

# 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**



Magnetically  
Coupled  
Rodless  
Cylinder

Basic type

Direct mount type

# Series CY3B/CY3R

## Improved durability

### Improved bearing performance

The wear ring length has increased by up to 70%, achieving an improvement in bearing performance compared to the CY1B.

### Improved lubrication by using a lubretainer

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

### Direct mount type *Series CY3R*



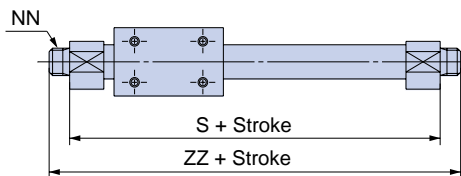
### Basic type *Series CY3B*



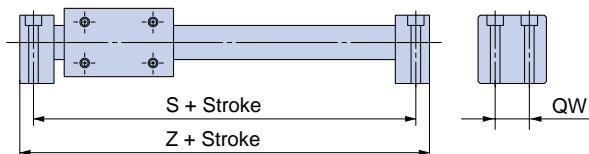
## Mounting dimensions are identical to those of series CY1.

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

### Series CY3B

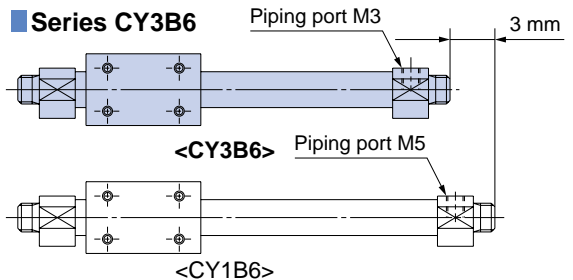


### Series CY3R

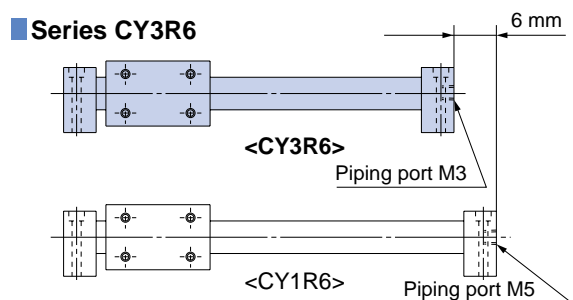


(\* For bore size of  $\phi 6$ , the mounting is not interchangeable with the CY1 series because the piping port has been reduced to a M3 size.)

### Series CY3B6

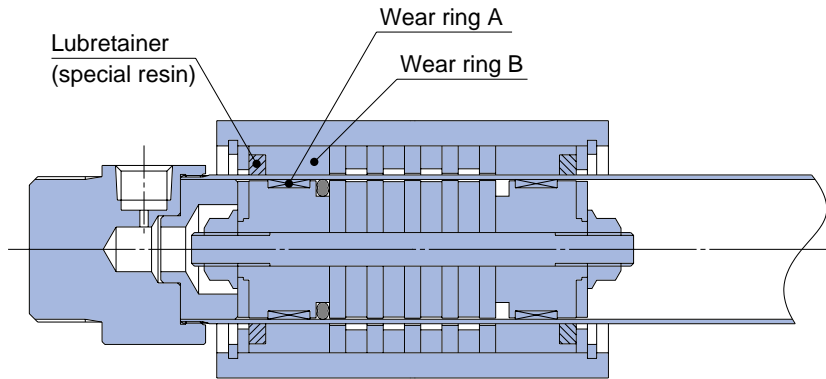


### Series CY3R6



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).

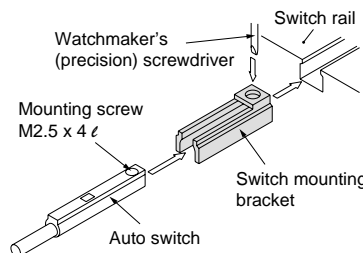
# Upgraded version of space saving magnetically rodless cylinder!



## 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 ø50 and ø60 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)

ø6, ø10, ø50, and ø63  
Series is completed by adding the new bore sizes. (ø6 to ø63)



## Series Variations

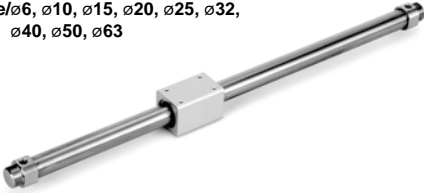
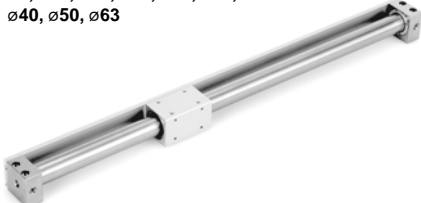
Series	Bore size	Standard stroke (mm)										Individual made-to-order products							
		50	100	150	200	250	300	350	400	450	500	600	700	800	900	1000			
CY3B	ø6	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø10	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø15	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø20	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø32	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	ø40	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	ø50	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CY3R	ø6	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø10	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø15	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø20	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
	ø32	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	ø40	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	ø50	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
ø63	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

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

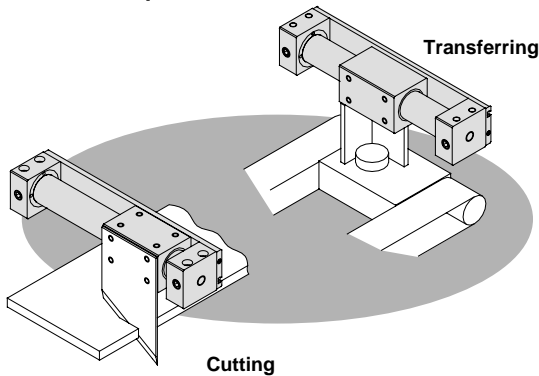
Availability of made to order products varies with the series and the bore size. For more information, please refer to page 24.

# 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>	<b>Guide non-integrated type</b>	<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 the cylinder.</li> <li>• Non-rotation mechanism is available within the allowable range.</li> <li>• Piping can be concentrated with the centralised 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

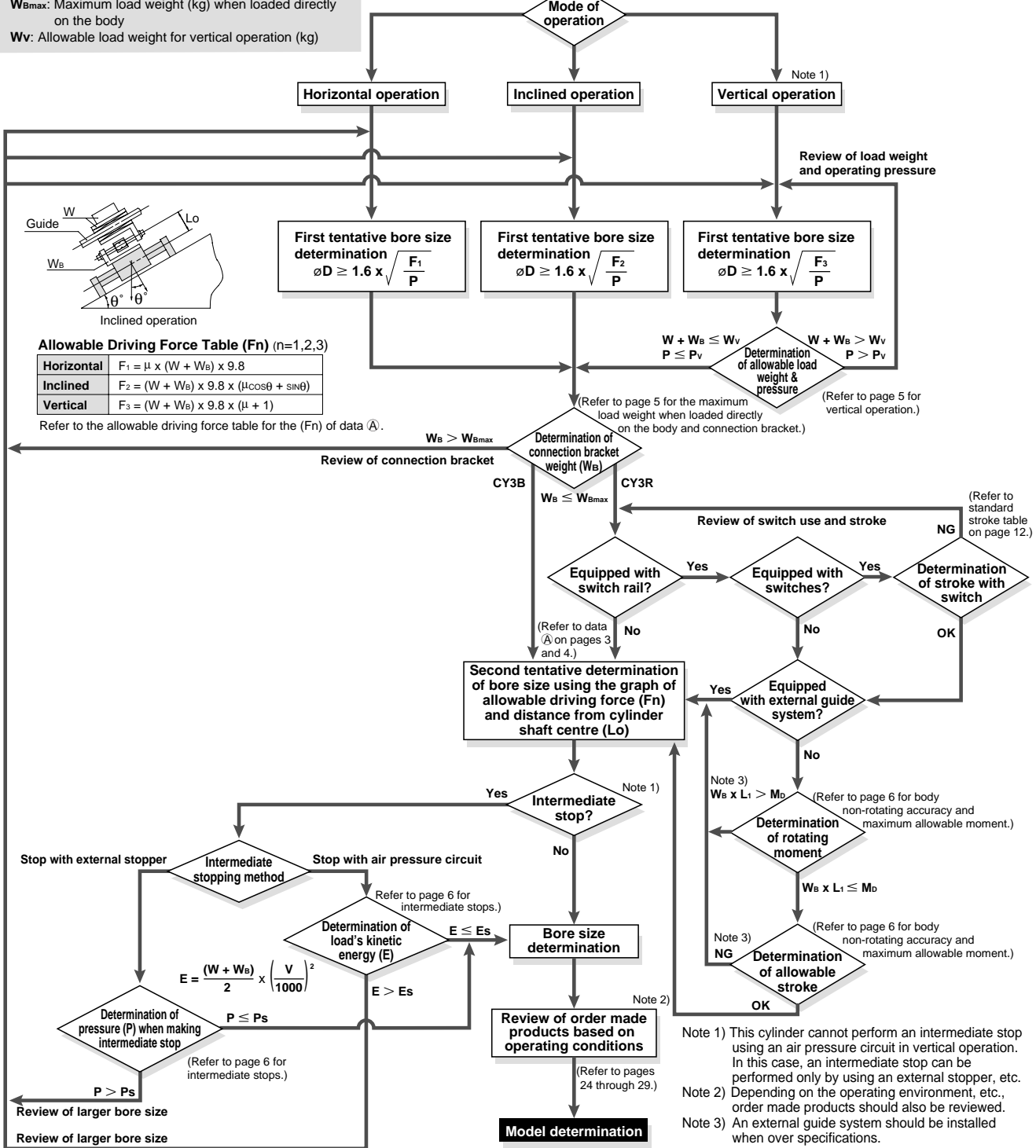
Ps: Operating pressure limit for intermediate stop using an external stopper, etc. (MPa)

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
  - L: Distance from cylinder shaft centre to workpiece point of application (cm)
  - L1: Distance from cylinder shaft centre to connection fitting, etc.
  - Switches
  - P: Operating pressure (MPa)
  - V: Speed (mm/s)
  - Stroke (mm)
  - Mode of operation (horizontal, inclined, vertical)



# Series CY3B/CY3R

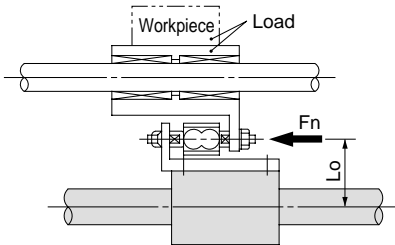
## Model Selection

### 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 centre of the cylinder shaft.
3. Select the bore size from  $L_o$  and  $F_n$ , based on data (A).



