

Plate Cylinder with Lock

Series *MLU*

ø25, ø32, ø40, ø50



New release-plate cylinder (oval piston) with lock
Ideal for maintaining supply pressure to prevent
dropping of the load when residual pressure is released.

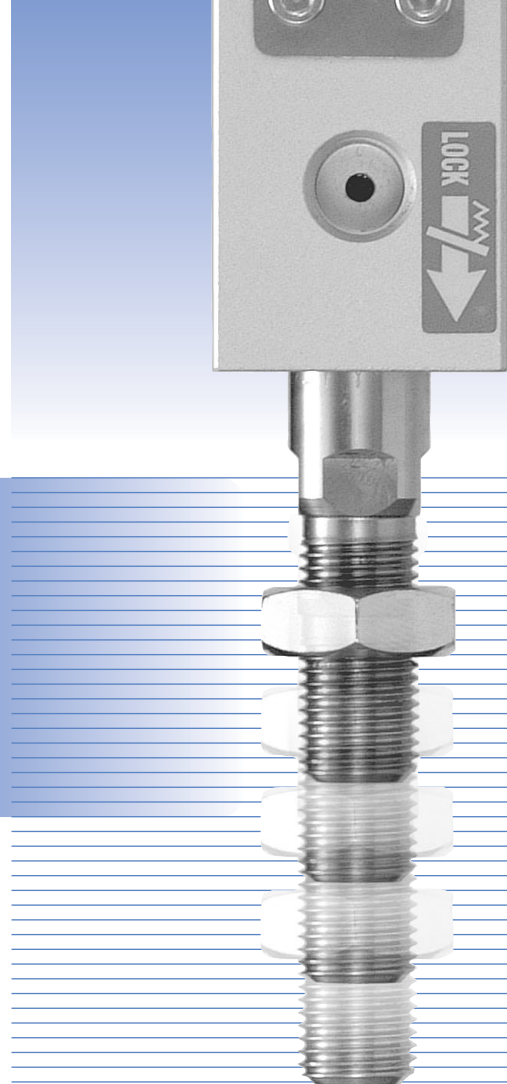
Plate Cylinder with Lock Series *MLU*

ø25, ø32, ø40, ø50

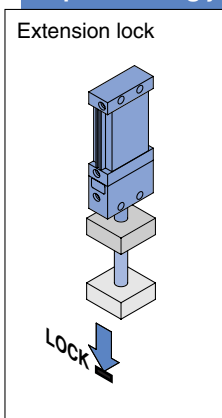
Drop prevention is possible at any point of stroke.

Cylinder can be locked at any desired position.

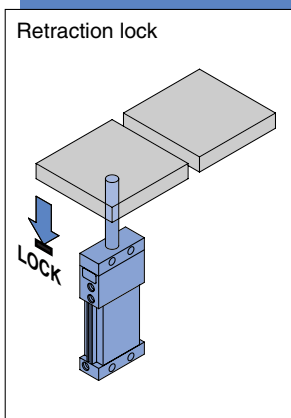
- Drop prevention for middle stroke emergency stops
- Lock positions can be changed to accommodate the position of the external stopper and the thickness of the clamped work piece.



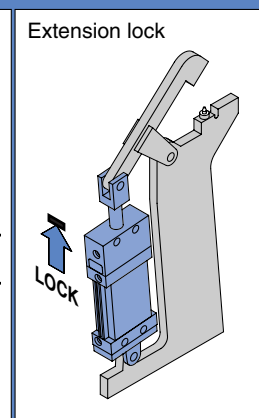
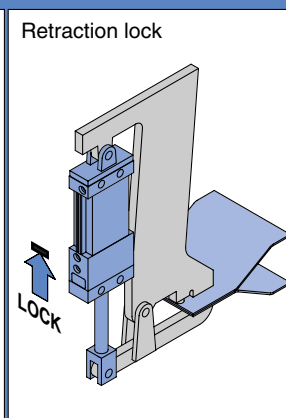
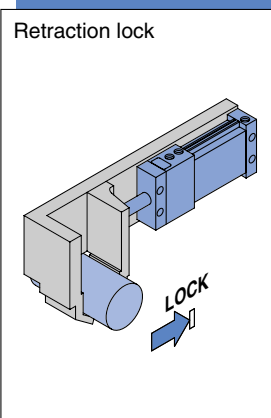
Drop prevention for press fitting jig



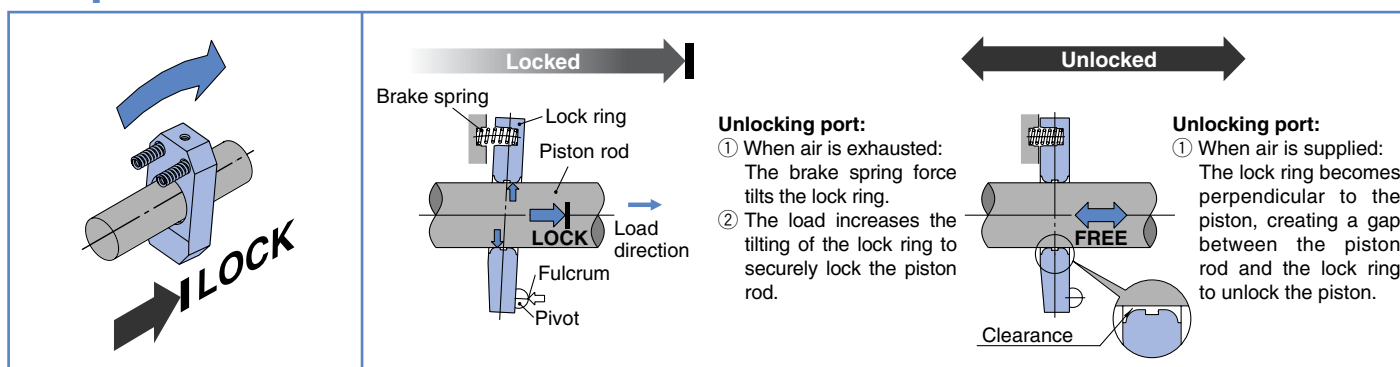
Drop prevention for litter



Holding clamped and unclamped positions



Simple construction: Simple and reliable locking system



Slim and compact lock unit

• Lock unit length

35mm to 50.5mm

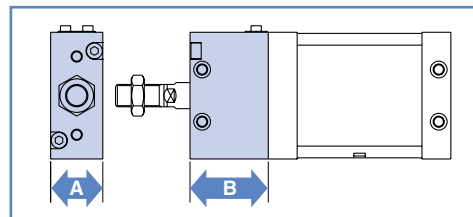
• Lock unit width

24mm to 39mm

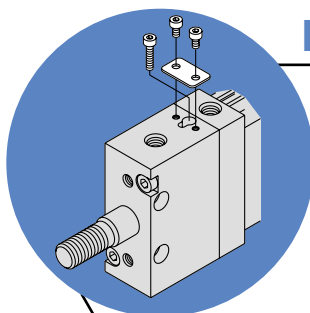
The compact lock unit does not protrude beyond the cylinder body surface.

Lock unit thickness (mm)

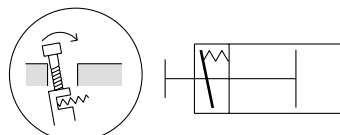
Bore size (mm)	A	B
25	24	35
32	28	42
40	32	44
50	39	50.5



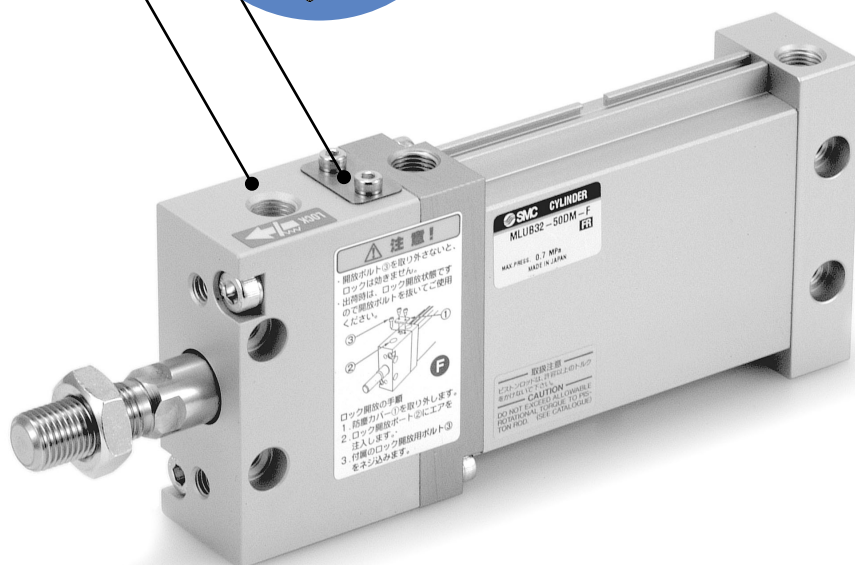
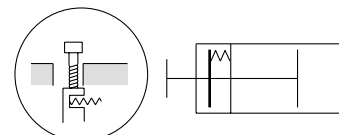
Easy manual unlocking



Locked

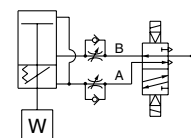


Unlocked

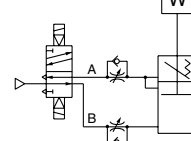


Locking direction can be selected.

