CAT.ES20-158 A

SMC

Rodless Cylinder for Vacuum

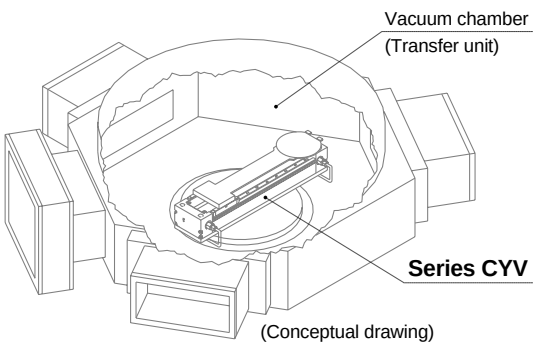
Series CYV

ø15, ø32

Air cylinder for transfer
in vacuum environments (1.3 x 10^{-4}Pa)

Simplifies and reduces the size of equipment

Since the cylinder can be installed inside a vacuum chamber, it contributes to simplifying and reducing the size of a transfer system.



Air cylinder for transfer

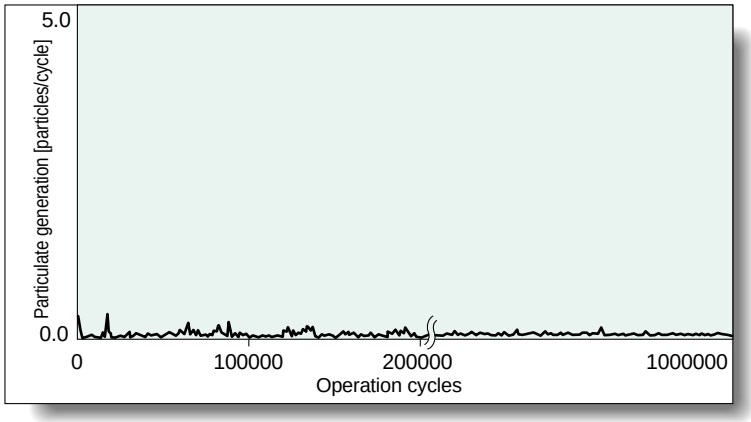
Rodless Cylinder for Vacuum

Series CYV

ø15, ø32

Low particulate generation

Average particle generation (particles >0.1 μ) is 0.1 particles/cycle. (Atmospheric conditions)



Note 1) This data indicates deterioration with age of the average number of particles per operation under the following test conditions.

<Test conditions>

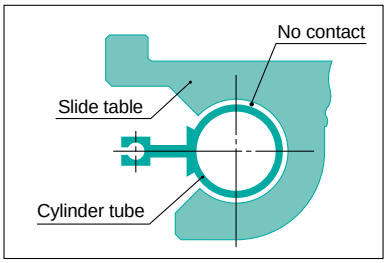
- **Cylinder:** CYV32-100
- **Work piece weight:** 5kg
- **Average speed:** 100mm/s
- **Measurement environment:** Operation in the atmosphere after baking at 150°C for 48 hours.

Note 2) This data is considered typical but not guaranteed.

Note 3) A particulate generation test has been conducted in a vacuum environment of 10^{-5}Pa.

Low particulate generation 1 Non-contact construction

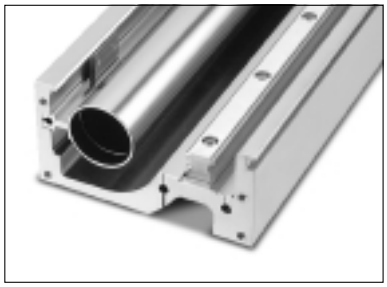
There is no particulate generation due to friction, since the construction does not allow contact between the cylinder tube's exterior surface and the slide table's internal surface.



Special cylinder tube

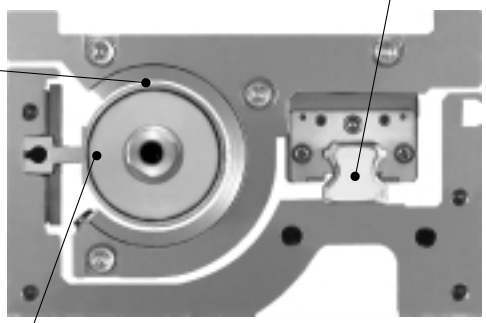
Long strokes (Max. 700mm)

A special cylinder tube using extruded aluminum material is employed.
No deflection or contact occurs even for long strokes, since the cylinder is rigidly attached to the base and the slide table is independently supported by a linear guide.



Low particulate generation 2 Stainless steel linear guide & low particulate generation vacuum grease

Particulate generation from the linear guide unit has been reduced with the use of a stainless steel linear guide and low particulate generating vacuum grease.

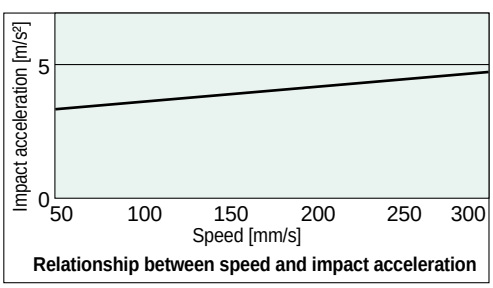


Low particulate generation 3 Reduced initial particulate generation

Cleaned, assembled, inspected and first-stage packaged in a clean environment.

Low particulate generation 4 Low particulate generation at the stroke ends

Particulate generation has been reduced at the stroke ends by reducing impact using a sine cushion and by stopping the stroke using an internal stopper.



Relationship between speed and impact acceleration

SMC

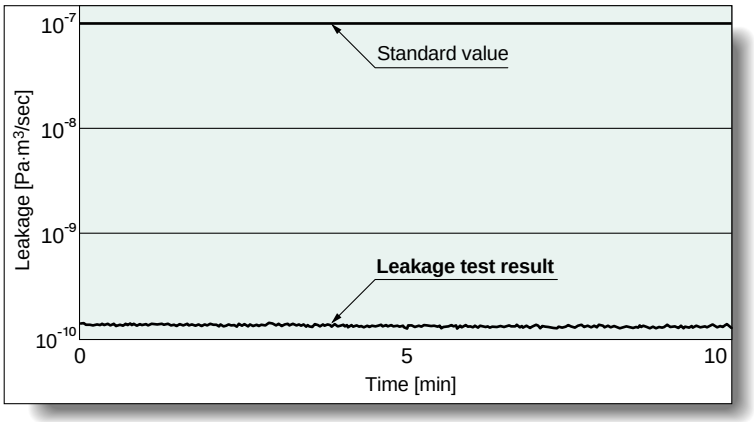
in vacuum environments (1.3×10^{-4}Pa)

Carefully designed for low particulate generation, low leakage, and low outgassing.

