operating pressure Pv psi (MPa)
10	3.1 (1.4)	80 (0.55)
15	4.4 (2.0)	94 (0.65)
25	26.5 (12)	94 (0.65)

## Intermediate Stop

### ① Intermediate stop by external stopper or stroke adjustment with adjustment bolt.

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

### Caution

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

Bore size (mm)	Holding force lbf (N)	Operating pressure limit for intermediate stop Ps psi (MPa)
10	12.1 (53.9)	80 (0.55)
15	30.8 (137)	94 (0.65)
25	81.6 (363)	94 (0.65)

### ② The load is stopped by pneumatic circuit.

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

### Caution

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

Bore size (mm)	Allowable kinetic energy for intermediate stop Es in·lbs (J)
10	0.27 (0.03)
15	1.15 (0.13)
25	3.98 (0.45)

# Series CY1F

## Model Selection 2

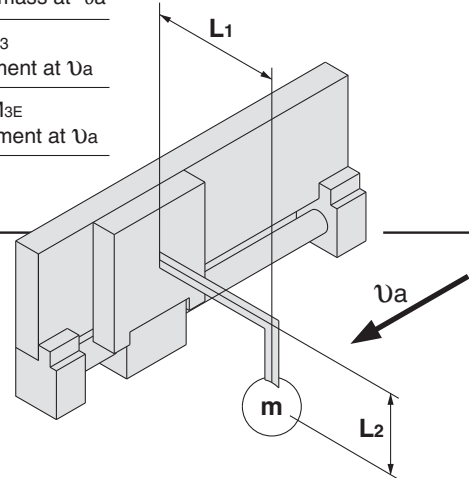
### Selection Calculation

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

$$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$$

Item	Load factor $\alpha_n$	Note
1 Maximum load mass	$\alpha_1 = m/m_{\max}$	Review $m$ $m_{\max}$ is the maximum load mass at $v_a$
2 Static moment	$\alpha_2 = M/M_{\max}$	Review $M_1, M_2, M_3$ $M_{\max}$ is the allowable moment at $v_a$
3 Dynamic moment	$\alpha_3 = M_E/M_{E\max}$	Review $M_{1E}, M_{2E}, M_{3E}$ $M_{E\max}$ is the allowable moment at $v_a$

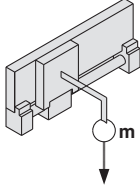
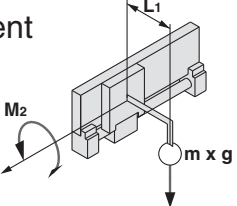
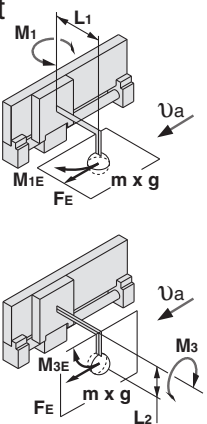
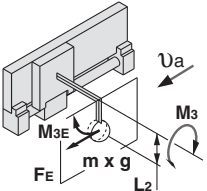
$v$ : Collision speed  $v_a$ : Average speed



### Calculation example 1

#### Operating conditions

Cylinder: CY1F15  
Terminal buffer mechanism: Standard (shock absorber)  
Mounting: Wall mounting  
Speed (average) :  $v_a = 300$  [mm/s]  
Load mass:  $m = 0.5$  [kg] (excluding weight of arm section)  
 $L_1 = 50$  [mm]  
 $L_2 = 40$  [mm]

Item	Load factor $\alpha_n$	Note
<b>1 Load mass</b> 	$\alpha_1 = m/m_{\max}$ $= 0.5/5$ $= 0.1$	Investigate $m$ . Find the value of $m_{\max}$ at 300mm/s in Graph 6 for $m_3$ on page 28.
<b>2 Static moment</b> 	$M_2 = m \times g \times L_1$ $= 0.5 \times 9.8 \times 0.05$ $= 0.245$ [N·m] $\alpha_2 = M_2/M_2 \max$ $= 0.245/3$ $= 0.082$	Investigate $M_2$ . $M_1$ and $M_3$ are not required because they are not generated.  Find the value of $M_2 \max$ at 300mm/s in Graph 2.
<b>3 Dynamic moment</b> 	$M_{1E} = 1/3 \times F_E \times L_1$ $(F_E = 1.4/100 \times v_a \times g \times m)$ $= 0.05 \times v_a \times m \times L_1$ $= 0.05 \times 300 \times 0.5 \times 0.05$ $= 0.375$ [N·m] $\alpha_{3A} = M_{1E}/M_{1E \max}$ $= 0.375/1.07$ $= 0.350$	Investigate $M_{1E}$ . Find the collision speed $v$ . $v = 1.4 \times v_a$ $= 1.4 \times 300$ $= 420$ [mm/s]  Find the value of $M_{E1} \max$ at 420mm/s in Graph 1.
	$M_{3E} = 1/3 \times F_E \times L_2$ $(F_E = 1.4/100 \times v_a \times g \times m)$ $= 0.05 \times v_a \times m \times L_2$ $= 0.05 \times 300 \times 0.5 \times 0.04$ $= 0.3$ [N·m] $\alpha_{3B} = M_{3E}/M_{3E \max}$ $= 0.3/1.07$ $= 0.28$	Investigate $M_{3E}$ .  From above, find the value of $M_{3E} \max$ at 420mm/s in Graph 3.

From above,

$$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_{3A} + \alpha_{3B} = 0.1 + 0.082 + 0.35 + 0.28 = 0.812.$$

From  $\Sigma\alpha_n = 0.812 \leq 1$ , it is applicable.

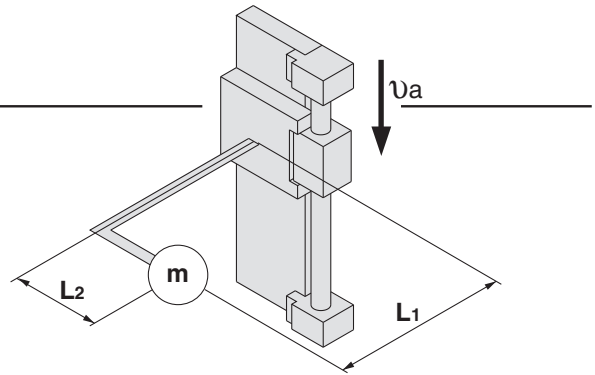
# Series CY1F

## Model Selection 3

### Calculation example 2

#### Operating conditions

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



Item	Load factor $\alpha_n$	Note
<b>1</b> Load mass 	$\alpha_1 = m/m_{max}$ $= 3/12$ $= \mathbf{0.25}$	Investigate $m$ . Find the value of $m$ max. at 300mm/s in Graph 7 for $m_3$ .
<b>2</b> Static moment 	$M_1 = m \times g \times L_1$ $= 3 \times 9.8 \times 0.05$ $= 1.47 \text{ [N}\cdot\text{m]}$ $\alpha_{2a} = M_1/M_1 \text{ max}$ $= 1.47/14$ $= \mathbf{0.105}$	Investigate $M_1$ . Find the value of $M_2$ max. at 300mm/s in Graph 1.
	$M_3 = m \times g \times L_2$ $= 3 \times 9.8 \times 0.04$ $= 1.176 \text{ [N}\cdot\text{m]}$ $\alpha_{2b} = M_3/M_3 \text{ max}$ $= 1.176/14$ $= \mathbf{0.084}$	Investigate $M_3$ . Find the value of $M_3$ max. at 300mm/s in Graph 3.
<b>3</b> Dynamic moment 	$M_{1E} = 1/3 \times F_E \times L_1$ $(F_E = 1.4/100 \times \upsilon_a \times g \times m)$ $= 0.05 \times \upsilon_a \times m \times L_1$ $= 0.05 \times 300 \times 3 \times 0.05$ $= 2.25 \text{ [N}\cdot\text{m]}$ $\alpha_{3A} = M_{1E}/M_{1E} \text{ max}$ $= 2.25/10$ $= \mathbf{0.225}$	Investigate $M_{1E}$ . Find the collision speed $U$ $U = 1.4 \times \upsilon_a$ $= 1.4 \times 300$ $= 420 \text{ [mm/s]}$ Find the value of $M_{1E}$ max. at 420mm/s in Graph 1.
	$M_{3E} = 0.05 \times \upsilon_a \times m \times L_2$ $(F_E = 1.4/100 \times \upsilon_a \times g \times m)$ $= 0.05 \times 300 \times 3 \times 0.04$ $= 1.8 \text{ [N}\cdot\text{m]}$ $\alpha_{3B} = M_{3E}/M_{3E} \text{ max}$ $= 1.8/10$ $= \mathbf{0.18}$	Investigate $M_{3E}$ . From above, find the value of $M_{3E}$ max. at 420mm/s in Graph 3.

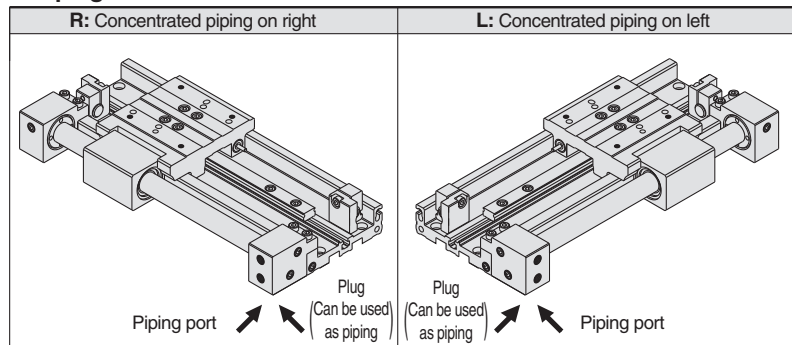
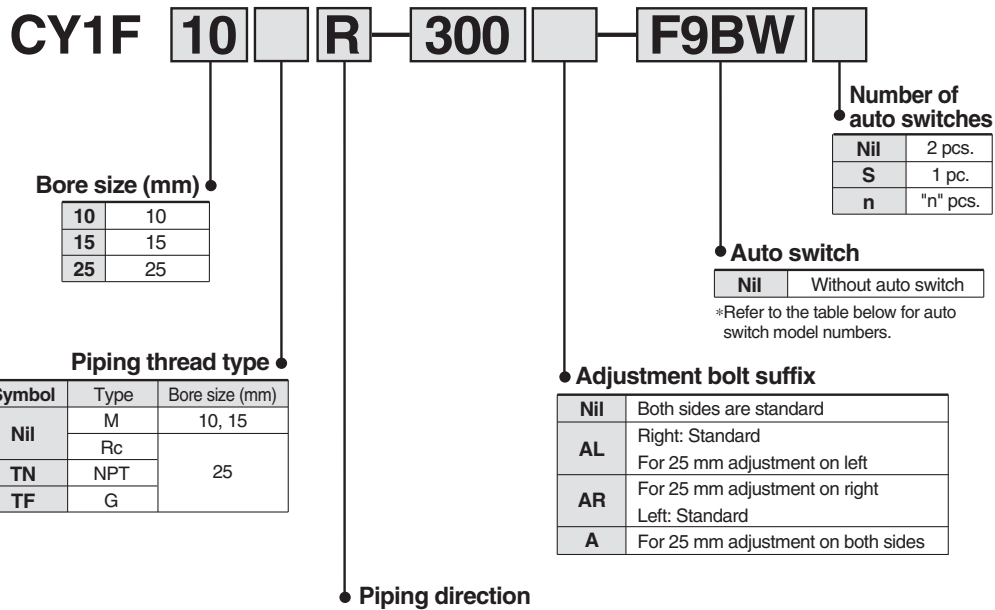
From above,  
 $\Sigma \alpha_n = \alpha_1 + \alpha_{2a} + \alpha_{2b} + \alpha_{3A} + \alpha_{3B} = 0.25 + 0.105 + 0.084 + 0.225 + 0.18 = 0.844$   
 From  $\Sigma \alpha_n = 0.844 \leq 1$ , it is applicable.

# Magnetically Coupled Rodless Cylinder

## Series *CY1F*

### Low Profile Guide Typ/ø10, ø15, ø25

#### How to order



#### Applicable auto switches/Refer to pages 14 through 19 for detailed auto switch specifications.

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch models		Lead wire length (m)*			Applicable load	
					DC	AC		Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)		
						24V	5V	100V or less	Perpendicular					
Reed switch	—	Grommet	No	2-wire	24V	5V	100V	<b>A90V</b>	<b>A90</b>	●	●	—	IC circuit	Relay PLC
			Yes	3-wire (NPN equiv.)	—	5V	—	<b>A93V</b>	<b>A93</b>	●	●	—	—	
Solid state switch	Diagnostic indication (2-color display)	Grommet	Yes	3-wire (NPN)	24V	5V	12V	<b>F9NV</b>	<b>F9N</b>	●	●	○	IC circuit	Relay PLC
				3-wire (PNP)				<b>F9PV</b>	<b>F9P</b>	●	●	○	—	
				2-wire				<b>F9BV</b>	<b>F9B</b>	●	●	○	—	
				3-wire (NPN)				<b>F9NWV</b>	<b>F9NW</b>	●	●	○	IC circuit	
				3-wire (PNP)				<b>F9PWV</b>	<b>F9PW</b>	●	●	○	—	
				2-wire				<b>F9B WV</b>	<b>F9B W</b>	●	●	○	—	

\*Lead wire length symbols 0.5m..... Nil (Example) F9NW  
 3m..... L F9NWL  
 5m..... Z F9NWZ

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

## Specifications



Bore size (mm)	10	15	25
Fluid	Air		
Lubrication	Non-lube		
Actuation	Double acting		
Maximum operating pressure	101psi (0.7 MPa)		
Minimum operating pressure	29psi (0.2MPa)		
Proof pressure	152psi (1.05MPa)		
Ambient and fluid temperature	14 to 140°F (−10 to 60°C)		
Piston speed (mm/s)	50 to 500		
Cushion	Built-in shock absorber		
Stroke length tolerance (mm)	0 to 250st: <sup>+1.0</sup> <sub>0</sub>	251 to 1000st: <sup>+1.4</sup> <sub>0</sub>	1001st to: <sup>+1.8</sup> <sub>0</sub>
Stroke adjustment movable range (mm) <sup>Note 1)</sup>	−1.2 to 0.8		−1.4 to 0.6
Piping type	Centralized piping		
Port size <sup>Note 2)</sup>	M5 x 0.8		1/8

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

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

## Shock Absorber Specifications

Applicable bore size (mm)	10, 15	25	
Shock absorber model	RB0805- X552	RB1006- X552	
Max. energy absorption	8.6 ft·lb (0.98J)	34.7 ft·lb (3.92J)	
Stroke absorption (mm)	5	6	
Max. impact speed (m/s) <sup>Note)</sup>	0.05 to 5		
Max. operating frequency (cycle/min)	80	70	
Spring force	When expanded	0.44 lbf (1.96N)	0.95 lbf (4.22N)
	When compressed	0.86 lbf (3.83N)	1.39 lbf (6.18N)
Weight	0.5oz. (15g)	0.88 oz. (25g)	

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

## Standard Stroke

Bore size (mm)	Standard stroke (mm)	Maximum stroke available (mm)
10	50, 100, 150, 200, 250, 300	500
15	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	750
25	100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600	1200



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

## Magnetic Holding Force

Bore size (mm)	Unit: lbf (N)		
	10	15	25
Holding force	12.1 (53.9)	30.8 (137)	81.6 (363)



## Made to order Specifications

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



# Series CY1F

## Theoretical Output

Unit: lbf (N)

Bore size (mm)	Piston area (mm <sup>2</sup> )	Operating pressure psi [MPa]					
		29 (0.2)	44 (0.3)	58 (0.4)	73 (0.5)	87 (0.6)	101 (0.7)
10	78	3.4 (15)	5.2 (23)	7.0 (31)	8.8 (39)	10.3 (46)	12.11 (54)
15	176	7.9 (35)	11.7 (52)	15.7 (70)	19.8 (88)	23.6 (105)	27.7 (123)
25	490	22 (98)	33 (147)	44.1 (196)	55.1 (245)	66.1 (294)	77.1 (343)

Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm<sup>2</sup>)

## Option

### Adjustment bolt

Bore size (mm)	Standard adjustment bolt	25 mm adjustment bolt
10, 15	CYF-S10	CYF-L10
25	CYF-S25	CYF-L25

## Weights

Unit: kg

Model	Basic weight	Additional weight per 50 mm stroke	Standard adjustment bolt weight	Weight of adjustment bolt for 25 mm adjustment
CY1F10	0.520	0.095	0.004	0.012
CY1F15	0.815	0.133	0.004	0.012
CY1F25	1.970	0.262	0.007	0.021

Calculation method example: CY1F15-150AL

(1 kg = 2.2 lbs)

Basic weight ..... 0.815kg    Cylinder stroke ..... 150st  
 Additional weight ..... 0.133kg/50st    Left ..... 25 mm adjustment bolt  
 Standard adjustment bolt weight ..... 0.004kg    Right ..... Standard adjustment bolt  
 Weight of adjustment bolt for 25 mm adjustment ..... 0.012kg  
 0.815 + 0.133 x 150 ÷ 50 + 0.004 + 0.012 = 1.23 (kg)

## Replacement Parts

### Part number of replacement shock absorber

Bore size (mm)	Shock absorber model no.
10, 15	RB0805- X552
25	RB1006- X552

Note) Order 2 units for each unit of cylinder.