Extension lock



Retraction lock



Various mounting brackets to accommodate wide range of applications.

Foot type



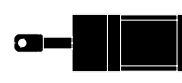
Flange type



Clevis type



Knuckle joint

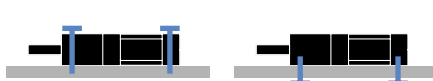


Flexible mounting: Possible to mount on all surfaces except for the one with ports

Bottom mounting type



Side mounting type



Axial surface mounting



Series Variations

Series	Locking direction	Bore size (mm)	Standard stroke (mm)															
			5	10	15	20	25	30	35	40	45	50	75	100	125	150	175	200
MLU	Extension lock	25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		32	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Retraction lock	40	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		50	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Plate Cylinder with Lock

Series *MLU*

ø25, ø32, ø40, ø50

How to Order

Without Auto Switch

MLU **B** **25** **30** **D** **F**

With Auto Switch

MDLU **B** **25** **30** **D** **F** **J79W** **S**

Built-in magnet

Mounting

B	Standard
L	Axial foot type
F	Front flange type
G	Rear flange type
C	Single clevis
D	Double clevis

Size

25	Pressure receiving area equivalent to that of ø25 type
32	Pressure receiving area equivalent to that of ø32 type
40	Pressure receiving area equivalent to that of ø40 type
50	Pressure receiving area equivalent to that of ø50 type

Port thread type

Nil	M threads	ø25
TN	Rc	ø32, ø40, ø50
	NPT	

Stroke (mm)

Refer to page 2 for standard strokes and intermediate strokes.

Action

D	Double acting
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Number of auto switches

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

Auto switch

Nil	Without auto switch (built-in magnet cylinder)
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*Select auto switch, models from the table below.

*The auto switch is packed together when shipped (unmounted).

Locking direction

F	Extension locking
B	Retraction locking

Rod end shape

Nil	Rod end female thread
M	Rod end male thread

Auto switch specifications

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Rail mount		Lead wire length (m) *				Applicable load	
					DC		AC	Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)	None (N)		
Reed switch	—	Grommet	Yes	3-wire (NPN equiv.)	—	5V	—	—	A76H	●	●	—	—	IC circuit	—
			No	2-wire		24V	—	200V	A72	A72H	●	●	—		
		Yes	12V		100V		A73	A73H	●	●	●	—			
		No	5V, 12V		100V or less		A80	A80H	●	●	—	—			
		Connector	—		—		A73C	—	●	●	●	●			
		5V, 12V	24V or less	A80C	—	●	●	●	●						
Diagnostic indication (2-color display)	Grommet	Yes	—	—	A79W	—	●	●	—	—					
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24V	5V, 12V	—	F7NV	F79	●	●	○	—	IC circuit	Relay, PLC
				3-wire (PNP)				F7PV	F7P	●	●	○	—		
		Connector		2-wire		12V		F7BV	J79	●	●	○	—	—	
	Diagnostic indication (2-color display)	Grommet		3-wire (NPN)		5V, 12V		F7N WV	F79W	●	●	○	—	IC circuit	
				3-wire (PNP)				—	F7PW	●	●	○	—		
				2-wire		12V		F7B WV	J79W	●	●	○	—	—	
								—	F7BA	—	●	○	—		
				3-wire (NPN)		5V, 12V		F7BAV	—	—	●	○	—	IC circuit	
								—	F7NT	—	●	○	—		
				With timer		Grommet		5V, 1 2V	—	F79F	●	●	○	—	
								—	—	F7LF	●	●	○	—	
	With diagnostic output (2-color display)	4-wire (NPN)		—		—		P5DW	—	●	●	—			
	Latch type with diagnostic output (2-color display)					—		—	—	—	—				
	Magnetic field resistant (2-color display)	2-wire		—		—		—	—	—	—	—			

*Lead wire length symbols 0.5m.....Nil (Example) A73C
3m.....L (Example) A73CL
5m.....Z (Example) A73CZ
None.....N (Example) A73CN

*Solid state switches marked with a "O" symbol are produced upon receipt of order.

*D-P5DW type can only be mounted on the types for tubing of ø40 and ø50.
Only D-P5DW is mounted when shipped.

Cylinder Specifications



Size	25	32	40	50
Action	Double acting single rod			
Fluid	Air			
Proof pressure	1.05MPa			
Maximum operating pressure	0.7MPa			
Minimum operating pressure	0.2MPa (Note)			
Ambient and fluid temperature	-10 to 60°C (with no freezing)			
Lubrication	Non-lube			
Cushion	Rubber bumper (standard)			
Rod end thread tolerance	JIS class 2			
Stroke length tolerance	$+1.4$ 0			
Piston speed	50 to 500mm/s			
Cylinder port size	M5 x 0.8	Rc, NPT, 1/8	Rc, NPT, 1/4	

Note) The minimum operating pressure of the cylinder is 0.1MPa when the cylinder and lock are connected to separate ports.

Lock Specifications

Size	25	32	40	50
Locking action	Spring locking (exhaust locking)			
Unlocking pressure	0.2MPa or more			
Locking pressure	0.05MPa or less			
Locking direction	One direction (extension locking, retraction locking, each type)			
Maximum operating pressure	0.7MPa			
Unlocking port connection size	M5 x 0.8	Rc, NPT, 1/8		
Holding force N (maximum static load)	245	403	629	982

Non-rotating Rod Accuracy

Size	25	32	40	50
Non-rotating rod accuracy	$\pm 1^\circ$	$\pm 0.8^\circ$	$\pm 0.5^\circ$	$\pm 0.5^\circ$

Standard Strokes

Size	Standard stroke (mm)	Max. manufacturable stroke
25, 32, 40, 50	5, 10, 15, 20, 25, 30, 35, 40, 45, 50 75, 100, 125, 150, 175, 200, 250, 300	300

*Strokes other than the above are produced upon receipt of order.

Weights

Unit: kg

	Size	25	32	40	50
Basic weight	Standard	0.34	0.58	0.87	1.52
	Axial foot type	0.41	0.72	1.08	1.86
	Flange type/Front, rear	0.44	0.72	1.10	1.98
	Single clevis	0.40	0.70	1.09	1.92
	Double clevis (with pin)	0.41	0.74	1.13	1.99
Additional weight per 50mm of stroke		0.12	0.16	0.22	0.34
Attached metal weight	Single clevis (Double clevis bracket)	0.06	0.12	0.22	0.40
	Double clevis (Single clevis bracket)	0.07	0.16	0.26	0.47
	Single knuckle joint	0.03	0.04	0.07	0.16
	Double knuckle joint (with pin)	0.05	0.09	0.14	0.29

Note) The weights of the attached metal single clevis and double clevis include the weight of two pieces of mounting bolts.

Calculation method—Example: MDLUL32-100

●Basic weight..... 0.72 (axial foot type-size32)

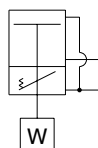
●Additional weight..... 0.16/50 stroke

●Stroke..... 100 stroke

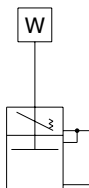
0.72 + 100/50 x 0.16 = 1.04kg

Symbol

Extension locking



Retraction locking



Theoretical Output

Unit: N

Size	Rod size (mm)	Actuation direction	Piston area (mm ²)
25	12	IN-OUT	378
32	14	IN-OUT	650
40	16	IN-OUT	1056
50	20	IN-OUT	1649

Size	Operating pressure (MPa)					
	0.2	0.3	0.4	0.5	0.6	0.7
25	76	113	151	189	227	265
32	130	195	260	325	390	455
40	211	317	422	528	634	739
50	330	495	660	824	989	1154

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

Mounting Bracket Part No.

