Doc. no. DOC1150206

Operation Manual

PRODUCT NAME

Magnetically Coupled Rodless Cylinder
(Slider Type: Slide Bearing)

MODEL / Series / Product Number

Series CY3S-Z

SMC Corporation

Contents

Safety Instructions

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

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

Danger	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
Warning	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Caution	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Warning

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

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

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

Safety Instructions

⚠ Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.
Use in non-manufacturing industries is not covered.
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

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

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

1. Mounting

⚠ Caution

1-1） Surface for mounting

①Mount the cylinder with the surface which flatness is 0.2mm or less.

When the flatness is more than 0.2mm, two guide shaft will be twisted, increasing sliding resistance, shortening the product life.

②If the required flatness is not available, make adjustment of the gap using a shim.

Make adjustment so that the slide block moves smoothly at the minimum operating pressure [0.18Mpa] for full stroke.

③Make sure that there are no foreign matters including debris on the mounting surface before mounting the cylinder.

If the cylinder is fixed with debris in between the cylinder and the mounting surface, the guide shaft may be twisted and poor performance or short life can result.

④It is recommended to configure the mounting surface for the cylinder with the same material of the cylinder.

If the material of the cylinder and the mounting surface is different, the flatness of the mating surface will be insufficient.

When the materials are different, adjust the flatness at 0.2mm or less using a shim.

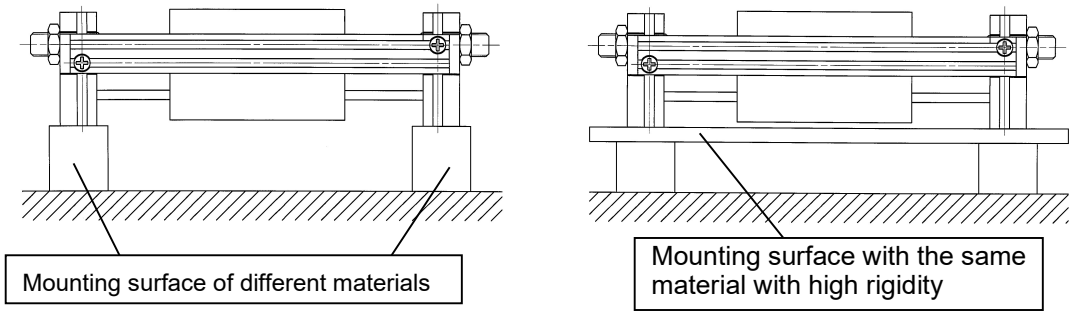


Fig.1 Cylinder mounting surface

⚠ Caution

1-2） Mounting the cylinder

① **Mount the cylinder using the plate on both ends.**

Do not mount the cylinder using the slide block (Fig.2).

Otherwise, excessive moment will be applied to the bushing at the stroke, wearing the bushing in early stage of life.

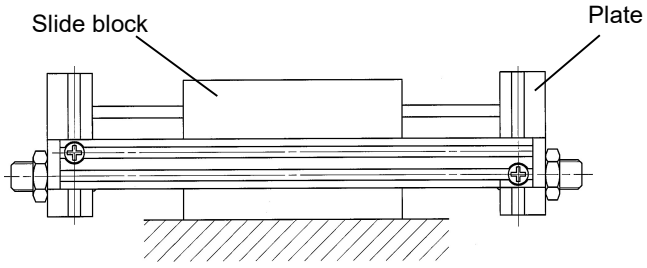


Fig.2 Mounting with slide block (prohibited)

②Cylinder has to be fixed by screws from the top surface of the plate (surface with countersunk).

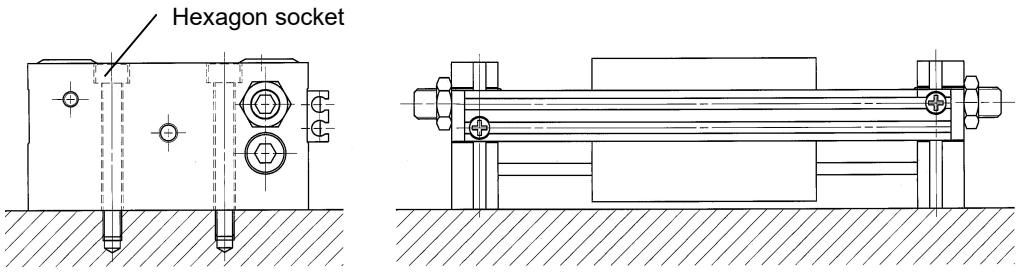


Fig.3 Cylinder mounting method

⚠ Caution

1-3） Minimum necessary space for the installation of the cylinder

Keep adequate space in operating directions of the bumper bolt, shock absorber and the fitting for ease of mounting and replacement (see Fig.4 and Table 1 (next page)).

Table 1 shows the minimum necessary space. Keep more space than is required.

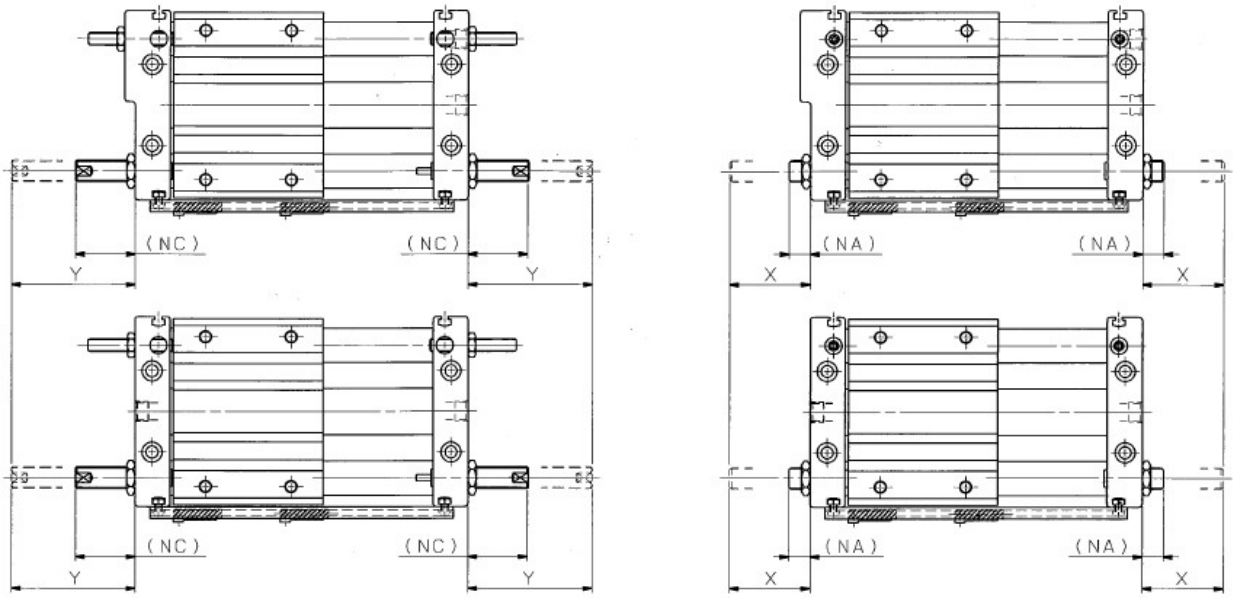


Fig.4 Minimum necessary space

Table 1. Minimum necessary space (Reference)

Tube I.D. (mm)	With shock absorber (mm)		With bumper bolt (mm)	
	(NC)	Y: Minimum necessary space	(NA)	X: Minimum necessary space
6	19	44	11	32
10	28	58	10.5	34
15	28	58	10.5	34
20	28	63	10.5	39
25	49	89	12.5	41
32	52	99	11.5	43
40	51	99	10.5	43

Note) The dimensions above show the minimum necessary space for the replacement of the shock absorber and bumper bolt. (Full length of the stopper + 10mm)

2. Operation

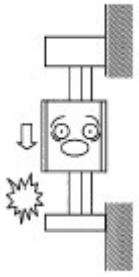
⚠ Warning

① **Do not put your hand between the plate and the slide block during the cylinder operation.**
It is very dangerous.

② **Do not apply the load more than allowable value of the cylinder.**
It will cause malfunctions.

③ **Check the supply pressure, and the kinetic energy that the cylinder generates, When performing an intermediate stop.**

Fine stroke end adjustment is considered as an intermediate stop, so the considerations for an intermediate stop must be observed.



[When stopping the external slider in an intermediate position with external stopper]

If the allowable pressure values are exceeded, the stopper position might be displaced or the external slider may become detached from the magnetic coupling and drop (see Table 10 on page 20).

[When stopping the external slider in an intermediate position in a pneumatic circuit]

If the external kinetic energy of the load on the slider exceeds the allowable values, the stopper position might be displaced or the external slider may become detached from the magnetic coupling and drop (see Table 11 on page20).

⚠ Caution

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

3. Functions

3-1) Piping selection

2 types of piping type are available: (1) Bilateral piping type[CY3S] One piping port is located at each end plate, (2) Centralized piping type [CY3SG] Two piping ports are both located at plate A. (Fig. 5-1, Fig. 5-2)

Reference: For the bilateral piping type: The full length of the cylinder is shorter than the centralized piping type: Integrated piping is possible.