## Replacement Actuator (Cylinder)

**CY1F B 10 [ ] R — Stroke**

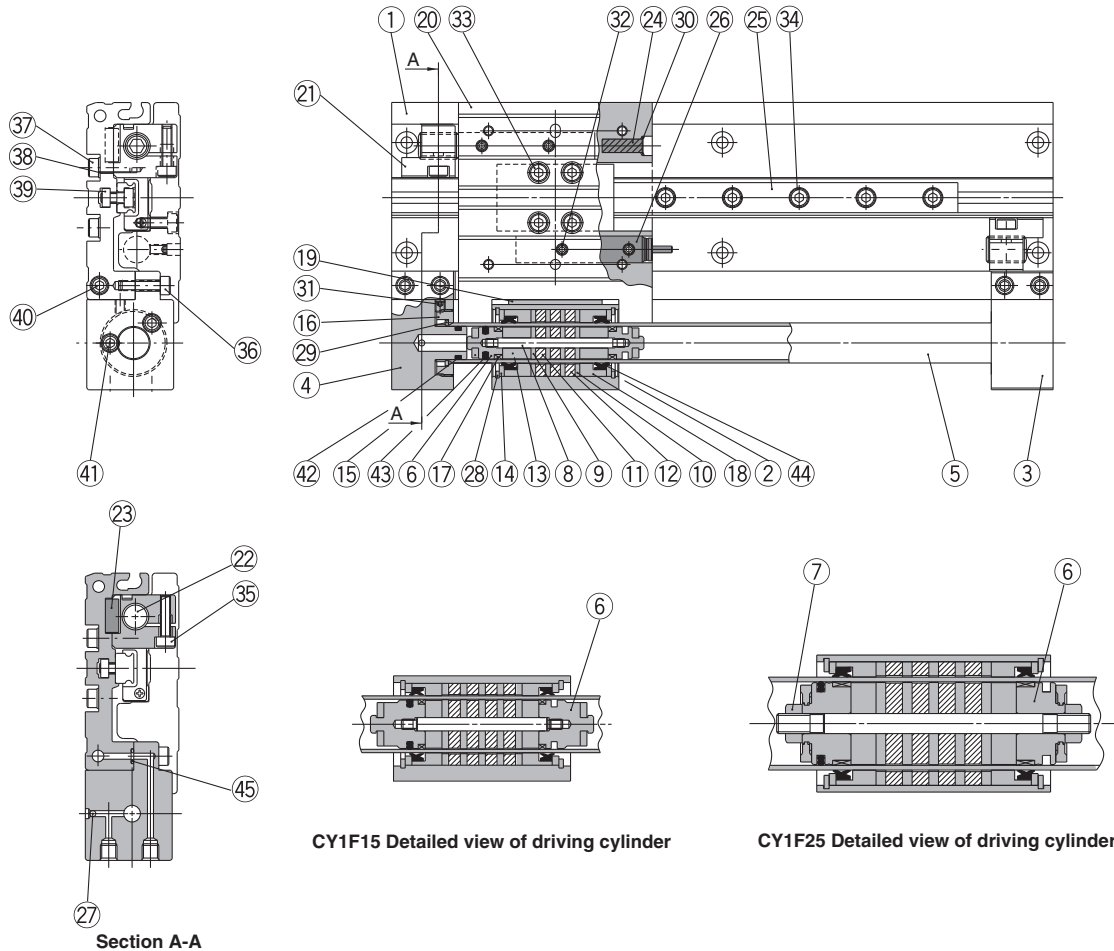
- Cylinder identification symbol**
- Bore size (mm)**

10	10
15	15
25	25
- Piping direction suffix**

R	Centralized piping on right
L	Centralized piping on left
- Piping thread type**

Symbol	Thread type	Bore size (mm)
Nil	M	10, 15
	Rc	
TN	NPT	25
TF	G	

**Construction**



CY1F15 Detailed view of driving cylinder

CY1F25 Detailed view of driving cylinder

**Parts list**

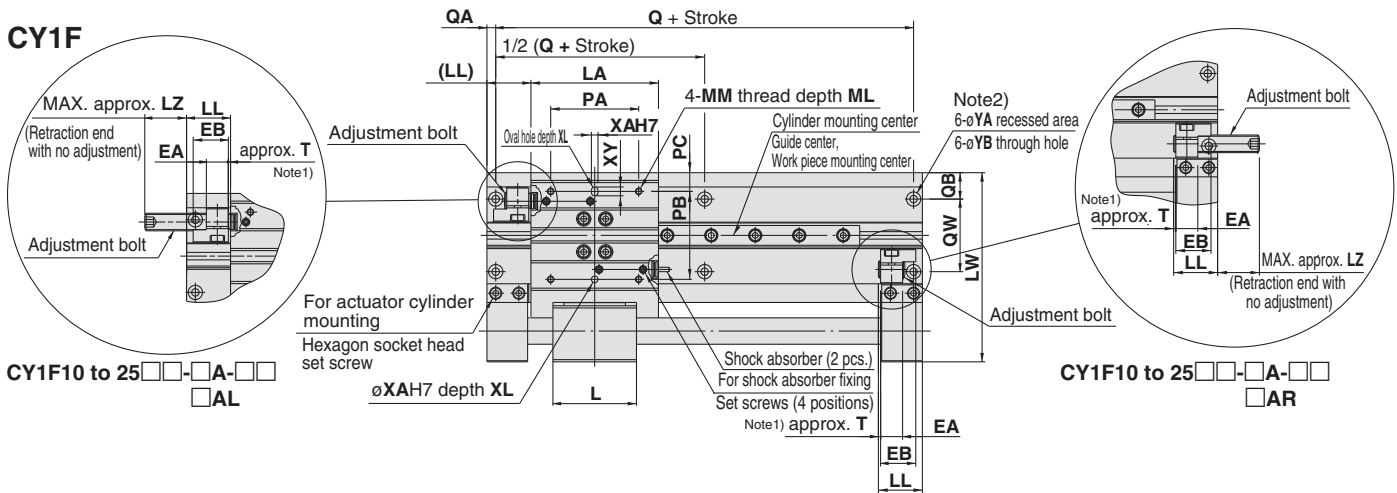
No.	Description	Material	Note
1	Body (rodless cylinder)	Aluminium alloy	Anodized
2	Body	Aluminium alloy	Hard anodized
3	End cover A	Aluminium alloy	Hard anodized
4	End cover B	Aluminium alloy	Hard anodized
5	Cylinder tube	Stainless steel	
6	Piston	Aluminium alloy	Chromate (ø25)
		Brass	Electroless nickel plated (ø10, ø15)
7	Piston nut	Carbon steel	(Only for ø25)
8	Shaft	Stainless steel	
9	Piston side yoke	Rolled steel plate	Zinc chromated (ø15, ø25) Zinc chromated (ø10)
10	External slider side yoke	Rolled steel plate	Zinc chromated (ø15, ø25) Zinc chromated (ø10)
11	Magnet A	Rare earth magnet	(ø15, ø25) (ø10)
12	Magnet B	Rare earth magnet	(ø15, ø25) Chromate (ø10)
13	Piston spacer	Aluminium alloy	
14	Spacer	Rolled steel plate	Nickel plated
15	Bumper	Urethane rubber	
16	Attachment ring	Aluminium alloy	Hard anodized
17	Wear ring A	Special resin	
18	Wear ring B	Special resin	
19	Wear ring C	Special resin	
20	Slide table	Aluminium alloy	Hard anodized
21	Adjuster holder	Carbon steel	Electroless nickel plated

**Parts list**

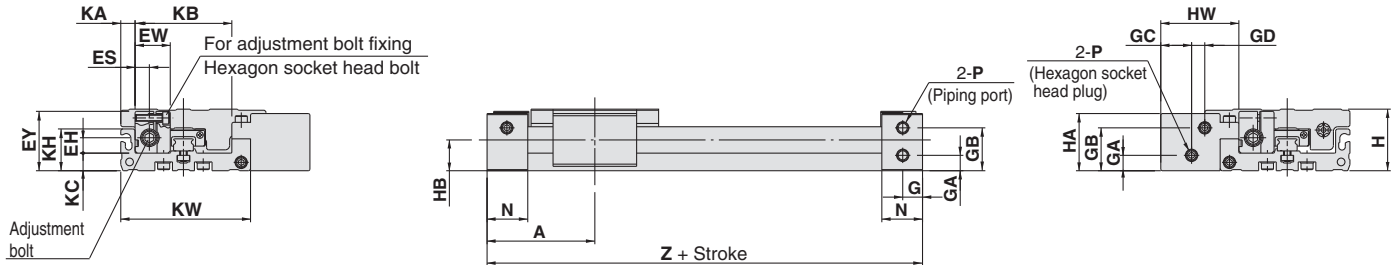
No.	Description	Material	Note
22	Adjustment bolt	Chrome molybdenum steel	Nickel plated
23	Adjuster holder positioning key	Carbon steel	Zinc chromated
24	Magnet	Rare earth magnet	
25	Guide	—	
26	Shock absorber	—	
27	Steel ball	Bearing steel	
28	C type snap ring for hole	Carbon tool steel	Nickel plated
29	C type snap ring for shaft	Hard steel wire	(ø15)
		Stainless steel	(ø10, ø25)
30	Snap ring	Stainless steel	
31	Hexagon socket head set screw	Chrome molybdenum steel	Nickel plated
32	Hexagon socket head set screw	Chrome molybdenum steel	Nickel plated
33	Hexagon socket head bolt	Chrome molybdenum steel	Nickel plated
34	Hexagon socket head bolt	Chrome molybdenum steel	Nickel plated
35	Hexagon socket head bolt	Chrome molybdenum steel	Nickel plated
36	Hexagon socket head bolt	Chrome molybdenum steel	Nickel plated
37	Hexagon socket head bolt	Chrome molybdenum steel	Nickel plated
38	Flat washer	Rolled steel	Nickel plated
39	Square nut	Carbon steel	Nickel plated
40	Hexagon socket head plug	Chrome molybdenum steel	Nickel plated
41	Hexagon socket head plug	Chrome molybdenum steel	Nickel plated (Hexagon socket head taper plug for ø25)
42	Cylinder tube gasket	NBR	
43	Piston seal	NBR	
44	Scraper	NBR	
45	Body (rodless cylinder) gasket	NBR	

# Series CY1F

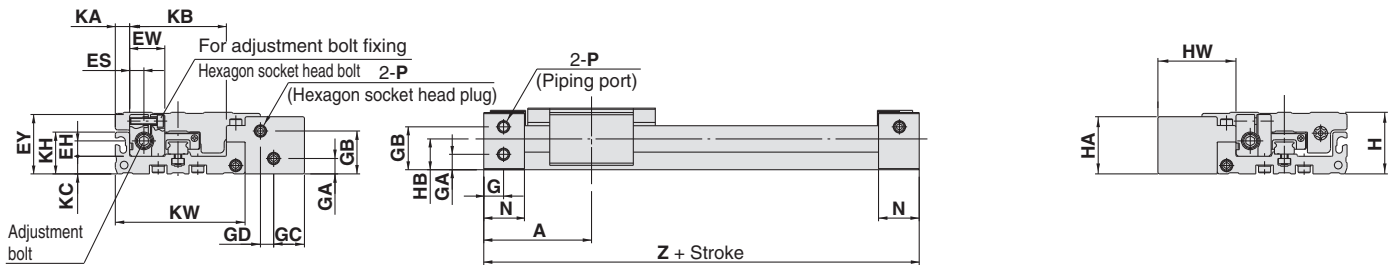
## Dimensions



### Concentrated piping on right (CY1F10 to 25 □ R - □ □ - □ □ □)



### Concentrated piping on left (CY1F10 to 25 □ L - □ □ - □ □ □)



Model	Standard stroke	A	EA	EB	EH	ES	EW	EY	G	GA	GB	GC	GD	H	HA	HB	HW
CY1F10	50,100,150,200,250,300	49	10	16	7	6.5	16	27	9	7	19.5	14	6	28	26	14	35.5
CY1F15	50,100,150,200,250,300,350,400,450,500	52.5	10	16	7	6.5	16	29	9	8	23	17	9	34	32	17	41.5
CY1F25	50,100,150,200,250,300,350,400,450,500,550,600	70	13	17	10.5	8	22	40	10	12	33.5	22.5	12	46	44	23.5	55

Model	KA	KB	KC	KH	KW	L	LA	LL	LW	LZ	ML	MM	N	PA	PB	PC	Q	QA	QB	QW
CY1F10	6.5	44	8	19	59	38	58	20	86	19	5	M3 x 0.5	18.5	40	40	8.5	90	4	12	33
CY1F15	6.5	51	10	19	66	53	65	20	99	19	5	M3 x 0.5	18.5	50	50	7	97	4	12	40
CY1F25	7.5	66	13	27	84.5	70	89	25.5	128.5	17	9	M5 x 0.8	24	65	65	8	129	5.5	14.5	52

Model	T	XA	XL	XY	YA	YB	Z	Shock absorber
CY1F10	1	3 <sup>+0.012</sup> <sub>0</sub>	4	4	6.5 depth 3.4	3.4	98	RB0805- X552
CY1F15	1	3 <sup>+0.012</sup> <sub>0</sub>	4	4	6.5 depth 3.4	3.4	105	RB0805- X552
CY1F25	1	5 <sup>+0.012</sup> <sub>0</sub>	5	7.5	9.5 depth 5.4	5.5	140	RB1006- X552

Model	P (Piping port)		
	Nil	TN	TF
CY1F10	M5 x 0.8	—	—
CY1F15	M5 x 0.8	—	—
CY1F25	Rc1/8	NPT1/8	G1/8

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

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

## Proper Mounting Position for Stroke End Detection

### D-A9□, D-A9□V

(mm)

Bore size (mm)	Mounting pattern①		Mounting pattern②		Mounting pattern③		* Operating range
	A1	B1	A2	B2	A3	B3	
10	38	60	18	80	38	80	9
15	39	66	19	86	39	86	10
25	44.5	95.5	24.5	115.5	44.5	115.5	11

### D-F9□, D-F9□V

(mm)

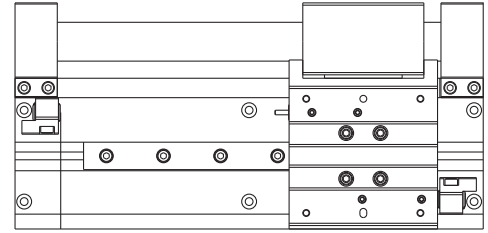
Bore size (mm)	Mounting pattern①		Mounting pattern②		Mounting pattern③		* Operating range
	A1	B1	A2	B2	A3	B3	
10	34	64	22	76	34	76	5.5
15	35	70	23	82	35	82	5
25	40.5	99.5	28.5	111.5	40.5	111.5	5

### D-F9□W, D-F9□WV

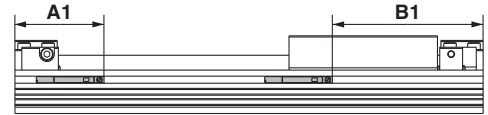
(mm)

Bore size (mm)	Mounting pattern①		Mounting pattern②		Mounting pattern③		* Operating range
	A1	B1	A2	B2	A3	B3	
10	34	64	22	76	34	76	5.5
15	35	70	23	82	35	82	5
25	40.5	99.5	28.5	111.5	40.5	111.5	5

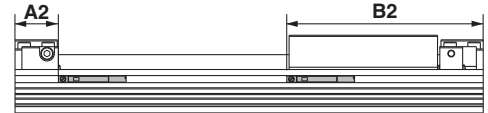
\*These values are given as a guideline including the hysteresis and are not guaranteed. They may vary significantly depending on the ambient environment (with ±30% variation).



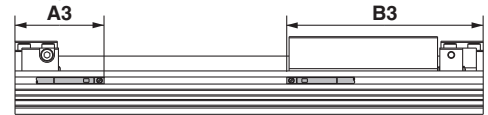
Mounting pattern①



Mounting pattern②



Mounting pattern③



## ⚠ Caution

- ① When adjusting the stroke, confirm the minimum stroke for auto switch mounting.  
See the table below for the minimum stroke for auto switch mounting.

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

(mm)

Bore size (mm)	D-A9□, D-A9□V D-F9□, D-F9□V	D-F9□W D-F9□WV
10	5	10
15		
25		

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

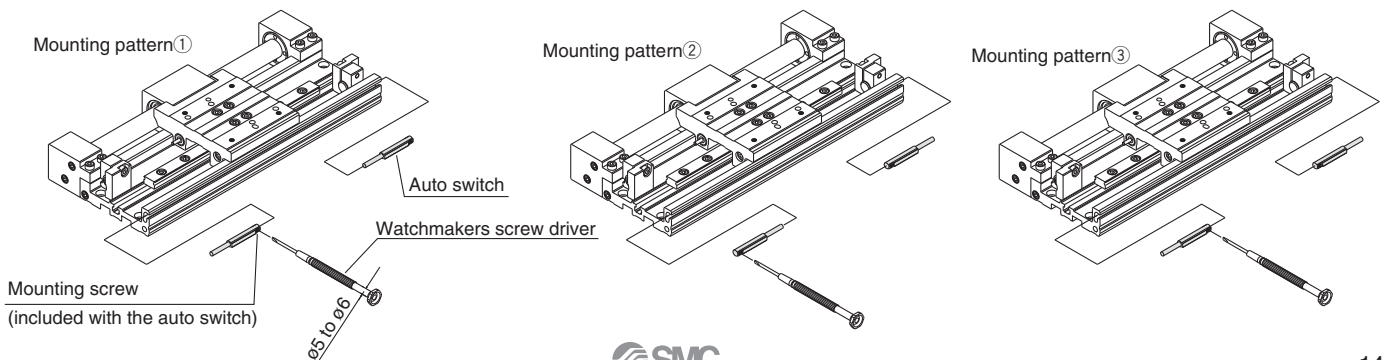
(mm)

Bore size (mm)	D-A90 D-A96	D-A93	D-A90V D-A96V D-A93V	D-F9□ D-F9□W	D-F9□V D-F9□WV
Mounting pattern①, ②	32	35	22	32	20
Mounting pattern③	20			12	

## Auto Switch Mounting

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

Note) When tightening the holding screw (included with the auto switch), use a watchmakers screw driver with a handle 5 to 6mm in diameter. The tightening torque should be 0.1 to 0.2N·m.



# Series CY1F

# Auto Switch Specifications

## Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3wire: 100 $\mu$ A or less, 2-wire: 0.8mA or less
Operating time	1.2ms	1ms or less
Impact resistance	300m/s <sup>2</sup>	1000m/s <sup>2</sup>
Insulation resistance	50M $\Omega$ or more at 500VDC (between lead wire and case)	
Withstand voltage	1500VAC for 1min. (between lead wire and case)	1000VAC for 1min. (between lead wire and case)
Ambient temperature	-10 to 60°C	
Enclosure	IEC529 standard IP67, JISC0920 watertight construction	

## Lead Wire Length

### Lead wire length indication

(Example) **D-F9P** **L**

**L**

Lead wire length

Nil	0.5m
L	3m
Z	5m

Note 1) Lead wire length Z: 5m applicable auto switches

Solid state: All types are produced upon receipt of order  
(standard availability)

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

(Example) **D-F9PL-61**

**61**  
Flexible specification

## Contact Protection Boxes/CD-P11, CD-P12

### <Applicable switches>

D-A9/A9□V

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

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

Use a contact protection box in any of the above situations.

The life of the contacts may otherwise be reduced. (The may stay ON all the time.)

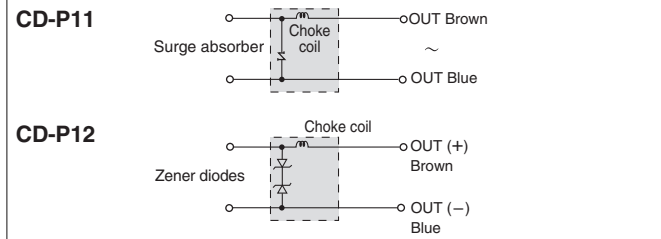
### Specifications

Part no	CD-P11		CD-P12
Load voltage	100VAC	200VAC	24VDC
Maximum load current	25mA	12.5mA	50mA

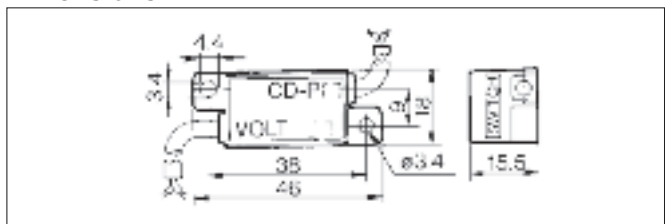
\*Lead wire length — Switch connection side 0.5m  
Load connection side 0.5m



### Internal circuits



### Dimensions



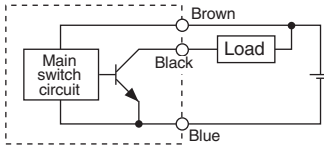
### Connection

To connect a switch to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch. Furthermore, the switch unit should be kept as close as possible to the contact protection box, with a lead wire length of no more than 1 meter between them.

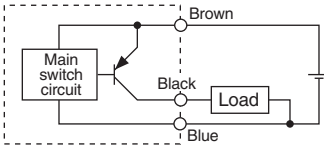
# Series CY1F Auto Switch Connections and Examples

## Basic Wiring

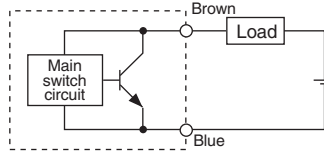
Solid state 3-wire, NPN



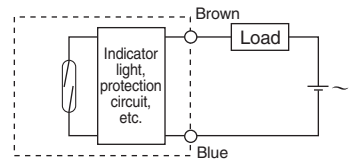
Solid state 3-wire, PNP



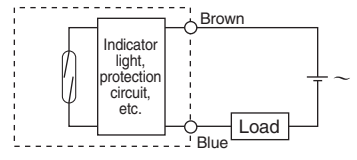
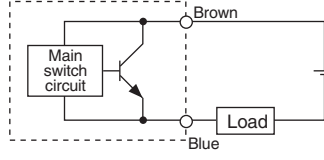
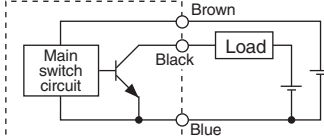
2-wire <Solid state>



2-wire <Reed switch>



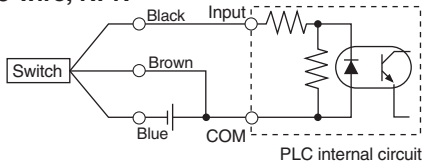
(Power supplies for switch and load are separate.)