Low leakage

Leakage: 1.3×10^{-7} Pa·m³/sec or less

(at normal temperatures, excluding gas permeation)



Note 1) The data indicates the leakage measured in a vacuum environment of 10^{-5}Pa.

Note 2) The leakage test result shown is based on a test conducted for 10 minutes after the cylinder was pressurized with helium at 0.1 MPa.

Note 3) This data is considered typical but not guaranteed.

Low leakage 1

Employs a magnetically coupled rodless cylinder with no air leakage from moving parts.

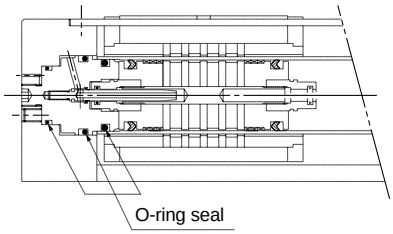
Low leakage 2

O-ring seals separate vacuum and atmosphere.

Static O-ring seals are used for all the seals between vacuum and atmosphere.

Note 1) The chart above shows the leakage test results based on a test conducted using this cylinder construction.

Note 2) To allow fine stroke adjustments, O-ring seals are installed to separate vacuum and atmosphere. Consult SMC if the sealing method needs to be altered.



Reduced outgassing

Reduced outgassing 1

Reduction of outgassing due to surface treatment

All the external parts (made of aluminum alloy) such as the body and slide table are electroless nickel plated.

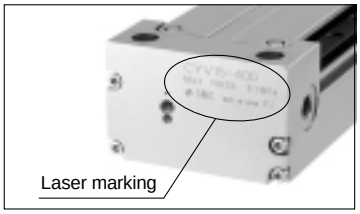
Furthermore, external magnets are coated with titanium nitride.

Note 1) Consult SMC if other specifications for surface treatment are required.

Reduced outgassing 2

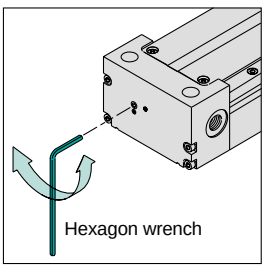
Resin materials eliminated

Laser marking is employed for the model designation.



Fine adjustments at the end of the stroke

Fine adjustments between –2 to 0mm can be made on one side (–4 to 0mm for both sides).



Rodless Cylinder for Vacuum

Series CYV

How to Order

CYV 15 — 200

- **CYV**: Rodless cylinder for vacuum
- **Bore size**

15	15mm
32	32mm

- **Standard stroke**

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

Specifications

Bore size (mm)	15	32
Operating environment pressure	Atmosphere to 1.3 x 10^{-4} Pa (ABS)	
Operating atmosphere	Air and inert gases	
Fluid	Air and inert gases	
Action	Double acting	
Proof pressure	0.5MPa	
Operating pressure range	0.05 to 0.3MPa	
Leakage	1.3 x 10^{-7}Pa·m³/sec or less (at normal temperatures, excluding gas permeation)	
Maximum baking temperature	150°C	
Ambient and fluid temperature	−10 to 60°C	
Piston speed	50 to 300mm/s	
Stroke adjustment	−2 to 0mm on each side (−4 to 0mm total)	
Cushion	Sine cushion (Air cushion)	
Port size	5/16-24UNF	7/16-20UNF
Lubrication	Vacuum grease for linear guide unit and inside the cylinder tube	

Weights

(kg)

Model	Standard stroke (mm)										
	100	150	200	250	300	350	400	450	500	600	700
CYV15	1.2	1.4	1.6	1.7	1.9	2.0	2.2	2.4	2.5	2.8	3.2
CYV32	4.2	4.6	5.0	5.5	5.9	6.3	6.7	7.1	7.5	8.3	9.1