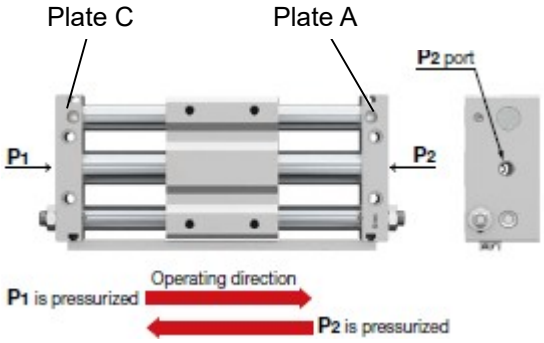
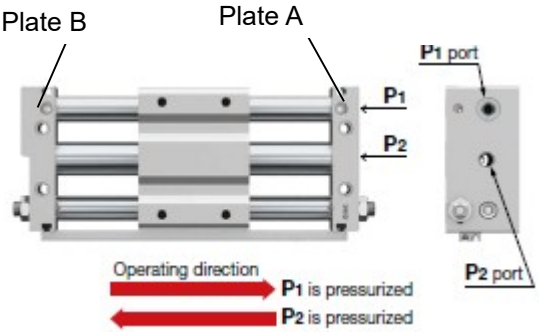


Fig.5-1 Bilateral piping type [CY3S]



Fig,5-2 Centralized piping type [CY3SG]

3-2) Stopper type

Select the stopper from the three types on the right. (Fig.6)

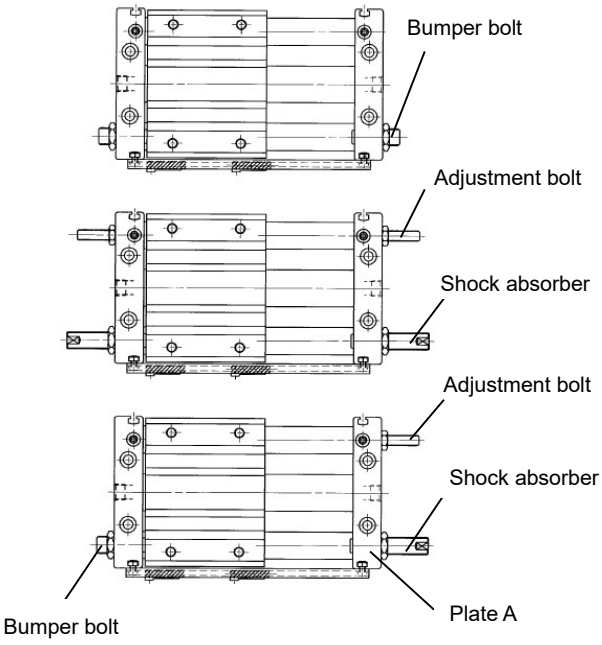
Bumper bolt (Resin tipped)

Shock absorber + adjustment bolt (metal ended)

Shock absorber + adjustment bolt (metal ended) on one side

Bumper bolt on one side (Resin tipped)

【With shock absorber on one side】
The shock absorber is attached to plate A.



Fig,6 Stopper Type

3-3) Auto switches selection

3-3-1) Applicable auto switches

Refer to Table 2. Pay attention to the type of auto switches.

Table2. Applicable Auto Switches

Applicable Auto Switches / Refer to the **Web Catalog** for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC		Load voltage AC	Auto switch model Perpendicular	Auto switch model In-line	Lead wire length [m] 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	Pre-wired connector	Applicable load	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				M9PV	M9P	●	●	●	○	○		
				2-wire		12 V		M9BV	M9B	●	●	●	○	○	—	
	Diagnostic indication (2-color indicator)			3-wire (NPN)		5 V, 12 V		M9NWV	M9NW	●	●	●	○	○	IC circuit	
				3-wire (PNP)				M9PWV	M9PW	●	●	●	○	○		
				2-wire		12 V		M9BWV	M9BW	●	●	●	○	○	—	
	Water resistant (2-color indicator)			3-wire (NPN)		5 V,12 V		M9NAV*1	M9NA*1	○	○	●	○	○	IC circuit	
				3-wire (PNP)				M9PAV*1	M9PA*1	○	○	●	○	○		
				2-wire		12 V		M9BAV*1	M9BA*1	○	○	●	○	○	—	
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	●	●	●	○	IC circuit	—
			No	2-wire	24 V	12 V	100 V	A93V	A93	●	●	●	●	○*2	—	Relay, PLC
							100 V or less	A90V	A90	●	●	●	●	○*2	IC circuit	

*1 Water-resistant type auto switches can be mounted on the above models, but SMC cannot guarantee water resistance.
*2 The load voltage used is 24 VDC.

* Lead wire length symbols: 0.5 m.....Nil (Example) M9NW
1 m..... M (Example) M9NWM
3 m..... L (Example) M9NWL
5 m..... Z (Example) M9NWZ

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

3-3-2) Mounting of auto switch

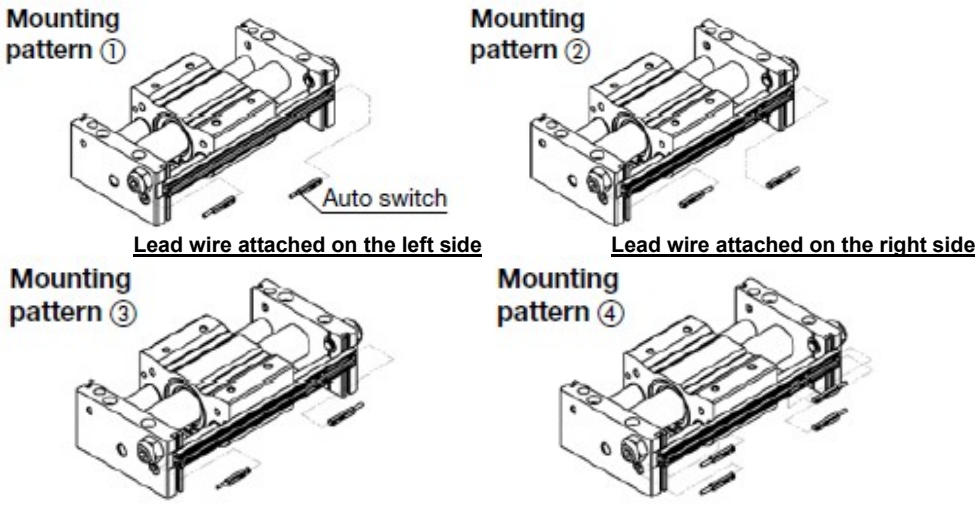
Auto switches can be mounted in either of the two grooves on the switch rail.

When two auto switches are installed, mounting one auto switch in each groove will prevent the lead wires from protruding from the mounting groove and allow for easy organization.

When mounting an auto switch, there are three mounting methods (mounting patterns ① to ③) depending on the lead wire exit direction, as shown in Fig.7.

It is also possible to mount two or more auto switches in the two mounting grooves on the switch rail (mounting pattern ④).

Insert the auto switch into the mounting groove from the end of the switch rail, set it in the desired mounting position,and then use a flat-head watchmaker's screwdriver to tighten the included auto switch mounting screws.



Fig,7 Mounting method of auto switch

Tightening Torque for Auto Switch Mounting Screw [N·m]

Auto switch model	Tightening torque
D-M9□(V) D-M9□W(V) D-A9□(V)	0.05 to 0.15
D-M9□A(V)	0.05 to 0.10

Watchmakers screwdriver:

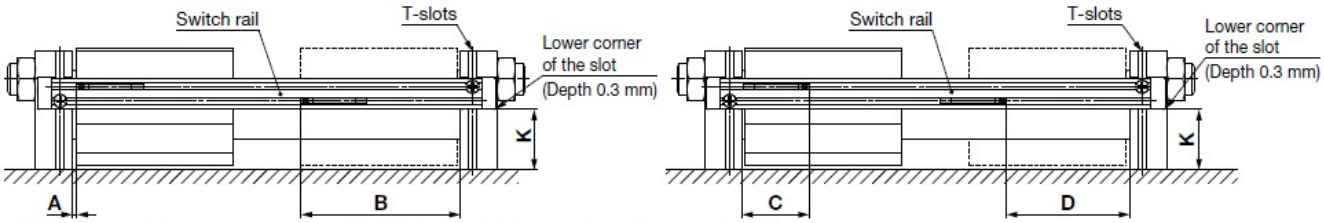
Grip diameter 5 to 6mm

3-3-3) Mounting and removal of the switch rail.

Care must be taken when removing the switch rail so that the screws,

nuts or washers are not lost.

Refer to the table 3 for mounting the switch rail again or to the opposite side (No stroke adjustment).



* The minimum stroke when 2 auto switches are mounted in parallel as shown above is 15 mm.
* The minimum stroke without auto switch is 10 mm.

Fig.8 Auto Switch Proper Mounting Position

Table3. Auto Switch Proper Mounting Position

Auto Switch Proper Mounting Position [mm]

Auto switch model / Bore size	K dimension (Switch rail height)	A		B		C		D	
		D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9□V	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV	D-A9□ D-A9 V
6	10.2	3	0	39	43	15	19	27	23
10	16.2	3	0	44	48	15	19	32	28
15	18.2	3	0	59	63	15	19	47	43
20	23.2	3.5	0	69.5	73.5	15.5	19.5	57.5	53.5
25	27.2	3.5	0	69.5	73.5	15.5	19.5	57.5	53.5
32	33.2	5	1	86	90	17	21	74	70
40	37.2	4	0	95	99	16	20	83	79