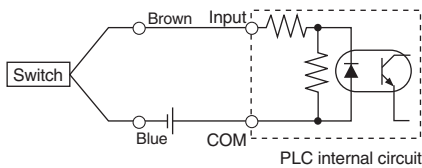
## Examples of Connection to PLC

### Sink input specifications

3-wire, NPN

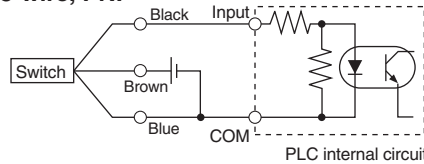


2-wire

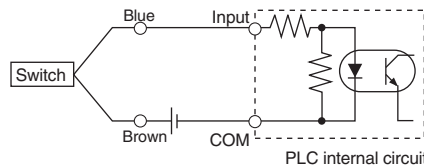


### Source input specifications

3-wire, PNP



2-wire

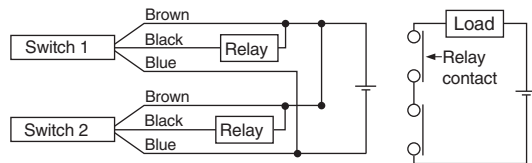


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

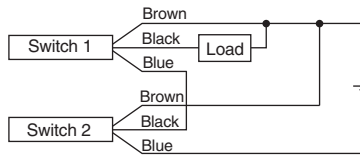
## Connection Examples for AND (Series) and OR (Parallel)

### 3-wire

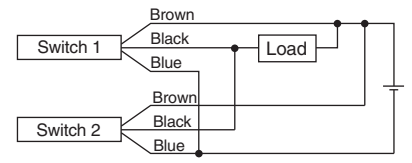
#### AND connection for NPN output (Using relays)



#### AND connection for NPN output (Performed with switches only)

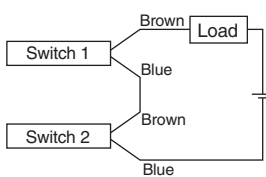


#### OR connection for NPN output



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

### 2-wire with 2 switch AND connection

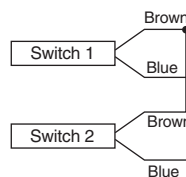


When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state. The indicator lights will light up if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \frac{\text{Internal voltage drop}}{\text{voltage}} \times 2 \text{ pcs.} \\ &= 24\text{V} - 4\text{V} \times 2 \text{ pcs.} \\ &= 16\text{V} \end{aligned}$$

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

### 2-wire with 2 switch OR connection



<Solid state>  
When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

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

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1\text{mA} \times 2 \text{ pcs.} \times 3\text{k}\Omega \\ &= 6\text{V} \end{aligned}$$

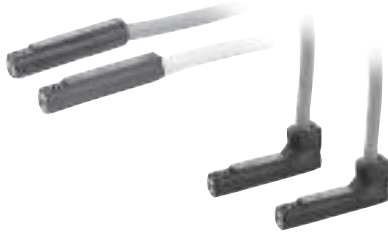
Example: Load impedance is 3kΩ  
Leakage current from switch is 1mA

# Reed Switches/Direct Mount Type

## D-A90 (V), D-A93 (V), D-A96 (V)

### Auto Switch Specifications

**Grommet**  
Electrical entry direction: Side



### Caution

#### Precautions

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

D-A90, D-A90V (without indicator light)			
Auto switch part no.	D-A90, D-A90V		
Applicable load	IC circuit, Relay, PLC		
Load voltage	24V <sub>DC</sub> <sup>AC</sup> or less	48V <sub>DC</sub> <sup>AC</sup> or less	100V <sub>DC</sub> <sup>AC</sup> or less
Maximum load current	50mA	40mA	20mA
Contact protection circuit	None		
Internal resistance	1Ω or less (including 3m lead wire length)		
D-A93, D-A93V, D-A96, D-A96V (with indicator light)			
Auto switch part no.	D-A93, D-A93V		D-A96, D-A96V
Applicable load	Relay, PLC		IC circuit
Load voltage	24VDC	100VAC	4 to 8VDC
Load current range and maximum load current	5 to 40mA	5 to 20mA	20mA
Contact protection circuit	None		
Internal voltage drop	D-A93 – 2.4V or less (to 20mA)/ 3V or less (to 40mA) D-A93V – 2.7V or less		0.8V or less
Indicator light	Red LED lights when ON		

#### Lead wire

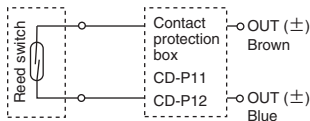
D-A90(V), D-A93(V) — Oil resistant vinyl heavy duty cable ø2.7, 0.18mm<sup>2</sup> x 2-wire (brown, blue), 0.5m  
D-A96(V) — Oil resistant vinyl heavy duty cable ø2.7, 0.15mm<sup>2</sup> x 3-wire (brown, black, blue), 0.5m

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

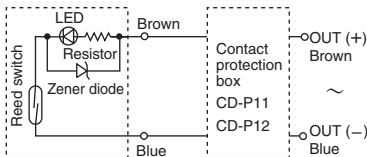
Note 2) Refer to page 15 for lead wire length.

### Auto Switch Internal Circuits

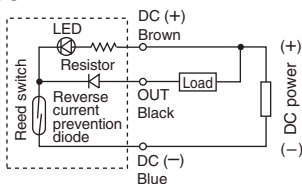
#### D-A90V



#### D-A93V



#### D-A96V



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

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

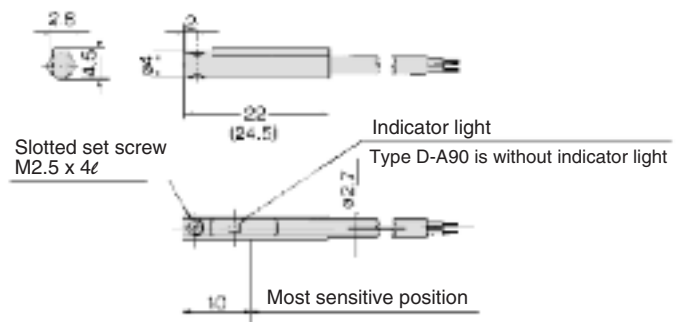
### Auto Switch Weights

Model	D-A90	D-A90V	D-A93	D-A93V	D-A96	D-A96V
Lead wire length 0.5m	6	6	6	6	8	8
Lead wire length 3m	30	30	30	30	41	41

(g)

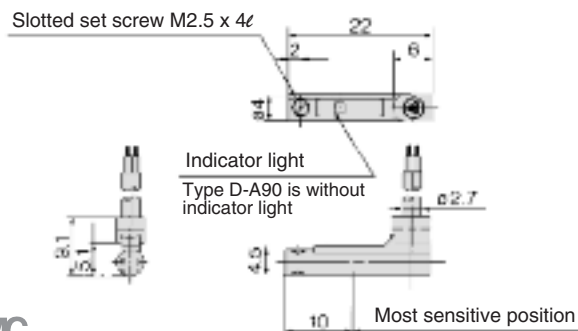
### Auto Switch Dimensions

#### D-A90, D-A93, D-A96



Type D-A93 dimensions are shown inside ( ).

#### D-A90V, D-A93V, D-A96V



# Solid State Switches/Direct Mount Type D-F9N(V), D-F9P(V), D-F9B(V)

## Grommet



## Caution

### Precautions

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

## Auto Switch Specifications

D-F9□, D-F9□V (with indicator light)						
Auto switch part no.	D-F9N	D-F9NV	D-F9P	D-F9PV	D-F9B	D-F9BV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3-wire			2-wire		
Output type	NPN		PNP		—	
Applicable load	IC circuit, Relay, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28V)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 8V)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less	
Indicator light	Red LED lights when ON					

- Lead wire — Oil proof heavy duty vinyl cord,  $\phi 2.7$ , 3 cores (brown, black, blue), 0.15mm<sup>2</sup>, 2 cores (brown, blue), 0.18 mm<sup>2</sup>, 0.5m

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

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

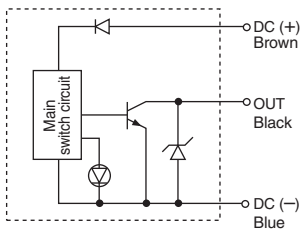
## Auto Switch Weights

Unit: g

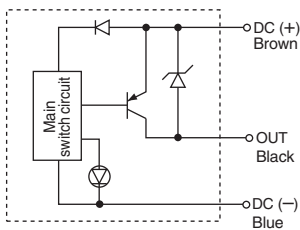
Model		D-F9N(V)	D-F9P(V)	D-F9B(V)
Lead wire length m	0.5	7	7	6
	3	37	37	31
	5	61	61	51

## Auto Switch Internal Circuits

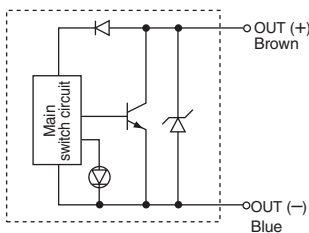
### D-F9N, F9NV



### D-F9P, F9PV

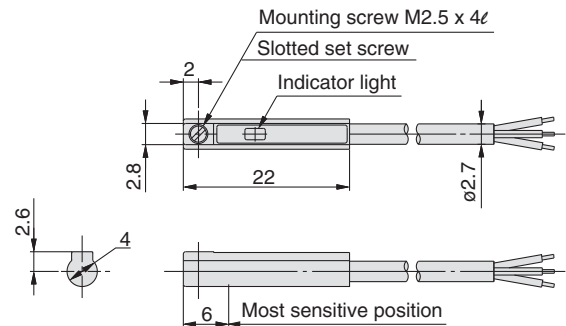


### D-F9B, F9BV

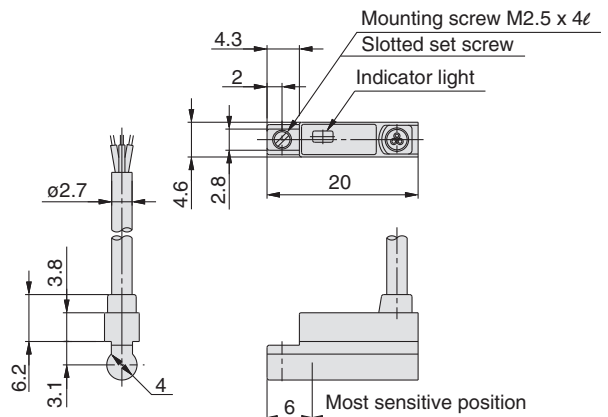


## Auto Switch Dimensions

### D-F9□



### D-F9□V





# 2-Color Display Solid State Switches/Direct Mount Type D-F9NW(V), D-F9PW(V), D-F9BW(V)

## Auto Switch Specifications

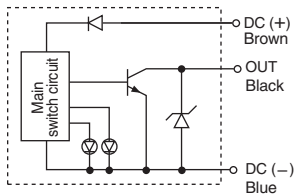
### Grommet



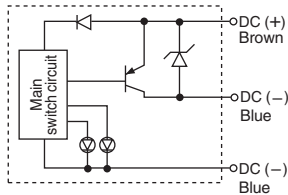
D-F9□W, D-F9□WV (with Indicator light)						
Auto switch part no.	D-F9NW	D-F9NWV	D-F9PW	D-F9PWV	D-F9BW	D-F9BWV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3-wire			2-wire		
Output type	NPN		PNP		—	
Applicable load	IC circuit, Relay IC, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28V)					—
Current consumption	10mA or less					—
Load voltage	28VDC or less		—		24VDC (10 to 28V)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less	
Indicator light	Actuated position ..... Red LED lights up Optimum operating position ... Green LED lights up					

### Auto Switch Internal Circuits

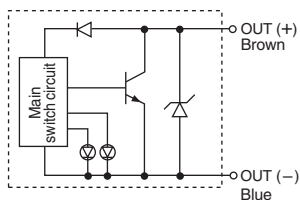
#### D-F9NW, F9NWV



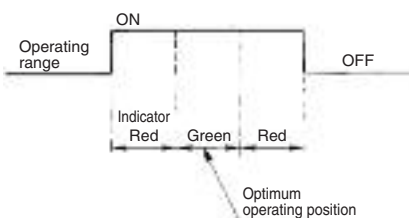
#### D-F9PW, F9PWV



#### D-F9BW, F9BWV



### Indicator light/Display method



- Lead wire — Oil proof heavy duty vinyl cord,  $\phi 2.7$ , 3 cores (brown, black, blue), 0.15mm<sup>2</sup>, 2 cores (brown, blue), 0.18mm<sup>2</sup>, 0.5m

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

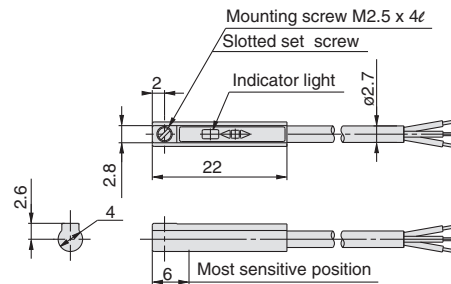
### Auto Switch Weights

Unit: g

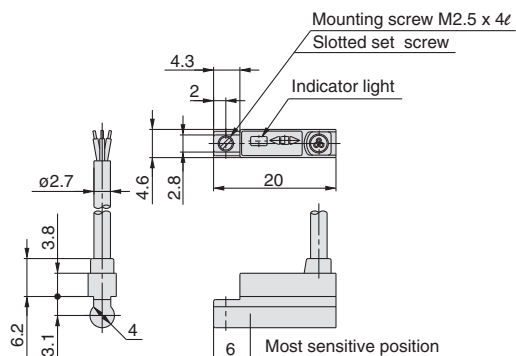
Model		D-F9NW(V)	D-F9PW(V)	D-F9BW(V)
Lead wire length m	0.5	7	7	7
	3	34	34	32
	5	56	56	52

### Auto Switch Dimensions

#### D-F9□W



#### D-F9□WV





Symbol

**-XB10**

## 1 Intermediate stroke

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

### Stroke range

Bore size (mm)	Stroke range (mm)
10	51 to 299
15	51 to 499
25	101 to 599

**CY1F** **Bore size** **Piping thread type** **Piping direction** **Stroke** **Adjustment bolt symbol** **Auto switch** **Symbol** **-XB10**

Example **CY1F10R-237AL-A93-XB10**

Symbol

**-XB11**

## 2 Long stroke

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

### Stroke range

Bore size (mm)	Stroke range (mm)
10	301 to 500
15	501 to 750
25	601 to 1200

**CY1F** **Bore size** **Piping thread type** **Piping direction** **Stroke** **Adjustment bolt symbol** **Auto switch** **Symbol** **-XB11**


Example **CY1F25L-777A-A93-XB11**





*Series CY1F*

# Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

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

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

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

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

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

## **Warning**

### **1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

### **2. Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

### **3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.

2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.

3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

### **4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.

2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.

3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

## Precaution on Design

### Caution

#### 1. There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc., and changes in forces occur.

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

#### 2. Install a protective cover when there is a risk of human injury.

If a driven object and moving parts of a cylinder pose a danger of human injury, design the structure to avoid contact with the human body.

#### 3. Securely tighten all mounting parts and connecting parts so that they will not become loose.

Especially when a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

#### 4. A deceleration circuit or shock absorber, etc., may be required.

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

#### 5. Consider a possible drop in operating pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and/or human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

#### 6. Consider a possible loss of power source.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

#### 7. Design circuitry to prevent sudden lurching of driven objects.

When a cylinder is driven by an exhaust center type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder. In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, equipment should be selected and circuits designed to prevent sudden lurching.

#### 8. Consider emergency stops.

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

#### 9. Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install safe manual control equipment.

## Selection

### Warning

#### 1. Confirm the specifications.

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.)

Consult SMC if you use a fluid other than compressed air.

#### 2. Intermediate stops

When intermediate stopping of a cylinder piston is performed with a 3 position closed center type directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure due to the compressibility of air.

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

### Caution

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

Refer to the air cylinder model selection procedure for the maximum useable stroke.

#### 2. Operate the piston within a range such that collision damage will not occur at the stroke end.

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the range within which damage will not occur.

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

#### 4. Provide intermediate supports for long stroke cylinders.

Provide intermediate supports for cylinders with long strokes to prevent bending of the tube, and deflection due to vibration and external loads, etc.

### Mounting

#### ⚠ Caution

##### 1. Do not apply strong impacts or excessive moment to the slide table (slider).

The slide table (slider) is supported by precision bearings. Therefore, do not apply strong impacts or excessive moment, etc., when mounting work pieces.

##### 2. Align carefully when connecting to a load having an external guide mechanism.

Magnetically coupled rodless cylinders (series CY1F) can be used with a direct load within the allowable range for each type of guide, but careful alignment is necessary when connecting to a load having an external guide mechanism.

As the stroke becomes longer, variations in the center axis become larger. Consider using a connection method (floating mechanism) that is able to absorb these variations.

##### 3. Do not scratch or gouge the cylinder tube by striking or grasping it with other objects.

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction.

##### 4. Do not use until you can verify that equipment can operate properly.

Verify correct mounting by suitable function and leakage inspections after compressed air and power are connected following mounting, maintenance or conversions.

##### 5. Instruction manual

The product should be mounted and operated after thoroughly reading the manual and understanding its contents. Keep the instruction manual where it can be referred to as needed.

### Piping

#### ⚠ Caution

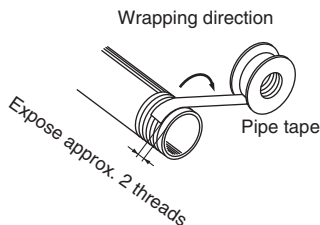
##### 1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

##### 2. Wrapping of pipe tape

When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



### Lubrication

#### ⚠ Caution

##### 1. Lubrication of non-lube type cylinder

The cylinder is lubricated at the factory and can be used without any further lubrication.

However, in the event that it will be lubricated, use class 1 turbine oil (without additives) ISO VG32.

Stopping lubrication later may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

### Air Supply

#### ⚠ Warning

##### 1. Use clean air.

Do not use compressed air which includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

#### ⚠ Caution

##### 1. Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be 5 $\mu$ m or finer.

##### 2. Install an after cooler, air dryer or water separator, etc.

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after cooler, air dryer or water separator, etc.

##### 3. Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing, since moisture in circuits can be frozen under 5°C, and this may cause damage to seals and lead to malfunction.

Refer to SMC's "Best Pneumatics vol.4" catalog for further details on compressed air quality.

## Operating Environment

### Warning

1. **Do not use in environments where there is a danger of corrosion.**

Refer to the construction drawings regarding cylinder materials.

2. **Provide a cover or other protection in dusty locations or where water, oil, etc., splash on the equipment.**

The cylinder may malfunction if operated in a location with a lot of dirt, water droplets, coolant or paper dust, etc. Provide a cover or other protective measure.

## Maintenance

### Warning

1. **Maintenance should be performed according to the procedure indicated in the instruction manual.**

If handled improperly, malfunction and damage of machinery or equipment may occur.

2. **Removal of equipment, and supply/exhaust of compressed air.**

When equipment is removed, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.

When machinery is restarted, proceed with caution after confirming measures to prevent cylinder lurching.

### Caution

1. **Drain flushing**

Remove drainage from air filters regularly.  
(Refer to specifications.)

# Series CY1F Auto Switch Precautions 1

Be sure to read before handling.

## Design and Selection

### ⚠ Caution

#### 1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications of current load, voltage, temperature or impact.

#### 2. Take precautions when multiple cylinders are used close together.

When multiple auto switch cylinders are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm. (When the allowable separation is indicated for each cylinder series, use the specified value.)

#### 3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

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

#### 4. Keep wiring as short as possible.

##### <Reed switch>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

- 1) Use a contact protection box when the wire length is 5m or longer.

##### <Solid state switch>

- 2) Although wire length does not affect switch function, use wiring 100m or shorter.

#### 5. Take precautions for the internal voltage drop of the switch.

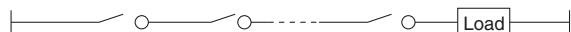
##### <Reed switch>

- 1) Switches with an indicator light (Except D-A96, A96V)

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



### ⚠ Warning

- In the same way, when operating below a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}$$

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

##### <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, note that a 12VDC relay is not applicable.

#### 6. Pay attention to leakage current.

##### <Solid state switch>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\text{Operating current of load (OFF condition)} > \text{Leakage current}$$

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

#### 7. Do not use a load that generates surge voltage.

##### <Reed switch>

If driving a load such as a relay that generates a surge voltage, use a contact protection box.

##### <Solid state switch>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid valve, which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

#### 8. Cautions for use in an interlock circuit

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

#### 9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.

# Series CY1F Auto Switch Precautions 2

Be sure to read before handling.