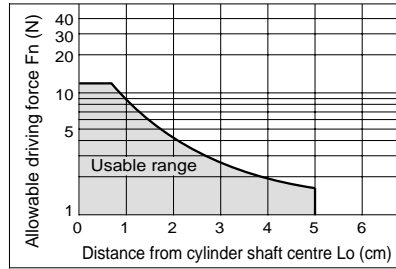
##### Selection example

Given a load drive resisting force of  $F_n = 100$  (N) and a distance from the cylinder shaft centre 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 centre is 8 cm, and then extending to the side, find the allowable driving force on the vertical axis.

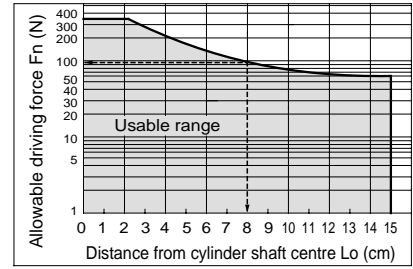
Models suitable in satisfying the requirement of 100 (N) are **CY3□32** or **CY3□40**.

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

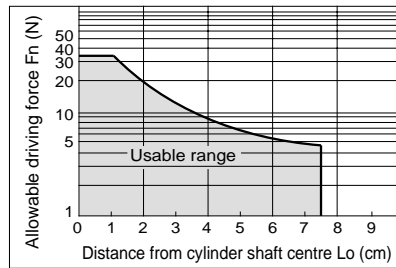
##### CY3B6



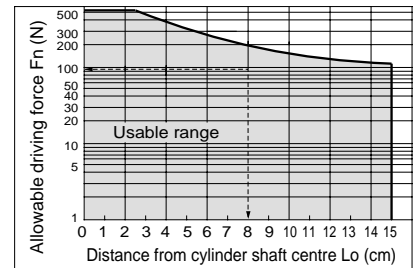
##### CY3B32



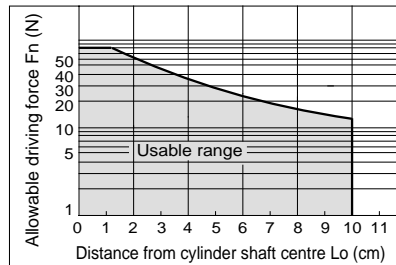
##### CY3B10



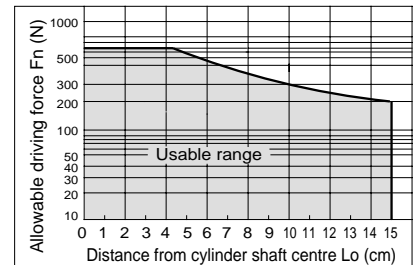
##### CY3B40



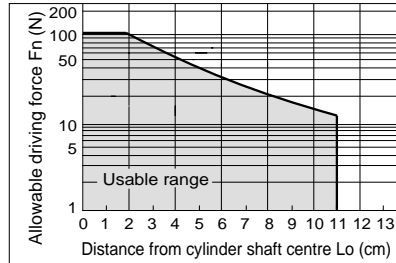
##### CY3B15



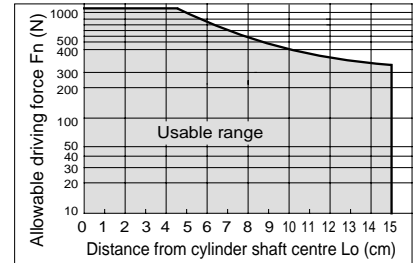
##### CY3B50



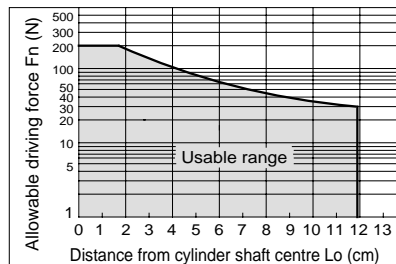
##### CY3B20



##### CY3B63



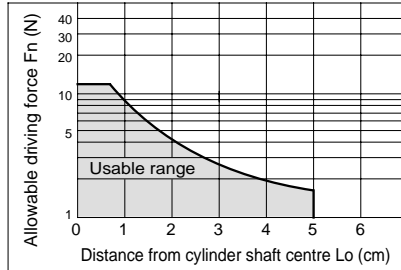
##### CY3B25



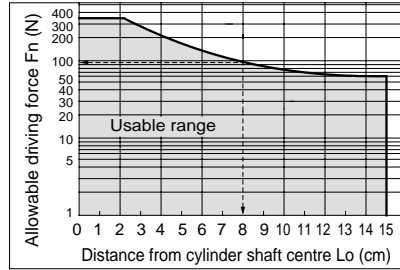
Precautions on Design 1

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

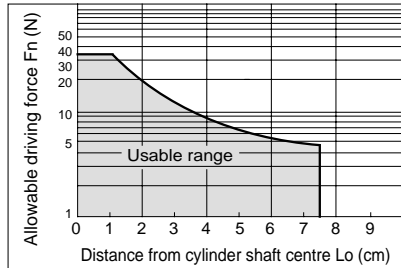
**CY3R6**



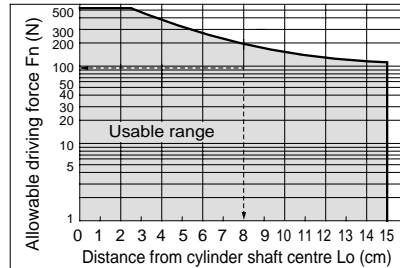
**CY3R32**



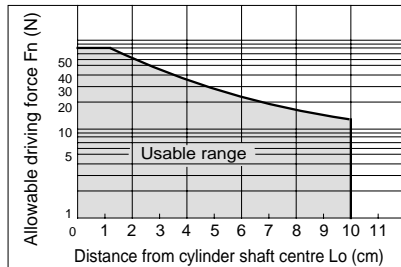
**CY3R10**



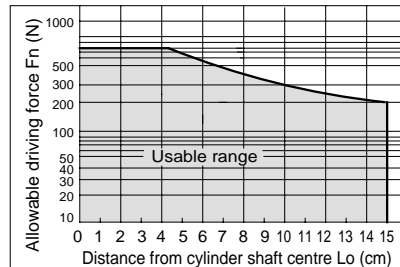
**CY3R40**



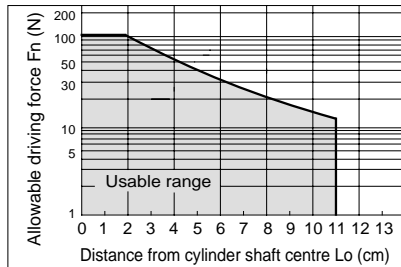
**CY3R15**



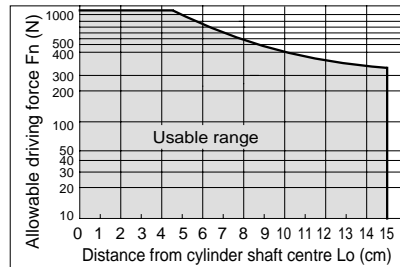
**CY3R50**



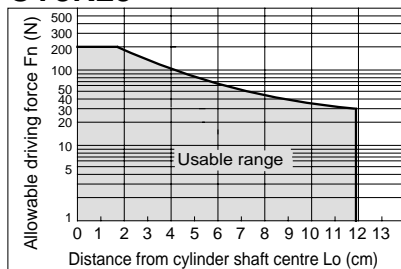
**CY3R20**



**CY3R63**



**CY3R25**

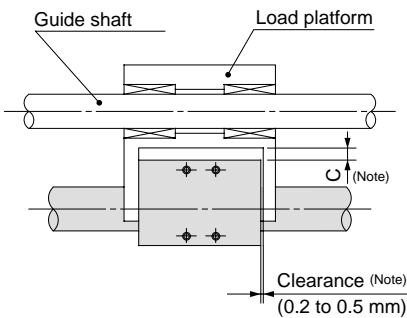


# Series CY3B/CY3R Model Selection

## 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 centre. Therefore, a connection method should be considered which can assimilate this deflection.

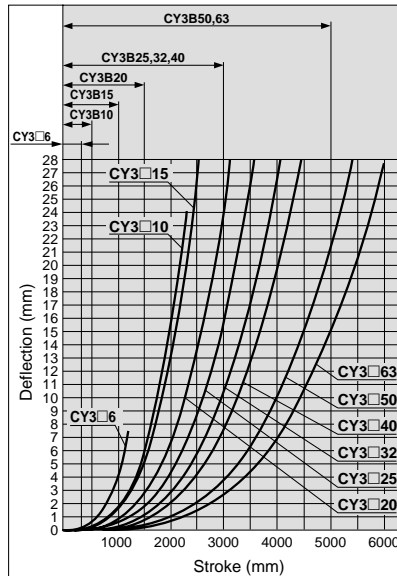
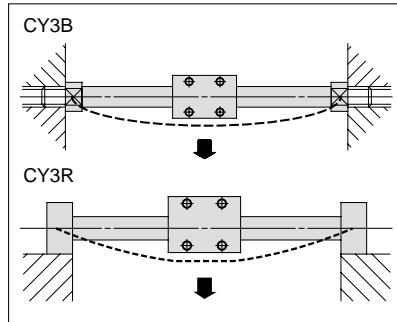


The above clearance amount is a reference value.

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 the 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.

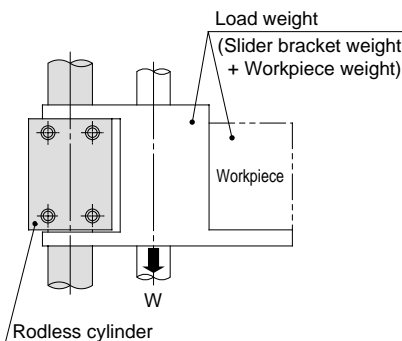
Note 3) The amount of deflection differs from the CY1B/CY1R. Adjust the clearance value by referring to the dead weight deflection as shown in the table on the right.



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

### 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 (Wv) (kg)	Max. operating pressure (Pv) (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.