Magnet Holding Force

Bore size (mm)	Magnet holding force (N)
15	59
32	268

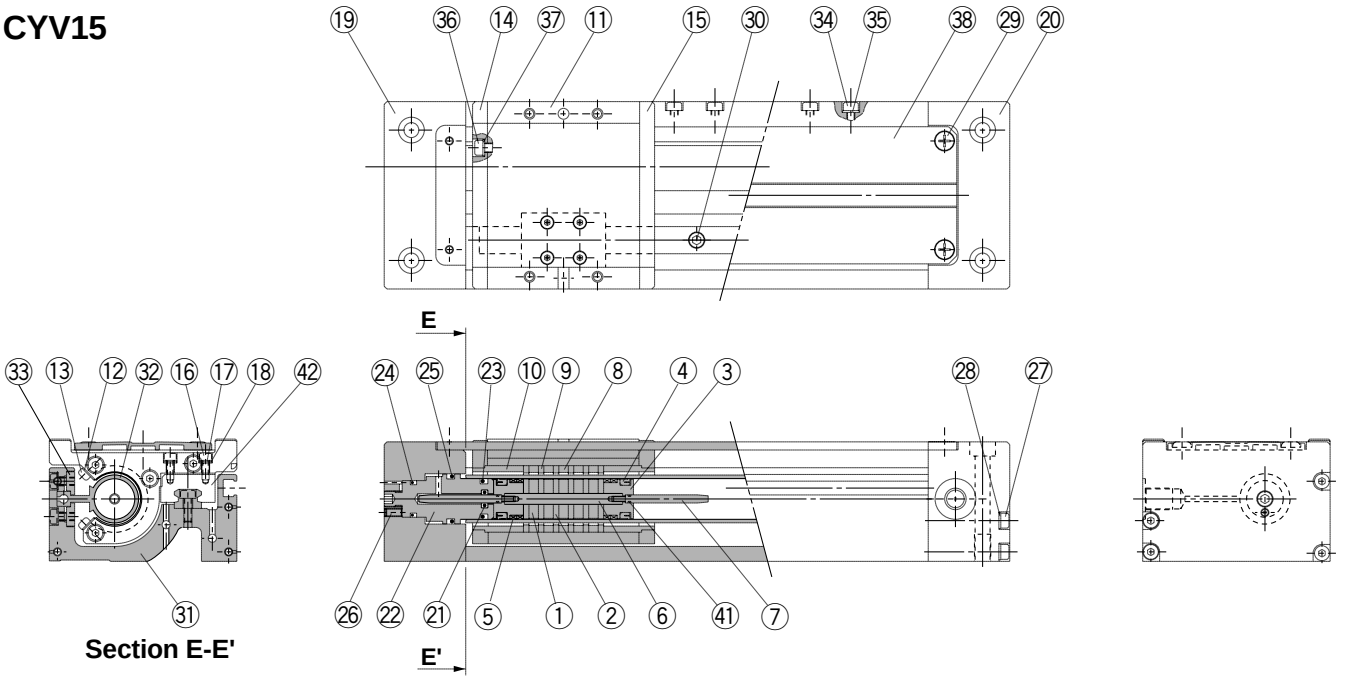
Theoretical Output

(N)

Bore size (mm)	Piston area (mm²)	Operating pressure (MPa)		
		0.1	0.2	0.3
15	176	18	35	53
32	804	80	161	241

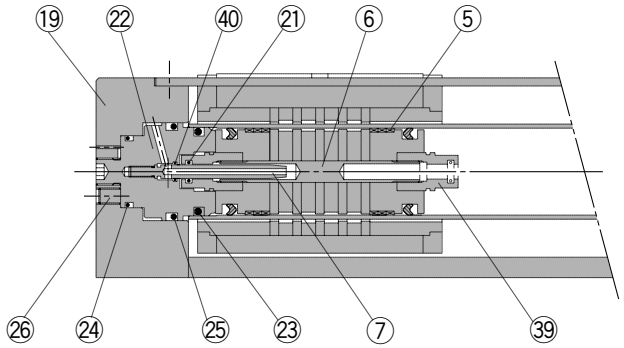
Construction

CYV15



Section E-E'