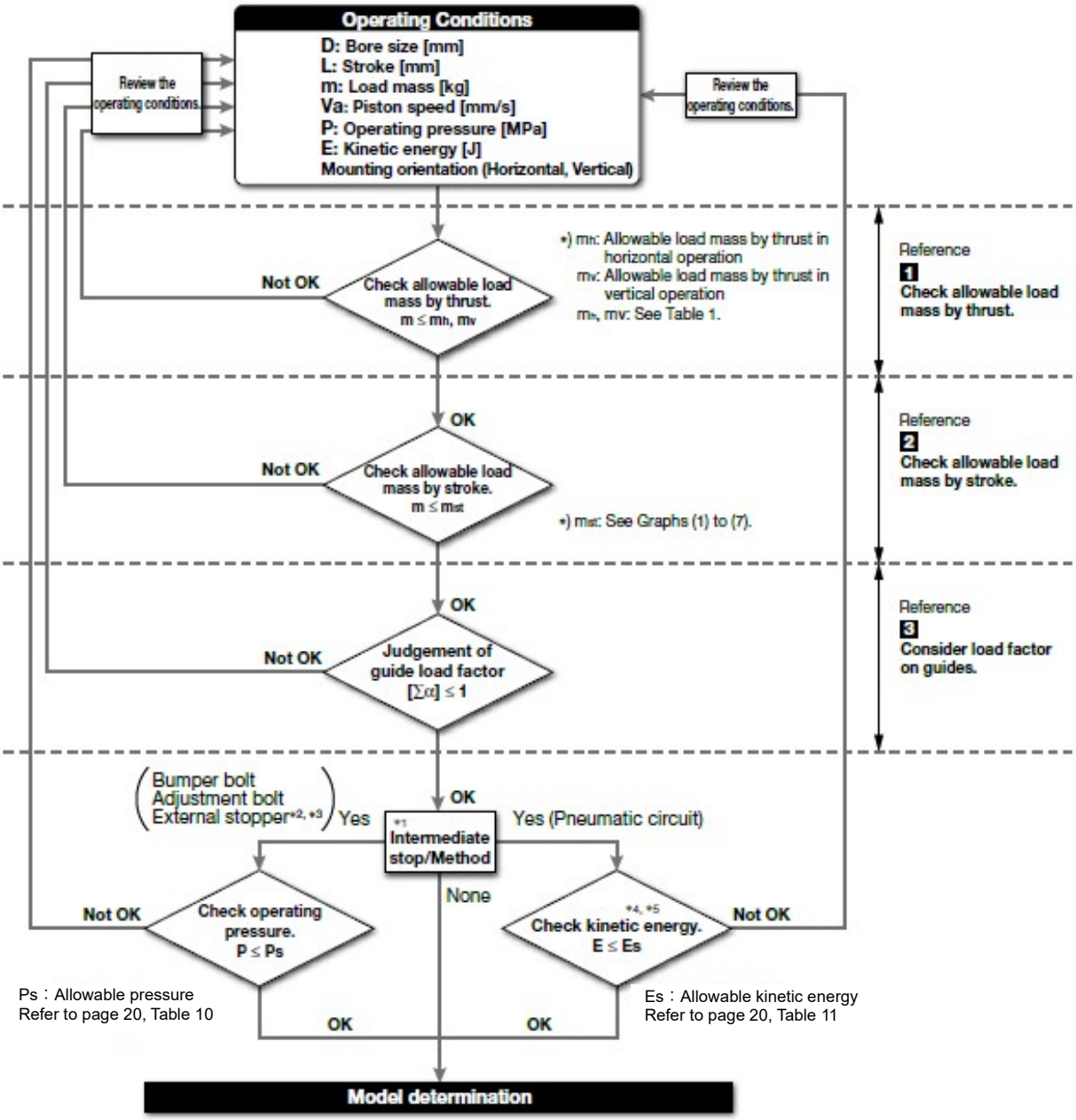
* The values in the table above are to be used as a reference when mounting auto switches for stroke end detection. Adjust the auto switch after confirming the operating conditions in the actual setting.
* If the switch rail is reassembled or mounted on the other side of the cylinder, maintain the **K**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

3-3-4) Switch response at intermediate positions of the stroke.

It is possible to install an auto switch at an intermediate position of the stroke, but the maximum speed of the cylinder, which can be detected by the switch, will be limited due to the load relay response.

4. Model selection

Selection Flow Chart



•1 Stroke adjustment with either a bumper bolt or adjustment bolt is considered as an intermediate stop.
•2 When an intermediate stop is performed with an external stopper, consider the dynamic load as shown below.
- •Bumper bolt: δ = 4/100
- •Shock absorber and air cushion: δ = 1/100

In addition to this, check the judgement results of the guide load factor. (δ: Bumper coefficient)
•3 When an external stopper is used in conjunction with a shock absorber, check the model selection of shock absorber separately.
•4 This cylinder cannot perform an intermediate stop with the pneumatic circuit in vertical operation.
The intermediate stop is only performed with a bumper bolt, adjustment bolt or external stopper.
•5 When an intermediate stop is performed with the pneumatic circuit, the stopping accuracy may vary significantly.
If accuracy is required, be sure to perform the intermediate stop with a bumper bolt, adjustment bolt or external stopper.

1 Check allowable load mass by thrust.

In this series, the work load and the maximum operating pressure are restricted to prevent the magnetic coupling from being separated. Ensure that the work load mass and operating pressure are within the values in Table 4.

Table4.Allowable load mass by thrust and maximum operating pressure

Bore size [mm]	Horizontal operation m_h [kg]	Horizontal operation Max. operating pressure P_h [MPa]*1	Vertical operation m_v [kg]	Vertical operation Max. operating pressure P_v [MPa]
6	1.8	0.70	1.0	0.55
10	3.0		2.7	
15	7.0		7.0	0.65
20	12		11	
25	20		18.5	
32	30		30	
40	50		47	

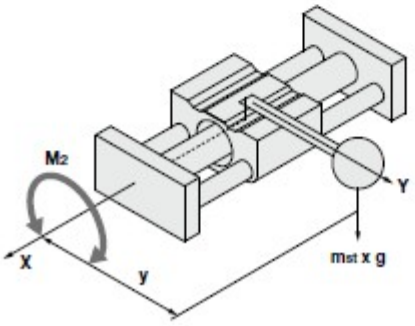
*1 Without stroke adjustment

When stroke adjustment is performed with bumper bolt, adjustment bolt, or intermediate stop is performed with an external stopper, the maximum operating pressure should be as shown on page20 (Table10).

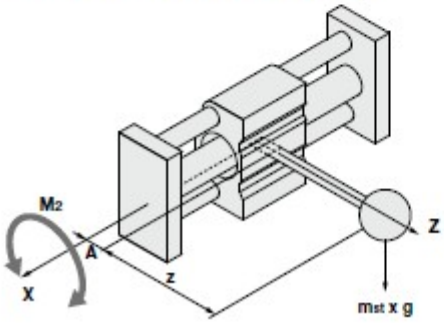
2 Check allowable load mass by stroke.

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

[Horizontal mounting and Ceiling mounting]
The allowable load mass by stroke range varies depending on the y direction of the loads center of gravity.



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



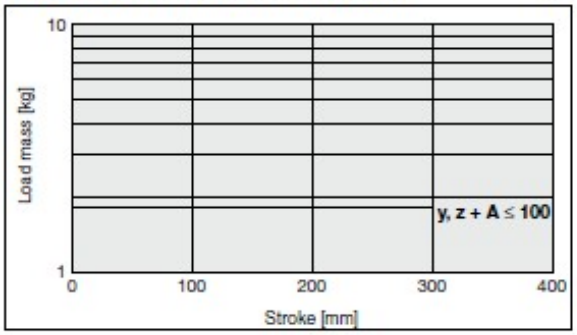
[Vertical mounting]
Load mass is not restricted by stroke.

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

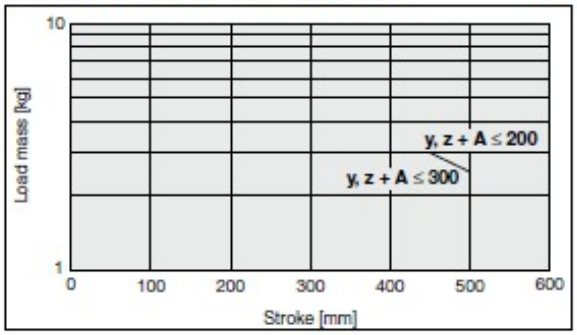
2 Check allowable load mass by stroke.

Selection Graph

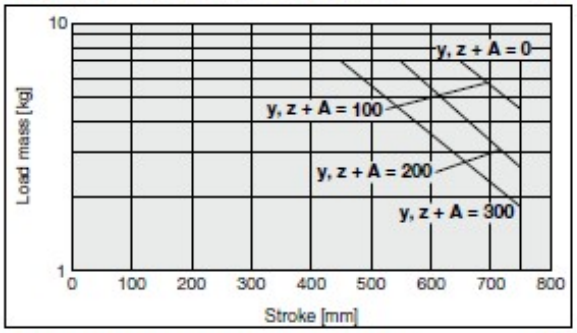
[Graph 1] Allowable load mass by stroke ø6



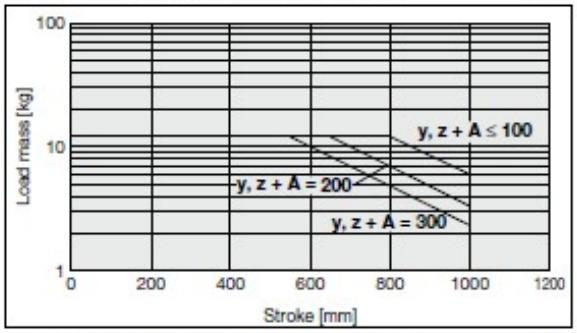
[Graph 2] Allowable load mass by stroke ø10



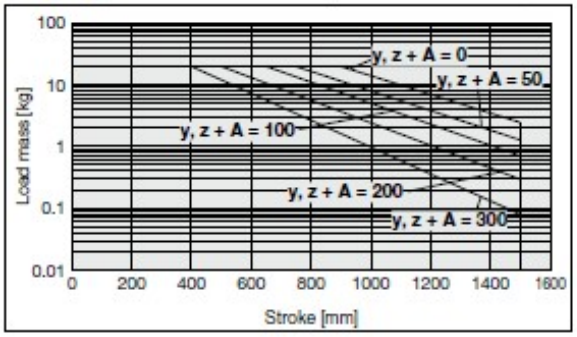
[Graph 3] Allowable load mass by stroke ø15



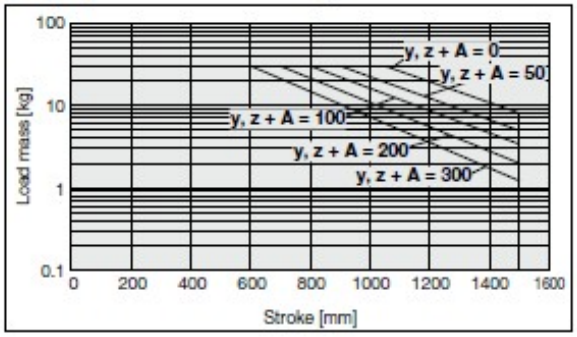
[Graph 4] Allowable load mass by stroke ø20



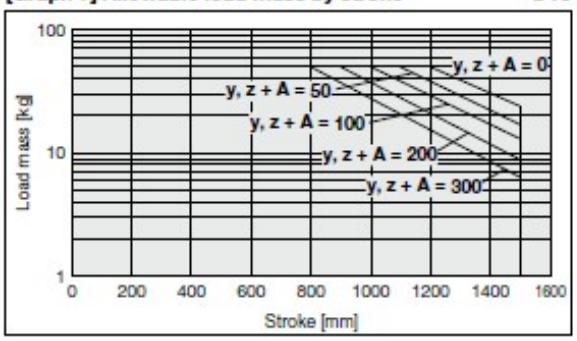
[Graph 5] Allowable load mass by stroke ø25



[Graph 6] Allowable load mass by stroke ø32



[Graph 7] Allowable load mass by stroke ø40



* If the load center of gravity exceeds the value of y, z + A on the graph, install an external guide on the cylinder separately to make sure it is within the allowable range.

