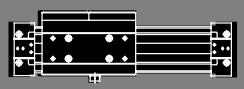


Stroke Reading Rodless Cylinder with Brake

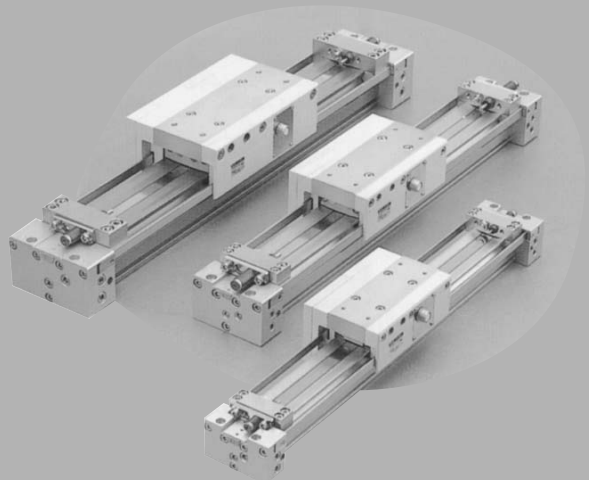
Series ML2B

ø25, ø32, ø40

Transfer

Position feedback

Rodless cylinder
With brake



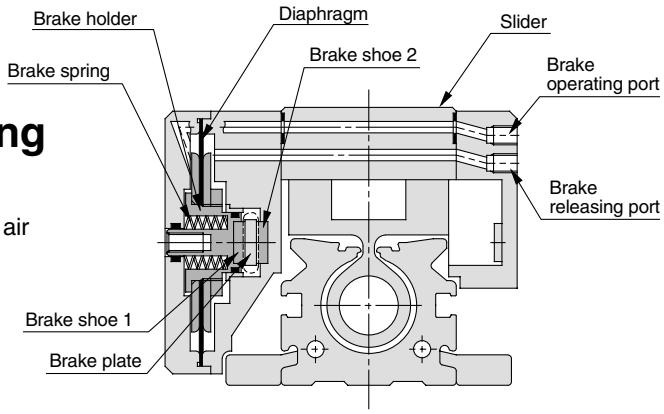
Stroke Reading Rodless Cylinder with Brake

Incorporating a brake mechanism and stroke sensor allows positioning with high repeatability. (Stopping accuracy ± 0.5 mm)

Brake mechanism

Employs a combination spring and pneumatic lock type.

The cylinder position will be held by spring force when air pressure is absent.



The brake mechanism gives no direct load on the cylinder.

Spring force acts directly on the brake shoes to hold the brake disk; therefore, the table can be stopped without affecting the cylinder performance.

Maintenance and inspection

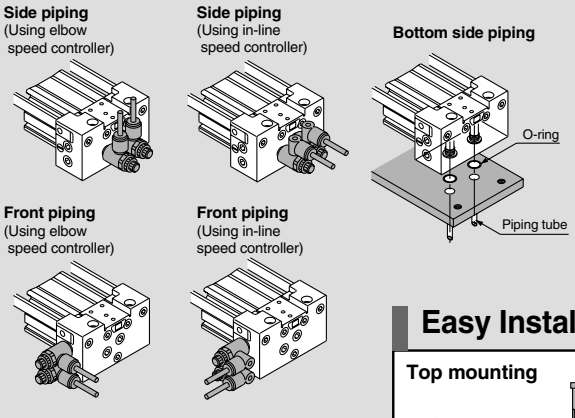
Brake unit is replaceable and has a manual override. Besides that, manual release is also possible manually.

Locking in both directions is possible.

Locking in either side of cylinder stroke is possible, too.

Rodless cylinder

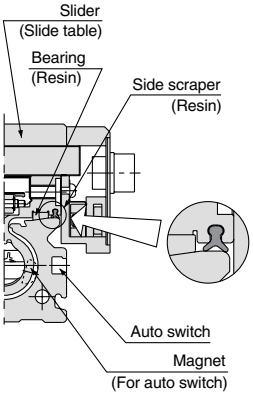
A variety of piping port locations gives high-freedom on machine design. (Operation air)



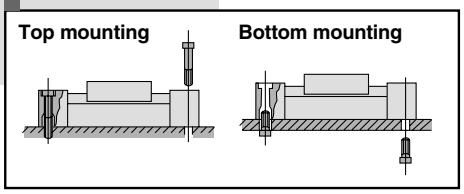
Dust protection

A special lip shaped side scraper installed on the bottom side of slide table prevents dust from entering

Auto switches can be recessed in the body.



Easy Installation and Space-saving



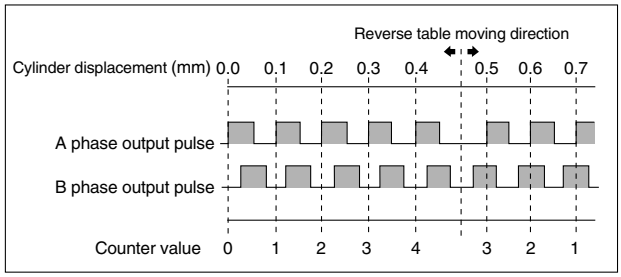
ø25, ø32, ø40

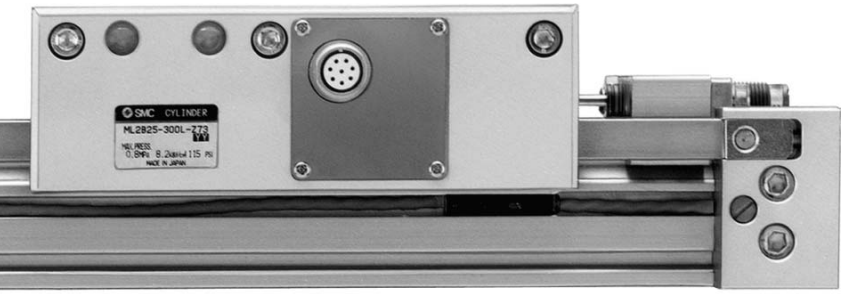
Measuring

Smallest measuring unit 0.1 mm/Pulse

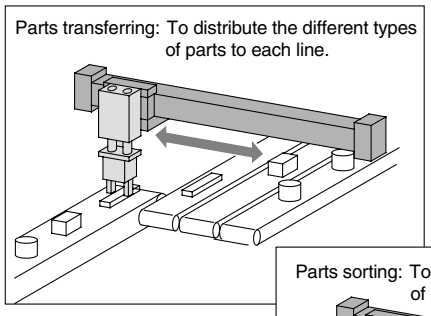
Measured with the scale plate with a sensing head built into the body.

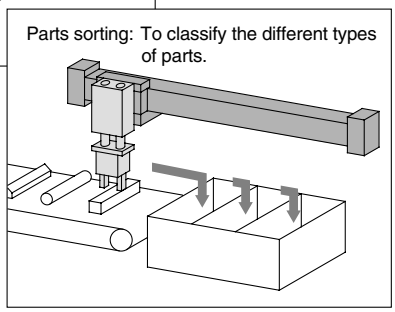
Relation between Displacement and Output Pulse on Stroke Reading Cylinder





Application Example





Stroke adjusting unit, integrated shock absorber and stopper bolt.

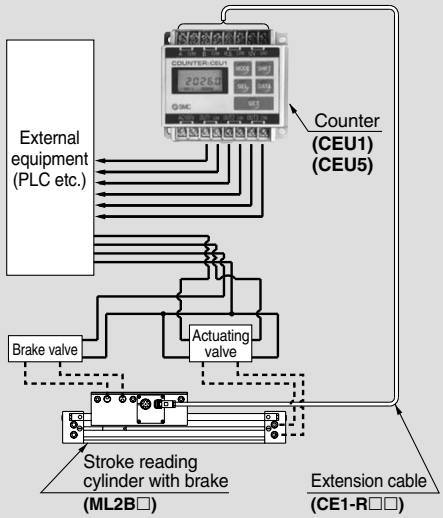
Stroke adjustment is possible.
Shock absorber is self adjusting for changing load demands.

For measuring intermediate stops

Stroke Reading Cylinder with Brake + Counter

Suitable for measurement on systems when table is stopped at intermediate strokes.

[3 point preset counter: *Series CEU1*]
[Multi-counter: *Series CEU5*]



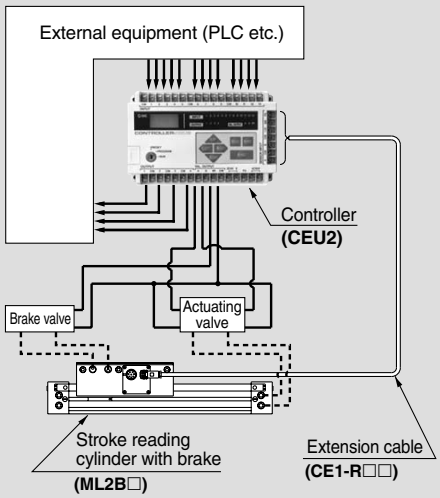
For precision positioning

(Stop accuracy ±0.5 mm)

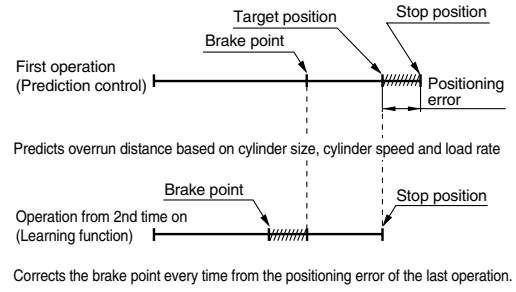
Stroke Reading Cylinder with Brake + Controller

Positioning with high reproducibility has been achieved by prediction control and learning function.
The stop position will be automatically redressed by re-try function.