CYV32



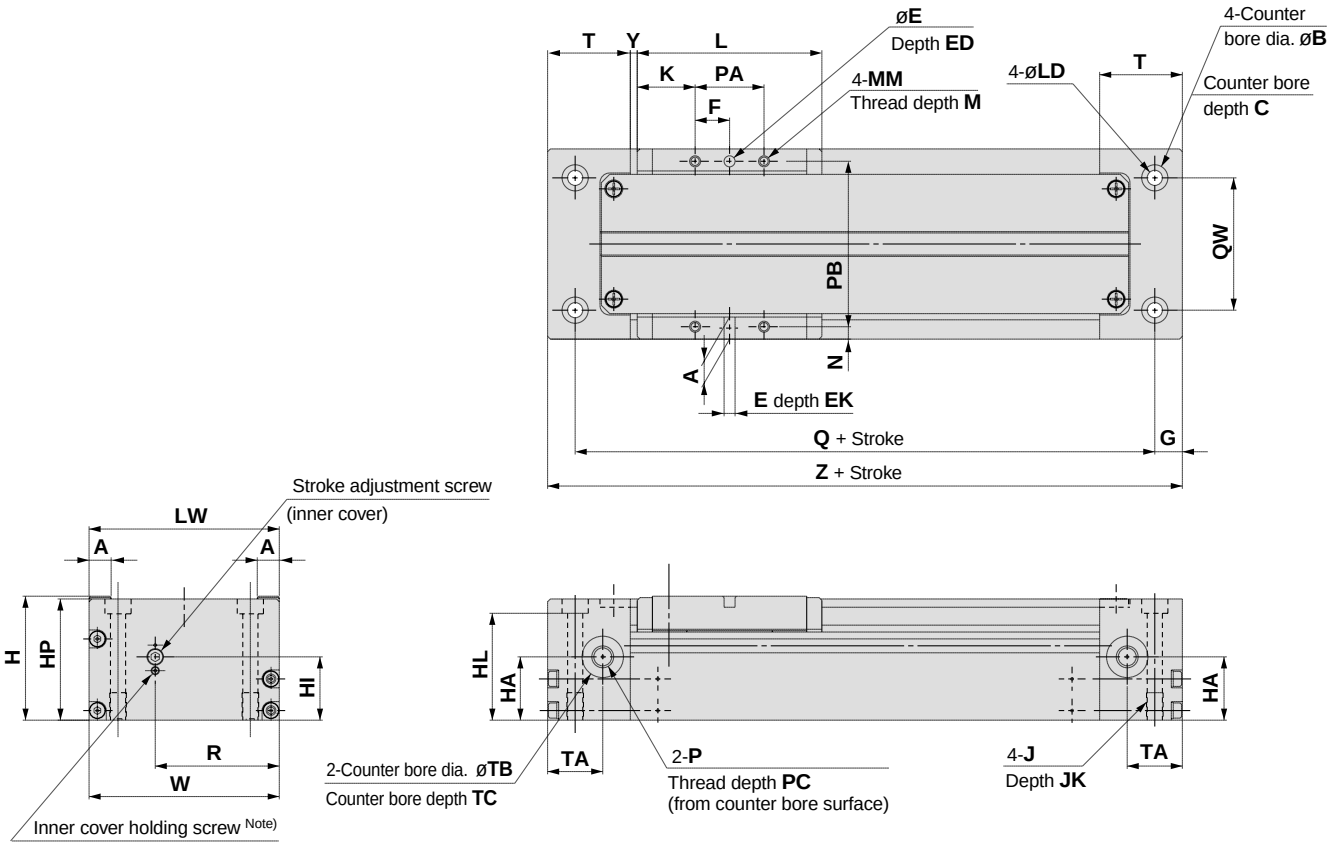
Parts list

No.	Description	Material	Note
1	Magnet A	Rare earth magnet	Aluminum chromated
2	Piston side yoke	Rolled steel plate	Zinc chromated
3	Piston	Brass/ Aluminum alloy	Electroless nickel plated/Chromated
4	Piston seal	Fluoro rubber	
5	Wear ring	Special bearing	
6	Shaft	Stainless steel	
7	Cushion ring	Stainless steel/Brass	—/Electroless nickel plated
8	Magnet B	Rare earth magnet	Titanium nitride coating
9	External slider side yoke	Rolled steel	Electroless nickel plated
10	Hold spacer	Aluminum alloy	Electroless nickel plated
11	Slide table	Aluminum alloy	Electroless nickel plated
12	Insertion guide plate	Stainless steel	
13	Round head Phillips screw	Stainless steel	
14	Side plate A	Aluminum alloy	Electroless nickel plated
15	Side plate B	Aluminum alloy	Electroless nickel plated
16	Hexagon socket head cap screw	Stainless steel	
17	Spring washer	Stainless steel	
18	Flat washer	Stainless steel	
19	Plate A	Aluminum alloy	Electroless nickel plated
20	Plate B	Aluminum alloy	Electroless nickel plated
21	Cushion seal	Fluoro rubber	

No.	Description	Material	Note
22	Inner cover	Aluminum alloy	Electroless nickel plated
23	Cylinder tube gasket	Fluoro rubber	
24	O-ring	Fluoro rubber	
25	O-ring	Fluoro rubber	
26	Hexagon socket head set screw	Stainless steel	
27	Hexagon socket head cap screw	Stainless steel	
28	Flat washer	Stainless steel	
29	Round head Phillips screw	Stainless steel	
30	Hexagon socket head cap screw	Stainless steel	
31	Base	Aluminum alloy	Electroless nickel plated
32	Cylinder tube	Aluminum alloy	Electroless nickel plated
33	Tube attaching bracket	Aluminum alloy	Electroless nickel plated
34	Hexagon socket head cap screw	Stainless steel	
35	Flat washer	Stainless steel	
36	Hexagon socket head cap screw	Stainless steel	
37	Flat washer	Stainless steel	
38	Top cover	Aluminum alloy	Electroless nickel plated
39	Cushion seal holder	Aluminum alloy	Chromated
40	O-ring	Fluoro rubber	
41	O-ring	Fluoro rubber	
42	Linear guide	Stainless steel	

Note) In the material and note columns of the parts list above, the first description is for CYV15 and the second description is for CYV32.

Dimensions



(mm)

Model	A	B	C	E	ED	EK	F	G	H	HA	HI	HL	HP	J	JK	K	L	LD
CYV15	8	10.5	6.4	$4_{H9}{}^{+0.030}_{0}$	9.5	4	12.5	10	45	23	23	37.6	44	M6 x 1	10	21	67	5.6
CYV32	12	16	10.2	$6_{H9}{}^{+0.030}_{0}$	13	6	25	9	75	39	39	63.3	73.5	M10 x 1.5	12	20	90	9.2

Model	LW	MM	M	N	P	PA	PB	PC	Q	QW	R	T	TA	TB	TC	W	Y	Z
CYV15	69	M4 x 0.7	6	4.5	5/16-24UNF	25	60	10	112	48	45	30	20	15	0.5	69	2.5	132
CYV32	115	M6 x 1	8	7.5	7/16-20UNF	50	100	12	147	83	79.5	34	22.5	22	0.5	115	3.5	165

Note) Refer to "Cushion Effect (Sine Cushion) and Stroke Adjustment" under Specific Product Precautions on page 11.

Series CYV
Model Selection 1

Design Parameters 1

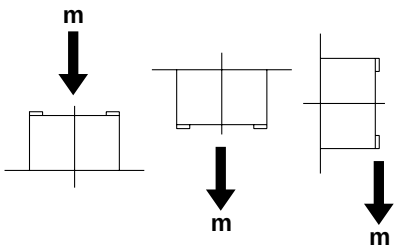
The allowable load mass moment differs depending on the work piece mounting method, cylinder mounting orientation and piston speed.
To determine whether or not the cylinder can be operated, do not allow the sum ($\Sigma\alpha n$) of the load factors (αn) for each mass and moment to exceed "1".

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

Load mass

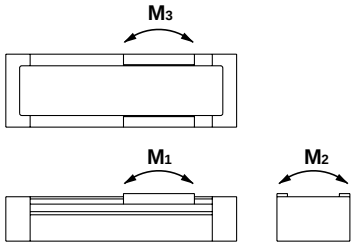
Max. load mass (kg)

Model	m_{max}
CYV15	1
CYV32	5



Moment

Allowable moment
(Static moment/Dynamic moment)



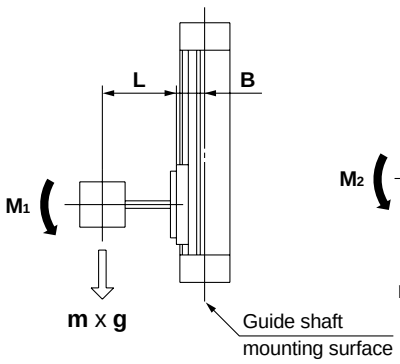
(N·m)

Model	M_1	M_2	M_3
CYV15	0.3	0.6	0.3
CYV32	3	4	3

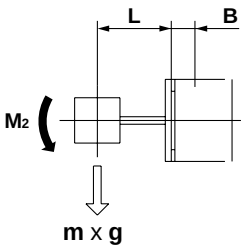
Static Moment

Moment generated by the work piece weight even when the cylinder is stopped

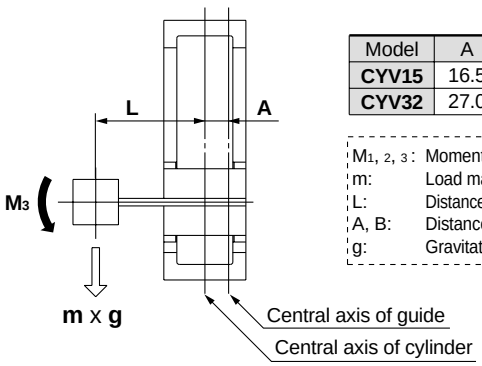
■ **Pitch moment**
M_1 = m x g x (L + B) x 10^{-3}