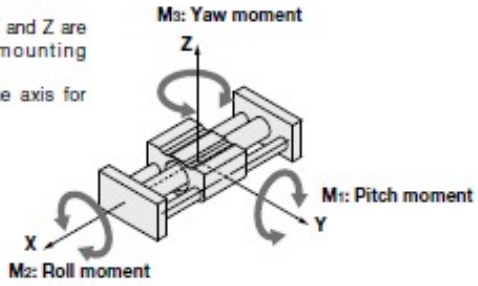
3 Consider load factor on guides.

3 –① Types of moment applied to rodless cylinders

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

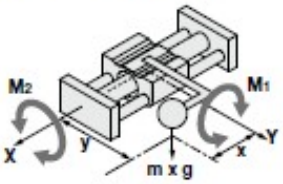
Coordinates and Moments

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

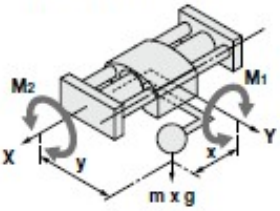


Static moment calculation by mounting type

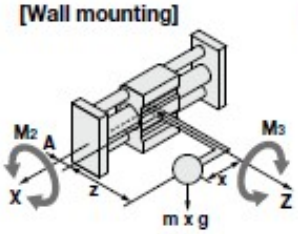
[Horizontal mounting]



[Ceiling mounting]



[Wall mounting]



[Vertical mounting]

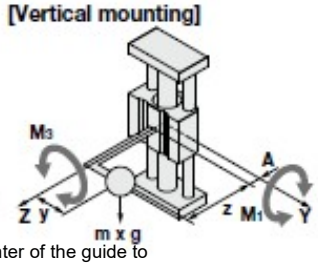


Table5. Mounting orientation and static moment

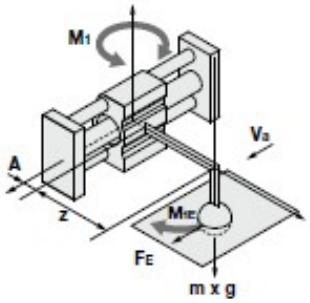
Mounting orientation		Horizontal mounting	Ceiling mounting	Wall mounting	Vertical mounting
Static load		m			
Static moment	M_1	m x g x x	m x g x x	—	m x g x (z + A)
	M_2	m x g x y	m x g x y	m x g x (z + A)	—
	M_3	—	—	m x g x x	m x g x y

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

Table6. Dimension from the center of the guide to the upper surface of the slide block

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

Dynamic moment calculation by mounting type



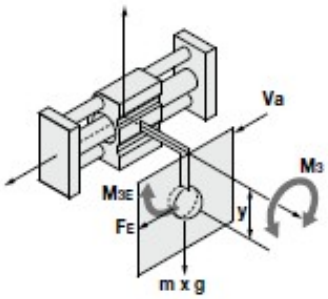


Table7. Mounting orientation and dynamic moment

Mounting orientation		Horizontal mounting	Ceiling mounting	Wall mounting	Vertical mounting
Dynamic load FE		δ x 1.4 x Va x m x g		Bumper bolt: δ = 4/100 Shock absorber: δ = 1/100	
Dynamic moment	M_{1E}	1/3 x FE x (z + A)			
	M_{2E}	Dynamic moment does not occur.			
	M_{3E}	1/3 x FE x y			

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

3 Consider load factor on guides.

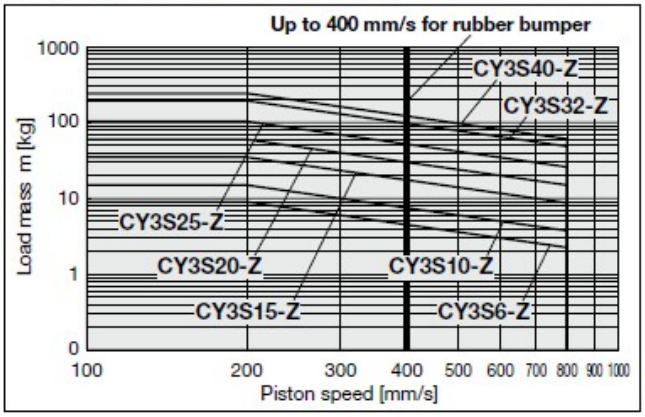
3 −② Allowable load mass on guides/Allowable moment

Table8. Allowable load mass on guides and moment

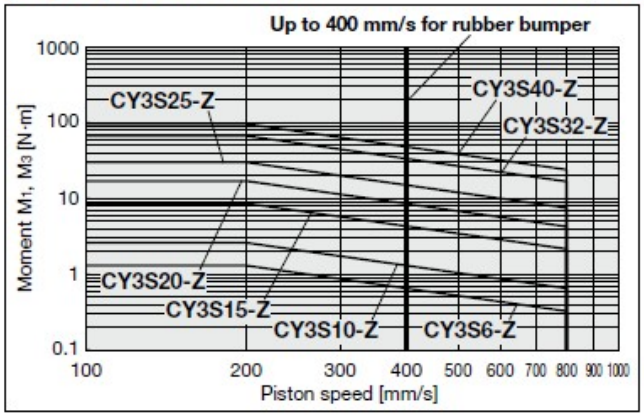
Bore size [mm]	Allowable load mass on guides m [kg]	Allowable moment [N·m]		
		M_1	M_2	M_3
6	9	1.3	1.4	1.3
10	15	2.6	2.9	2.6
15	35	8.6	8.9	8.6
20	60	17	18	17
25	104	30	35	30
32	195	67	82	67
40	244	96	124	96

The table above indicates the maximum performance of the guide, but does not show the actual allowable work load mass. Refer to Graphs (8) to (10) for correct allowable mass by piston speed.

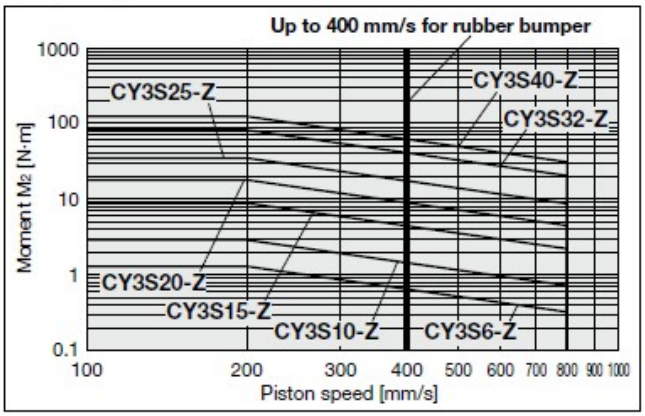
[Graph 8] Allowable load mass on guides **m**



[Graph 9] Allowable moment **M_1, M_3**



[Graph 10] Allowable moment **M_2**



3 –③ Consideration of guide load factor

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

Whether the cylinder is suitable or not is decided by the allowable load mass on guides in the graphs.
The selection calculation is shown below.

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

* i)·ii) is calculated with Va (average speed) and iii) is calculated with V (collision speed V = 1.4Va).
Calculate m_{max} of i) from the allowable load mass on guides in Graph (8),
and calculate Mmax of ii) and iii) from the allowable moment (M_1, M_2, M_3) in Graphs (9) and (10).

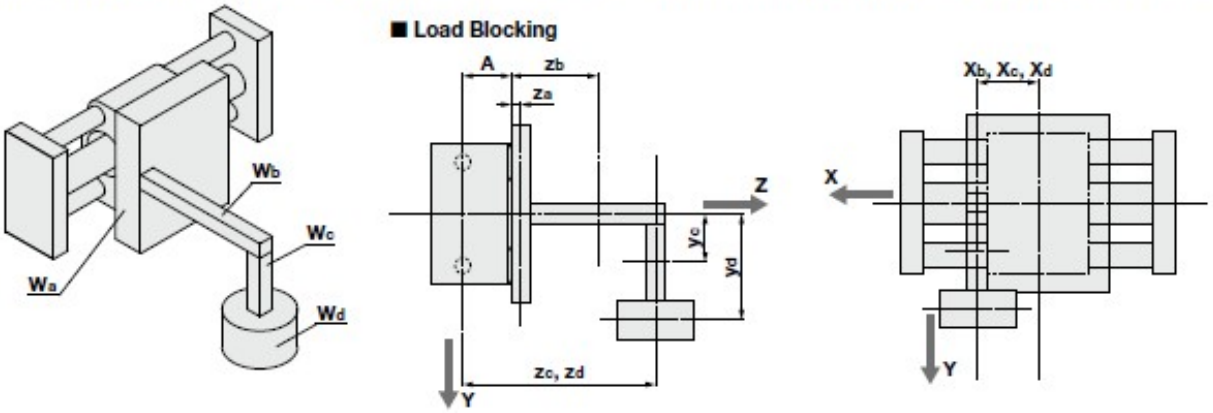
Sum of guide load factors

$$\Sigma\alpha = \frac{\text{Load mass (m)}}{\text{Allowable load mass on guides } (m_{max})} + \frac{\text{Static moment (M)}^{*1}}{\text{Allowable static moment } (M_{max})} + \frac{\text{Dynamic moment } (M_E)^{*2}}{\text{Allowable dynamic moment } (M_{Emax})} \leq 1$$

*1 Moment caused by the load etc., with cylinder in resting condition
*2 Moment caused by the load equivalent to impact at the stroke end (at the time of impact with stopper)
* Several moments might be generated depending on the cylinder mounting orientation or the load center of gravity, so the sum of the allowable load mass on guides, allowable static moment and allowable dynamic moment will be the sum of all these guide load factors.

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

When several loads are mounted on the cylinder, it is difficult to calculate the center of gravity.
As shown in the figure below, the center of gravity of the load is calculated from the total load mass and of center of gravity for all the loads.



Mass and center of gravity of the load

Load no. W_n	Mass m_n	Center of gravity		
		X-axis x_n	Y-axis y_n	Z-axis z_n
Wa	m_a	x_a	y_a	z_a
Wb	m_b	x_b	y_b	z_b
Wc	m_c	x_c	y_c	z_c
Wd	m_d	x_d	y_d	z_d

■ Calculation for Overall Center of Gravity

$$m_t = \Sigma m_n \quad \ldots①$$

$$X = \frac{1}{m_t} \times \Sigma (m_n \times x_n) \quad \ldots②$$

$$Y = \frac{1}{m_t} \times \Sigma (m_n \times y_n) \quad \ldots③$$

$$Z = \frac{1}{m_t} \times \Sigma \{m_n \times (A + z_n)\} \quad \ldots④$$

(n = a, b, c, d)

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

Refer pages 16 to 19 for detailed selection procedures.