Bracket \ Size	25	32	40	50
Foot ^{Note 1)}	MU-L02	MU-L03	MU-L04	MU-L05
Flange	MU-F02	MU-F03	MU-F04	MU-F05
Single clevis	MU-C02	MU-C03	MU-C04	MU-C05
Double clevis ^{Note 3)}	MU-D02	MU-D03	MU-D04	MU-D05



Note 1) When ordering foot brackets, order 2 pieces for each cylinder.

Note 2) The parts included with each bracket are shown below.

Foot, Flange, Single clevis/Body mounting bolt

Double clevis/Pins for clevis, C set ring for axis, Body mounting

Note 3) Clevis pin and snap ring are included with the double clevis type.

Auto Switch Mounting Bracket Part No.

Size	Bracket no.	Note	Applicable switch	
			Reed switch	Solid state switch
25, 32, 40, 50	BMU1-025	Auto switch mounting screw (M3 x 0.5 x 6.5ℓ) Auto switch mounting nut	D-A7□, D-A80 D-A7□H, D-A80H D-A73C, D-A80C D-A79W	D-F7□, D-J79 D-F7□V, D-J79C D-F7□W, D-J79W D-F7□WV, D-F7□F D-F7NTL D-F7BAL, F7BAVL
40, 50	BMU2-040	Auto switch mounting bracket Round head Philips screw (M3 x 0.5 x 14ℓ) Hexagon socket head cap bolt (M3 x 0.5 x 5ℓ) Flat washer, Auto switch mounting nut	—	D-P5DWL

*Stainless steel mounting screw kit

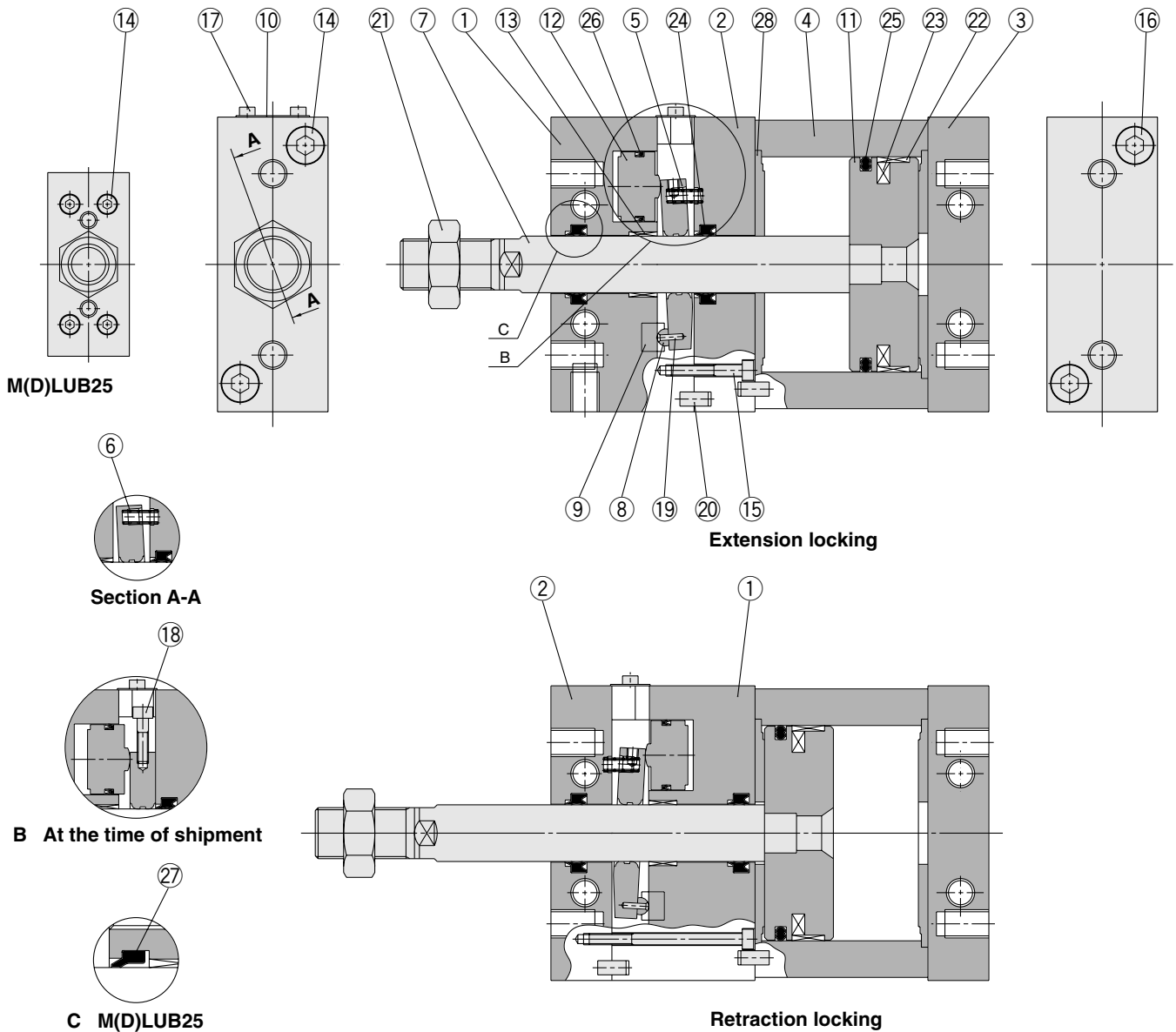
Use the following stainless steel mounting screw kit (includes nut) depending on the operating environment.

BBA2: D-A7/A8/F7/J7

The above stainless steel screw kit is used for auto switch D-F7BAL and D-F7BAVL when it is shipped mounted on a cylinder.

Also, BBA2 is included when a auto switch alone is shipped.

Construction



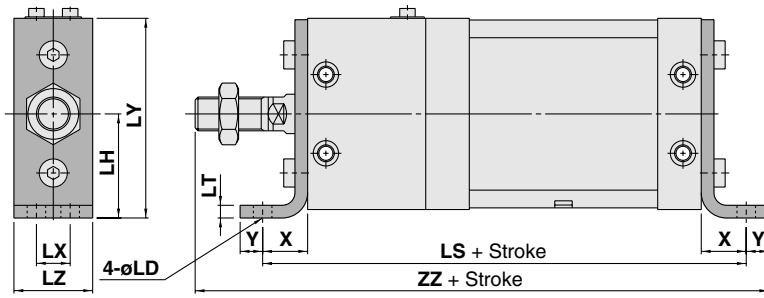
Parts list

No.	Description	Material	Note
1	Lock body	Aluminium alloy	Hard anodized
2	Cover	Aluminium alloy	Hard anodized
3	Head cover	Aluminium alloy	Hard anodized
4	Cylinder tube	Aluminium alloy	Hard anodized
5	Lock ring	Carbon steel	Heat treatment
6	Brake spring	Steel wire	Zinc chromated
7	Piston rod	Carbon steel	Hard chromium electro plating
8	Pivot	Carbon steel	Heat treatment, zinc chromated
9	Pivot key	Carbon steel	Heat treatment, zinc chromated
10	Dust proof cover	Stainless steel	
11	Piston	Aluminium alloy	Chromate
12	Release piston	Special steel	Heat treatment
13	Bushing	Sintering oil impregnated alloy	M(D)LUB25, 32
		Lead-bronze casting	M(D)LUB40, 50
14	Hexagon socket head cap bolt A	Stainless steel	

No.	Description	Material	Note
15	Hexagon socket head cap bolt B	Stainless steel	
16	Hexagon socket head cap bolt C	Stainless steel	
17	Hexagon socket head cap bolt D	Chrome molybdenum steel	Nickel plated
18	Hexagon socket head cap bolt E	Chrome molybdenum steel	Nickel plated
19	Spring pin	Carbon steel	JIS B2808
20	Parallel pin	Stainless steel	JIS B1354
21	Rod end nut	Rolling steel	Only for use with nickel plated rod end male thread
22	Wear ring	Resin	
23	Magnet	Magnet	Only for use with built-in magnet type
24	Rod seal	NBR	Use one piece with M(D)LUB25 Use 2 pieces with M(D)LUB32-50
25	Piston seal	NBR	
26	Release piston seal	NBR	Only for use with M(D)LUB25
27	Scraper	NBR	
28	Bumper	Urethane rubber	