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



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



(mm)

Model	A	B
CYV15	16.5	25.5
CYV32	27.0	48.0

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

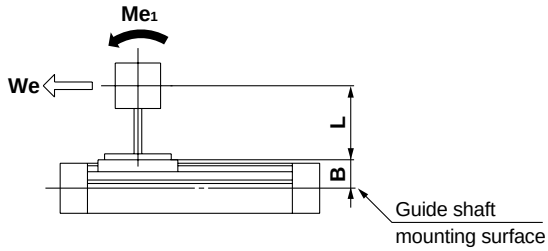
Dynamic Moment

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

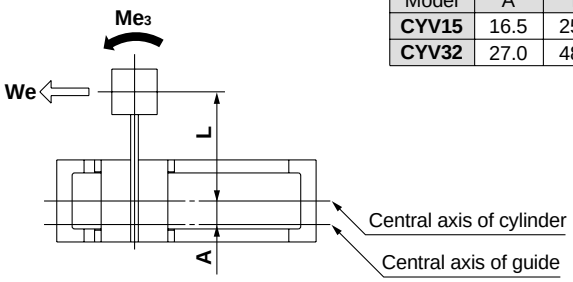
$$We = 5 \times 10^{-3} \times m \times g \times U$$

We: Load equivalent to impact [N]
m: Load mass [kg]
U: Max. speed [mm/s]
g: Gravitational acceleration [9.8m/s^3]

■ **Pitch moment**
Me_1 = 1/3 · We(L + B) · 10^{-3} *
∗ Average load coefficient



■ **Yaw moment**
Me_3 = 1/3 · We(L + A) · 10^{-3} *
∗ Average load coefficient



(mm)

Model	A	B
CYV15	16.5	25.5
CYV32	27.0	48.0

Series CYV
Model Selection 2

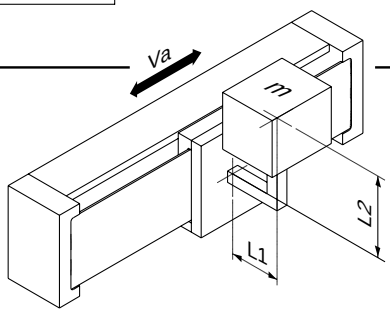
Selection Calculation

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

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

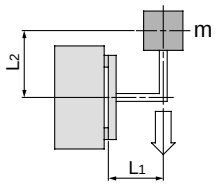
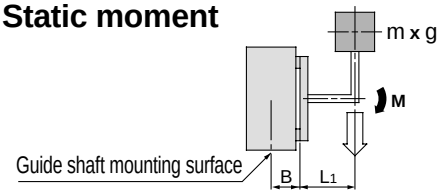
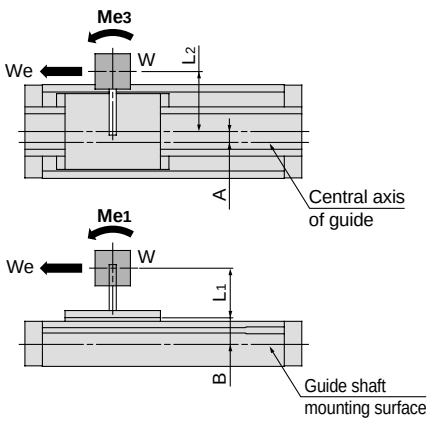
Item	Load factor αn	Note
1. Max. load mass	α_1 = m/m max	Review m. m max is the maximum load mass.
2. Static moment	α_2 = M/M max	Review M_1, M_2, M_3. M max is the allowable moment.
3. Dynamic moment	α_3 = Me/Me max	Review Me_1, Me_3. Me max is the allowable moment.

Calculation Example



Operating conditions

Cylinder: CYV32
Mounting: Horizontal wall mounting
Maximum speed: U = 300 [mm/s]
Load mass: m = 1 [kg] (excluding mass of the arm section)
L_1 = 50 [mm]
L_2 = 50 [mm]

Item	Load factor αn	Note
1. Maximum load mass 	α_1 = m/m max = 1/5 **= 0.20**	Review m.
2. Static moment 	$M_2 = m \cdot g \cdot (L_1 + B) \cdot 10^{-3}$ $= 1 \cdot 9.8 \cdot (50 + 48) \cdot 10^{-3}$ $= 0.96$ [N·m] $\alpha_2 = M_2/M_2$ max = 0.96/4 **= 0.24**	Review M_2. Since M_1 and M_3 are not generated, review is unnecessary.
3. Dynamic moment 	We = $5 \times 10^{-3} \cdot m \cdot g \cdot U$ $= 5 \times 10^{-3} \cdot 1 \cdot 9.8 \cdot 300$ $= 14.7$ [N] $Me_3 = 1/3 \cdot We(L_2 + A) \cdot 10^{-3}$ $= 1/3 \cdot 14.7 \cdot (50 + 27) \cdot 10^{-3}$ $= 0.38$ [N·m] $\alpha_{3a} = Me_3/Me_3$ max = 0.38/3 **= 0.13**	Review Me_3.
	$Me_1 = 1/3 \cdot We \cdot (L_1 + B) \cdot 10^{-3}$ $= 1/3 \cdot 14.7 \cdot (50 + 48) \cdot 10^{-3}$ $= 0.48$ [N·m] $\alpha_{3b} = Me_1/Me_1$ max = 0.48/3 **= 0.16**	Review Me_1.

$$\Sigma\alpha n = \alpha_1 + \alpha_2 + (\alpha_{3a} + \alpha_{3b}) = 0.20 + 0.24 + (0.13 + 0.16) = 0.73$$

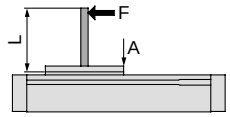
The result $\Sigma\alpha n = 0.73 \leq 1$ allows operation.