## Mounting and Adjustment

### ⚠ Warning

#### 1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s<sup>2</sup> or more for reed switches and 1000m/s<sup>2</sup> or more for solid state switches) while handling.

Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

#### 2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

#### 3. Mount switches using the proper tightening torque.

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

#### 4. Mount a switch at the center of the operating range.

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

## Wiring

### ⚠ Warning

#### 1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from repeatedly applying bending stress or stretching force to the lead wires.

#### 2. Be sure to connect the load before power is applied.

<2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

#### 3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

#### 4. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

## Wiring

### ⚠ Warning

#### 5. Do not allow short circuit of loads.

<Reed switch>

If the power is turned ON with a load in a short circuit condition, the switch will be instantly damaged because of excess current flow into the switch.

<Solid state switch>

All models of PNP output type switches do not have built-in short circuit protection circuits. If loads are short circuited, the switches will be instantly damaged, as in the case of reed switches.

Take special care to avoid reverse wiring with the brown power supply line and the black output line on 3-wire type switches.

#### 6. Avoid incorrect wiring.

<Reed switch>

A 24VDC switch with indicator light has polarity. The brown lead wire or terminal no. 1 is (+), and the blue lead wire or terminal no. 2 is (-).

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

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models: D-A93, A93V

<Solid state switch>

1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will be in a normally ON state. However, note that the switch will be damaged if reversed connections are made while the load is in a short circuited condition.

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

#### \* Lead wire color changes

Lead wire colors of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided.

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

#### 2-wire

	Old	New
Output (+)	Red	Brown
Output (-)	Black	Blue

#### 3-wire

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black

#### Solid state with diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

#### Solid state with latch type diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange



## Operating Environment

### Warning

- 1. Never use in an atmosphere of explosive gases.**

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.
- 2. Do not use in an area where a magnetic field is generated.**

Auto switches will malfunction or magnets inside cylinders will become demagnetized. (Consult SMC regarding the availability of a magnetic field resistant auto switch.)
- 3. Do not use in an environment where the auto switch will be continually exposed to water.**

Although switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction), do not use switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.
- 4. Do not use in an environment with oil or chemicals.**

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.
- 5. Do not use in an environment with temperature cycles.**

Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as they may be adversely affected internally.
- 6. Do not use in an environment where there is excessive impact shock.**

<Reed switch>  
When excessive impact (300m/s<sup>2</sup> or more) is applied to a reed switch during operation, the contact will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment.
- 7. Do not use in an area where surges are generated.**

<Solid state switch>  
When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to internal circuit elements of the switch. Avoid sources of surge generation and crossed lines.
- 8. Avoid accumulation of iron debris or close contact with magnetic substances.**

When a large amount of ferrous debris such as machining chips or welding spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

## Maintenance

### Warning

- 1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.**
  - 1) Securely tighten switch mounting screws.  
If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.
  - 2) Confirm that there is no damage to lead wires.  
To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.
  - 3) Confirm the lighting of the green light on a 2-color display type switch.  
Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

## Other

### Warning

- 1. Consult SMC concerning water resistance, elasticity of lead wires and usage at welding sites, etc.**

# Series CY1F Specific Product Precautions 1

Be sure to read before handling.

## Mounting

### ⚠ Caution

#### 1. Do not apply a large impact or excessive moment to the slide table (slider).

Because the slide table (slider) is supported by a precision bearing, do not apply a large impact or excessive moment when mounting a work piece.

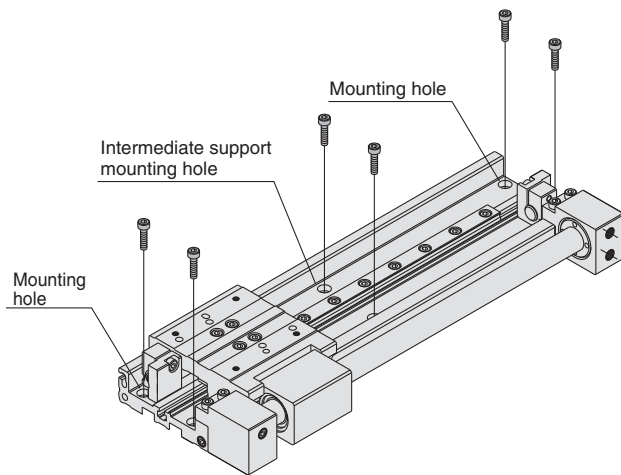
#### 2. Align carefully when connecting to a load with an external guide mechanism.

Although a magnetic rodless cylinder (series CY1F) can directly receive a load within the allowable range of the guide, it is necessary to align sufficiently when connecting to a load with an external guide mechanism.

The longer the stroke is, the greater the displacement of the shaft center becomes. Therefore, adopt a connection method (floating mechanism) that can ensure absorption of the displacement.

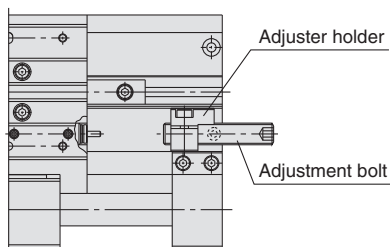
#### 3. Be sure to use the 4 mounting holes on both ends of the guide body when mounting the product on equipment.

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



#### 4. When a 25 mm adjustment bolt is selected, the mounting holes will be hidden behind it. Adjust the adjustment bolt after the cylinder is installed.

According to (2) "Adjusting bolt adjustment" on page 31, move the adjustment bolt to a position where it does not interfere with any of the mounting holes and secure the cylinder with mounting screws. After securing the cylinder, readjust the stroke with the adjustment bolt.



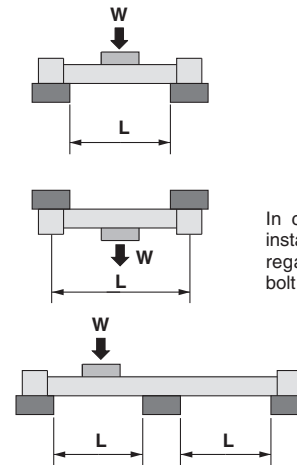
25 mm adjustment bolt

### ⚠ Caution

#### 5. Long stroke operation causes deflection of the path table or cylinder tube. In such a case, provide an intermediate support.

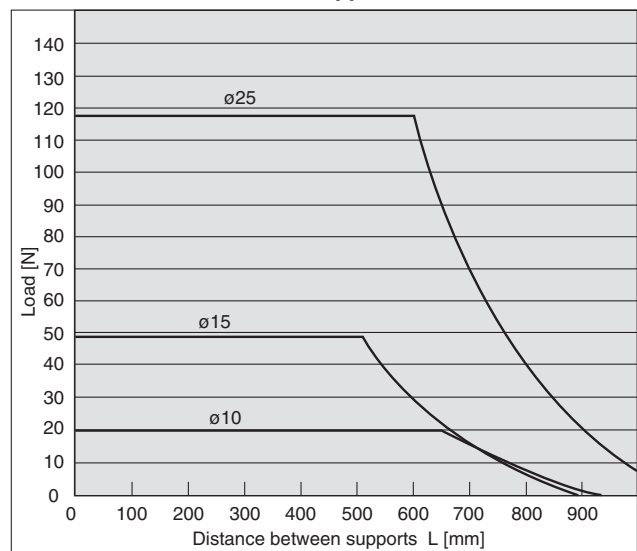
Provide an intermediate support with the mounting holes on the center of the path table so that the distance between supports given as L in the figure will not exceed the value shown in the graph.

- If the counter surface lacks precision, malfunction may result so adjust the level at the same time.
- In an environment where vibration or impact occurs, provide an intermediate support even if the distance is within the allowable range in the graph.



In case the product is installed on the ceiling, regard the mounting bolt pitch as L.

Distance between load and supports



(1N = 0.22 lbf)

#### 6. There are limitations on the load mass and operating pressure in case the product is used in the vertical direction.

When using the product in the vertical direction, confirm the allowable values in "Vertical Operation" in Model Selection (1). If the allowable value is exceeded, the magnet coupling may slip off, causing the work piece to drop down.

### Handling

#### ⚠ Caution

##### 1. Do not inadvertently move the guide adjusting unit.

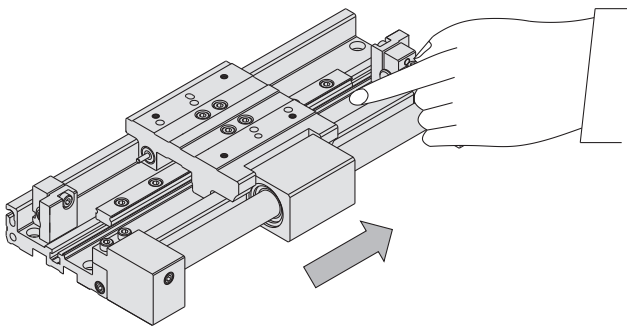
The guide is installed at the proper tightening torque. Do not loosen the mounting bolts of the guide.

##### 2. Do not operate the magnetic rodless cylinder if the magnet couplings on the actuator are displaced.

If the magnet couplings are displaced by an external force beyond the holding force, supply an air pressure of 0.7MPa to the cylinder port to return the external slider to the right position of the stroke end.

##### 3. Take precautions to avoid getting your hands caught in the unit.

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



##### 4. Never disassemble the magnetic component parts (external slider, internal slider) of the actuator (cylinder).

If will cause decline of the holding force, etc.

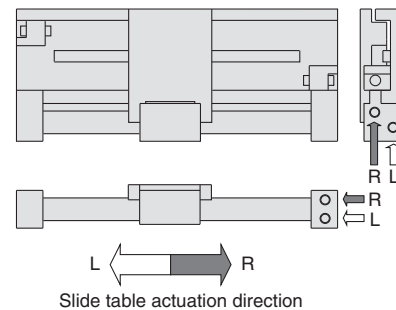
### Piping

#### ⚠ Caution

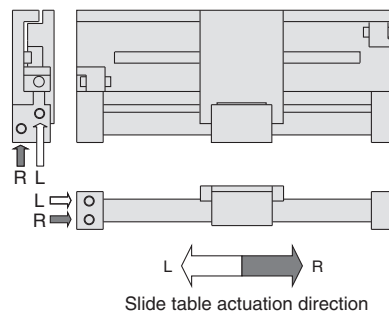
##### 1. Be careful about the direction of the piping port and that of the slide table movement.

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

##### Centralized piping on right



##### Centralized piping on left



##### 2. The plug position of the piping port can be changed to suit the operating conditions.

When screwing in the plug for the second time, wrap a sealant tape around the plug to prevent leakage.

###### (1) M5

First tighten lightly until the rotation stops. Then tighten an additional 1/6 to 1/4 turn.

###### (2) Rc1/8

Tighten with a 7 to 9N·m torque using tightening tools.

# Series CY1F

## Specific Product Precautions 3

Be sure to read before handling.

### Adjustment

#### ⚠ Caution

##### 1. Stroke adjustable range

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

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

Bore size (mm)	Standard adjustment bolt	25mm adjustment bolt
10	-1.2 to 0.8	-25.2 to 0.8
15	-1.2 to 0.8	-25.2 to 0.8
25	-1.4 to 0.6	-25.4 to 0.6

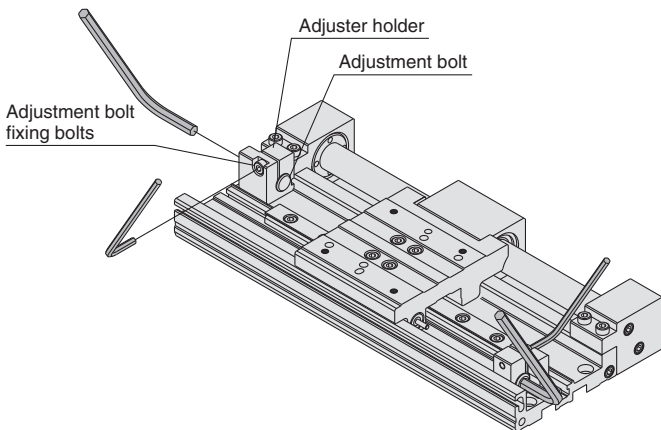
(mm)

The adjustment values above are those for one side.

##### 2. Adjusting bolt adjustment

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

Bore size (mm)	Adjustment bolt fixing bolts	Tightening torque	Adjustment width across flats
10	M3	1.0 to 1.3N·m	4
15	M3	1.0 to 1.3N·m	4
25	M5	4.6 to 6.2N·m	5



#### ⚠ Caution

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

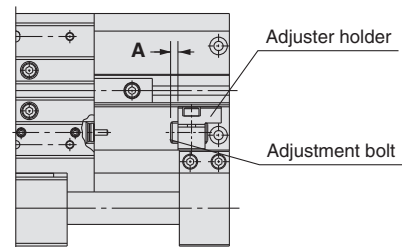
When making the stroke smaller than the reference stroke with the adjustment bolt, operate at a pressure below the operating pressure limit in (1) "Intermediate stop by external stopper or stroke adjustment with adjustment bolt." on page 5. If the operating pressure limit is exceeded, the magnet coupling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

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

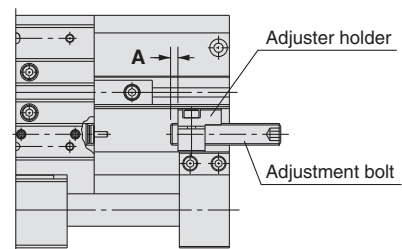
If dimension A is made smaller than 0, the slide table and adjuster holder will collide, resulting in damage to the slide table such as scratches or gouges.

Bore size (mm)	At the minimum stroke of standard adjustment bolt	At the minimum stroke of 25 mm adjustment bolt	Basic stroke	At maximum stroke adjustment
10	$A < 2$	$A < 26$	$A = 0.8$	$A \geq 0$
15	$A < 2$	$A < 26$	$A = 0.8$	
25	$A < 2$	$A < 26$	$A = 0.6$	

(mm)



Standard adjustment bolt



25 mm adjustment bolt

## Maintenance and Replacement

### ⚠ Caution

#### Replacement of actuator

#### 1. The actuator (cylinder) of series CY1F can be replaced.

Refer to "Replacement Actuator (Cylinder)" on page 11 about how to order .

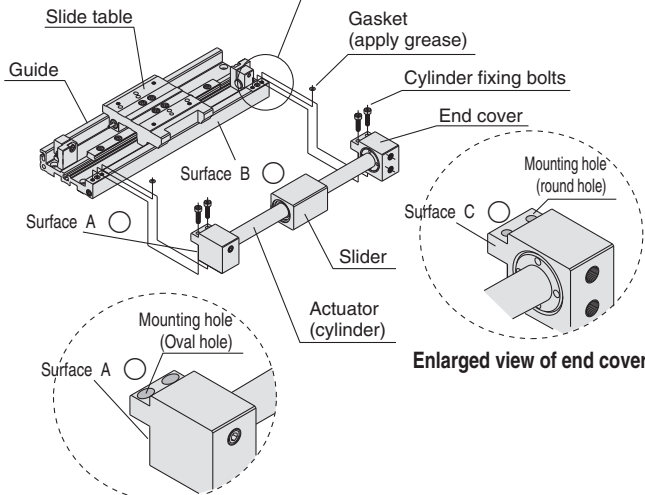
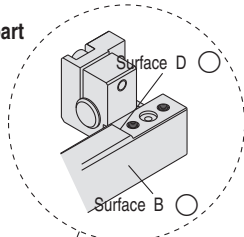
#### 2. Replacement of actuator (cylinder) of series CY1F.

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

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

(1N·m = 0.74 ft·lbs)

#### Enlarged view of stepped part



#### Enlarged view end cover

#### 3. Be sure to fasten the cylinder fixing bolts.

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

### ⚠ Caution

#### Replacement of shock absorber

#### 1. The shock absorber of series CY1F can be replaced.

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

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

Bore size (mm)	No.
10	RB0805-X552
15	
25	RB1006-X552

#### 2. Replacement of shock absorber

Follow the steps below to replace the shock absorber.

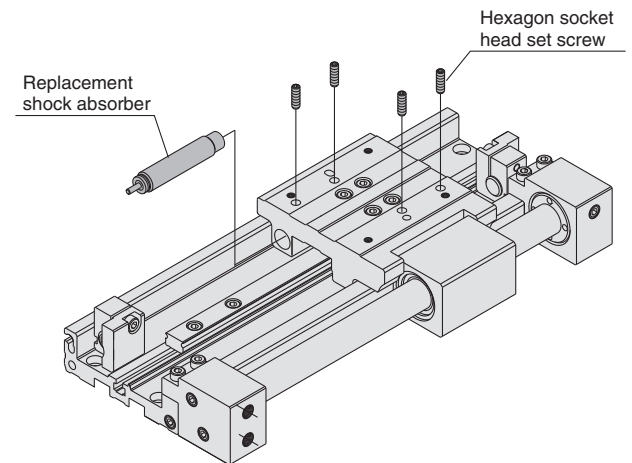
- 1) Remove the work piece from the slide table.
- 2) Loosen the 4 hexagon socket head screws on the top of the slide table and pull out the shock absorber.
- 3) Insert the replacement shock absorber into the slide table until it reaches the rear end and tighten 4 hexagon socket head screws.

Bore size (mm)	Hexagon socket head set screw	Tightening torque
10	M3	0.37 to 0.45N·m
15		
25	M5	0.54 to 0.64N·m

(1N·m = 0.74 ft·lbs)