Dimensions

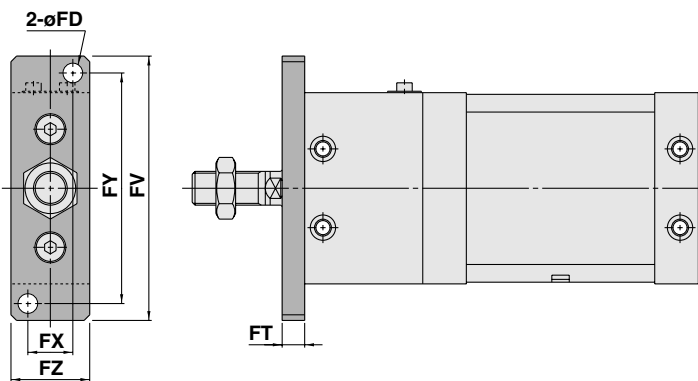
Axial foot type



(mm)

Model	LD	LH	LS	LT	LX	LY	LZ	X	Y	ZZ
MLUL25	5.5	29	114	3.2	11	56	23	12	6	144
MLUL32	6.6	37	132	4.5	12	71	27	16	8	164
MLUL40	9	46	140	4.5	15	89	31	18	10	177
MLUL50	11	57	166.5	5	18	109	37	21	11	209.5

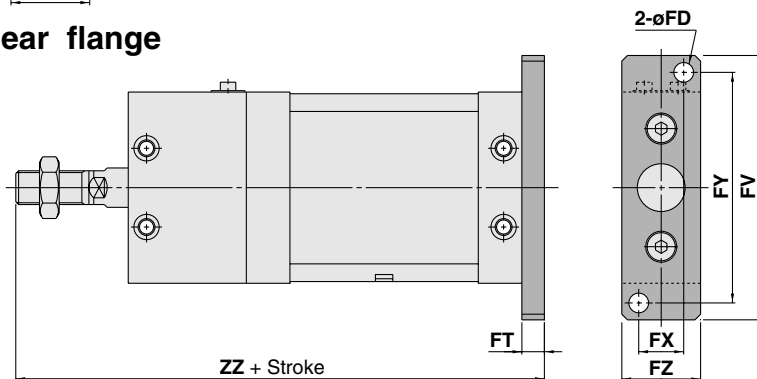
Front flange type



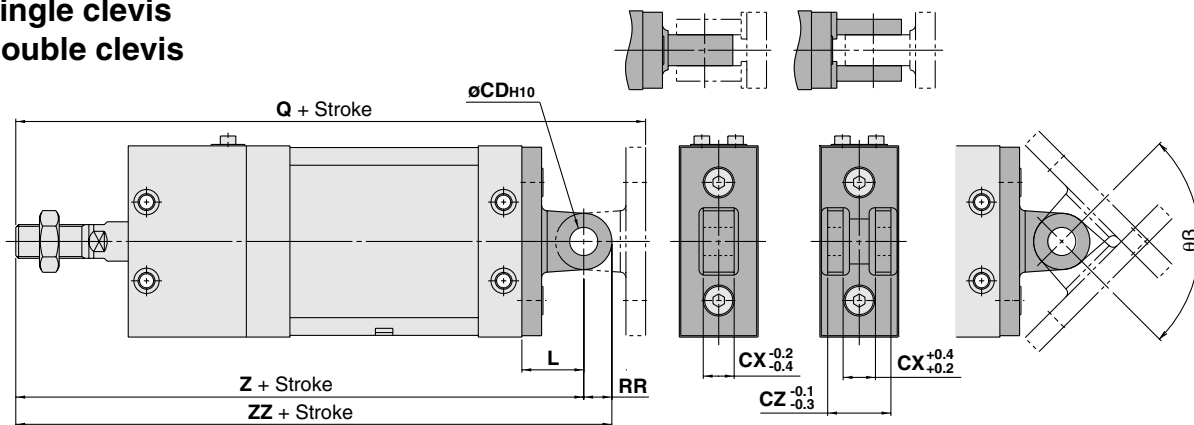
(mm)

Model	FD	FT	FV	FX	FY	FZ	ZZ
MLUF25, MLUG25	5.5	8	76	14	66	24	134
MLUF32, MLUG32	7	8	94	16	82	28	148
MLUF40, MLUG40	9	9	118	18	102	32	158
MLUF50, MLUG50	11	12	144	22	126	39	189.5

Rear flange



Single clevis Double clevis



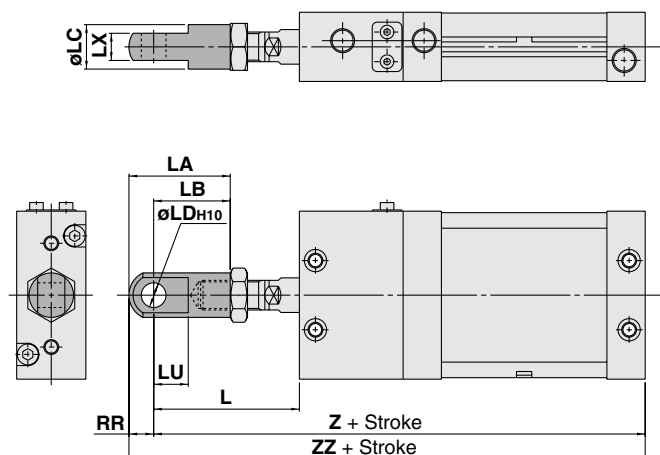
(mm)

Model	CDH10	CX	CZ	L	Q	RR	Z	ZZ	Rotation angle
MLUC25, MLUD25	8 ^{+0.058} ₀	9	18	17	160	8	143	151	100
MLUC32, MLUD32	10 ^{+0.058} ₀	11	22	22	184	10	162	172	90
MLUC40, MLUD40	10 ^{+0.058} ₀	13	26	27	203	10	176	186	80
MLUC50, MLUD50	14 ^{+0.070} ₀	16	32	32	241.5	14	209.5	223.5	80

Series MLU

Accessories

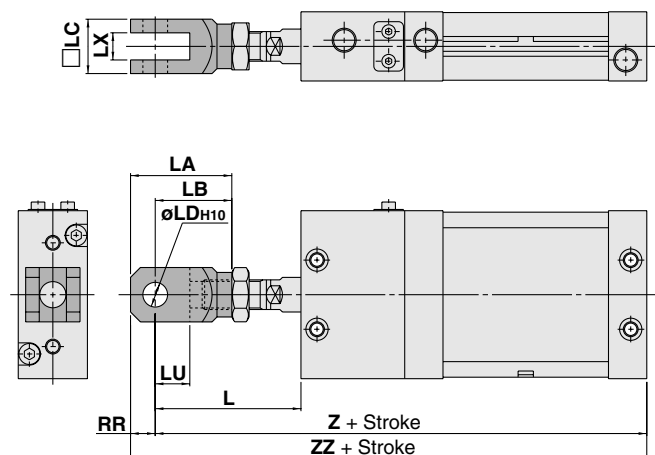
Single knuckle joint



Model	L	LA	LB	LC	LD	LU	LX	RR	Z	ZZ
MLU□25	52.5	35.5	27	16	8 ^{+0.058} ₀	11	9 ^{-0.2} _{-0.4}	8.5	142.5	151
MLU□32	59	41	31	18	10 ^{+0.058} ₀	14	11 ^{-0.2} _{-0.4}	10	159	169
MLU□40	67	47	36	20	10 ^{+0.058} ₀	15	13 ^{-0.2} _{-0.4}	11	171	182
MLU□50	81	62	46	28	14 ^{+0.070} ₀	20	16 ^{-0.2} _{-0.4}	16	205.5	221.5

The L, Z and ZZ dimensions are reference dimensions when mounting a single knuckle joint. Please use them as guidelines.