Model Selection 3

Design Parameters 2

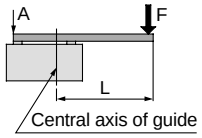
Table Deflection Note)

Table deflection due to pitch moment load



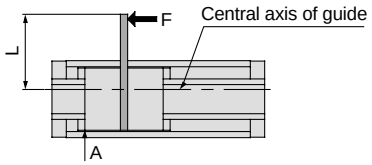
$M_1 = F \times L$

Table deflection due to roll moment load



$M_2 = F \times L$

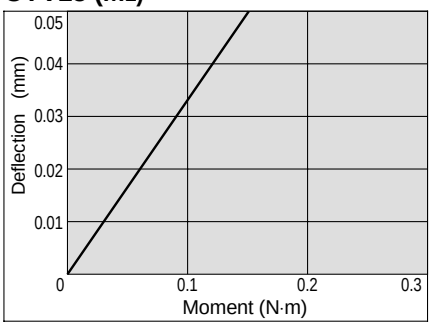
Table deflection due to yaw moment load



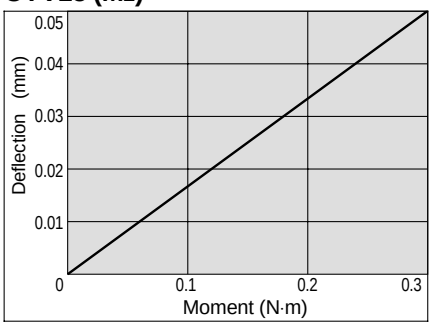
$M_3 = F \times L$

Note) Deflection: Displacement of point A when force acts on point F
Point A: Indicates a measurement point

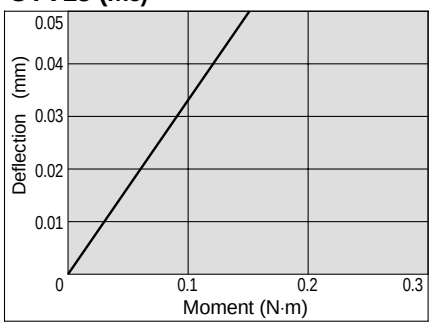
CYV15 (M_1)



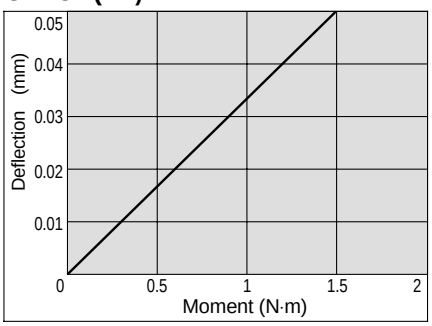
CYV15 (M_2)



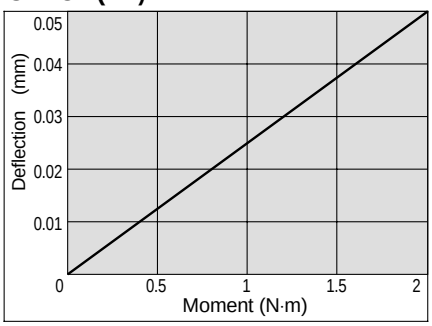
CYV15 (M_3)



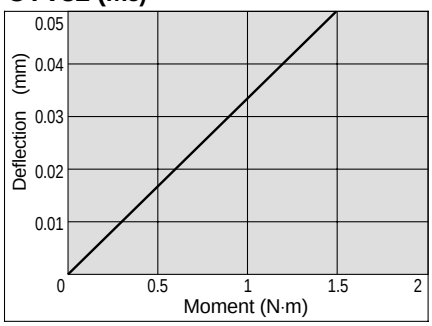
CYV32 (M_1)



CYV32 (M_2)



CYV32 (M_3)



Vertical Operation

When using in vertical operation, prevention of work piece dropping due to breaking of the magnetic coupling should be considered. The allowable load mass and maximum operating pressure should be as shown in the table below.

Model	Allowable load mass mv (kg)	Maximum operating pressure Pv (MPa)
CYV15	1	0.3
CYV32	5	

Intermediate Stops

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

The cushion effect (smooth start-up, soft stop) is not available an intermediate stop or return from an intermediate stop using an external stopper, etc.

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

Cushion stroke

Model	Stroke (mm)
CYV15	25
CYV32	30

Series CYV
Safety Instructions

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

⚠ Caution : Operator error could result in injury or equipment damage.

⚠ Warning : Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

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

⚠Warning

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

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

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

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

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

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Series CYV
Actuator Precautions 1
Be sure to read before handling.

Design

⚠Warning

1. There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc., and changes in forces occur.

In such cases, human injury may occur, e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

2. Install a protective cover when there is a risk of human injury.

If a driven object and moving parts of a cylinder pose a danger of human injury, design the structure to avoid contact with the human body.

3. Securely tighten all stationary parts and connected parts so that they will not become loose.

Especially when a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

4. A deceleration circuit may be required.

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

5. Consider a possible drop in operating pressure due to a power outage, etc.

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and/or human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

6. Consider a possible loss of power supply.

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by pneumatics, electricity or hydraulics, etc.

7. Design circuitry to prevent sudden lurching of driven objects.

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

8. Consider emergency stops.

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, such as a power outage or a manual emergency stop.

9. Consider the action when operation is restarted after an emergency stop or abnormal stop.

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install safe manual control equipment.

Selection

⚠Warning

1. Confirm the specifications.

The products advertised in this catalog are designed only for use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are outside the specifications, this may cause damage and/or malfunction. Do not use in these conditions. (Refer to specifications.)

Consult SMC if you use a fluid other than compressed air.

2. Intermediate stops

When intermediate stop of a cylinder piston is performed with a 3 position closed center type directional control valve, it is difficult to achieve stop positions as accurate and precise as with hydraulic pressure due to the compressibility of air.

Furthermore, since zero air leakages is not guaranteed, it may not be possible to hold a stop position for an extended period of time. Contact SMC if it is necessary to hold a stopped position for an extended period.

⚠Caution

1. Operate within the limits of the maximum operating stroke.

Refer to the standard strokes for the maximum operating stroke.

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

Series CYV
Actuator Precautions 2
Be sure to read before handling.

Air Supply

⚠Warning

1. Use clean air.

Do not use compressed air including chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

⚠Caution

1. Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be 5µm or finer.

2. Install an after-cooler, air dryer or water separator, etc.

Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an after-cooler, air dryer or water separator, etc.