[Controller: *Series CEU2*]



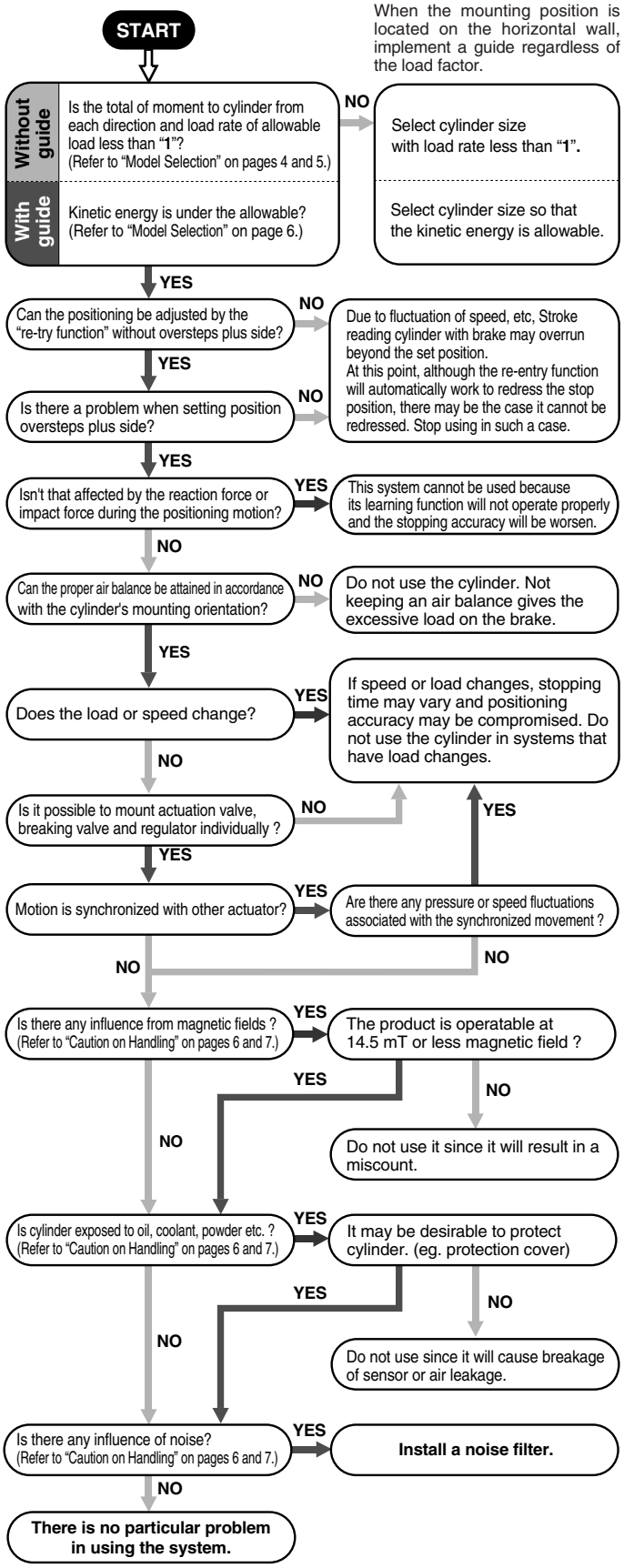
Prediction control and learning function



Before Operation

System Checking Flow Chart

Stroke reading cylinder with brake permits precise positioning at any designated point on its travel with combination of CEU2, directional control valve, brake valve. Check the operation flow chart below before starting the operation or stopping positioning repeatability may be compromised.

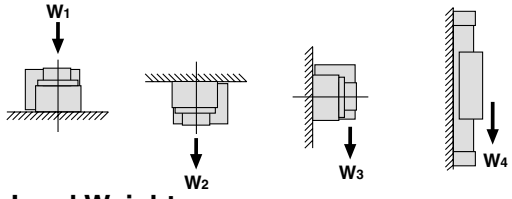


Model Selection

Maximum allowable load and allowable moment will vary depending on workpiece mounting methods, mounting orientation and piston speed.
A determination of usability is performed based on the operating limit values in the graphs with respect to operating conditions, but the total ($\Sigma\alpha n$) of the load factors (αn) for each weight and moment should not exceed 1. Besides, if it is used for positioning, maximum speed that can be achieved shall be 500 mm/s or less.
For details, refer to either "Instruction manual for positioning system with brake (rodless type)" or "Instruction manual for Hy-rodless Cylinder".

Load Weight

Load weight (kg)



Maximum Load Weight

(kg)

Model	W1	W2	W3	W4
ML2B25	20.4	4.8	4.4	10.2
ML2B32	30.6	6.5	7.3	15.3
ML2B40	51.0	8.1	11.5	25.5

Moment

Allowable Moment

(N·m)

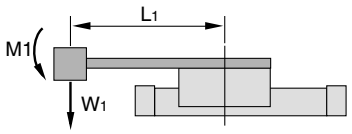
Model	Pitch moment	Roll moment	Yaw moment
	M1/M1e	**M2**	**M3/M3e**
ML2B25	10	1.2	3.0
ML2B32	20	2.4	6.0
ML2B40	40	4.8	12

Static Moment

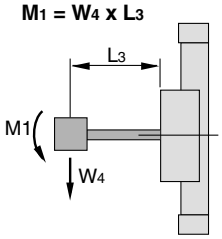
Moment generated by the workpiece weight even when the cylinder is stopped

■ **Pitch moment**

M1 = W1 x L1

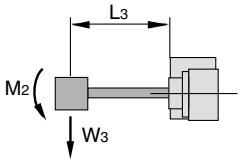


M1 = W4 x L3

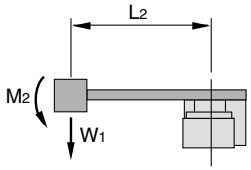


■ **Roll moment**

M2 = W3 x L3

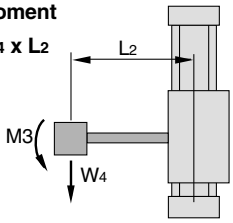


M2 = W1 x L2



■ **Yaw moment**

M3 = W4 x L2

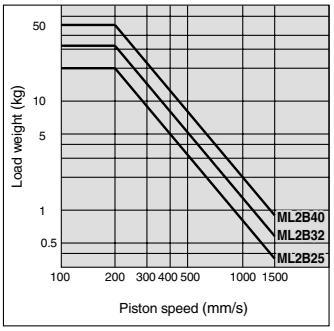


Maximum Load Weight/Allowable Moment (Not using external guide)

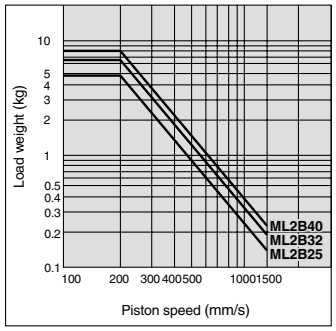
$$\text{The sum of the load rate } \sum \alpha n = \frac{\text{Load weight [kg]}}{\text{Maximum load weight [Wmax]}} + \frac{\text{Static moment [M]}}{\text{Allowable static moment [Mmax]}} + \frac{\text{Dynamic moment [Me]}}{\text{Allowable dynamic moment [Memax]}} \leqq 1$$

Wmax, Mmax, Memax from below graphs.

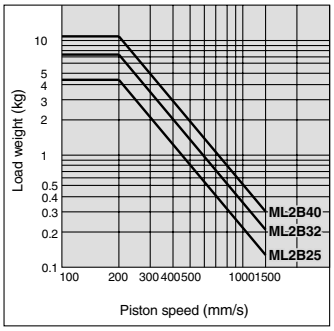
ML2B/W1



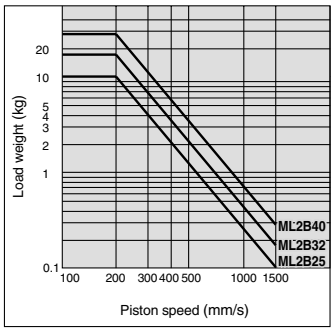
ML2B/W2



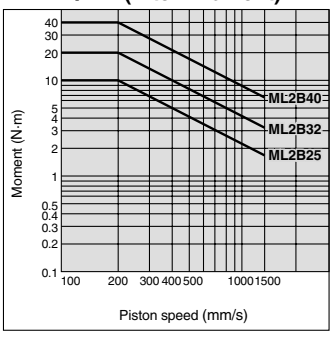
ML2B/W3



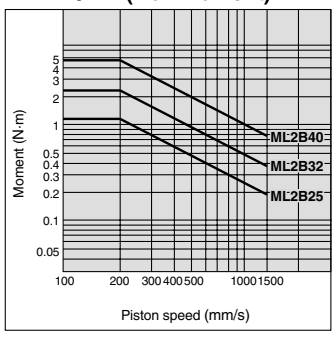
ML2B/W4



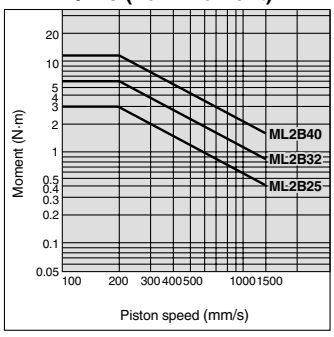
ML2B/M1 (Pitch moment)