### 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

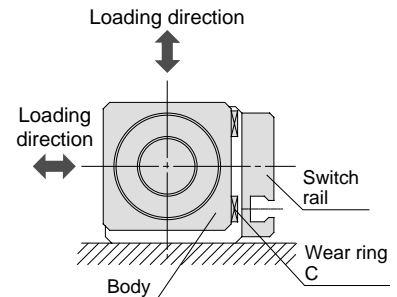
Model	Max. connection bracket weight (W <sub>max</sub> ) (kg)
CY3□6	0.2
CY3□10	0.4
CY3□15	1.0
CY3□20	1.1
CY3□25	1.2
CY3□32	1.5
CY3□40	2.0
CY3□50	2.5
CY3□63	3.0

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 <sub>max</sub> ) (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





## Precautions on Design 3

### Intermediate Stop

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

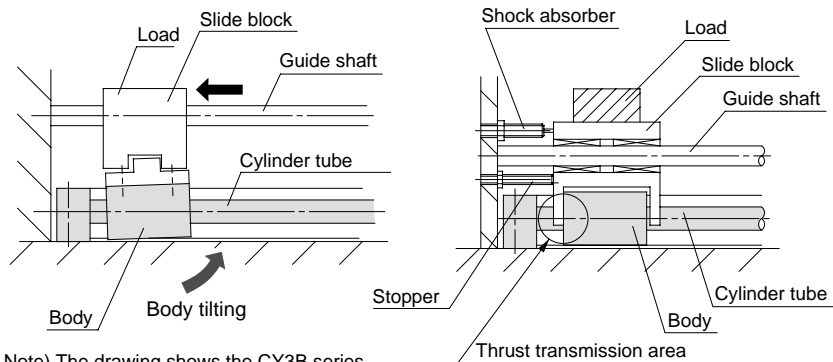
When performing an intermediate stop of a load using an air pressure circuit, operate at or below the kinetic energy shown in the table below. Use caution, as operation when exceeding the allowable value can result in breaking of the magnetic coupling.

(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	1.53
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 centre of the body so that tilting will not occur.



Note) The drawing shows the CY3B series.

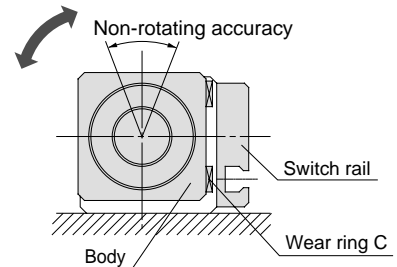
#### <CY3R>

### 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>0</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 •

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

Standard stroke  
Refer to the standard stroke table shown below.

Port thread type

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

### 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

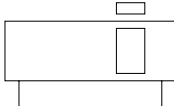
## Specifications

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: $+1.0$ , 251 to 1000 st: $+1.4$ , 1001 st to: $+1.8$
Mounting orientation	Horizontal, Inclined, Vertical (Note)
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.



JIS Symbol



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

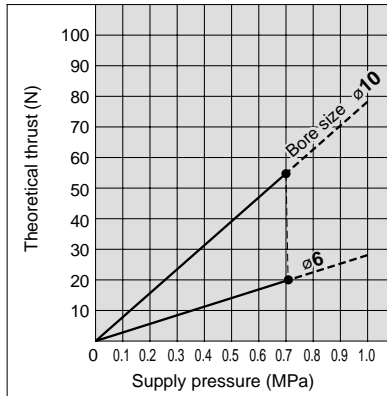
Symbol	Specifications
-XB6	Heat resistant specifications
-XB9	Low speed specifications (15 to 50 mm/s)
-XB11	Long stroke
-XB13	Low speed specifications (7 to 50 mm/s)
-X116	Hydro specifications
-X132	Axial ports
-X160	High speed specifications
-X168	Helical insert thread specifications
-X206	Added mounting 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

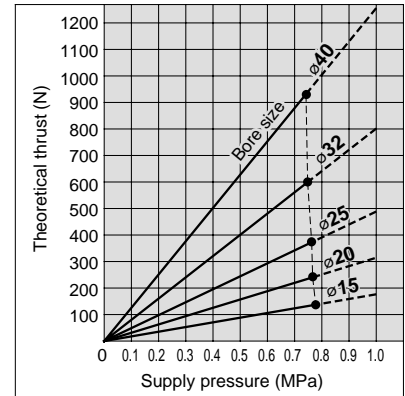


When calculating the actual thrust, design should consider the minimum actuating pressure.

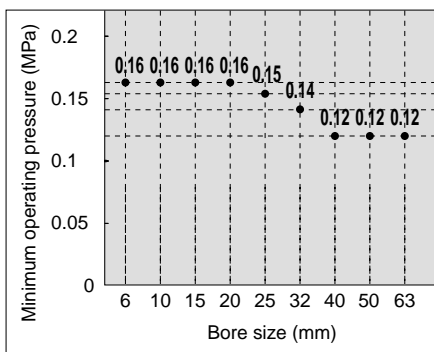
### ø6, ø10



### ø15, ø20, ø25, ø32, ø40

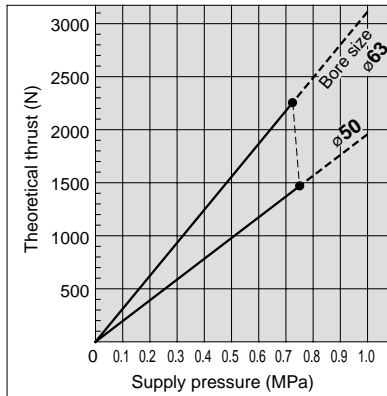


## Minimum Operating Pressure



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

Bore size (mm)	Unit: kg								
	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

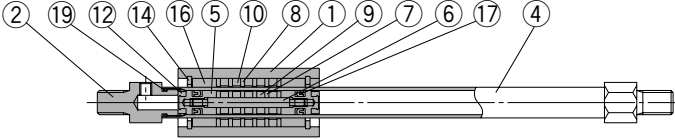
Calculation method/Example: CY3B32-500

Basic weight ..... 1.287 kg  
 Additional weight ..... 0.033 kg/50 st  
 Cylinder stroke ..... 500 st  
 Calculation: 1.287 + 0.033 x 500 ÷ 50 = 1.617 kg

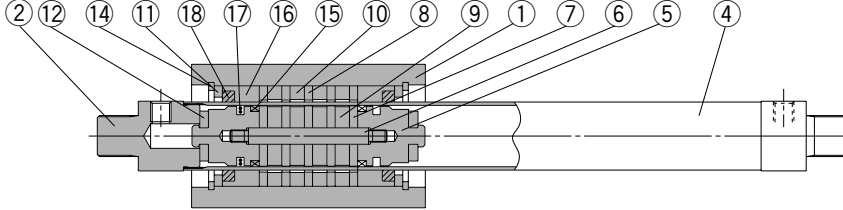
# Series CY3B

## Construction

### Basic type CY3B6

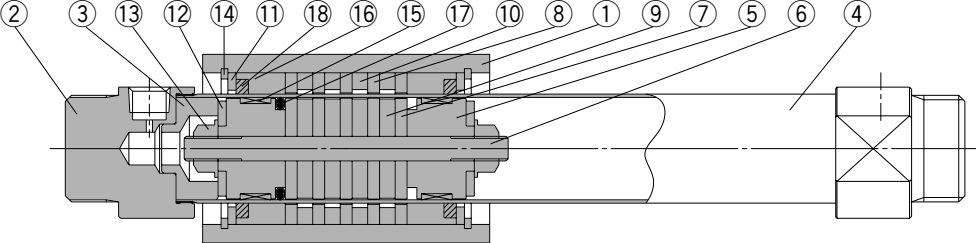


### CY3B10, 15

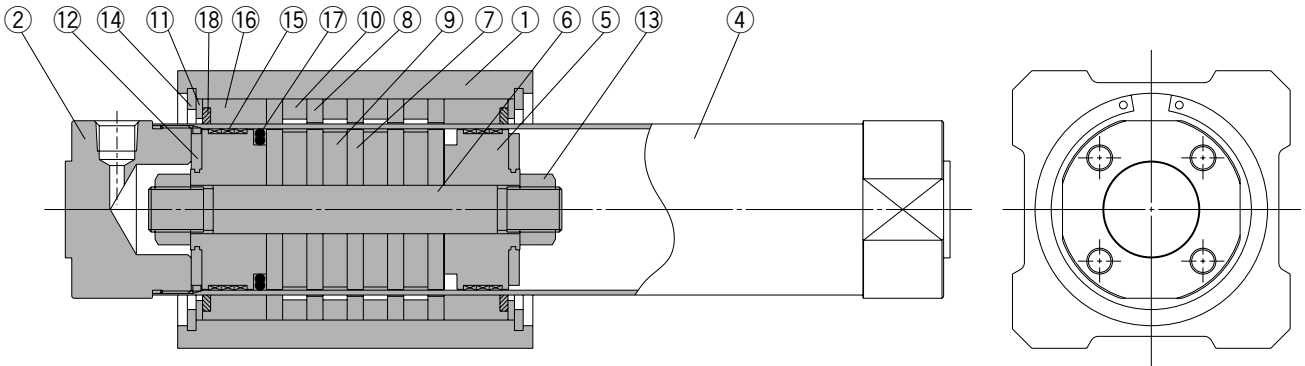


\* The above drawing is  $\phi 15$ . (3 magnets are used in  $\phi 10$ .)

### 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 $\phi 15$ to $\phi 63$ Aluminum alloy	Electroless Ni plated
3	End collar	Aluminum alloy	$\phi 20$ to $\phi 40$ only
4	Cylinder tube	Stainless steel	
5	Piston	$\phi 6$ to $\phi 15$ Brass $\phi 20$ to $\phi 63$ Aluminum alloy	$\phi 6$ to $\phi 15$ Electroless Ni plated $\phi 20$ 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