3. Use the product within the specified range of fluid and ambient temperatures.

Take measures to prevent freezing, since moisture in circuits will be frozen under 5°C, and this can cause damage to seals and malfunction.

Refer to SMC's clean pneumatic series "Air Cleaning Equipment" catalog for further details on compressed air quality.

Operating Environment

⚠Warning

1. Do not use in environments where there is a danger of corrosion.

Refer to the construction drawings regarding cylinder materials and surface treatment.

2. Use an operating environment pressure within the specified range.

Maintenance

⚠Warning

1. Perform maintenance according to the procedure indicated in the instruction manual.

Improper handling can cause malfunction and damage of machinery or equipment.

2. Removal of equipment and supply/exhaust of compressed air.

When machinery is serviced, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.

When machinery is restarted, proceed with caution after confirming measures to prevent lurching of actuators.

⚠Caution

1. Drain flushing

Remove drainage from air filters regularly.

Specific Product Precautions 1

Be sure to read before handling.

Handling

⚠Caution

1. **Open the inner package of the double packaged clean series product inside a clean room or other clean environment.**
2. **Do not install a cylinder with bare hands. Outgassing characteristics can be degraded.**
3. **Perform parts replacement and disassembly work inside the chamber after exhausting compressed air in the piping to the outside of the clean room.**

Mounting

⚠Caution

1. **Take care to avoid striking the cylinder tube with other objects or handling it in a way that could cause deformation.**

   The cylinder tube and slider units have a non-contact construction. For this reason, even a slight deformation or slippage of position can cause malfunction and loss of durability, as well as a danger of degrading particulate generation characteristics.
2. **Do not scratch or gouge the linear guide by striking it with other objects.**
3. **Since the slide table is supported by precision bearings, do not apply strong impacts or excessive moment when mounting work pieces.**
4. **The cylinder can be operated by directly applying a load within the allowable range. However, careful alignment is necessary when connecting to a load with an external guide mechanism.**

   Since displacement of the alignment increases as the stroke becomes longer, consider a connection method that can absorb the displacement and does not cause interference at any point within the stroke. Also, operate with due consideration of measures against particulate generation.
5. **Be sure to operate the cylinder with the plates on both sides secured.**

   Avoid applications in which the slide table or only one plate is secured.
6. **Do not use until you verify that the equipment can be operated properly.**

   After mounting or repair, connect the air supply and electric power, and then confirm proper mounting by performing appropriate function and leakage tests.
7. **Instruction manual**

   Mount and operate the product after thoroughly reading the manual and understanding its contents. Also, store it where it can be referred at any time.

Operation

⚠Caution

1. **The maximum operating pressure for the vacuum rodless cylinder is 0.3MPa**

   If the maximum operating pressure of 0.3MPa for the vacuum rodless cylinder is exceeded, the magnetic coupling can be broken, causing a danger of malfunction or degradation of particulate generation characteristics, etc.

Operation

⚠Caution

2. **When used for vertical operation, take precautions against possible dropping due to separation of the magnetic coupling.**

   When used for vertical operation, use caution as there is a possibility of dropping due to separation of the magnetic coupling if a load (pressure) greater than the allowable value is applied.
3. **Do not operate with the magnetic coupling out of position.**

   If the magnetic coupling is out of position, push the external slider (or the piston slider by using air pressure) back to the proper position at the stroke end. (When pushing the external slider, do not push it with bare hands.)
4. **Do not apply lubricant, as this is a non-lube product.**

   The interior of the cylinder is lubricated at the factory, and lubrication with turbine oil, etc., will not satisfy the product's specifications.
5. **Never reapply lubricant.**

   Never reapply lubricant, as this may cause a degradation of particulate generation or operation characteristics.
6. **Use the cylinder in inert gas environments.**

   Corrosive gases may cause corrosion of a cylinder and loss of durability.
7. **Be sure to use the cylinder in pressure environments from atmosphere to 1.3 x 10^{-4}Pa (ABS).**

   If used in pressure environments below these conditions, grease applied to the guide unit will evaporate excessively and may cause environmental contamination and loss of durability.
8. **Be sure to set the baking temperature to 150°C or less.**

   If a higher temperature is used, the grease will evaporate excessively and may cause environmental contamination and loss of durability.
9. **Positioning of a cylinder should be performed using an optical sensor from outside the chamber.**

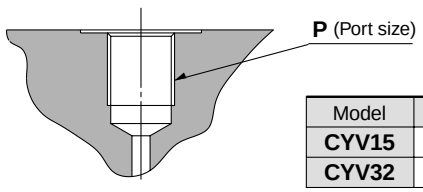
   A positioning sensor cannot be mounted on the cylinder.

Fitting

⚠Caution

1. **A fitting with an O-ring is used for a high vacuum rodless cylinder.**

   Use a fitting that conforms to the dimensions below, and install it so that there is no air leakage.



Model	**P** (Port size)
CYV15	5/16-24 UNF
CYV32	7/16-20 UNF

2. **Air blow and clean fittings and piping materials completely with clean air to remove oil and impurities, etc., before piping.**

Specific Product Precautions 2

Be sure to read before handling.

Speed Adjustment

⚠ Caution

1. **A speed controller for clean room use is recommended for speed adjustment.**
2. **Install the speed controller outside the chamber.**
3. **In case of vertical mounting, a system with a regulated supply circuit installed on the down side is recommended. (This is effective against delays at the start of upward movement and for conservation of air.)**

Cushion Effect (Sine Cushion) and Stroke Adjustment

⚠ Caution

1. **A sine cushion (smooth start-up, soft stop) function is included in the standard specifications.**

   Due to the nature of a sine cushion, adjustment of the cushion effect is not possible. There is no cushion needle adjustment as in the case of conventional cushion mechanisms.

2. **The stroke adjustment is a mechanism to adapt the slide table's stroke end position to a mechanical stopper on other equipment, etc.**

   (Adjustment range: Total of both sides –4 to 0mm)

   To ensure safety, perform adjustment after shutting off the drive air, releasing the residual pressure and implementing drop prevention measures, etc.

   1) Loosen the inner cover holding screw with a hexagon wrench, etc.