Calculation of Guide Load Factor

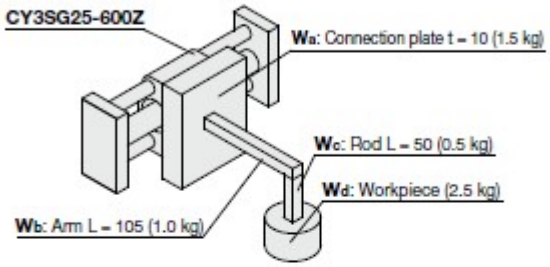
The selection calculation finds the load factors (αn) of the items below, where the total does not exceed 1.

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

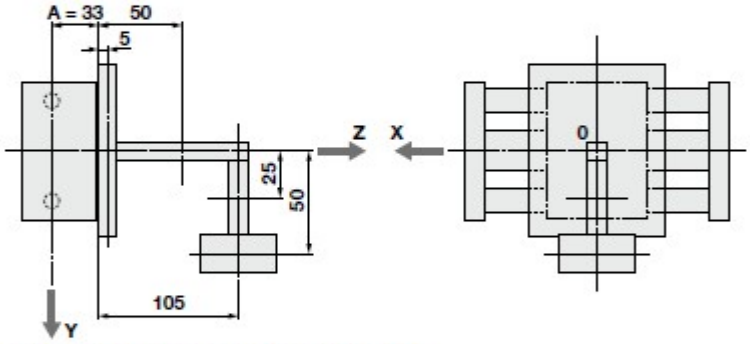
Calculation example 1 Mounting on horizontal wall

[1] Operating Conditions

Cylinder: **CY3SG25-600Z**
Cushion: Shock absorber
Mounting: Horizontal wall mounting
Speed: Va = 250 [mm/s]



[2] Load Blocking



Mass and center of gravity of the load

Load no. W_n	Mass m_n	Center of gravity		
		X-axis x_n	Y-axis y_n	Z-axis z_n
Wa	1.5 kg	0 mm	0 mm	5 mm
Wb	1.0 kg	0 mm	0 mm	50 mm
Wc	0.5 kg	0 mm	25 mm	105 mm
Wd	2.5 kg	0 mm	50 mm	105 mm

n = a, b, c, d

[3] Calculation for Overall Center of Gravity

$$m_t = \Sigma m_n$$
$$= 1.5 + 1.0 + 0.5 + 2.5$$
$$= 5.5 \text{ kg}$$
$$X = 0 \text{ mm}$$

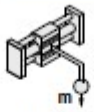
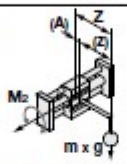
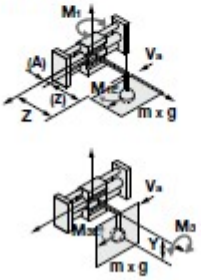
(The center of gravity in the x direction of all workpieces is 0, so X = 0 mm.)

$$Y = \frac{1}{m_t} \times \Sigma (m_n \times y_n)$$
$$= \frac{1}{5.5} \times (1.5 \times 0 + 1.0 \times 0 + 0.5 \times 25 + 2.5 \times 50)$$
$$= 25 \text{ mm}$$
$$Z = \frac{1}{m_t} \times \Sigma \{m_n \times (A + z_n)\}$$
$$= \frac{1}{5.5} \times \{1.5 \times (33 + 5) + 1.0 \times (33 + 50) + 0.5 \times (33 + 105) + 2.5 \times (33 + 105)\}$$
$$= 100 \text{ mm}$$

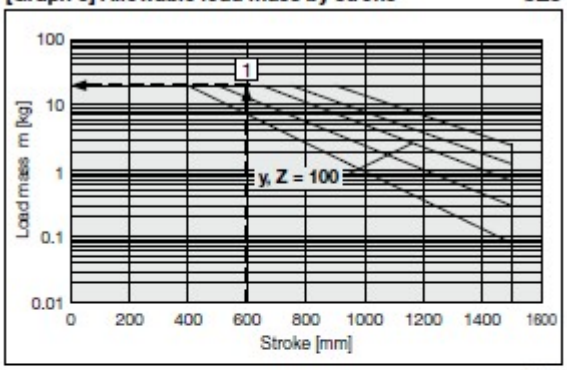
[4] Check the allowable load.

Item	Result	Note
(1) Check allowable load mass by thrust.	Work load is 5.5 kg < 20 kg. OK	Check allowable load by thrust. The bore size is ø25, so the allowable load by thrust will be 20 kg.
(2) Allowable load by stroke	Work load is 5.5 kg < 20 kg. OK	The load is restricted to 20 kg when the stroke is 600 mm and Z = 100 mm taken from Graph (5) 1 (Refer to page 12).

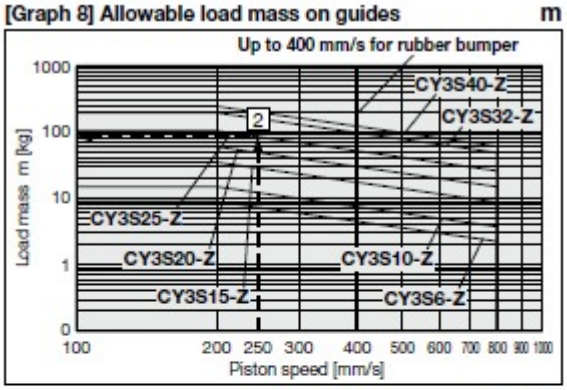
[5] Judgement of Guide Load Factor

Item	Load factor αn	Note
1 Load mass 	$\alpha_1 = m/m_{max}$ $= 5.5/83.2$ $= 0.07$	Examine m. Find the value of m_{max} when Va = 250 mm/s from Graph (8) 2.
2 Static moment 	$M_2 = m \times g \times Z$ $= 5.5 \times 9.8 \times 100/1000$ $= 5.4$ [N·m] $\alpha_2 = M_2/M_{2max}$ $= 5.4/28.0$ $= 0.19$	Examine M_2. M_1, M_3 values do not apply to this example. Refer to [3] Calculation for Overall Center of Gravity in the Z-axis. Find the value M_{2max} when Va = 250 mm/s from Graph (10) 3.
3 Dynamic moment 	$F_E = 1.4 \times Va \times m \times g \times \delta$ $= 1.4 \times 250 \times 5.5 \times 9.8 \times 1/100$ $= 188.7$ [N] $M_{1E} = 1/3 \times F_E \times Z$ $= 1/3 \times 188.7 \times 100/1000$ $= 6.3$ [N·m] $\alpha_{3A} = M_{1E}/M_{1max}$ $= 6.3/17.1$ $= 0.37$	Calculate for the impact load. Since the impact is absorbed by shock absorber, the bumper coefficient $\delta = 1/100$ Examine M_{1E}. Calculate the collision speed V. $V = 1.4 \times Va$ $V = 1.4 \times 250$ $V = 350$ mm/s Find the value M_{1Emax} when Va = 350 mm/s from Graph (9) 4.
	$M_{3E} = 1/3 \times F_E \times Y$ $= 1/3 \times 188.7 \times 25/1000$ $= 1.6$ [N·m] $\alpha_{3B} = M_{3E}/M_{3max}$ $= 1.6/17.1$ $= 0.09$	Examine M_{3E}. Refer to [3] Calculation for Overall Center of Gravity in the Y-axis. From the results above, Find the value M_{3Emax} when Va = 350 mm/s from Graph (9) 5.
4 Judgement	$\Sigma\alpha n = \alpha_1 + \alpha_2 + \alpha_{3A} + \alpha_{3B}$ $= 0.07 + 0.19 + 0.37 + 0.09$ $= 0.72$	$\Sigma\alpha n = 0.72 \leq 1$, so the cylinder can be used.

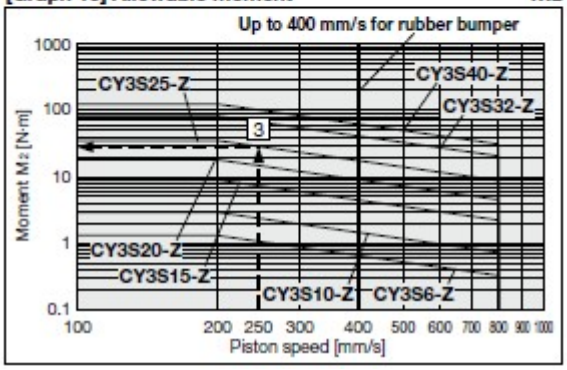
[Graph 5] Allowable load mass by stroke ø25



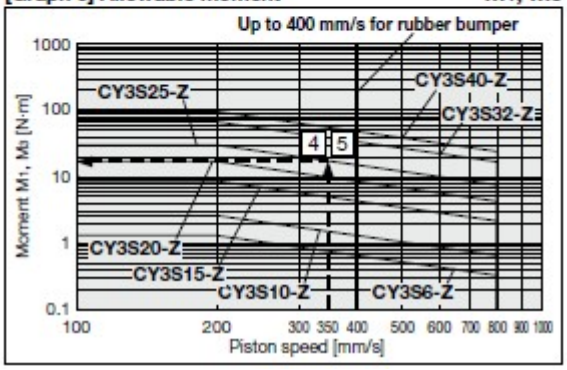
[Graph 8] Allowable load mass on guides m



