Mechanical Joint Rodless Cylinder with Brake

Hy-Rodless Cylinder

Series ML1

ø25, ø32, ø40

Brake mechanism has been compactly integrated into the slide table which enables intermediate stops of the rodless cylinder.

Large holding brake force

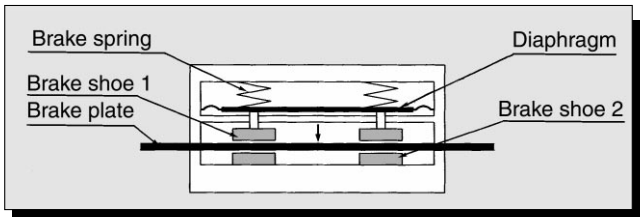
Force from 4 brake springs hold slide tightly.

Holding force ø25—320N
ø32—500N
ø40—800N

Refer to "Holding force" on p.4.7-6.

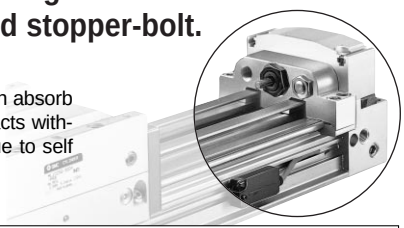
Brake construction is designed not to allow loads on guide.

Spring force works directly on the brake-shoe and the brake plate is caught between brake shoes from top and bottom so that the slide table can stop without compromising guide performance. The brake shoe yields long service life due to special friction resistant material.



Stroke adjusting unit: Built-in shock absorber and stopper-bolt.

Shock absorber can absorb small to large impacts without adjustments due to self compensation.



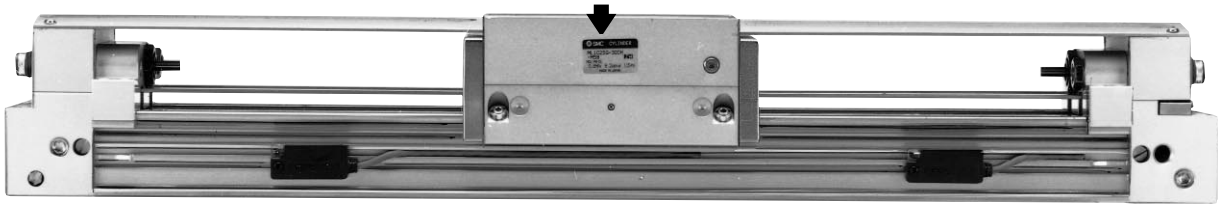
Refer to "Stroke adjusting unit specifications" on p.4.7-5 and "Cushion capacity" on p.4.7-7.

Stop is possible at the arbitrary position.

Refer to "Stopping accuracy" on p.4.7-6.

Lock is possible in both directions.

Lock is possible in each direction of cylinder stroke.



Many kinds of auto switches are applicable.

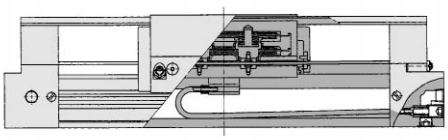
Reed switch—D-E7□A, D-E80A
Solid state switch—D-M5
2 color indication solid state switch—D-M5□W
Timer equipped solid state switch—D-M5□TL

Cam follower guide style

Cam follower style guide mechanism adopted.
Excellent moment resistance.

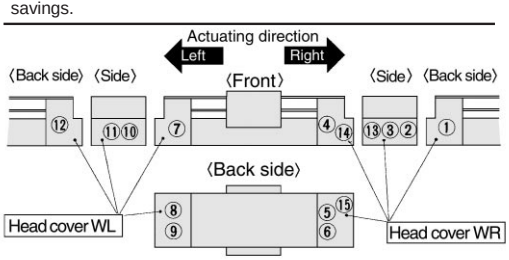
External air piping for brake release not required.

Brake releasing air flows from head cover to slide table through air tube in cylinder body. There is no restriction on piping requirements because piping to the outside of the slide table is not necessary.



Centralized piping style "High degree of freedom".

Air connections can be done at one end for additional space savings.



	Piping port	Side table direction	Piping port number
A	Actuating port	Left	③④⑤⑦⑧⑩
B	Actuating port	Right	①②⑥⑨⑪⑫
C	Brake release port	—	⑬⑭⑮

There are 6 actuating ports and 3 brake release ports at head cover WR, and 6 actuating ports on the head cover WL. The most suitable piping position can be selected by choosing each 1 port from A, B, C and combining them.

Made to Order Specifications	Refer to p.5.4-79 for "Made to Order Specifications" of series ML1.	①Long stroke (-X B11) ②Holder mounting bracket (-X $\frac{416}{417}$)

Prior to Use

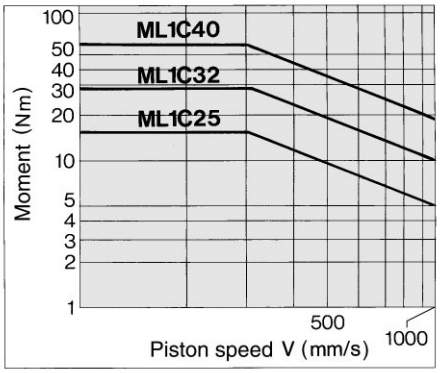
Max. allowable moment/Max. payload

Model	Allowable monent (Nm)			Max. payload (kg)			
	M1	M2	M3	W1	W2	W3	W4
ML1C25	14.7	4.90	4.90	20	12	3	10
ML1C32	29.4	9.80	9.80	32	19	5	16
ML1C40	58.8	19.6	19.6	50	30	8	25

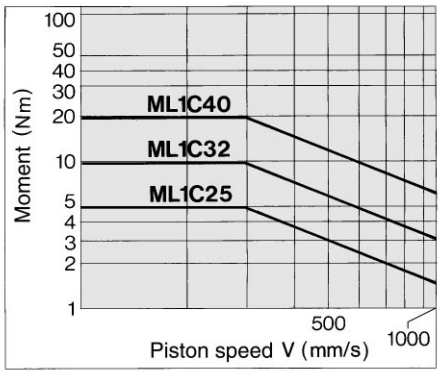
Max. Allowable Moment

Select the moment within the limits shown in the graphs below. Note that the maximum payload value in some cases may exceed Max. allowable payload despite being within the limit shown in the graph; therefore, payload on the operating conditions should be checked.