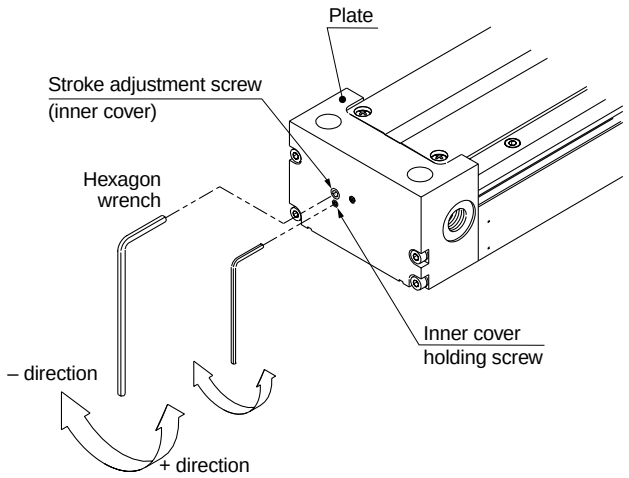
   2) To match the position with a mechanical stopper on other equipment, etc., rotate the stroke adjustment screw (inner cover) to the left or right with a hexagon wrench to move the inner cover back and forth.

   3) The maximum adjustment on one side is –2 to 0mm. A total adjustment of approximately –4 to 0mm is possible using both sides.

   4) After completing the stroke adjustment, tighten the inner cover holding screw with a hexagon wrench, etc.

Inner cover holding screw tightening torques [N·m]

Model	Screw size	Tightening torque
CYV15	M3 x 0.5	0.3
CYV32	M6 x 1	2.45



Maintenance

⚠ Caution

1. **Never disassemble the cylinder tube or linear guide, etc.**

   If disassembled, the slide table may touch the outside surface of the cylinder tube resulting in a degradation of particulate generation characteristics.

2. **Consult SMC when replacing seals and bearings (wear rings).**
3. **For repair of a cylinder inadvertently exposed to a corrosive gas, consult SMC after clarifying the name of the corrosive gas.**

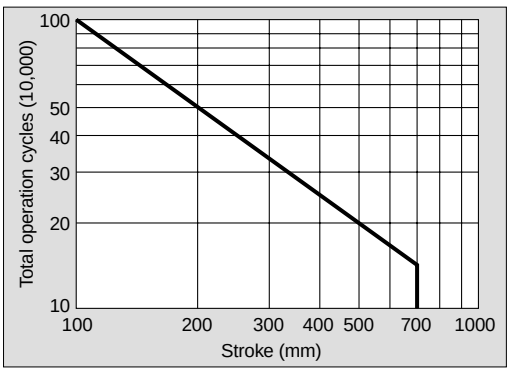
Particulate Generation Characteristics

⚠ Caution

1. **In order to maintain the particulate generation grade, use operation of 1 million cycles or travel distance of about 200km as a guide. (Table 1 below)**

   If operation is continued beyond the recommended values, lubrication failure of the linear guide and a degradation of particulate generation characteristics may occur.

Table 1



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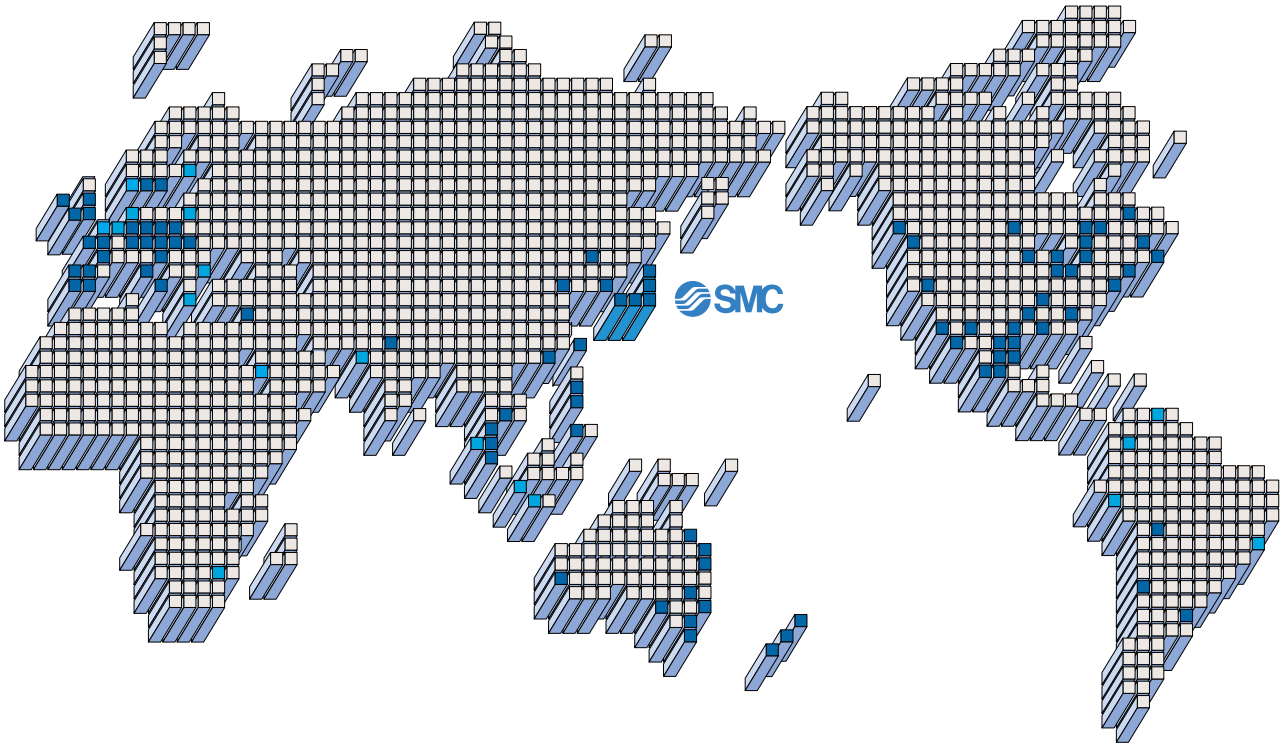

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