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

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



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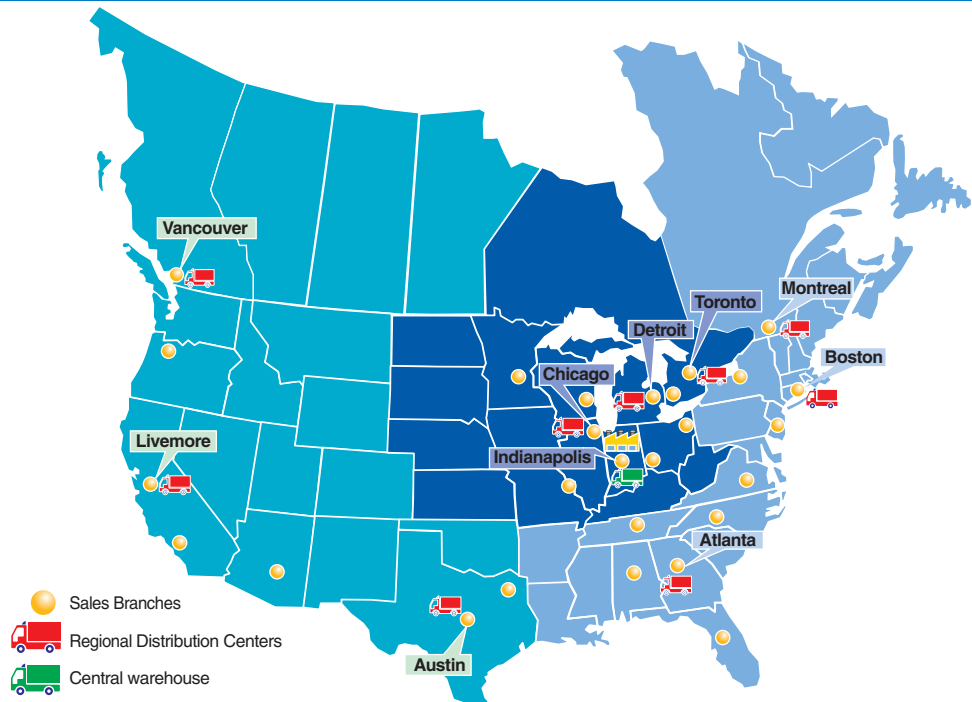
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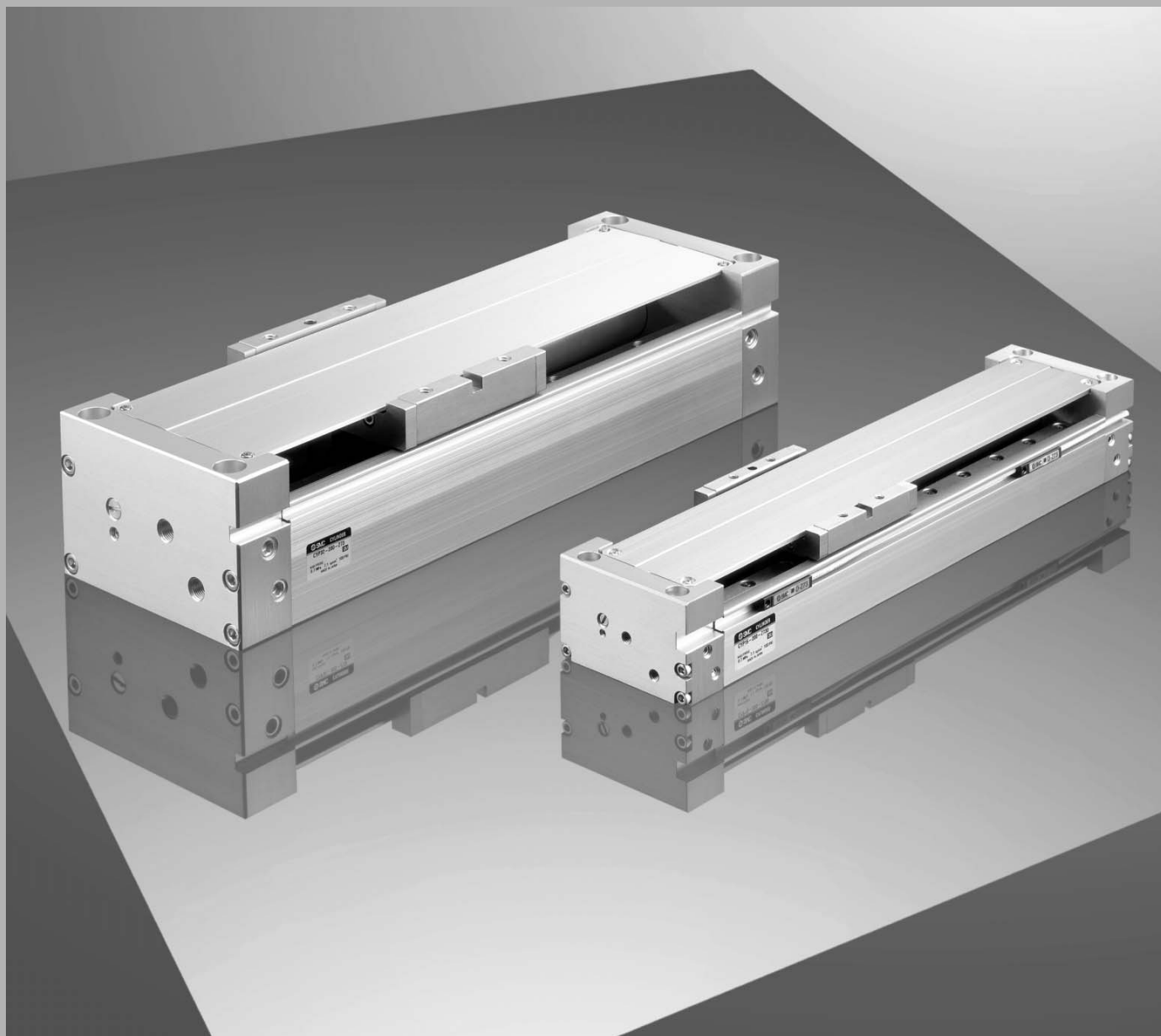
**For International Inquiries: [www.smcworld.com](http://www.smcworld.com)**



# Clean Room Rodless Cylinder

## Series *CYP*

ø15, ø32



MX□

MTS

MY□

**CY□**

MG□

CX□

D-

-X

20-

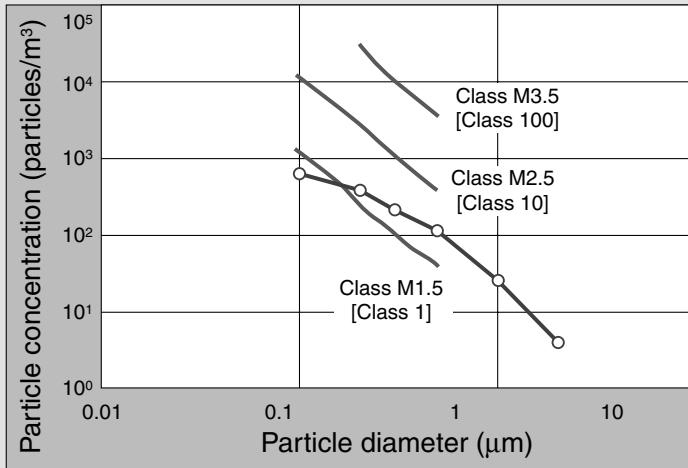
Data

Magnetically coupled rodless cylinder for transfer in clean environments.

# Low particle generation: 1/20

(compared to previous series)

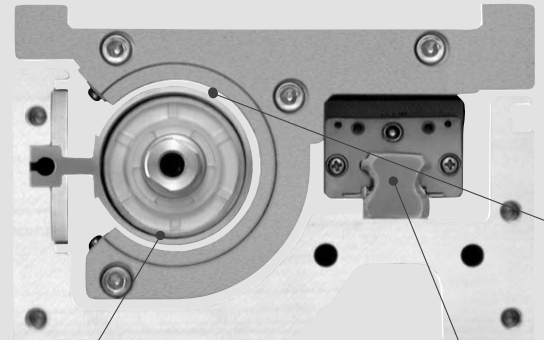
- High cleanliness is achieved with **non-contact construction** of the cylinder tube exterior and a **stainless steel linear guide (specially treated)**.
- Particle generation has been reduced to 1/20 compared to series 12-CY1B (previous SMC product) even without vacuum suction.



- 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 m<sup>3</sup>) 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: 2000 mm/s)  
 Note 5) The data above provide a guide for selection but is not guaranteed.

# Long stroke

(Max. 700 mm)

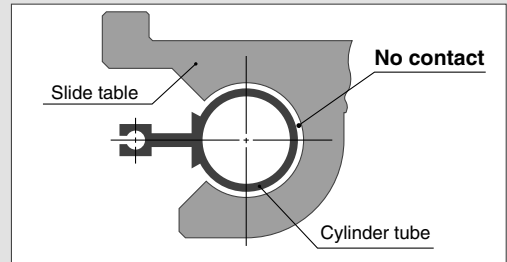


**Stainless steel linear guide (specially treated)**

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

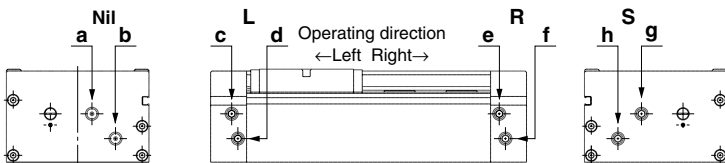
### Non-contact construction

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

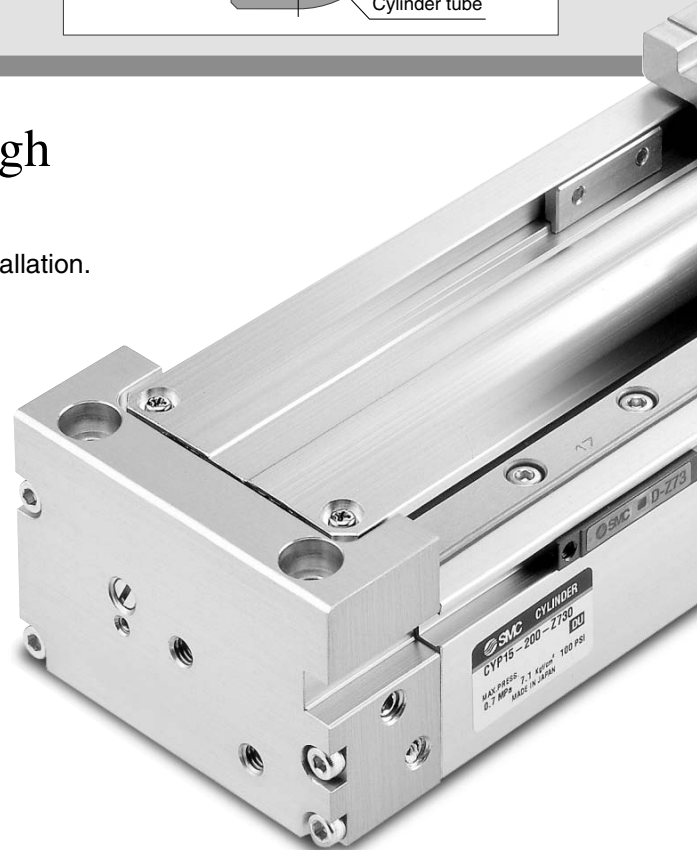
Piping port positions can be selected to accommodate the installation.



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





# A magnetically coupled rodless cylinder that can be used for transfer in clean environments

## Special cylinder tube

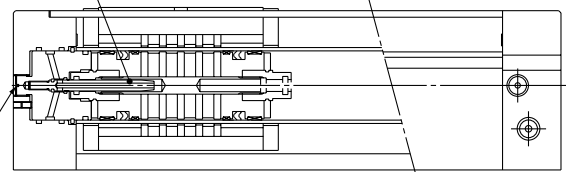
A special cylinder tube is employed using extruded aluminum material. Even long strokes are not subject to deflection because of direct attachment to the cylinder body, and non-contact construction is achieved through combination with a linear guide.



## Shock-free

A sine cushion is used at the end of the stroke. Smooth acceleration and deceleration are possible at 0.5 G or less.

Sine cushion

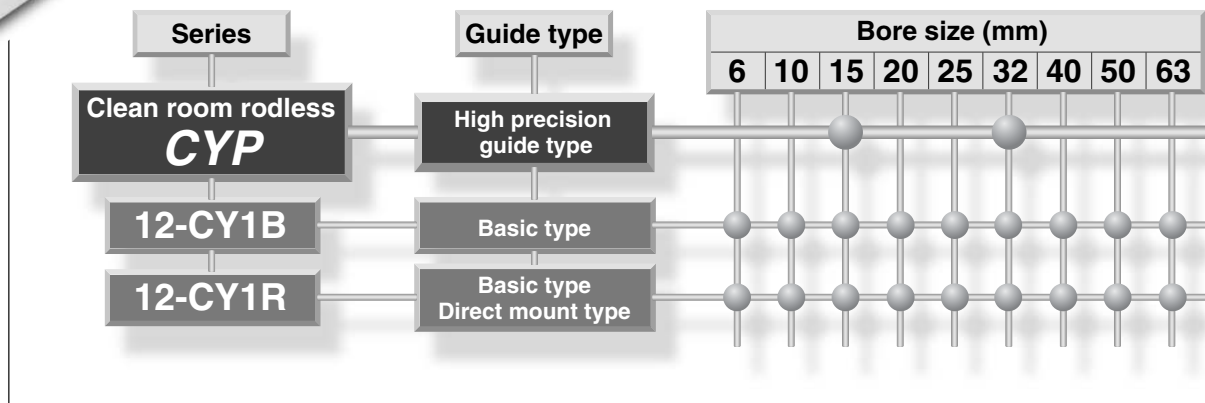
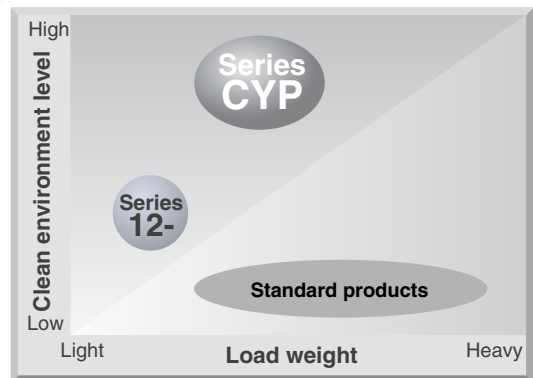


Stroke adjustment screw

## Stroke adjustment

The stroke adjustment screw allows fine control of the stroke ( $\pm 1$  mm on each side)

## Series Variations



- MX
- MTS
- MY
- CY**
- MG
- CX
- D-
- X
- 20-
- Data

# Series CYP Model Selection 1

## Caution on Design (1)

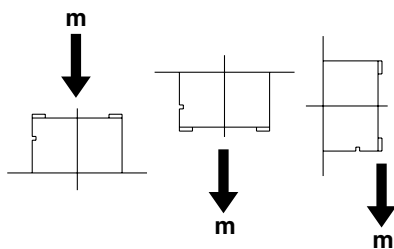
The load mass allowable moment differs depending on the workpiece mounting method, cylinder mounting orientation and piston speed. In making a determination of usability, do not allow the sum ( $\Sigma\alpha_n$ ) of the load factors ( $\alpha_n$ ) for each mass and moment to exceed "1".

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

## Load Mass

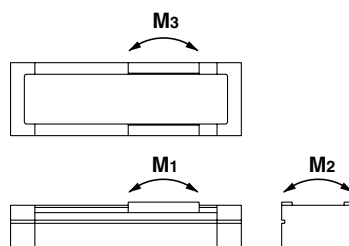
Max. load mass (kg)

Model	m max
CYP15	1
CYP32	5



## Moment

Allowable moment  
(Static moment/Dynamic moment)



Model	M1	M2	M3
CYP15	0.3	0.6	0.3
CYP32	3	4	3

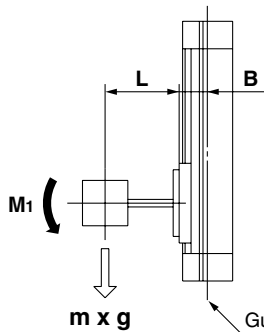
(N-m)

## Static Moment

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

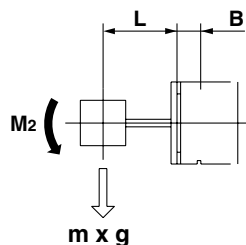
### ■ Pitch moment

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



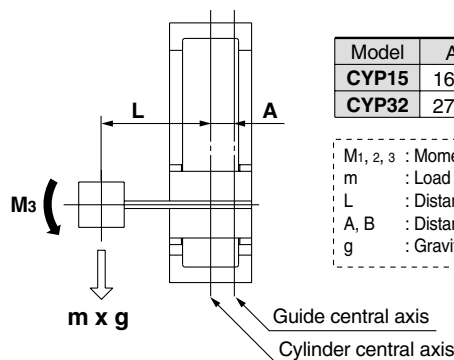
### ■ Roll moment

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



### ■ Yaw moment

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



Model	A	B
CYP15	16.5	25.5
CYP32	27.0	48.0

(mm)

M<sub>1, 2, 3</sub> : 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/s<sup>2</sup>]

## Dynamic Moment

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

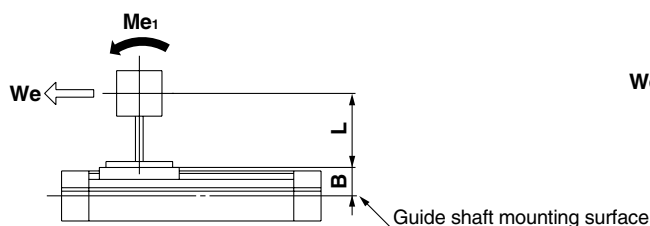
$$We = 5 \times 10^{-3} \times m \times g \times U$$

We: Load equivalent to impact [N]    U: Max. speed [mm/s]  
 m : Load mass [kg]    g: Gravitational acceleration [9.8 m/s<sup>2</sup>]

### ■ Pitch moment

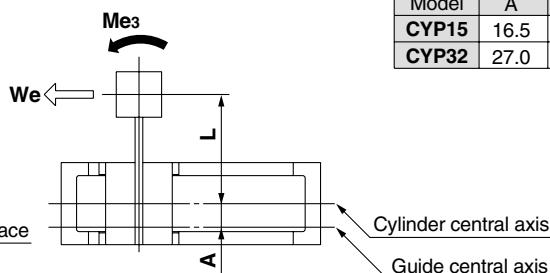
$$Me_1 = 1/3 * We (L + B) \cdot 10^{-3}$$

\* Average load coefficient



### ■ Yaw moment

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



Model	A	B
CYP15	16.5	25.5
CYP32	27.0	48.0

(mm)

# Series CYP Model Selection 2

## 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.

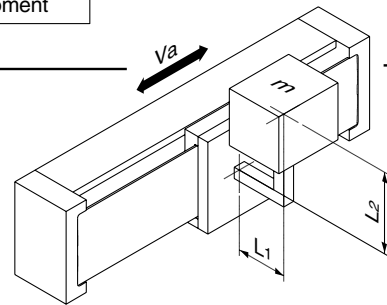
$$\Sigma \alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$$

Item	Load factor $\alpha_n$	Note
1. Max. load mass	$\alpha_1 = m/m_{\max}$	Review m $m_{\max}$ is the maximum load mass
2. Static moment	$\alpha_2 = M/M_{\max}$	Review $M_1, M_2, M_3$ $M_{\max}$ is the allowable moment
3. Dynamic moment	$\alpha_3 = M_e/M_{e\max}$	Review $M_{e1}, M_{e3}$ $M_{e\max}$ 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
<b>1. Maximum load mass</b> 	$\alpha_1 = m/m_{\max}$ $= 1/5$ $= 0.20$	Review m.
<b>2. Static moment</b> 	$M_2 = m \cdot g \cdot (L_1 + B) \cdot 10^{-3}$ $= 1 \cdot 9.8 \cdot (50 + 48) \cdot 10^{-3}$ $= 0.96$ [N·m] $\alpha_2 = M_2/M_2 \max$ $= 0.96/4$ $= 0.24$	Review $M_2$ . Since $M_1$ & $M_3$ are not generated, review is unnecessary.
<b>3. Dynamic moment</b> 	$W_e = 5 \times 10^{-3} \cdot m \cdot g \cdot U$ $= 5 \times 10^{-3} \cdot 1 \cdot 9.8 \cdot 300$ $= 14.7$ [N] $M_{e3} = 1/3 \cdot W_e \cdot (L_2 + A) \cdot 10^{-3}$ $= 1/3 \cdot 14.7 \cdot (50 + 27) \cdot 10^{-3}$ $= 0.38$ [N·m] $\alpha_3 = M_{e3}/M_{e3} \max$ $= 0.38/3$ $= 0.13$	Review $M_{e3}$ .
	$M_{e1} = 1/3 \cdot W_e \cdot (L_1 + B) \cdot 10^{-3}$ $= 1/3 \cdot 14.7 \cdot (50 + 48) \cdot 10^{-3}$ $= 0.48$ [N·m] $\alpha_4 = M_{e1}/M_{e1} \max$ $= 0.48/3$ $= 0.16$	Review $M_{e1}$ .

$$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4$$

$$= 0.20 + 0.24 + 0.13 + 0.16$$

$$= 0.73$$

$\Sigma\alpha_n = 0.73 \leq 1$  Therefore it can be used.