ML1C/M1



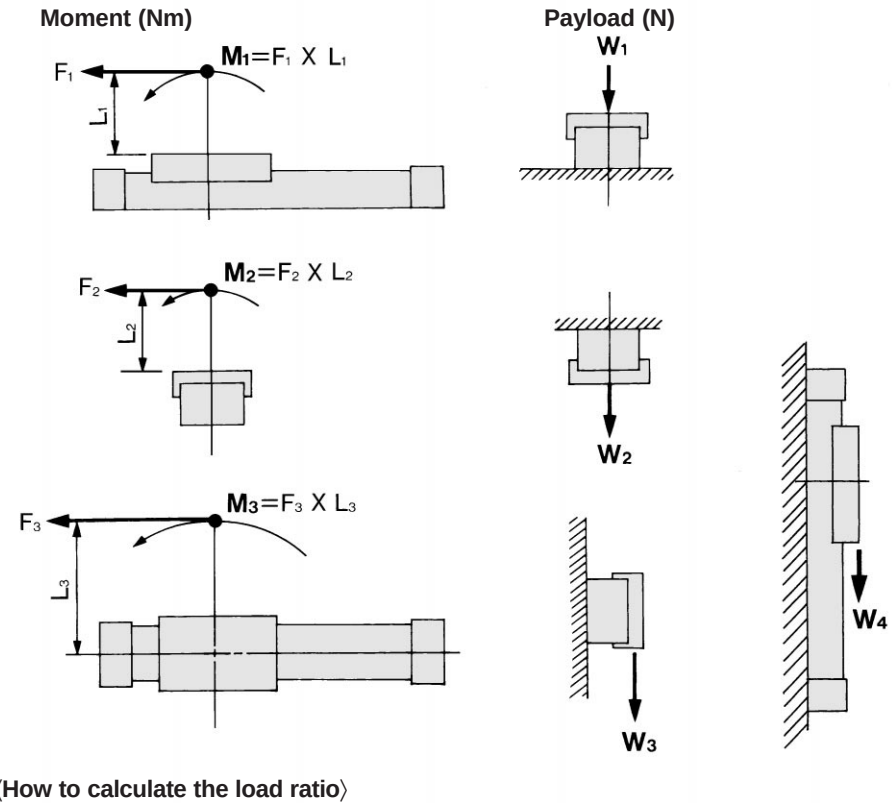
ML1C/M2,M3



Design Consideration

Allowable moment and Max. payload

Allowable moment and Max. payload varies depending on mounting orientation, piston speed etc. Therefore, use the cylinder within the range shown in the graph corresponding to operating conditions.



⟨How to calculate the load ratio⟩

A. Consider ① Max. payload, ② static moment, ③ dynamic moment (when stopper collides) when calculating the Max. allowable moment and payload.
∗Evaluate ① and ② as υa (average speed), and ③ as υ (collision speed υ=1.4υa). Calculate ① (Wmax) from the graph of Max. payload (W_1, W_2, W_3) and calculate ② and ③ (Mmax) from the graph of Max. allowable moment.

$$\text{Sum of load ratio } \Sigma\alpha = \frac{\text{Payload [m]}}{\text{Max. payload [mmax]}} + \frac{\text{Static moment [M]}^{(1)}}{\text{Static allowable moment [Mmax]}} + \frac{\text{Dynamic moment [ME]}^{(2)}}{\text{Dynamic allowable moment [MEmax]}} \leqq 1$$

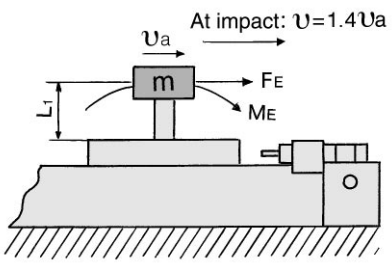
Note 1) Moment generated by load, etc. when the cylinder stops.
Note 2) Moment generated by load equivalent to impact at stroke end (when stopper collides).
Note 3) In some shapes of workpiece, there are cases where more than one moment is generated, and sum of load ratio ($\Sigma\alpha$) includes those cases.

B. Reference calculation [Dynamic moment at impact]
Refer to following calculation for dynamic moment considering the impact when stopper collides.

W: Weight (kg)
F: Load (N)
F_E: Load equivalent to impact (N)
υ_a: Average speed (mm/s)
M: Static moment (Nm)
υ: Collision speed (mm/s)
L_1: Distance to center of load gravity (m)
M_E: Dynamic moment (Nm)
g: Gravitational acceleration (9.8m/s2)

$\upsilon = 1.4\,\upsilon_a$(mm/s) $\quad F_E = \frac{1.4}{100}\upsilon_{ag}W$

$$\therefore M_E^{(4)} = \frac{1}{3} F_E L_1 = 0.05\upsilon_a W L_1 \text{(Nm)}$$

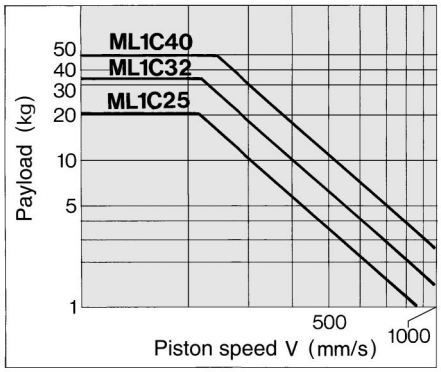


Note 4) Average load ratio (This is for averaging Max. load moment when stopper collides in case of calculating the life.)

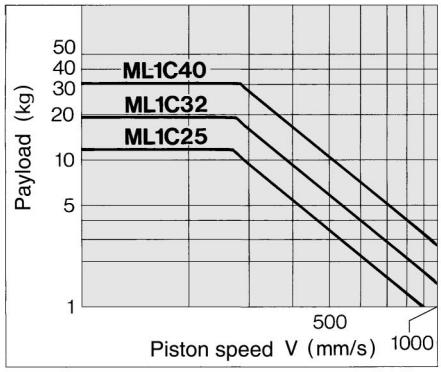
Max. Payload

Select the Max. payload to be applied within the limits shown in the graph. Note that the maximum allowable moment may in some cases exceed Max. allowable moment despite being within the limit shown in the graph: therefore, allowable moment on operating conditions should be checked.