ML2B/M2 (Roll moment)



ML2B/M3 (Yaw moment)

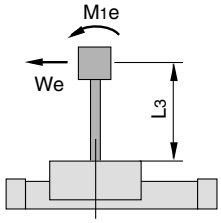


Dynamic Moment

Moment generated by impact load at stroke end

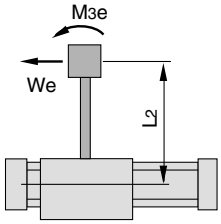
■ Pitch moment

$$M_{1e} = We \times L_3 \times \frac{1}{3}$$



■ Yaw moment

$$M_{3e} = We \times L_2 \times \frac{1}{3}$$



■ Reference formula [Dynamic moment at impact]

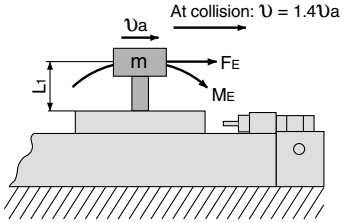
Use the following formula to calculate dynamic moment when shock for stopper collision impact is taken into consideration.

- m : Load weight (kg)
- F : Load (N)
- F_E : Load equivalent to impact (at impact with stopper) (N)
- υa : Average speed (mm/s)
- υ : Collision speed (mm/s)
- L_1 : Distance to the center of load gravity (m)
- M_E : Dynamic moment (N·m)
- g : Gravitational acceleration (9.8 m/s²)

$\upsilon = 1.4\upsilon a$ (mm/s) $F_E = \frac{1.4}{100}\upsilon a \cdot g \cdot m$

$$\therefore M_E = \frac{1}{3} \cdot F_E \cdot L_1 = 0.05\upsilon a \cdot m\ L_1 \text{ (N·m)} \quad \text{Note)}$$

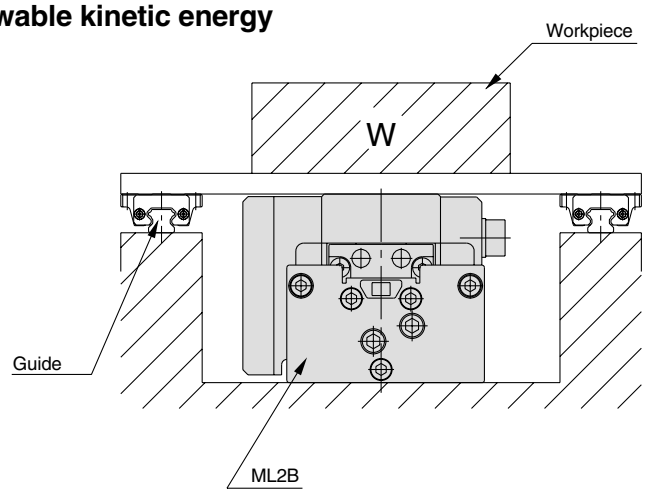
Note) Average load coefficient (This coefficient is meant to average the maximum load moment at the time of impact with stopper in the light of calculating the service life.)



Series ML2B
Before Operation

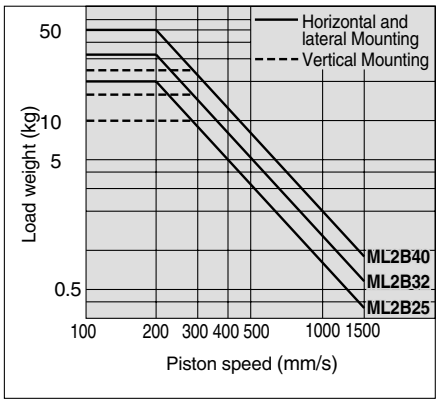
Model Selection | Allowable Kinetic Energy (With external guide)

Allowable kinetic energy



Type	ML2B25	ML2B32	ML2B40
Allowable kinetic energy (J)	0.43	0.68	1.21

- The piston speed will exceed the average speed immediately before locking. To determine the piston speed for the purpose of obtaining the kinetic energy of load, use 1.4 times the average speed as a guide.
- The relation between the speed and the load of the respective tube bores is indicated in the diagram on the right. Use the cylinder in the range below the line.
- Locking mechanism has to absorb not only kinetic energy of pay load but also thrust energy of cylinder when locking. Accordingly, to secure breaking force there is a certain limit for pay load despite being within allowable kinetic energy. In the case of horizontal orientation, the solid line is the load limit. In the case of vertical orientation, the dotted line is the load limit.



Handling of Technical Material

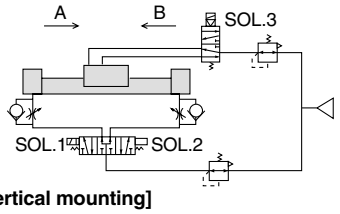
- For further positioning system, refer to “Instruction manual for positioning system with brake (rodless type)”.
- For further cylinder information, refer to “Instruction manual for Hy-rodless Cylinder”.

⚠ Caution on Handling

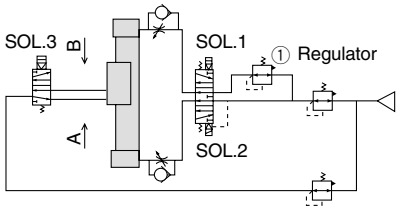
Pneumatic Circuit Design

1. Operating pneumatic circuit

[Horizontal and lateral mounting]



[Vertical mounting]



	SOL.1	SOL.2	SOL.3
A	ON	OFF	ON
B	OFF	ON	ON
Stop	OFF	OFF	OFF

2. Solenoid valve for driving and brake

		Horizontal and lateral mounting	Vertical mounting
Solenoid valve for driving		VFS25□0	VFS24□0R
Solenoid valve for braking		VFS21□0	
Regulator		AR425	
Piping size	ML2B25, 32	Bore size ø4 or more	
	ML2B40	Bore size ø5 or more	

3. Piping

Piping length between cylinder ports and solenoid valve for driving should be less than 50 cm. When using system with brake, piping length between solenoid valve for braking and brake supply port should be less than 1 m. If longer, the brake function may be delayed when the cylinder position is held, for emergency stops or cylinder may eject at brake release.

4. Air balance

Air balance on both pneumatic circuits mentioned above is made by supplying air pressure, to both sides of the piston when at intermediate stop.

When mounting vertically the balance of load is kept by a regulator (1) decreases up-stream pressure. Use caution the piston rod may be lurched when the next motion gets started after the intermediate stops or commence the operation after the reverse motion gets done, unless the air balance is taken. It may result in degrading its accuracy.

5. Supply pressure

Set supply pressure 0.3 to 0.5 MPa to brake release port.

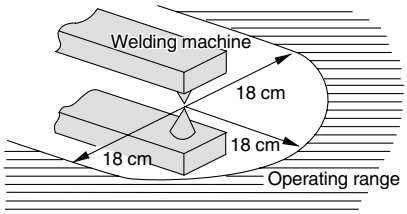
When supply pressure is below 0.3 MPa brake may not be released, when it is over 0.5 MPa brake life may be shortened. If line pressure is used directly as supply pressure, any fluctuation in pressure will appear in the form of changes in cylinder characteristics. Therefore, make sure to use a pressure regulator to convert line pressure into supply pressure for the solenoid valve for driving and the solenoid valve for braking. In order to actuate multiple cylinders at once, use a pressure regulator that can handle a large air flow volume and also consider installing an air tank.

Mounting

1. Position detecting sensor

Stroke reading rodless cylinder with brake is a magnetic type sensor. Strong magnetic fields around the sensor will cause a malfunction. External magnetic fields should be less than 14.5 mT.

> A magnetic field of 14.5 mT is equivalent to a position that has about 18 cm radius from a welded part using about 15,000 amperes of welding amperage. When using it in a stronger magnetic field, cover the sensor with magnetic and shield it.



Avoid applications where the cylinder is in direct contact with water and oil, etc.

2. Noise

When stroke reading hy-rodless cylinder with brake is used in an atmosphere with electrical noise from a motor, welding machine, miscount is created by this noise: To prevent this, the noise source and wiring should be seperated from power wire.

Maximum transmitted distance for stroke reading rodless cylinder with brake is 20 m. Be sure not to exceed this wire length.

3. Mounting

Flush piping thoroughly before connection in order to prevent dust or chips from entering the cylinder.

Take care not to score slide surface of the cylinder tube. This may damage the bearing and scraper, resulting in malfunctioning of the cylinder.