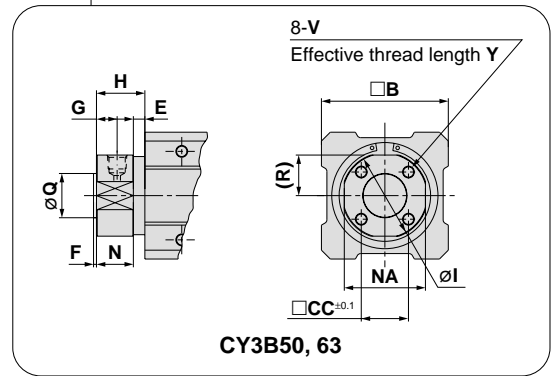
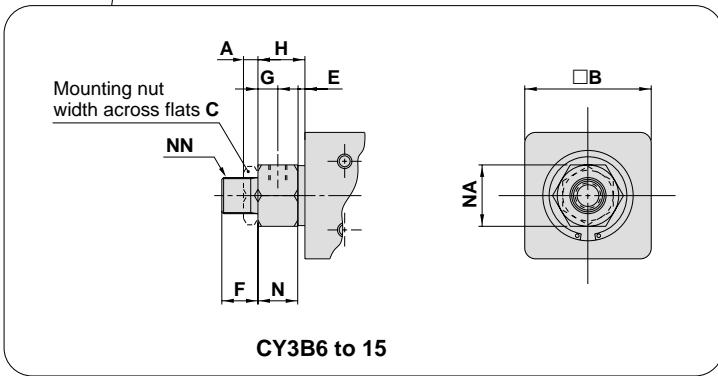
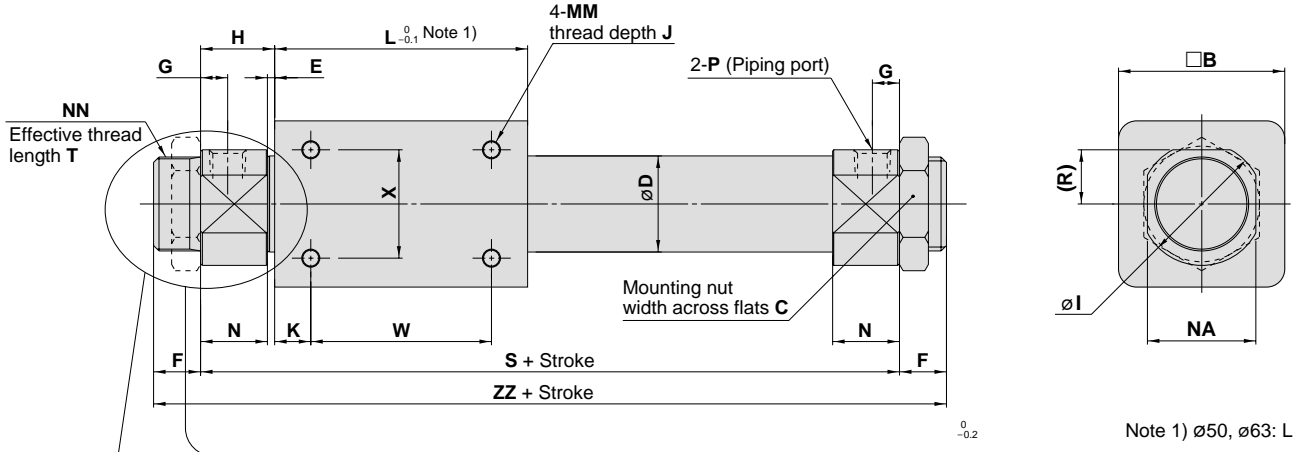
Bore size (mm)	Kit no.	Contents
6	CY3B6-PS	Numbers 15, 16, 17, 19 above
10	CY3B10-PS	Numbers 15, 16, 17, 18, 19 above
15	CY3B15-PS	Numbers 15, 16, 17, 18 above
20	CY3B20-PS	
25	CY3B25-PS	
32	CY3B32-PS	
40	CY3B40-PS	
50	CY3B50-PS	
63	CY3B63-PS	

\* 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**

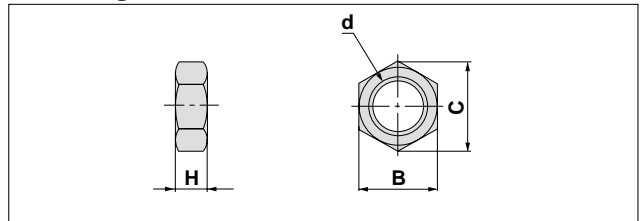


Model	A	B	C	CC	D	E	F	G	H	I	J	K	L	MM	N	NA	NN	Q	R	S	T	V
CY3B6	4	17	8*	—	7.6	4	8*	5	13.5*	—	4.5	5	35	M3	9.5*	10*	M6 *	—	—	62*	6.5	—
CY3B10	4	25	14	—	12	1.5	9	5	12.5	—	4.5	4	38	M3	11	14	M10 x 1	—	—	63	7.5	—
CY3B15	4	35	14	—	16.6*	2	10	5.5	13	—	6	11	57	M4	11	17	M10 x 1	—	—	83	8	—
CY3B20	8	36	26	—	21.6*	2*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

Model	W	X	Y	ZZ	P (Piping port)		
					-	TN*	TF*
CY3B6	25	10	—	78*	M3 *	—	—
CY3B10	30	16	—	81	M5	—	—
CY3B15	35	19	—	103	M5	—	—
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 astrisk 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	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**

-	Both sides piping type
<b>G</b>	Centralised piping type

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

**Bore size**

<b>6</b>	6 mm
<b>10</b>	10 mm
<b>15</b>	15 mm
<b>20</b>	20 mm
<b>25</b>	25 mm
<b>32</b>	32 mm
<b>40</b>	40 mm
<b>50</b>	50 mm
<b>63</b>	63 mm

**Port thread type**

Symbol	Type	Bore size
-	M thread	6, 10, 15
-	Rc	20, 25, 32, 40
<b>TN</b>	NPT	50, 63
<b>TF</b>	G	50, 63

**Number of auto switches**

-	2 pcs.
<b>S</b>	1 ps.
<b>n</b>	"n" pcs.

**Auto switch type**

-	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**

-	With switch rail
<b>N</b>	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)				
Reed switch	—	Grommet	No	2-wire	24 V	5 V, 12 V	100 V or less	<b>A90</b>	●	●	—	—	IC circuit	Relay, PLC
						12 V			100 V	—	—	—	—	
				3-wire (NPN equiv.)	—	5 V	—	<b>A96</b>	●	●	—	—	IC circuit	—
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	<b>M9N</b>	●	●	○	○	IC circuit	Relay, PLC
									3-wire (PNP)	●	●	○	○	
				2-wire	12 V	<b>M9B</b>	●	●	○	○	—			
				3-wire (NPN)	5 V, 12 V	<b>M9NW</b>	●	●	○	○	IC circuit			
				3-wire (PNP)		<b>M9PW</b>	●	●	○	○	IC circuit			
				2-wire	12 V	<b>M9BW</b>	●	●	○	○	—			

\* 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 to 63. Other than the applicable auto switches listed in the "How to Order", other auto switches can be mounted. For detailed specifications, refer to page 18.
- Solid state auto switches are also available with a pre-wired connector. For specifications, refer to "SMC Best Pneumatics" catalogue.

## 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.)

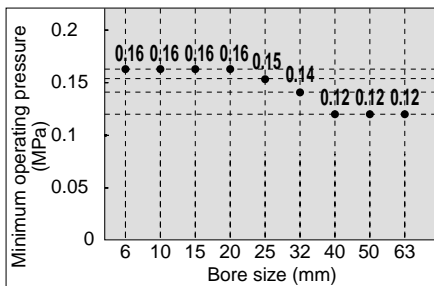
Symbol	Specifications
-X116	Hydro specifications
-X160	High speed specifications
-X322	Outside of cylinder tube with hard chrome plating
-X1468	Interchangeable specification with CY1□6
-XC57	With floating joint

## 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	100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000	2000	1500
40			
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.

## Minimum Operating Pressure



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

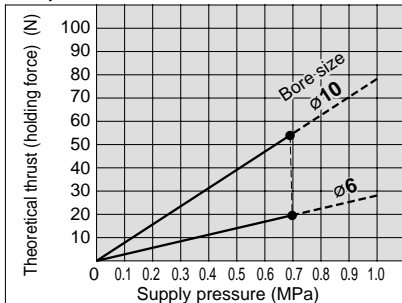
## Magnetic Holding Force

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

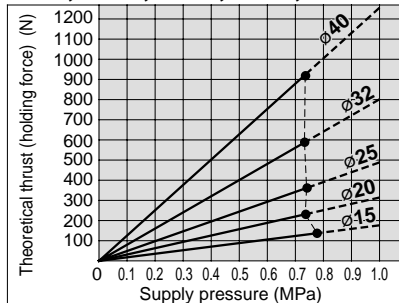
## Theoretical Cylinder Thrust

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

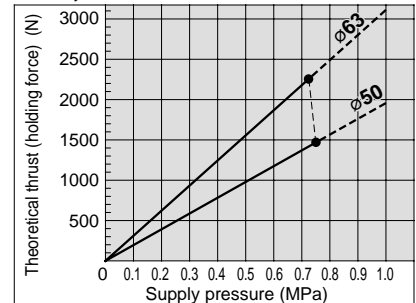
### ø6, ø10



### 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

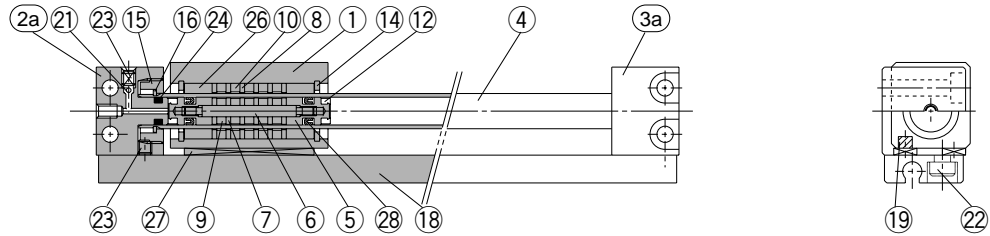
Calculation method/Example: CY3R25-500 (with switch rail) Basic weight...0.622 (kg), Additional weight...0.056 (kg/50 st), Cylinder stroke...500 (st)  
0.622 + 0.056 x 500 ÷ 50 = 1.182 (kg)

# Series CY3R

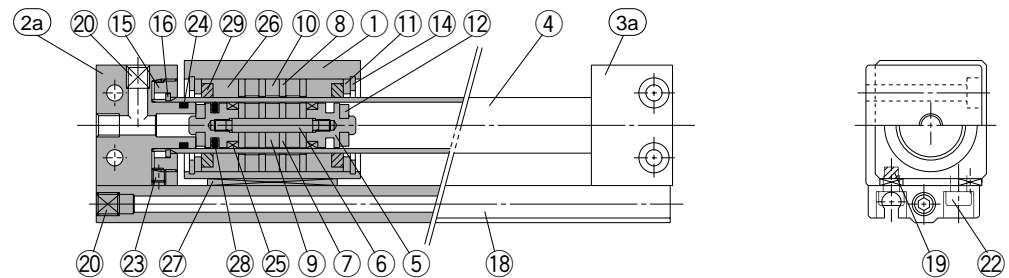
## Construction

### Both sides piping type

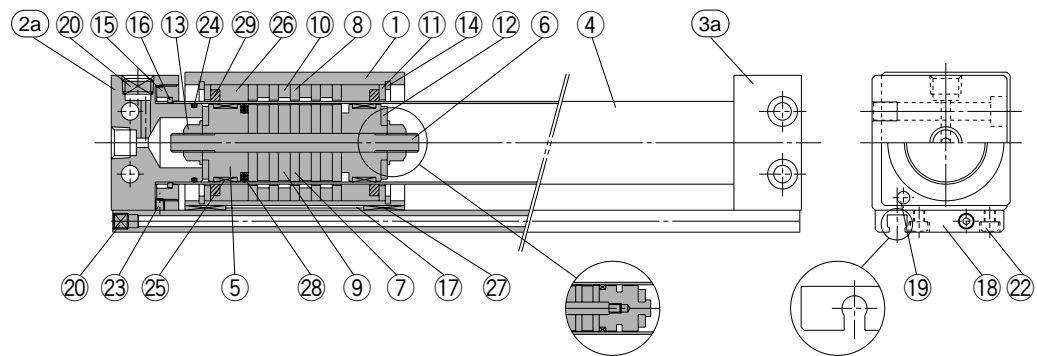
#### CY3R6



#### 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	ø6 to ø15 Brass ø20 to ø63 Aluminum alloy	ø6 to ø15 Electroless nickel plated 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	
11	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	
17	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	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	