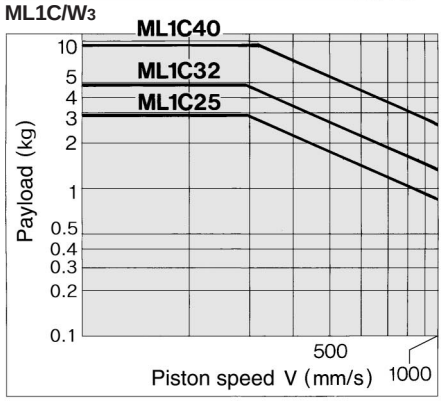
ML1C/W1



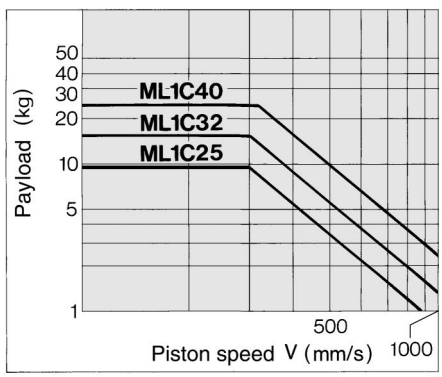
ML1C/W2



ML1C/W3



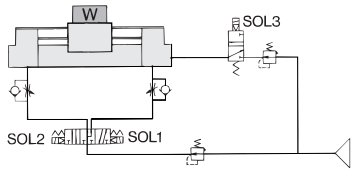
ML1C/W4



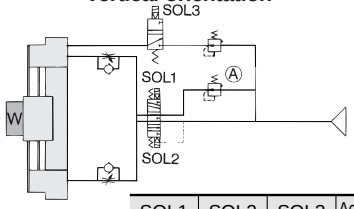
Precautions for Air Pressure Circuit Design

[Recommended pneumatic circuit example]

Horizontal orientation



Vertical orientation



SOL1	SOL2	SOL3	Actuation
OFF	OFF	OFF	STOP
ON	OFF	ON	To left
OFF	ON	ON	To right

∗Be sure to use the circuit above.
Consult SMC in case of using other circuits.

Solenoid valve for actuating and braking

<Solenoid valve for actuating>

Horizontal orientation

Use pressure center style valve.

Control the operation with a meter-out system.

Vertical orientation

Use exhaust center style valve (external pilot style or direct operated style).

<Solenoid valve for braking>

- The Cv factor of the solenoid valve used for braking should be almost the same level as that of the solenoid valve for actuating. If the Cv factor is smaller, it may cause unexpected sudden slide table movements.
- Install a solenoid valve for braking as close to the cylinder as possible. If there is a long distance between the cylinder and valve, it may cause fluctuations in the stop accuracy or unexpected sudden slide table movements.

<Recommended solenoid valve examples>

	Horizontal	Vartical
Actuating	VFS2500	VFS2400R
Braking	VP300 or VFS2100	

∗ Determine the size of the solenoid valve according to the operating cylinder speed.

Air balance

On both above mentioned circuits, the air balance is made by pressurizing to both sides of cylinder on the condition of the intermediate stop. In case of the vertical orientation, reduce the pressure of the upside by the regulator Ⓐ to keep the balance of load. If the air balance is not made, it may cause unexpected sudden slide table movements after the intermediate stop operation, once the reverse operation occurs, resulting in compromised accuracy of the cylinder.

Supply pressure

- Set the supply pressure at 0.25 to 0.5MPa. If setting at less than 0.25 MPa. malfunction of the release brake may occur.
- If air is directly supplied from main line, pressure fluctuation on the main line will directly influence to cylinder operation characteristics. Accordingly, install a regulator before the actuating/braking valve so that regulated air is supplied to cylinder. If many cylinders are operated, use large flow regulators and a surge tank may be installed for better operation.

⚠Precautions

Be sure to read before handling.
Refer to p.0.39 to 0-46 for Safety Instructions and common precautions.

Operation

⚠Caution

①Even though Hy-rodless cylinder can be loaded within the Max. allowable payload, precise alignment is required if connected to a payload which has external support structure.

②Due to factory pre-adjusted guide and brake plate, re-adjustment is not required under normal operating conditions. Accordingly, do not change the setting on adjustment section.

③Do not operate the cylinder in an environment in which the cylinder will be exposed to cutting chips, dust (paper debris, lint, etc.), spatter, or cutting fluid (light oil, water, warm water, etc.), which could lead to operational problems.

④It is recommended that grease be applied periodically to the sliding portion of the bearing and to the dust seal band to increase their service life.

⑤Under operating conditions in which a vacuum is created in the cylinder through external forces or inertia, be aware that air could leak out through the separation of the seal belt.

Precautions for Mounting

⚠Caution

①Take care not to mark or damage the outside surface of the cylinder tube. This may result in damaged bearings or scraper, which will cause cylinder malfunction.

②Take care not to apply any loads to the dust proof cover. It can cause a cylinder malfunction.

③Because the slider is supported by a precision bearing system, take care not to apply a strong impacts or excessive moments to the table when loading a workpiece.

Mechanical Joint Rodless Cylinder with Brake

Hy-Rodless Cylinder

Series ML1

ø25, ø32, ø40

How to Order

Hy-rodless cylinder (with brake) ML1C [25] G— [300] [ ] [ ] — [E73A] [ ]

Cylinder bore size

ø25	25mm
ø32	32mm
ø40	40mm

Number of auto switches

—	2
S	1
n	n

Standard stroke

Bore size (mm)	Standard stroke* (mm)	Max. stroke (mm)
ø25	100, 200, 300, 400, 500, 600, 700, 800, 900, 1000	2000
ø32	100, 200, 300, 400, 500, 600, 700, 800, 900, 1000	2000
ø40	100, 200, 300, 400, 500, 600, 700, 800, 900, 1000	2000

*When the required stroke is longer than the standard stroke , refer to the specifications for Made to Order ① (p.5.4-79) longer stroke styles.

Stroke adjusting unit

—	Without adjusting unit
H	Shock absorber+Adjusting bolt

Shock absorber for stroke adjusting unit

ø25	ø32	ø40
RB1412	RB2015	RB2015

Number of stroke adjusting units

—	2
S	1

Auto switch

—	Without auto switch (Built-in magnet is standard)

Applicable Auto Switches Refer to p.5.3-2 for further information on auto switch.