MX

MTS

MY

CY

MG

CX

D-

-X

20-

Data

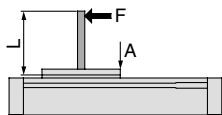
# Series CYP

## Model Selection 3

### Caution on Design (2)

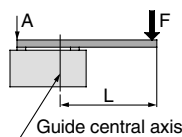
#### Table Deflection Note)

Table deflection due to pitch moment load



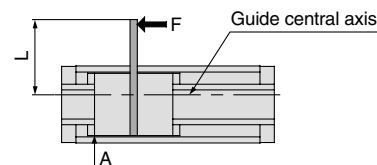
$$M_1 = F \times L$$

Table deflection due to roll moment load



$$M_2 = F \times L$$

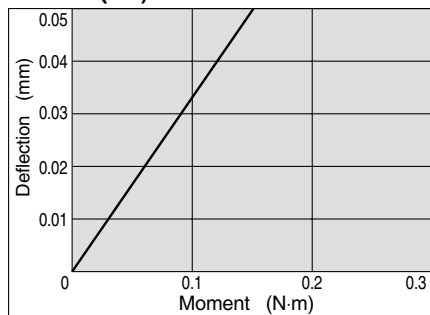
Table deflection due to yaw moment load



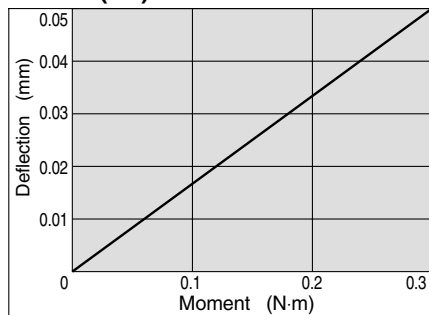
$$M_3 = F \times L$$

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

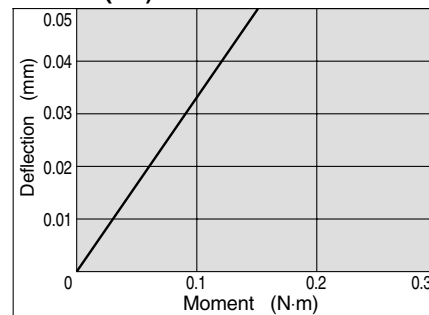
#### CYP15 (M<sub>1</sub>)



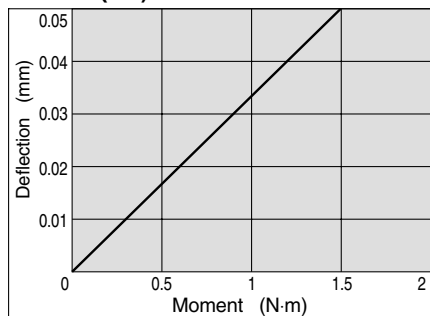
#### CYP15 (M<sub>2</sub>)



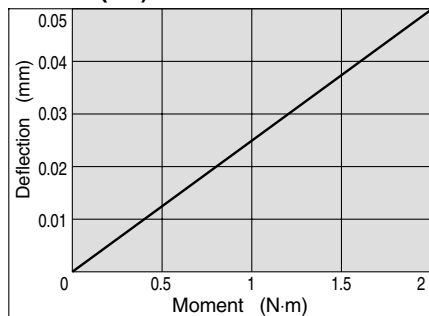
#### CYP15 (M<sub>3</sub>)



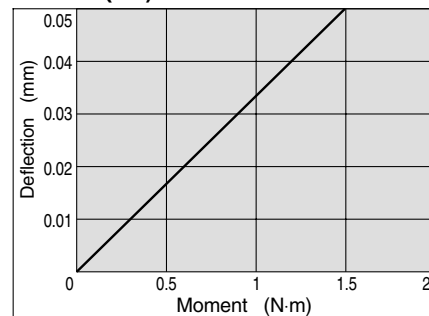
#### CYP32 (M<sub>1</sub>)



#### CYP32 (M<sub>2</sub>)



#### CYP32 (M<sub>3</sub>)



### 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.

Model	Allowable load mass $m_v$ (kg)	Maximum operating pressure $P_v$ (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 Room Rodless Cylinder

## Series CYP

ø15, ø32

### How to Order

**CYP** **15** — **200** — **Z73**

**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.

**Number of auto switches**

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

**Auto switch**

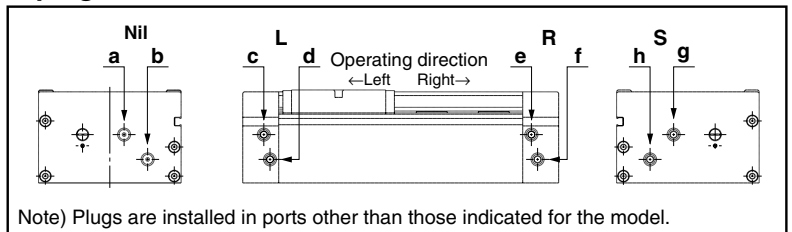
Nil	Without auto switch
-----	---------------------

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

**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

### Piping Port Location



### Applicable Auto Switch/Refer to page 8-30-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (mm)*			Applicable load		
					DC	AC	Electrical entry direction	Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)		
Reed switch	—	Grommet	Yes	3-wire	—	5 V	—	—	Z76	●	●	—	IC circuit	Relay, PLC
				2-wire	24 V	12 V 5 V, 12 V	100 V 100 V or less	—	Z73	●	●	●	—	
			No	—	—	—	Z80	●	●	—	—	—	—	
Solid state switch	Diagnostic indication (2-color indication)	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	Y69A	Y59A	●	●	○	IC circuit	Relay, PLC
				3-wire (PNP)				Y7PV	Y7P	●	●	○	IC circuit	
				2-wire				Y69B	Y59B	●	●	○	—	
				3-wire (NPN)				Y7NWV	Y7NW	●	●	○	IC circuit	
				3-wire (PNP)				Y7PWV	Y7PW	●	●	○	IC circuit	
				2-wire				Y7BWV	Y7BW	●	●	○	—	

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

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

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Data

# Series CYP



## Specifications

Bore size (mm)	15	32
Fluid	Air/Inert gas	
Action	Double acting	
Proof pressure	0.5MPa	
Operating pressure range	0.05 to 0.3MPa	
Ambient and fluid temperature	-10 to 60°C	
Piston speed	50 to 300mm/s	
Lubrication	Non-lube	
Stroke adjustment	±1mm on each side (±2mm total)	
Cushion	Sine cushion (Air cushion)	
Port size	M5 x 0.8	Rc 1/8

## Weight

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

## Magnetic Holding Force

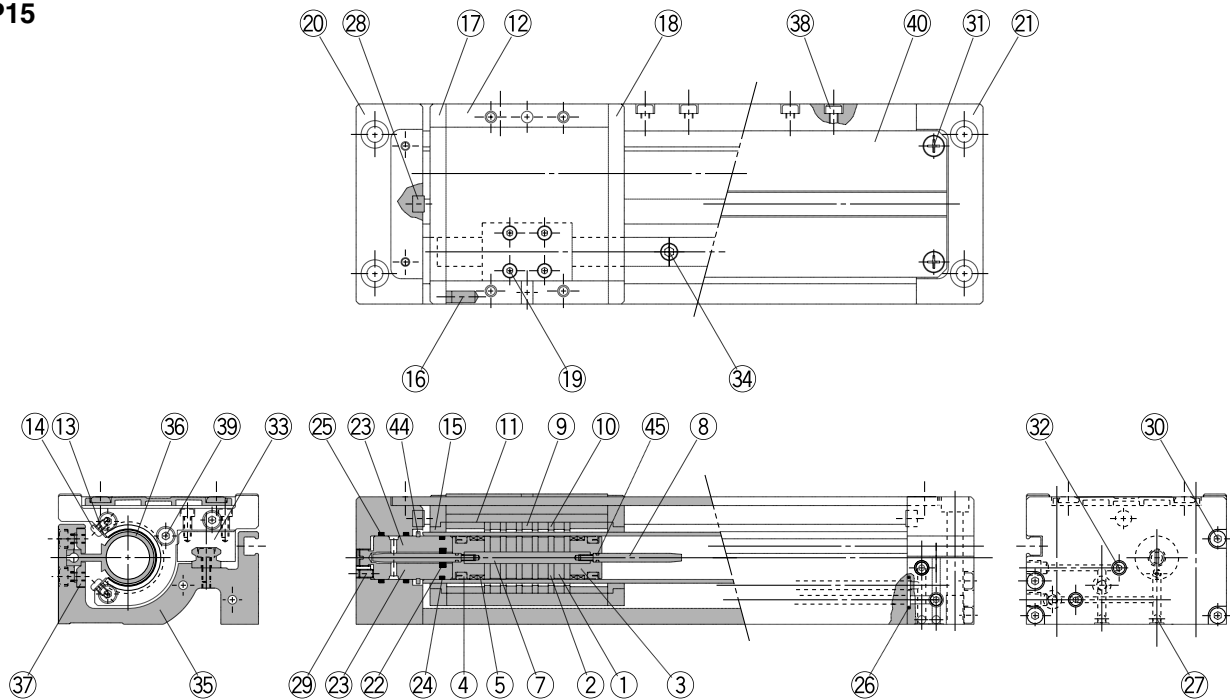
Bore size (mm)	Magnetic holding force (N)
<b>15</b>	59
<b>32</b>	268

## Theoretical Output

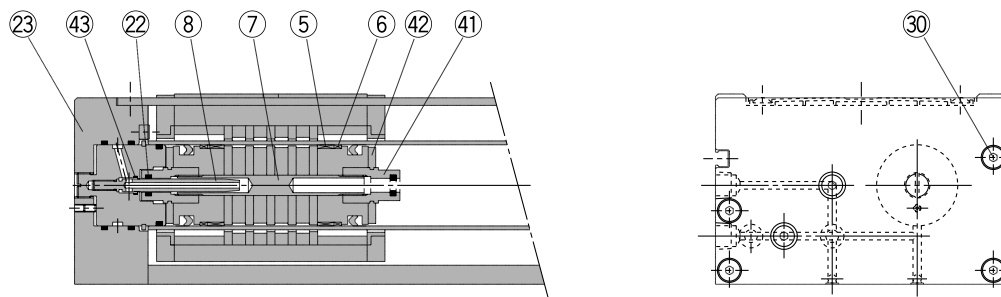
Bore size (mm)	Piston area (mm <sup>2</sup> )	Operating pressure (MPa)		
		0.1	0.2	0.3
<b>15</b>	176	18	35	53
<b>32</b>	804	80	161	241

## Construction

### CYP15



### CYP32



## Component Parts

No.	Description	Material	Note
①	Magnet A	Rare earth magnet	
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 B	Special resin	
⑦	Shaft	Stainless steel	
⑧	Cushion ring	Stainless steel/Brass	ø15: Electroless nickel plated
⑨	Magnet B	Rare earth magnet	
⑩	External slider side yoke	Rolled steel	Electroless nickel plated
⑪	External 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	Hold spacer	Aluminum alloy	Electroless nickel plated
⑯	Magnet	Rare earth magnet	
⑰	Side plate A	Aluminum alloy	Electroless nickel plated
⑱	Side plate B	Aluminum alloy	Electroless nickel plated
⑲	Hexagon socket head cap screw	Chrome molybdenum steel	Nickel plated
⑳	Plate A	Aluminum alloy	Clear hard anodized
㉑	Plate B	Aluminum alloy	Clear hard anodized
㉒	Cushion seal	NBR	

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

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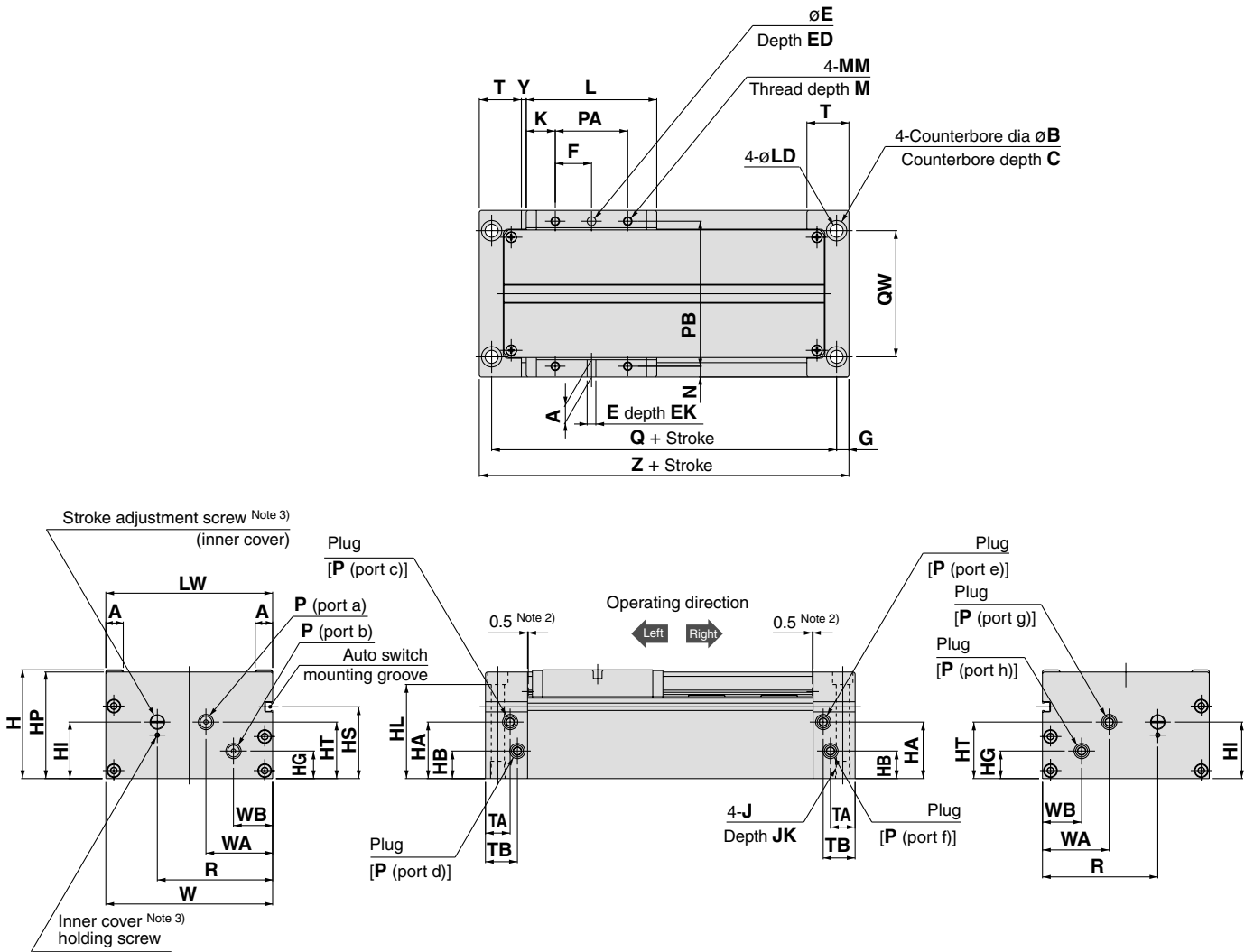
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Data

# Series CYP

## Dimensions



(mm)

Model	A	B	C	E	ED	EK	F	G	H	HA	HB	HG	HI	HL	HP	HS	HT	J	JK	K
CYP15	8	9.5	5.4	4H9 <sup>+0.030</sup> <sub>0</sub>	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
CYP32	12	14	8.6	6H9 <sup>+0.030</sup> <sub>0</sub>	13	6	25	8.5	75	39	19	19	39	64.9	73.5	49.5	39	M10 x 1.5	12	20

Model	L	LD	LW	MM	M	N	P	PA	PB	Q	QW	R	T	TA	TB	W	WA	WB	Y	Z
CYP15	67	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
CYP32	90	8.6	115	M6 x 1	8	7.5	Rc 1/8	50	100	138	87	79.5	29	17	22	115	46	27	3.5	155

Note 1) These dimension drawings indicate the case of piping port location "Nil".

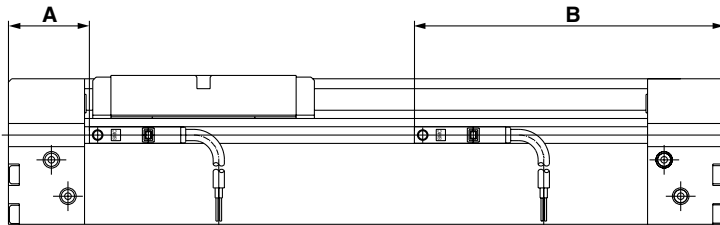
Note 2) These dimensions indicate the protruding portion of the bumper.

Note 3) Refer to "Specific Product Precautions" [Cushion Effect (Sine Cushion) and Stroke Adjustment] on page 8-17-13.



# Series CYP With Auto Switch

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



## Proper Auto Switch Mounting Position

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

## Operating Range

Auto switch model Cylinder model	D-Z7□ D-Z80	D-Y7□W D-Y7□WV D-Y5□ D-Y6□ D-Y7P D-Y7PV
	CYP15	6.5
CYP32	9.5	3

Note) Operating ranges are standards including hysteresis, and are not guaranteed. (variations on the order of  $\pm 30\%$ )

Large variations may occur depending on the surrounding environment.

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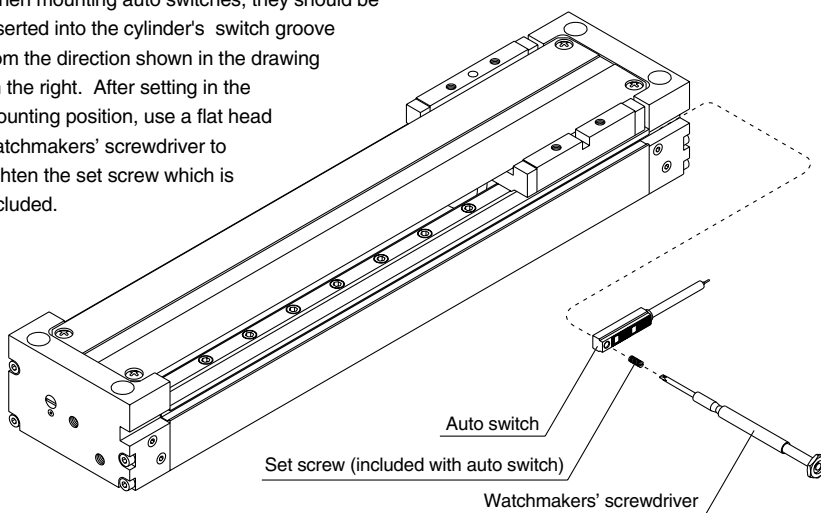
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Data

## Mounting of Auto Switch

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



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



## Series CYP

# Specific Product Precautions 1

Be sure to read before handling.

### 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.

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.

### 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.

### Operation

#### ⚠ Caution

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.

6. Never reapply lubricant.

Never reapply lubricant, as there may be a degradation of particulate generation or operation characteristics.

### 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-01-06-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-01-06-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	

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.)



# Series CY1F

# Specific Product Precautions 2

Be sure to read before handing.

## 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 conventional cushion mechanisms.

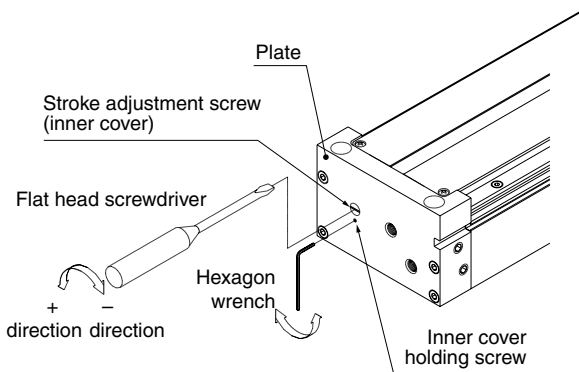
2. The stroke end adjustment is a mechanism to adapt the slide table's stroke end position to a mechanical stopper on other equipment, etc.

(Adjustment range: Total of both sides  $\pm 2$  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, etc.
- 2) To match the position with a mechanical stopper on other equipment, etc., rotate the stroke adjustment screw (inner cover) to the left or right with a flat head screwdriver to move the inner stopper back and forth. Approximately 1 mm of adjustment is possible with one rotation.
- 3) The maximum adjustment on one side is  $\pm 1$  mm. A total adjustment of approximately  $\pm 2$  mm is possible using both sides.
- 4) After completing the stroke end adjustment, tighten the inner cover holding screw with a hexagon wrench, etc.

### Inner Cover Holding Screw Tightening Torque [N·m]

Model	Screw size	Tightening torque
CYP15	M3 x 0.5	0.3
CYP32	M6 x 1	2.45



## 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. Please consult with SMC when replacing seals and bearings (wear rings).

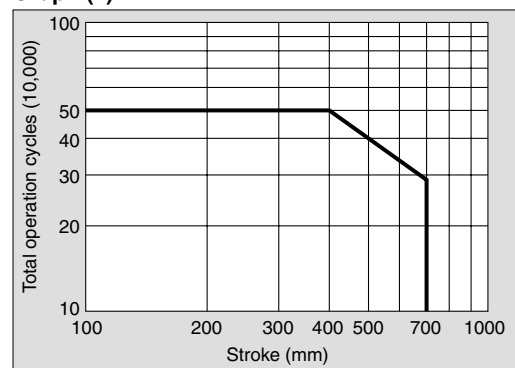
## Particulate Generation Characteristics

### ⚠ Caution

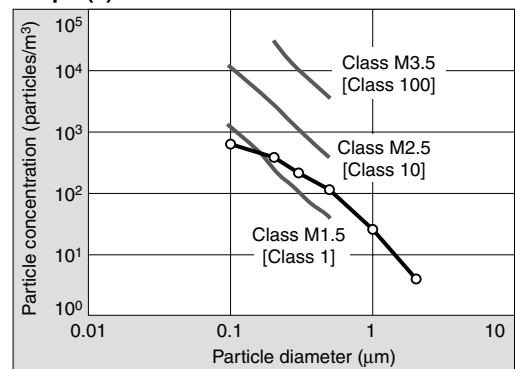
1. In order to maintain the particulate generation grade, use operation of 500 thousand cycles or travel distance of about 400 km as a standard. (Graph (1) below)

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 m<sup>3</sup>) 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.