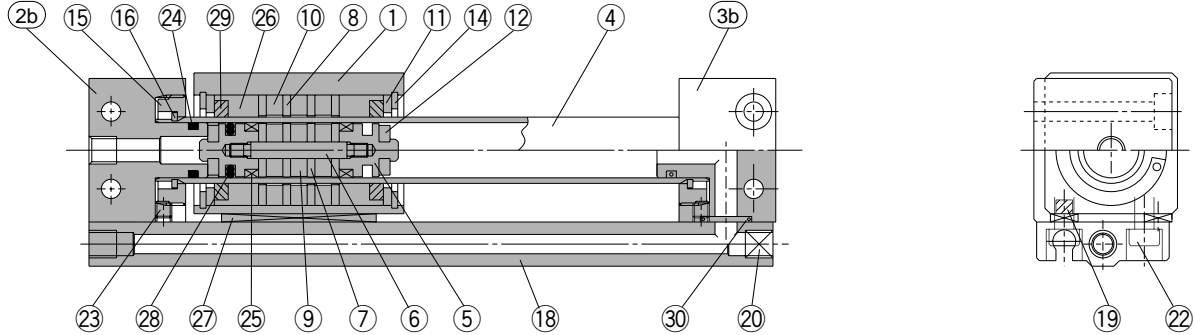
\* Seal kits are the same for both the both sides piping type and the centralised piping type.



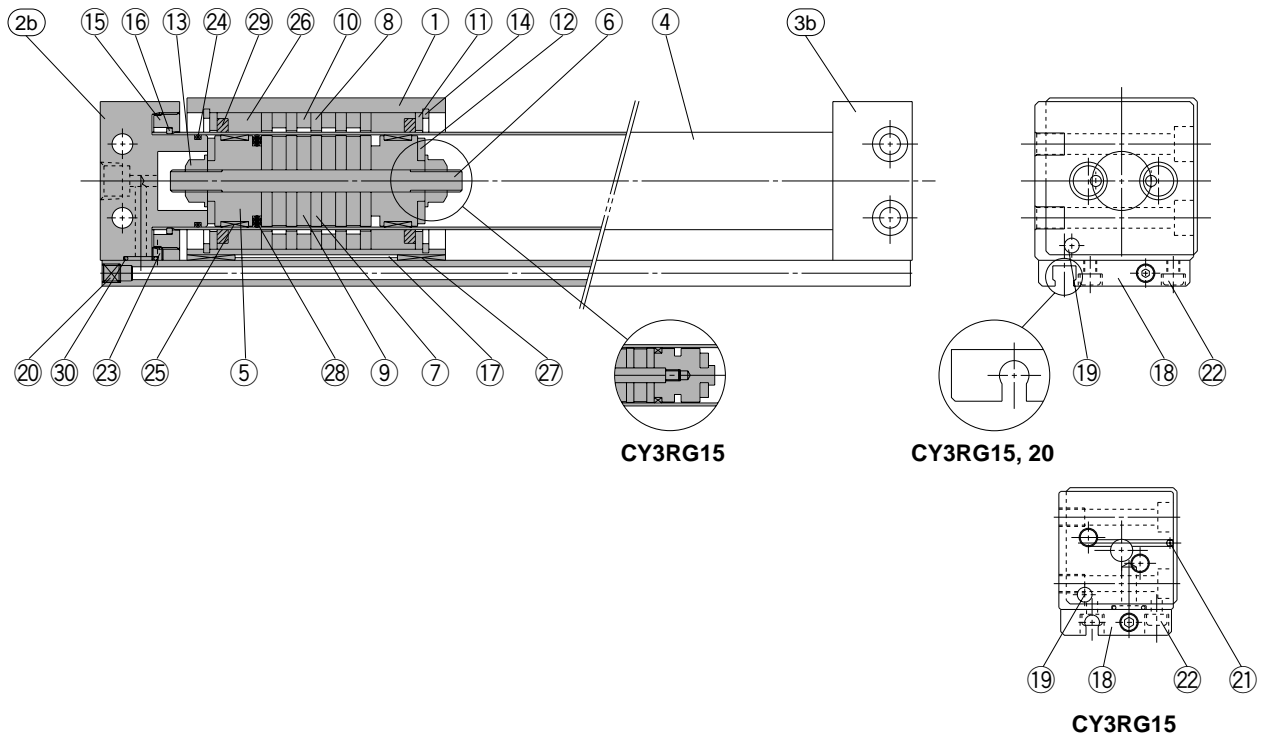
## Construction

### Centralised piping type

#### CY3RG10



#### CY3RG15 to 63

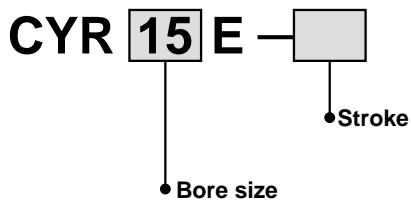


CY3RG15

CY3RG15, 20

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 <small>Note 2)</small>
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.

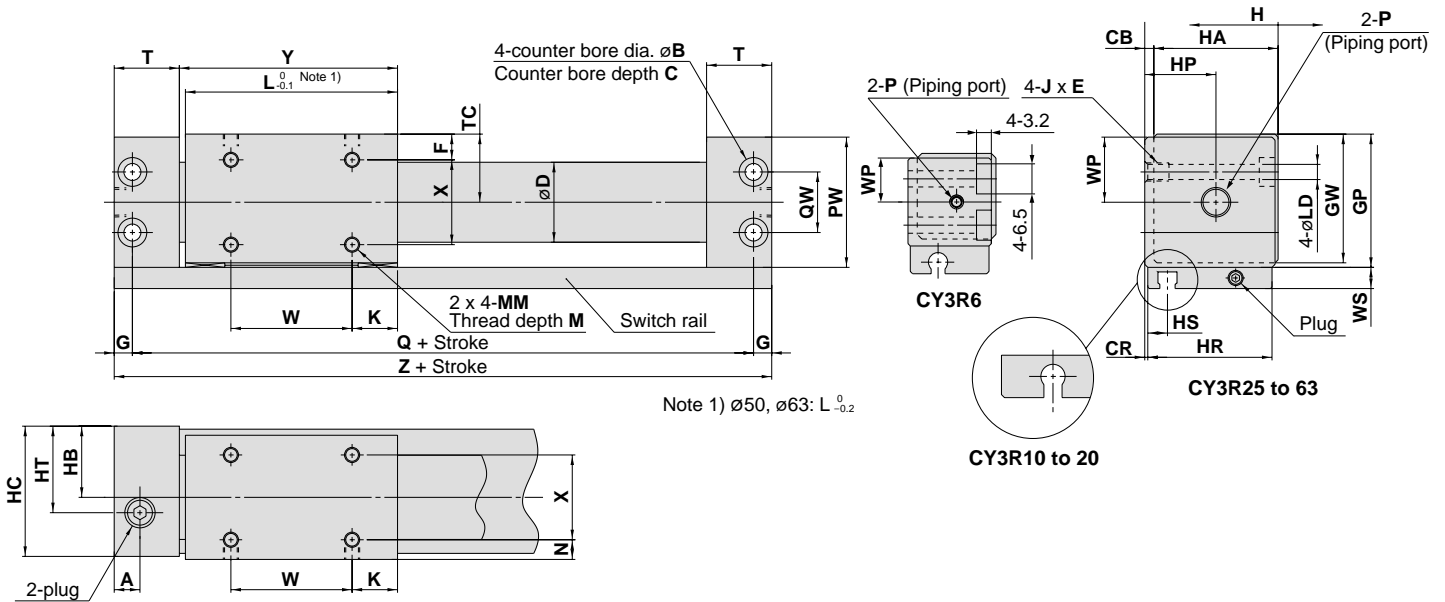
Note 2) A magnet is already built in for ø15.

# Series CY3R

## Dimensions

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

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



Note 1)  $\phi 50, \phi 63: L \overset{0}{\underset{.2}{}}$

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 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 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 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 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 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 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 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 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 15	24

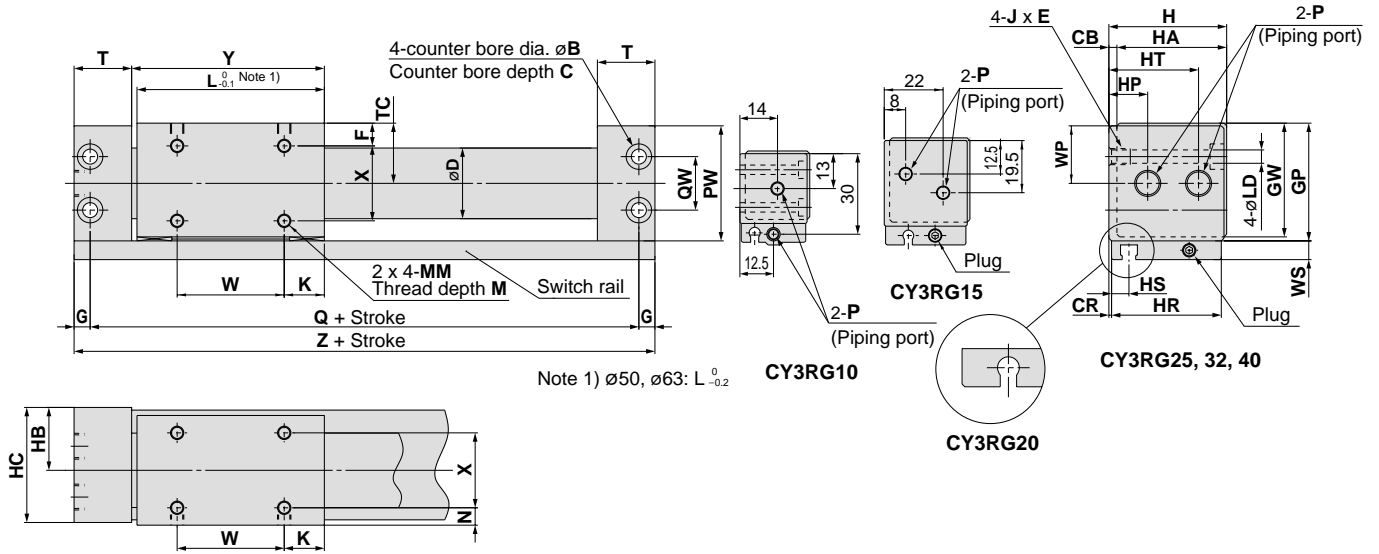
Model	L	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	WS	X	Y	Z
CY3R6	34	3.5	3.5	M3	3.5	19	60*	10	14.5*	10.5	20	9.5	6	10	35.5	66*
CY3R10	38	3.5	4	M3	4.5	26	68	14	17.5	14	20	13	8	15	39.5	76
CY3R15	53	4.3	5	M4	6	32	84	18	19	17	25	16	7	18	54.5	94
CY3R20	62	5.4	5	M4	7	38	95	17	20.5	20	40	19	7	22	64	107
CY3R25	70	5.4	6	M5	6.5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