Style	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage DC	Load voltage AC	Auto switch model	Lead wire (m) 0.5 (—)	Lead wire (m) 3 (L)	Lead wire (m) 5 (M)	Applicable load	
Reed	—	Grommet	Yes	3 wire	—	—	**E76A**	●	●	—	IC	Relay PLC
				2 wire	24V 12V	100V	**E73A**	●	●	—	—	
			No		5V 12V	100V or less	**E80A**	●	●	—	IC	—
Solid state	—	Grommet	Yes	3 wire (NPN)	24V 5V 12V	—	**M5N**	●	●	●	IC	Relay PLC
				3 wire (PNP)			**M5P**	●	●	●		
				2 wire		12V	**M5B**	●	●	●	—	
	Diagnosis indication (2 color)			3 wire (NPN)		5V 12V	**M5NW**	●	●	●	IC	
				3 wire (PNP)			**M5PW**	●	●	●		
				2 wire		12V	**M5BW**	●	●	●	—	
	With timer			3 wire (NPN)		5V 12V	**M5NT**	—	●	●		
				3 wire (PNP)			**M5PT**	—	●	●		

Lead wire length symbol 0.5m·····— (Ex.) M5P
3m····· L M5PL
5m····· Z M5PZ

Auto Switch Mounting Bracket

Cylinder bore size (mm)	Mounting bracket Part No.	Note	Applicable swich
ø25 ø32 ø40	**BMY1-025**	●Switch mounting screw M2.5 X 10ℓ ●Switch mounting nut	D-E73A/76A/80A
	BMY2-025	●Switch mounting screw M2.5 X 12ℓ ●Switch mounting nut	D-M5N/M5P/M5B D-M5NW/M5PW/M5BW D-M5NTL/M5PTL

Options

Stroke Adjusting Unit

Cylinder bore size (mm)	ø25	ø32	ø40
Part No.	ML1-A25H	ML1-A32H	ML1-A40H

Side Support

Bracket \ Bore (mm)	ø25	ø32	ø40
Side support A	MY-S25A	MY-S32A	MY-S40A
Side support B	MY-S25B	MY-S32B	MY-S40B

Refer to p.4.7-9 for the detailed information on size etc.

Cylinder Specifications

Bore size (mm)		ø25	ø32	ø40
Guide mechanism		Cam follower guide		
Fluid		Air		
Action		Double acting		
Operating pressure range (MPa)		0.1 to 0.8		
Proof pressure (MPa)		1.2		
Ambient and fluid temperature		5 to 60°C		
Operating piston speed (mm/s)		100 to 1000		
Cushion		Air cushion at both sides (Standard)		
Lubrication		Non-lube		
Stroke length tolerance (mm)		$^{+1.8}_{0}$		
Port size Rc (pt)	Front port, Side port, Bottom port	1/8		1/4

Brake Specifications

Locking mechanism	Spring lock (Exhaust lock)
Fluid	Air
Max. operating pressure (MPa)	0.5
Brake releasing pressure (MPa)	0.25
Braking pressure (MPa)	0.18
Braking direction	Both directions

Stroke Adjusting Unit Specifications

Applicable cylinder size		ø25	ø32	ø40
Stroke fine adjusting range		Any position on the entire stroke		
Stroke fine adjusting range (mm)		0 to –11.5	0 to –12	0 to –16
Shock absorber model		RB1412	RB2015	RB2015
Max. absorbing energy (J)		19.6	58.8	58.8
Absorption stroke (mm)		12	15	15
Max. collision speed (mm/s)		1000	1000	1000
Max. operating frequency (cycle/min)		45	25	25
Spring Force (N)	When extended	6.86	8.34	8.34
	When retracted	15.98	20.50	20.50
Operating temperature range		5 to 60°C		

Made to Order Specifications

Refer to p.5.4-18 and 5.4-108 for Made to Order Specifications of ML1.

Weight

Unit: kg

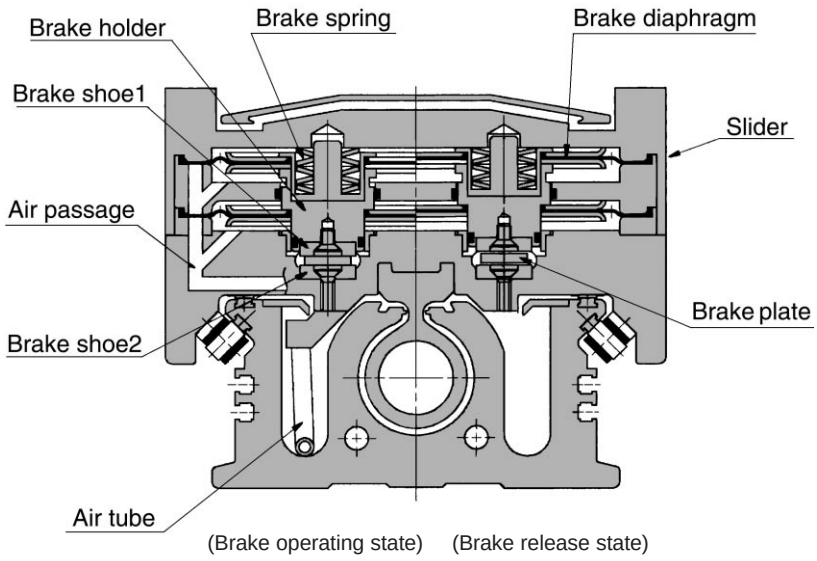
Bore size (mm)	Base weight	Additional weight per 50 stroke increments	Side support bracket weight		Stroke adjusting unit weight (per unit)
			A type	B type	
ø25	3.86	0.275	0.015	0.016	0.25
ø32	6.05	0.425	0.040	0.041	0.41
ø40	8.38	0.545	0.076	0.080	0.50

Theoretical Force

Unit: N

Bore size (mm)	Piston area (mm^2)	Operating pressure (MPa)						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
ø25	490	98	147	196	245	294	343	392
ø32	804	161	241	322	402	483	563	643
ø40	1256	251	377	502	628	754	879	1005

Brake Operating Principles



〈**Braking**〉
Brake force is generated by a brake spring acting on a brake shoe 1 attached to brake holder, brake rails and holds brake plate between brake shoe 1 and brake shoe 2 fixed to slider side so that slider will stop.

〈**Brake releasing**〉
Air pressure supplied from the head cover side goes to the slide table through the air tube and acts on the brake diaphragm, reducing the spring force and releasing the brake.

Brake Capacity

Holding force (Max. static load)

Bore size (mm)	ø25	ø32	ø40
Holding force	320N	500N	800N

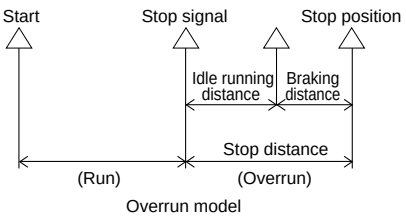
①Holding force is the force which can hold a static load which does not involve vibration or shock in the locking condition with cylinder pressure balanced. Therefore, cylinder application is around the max. holding force. Please note the following points.
- Select the cylinder bore size so that the load is less than 80% of the holding force.
- If slipping occurs when the load is over holding force, the brake shoe will be damaged, and it is possible the holding force will become smaller or the cylinder life shortened.