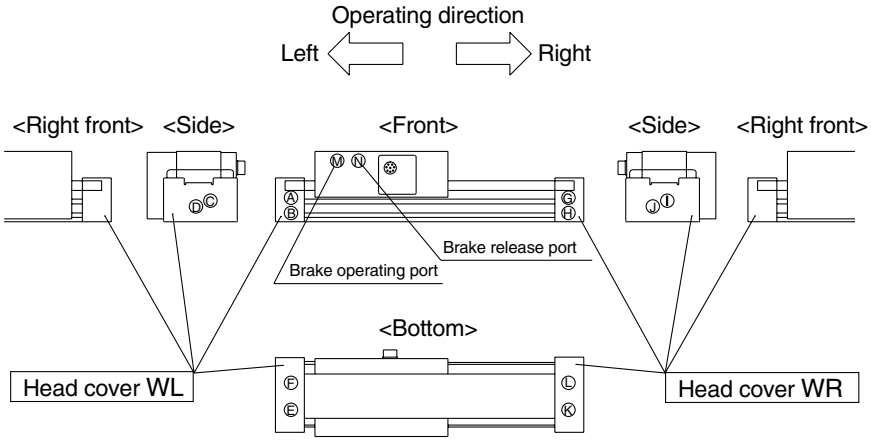
Take care not to apply a strong impact or excessive moment to the table when loading a workpiece as slide table is supported by bearing made of resin.

4. Piping

Piping connection to head covers can be selected according to application.

Bottom piping is effective for high density designed equipment and machines since piping does not come out from the mounting surface. (Below fig.: Refer to piping port variation.)

Piping port variation



No. of piping surface		①	②	③	④	⑤	⑥
Head cover		Head cover WL			Head cover WR		
Piping surface		Front	Side	Bottom	Front	Side	Bottom
Operating direction	Left	A	C	E	G	I	K
	Right	B	D	F	H	J	L

Note 1) The 6 types of tcentralized piping shown above are available in centralized piping model.

Note 2) SMC speed controller with One-touch fitting can be directly mounted on piping surface 1. 2, 4, 5, and 6.

Using

1. When a stroke reading hy-rodless cylinder with brake is connected to load with an external support mechanism, accurate alignment is required even if the ML2B can be used with direct load within the allowable range. If stroke is longer, axis alignment deflection will be greater, therefore install floating mechanism to absorb deflection. This actuator can be used without lubricaton. However, if it is lubricated, use turbine oil Class 1 (ISO VG32).
(Do not use machine oil or spindle oil.)

2. Cover the cylinder when it is used in an environment where cutting dust, powder (paper powder, thread yarn, etc.) and cutting oil (gas oil, water, warm water, etc.)

3. We recommend that grease be regularly applied to bearing (slide part) and dust seal band as it may extend the service life.

4. Brake and scale plate should be protected from load and external force which may cause malfunction. Do not apply load and external force on brake and scale plate. Readjustment for brake and scale plate in normal operating condition is not necessary due to preadjustment prior to delivery. Therefore, do not change the setting on adjustment parts carelessly.

Operating

1. Positioning at cylinder stroke end

Stable stop accuraccy at end of stroke positioning is not obtained due to large speed change from cushion influence. Therefore, positioning position must not be within cushion stroke. (Refer to cushion stroke table.)

2. System with counter

Counter respond speed is generally called “counting speed”. If cylinder with brake is faster than “counting speed” in counter, the counter will make a reading error and miss-counting occurs.

> Use CEU1, CEU2, or CEU5.
> **Cylinder speed < “Counting speed” in counter**
> (Cylinder speed 500 mm/s is equivalent to 5 kcps of “counting speed” in counter.)

3. Ejection from jumping at beginning of extend or retract stroke may cause temporarily high speeds exceeding the response speed “counting speed” in the counter or position detection sensor. This can be a cause of malfunction.

Stroke Reading Rodless Cylinder with Brake

Series ML2B

ø25, ø32, ø40

How to Order

ML2B [25] [ ] — [500] [L] [ ] — [Y7BW] [ ]

Basic type

Bore size

25	25 mm
32	32 mm
40	40 mm

Control method

Nil	With brake and stroke sensor
S	With stroke sensor (Without brake)
B	With brake (Without stroke sensor)

Stroke (mm)

Refer to "Standard Stroke" on page 10-13-9.

Stroke adjusting unit

Nil	Without adjusting unit
L*	Shock absorber + Adjusting bolt

* **Shock absorber model**

Type	ø25	ø32	ø40
	RB1007	RB1412	RB1412

Suffix for stroke adjusting unit

Nil	2 pcs.
S	1 pc.

Auto switch

Nil	Without auto switch

* For the applicable auto switch model, refer to the table below.
* Auto switches are shipped together, (but not assembled).

Number of auto switch

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

Applicable counter/Controller
Series CEU1
Series CEU5
Series CEU2

Applicable Auto Switch/Refer to page 10-20-1 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)	3 (L)	5 (Z)	Pre-wire connector	Applicable load	
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	—	**Z76**	●	●	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	—	**Z73**	●	●	●	—	—	Relay, PLC
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	**Y69A**	**Y59A**	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				**Y7PV**	**Y7P**	●	●	○	○		
				2-wire		12 V		**Y69B**	**Y59B**	●	●	○	○	—	
	Diagnostic indication (2-color indication)			3-wire (NPN)		5 V, 12 V		**Y7NWV**	**Y7NW**	●	●	○	○	IC circuit	
				3-wire (PNP)				**Y7PWV**	**Y7PW**	●	●	○	○		
				2-wire		12 V		**Y7BWV**	**Y7BW**	●	●	○	○	—	

* Lead wire length symbols: 0.5 m ····· Nil (Example) Y59A
3 m ····· L (Example) Y59AL
5 m ····· Z (Example) Y59AZ

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

• Since there are other applicable auto switches than listed, refer to page 10-13-17 for details.
• For details about auto switches with pre-wire connector, refer to page 10-20-66.

Cylinder Specifications

Bore size (mm)		25	32	40
Fluid		Air		
Action	Cylinder	Double acting		
	Brake	Spring and pneumatic		
Operating pressure range	Cylinder	0.1 to 0.8 MPa		
	Brake	0.3 to 0.5 MPa		
Proof pressure	Cylinder	1.2 MPa		
	Brake	0.75 MPa		
Ambient and fluid temperature		5 to 60°C (No freezing)		
Piston speed		100 to 1500 mm/s (During the positioning 100 to 500 mm/s)		
Cushion		Air cushion on both sides		
Lubrication		Non-lube		
Stroke tolerance (mm)		0 to 1.8		
Piping port size	Front/Side ported	Rc 1/8		Rc 1/4
	Bottom ported	ø5	ø6	ø8

Sensor Specifications

Maximum transmission distance	20 m (In the case of using our cable as well as our controller or counter.)
Position detection method	Incremental type
Magnetic field resistance	14.5 mT
Power supply	10.8 to 13.2 VDC (Ripple less than 1%)
Current consumption	40 mA
Resolution	0.1 mm/pulse
Accuracy	±0.2 mm Note) (at 20°C)
Output type	NPN open collector (35 VDC, 80 mA)
Output signal	A/B phase difference output
Insulation resistance	500 VDC, 50 MΩ or more (between case and 12E)
Vibration resistance	33.3 Hz, 2 hours at X, Y and 4 hours at Z JIS D 1601 as standard
Impact resistance	30 G, 3 times at X, Y, Z
Enclosure	IP50 (IEC standard)
Extension cable (Option)	5 m, 10 m, 15 m, 20 m Cable: ø7, 6 core twisted pair shielded wire, oil, heat and frame resistant cable

Note) Digital error under Controller (CEU2), Counter (CEU1 or CEU5) is included. Besides, the whole accuracy after mounting on an equipment may be varied depending on the mounting condition and surroundings. As an equipment, calibration should be done by customer.

Stroke Adjusting Unit Specifications

Applicable bore size (mm)		25	32	40
Shock absorber model		RB1007	RB1412	RB1412
Maximum energy absorption (J)		5.9	19.6	19.6
Stroke absorption (mm)		7	12	12
Maximum collision speed (mm/s)		1500	1500	1500
Maximum operating frequency (cycle/min)		70	45	45
Spring force (N)	Extended	4.22	6.86	6.86
	Retracted	6.86	15.98	15.98
Operating temperature range (°C)		5 to 60		

Made to Order Specifications (For details, refer to page 10-21-1.)

Symbol	Specifications
-X416	Holder mounting bracket Ⅰ
-X417	Holder mounting bracket Ⅱ

Theoretical Output

(N)

Bore size (mm)	Piston area (mm²)	Operating pressure (MPa)						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
25	490	98	147	196	245	294	343	392
32	804	161	241	322	402	483	563	643
40	1256	251	377	502	628	754	879	1005

Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm²)

Standard Stroke

Bore size (mm)	Series	Standard stroke (mm)
25	**ML2B**	100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1200, 1400, 1600, 1800, 2000
32		
40		

It is possible to make 100 stroke up to 2000 by the 1 mm interval.

Stroke Adjusting Unit Part No.

Bore size (mm) / Unit no.	**25**	**32**	**40**
Type	MY-A25L	MY-A32L	MY-A40L

Side Support Part No.

Bore size (mm) / Type	**25**	**32**	**40**
Side support A	MY-S25A		MY-S32A
Side support B	MY-S25B		MY-S32B

Weight

(kg)

Bore size (mm)	Series	Basic weight	Additional weight per each 50 mm of stroke	Side support weight (per set)		Stroke adjusting unit weight (per unit)
				Type A	Type B	
25	**ML2B**	2.89	0.142	0.015	0.016	0.10
32		4.75	0.199	0.015	0.016	0.21
40		6.87	0.290	0.040	0.041	0.32

As for 3 point preset counter and multi counter, it will be common to CEP1 and CE1 series. For details, refer to 3 point preset counter/CEU1 on page 10-12-30, and Multi counter/CEU5 on page 10-12-27 respectively. Regarding controller, since it will be common to CE2 series, refer to Controller/CEU2 on page 10-12-54 for details.