Model	P (Piping port)		
	-	TN*	TF*
CY3R6	M3*	—	—
CY3R10	M5	—	—
CY3R15	M5	—	—
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

Centralised 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 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 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 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 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 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 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 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 15	24	118

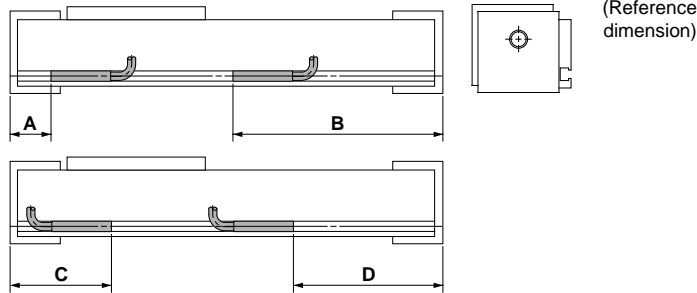
Model	LD	M	MM	N	PW	Q	QW	T	TC	W	WP	WS	X	Y	Z
CY3RG10	3.5	4	M3	4.5	26	68	14	17.5	14	20	13	8	15	39.5	76
CY3RG15	4.3	5	M4	6	32	84	18	19	17	25	16	7	18	54.5	94
CY3RG20	5.4	5	M4	7	38	95	17	20.5	20	40	19	7	22	64	107
CY3RG25	5.4	6	M5	6.5	43	105	20	21.5	22.5	40	21.5	7	28	72	117
CY3RG32	7	7	M6	8.5	54	116	26	24	28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

Model	P (Piping port)		
	-	TN*	TF*
CY3RG10	M5	—	—
CY3RG15	M5	—	—
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 asterisk 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-M9□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□	—	—	—	—	5	5	6	6	6
D-Y7□	—	—	—	—	—	—	—	—	—
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

(mm)

Auto switch model Bore size (mm)	A		B		C		D	
	D-A9□	D-M9□ D-M9□W	D-A9□	D-M9□ D-M9□W	D-A9□	D-M9□ D-M9□W	D-A9□	D-M9□ D-M9□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

(mm)

Auto switch model Bore size (mm)	A				B				C				D			
	D-A9□	D-M9□ D-M9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-M9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-M9□W	D-Z7□ D-Z80	D-Y5□ D-Y7P D-Y7□W	D-A9□	D-M9□ D-M9□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.

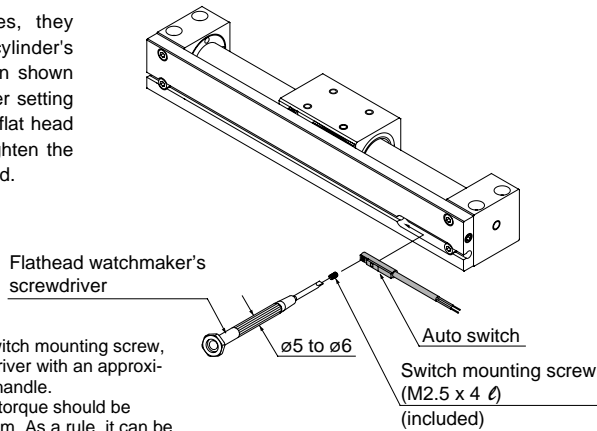
Note 2) Figures in the table above are used as a reference when mounting the auto switches for stroke end detection. In the case of actually setting the auto switches, adjust them after confirming their operation.

Note 3) Mounting brackets are additionally required for the D-A9□, M9□ and M9□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.

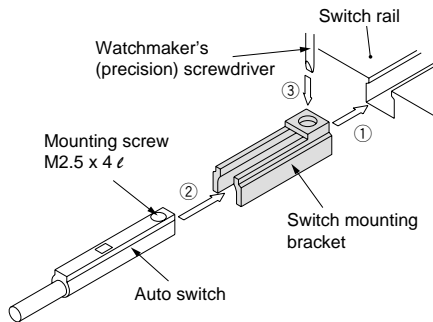


Note) When tightening the auto switch mounting screw, use a watchmaker's screwdriver with an approximately 5 to 6 mm diameter handle. Furthermore, the tightening torque should be approximately 0.1 to 0.15 N·m. As a rule, it can be turned about 90° past the point at which tightening can be felt.

### ø25 to ø63

- (1) Insert the front side of the auto switch into the auto switch groove and slide the switch to the desired position.
- (2) After the detection position is confirmed, securely tighten the mounting screw (M2.5) on the auto switch.
- (3) 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

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

### 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-M9□W
32			
40			
50			
63			

Other than the applicable auto switches listed in the "How to Order", the following auto switches can be mounted. For detailed specifications, refer to "SMC Best Pneumatics" catalogue.

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-colour 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" catalogue.  
\* Normally closed (NC = b contact), solid state switch (D-F9G/F9H/Y7G/Y7H type) are also available. For details, refer to "SMC Best Pneumatics" catalogue.

# Series CY3

# 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-colour indication is 3 metres. (Not available 0.5 m)

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

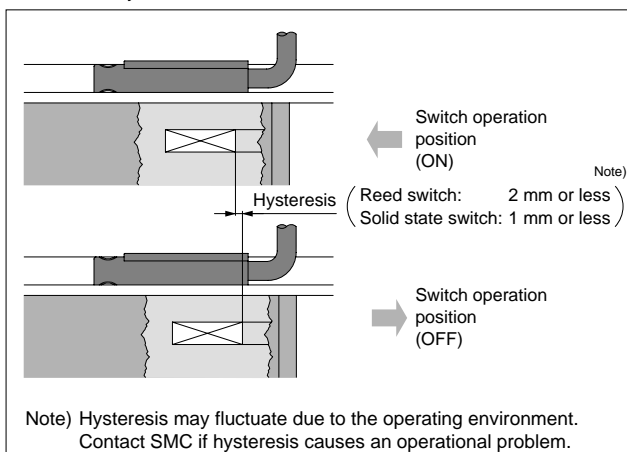
(Example) **D-M9NWL-61**

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 energising conditions.)

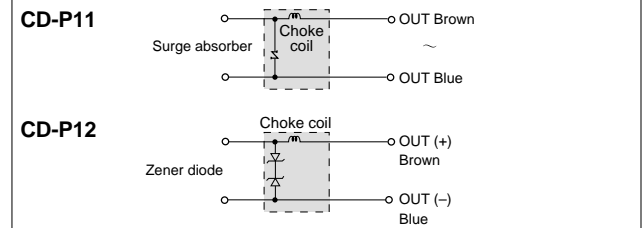
## Specifications

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

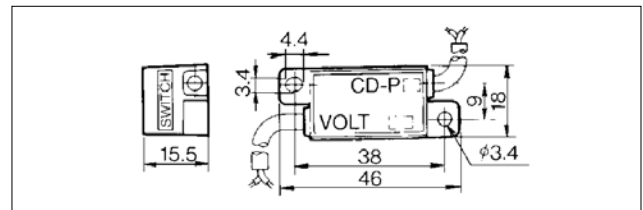
\* Lead wire length — Switch connection side 0.5 m  
Load connection side 0.5 m



## Internal Circuit



## Dimensions



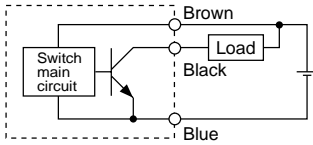
## Connection

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 metre.

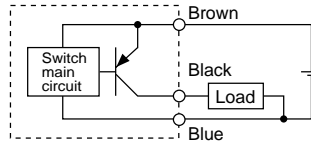
# Series CY3 Auto Switch Connections and Examples

## Basic Wiring

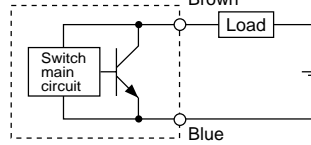
### Solid state 3-wire, NPN



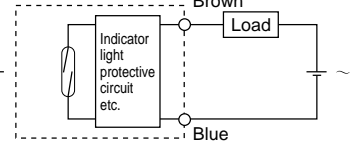
### Solid state 3-wire, PNP



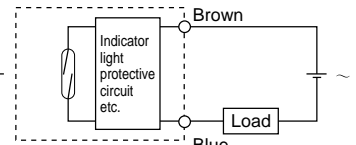
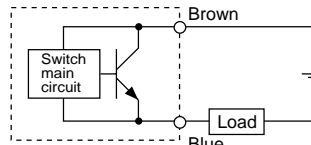
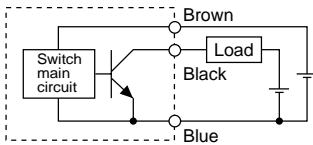
### 2-wire (Solid state)



### 2-wire (Reed switch)

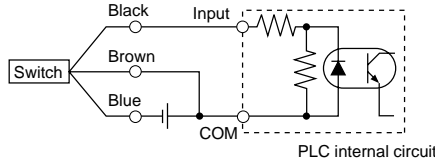


(Power supplies for switch and load are separate.)