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Data

# Rodless Cylinder for Vacuum

## Series *CYV*

ø15, ø32



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MY□

**CY□**

MG□

CX□

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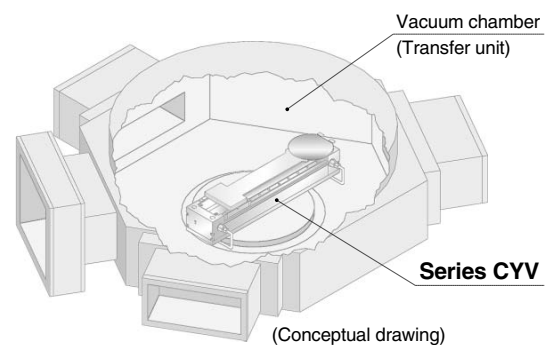
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Data

Air cylinder for transfer  
in vacuum environments ( $1.3 \times 10^{-4}$  Pa)

**Simplifies and reduces  
the size of equipment**  
Since the cylinder can be installed inside a vacuum  
chamber, it contributes to simplifying  
and reducing the size of a transfer system.



# Air cylinder for transfer

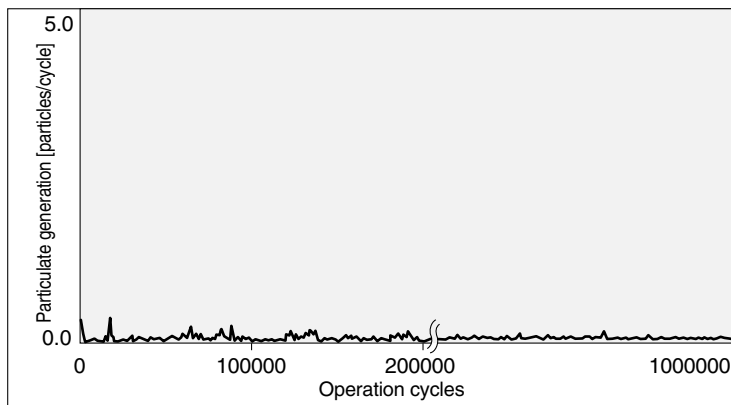
Rodless Cylinder for Vacuum

Series **CYV**

ø15, ø32

Low particulate generation

Average particle generation (particles > 0.1 μ) is **0.1 particles/cycle.** (Atmospheric conditions)



Note 1) This data indicates deterioration with age of the average number of particles per operation under the following test conditions.

<Test conditions>

- Cylinder: CYV32-100
- Workpiece weight: 5 kg
- Average speed: 100 mm/s
- Measurement environment: Operation in the atmosphere after baking at 150°C for 48 hours.

Note 2) This data is considered typical but not guaranteed.

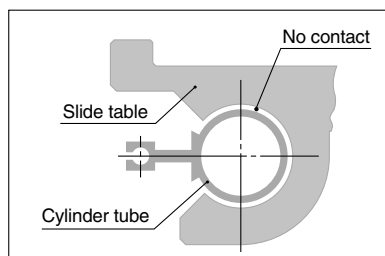
Note 3) A particulate generation test has been conducted in a vacuum environment of 10<sup>-6</sup> Pa.

Low particulate generation

**1**

## Non-contact construction

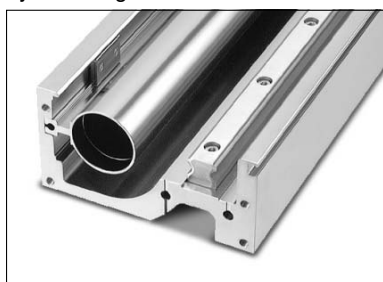
There is no particulate generation due to friction, since the construction does not allow contact between the cylinder tube's exterior surface and the slide table's internal surface.



## Special cylinder tube

Long stroke  
(Max. 700 mm)

A special cylinder tube using extruded aluminum material is employed. No deflection or contact occurs even for long strokes, since the cylinder is rigidly attached to the base and the slide table is independently supported by a linear guide.



Low particulate generation

**2**

## Stainless steel linear guide & low particulate generation vacuum grease

Particulate generation from the linear guide unit has been reduced with the use of a stainless steel linear guide and low particulate generating vacuum grease.

Low particulate generation

**3**

## Reduced initial particulate generation

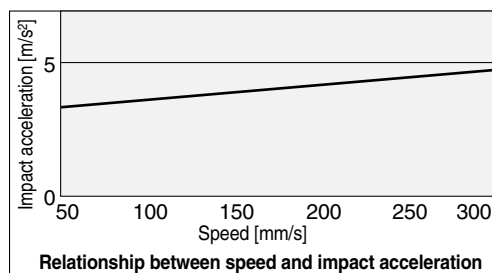
Cleaned, assembled, inspected and first-stage packaged in a clean environment.

Low particulate generation

**4**

## Low particulate generation at the stroke ends

Particulate generation has been reduced at the stroke ends by reducing impact using a sine cushion and by stopping the stroke using an internal stopper.

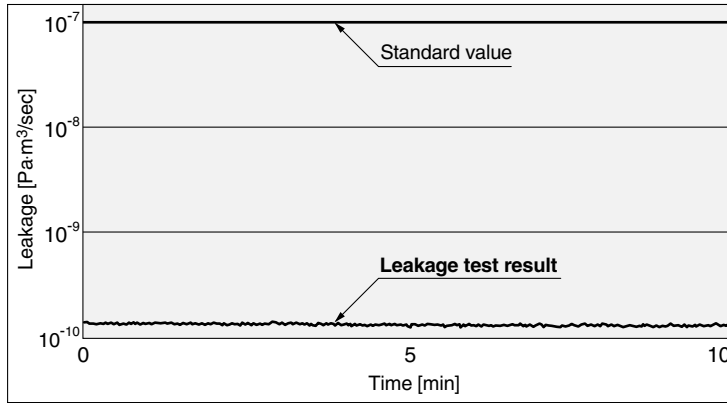


# in vacuum environments (1.3 x 10<sup>-4</sup> Pa)

Carefully designed for low particulate generation, low leakage, and low outgassing.

## Low leakage

**Leakage: 1.3 x 10<sup>-7</sup> Pa·m<sup>3</sup>/sec or less**  
(at normal temperatures, excluding gas permeation)



Note 1) The data indicates the leakage measured in a vacuum environment of 10<sup>-5</sup> Pa.

Note 2) The leakage test result shown is based on a test conducted for 10 minutes after the cylinder was pressurized with helium at 0.1 MPa.

Note 3) This data is considered typical but not guaranteed.

Low leakage  
**1**

Employs a magnetically coupled rodless cylinder with no air leakage from moving parts.

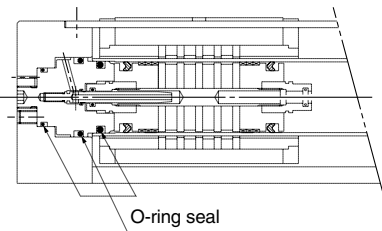
Low leakage  
**2**

O-ring seals separate vacuum and atmosphere.

Static O-ring seals are used for all the seals between vacuum and atmosphere.

Note 1) The chart above shows the leakage test results based on a test conducted using this cylinder construction.

Note 2) To allow fine stroke adjustments, O-ring seals are installed to separate vacuum and atmosphere. Please consult with SMC if the sealing method needs to be altered.



## Reduced outgassing

Reduced outgassing  
**1**

Reduction of outgassing due to surface treatment

All the external parts (made of aluminum alloy) such as the body and slide table are electroless nickel plated.

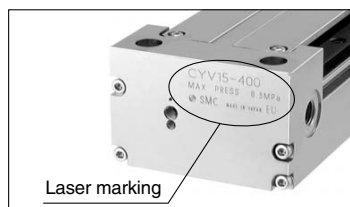
Furthermore, external magnets are coated with titanium nitride.

Note 1) Please consult with SMC if other specifications for surface treatment are required.

Reduced outgassing  
**2**

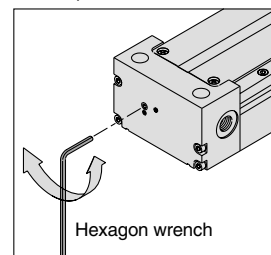
Resin materials eliminated

Laser marking is employed for the model designation.



## Fine adjustments at the end of the stroke

Fine adjustments between -2 to 0 mm can be made on one side (-4 to 0 mm for both sides).



MX

MTS

MY

CY

MG

CX

D-

-X

20-

Data

# Series CYV Model Selection 1

## Caution on Design (1)

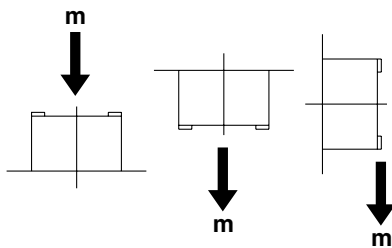
The allowable load mass moment differs depending on the workpiece mounting method, cylinder mounting orientation and piston speed. To determine whether or not the cylinder can be operated, do not allow the sum ( $\Sigma \alpha_n$ ) of the load factors ( $\alpha_n$ ) for each mass and moment to exceed "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

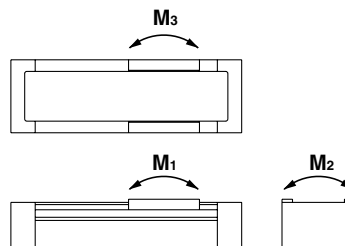
Max. load mass (kg)

Model	m max
CYV15	1
CYV32	5



### Moment

Allowable moment  
(Static moment/Dynamic moment)



Model	M1	M2	M3
CYV15	0.3	0.6	0.3
CYV32	3	4	3

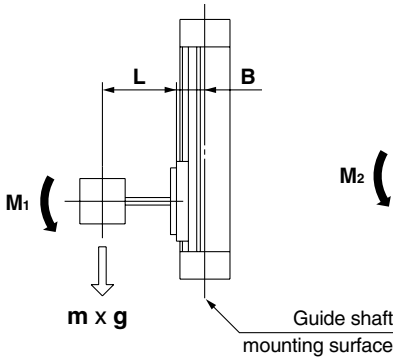
(N-m)

### Static Moment

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

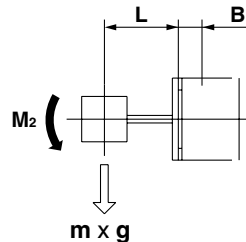
#### ■ Pitch moment

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



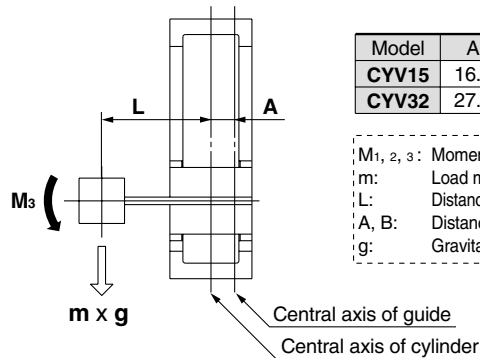
#### ■ Roll moment

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



#### ■ Yaw moment

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



Model	A	B
CYV15	16.5	25.5
CYV32	27.0	48.0

(mm)

M<sub>1, 2, 3</sub>: 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/s<sup>2</sup>]

### Dynamic Moment

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

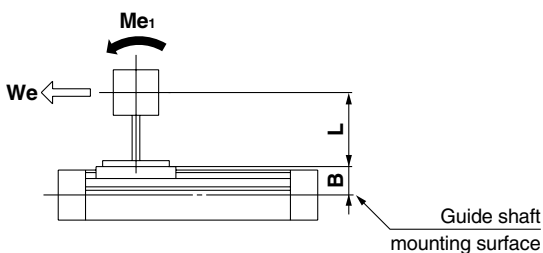
$$We = 5 \times 10^{-3} \times m \times g \times U$$

We: Load equivalent to impact [N]  
m: Load mass [kg]  
U: Max. speed [mm/s]  
g: Gravitational acceleration [9.8 m/s<sup>2</sup>]

#### ■ Pitch moment

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

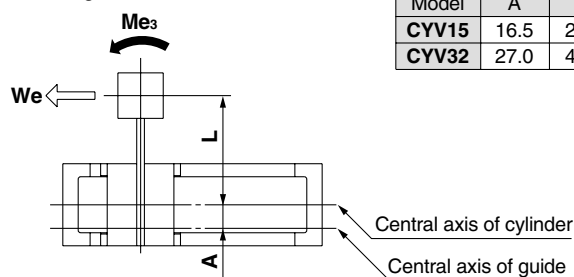
\* Average load coefficient



#### ■ Yaw moment

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

\* Average load coefficient



Model	A	B
CYV15	16.5	25.5
CYV32	27.0	48.0

(mm)

# Series CYV Model Selection 2

## 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".

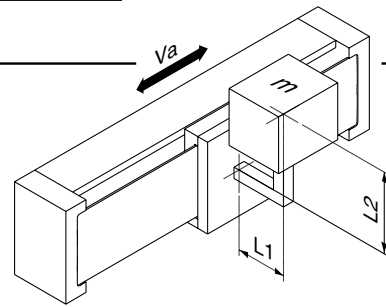
$$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$$

Item	Load factor $\alpha_n$	Note
1. Max. load mass	$\alpha_1 = m/m_{\text{max}}$	Review $m$ . $m_{\text{max}}$ is the maximum load mass.
2. Static moment	$\alpha_2 = M/M_{\text{max}}$	Review $M_1, M_2, M_3$ . $M_{\text{max}}$ is the allowable moment.
3. Dynamic moment	$\alpha_3 = M_e/M_{e\text{max}}$	Review $M_{e1}, M_{e3}$ . $M_{e\text{max}}$ is the allowable moment.

## Calculation Example

### Operating Conditions

Cylinder: CYV32  
 Mounting: Horizontal wall mounting  
 Maximum speed:  $U = 300$  [mm/s]  
 Load mass:  $m = 1$  [kg] (excluding mass of the arm section)  
 $L_1 = 50$  [mm]  
 $L_2 = 50$  [mm]



Item	Load factor $\alpha_n$	Note
<b>1. Maximum load mass</b> 	$\alpha_1 = m/m_{\text{max}}$ $= 1/5$ $= 0.20$	Review $m$ .
<b>2. Static moment</b> 	$M_2 = m \cdot g \cdot (L_1 + B) \cdot 10^{-3}$ $= 1 \cdot 9.8 \cdot (50 + 48) \cdot 10^{-3}$ $= 0.96$ [N·m] $\alpha_2 = M_2/M_2_{\text{max}}$ $= 0.96/4$ $= 0.24$	Review $M_2$ . Since $M_1$ and $M_3$ are not generated, review is unnecessary.
<b>3. Dynamic moment</b> 	$W_e = 5 \times 10^{-3} \cdot m \cdot g \cdot U$ $= 5 \times 10^{-3} \cdot 1 \cdot 9.8 \cdot 300$ $= 14.7$ [N] $M_{e3} = 1/3 \cdot W_e \cdot (L_2 + A) \cdot 10^{-3}$ $= 1/3 \cdot 14.7 \cdot (50 + 27) \cdot 10^{-3}$ $= 0.38$ [N·m] $\alpha_{3a} = M_{e3}/M_{e3\text{max}}$ $= 0.38/3$ $= 0.13$	Review $M_{e3}$ .
	$M_{e1} = 1/3 \cdot W_e \cdot (L_1 + B) \cdot 10^{-3}$ $= 1/3 \cdot 14.7 \cdot (50 + 48) \cdot 10^{-3}$ $= 0.48$ [N·m] $\alpha_{3b} = M_{e1}/M_{e1\text{max}}$ $= 0.48/3$ $= 0.16$	Review $M_{e1}$ .

$$\begin{aligned} \Sigma\alpha_n &= \alpha_1 + \alpha_2 + (\alpha_{3a} + \alpha_{3b}) \\ &= 0.20 + 0.24 + (0.13 + 0.16) \\ &= 0.73 \end{aligned}$$

The result  $\Sigma\alpha_n = 0.73 \leq 1$  allows operation.

MX

MTS

MY

CY

MG

CX

D-

-X

20-

Data

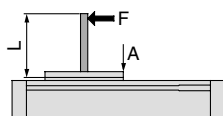


# Series CYV Model Selection 3

## Caution on Design (2)

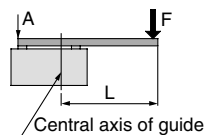
### Table Deflection Note)

Table deflection due to pitch moment load



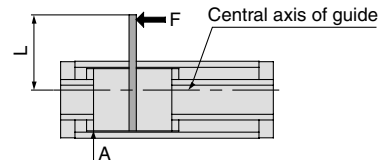
$$M_1 = F \times L$$

Table deflection due to roll moment load



$$M_2 = F \times L$$

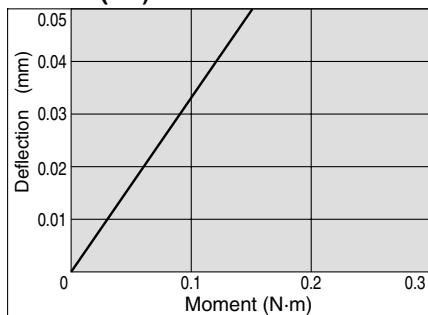
Table deflection due to yaw moment load



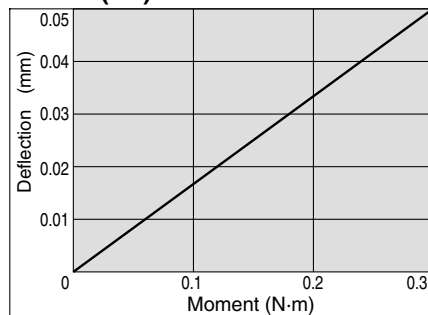
$$M_3 = F \times L$$

Note) Deflection: Displacement of point A when force acts on point F  
Point A: Indicates a measurement point

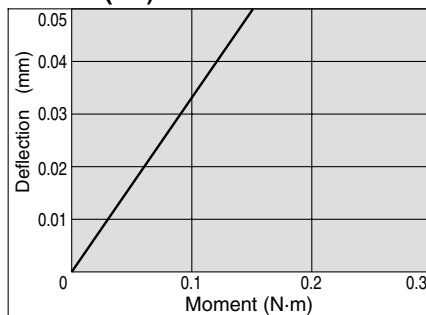
CYV15 (M<sub>1</sub>)



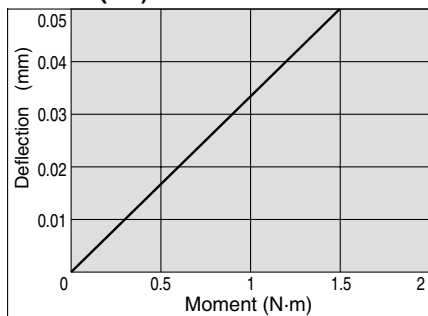
CYV15 (M<sub>2</sub>)



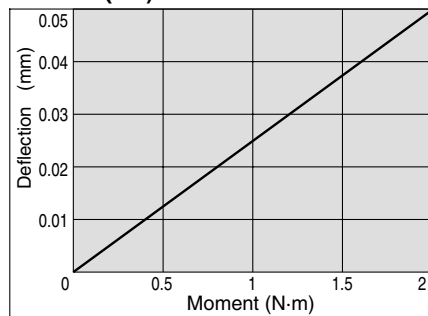
CYV15 (M<sub>3</sub>)



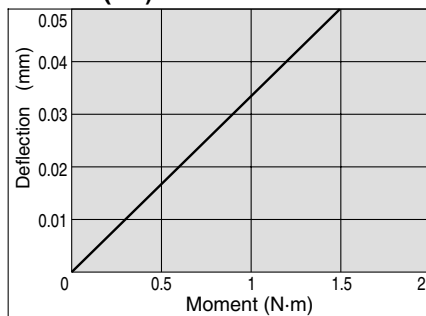
CYV32 (M<sub>1</sub>)



CYV32 (M<sub>2</sub>)



CYV32 (M<sub>3</sub>)



## 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.

Model	Allowable load mass mv (kg)	Maximum operating pressure Pv (MPa)
CYV15	1	0.3
CYV32	5	

## Intermediate Stop

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

The cushion effect (smooth start-up, soft stop) is not available an intermediate stop or return from an intermediate stop using an external stopper, etc.