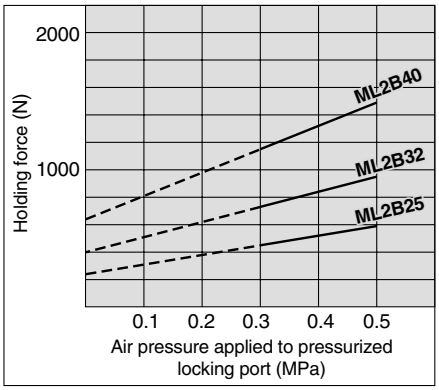
Brake Capacity

Holding Force of Spring Locking (Maximum static load)

Bore size (mm)	25	32	40
Holding force	245 N	400 N	628 N

Note) The holding force is the lock's ability to hold a static load that does not involve vibrations or impacts, when it is locked without a load.
Therefore, when normally using the cylinder near the upper limit of the holding force, be aware of the points described below.
- Select the cylinder bore size so that the load is less than 80% of the holding force.
- If the piston rod slips because the lock's holding force has been exceeded, the brake shoe could be damaged, resulting in a reduced holding force or shortened life.

Holding Force of Locking for Pneumatic and Spring



Stopping Accuracy

When the cylinder is stopped at intermediate strokes by PLC and erratic stopping positions appear. Check piston speed, load, piping conditions, control method, etc. Use values on the table below as reference.

1. ML2B + CEU2

Piston speed	100 to 500 mm/s
Stopping accuracy	±0.5 mm

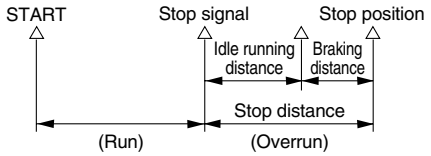
2. ML2B + PLC

Piston speed (mm/s)	100	300	500	800	1000
Stopping accuracy (mm)	±0.5	±1.0	±2.0	±3.0	±4.0

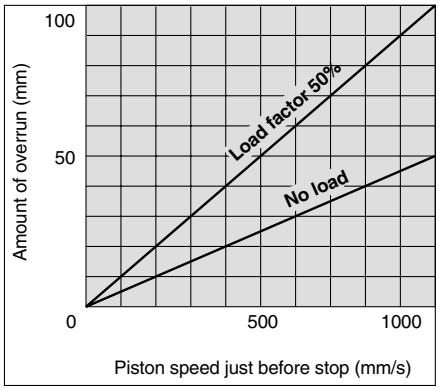
Condition/Driving pressure: 0.5 MPa
Brake releasing pressure: 0.3 MPa
Load factor: 25%
(Solenoid valve for brake releasing is connected to the cylinder directly and the dispersion of control system is not included.)

Overrun (ML2B + PLC)

When cylinder is stopped at intermediate strokes, "idle running distance" is from the detection of stop signal to beginning of brake operation and "braking distance" is from beginning of brake operation to stop of slider.

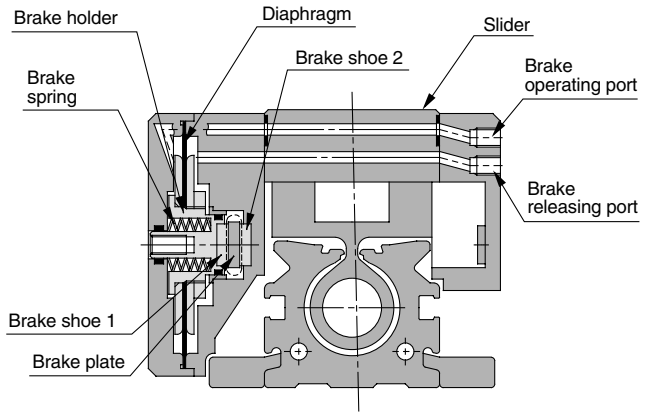


The graph below shows the relation between piston speed and overrun. (The length of overrun is changed dependent on piston speed, load, piping condition and control method. Be sure to adjust the stop signal position, etc. by trial operation with the actual machine.)



Condition/Driving pressure: 0.5 MPa
Brake releasing pressure: 0.3 MPa
Load factor: Horizontal

Working Principle of Brake Mechanism



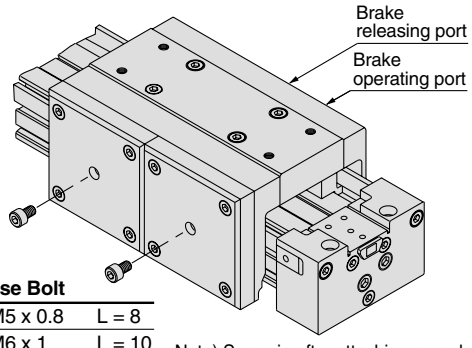
Anatomy of brake operation
Spring force generated by the brake spring and the air pressure supplied to brake operating port work on brake shoe 1 fixed to the brake holder, bend brake plate fixed on head cover on both sides, and stop slider by putting brake plate between brake shoe 1 and brake shoe 2 fixed on the slider side.

Brake release
The air pressure supplied to the brake releasing port acts on a diaphragm, extending the brake spring, and canceling the brake.

Manual Operation

[Brake releasing]
1. Supply brake releasing pressure of 0.3 to 0.5 MPa to brake releasing port on slider side.
2. Screw on appropriate hexagon socket head bolt into manual port on slide side.
3. Exhaust brake releasing air.

[Brake operation]
1. Supply brake releasing pressure of 0.3 to 0.5 MPa to brake releasing port on slider side.
2. Remove the bolt threaded into manual port.
3. Exhaust brake releasing air.



Manual Release Bolt

ML2B25	M5 x 0.8	L = 8
ML2B32	M6 x 1	L = 10
ML2B40	M8 x 1.25	L = 12

Note) Screw in after attaching a washer in the hexagon socket head cap bolt.

Cushion Capacity

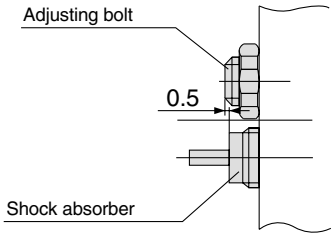
Cushion Selection

<Air cushion>
Stroke reading hy-rodless cylinder with brake is equipped with a standard air cushion.
The air cushion mechanism is incorporated to prevent excessive impact of the piston at the stroke end during high speed operation. The purpose of air cushion, thus, is not to decelerate the piston near the stroke end.
The weight and speed ranges that the air cushion can absorb are shown within the limit lines on the graph.

<Stroke adjusting unit with shock absorber>
Use this unit to decelerate the cylinder when weight and speed are beyond the air cushion limit lines or when the stroke adjustment causes limited or no cushion engagement.

⚠ Caution

1. The absorption capacity of each unit shown here is given for the mounted shock absorber when used at full stroke. When the effective stroke of the absorber decreases as a result of stroke adjustment, the absorption capacity becomes extremely small. Fix the adjusting bolt to around 0.5 mm projection from the shock absorber as shown below.



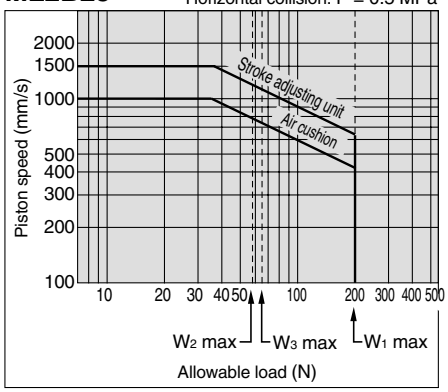
2. When the shock absorber is used within the air cushion stroke range, almost open the air cushion needle (about 1 turn from the fully closed position).