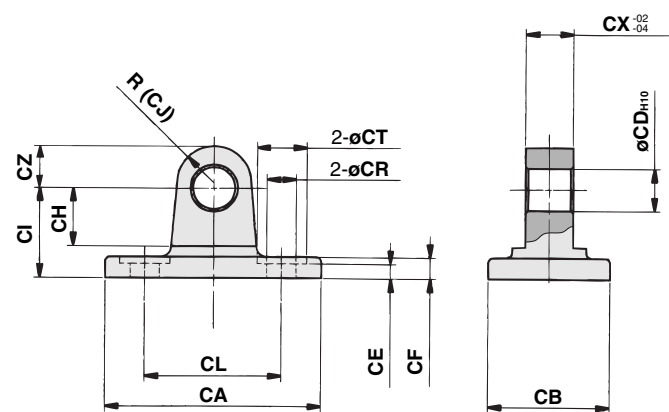
Double knuckle joint



Model	L	LA	LB	LC	LD	LU	LX	RR	Z	ZZ	Applicable pin no.
MLU□25	52.5	35	27	18	8 ^{+0.058} ₀	13	9 ^{+0.4} _{+0.2}	8	142.5	150.5	CD-MU02
MLU□32	59	41	31	22	10 ^{+0.058} ₀	14	11 ^{+0.4} _{+0.2}	10	159	169	CD-MU03
MLU□40	67	46	36	26	10 ^{+0.058} ₀	17	13 ^{+0.4} _{+0.2}	10	171	181	CD-MU04
MLU□50	81	62	46	32	14 ^{+0.070} ₀	23	16 ^{+0.4} _{+0.2}	16	205.5	221.5	CD-MU05

The L, Z and ZZ dimensions are reference dimensions when mounting a double knuckle joint. Please use them as guidelines.

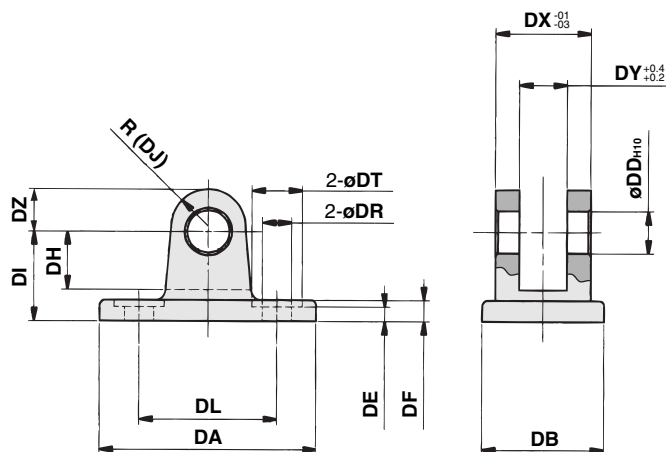
Single clevis (Double clevis bracket)



Part no.	Size	CA	CB	CD _{H10}	CE	CF	CH	CI	CJ
MU-C02	25	53	23	8 ^{+0.058} ₀	3.5	4	11	17	7
MU-C03	32	67	27	10 ^{+0.058} ₀	3.5	7	13	22	10
MU-C04	40	85	31	10 ^{+0.058} ₀	3.5	10	13	27	10
MU-C05	50	103	37	14 ^{+0.058} ₀	5.5	12	17	32	14

Part no.	CL	CR	CT	CX	CZ
MU-C02	26	5.3	9.5	9	8
MU-C03	42	6.4	11	11	10
MU-C04	54	8.4	14	13	10
MU-C05	64	10.5	17	16	14

Double clevis (Single clevis bracket)

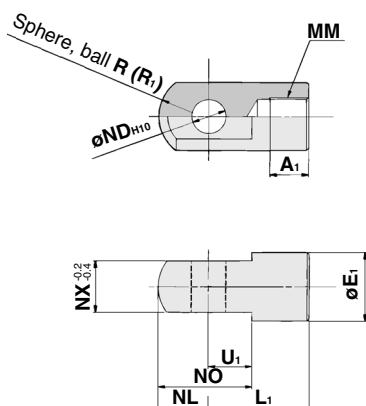


Part no.	Size	DA	DB	DD _{H10}	DE	DF	DH	DI	DJ
MU-D02	25	53	23	8 ^{+0.058} ₀	3.5	4	11	17	7
MU-D03	32	67	27	10 ^{+0.058} ₀	3.5	7	13	22	10
MU-D04	40	85	31	10 ^{+0.058} ₀	3.5	10	13	27	10
MU-D05	50	103	37	14 ^{+0.070} ₀	5.5	12	17	32	14

Part no.	DL	DR	DT	DX	DY	DZ	Applicable pin no.
MU-D02	26	5.3	9.5	18	9	8	CD-MU02
MU-D03	42	6.4	11	22	11	10	CD-MU03
MU-D04	54	8.4	14	26	13	10	CD-MU04
MU-D05	64	10.5	17	32	16	14	CD-MU05

Clevis pins and snap rings are included with the double clevis type.

Single knuckle joint

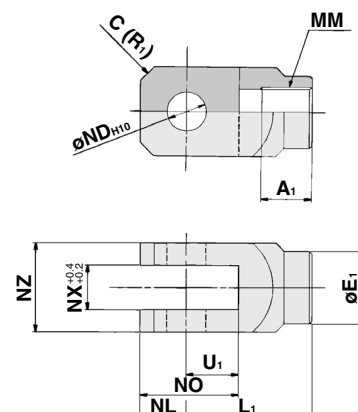


(mm)

Part no.	Size	A ₁	E ₁	L ₁	MM
I-MU02	25	10.5	16	27	M10 x 1.25
I-MU03	32	12	18	31	M12 x 1.25
I-MU04	40	14	20	36	M14 x 1.5
I-MU05	50	18	28	46	M18 x 1.5

Part no.	ND _{H10}	NL	NO	NX	R ₁	U ₁
I-MU02	8 ^{+0.058} ₀	8.5	19.5	9	8.5	11
I-MU03	10 ^{+0.058} ₀	10	24	11	10	14
I-MU04	10 ^{+0.058} ₀	11	26	13	11	15
I-MU05	14 ^{+0.070} ₀	16	36	16	16	20

Double knuckle joint



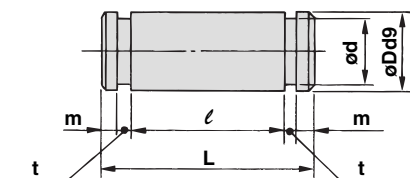
(mm)

Part no.	Size	A ₁	E ₁	L ₁	MM	ND _{H10}
Y-MU02	25	10.5	14	27	M10 x 1.25	8 ^{+0.058} ₀
Y-MU03	32	12	18	31	M12 x 1.25	10 ^{+0.058} ₀
Y-MU04	40	14	20	36	M14 x 1.5	10 ^{+0.058} ₀
Y-MU05	50	18	28	46	M18 x 1.5	14 ^{+0.070} ₀

Part no.	NL	NO	NX	NZ	R ₁	U ₁	Applicable pin no.
Y-MU02	8	21	9	18	3	13	CD-MU02
Y-MU03	10	24	11	22	4	14	CD-MU03
Y-MU04	10	27	13	26	5	17	CD-MU04
Y-MU05	16	39	16	32	6	23	CD-MU05

*Knuckle pin and snap ring are included.

Clevis pin and knuckle pin



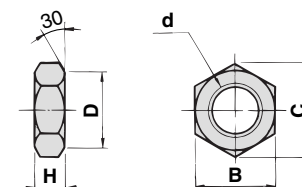
(mm)

Part no.	Size	Dd9	L	d	ℓ
CD-MU02	25	8 ^{-0.040} _{-0.076}	23	7.6	18.2
CD-MU03	32	10 ^{-0.040} _{-0.076}	27	9.6	22.2
CD-MU04	40	10 ^{-0.040} _{-0.076}	31	9.6	26.2
CD-MU05	50	14 ^{-0.050} _{-0.093}	38	13.4	32.2

Part no.	m	t	Snap ring
CD-MU02	1.5	0.9	C8 type for pivot
CD-MU03	1.25	1.15	C10 type for pivot
CD-MU04	1.25	1.15	C10 type for pivot
CD-MU05	1.75	1.15	C14 type for pivot

*Included with the double clevis and double knuckle joint as standard.

Rod end nut



(mm)

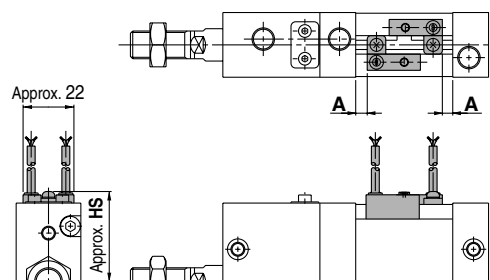
Part no.	Size	d	H	B	C	D
NT-03	25	M10 x 1.25	6	17	19.6	16.5
NT-MU03	32	M12 x 1.25	7	19	21.9	18
NT-04	40	M14 x 1.5	8	22	25.4	21
NT-05	50	M18 x 1.5	11	27	31.2	26

*One piece is included with the rod end male thread as standard.