[Graph 10] Allowable moment M_2



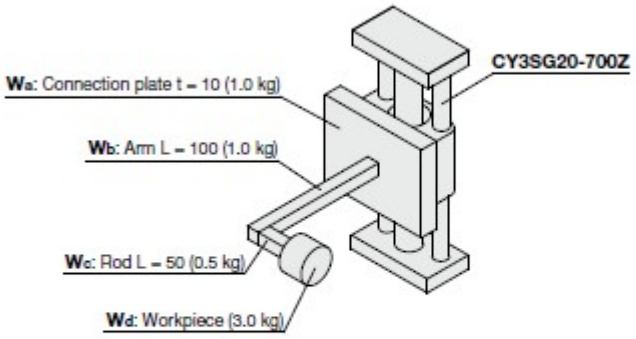
[Graph 9] Allowable moment M_1, M_3



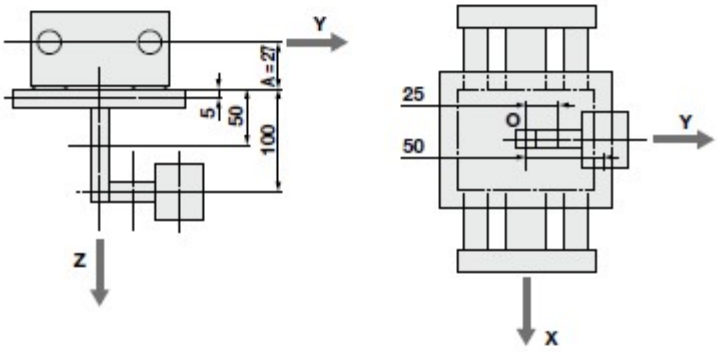
Calculation example 2 Vertical mounting

[1] Operating Conditions

Cylinder: **CY3SG20-700Z**
Cushion: Shock absorber
Mounting: Vertical mounting
Speed: Va = 200 [mm/s]



[2] Load Blocking



Mass and center of gravity of the load

Load no. W_n	Mass m_n	Center of gravity		
		X-axis x_n	Y-axis y_n	Z-axis z_n
W_a	1.0 kg	0 mm	0 mm	5 mm
W_b	1.0 kg	0 mm	0 mm	50 mm
W_c	0.5 kg	0 mm	25 mm	100 mm
W_d	3.0 kg	0 mm	50 mm	100 mm

n = a, b, c, d

[3] Calculation for Overall Center of Gravity

$$m_t = \Sigma m_n$$
$$= 1.0 + 1.0 + 0.5 + 3.0$$
$$= 5.5 \text{ kg}$$
$$X = 0 \text{ mm}$$

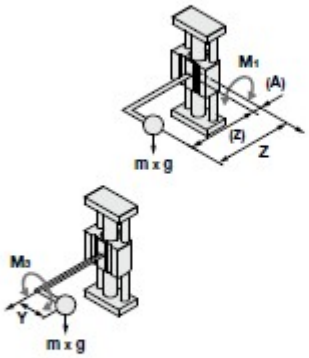
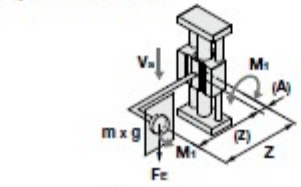
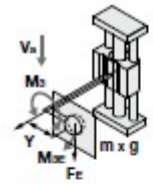
(The center of gravity in the x direction of all workpieces is 0, so X = 0 mm.)

$$Y = \frac{1}{m_t} \times \Sigma (m_n \times y_n)$$
$$= \frac{1}{5.5} \times (1.0 \times 0 + 1.0 \times 0 + 0.5 \times 25 + 3.0 \times 50)$$
$$= 30 \text{ mm}$$
$$Z = \frac{1}{m_t} \times \Sigma \{m_n \times (A + z_n)\}$$
$$= \frac{1}{5.5} \times \{1.0 \times (27 + 5) + 1.0 \times (27 + 50) + 0.5 \times (27 + 100) + 3.0 \times (27 + 100)\}$$
$$= 101 \text{ mm}$$

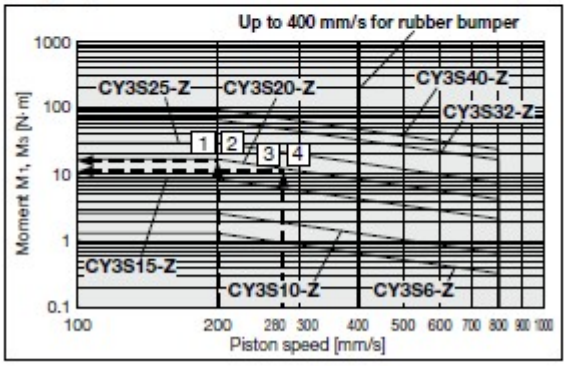
[4] Check the allowable load.

Item	Result	Note
(1) Check allowable load mass by thrust.	Work load is 5.5 kg < 11 kg. OK	Check the allowable load for vertical mounting. The bore size is ø20, so the maximum load for vertical mounting will be 11 kg.
(2) Allowable load by stroke	No restriction	The cylinder is mounted in the vertical direction, and the load generates no rolling moment, so there is not restriction.

[5] Judgement of Guide Load Factor

Item	Load factor αn	Note
1 Load mass	$\alpha_1 = 0$	In case of vertical mounting, no static load is applied.
2 Static moment 	$M_1 = m \times g \times Z$ $= 5.5 \times 9.8 \times 101/1000$ $= 5.4$ [N·m] $\alpha_{2A} = M_1/M_{1max}$ $= 5.4/17.0$ $= 0.32$	Examine M_1. Refer to [3] Calculation for Overall Center of Gravity in the Z-axis. Find the value of M_{1max} when Va = 200 mm/s from Graph (9) 1.
	$M_3 = m \times g \times Y$ $= 5.5 \times 9.8 \times 30/1000$ $= 1.6$ [N·m] $\alpha_{2B} = M_3/M_{3max}$ $= 1.6/17.0$ $= 0.10$	Examine M_3. Refer to [3] Calculation for Overall Center of Gravity in the Y-axis. Find the value of M_{3max} when Va = 200 mm/s from Graph (9) 2. M_2 value does not apply to this example.
3 Dynamic moment  	$F_E = 1.4 \times Va \times m \times g \times \delta$ $= 1.4 \times 200 \times 5.5 \times 9.8 \times 1/100$ $= 150.9$ [N] $M_{1E} = 1/3 \times F_E \times Z$ $= 1/3 \times 150.9 \times 101/1000$ $= 5.1$ [N·m] $\alpha_{3A} = M_{1E}/M_{1max}$ $= 5.1/12.1$ $= 0.42$	Calculate the impact load. Since the impact is absorbed by shock absorber, the bumper coefficient $\delta = 1/100$ Examine M_{1E}. Calculate the collision speed V. $V = 1.4 \times Va$ $V = 1.4 \times 200$ $V = 280$ mm/s Find the value of M_{1Emax} when Va = 280 mm/s from Graph (9) 3.
	$M_{3E} = 1/3 \times F_E \times Y$ $= 1/3 \times 150.9 \times 30/1000$ $= 1.5$ [N·m] $\alpha_{3B} = M_{3E}/M_{3max}$ $= 1.5/12.1$ $= 0.12$	Examine M_{3E}. From the results above, Find the value of M_{3Emax} when Va = 280 mm/s from Graph (9) 4.
4 Judgement	$\Sigma\alpha_n = \alpha_1 + \alpha_{2A} + \alpha_{2B} + \alpha_{3A} + \alpha_{3B}$ $= 0 + 0.32 + 0.10 + 0.42 + 0.12$ $= 0.96$	$\Sigma\alpha_n = 0.96 \leq 1$, so the cylinder can be used.

[Graph 9] Allowable moment **M1, M3**



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

5. Vertical operation and intermediate stop

5-1) Vertical operation

When operating, it should be operated within limits of the allowable load mass and maximum operating pressures as shown in table 9.

Operating the cylinder above the specified values may lead to the load dropping.

If an accurate stopping position is required, consider using a metal-ended external stopper.

Table 9 Allowable load weight and pressure for vertical operation

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

5-2) Intermediate stop

Fine stroke adjustment is considered as an intermediate stop, so the considerations for an intermediate stop must be observed.

Consider the following points.

Table 10 Allowable pressure for intermediate stops with an external stopper

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

① **<u>Stop the slide block using the external stopper</u>**

When stopping a load in mid-stroke using an external stopper, adjustment bolt or bumper bolt, operate within the operating pressure limits shown in the table 10. Use caution, as operating the cylinder above these pressures may lead to the breaking of the magnetic coupling.

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

Table 11 Allowable kinetic energy for stopping at the piston side

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

② **<u>When stopping the internal slider with a pneumatic circuit</u>**

When an intermediate stop is performed with a pneumatic circuit with a 3-position solenoid valve, the kinetic energy should be equal to or less than the values in the table 11.

（Piston speed has to be less than the allowable value）

6. Stopper

6-1) Stroke setting

With bumper bolt

Loosen the hexagon nut, and move the bumper bolt to the set stroke end position with a hexagon wrench or by hand. Tighten the hexagon nut to the torque values shown in the table 12.

With shock absorber

The cylinder stroke is controlled by the position of the adjustment bolt.

Parallel pins of similar size to the rod diameter of the shock absorber are mounted on the slide block, these pins collide with the adjustment bolt and shock absorber. Therefore, the stopper of the shock absorber should not come into contact with the slide block directly. Mount the shock absorber stopper approximately 0.2mm shorter than the adjustment bolt.

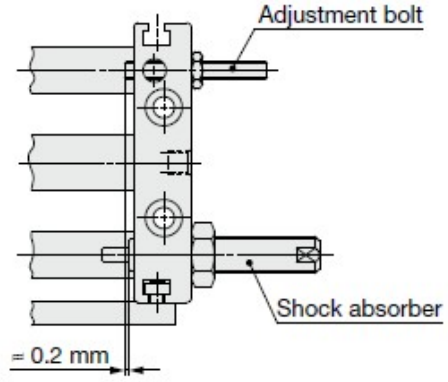


Fig. 9 Stopper

Table 12. Stopper tightening torque

Bore size [mm]	Nut for bumper bolt		Nut for shock absorber		Nut for adjustment bolt	
	Thread size	Tightening torque [N·m]	Thread size	Tightening torque [N·m]	Thread size	Tightening torque [N·m]
6	M6 x 0.75	5.2	M6 x 0.75	0.85	M4 x 0.7	1.5
10	M8 x 1	12.5	M8 x 1	1.67		
15						
20	M10 x 1	24.5	M10 x 1	3.14	M6 x 1	5.2
25	M14 x 1.5	68.0	M14 x 1.5	10.80		
32	M20 x 1.5	204.0	M20 x 1.5	23.50	M8 x 1.25	12.5
40						

6-2) Caution when replacing shock absorber

A Cylinder with shock absorber has an adjuster bolt for adjusting the stopping position of the cylinder stroke. Do not change the adjustment bolt position when replacing the shock absorber without changing the stopping position of the cylinder stroke.

7. Air supply

7-1) Install an air filter.