Air Cushion Stroke

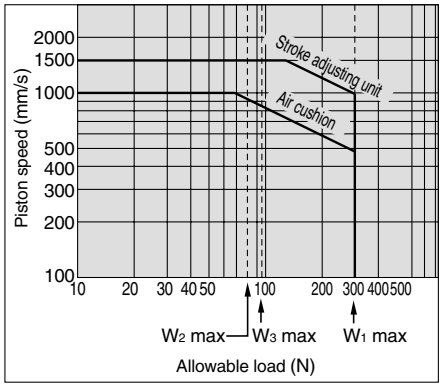
Bore size (mm)	Cushion stroke
25	15
32	19
40	24

Absorption Capacity of the Air Cushion and Stroke Adjusting Unit

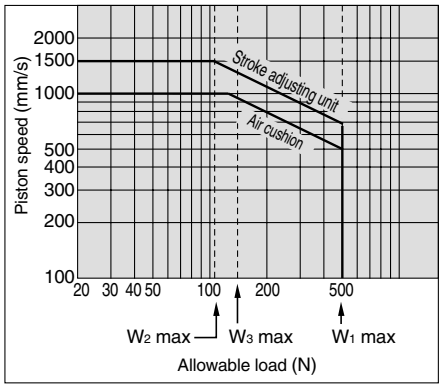
ML2B25



ML2B32



ML2B40



Tightening Torque for Stroke Adjusting Unit Holding Bolts

(N·m)

Bore size (mm)	Tightening torque
25	3
32	5
40	10

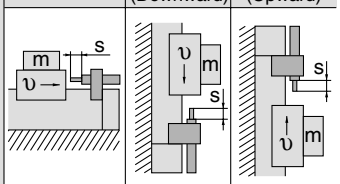
Tightening Torque for Stroke Adjusting Unit Lock Plate Holding Bolts

(N·m)

Bore size (mm)	Tightening torque
25	1.2
32	3.3
40	3.3

Calculation of Absorbed Energy for Stroke Adjusting Unit with Shock Absorber

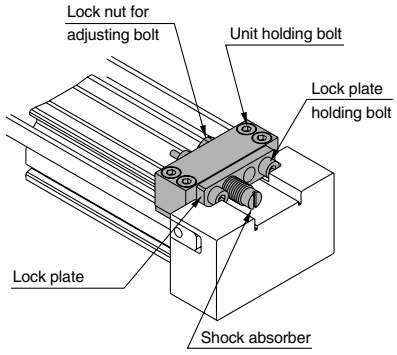
(N·m)

	Horizontal collision	Vertical collision (Downward)	Vertical collision (Upward)
Type of impact			
Kinetic energy E_1	$\frac{1}{2} m \cdot \upsilon^2$		
Thrust energy E_2	F·s	F·s + m·g·s	F·s–m·g·s
Absorbed energy E	$E_1 + E_2$		

Symbol
υ : Speed of impact object (m/s) m : Weight of impact object (kg)
F : Cylinder thrust (N) g : Gravitational acceleration (9.8 m/s²)
s : Shock absorber stroke (m)

Note) The speed of the impact object is measured at the time of impact with the shock absorber.

Adjusting Procedure



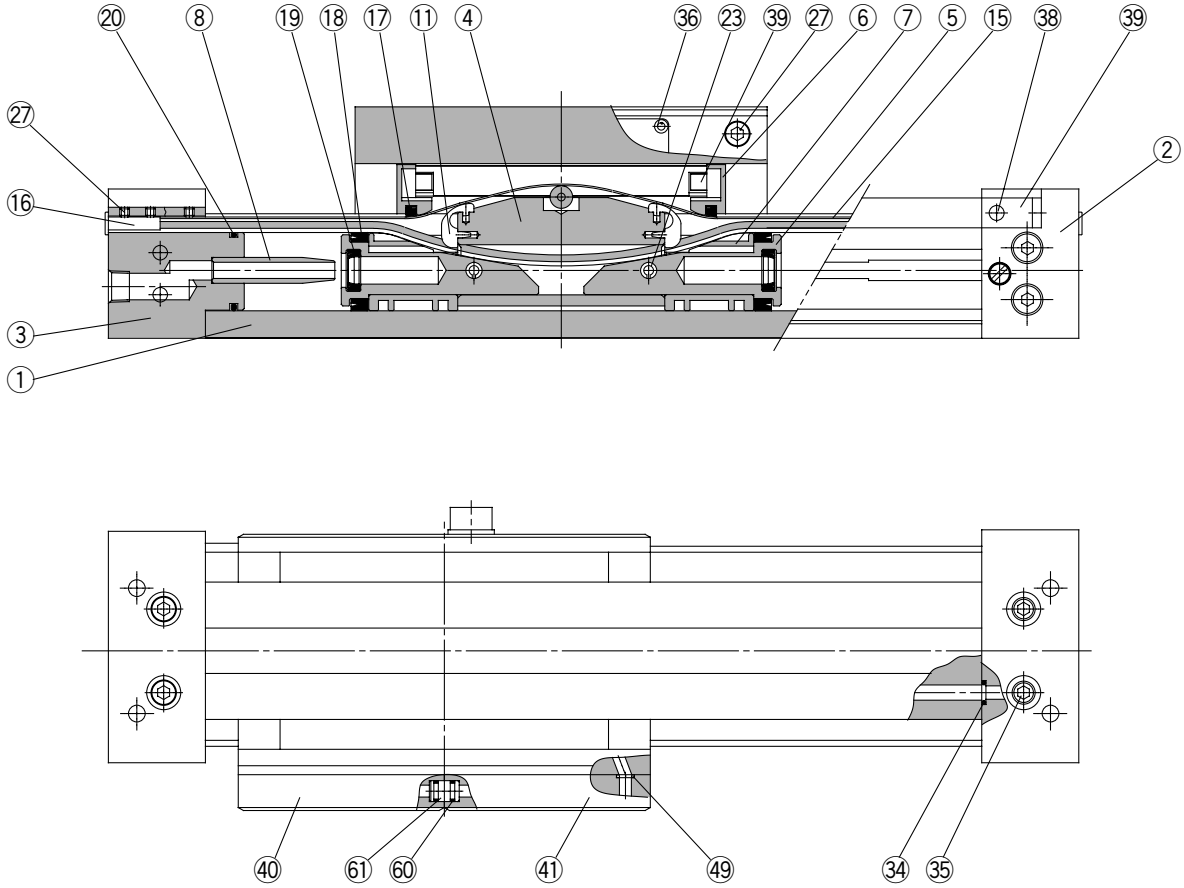
<Movement and location of stroke adjustment>
The unit body can be moved after the four unit holding bolts are loosened and can be fixed at any position by uniformly tightening the four unit holding bolts. However, there is a possibility that the adjustment mechanism will be tilted due to high impact energy.
Since the holder mounting bracket for adjustment is available as an option for -X416, -X417, we recommend that you use it. If any other length is desired, please consult with SMC. (Refer to "Tightening Torque for Stroke Adjusting Unit Holding Bolts".)

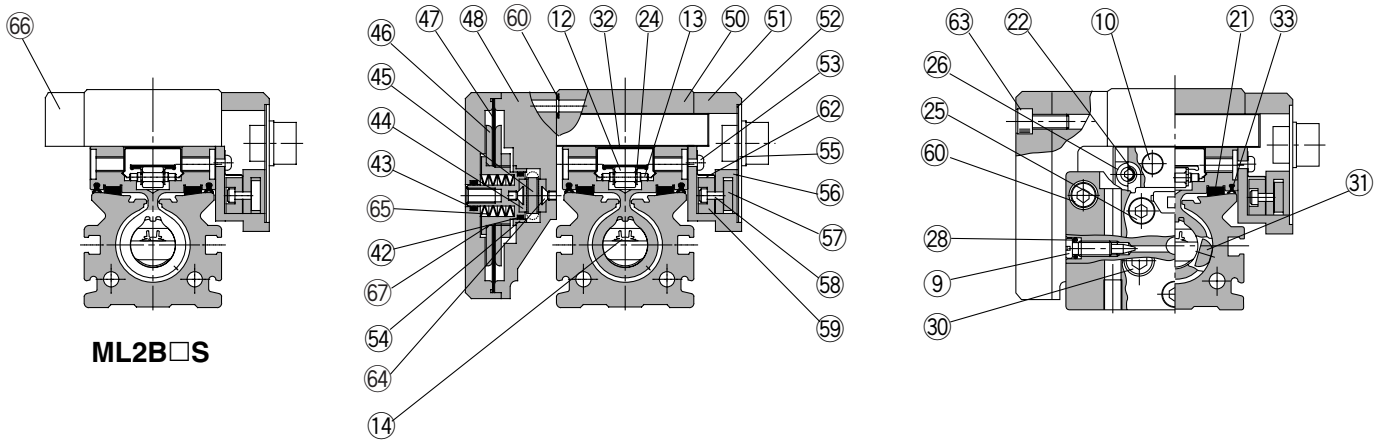
<Stroke adjustment of the adjusting bolt>
Loosen the lock nut of the adjusting bolt, adjust the stroke from the lock plate side using a wrench, then re-tighten it.

<Adjustment of shock absorber>
Loosen the two lock plate holding bolts, turn the shock absorber and adjust the stroke. Then, uniformly tighten the lock plate holding bolts and secure the shock absorber. Take care not to over-tighten the holding bolts.
(Refer to "Tightening Torque for Stroke Adjusting Unit Lock Plate Holding Bolts".)

Note)
Although the lock plate may slightly bend due to tightening of the lock plate holding bolt, this does not affect the shock absorber and locking function.