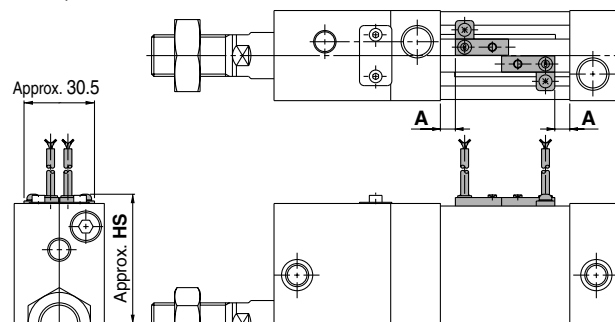
Auto Switches/Proper Mounting Positions and Height for Stroke End Detection

D-A7□
D-A80

ø25, ø32

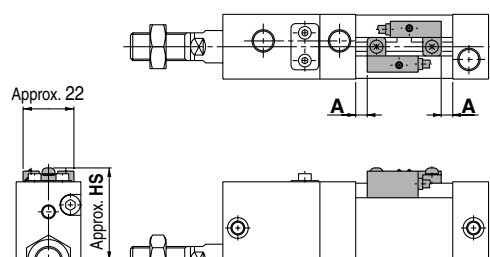


ø40, ø50

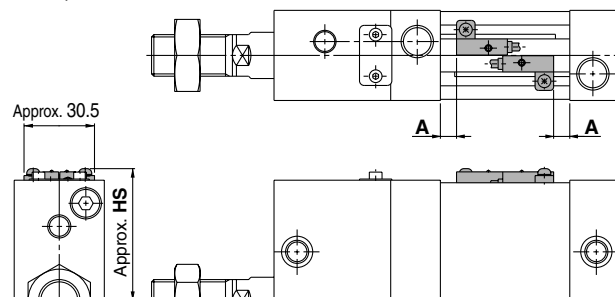


D-A7□H
D-A80H
D-F7□
D-J79
D-F7□W
D-J79W
D-F7□F
D-F7NT
D-F7BAL

ø25, ø32

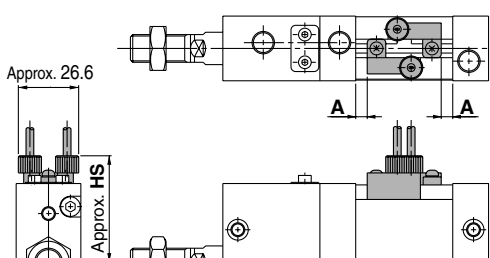


ø40, ø50

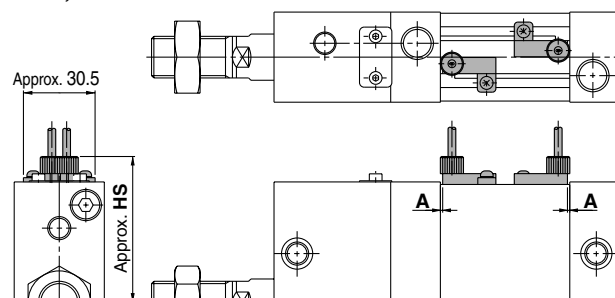


D-A73C
D-A80C
D-J79C

ø25, ø32

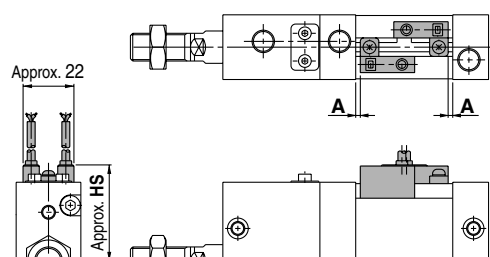


ø40, ø50

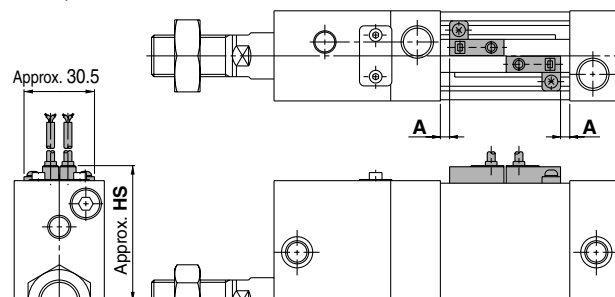


D-A79W
D-F7□WV
D-F7□V
D-F7BAVL

ø25, ø32

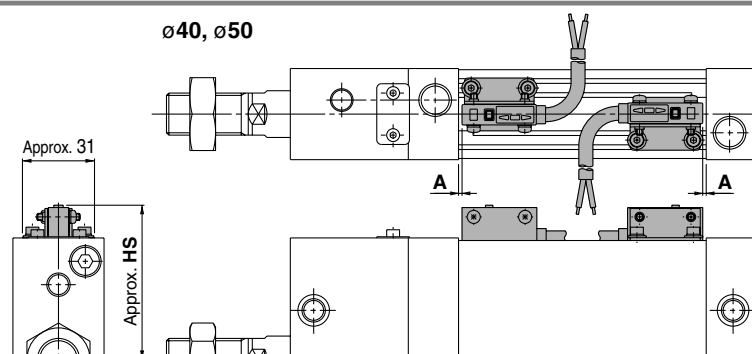


ø40, ø50



D-P5DW

ø40, ø50



Proper auto switch mounting position

(mm)

Auto switch model	D-A7□ D-A80	D-A7□H D-A80H D-F7□ D-F7□V D-J79 D-F7□W D-F7□WV D-J79W D-F7BAL D-F7BAVL D-F79F	D-A73C D-A80C D-J79C	D-A79W	D-F7LF	D-F7NTL	D-P5DWL
Size	A	A	A	A	A	A	A
25	4.5	5	5	2	9	10	—
32	4.5	5	5	2	9	10	—
40	5	5.5	0	2.5	9.5	10.5	0.5
50	6.5	7	1	4	11	12	2

Auto switch mounting height

(mm)

D-A7□ D-A80	D-A7□H D-80H D-F7□ D-J79 D-F7□W D-79W D-F7NTL D-F7□F D-F7BAL	D-A73C D-A80C	D-F7□V D-F7□WV D-F7BAVL	D-J79C	D-A79W	D-P5DWL
Hs	Hs	Hs	Hs	Hs	Hs	Hs
32	33	39	35.5	37.5	34.5	—
39	40	46	42.5	44.5	41.5	—
47	48	54	50.5	52.5	49.5	56.5
56	57	63	59.5	61.5	58.5	66

Operating range

(mm)

Auto switch model	Bore size			
	25	32	40	50
D-A7□, A80 D-A7□H, A80H D-A73C, A80C	13	13	13	13
D-A79W	13	13	14	14
D-F7□, J79 D-F7□V, J79C D-F7□W, F7□WV D-J79W, F7NTL D-F7BAL, F7BAVL D-F79F	6.5	7	6.5	6.5
D-F7LF	7	7.5	7	7
D-P5DWL	—	—	5	5

*Hysteresis specifications are given as a guide, it is not a guaranteed range.

(Tolerance ±30%)

Hysteresis may fluctuate due to the operating environment.

Minimum strokes for auto switch mounting

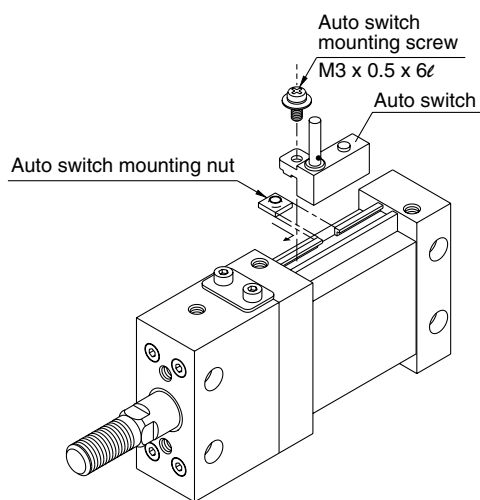
(mm)

Number of auto switches	D-F7□V D-J79C	D-A7□ D-A80 D-A73C D-A80C	D-F7□WV D-F7BAVL	D-A7□H, D-A80H D-A79W D-F7□, D-J79 D-F7□W, D-J79W D-F7BAL, D-F7NTL D-F7□F	D-P5DWL *	
					Different side(s)	Same side
2 pcs.	5	10	15	15	20	75
1 pc.	5	5	10	15	20	

*Only size 40 and 50 can be mounted.