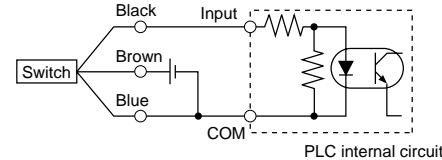


## Example of Connection to PLC (Programmable Logic Controller)

### • Sink input specifications 3-wire, NPN

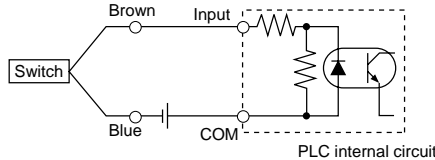


### • Source input specifications 3-wire, PNP

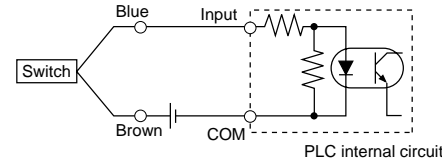


Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

### 2-wire



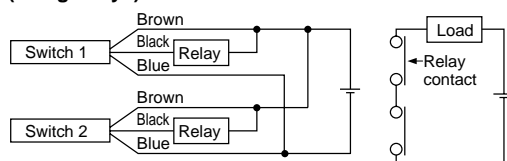
### 2-wire



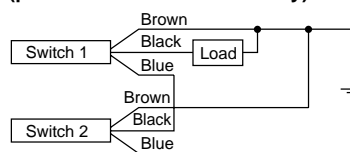
## Example of AND (Serial) and OR (Parallel) Connection

### • 3-wire

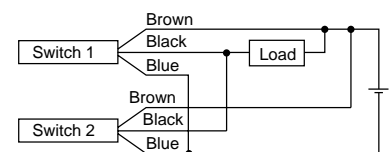
#### AND connection for NPN output (using relays)



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

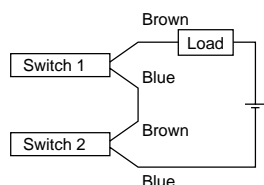


#### OR connection for NPN output



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

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

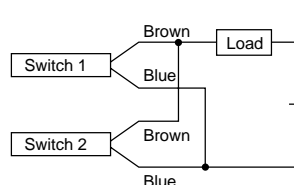


When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state. The indicator lights will illuminate if both of the switches are in the ON state.

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

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.

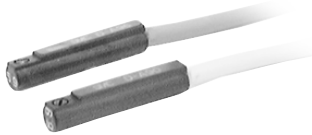
# Reed Switch: Direct Mounting Style

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



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

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

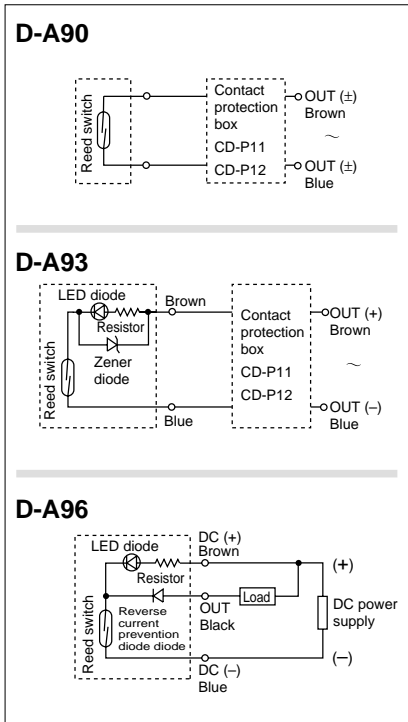


### Caution

#### 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.)

### Auto Switch Specifications

PLC: Programmable Logic Controller

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

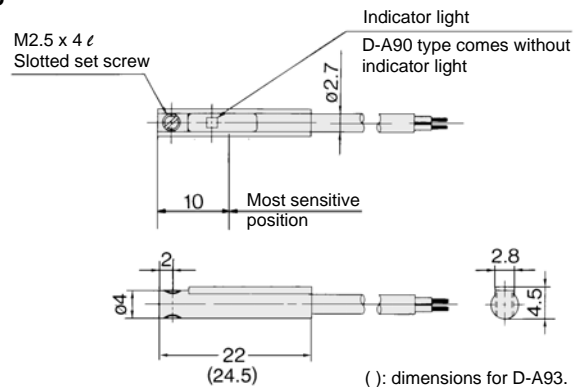
Unit: g

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



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### 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:  $\varnothing 2.7 \times 3.2$  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.

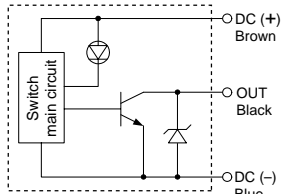
### Weight

Unit: g

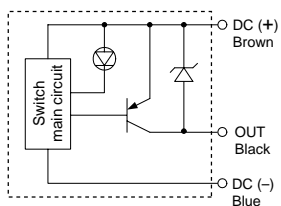
Auto switch part no.	D-M9N	D-M9P	D-M9B	
Lead wire length (m)	0.5	8	8	7
	3	41	41	38
	5	68	68	63

### Auto Switch Internal Circuit

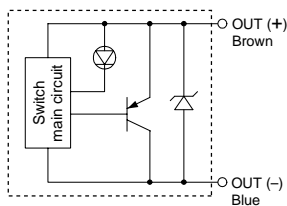
#### D-M9N



#### D-M9P



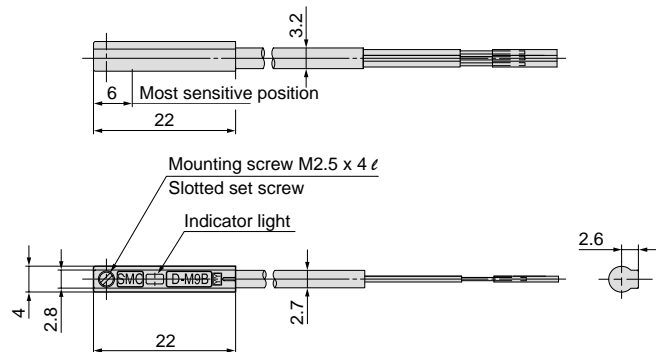
#### D-M9B



### Dimensions

Unit: mm

#### D-M9□



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

## D-M9NW/D-M9PW/D-M9BW

### Grommet



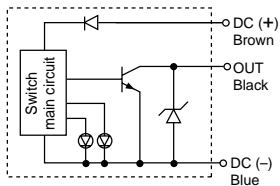
### Caution

#### Operating Precautions

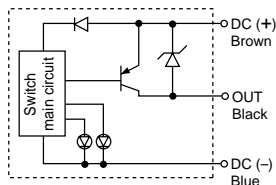
Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

#### Auto Switch Internal Circuit

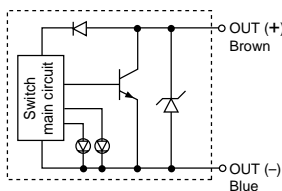
##### D-M9NW



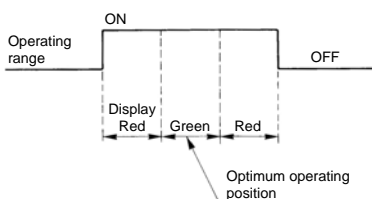
##### D-M9PW



##### D-M9BW



#### Indicator light/Display method



### Auto Switch Specifications



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PLC: Programmable Logic Controller

D-M9□W (With indicator light)			
Auto switch part no.	D-M9NW	D-M9PW	D-M9BW
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.		

#### 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

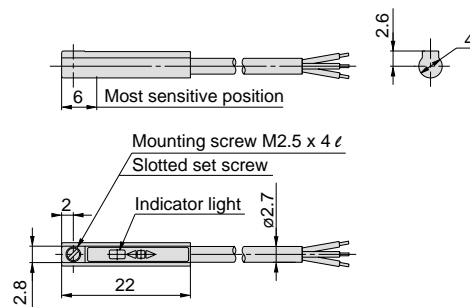
Unit: g

Auto switch part no.	D-M9NW	D-M9PW	D-M9BW
Lead wire length (m)	0.5	7	7
	3	34	32
	5	56	52

### Dimensions

Unit: mm

#### D-M9□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.

# Series CY3

# Made to Order 1

Contact SMC for detailed specifications, lead times and prices.

Symbol

-XB6

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

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 a range of less than 100°C it could make a difference to 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*
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\* Use caution as the magnet coupling will be broken, if stopped in an intermediate stroke by an external stopper with the operating pressure over 0.4 MPa.

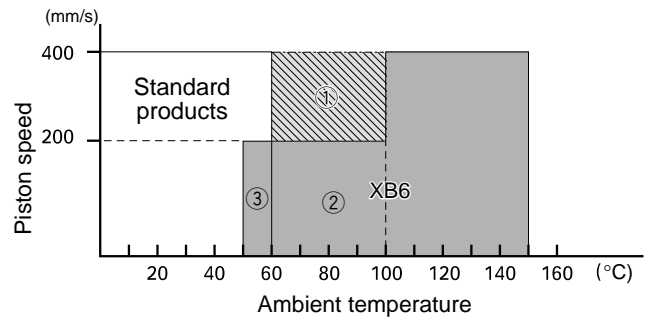
### Magnetic Holding Force

(N)

Bore size (mm)	6	10	15	20	25	32	40	50	63
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) -XB11

Symbol

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	From 2001 mm to Max. manufacturable stroke

Note) Please contact SMC for the delivery.

## 3 Low speed (7 to 50 mm/s) specifications -XB13

Symbol

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

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 both sides piping type 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

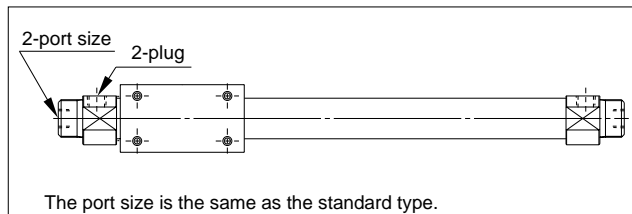
CY3B Bore size Port thread type Stroke - X132

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



## 6 High speed specifications Symbol -X160

CY3B Bore size Port thread type Stroke - X160

High speed specifications

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

### Specifications

Applicable series	CY3B/CY3R
Bore size	ø20 to 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 both sides piping type is available with the CY3R series.

## 7 Helical insert thread specifications Symbol -X168

CY3B Bore size Port thread type Stroke - X168

Helical insert thread specifications

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

### Specifications

Applicable series	CY3B
Bore size	ø20 to ø63

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

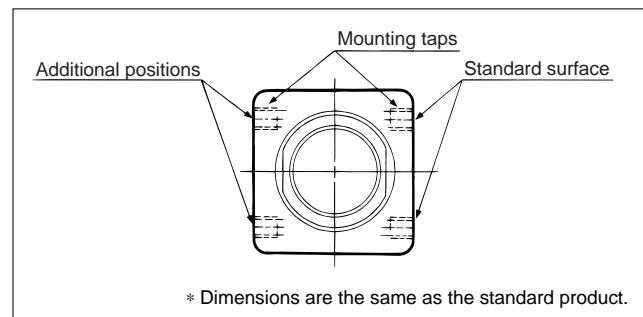
CY3B Bore size Port thread type Stroke - X206

Added mounting tap positions for slider

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

### Specifications

Applicable series	CY3B
Bore size	ø6 to ø63



# 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

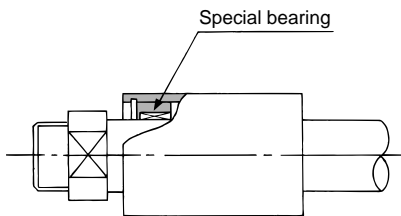
Suitable for environments where oil is not tolerated. A lubretainer is not installed. A separate version -X324 (with dust seal) is available in cases in which dust, etc. is dispersed throughout the environment.