Construction





ML2B□S

Component Parts

No.	Description	Material	Qty.	Note
①	Cylinder tube	Aluminum alloy	1	Hard anodized
②	Head cover WR	Aluminum alloy	1	Glossy, self-coloring
③	Head cover WL	Aluminum alloy	1	Glossy, self-coloring
④	Piston yoke	Aluminum alloy	1	Hard anodized
⑤	Piston	Aluminum alloy	2	Hard anodized
⑥	End cover	Special resin	2	
⑦	Wear ring	Special resin	2	
⑧	Cushion ring	Stainless steel	2	Nickel plated
⑨	Cushion needle	Rolled steel	2	
⑩	Stopper	Carbon steel	4	
⑪	Belt separator	Special resin	2	
⑫	Guide roller	Special resin	1	
⑬	Guide roller shaft	Stainless steel	1	
⑯	Belt clamp	Special resin	2	
㉑	Bearing	Special resin	2	
㉒	Spacer	Stainless steel	4	
㉓	Spring pin	Carbon tool steel	2	Black zinc chromated
㉔	Type E snap ring	Cold rolled special steel strip	2	
㉕	Hexagon socket head cap screw	Chromium molybdenum steel	6	Nickel plated
㉖	Hexagon socket button head screw	Chromium molybdenum steel	4	Nickel plated
㉗	Hexagon socket head set screw	Chromium molybdenum steel	8	Nickel plated
㉙	Double round parallel key	Carbon steel	2	
㉚	Hexagon socket head taper plug	Carbon steel	6	Nickel plated
㉛	Magnet	Rare earth magnet	2	
㉜	Top cover	Stainless steel	1	
㉝	Side scraper	Special resin	2	
㉟	Hexagon socket head taper plug	Carbon steel	4	Nickel plated
㊱	Round head Phillips screw	Carbon steel	4	Nickel plated
㊲	Hexagon socket head cap screw	Carbon steel	3	Nickel plated
㊳	Parallel pin	Carbon steel	4	
㊴	Tension plate	Carbon steel	4	Nickel plated
㊵	Side cover L	Aluminum alloy	1	Hard anodized, Urban white
㊶	Side cover R	Aluminum alloy	1	Hard anodized, Urban white
㊹	Brake shoe	Special abrasion material	4	
㊺	Brake plate	Stainless steel	1	
㊻	Diaphragm shell	Stainless steel	4	
㊼	Diaphragm	NBR	2	
㊽	Brake guide	Aluminum alloy	1	Hard anodized, white
㊿	Slide table	Aluminum alloy	1	Hard anodized
(51)	Sensor body	Aluminum alloy	1	Hard anodized, white
(53)	Round head Phillips screw	Carbon steel	2	Nickel plated
(54)	Brake guide	Carbon steel	2	Gas soft treated
(55)	Connector cover	Carbon steel	1	Nickel plated
(56)	Sensor guide	Special abrasion material	1	
(57)	Scale plate A, B	Carbon steel	1	Nickel plated
(58)	Hexagon socket head cap screw	Carbon steel	2	Nickel plated
(59)	Sensor unit	—	1	
(61)	Air joint	Stainless steel	1	
(62)	Sensor holder	Carbon steel	1	
(63)	Hexagon socket head cap screw	Carbon steel	8	
(64)	Cross recessed countersunk head screw	Carbon steel	4	
(65)	Brake spring	—	2	
(66)	Side plate	Aluminum alloy	1	Hard anodized, white
(68)	Hexagon socket head cap screw	Chromium molybdenum steel	6	Nickel plated

∗ There are two dust seal bands, and part no. is different according to color of the treated "Hexagon socket head set screw" of ㉗. Please contact SMC.
A: Black zinc chromate color: MY□□-16B-Stroke
B: Nickel color: MY□□-16BW-Stroke

Seal List

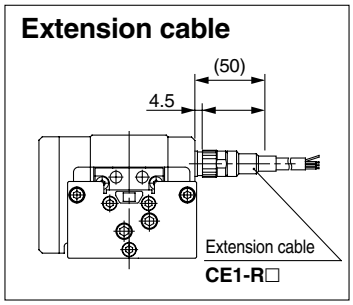
No.	Description	Material	Qty.	ML2B25	ML2B32	ML2B40
⑭	Seal belt	Special resin	1	MY25-16A-stroke	MY32-16A-stroke	MY40-16A-stroke
⑮	Dust seal band	Stainless steel	1	MY25-16B-stroke	MY32-16B-stroke	MY40-16B-stroke
⑰	Scraper	NBR	2	MYB25-15AA5900	MYB32-15AA5901	MYB40-15AA5902
⑱	Piston seal	NBR	2	GMY25	GMY32	GMY40
⑲	Cushion seal	NBR	2	RCS-8	RCS-10	RCS-12
⑳	Tube gasket	NBR	2	NLP-25-19A	NLP-32A	NLP-40A
㉘	O-ring	NBR	2	ø7.15 x ø3.75 x ø1.7	ø8.3 x ø4.5 x ø1.9	C-4
㉞	O-ring	NBR	4	P-5	P-6	C-9
㊷	O-ring	NBR	2	SO-015-16	SO-016-9	SO-015-20
㊸	O-ring	NBR	2	P-7	P-9	P-11
㊾	O-ring	NBR	1	SO-010-16	SO-010-21	SO-010-24
(52)	Connector guide	NBR	1	M2L025-07B82106	M2L032-07B82107	M2L040-07B82108
(60)	O-ring	NBR	6	SO-010-20	SO-010-21	SO-010-24
(67)	O-ring	NBR	2	ø17.6 x ø19.4 x ø0.9	ø22.2 x ø24 x ø0.9	ø28 x ø30 x ø1

∗ Since there is a possibility of improper operation, please contact SMC regarding the replacement of seals.

Dimensions

Basic style

ML2B **Bore size** — **Stroke**

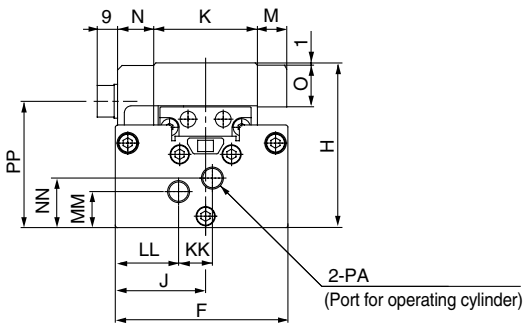


Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
ML2B25	110	220	206	42	138	93.5	30	73	76.5	40	46	45.5	30.9	16	69	41	106	30	16	11	14.5	63.5	22	24	16	28
ML2B32	140	280	264	51	168	107.5	37	88	91	46.5	58	54	32.4	15	84	56	133	35	19	15	16	77.5	27	32	19	32
ML2B40	170	340	322	59	204	130.5	45	106	110	55	68	64	41.4	19	102	68	164	40	23	16.5	22	95	35	37	23	36

Model	KK	LL	MM	NN	OO	PP	QQ	RR	MA	LA	MB	LB	MC	LC	MD	LD	ND	PA	PB
ML2B25	15	28	16	22	9	56	34.5	37.5	M5 x 0.8	11	M6 x 1	9.5	M5 x 0.8	9.5	9	5.5	5.6	Rc 1/8	Rc 1/16
ML2B32	16	30.5	21.5	26	10	62.5	42	45	M6 x 1	12	M8 x 1.25	16	M6 x 1	12	11	6.5	6.8	Rc 1/8	Rc 1/16
ML2B40	17.5	37.5	24.5	37.5	23	77	51	54	M8 x 1.25	14	M10 x 1.5	15	M8 x 1.25	12	14	8.5	8.6	Rc 1/4	Rc 1/8

With stroke sensor:

ML2B **Bore size** **S** — **Stroke**



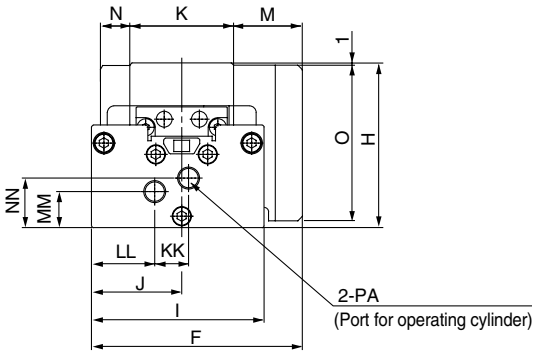
(mm)

Applicable cylinder	F	H	J	K	M	N	O
ML2B25	76.5	73	40	46	13	16	18.5
ML2B32	91	88	46.5	58	15	15	19.5
ML2B40	110	106	55	68	19	19	21.5

Applicable cylinder	KK	LL	MM	NN	PA	PP
ML2B25	15	28	16	22	Rc 1/8	56
ML2B32	16	30.5	21.5	26	Rc 1/8	62.5
ML2B40	17.5	37.5	24.5	37.5	Rc 1/4	77

With brake:

ML2B **Bore size** **B** — **Stroke**



(mm)

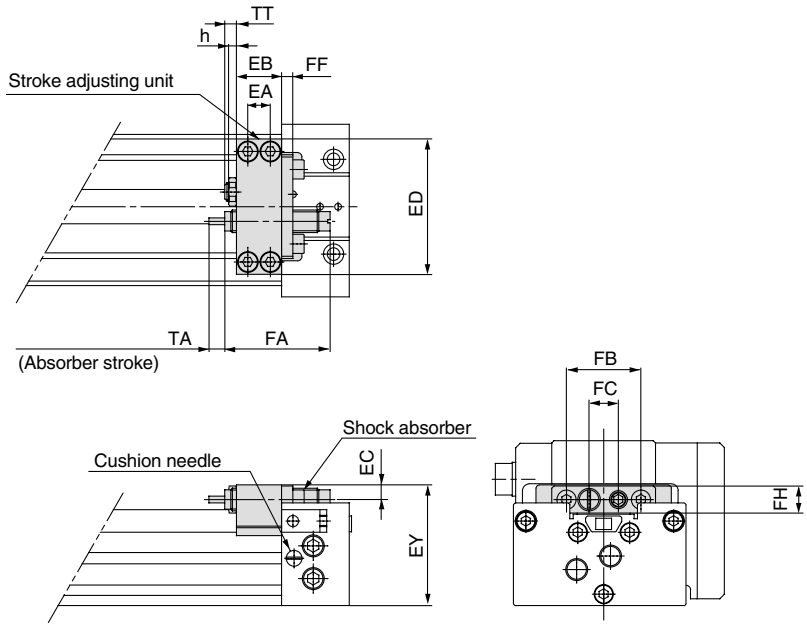
Applicable cylinder	F	H	I	J	K	M	N
ML2B25	93.5	73	76.5	40	46	30.5	16
ML2B32	107.5	88	91	46.5	58	32	15
ML2B40	130.5	106	110	55	68	41.5	19