Allowable kinetic energy

Bore size (mm)	ø25	ø32	ø40
Allowable kinetic energy (J)	0.43	0.68	1.21

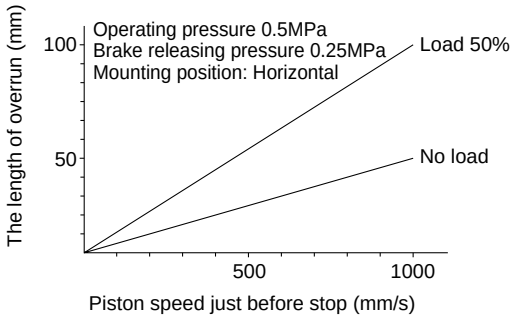
Overrun

Overrun



Overrun model

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



The length of overrun

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

Stop dispersion

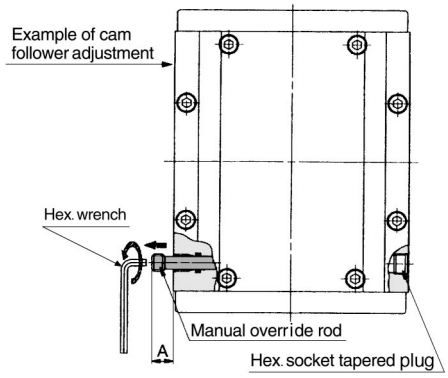
When cylinder is stopped at intermediate stroke, there is dispersion of stop position. Dispersion of stop position is changed dependent on piston speed, load, piping condition and control method. Use values on the table below as reference.

Stopping accuracy

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

Conditions: Operating pressure 0.5MPa
Brake releasing pressure 0.25MPa
Load 25%
Solenoid valve: Installed on the brake release port
Dispersion of control system is disregarded.

Manual Override Operation



⚠ Warning

In case of manual operation, be sure to supply air for brake releasing. If not, this may result in damage to the brake, which will cause a cylinder malfunction.

Brake releasing

①Supply the air for releasing the brake to the air supply port on the head cover. This air should be 0.4 to 0.5MPa.

②Loosen the manual override (nickel plated) rod on the slide table, and draw the rod until it reaches to the end. The size of the hexagon wrench should be 3mm (ML1C25, 32) or 4mm (ML1C40).

③Exhaust the air to release the brake.

Manual rod drawing dimensions

Part No.	A
ML1C25	23
ML1C32	27
ML1C40	32

Operation of brake

①Supply the air for releasing brake to braking air supply port on the head cover. This should be 0.4 to 0.5MPa.

②Screw the manual rod into the slide table completely.

③Exhaust the air for brake releasing.

Cushion Ability

Cushion sizing

<Air cushion>

Air cushion is standard on Hy-rodless cylinder. Air cushion is installed to prevent the impact which occurs as the piston is stopped at the stroke end with a large moment. Air cushion is not applied for slow piston operation around the stroke end. A range of the weights a and speeds that an air cushion can absorb is within the limits shown in the graph, "Air cushion absorbing capacity".

<Stroke adjustment unit with shock absorber>

When weight and speed are over the air cushioning capacity, or when impact absorption is over the air cushion stroke caused by stroke adjustment use shock absorbers.

Notes)

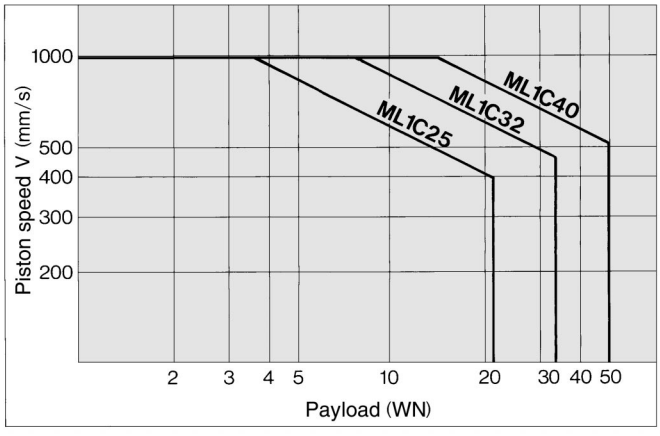
①Adjust the shock absorber so that stroke will be fully utilized to near the limit of allowable energy, because absorption capacity becomes extremely small if the absorber's effective stroke is short due to a stroke adjustment.

②In case of using a shock absorber within the range of the air cushion stroke, revolve the air cushion needle thoroughly (1 revolution from the end).

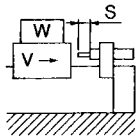
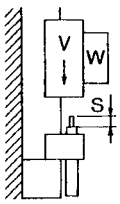
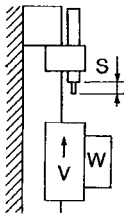
Air cushion stroke (mm)

Bore size	Cushion stroke
ø25	15
ø32	19
ø40	24

Air cushion absorbing capacity



Stroke adjusting unit with shock absorber/ Calculation of absorbed energy

	Horizontal impact	Vertical impact (down)	Vertical impact (up)
Configuration of impact			
Oparating energy E_1	$\frac{W}{2g}V^2$		
Thrust energy E_2	Fs	Fs+Ws	Fs-Ws
Absorbing energy E	E_1+E_2		

Symbols

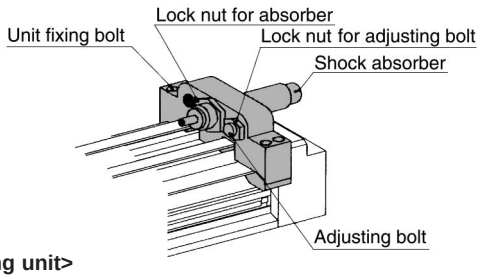
V: Impact speed (m/s) g: Gravitational acceleration (9.8m/s^2)

W: Impact mass amount (kg) F: Cylinder thrust (N)

s: Stroke length of shock absorber (m)

Note) "Impact speed" means the speed at point of collision with shock absorber.

How to Adjust



<Moving and fixing unit>

Remove the dust proof cover, loosen the four fixing bolts to move the unit body. Tighten four fixing bolts to fix the unit body with equal tightening torque. However, there is a possibility that the adjustment mechanism will be tilted due to high impact energy. We recommend a holder mounting bracket for adjustments. Holder mounting bracket for adjustments is available as an option. (Please add "-X461" or "-X417" suffix to the part number.) If any other length is required, please consult SMC.