The cylinder is lubrication free. Install an air filter upstream of the valve and use the air pressure set at the specified pressure with a pressure reducing valve.

7-2) Lubrication to compressed air

Please check our website for the brands of each company's class 1 turbine oil (with no additives) and class 2 (with additives).

7-3) Use of air with low dew point

If low dew point air is used as the fluid, the reliability (life) of the equipment may be affected due to deterioration of the lubrication properties inside the equipment.

Please consider using low dew point compatible products such as the 25A-series.

8. Other precautions

8-1) Handling precautions

1. Do not put your hand in the cylinder while it is operating.

Do not put your hand inside the cylinder during operation.
There is a risk of injury from being caught in the cylinder.

2. To the cylinder, do not apply a load above the allowable value.

Load exceeding allowable value may cause operation failure.

3. Avoid using the product in an environment where water, cutting fluid, or other liquids are splashed, or where water vapor, sticky foreign matter, or dust exists. The lubricity of the sliding parts of the cylinder will deteriorate.

4. When applying grease to the cylinder, use the same grease as that applied on the product.

For the product number of the grease pack, refer to “3. Replacement parts (seal kits)” on page 14.

8-2) Precautions to observe during mounting

1. Be careful not to dent or damage the external surface of the cylinder tube.

Failure to follow this precaution may lead to damage of lube-retainer and wear ring, possibly causing an operation failure.

2. Do not use the cylinder with the magnetic coupling detached.

If the operation of the cylinder is continued with the magnetic coupling detached, the piston slider may be broken.Be sure to return the cylinder to the normal condition before operating it.It is possible to return the cylinder to the correct position by strongly pushing the external slider by hand at the stroke end (or pressing the piston slider by means of pneumatics pressure).

3. When mounting, be sure to thoroughly flush the connecting piping and pay attention not to allow dust, chips, or foreign matter to enter the cylinder.

Otherwise, operation failure may occur.

9. Maintenance

⚠ Warning

Instruction 1) Follow the steps below to perform maintenance.
Incorrect handling can cause damage to equipment and device, and operation failure.

Instruction 2) When removing equipment or removing compressed air supply/exhaust components, first confirm that measures such as drop prevention and safe lock out of the driven object are in place. Then, cut off the air supply and power supply to the equipment, and discharge all compressed air from the system. Before restarting the equipment, confirm that measures are taken to prevent sudden action.

9-1) Inspection

9-1-1) Daily inspection

1) Smoothness of the operation
2) Changes in piston speed and cycle time
3) Smooth movement of the entire stroke

9-1-2) Regular inspection (about once a month)

1) Looseness of cylinder mounting bolts, workpiece mounting bolts, etc.
2) Smooth operation
3) Changes in the piston speed and cycle time
4) Smooth movement of the entire stroke
5) Blow-by of the air
6) Any abnormalities such as scratches or damages to the cylinder
7) No accumulation of drain in the air filter or piping
8) Increase in the play of the external slider

When any abnormality in the cylinder was observed through the inspection above, take necessary countermeasures referring to section 9-2) Troubleshooting (Quick Reference).

9-1-3) Grease lubrication (about once a month)

Regular application (once a month) of grease to the bearing, sliding parts, and the guide (when with a guide) are recommended for extending the life.

9-2) Troubleshooting (Quick Reference: For all series)

* Refer to the seal replacement procedure or other references when disassembling the cylinder. Any scratch on the seal during disassembling may cause an air leak or other abnormalities. Disassembling will void the product's warranty. The repair work can be handled at the SMC factory when it is difficult to be handled by the customer.

Reported failure	Possible causes	Countermeasures
・Operation is not smooth ・The speed or cycle is delaying ・Does not operate	1) The cylinder axis and workpiece (external guide) are misaligned. [CY3B/CY3R]	・Align the cylinder to allow operation of the cylinder with appropriate minimum operating pressure through the whole stroke. ・Provide clearance at the connection part between the cylinder and the external guide.
	2) Operation with the minimum operating speed or less [All series]	・Operate with a speed at the minimum operating speed or more. ・When necessary to operate at a speed less than the minimum operating speed, consider using the low-speed specification model (XB13/XB9).
	3) The configuration of the pneumatic circuit is not appropriate [All series]	・Use appropriate piping tube, fitting, directional control valve, speed controller, etc.
	4) Insufficient grease due to life or environmental factor [All series]	・Lubricate grease. In general, it is recommended to lubricate once a month. Application section: [All series] Cylinder tube surface [CY1S/CY3S/CY1L] Guide rod surface [CY1H/CY1F] Linear guide rail surface
	5) Grease discharge due to exposure to splashing water or cutting liquid, exposure to moisture, immersion in water, etc.[All series] 6) Evaporation of grease due to exposure to high-temperature air or air flow [All series]	・Install a protective cover to protect the cylinder. ・Lubricate grease on the tube and guide. ・Consider using the non-lubricant exterior specification (X210/X324).
	7) Loosing or solidification of grease due to adhesion of minute powder like paper powder, lint, or flour. 8) Foreign matter caught at the sliding part [All series]	・Install a protective cover to protect the cylinder. ・Consider using the non-lubricant exterior specification (X210/X324). ・Consider installing a coil scraper (special product).
	9) Discharge of grease inside the tube due to drain in air pressure. [All series]	・Remove the drain with an appropriate filter.
	10) Change from air for lubrication to air for no lubrication [All series]	・Continue using air for lubrication because the initially applied grease is flowing out.
	11) Insufficient air pressure [All series]	・Supply appropriate pressure. ・Take necessary countermeasures if any of the following applies. (1) Decrease of source pressure (including insufficient flow rate) (2) Incorrect setting of the regulator (3) Clogging, disconnection, bending, etc. of the piping

Reported failure	Possible causes	Countermeasures
・Operation is not smooth ・The speed or cycle is delaying ・Does not operate	12) Insufficient cylinder output [All series]	・Increase the pressure or change to a larger bore size. Select to obtain a sufficient load factor (about 50%) taking the resistance of the cylinder and peripheral devices into consideration.
	13) Failure of equipment other than the cylinder [All series]	・Investigate system components in concern one by one. ・Take necessary countermeasures if any of the following applies. (1) Failure of the directional control valve (2) Insufficient adjustment or malfunction of the speed controller (3) Clogging, disconnection, or bending of the piping (4) Clogging, etc. of the filter
	14) Operation above maximum operating speed【XB6】	・The maximum operating speed varies depending on the ambient temperature. Please use within the operating speed range that corresponds to the ambient temperature.
	15) Mounting surface parallelism is not met. 【CY1S/CY3S/CY1L】	・Keep the flatness of the cylinder mounting surface to 0.2mm or less. ・ Install the cylinder so that it operates smoothly at the appropriate minimum operating pressure over its full stroke.
・Abnormal stroke	1) Jamming of foreign matter [All series]	・Remove any foreign matter caught in the sliding portion of the slider. ・ Install a protective cover to prevent foreign matter from coming into contact with the cylinder.
	2) Entry of foreign matter inside the cylinder [All series]	・Check if there is any foreign matter such as drain inside the cylinder. Remove foreign matter, if any.
	3) Detachment of the magnetic coupling [All series]	・Correct the magnetic coupling to the normal position. (See seal kit replacement procedure)
・Air leakage	1) Wear or damage of the seals [All series]	・When caused due to reaching its life period, replace the seal kit and lubricate the grease. ・Take necessary countermeasures and replace the seal kit if any of the following applies. (1) Application of a load or lateral load exceeding the allowable load →Load reduction, improvement in misalignment with the external guide, etc. (2) High-temperature environment exceeding the ambient temperature range→Decrease temperature to be within the allowable temperature (3) Mixture of foreign matter entering inside the tube and damage in seal parts→ Remove foreign matter
・Decoupling of the magnetic coupling	1) High-pressure air is supplied to the cylinder (intermediate stop by external stopper) [All series]	・Adjust the air pressure to be within the allowable range.
	2) Pressure increase in the tube (application of excessive external force from the opposite direction of the operating direction) [All series]	・Do not push the external slider in the direction opposite to the pressurizing direction.
	3) Application of excessive kinetic energy (intermediate stop by pneumatic circuit) [All series]	・Keep kinetic energy within the allowable range.
	4) The magnetic force dropped because of the high-temperature environment around the cylinder [All series]	・Reduce the peripheral environment temperature to 60°C or less. ・Reduce the air pressure.
	5) The magnetic force dropped because of corrosion of the magnet or yoke [All series]	・Handle corrosion countermeasures (adoption of coating for preventing corrosion (special product).
	6) During maintenance,the magnetic holding force may decrease due to incorrect reassembly 【All series】	・Refer to the separate seel kit replacement instructions when reassembling.Make sure that the valve operates to the stroke end on both sides.
・ Theae is a loud noise at the end of the stroke.	1) Magnetic coupling release 【All series】	Correct the magnetic coupling to the correct position. (See the separate seel kit replacement instructions.)
The parts are damaged. (1) Damage in the external slider yoke (2) Damage to the piston slider (3) Damage in the plate on the stroke end (4) Scratches on cylinder tube or guide shaft	1) Operation at high speed [X160]	・Make sure to install a shock-absorbing device on the stroke end.
	2) Excessive impact at the stroke end [All series]	・Make sure to install a shock-absorbing device on the stroke end.
	3) Overload or excessive moment [All series]	・Adjust the load weight and moment to be within the allowable range.
	4) Separation of magnetic coupling (When stopped at the intermediate stop position by an external stopper) [All series]	・However, adjust the magnetic coupling to the normal position. (See seal kit replacement procedure)
	5) Contact of the yoke to the tube during operation due to excessive wear of the wear ring [All series]	・Cylinder replacement is recommended.
・Increase in play of the external slider	1) Worn wear ring [All series]	・When excessive wear is observed, take countermeasures against the root cause (excessive external force, insufficient lubrication by external factors, etc.). ・Replace the seal kit.
	2) Worn bushing [CY1S]	・When excessive wear is observed, take countermeasures against the root cause (excessive external force, insufficient lubrication by external factors, etc.). ・Request for repair at SMC factory.
	3) Worn or damaged ball bushing [CY1L]	
	4) Loose tightening bolt of the slide table and linear guide or other loose tightening bolts [CY1H/CY1F]	・Change the load weight and moment to be within the allowable range. ・Re-tighten the bolt.

*) Consider replacing the cylinder when excessive scratches or excessive damaged conditions are observed.