Applicable cylinder	O	KK	LL	MM	NN	PA
ML2B25	69	15	28	16	22	Rc 1/8
ML2B32	84	16	30.5	21.5	26	Rc 1/8
ML2B40	102	17.5	37.5	24.5	37.5	Rc 1/4

Stroke Adjusting Unit

With shock absorber:

ML2B **Bore size** **S** — **Stroke** **L**

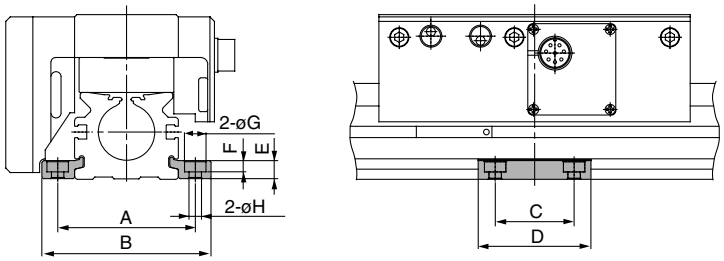


(mm)

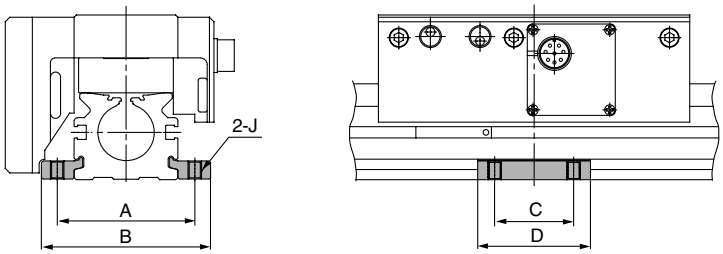
Applicable cylinder	h	EA	EB	EC	ED	EY	FA	FB	FC	FF	FH	TA	TT
ML2B25	3.5	10	20	6.5	60	53.5	46.7	33	13	6	12	7	Max. 16.5
ML2B32	4.5	12	25	8.5	74	67	67.3	43	17	6	16	12	Max. 20
ML2B40	4.5	15	31	9.5	94	81.5	67.3	43	17	6	16	12	Max. 25

Dimensions

Side support A
MY-S□A



Side support B
MY-S□B



(mm)

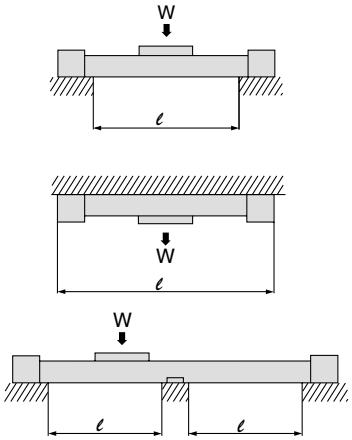
Part no.	Applicable cylinder	A	B	C	D	E	F	G	H	J
MY-S25$^{A}_{B}$	ML2B25	61	75	35	50	8	5	9.5	5.5	M6 x 1
	ML2B32	70	84							
MY-S32$^{A}_{B}$	ML2B40	87	105	45	64	11.7	6	11	6.6	M8 x 1.25

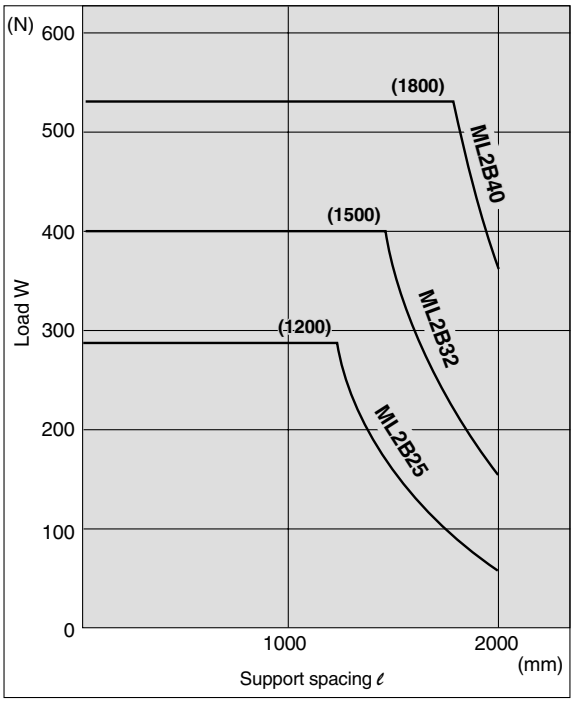
Guide for Side Support Application

For long stroke operation, the cylinder tube may be deflected depending on its own weight and the load weight. In such a case, use a side support in the middle section. The spacing (ℓ) of the support must be no more than the values shown in the graph on the right.

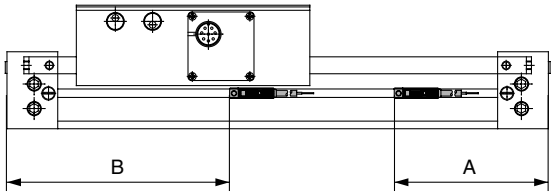
⚠ Caution

If the cylinder mounting surfaces are not measured accurately, using a side support may cause poor operation. Therefore, be sure to level the cylinder tube when mounting.
If there is vibration, impact, etc. at long stroke, we recommend adoption of side support even if it is within the allowable value shown in the graph.





Proper Auto Switch Mounting Position (Detection at stroke end)



Auto switch model / Bore size (mm)	D-Z7□/Z80 D-Y59□/Y69□ D-Y7P/Y7PV D-Y7□W D-Y7□WV	
	A	**B**
25	91	131.5
32	102.5	180
40	126.5	206

Operating Range

Auto switch model	Bore size (mm)		
	25	**32**	**40**
D-Z7□/Z80	12	12	12
D-Y59□/Y69□ **D-Y7P/Y7PV** **D-Y7□W/Y7□WV**	6	6	6

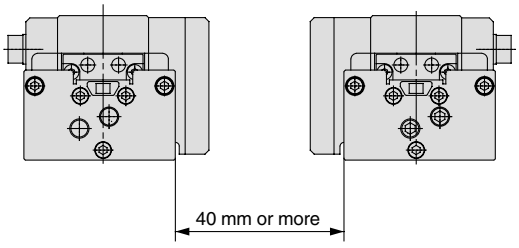
∗ Since this is a guideline including hysteresis, not meant to be guaranteed. (assuming approximately ±30% dispersion.)
There may be the case it will vary substantially depending on an ambient environment.

⚠ Caution on Handling Auto Switch

1. Always connect the auto switch to the power supply after the load has been connected.

2. Use caution not to apply excessive impact forces by dropping and bumping when handling.

3. When more than 2 pcs cylinders with auto switches are juxtaposed, leave the distance of 40 mm or more between the cylinder tubes as shown in the below.



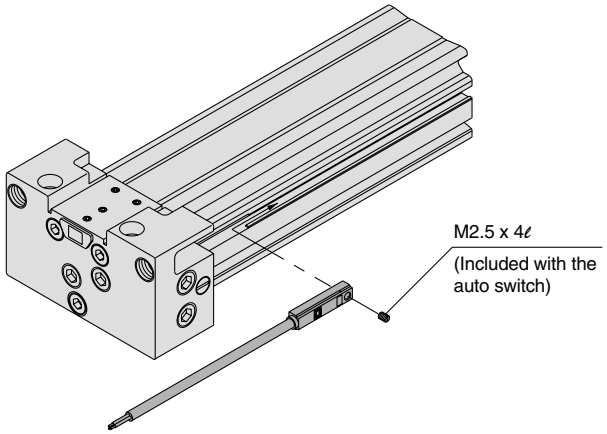
4. Avoid wiring patterns in which bending stress and pulling force are repeatedly applied to the lead wires.

5. Please consult with SMC when using in locations where water or coolant liquid, etc is splashing constantly.

6. Avoid the use in locations where the large amount of magnetism is occurring.

Mounting of Auto Switch

When mounting and securing auto switches, they should be inserted into the cylinder's switch mounting rail from the direction shown in the drawing below. After setting in the mounting position, use a flat head watchmakers' screwdriver to tighten the set screw that is included.



Note) When tightening an auto switch mounting screw, use a watchmakers' screwdriver with a handle of approximately 5 to 6 mm in diameter.
Also, tighten with a torque of about 0.05 to 0.1 N·m. As a guide, turn about 90° past the point at which tightening can first be felt.

Other than the applicable auto switches listed in "How to Order", the following auto switches can be mounted. For detailed specifications, refer to page 10-20-1.

Type	Model	Electrical entry (Fetching direction)	Features
Reed switch	D-Z80	Grommet (In-line)	Without indicator light

∗ Normally closed (NC = b contact), solid state switch (D-Y7G/Y7H type) are also available. For details, refer to page 10-20-41.