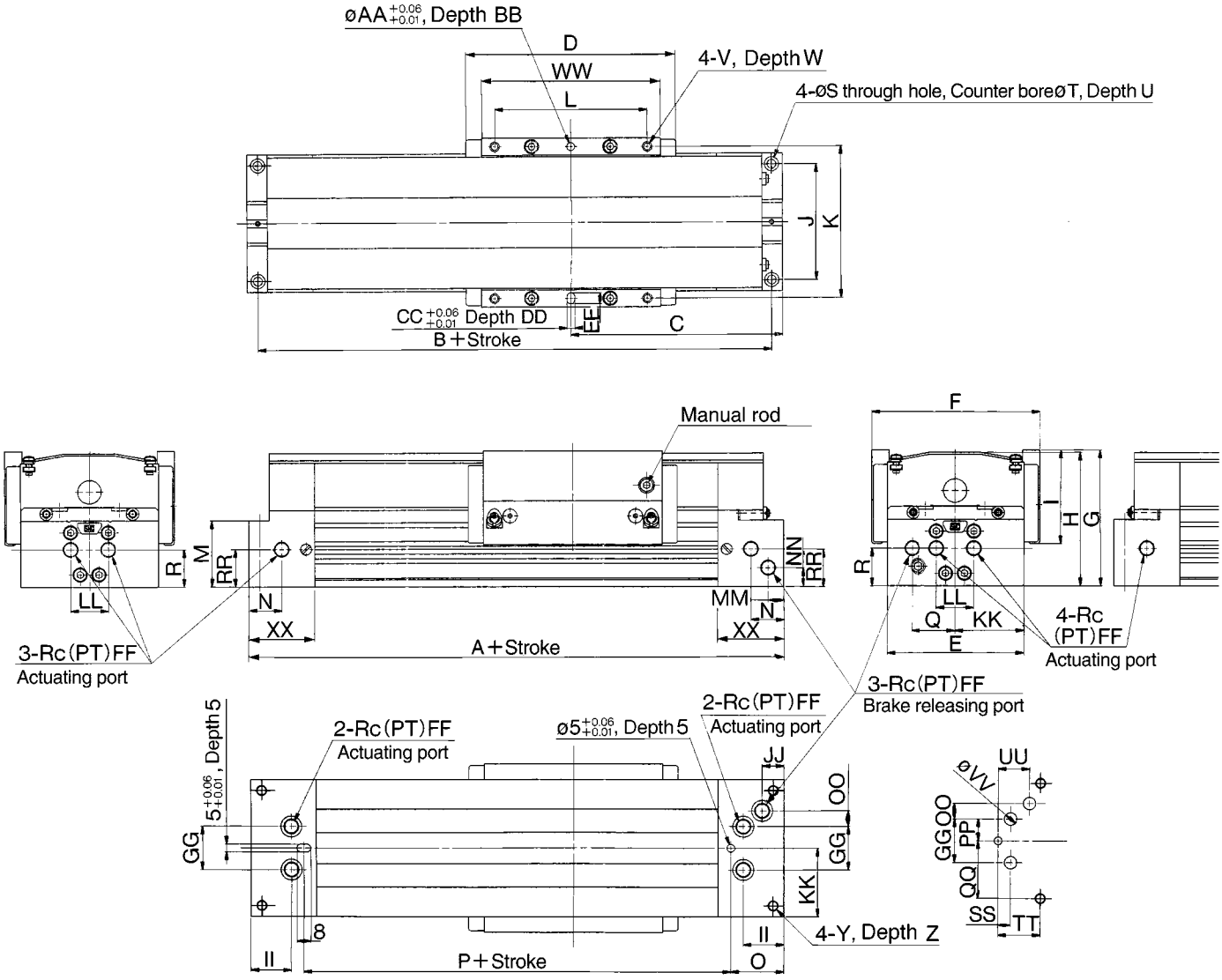
<Stroke adjustment of adjusting bolt >

After loosening the lock nut for adjusting bolt, adjust the stroke with hexagon wrench. Then, tighten lock nut.

<Stroke adjusting of shock absorber>

After loosening the lock nut for the shock absorber, adjust the stroke by rotating shock absorber, then fix the shock absorber by tightening lock nut. Do not over tighten the lock nut.

Basic Style



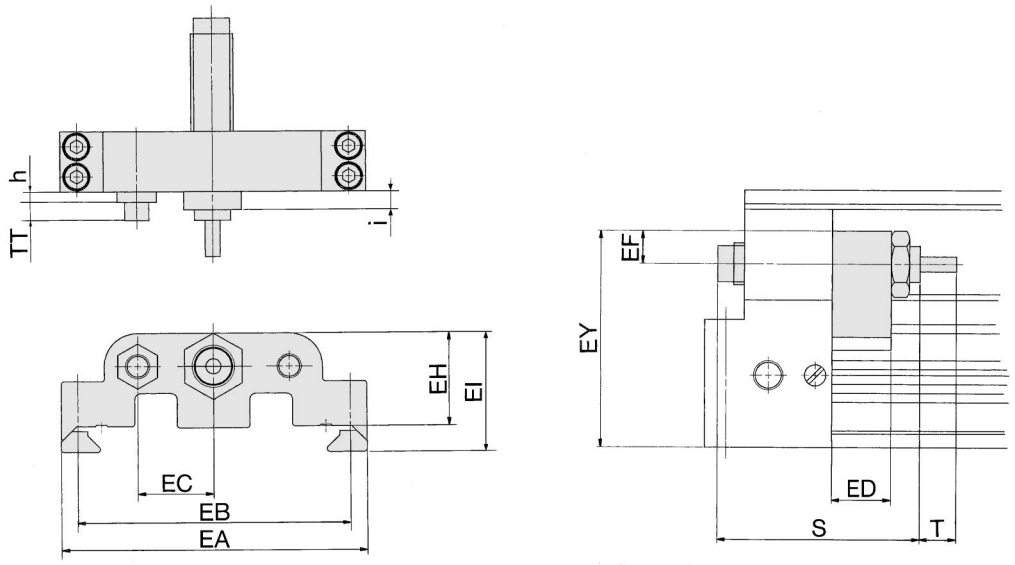
Bottom side piping port size
Mounting side should be processed according to the dimensions below.