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

### Cushion Stroke

Model	Stroke (mm)
CYV15	25
CYV32	30

# Rodless Cylinder for Vacuum

# Series **CYV**

ø15, ø32



## How to Order

**CYV 15 - 200**

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

## Specifications

Bore size (mm)	15	32
Operating environment pressure	Atmosphere to $1.3 \times 10^{-4}$ Pa (ABS)	
Operating atmosphere	Air/Inert gas	
Fluid	Air/Inert gas	
Action	Double acting	
Proof pressure	0.5 MPa	
Operating pressure range	0.05 to 0.3 MPa	
Leakage	$1.3 \times 10^{-7}$ Pa·m <sup>3</sup> /sec or less (at normal temperatures, excluding gas permeation)	
Maximum baking temperature	150°C	
Ambient and fluid temperature	-10 to 60°C	
Piston speed	50 to 300 mm/s	
Stroke adjustment	-2 to 0 mm on each side (-4 to 0 mm total)	
Cushion	Sine cushion (Air cushion)	
Port size	5/16-24 UNF	7/16-20 UNF
Lubrication	Vacuum grease for linear guide unit and inside the cylinder tube	

## Weight

Model	Standard stroke (mm)										
	100	150	200	250	300	350	400	450	500	600	700
<b>CYV15</b>	1.2	1.4	1.6	1.7	1.9	2.0	2.2	2.4	2.5	2.8	3.2
<b>CYV32</b>	4.2	4.6	5.0	5.5	5.9	6.3	6.7	7.1	7.5	8.3	9.1

(kg)

## Magnetic Holding Force

Bore size (mm)	Magnetic holding force (N)
<b>15</b>	59
<b>32</b>	268

## Theoretical Output

Bore size (mm)	Piston area (mm <sup>2</sup> )	Operating pressure (MPa)		
		0.1	0.2	0.3
<b>15</b>	176	18	35	53
<b>32</b>	804	80	161	241

(N)

MX

MTS

MY

**CY**

MG

CX

D-

-X

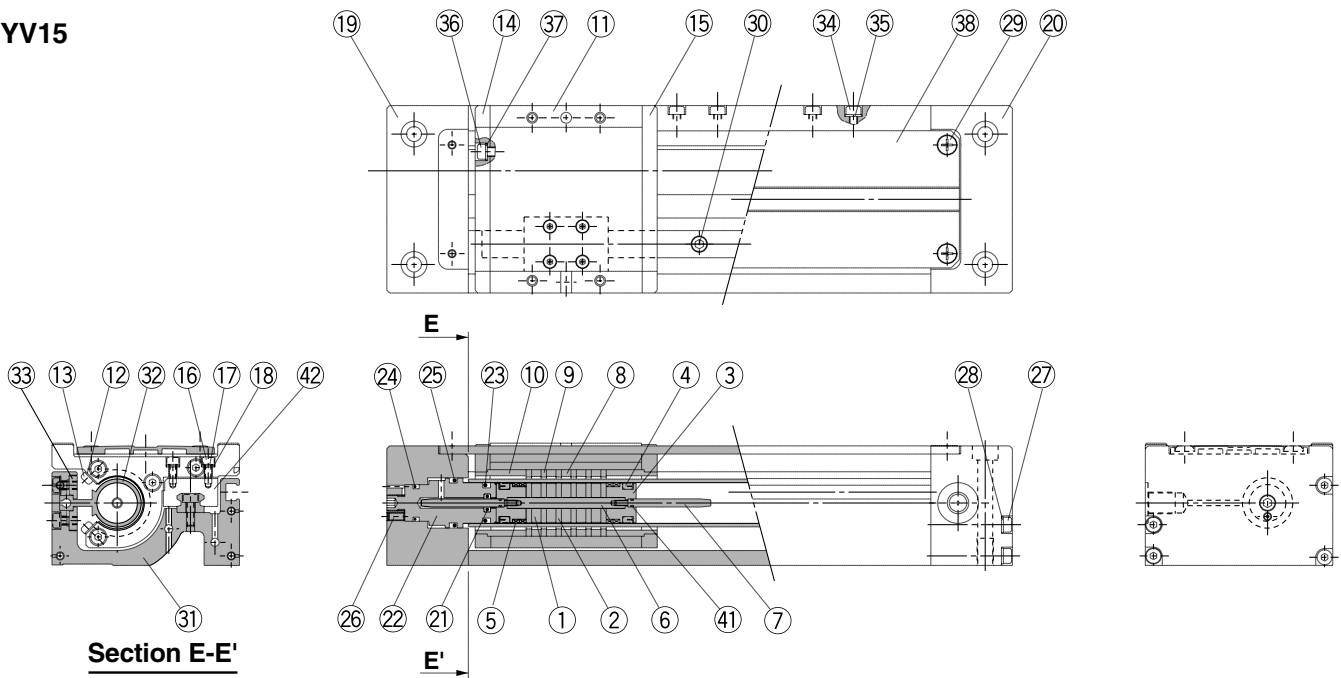
20-

Data

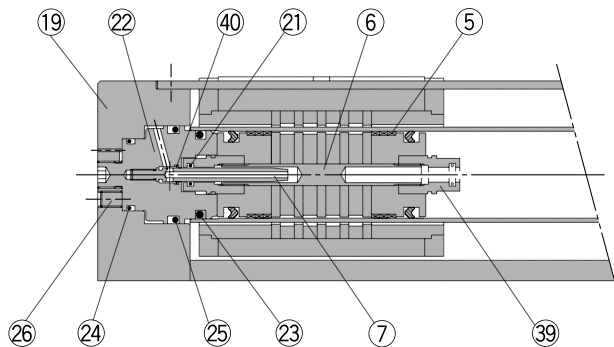
# Series CYV

## Construction

### CYV15



### CYV32



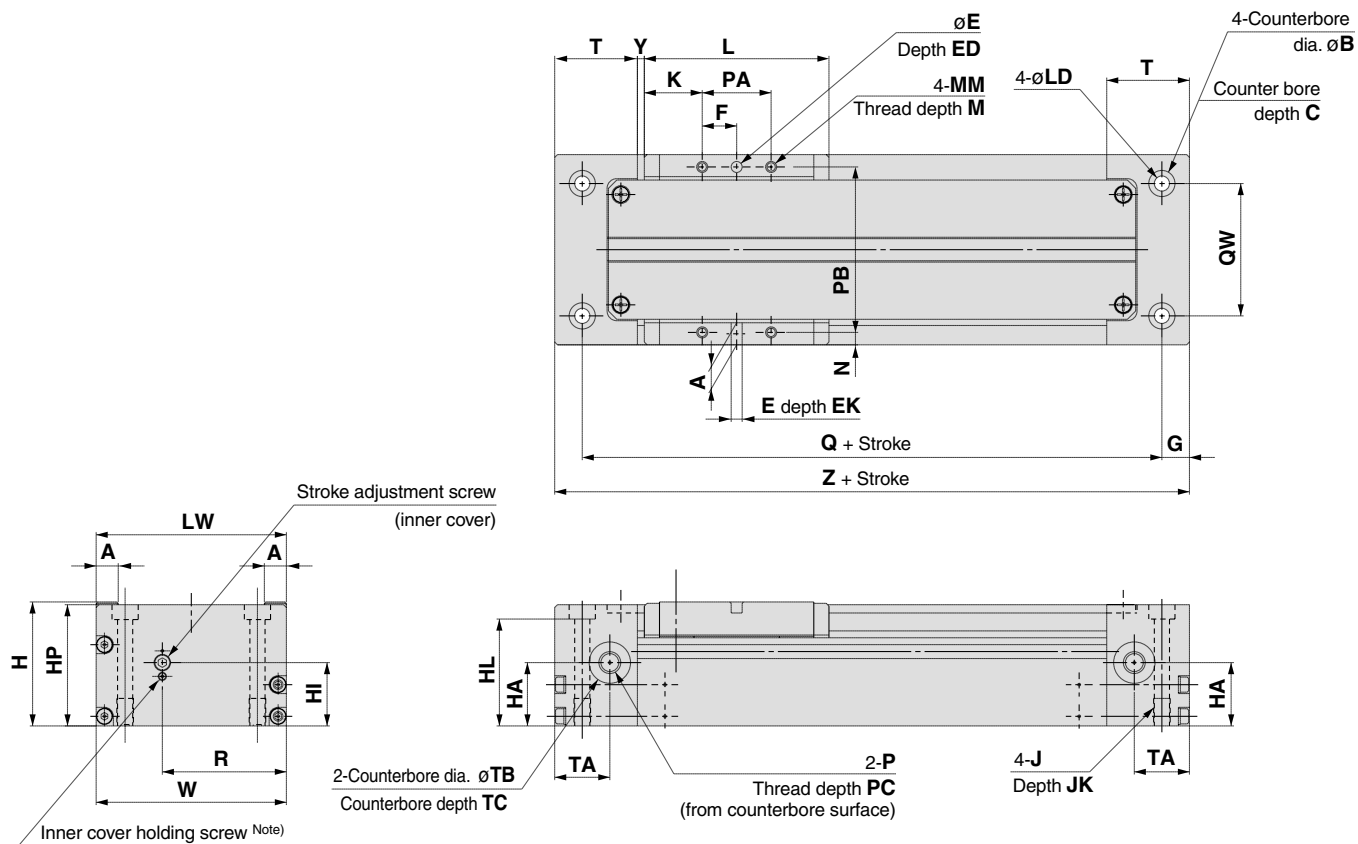
### Component Parts

No.	Description	Material	Note
①	Magnet A	Rare earth magnet	Aluminum chromated
②	Piston side yoke	Rolled steel plate	Zinc chromated
③	Piston	Brass/ Aluminum alloy	Electroless nickel plated/Chromated
④	Piston seal	Fluoro rubber	
⑤	Wear ring	Special bearing	
⑥	Shaft	Stainless steel	
⑦	Cushion ring	Stainless steel/Brass	—/Electroless nickel plated
⑧	Magnet B	Rare earth magnet	Titanium nitride coating
⑨	External slider side yoke	Rolled steel	Electroless nickel plated
⑩	Hold spacer	Aluminum alloy	Electroless nickel plated
⑪	Slide table	Aluminum alloy	Electroless nickel plated
⑫	Insertion guide plate	Stainless steel	
⑬	Round head Phillips screw	Stainless steel	
⑭	Side plate A	Aluminum alloy	Electroless nickel plated
⑮	Side plate B	Aluminum alloy	Electroless nickel plated
⑯	Hexagon socket head cap screw	Stainless steel	
⑰	Spring washer	Stainless steel	
⑱	Flat washer	Stainless steel	
⑲	Plate A	Aluminum alloy	Electroless nickel plated
⑳	Plate B	Aluminum alloy	Electroless nickel plated
㉑	Cushion seal	Fluoro rubber	

No.	Description	Material	Note
㉒	Inner cover	Aluminum alloy	Electroless nickel plated
㉓	Cylinder tube gasket	Fluoro rubber	
㉔	O-ring	Fluoro rubber	
㉕	O-ring	Fluoro rubber	
㉖	Hexagon socket head set screw	Stainless steel	
㉗	Hexagon socket head cap screw	Stainless steel	
㉘	Flat washer	Stainless steel	
㉙	Round head Phillips screw	Stainless steel	
㉚	Hexagon socket head cap screw	Stainless steel	
㉛	Base	Aluminum alloy	Electroless nickel plated
㉜	Cylinder tube	Aluminum alloy	Electroless nickel plated
㉝	Tube attaching bracket	Aluminum alloy	Electroless nickel plated
㉞	Hexagon socket head cap screw	Stainless steel	
㉟	Flat washer	Stainless steel	
㊱	Hexagon socket head cap screw	Stainless steel	
㊲	Flat washer	Stainless steel	
㊳	Top cover	Aluminum alloy	Electroless nickel plated
㊴	Cushion seal holder	Aluminum alloy	Chromated
㊵	O-ring	Fluoro rubber	
㊶	O-ring	Fluoro rubber	
㊷	Linear guide	Stainless steel	

Note) In the material and note columns of the Component Parts list above, the first description is for CYV15 and the second description is for CYV32.

## Dimensions



- MX
- MTS
- MY
- CY**
- MG
- CX
- D-
- X
- 20-
- Data

Model	A	B	C	E	ED	EK	F	G	H	HA	HI	HL	HP	J	JK	K	L	LD
CYV15	8	10.5	6.4	$4_{+0.030}^{+0.030}$	9.5	4	12.5	10	45	23	23	37.6	44	M6 x 1	10	21	67	5.6
CYV32	12	16	10.2	$6_{+0.030}^{+0.030}$	13	6	25	9	75	39	39	63.3	73.5	M10 x 1.5	12	20	90	9.2

Model	LW	MM	M	N	P	PA	PB	PC	Q	QW	R	T	TA	TB	TC	W	Y	Z
CYV15	69	M4 x 0.7	6	4.5	5/16-24 UNF	25	60	10	112	48	45	30	20	15	0.5	69	2.5	132
CYV32	115	M6 x 1	8	7.5	7/16-20 UNF	50	100	12	147	83	79.5	34	22.5	22	0.5	115	3.5	165

Note) Refer to "Cushion Effect (Sine Cushion) and Stroke Adjustment" under Specific Product Precautions on page 8-18-11.



Be sure to read before handling.

## Handling

### ⚠ Caution

1. Open the inner package of the double packaged clean series product inside a clean room or other clean environment.
2. Do not install a cylinder with bare hands. Outgassing characteristics can be degraded.
3. Perform parts replacement and disassembly work inside the chamber after exhausting compressed air in the piping to the outside of 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 particulate generation characteristics.

2. Do not scratch or gouge the linear guide by striking it with other objects.
3. Since the slide table is supported by precision bearings, do not apply strong impacts or excessive moment when mounting workpieces.
4. The cylinder can be operated by directly applying a load within the allowable range. However, careful alignment is necessary when connecting to a load with an external guide mechanism.

Since displacement of the alignment increases as the stroke becomes longer, consider a connection method that can absorb the displacement and does not cause interference at any point within the stroke. Also, operate with due consideration of measures against particulate generation.

5. 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.

6. Do not use until you verify that the equipment can be operated properly.

After mounting or repair, connect the air supply and electric power, and then confirm proper mounting by performing appropriate function and leakage tests.

7. Instruction manual

Mount and operate the product after thoroughly reading the manual and understanding its contents. Also, store it where it can be referred at any time.

## Operation

### ⚠ Caution

1. The maximum operating pressure for the vacuum rodless cylinder is 0.3 MPa.

If the maximum operating pressure of 0.3 MPa for the vacuum rodless cylinder is exceeded, the magnetic coupling can be broken, causing a danger of malfunction or degradation of particulate generation characteristics, etc.

## Operation

### ⚠ Caution

2. When used for vertical operation, take precautions against 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.

3. Do not operate with the magnetic coupling out of position.

If the magnetic coupling is out of position, push the external slider (or the piston slider by using air pressure) back to the proper position at the stroke end. (When pushing the external slider, do not push it with bare hands.)

4. Do not apply lubricant, 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.

5. Never reapply lubricant.

Never reapply lubricant, as this may cause a degradation of particulate generation or operation characteristics.

6. Use the cylinder in inert gas environments.

Corrosive gases may cause corrosion of a cylinder and loss of durability.

7. Be sure to use the cylinder in pressure environments from atmosphere to  $1.3 \times 10^{-4}$  Pa (ABS).

If used in pressure environments below these conditions, grease applied to the guide unit will evaporate excessively and may cause environmental contamination and loss of durability.

8. Be sure to set the baking temperature to 150°C or less.

If a higher temperature is used, the grease will evaporate excessively and may cause environmental contamination and loss of durability.

9. Positioning of a cylinder should be performed using an optical sensor from outside the chamber.

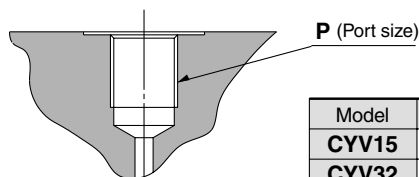
A positioning sensor cannot be mounted on the cylinder.

## Fitting

### ⚠ Caution

1. A fitting with an O-ring is used for a high vacuum rodless cylinder.

Use a fitting that conforms to the dimensions below, and install it so that there is no air leakage.



Model	P (Port size)
CYV15	5/16-24 UNF
CYV32	7/16-20 UNF

2. Air blow and clean fittings and piping materials completely with clean air to remove oil and impurities, etc., before piping.



# Series CYV

# Specific Product Precautions 2

Be sure to read before handing.

## Speed Adjustment

### ⚠ Caution

1. A speed controller for clean room use is recommended for speed adjustment.
2. Install the speed controller outside the chamber.
3. In case of vertical mounting, a system with a regulated supply circuit installed on the down side is recommended. (This is effective against delays at the start of upward movement and for conservation of air.)

## Cushion Effect (Sine Cushion) and Stroke Adjustment

### ⚠ Caution

1. A sine cushion (smooth start-up, 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 conventional cushion mechanisms.

2. The stroke adjustment is a mechanism to adapt the slide table's stroke end position to a mechanical stopper on other equipment, etc.

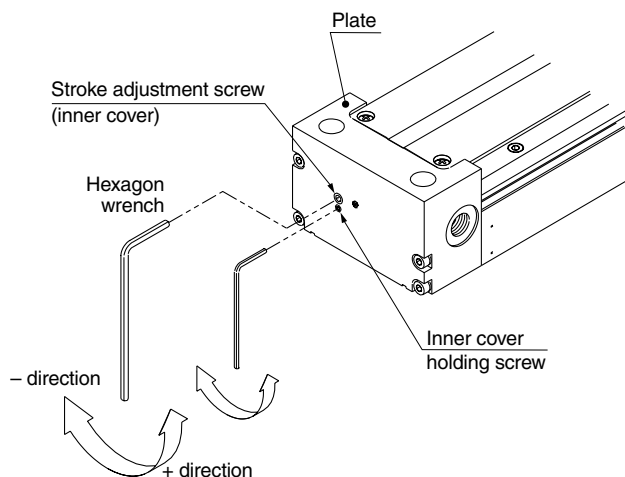
(Adjustment range: Total of both sides -4 to 0 mm)

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, etc.
- 2) To match the position with a mechanical stopper on other equipment, etc., rotate the stroke adjustment screw (inner cover) to the left or right with a hexagon wrench to move the inner cover back and forth.
- 3) The maximum adjustment on one side is -2 to 0 mm. A total adjustment of approximately -4 to 0 mm is possible using both sides.
- 4) After completing the stroke adjustment, tighten the inner cover holding screw with a hexagon wrench, etc.

### Inner Cover Holding Screw Tightening Torques [N·m]

Model	Screw size	Tightening torque
CYV15	M3 x 0.5	0.3
CYV32	M6 x 1	2.45



## 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. Please consult with SMC when replacing seals and bearings (wear rings).
3. For repair of a cylinder inadvertently exposed to a corrosive gas, please consult with SMC after clarifying the name of the corrosive gas.

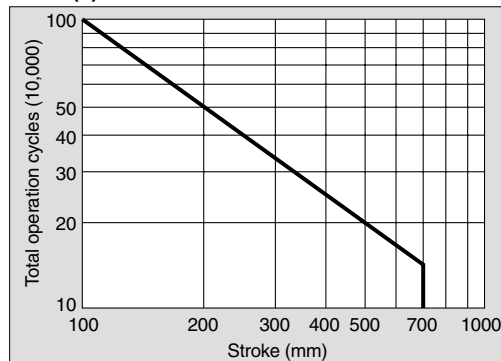
## Particulate Generation Characteristics

### ⚠ Caution

1. In order to maintain the particulate generation grade, use operation of 1 million cycles or travel distance of about 200 km as a guide. (Table (1) below)

If operation is continued beyond the recommended values, lubrication failure of the linear guide and a degradation of particulate generation characteristics may occur.

Table (1)



MX□

MTS

MY□

CY□

MG□

CX□

D-

-X

20-

Data