10. Cautions for disassembly and maintenance

⚠ Warning

① **The attraction force of the magnet is very strong.**

Be careful so that your hand is not caught when removing the external and piston slider from the cylinder tube during maintenance.

The external slider and the piston slider may be attracted to each other by magnetic force.

Use caution when handling.

⚠ Caution

① **Refer to the maintenance procedure for the replacement of the seals.**

② **Disengage the magnetic attraction of the internal and external slider when removing the sliders from the cylinder tube.**

Dislocate the magnetic position of the magnet coupling between the internal and external slider before removing the external slider or piston slider separately from the cylinder tube.

If the internal and external slider are removed from the cylinder tube while they are attracted to each other, they will be attracted directly and become impossible to separate.

③ **If the slider is disassembled for maintenance, do not disassemble the magnet.**

As the holding force of the magnet will decrease or result in operational failure.

④ **The set screws in the Fig.10 below are for securing the guide shaft, so do not loosen them except for the purposes of replacing the seals.**

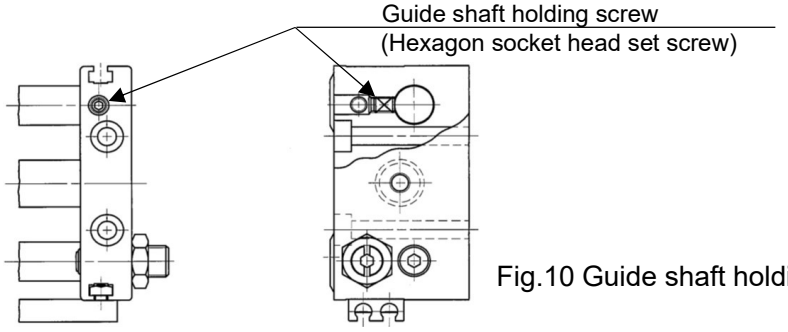


Fig.10 Guide shaft holding screws

⑤ **Make sure the external slider is in the correct direction.**

The inner outer sliders of φ10 to φ40 have a specific assembly direction. When disassembling and reassembling, please refer to Fig.11-1 and 11-2 and assemble in the correct direction (φ6 does not have a specific direction).

If assembled incorrectly, remove and rotate the piston slider by 180°, then re-insert into the correct the position. If the direction is not correct, it will be impossible to obtain the specified holding force.

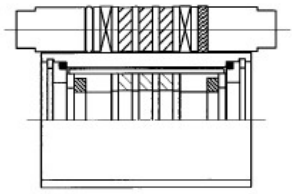


Fig. 11-1 Correct position

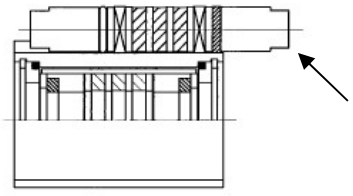
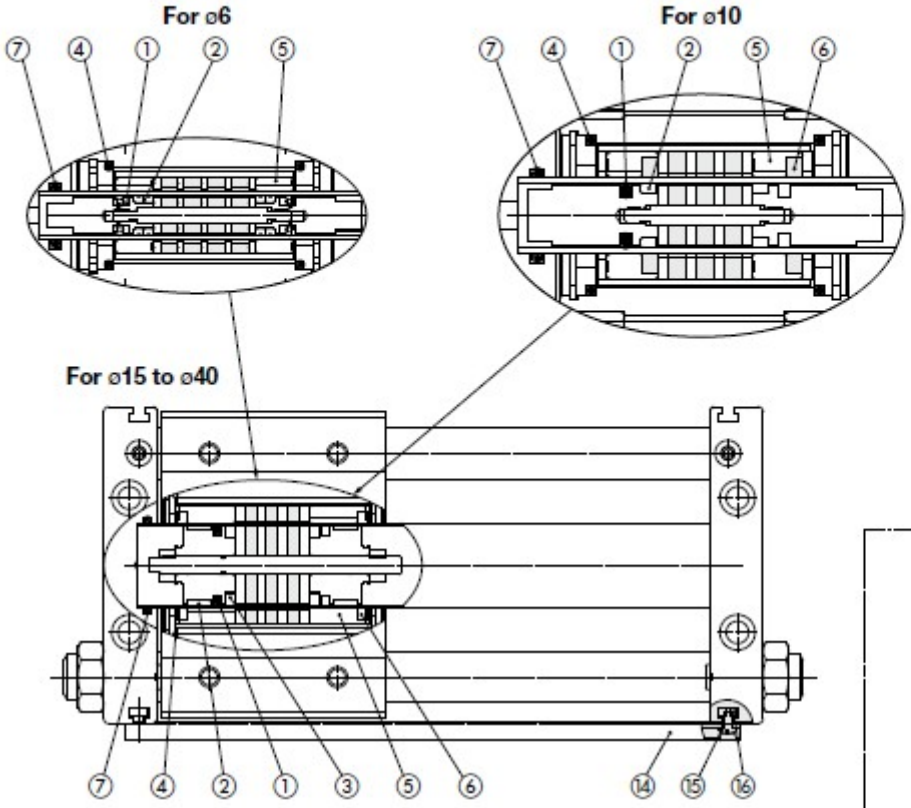
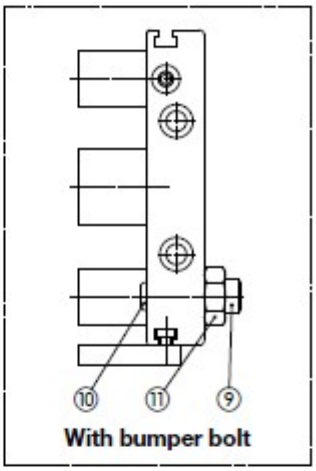


Fig. 11-2 Incorrect position

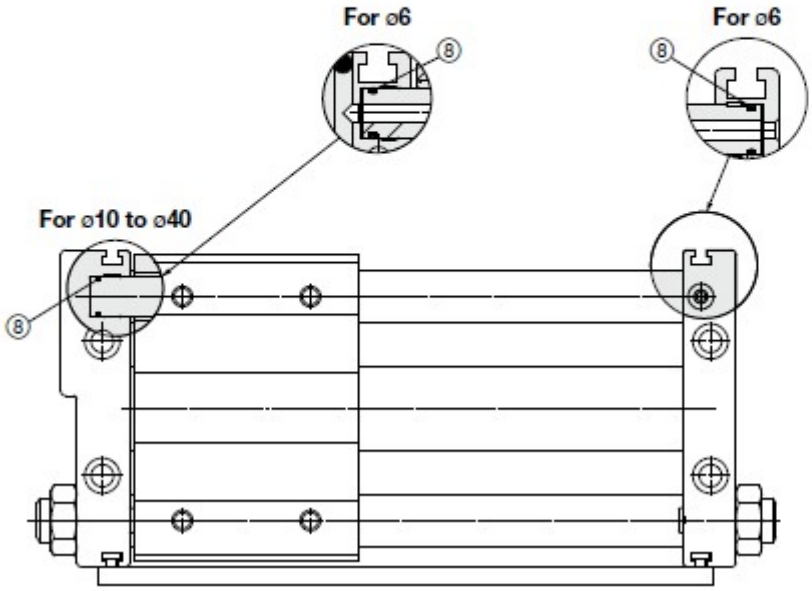
Construction

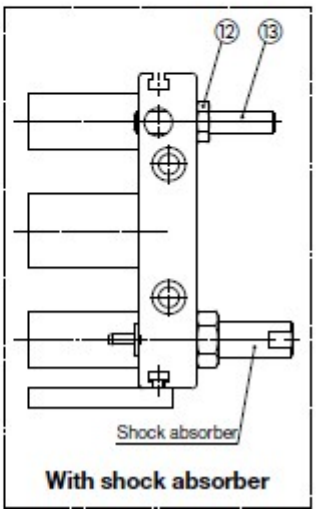
CY3S / Bilateral piping type





CY3SG / Centralized piping type





Component Parts

No.	Description
1	Piston seal
2	Wear ring A
3	Lube-retainer A
4	Slider gasket
5	Wear ring B
6	Lube-retainer B
7	Cylinder tube gasket
8	Guide shaft gasket
9	Bumper bolt
10	Bumper
11	Hexagon nut
12	Hexagon nut
13	Adjustment bolt
14	Switch rail
15	Cross recessed round head screw
16	Square nut

Seal Kit

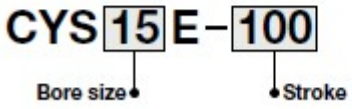
Bore size [mm]	Seal kit	
	Kit no.	Contents
6	CY3S6-Z-PS	Set of nos. 1, 2, 4, 5, 7, 8
10	CY3S10-Z-PS	Set of nos. 1, 4, 5, 6, 7, 8
15	CY3S15-Z-PS	Set of nos. 1 to 8
20	CY3S20-Z-PS	
25	CY3S25-Z-PS	
32	CY3S32-Z-PS	
40	CY3S40-Z-PS	

- The seal kit includes 1, 2, 4, 5, 7, and 8 for ø6, 1, 4, 5, 6, 7, and 8 for ø10, and 1 to 8 for ø15 to ø40. Order the seal kit based on each bore size.
- The seal kit includes a grease pack (10 g).
  Order with the following part number when only the grease pack is needed.
  Grease pack part number: GR-S-010

Replacement Parts

Bore size [mm]	Bumper bolt assembly		Adjustment bolt assembly	
	Kit no.	Contents	Kit no.	Contents
6	CYS06-37-AJ024-R	Set of nos. 9, 10, 11	CYS06-37AAJ024A-R	Set of nos. 12, 13
10	CYS10-37-AJ025-R		CYS10-37AAJ025A-R	
15				
20	CYS20-37-AJ027-R		CYS20-37AAJ027A-R	
25	CYS25-37-AJ028-R			
32	CYS32-37-AJ029-R		CYS32-37AAJ029A-R	
40				

Switch Rail Accessory Kit Nos.



Switch Rail Accessory Kit

Bore size [mm]	Switch rail accessory	Contents
6	CYS6E-□	Set of nos. 14, 15, 16
10	CYS10E-□	
15	CYS15E-□	
20	CYS20E-□	
25	CYS25E-□	
32	CYS32E-□	
40	CYS40E-□	

- □ indicates the stroke.
- CY1S-Z series switch rails cannot be mounted to CY3S-Z series products.

Revision history

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