Model	OO	PP	QQ	RR	SS	TT	UU	VV	Gasket
ML1C25	10	14	37	24	8	27	20	ø8	C11.2
ML1C32	16.5	18	46	30	12	32	22	ø8	C11.2
ML1C40	17	23.5	53	40	12.5	34	26	ø10	C14

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Y	Z
ML1C25	274	260	137	140	88	108	87	85.5	60	74	97	100	42.5	26	34	206	28	24	ø5.6	ø9	5.5	M5 X 0.8	8.5	M6 X 1	9.5
ML1C32	322	306	161	160	108	131	101	99.5	64	92	118	120	53.5	28	40	242	36.5	30	ø6.8	ø11	6.6	M6 X 1	12	M8 X 1.25	16
ML1C40	372	354	186	190	124	158	118	116.5	73	106	144	140	64	30.5	43	286	40.5	35	ø8.6	ø14	8.5	M8 X 1.25	14	M10 X 1.5	15

Model	AA	BB	CC	DD	EE	FF	GG	II	JJ	KK	LL	MM	NN	WW	XX
ML1C25	ø5	5	5	5	7	1/8	28	26	14	44	20	16	12.5	120	42
ML1C32	ø6	5	6	5	8	1/8	36	28	18	54	36	18	12.5	140	48
ML1C40	ø6	5	6	5	8	1/4	47	30.5	17	62	30	22	16.5	170	51

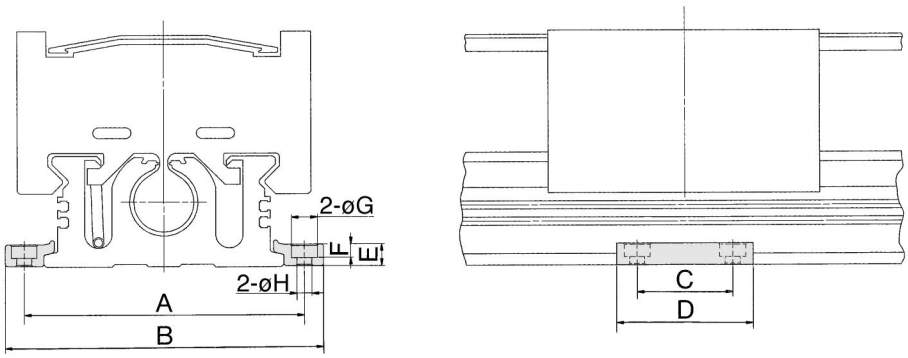
Stroke Adjusting Unit



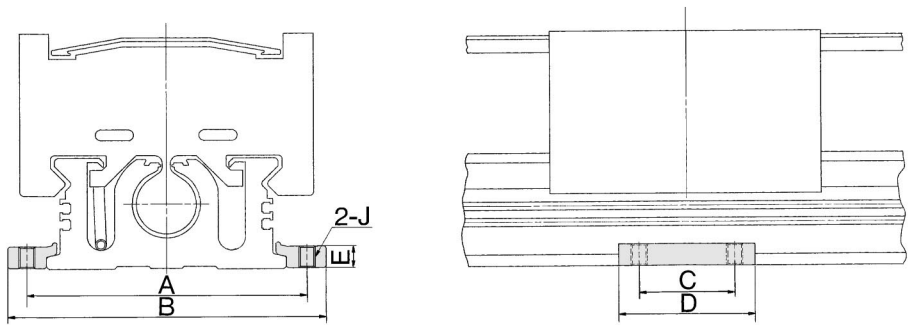
Part No.	Cylinder	EA	EB	EC	ED	EF	EY	S	T	EH	EI	TT	h	i	Absorber model
ML1-A25H	**ML1C25**	101	90	25	20	11	72	67.3	12	31	39.5	MAX. 16.5	4.5	3	RB1412
ML1-A32H	**ML1C32**	120	107	30	25	16	93	73.2	15	38	49	MAX. 20	5.5	6	RB2015
ML1-A40H	**ML1C40**	147	129	30	31	16	105.5	73.2	15	40.5	54.5	MAX. 25	5.5	6	

Side Support

Side support A



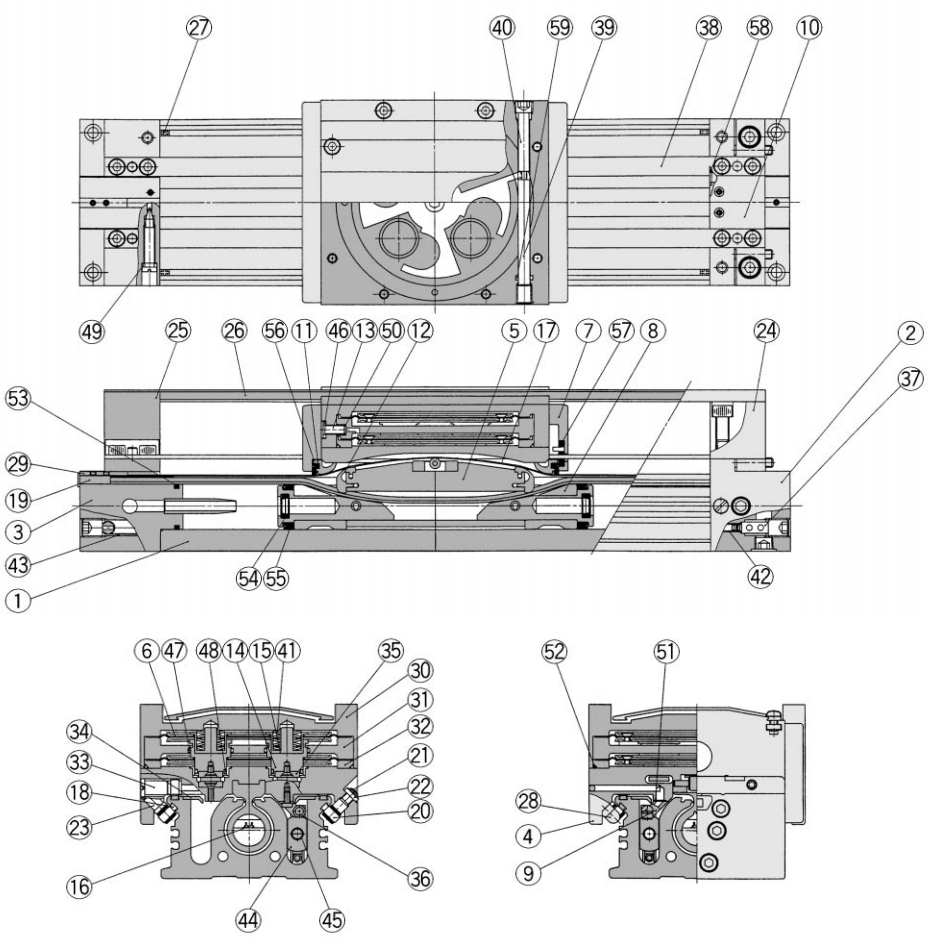
Side support B



(mm)

Part No.	Cylinder	A	B	C	D	E	F	øG	øH	J
MY-S25$^{A}_{B}$	**ML1C25**	103	117	35	50	8	5	9.5	5.5	M6 X 1
MY-S32$^{A}_{B}$	**ML1C32**	128	146	45	64	11.7	6	11	6.6	M8 X 1.25
MY-S40$^{A}_{B}$	**ML1C40**	148	170	55	80	14.8	5	14	9	M10 X 1.5