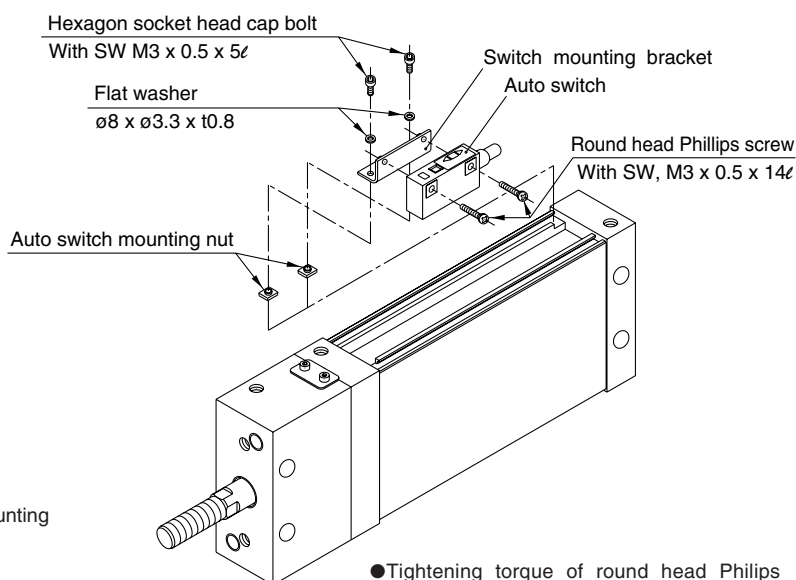
Auto Switch Mounting

Except for D-P5DWL



●Tightening torque of auto switch mounting screws should be 0.5 to 0.7N·m.

D-P5DWL

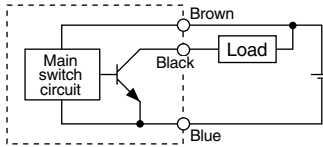


●Tightening torque of round head Phillips screws and hexagon head bolts should be 0.5 to 0.7N·m.

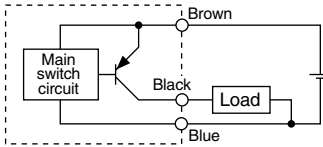
Series MLU Auto Switch Connections and Examples

Basic Wiring

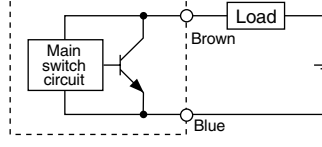
Solid state 3-wire, NPN



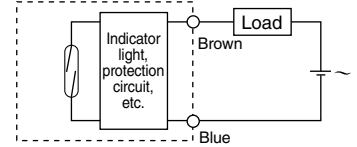
Solid state 3-wire, PNP



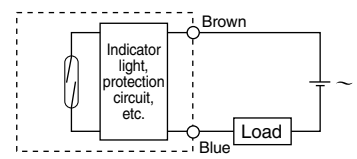
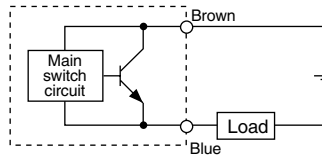
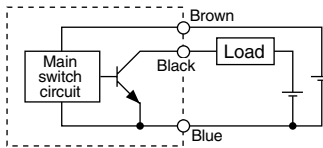
2-wire (Solid state)



2-wire (Reed switch)



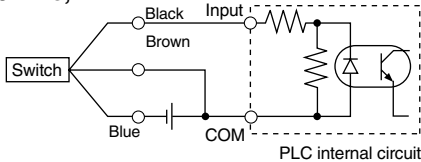
(Power supplies for switch and load are separate.)



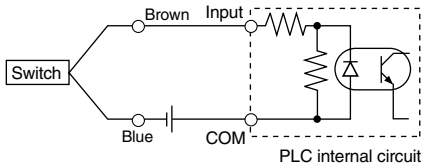
Examples of Connection to PLC

Sink input specifications

3-wire, NPN

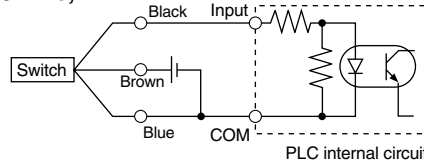


2-wire

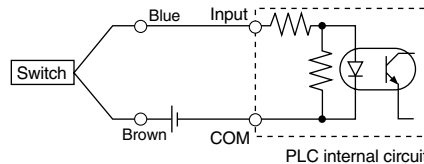


Source input specifications

3-wire, PNP



2-wire

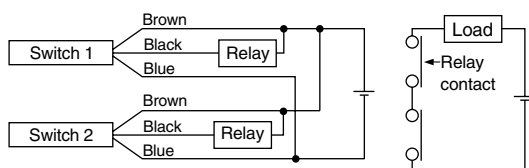


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

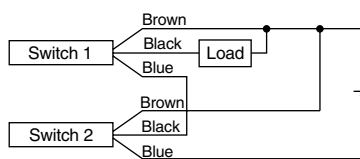
Connection Examples for AND (Series) and OR (Parallel)

3-wire

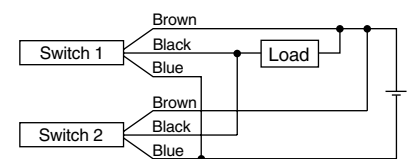
AND connection for NPN output (using relays)



AND connection for NPN output (performed with switches only)

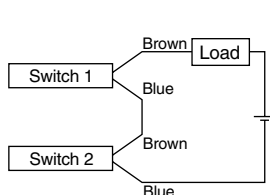


OR connection for NPN output



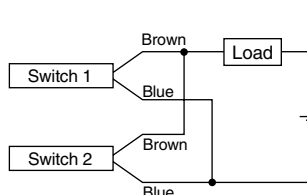
The indicator lights will light up when both switches are turned ON.

2-wire with 2 switch AND connection



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

2-wire with 2 switch OR connection



(Solid state)
When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

(Reed switch)
Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light up, because of dispersion and reduction of the current flowing to the switches.

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

Example: Power supply is 24VDC
Internal voltage drop in switch is 4V

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1\text{mA} \times 2 \text{ pcs.} \times 3\text{k}\Omega \\ &= 6\text{V} \end{aligned}$$

Example: Load impedance is 3kΩ
Leakage current from switch is 1mA



Series MLU

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 an operator is unfamiliar with it. 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 MLU 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. **Attach a protective cover to minimize the 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 or shock absorber, etc., 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, or install an external shock absorber to relieve the impact. In this case, the rigidity of the machinery should also be examined.

5. **Consider a possible drop in circuit 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 source.**

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 air pressure, 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, 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 according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use in these conditions. (Refer to specifications.)

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

Caution

1. **Operate within the limits of the maximum usable stroke.**

The piston rod will be damaged if operated beyond the maximum stroke. Refer to the air cylinder model selection procedures for the maximum usable stroke.

2. **Operate the piston within a range such that collision damage will not occur at the stroke end.**

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder model selection procedure for the range within which damage will not occur.

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

Mounting

Caution

1. **Be certain to align the rod axis with the load and direction of movement when connecting.**

When not properly aligned, twisting may occur in the rod and tube, and damage may be caused due to wear on the inner tube surface, bushings, rod surface and seals, etc.

2. **When an external guide is used, connect the rod end and the load in such a way that there is no interference at any point within the stroke.**

3. **Do not scratch or gouge the sliding parts of the cylinder tube or piston rod, etc., by striking or grasping them with other objects.**

Cylinder bores are manufactured to precise tolerances, so that even a slight deformation may cause malfunction. Also, scratches or gouges, etc., in the piston rod may lead to damaged seals and cause air leakage.

4. **Prevent the seizure of rotating parts.**

Prevent the seizure of rotating parts (pins, etc.) by applying grease.

5. **Do not use until you can verify that equipment can operate properly.**

Following mounting, maintenance or conversions, verify correct mounting by suitable function and leakage tests after compressed air and power are connected

6. **Instruction manual**

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.



Series MLU Actuator Precautions 2

Be sure to read before handling.

Piping

⚠ Caution

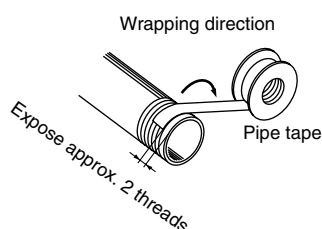
1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

2. Wrapping of pipe tape

When screwing together pipes and fittings, etc., be certain that chips from the pipe threads and sealing material do not get inside the piping.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



Lubrication

⚠ Caution

1. Lubrication of non-lube type cylinder

The cylinder is lubricated at the factory and can be used without any further lubrication.