#### Specifications

Applicable series	CY3B
Bore size	ø6 to ø63

#### Construction

CY3B



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

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

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.

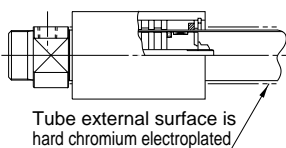
#### Specifications

Applicable series	CY3B/CY3R
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.

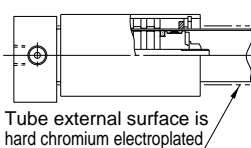
#### Construction

CY3B



Tube external surface is hard chromium electroplated.

CY3R



Tube external surface is hard chromium electroplated.

### 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)

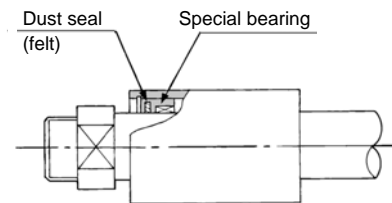
This unit has oil-free exterior specifications, with a dust seal provided on the cylinder body.

#### Specifications

Applicable series	CY3B
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

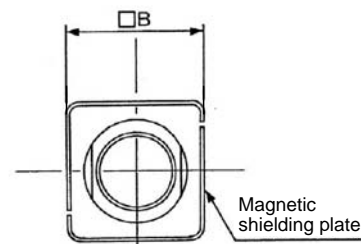
With magnetic shielding plate

Shields against the magnetic leakage from an external slider.

#### Specifications

Applicable series	CY3B
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.

# 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

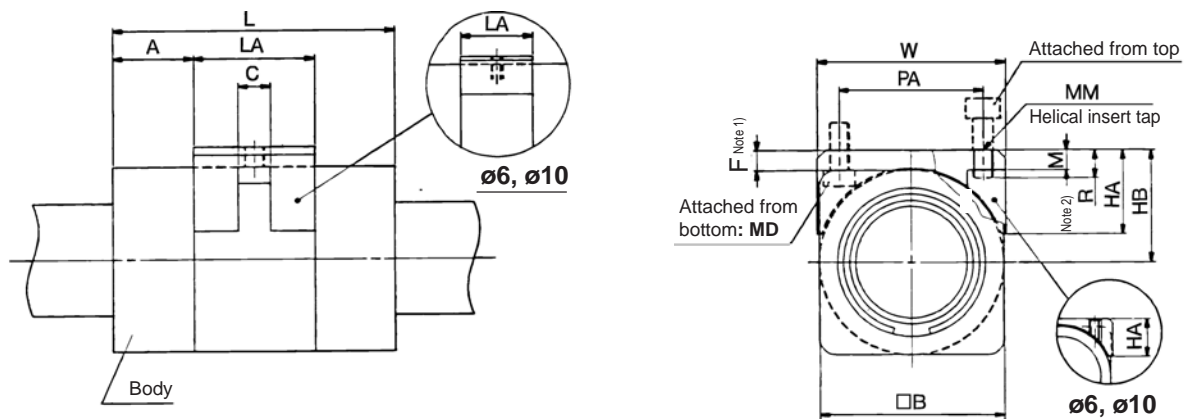
A special floating joint is added to the CY3B series, and the number of connections to the guide on the other axis (the load side) is reduced. The attachment of the bolt to the floating joint and the load are possible from either the top or the bottom. (For  $\phi 6$  and  $\phi 10$  bore the attachment of the bolts is only possible from the top).

### Specifications

Bore size	$\phi 6$ to $\phi 63$
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Note) Since the body of this cylinder is designed for connection with a floating joint, it cannot be connected to the bodies of standard products. Contact SMC if this is necessary.

### Dimensions



(mm)

Model	A	$\square B$	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 3 $\ell$	—	—	12	—	18
<b>10</b>	10	25	—	2.5	9.5	15	38	18	M3 x 3 $\ell$	—	—	17	—	26
<b>15</b>	16	35	6.5	5.5	16.5	23	57	25	M4	M3	4	25	6	36
<b>20</b>	18	36	6.5	5.5	17	23.5	66	30	M5	M3	4	27	6	37
<b>25</b>	20	46	8.0	5.5	21	28.5	70	30	M6	M4	5	36	7	47
<b>32</b>	22.5	60	9.5	6.0	27.5	36	80	35	M6	M5	6	47	8	61
<b>40</b>	26	70	9.5	6.0	28.5	41	92	40	M6	M5	6	55	8	71
<b>50</b>	35	86	11	6.0	35	49	110	40	M8	M6	8	65	11	87
<b>63</b>	36	100	18	7.0	42	57	122	50	M8	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 R (3 mm or more for  $\phi 6$  and  $\phi 10$ ), 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

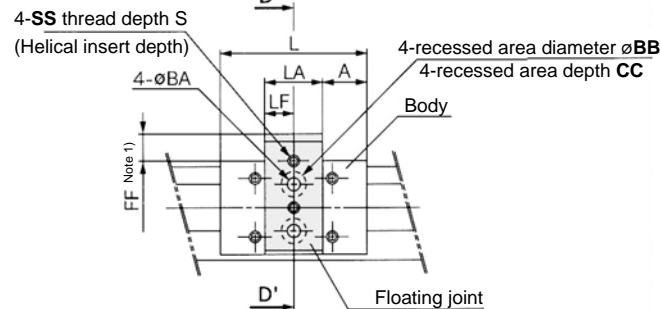
Bore size	ø6 to ø63
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Note) Since the body of this cylinder is designed for connection with a floating joint, it cannot be connected to the bodies of standard products. Contact SMC if this is necessary.

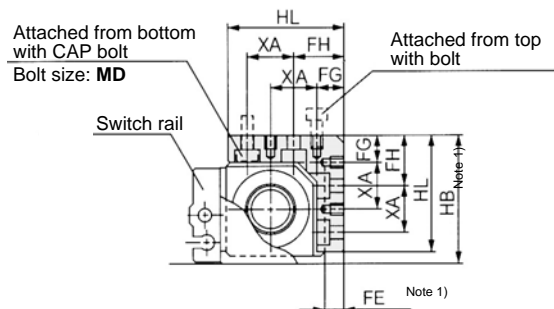
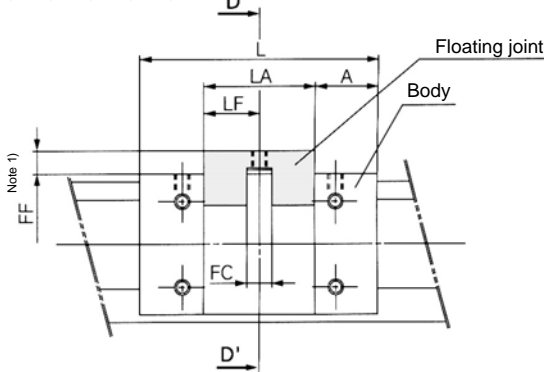
A special floating joint is added to the CY3R series, and the number of connections to the guide on the other axis (the load side) is reduced. The attachment of the bolt to the floating joint and the load are possible from either the top or the bottom.

### Dimensions

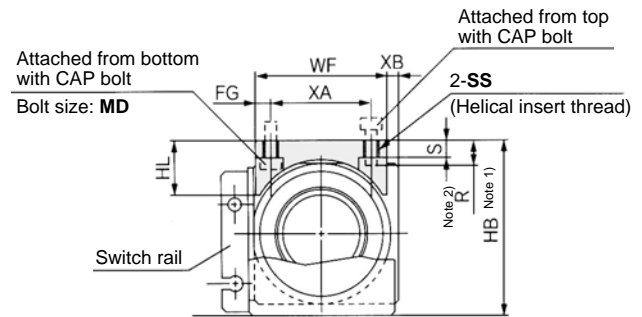
ø6, ø10, ø15



ø20, ø25, ø32, ø40, ø50, ø63



Section D-D'



Section D-D'

(mm)

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	—	10	—
10	11.5	3.4	6.5	3.3	—	5	7	7	13	33	30	38	15	7.5	M3	—	3.5	M3	—	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	—	14	—
20	16.5	—	—	—	6.5	—	6	4	—	45	14	62	29	14.5	M3	7	4.5	M4	34	26	3
25	20.5	—	—	—	8	—	7	4	—	51	17	70	29	14.5	M4	8	5.5	M5	39	31	3
32	21	—	—	—	9.5	—	7.5	4.5	—	62.5	22	76	34	17	M5	10	6.5	M6	50	41	3
40	25.5	—	—	—	9.5	—	7.5	7.5	—	74.5	28	90	39	19.5	M5	10	6.5	M6	60	45	3
50	35.5	—	—	—	11	—	7.5	9	—	92.5	38	110	39	19.5	M6	15	10	M8	78	60	3
63	34.5	—	—	—	18	—	7.5	10	—	104.5	39	118	49	24.5	M6	15	10	M8	90	70	3

Note 1) FE, FF and HB provide a clearance of 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 catalogue 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 catalogues 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.

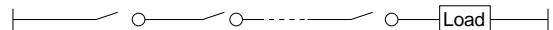
##### <Reed switch>

##### 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.

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

- 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>

- 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 centre of the operating range.

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

(The mounting position shown in a catalogue 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 centre 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□, M9□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>

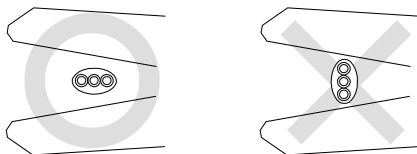
1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this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

#### 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-colour 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)

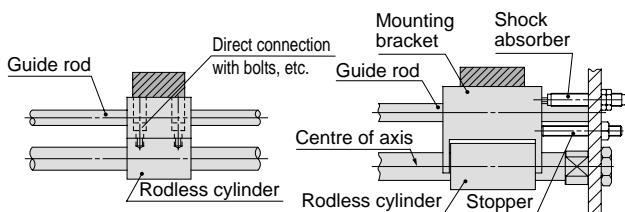
5. If gaps occur between the mounting surface and the end covers when mounting with bolts, perform shim adjustment using spacers, etc. so that there is no unreasonable stress. (CY3R)

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 centre 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 centre, so that the cylinder is not subjected to moments.

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 centre 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.

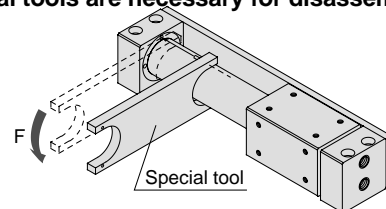
When removing the external slider and piston slider from the cylinder tube for maintenance, etc., handle with caution, since the magnets installed in each slider have very strong attractive power.

### ⚠ 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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