Construction



Component Parts

No	Description	Material	Note
①	Cylinder tube	Aluminum alloy	Hard anodized
②	Head cover WR	Aluminum alloy	Hard anodized
③	Head cover WL	Aluminum alloy	Hard anodized
④	Side table	Aluminum alloy	Hard anodized
⑤	Piston assembly	Aluminum alloy	Hard anodized
⑥	Brake diaphragm assembly	—	
⑦	End cover	Chrome molybdenum steel	Nickel plated
⑧	Wear ring	Special resin	
⑨	Air joint assembly	—	
⑩	Plate tensile table	Rolled steel	Nickel plated
⑪	Back up plate	Special resin	
⑫	Belt separator	Special resin	
⑬	Port joint	Stainless steel	
⑭	Brake holder assembly	Carbon steel	Gas soft nitrided
⑮	Spring holder	Carbon steel	Gas soft nitrided
⑯	Seal belt	Special resin	
⑰	Dust seal band	Stainless steel	
⑱	Rail	Hard steel wire	
⑲	Belt clamp	Special resin	
⑳	Cam follower	—	
㉑	Eccentric screw cap	Stainless steel	
㉒	Lock nut	Stainless steel	
㉓	Bushing	Stainless steel	
㉔	Dust proof cover mount table R	Aluminum alloy	Hard anodized
㉕	Dust proof cover mount table L	Aluminum alloy	Hard anodized
㉖	Dust proof cover	Aluminum alloy	Hard anodized
㉗	End spacer	Special resin	
㉘	Magnet assembly	Aluminum alloy	Anodized
㉙	Seal lock plate	Rolled steel	Nickel plated
㉚	Slider cover assembly	Aluminum alloy	Hard anodized
㉛	Diaphragm plate assembly	Aluminum alloy	Chromated
㉜	Diaphragm ring	Aluminum alloy	Chromated (ø25only)

Component Parts

No	Description	Material	Note
㉝	Cam follower cap	Aluminum alloy	Hard anodized
㉞	Tube cover	Aluminum alloy	Hard anodized
㉟	Brake shoe	Special brake lining	
㊱	Joint ring	Stainless steel	
㊲	Air coupler 2	Stainless steel	
㊳	Brake disc	Stainless steel	Hard chrome plated
㊴	Manual rod 1	Carbon steel	
㊵	Manual rod 2	Carbon steel	
㊶	Brake spring		
㊷	Air tube	Special resin	
㊸	Cable	Stainless steel	
㊹	Tube guide assembly		
㊺	Guide rod	Stainless steel	

Replacement Parts

No	Description	Material	ML1C25G	ML1C32G	ML1C40G
㊻	O ring	NBR	C-7	C-7	C-7
㊼	O ring	NBR	SO-015-22	SO-015-24	SO-020-31
㊽	O ring	NBR	SO-015-16	SO-016-9	SO-015-20
㊾	Needle gasket	NBR	8.3 X 4.5 X 1.9	C-4	C-4
㊿	O ring	NBR	SO-010-16	SO-010-16	SO-010-16
(51)	O ring	NBR	SO-010-16	C-6	C-8
(52)	O ring	NBR	C-100	AS568-048	C-150
(53)	Tube gasket	NBR	NLP-25-19A	NLP-32A	NLP-40A
(54)	Cushion seal	NBR	RCS-8	RCS-10	RCS-12
(55)	Piston sael	NBR	GMY25	GMY32	GMY40
(56)	Scraper 1	NBR	M1L025-17A82076	M1L032-17A82077	M1L040-17A82078
(57)	Scraper 2	NBR	M1L025-17B82076	M1L025-17B82076	M1L040-17B82078
(58)	Bypass gasket	NBR	C-6	C-7	C-9
(59)	O ring	NBR	P-6	P-6	P-8

Auto Switch Specifications

Refer to p.5.3-2 for the details of auto switch.

Applicable auto switch

Style	Model	Electrical entry	Indicator	Page
Reed switch	**D-E7□A**	Grommet (In-line)	Yes	5.3-24
	D-E80A		No	5.3-24
Solid state	**D-M5**	Grommet (In-line)	Yes	5.3-41
	D-M5□W		Yes (2 color indication)	5.3-47
	D-M5□TL		Yes (With timer)	5.3-62

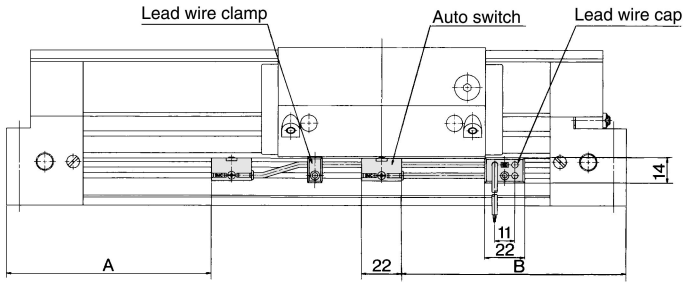
MK/MK2
RSQ/RSG
RSH
CE1
CE2
ML2B
ML1C
REA
REC
RHC
MTS
CC

⚠ Precautions

Be sure to read before handling.
Refer to p.0-44 to 0-46 for common precautions of auto switch.

Mounting Position (Stroke End)/Reed Switch

D-E73A (L), D-E76A (L), D-E80A (L)



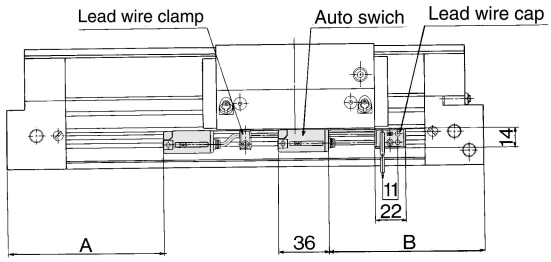
Lead wire clamp/Lead wire cap (option)

Series	Lead wire clamp	Lead wire cap
ML1C	LC-01	LP-01

Series	Mounting position	ø25	ø32	ø40
ML1C	A	128.5	152.5	177.5
	B	123.5	147.5	172.5

Mounting Position (Stroke End)/Solid State Switch

D-M5B (L), D-M5N (L), D-M5P (L)
D-M5BW (L), D-M5NW (L), D-M5PW (L)
D-M5NTL, D-M5PTL



Lead wire clamp/Lead wire cap (option)

Series	Lead wire clamp	Lead wire cap
ML1C	LC-01	LP-01

Unit: mm

Series	Mounting position	ø25	ø32	ø40
ML1C	A	124.8	148.8	173.8
	B	113.2	137.2	162.2