Air Supply

⚠ Warning

1. Use clean air.

Do not use compressed air that includes 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 temperature.

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

Refer to SMC's "Best Pneumatics vol. 4" for further details on compressed air quality.

Operating Environment

⚠ Warning

1. Do not use in environments where there is a danger of corrosion.
2. In dusty locations or where water, oil, etc., splash on the equipment, take suitable measures to protect rod.
3. When using auto switches, do not operate in an environment with strong magnetic fields.

Maintenance

⚠ Warning

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

If handled improperly, malfunction and damage of machinery or equipment may occur.

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

When equipment is removed, 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 cylinder lurching.

⚠ Caution

1. Drain flushing

Remove drainage from air filters regularly.

(Refer to specifications.)



Series MLU Auto Switch Precautions 1

Be sure to read before handling.

Design and Selection

Warning

1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications for load current, voltage, temperature or impact.

2. Take precautions when multiple cylinders are used close together.

When multiple auto switch cylinders are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm.

3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

In case of high piston speed, the operating time of the load can be extended by using an auto switch (D-F7NT) with built-in OFF delay timer (approx. 200ms).

4. Keep wiring as short as possible.

<Reed switches>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

Use a contact protection box when the wire length is 5m or longer.

<Solid state switches>

Although wire length should not affect switch function, use a wire 100m or shorter.

5. Pay attention to the internal voltage drop of the switch.

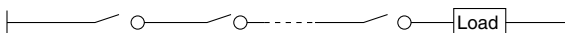
<Reed switches>

- 1) Switches with an indicator light (except D-A76H)

- If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



- In the same way, when operating below a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

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

- 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (model D-A80/A80H).

<Solid state switches>

- 3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).

Also, note that a 12VDC relay is not applicable.

6. Pay attention to leakage current.

<Solid state switches>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\text{Operating current of load (OFF condition)} > \text{Leakage current}$$

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

7. Do not use a load that generates surge voltage.

<Reed switches>

If driving a load such as a relay that generates a surge voltage, use a contact protection box.

<Solid state switches>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load such as a relay or solenoid which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

8. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch.

Also perform periodic maintenance and confirm proper operation.

9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.



Series MLU Auto Switch Precautions 2

Be sure to read before handling.

Mounting and Adjustment

⚠ Warning

1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s² or more for reed switches and 1000m/s² or more for solid state switches) while handling. Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

3. Mount switches using the proper tightening torque.

If a switch is tightened beyond the range of tightening torque, the mounting screws, mounting brackets or switch may be damaged.

On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position. (Refer to page 10 for switch mounting instructions and tightening torque.)

4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting position shown in the catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation may be unstable.

Wiring

⚠ Warning

1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires can result from wiring patterns which repeatedly apply bending stress or stretching force to the lead wires.

2. Be sure to connect the load before power is applied.

<2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

3. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

4. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits containing auto switches may malfunction due to noise from these other lines.

Wiring

⚠ Warning

5. Do not allow short circuit of loads.

<Reed switches>

If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.

<Solid state switches>

All models of PNP output type switches do not have built-in short circuit protection circuits.

Note that if a load is short circuited, the switch will be instantly damaged as in the case of reed switches.

*Take special care to avoid reverse wiring of the brown [red] power supply line and the black [white] output line on 3-wire type switches.

6. Avoid incorrect wiring.

<Reed switches>

A 24VDC switch with indicator light has polarity. The brown [red] lead wire is (+), and the blue [black] lead wire is (–).

- 1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models: D-A73/A73H/A73C

- 2) Note however, that in the case of 2-color display auto switches (D-A79W), the switch will be in a normally ON condition if the wiring is reversed.

<Solid state switches>

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

- *2) If connections are reversed (power supply line + and power supply line –) on a 3-wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue [black] wire and the power supply line (–) is connected to the black [white] wire, the switch will be damaged.

* Lead wire color changes

Lead wire colors of SMC switches have been changed in order to meet NECA Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided.

Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

2-wire

	Old	New
Output (+)	Red	Brown
Output (–)	Black	Blue

Solid state with diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

3-wire

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black

Solid state with latch type diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Latch type diagnostic output	Yellow	Orange



Series MLU Auto Switch Precautions 3

Be sure to read before handling.

Operating Environment

Warning

1. Never use in an atmosphere of explosive gases.

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.

Auto switches can malfunction or magnets inside cylinders can become demagnetized. (Consult SMC regarding the availability of a magnetic field resistant auto switch.)

3. Do not use in an environment where the auto switch will be continually exposed to water.

Although switches satisfy IEC standard IP67 construction (JIS C 0920: watertight construction), avoid using switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

5. Do not use in an environment with temperature cycles.

Consult SMC if switches are used where there are temperature cycles other than normal air temperature changes, as there may be adverse effects inside the switches.

6. Do not use in an environment where there is excessive impact shock.

<Reed switches>

When excessive impact (300m/s² or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment.

7. Do not use in an area where surges are generated.

<Solid state switches>

When there are units (solenoid type lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

8. Avoid accumulation of iron waste or close contact with magnetic substances.

When a large amount of iron waste such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause auto switches to malfunction due to a loss of the magnetic force inside the cylinder.

Maintenance

Warning

1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.

1) Securely tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.

2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.

3) Confirm the lighting of the green light on the 2-color display type switch.

Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

Other

Warning

1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.



Series MLU

Specific Product Precautions 1

Be sure to read before handling.

Refer to pages 12 through 17 for safety instructions, actuator precautions and auto switch precautions.

Selection

Warning

1. Do not use for intermediate cylinder stops.

This cylinder is designed for locking against inadvertent movement from a stationary condition. Do not perform intermediate stops while the cylinder is operating, as this will shorten its service life.

2. Select the correct locking direction, as this cylinder does not generate holding force opposite to the locking direction.

The extension locking direction does not generate holding force in the cylinder's retracting direction, and the retraction locking direction does not generate holding force in the cylinder's extending direction (free).

3. Even when locked, there may be stroke movement of about 1mm in the locking direction due to external forces such as the weight of the work piece.

Even when locked, if air pressure drops, stroke movement of about 1mm may be generated in the locking direction of the lock mechanism due to external forces such as the work piece weight.

4. When locked, do not apply impact loads, strong vibration or rotational force, etc.

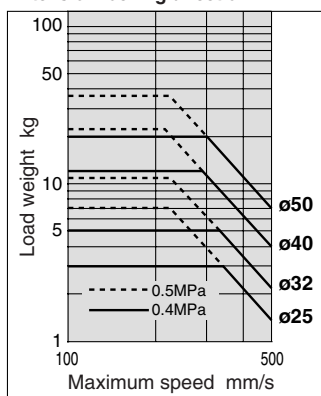
This will lead to lock mechanism damage and reduced service life, etc.

5. Operate so that load weight, maximum speed and eccentric distance are within the limiting ranges in the graphs below.

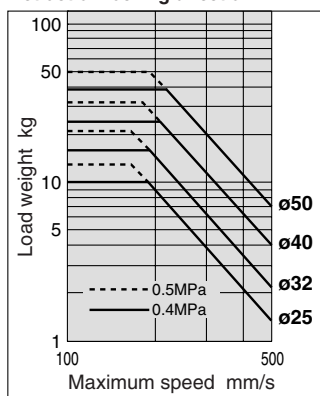
Operation beyond the limiting range will lead to cylinder damage and reduced service life, etc.

Allowable kinetic energy

Extension locking direction



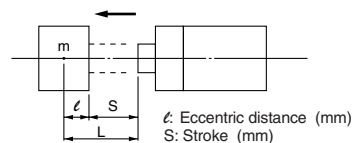
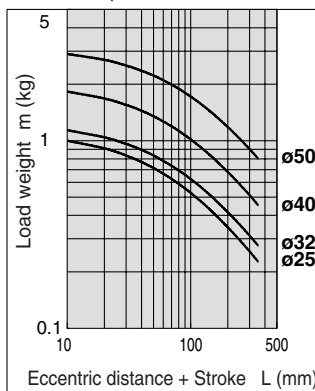
Retraction locking direction



Selection

Allowable load weight

Horizontal (without switch and with switch)



Pneumatic Circuits

Warning

1. Do not use 3 position valves.

The lock may be released due to inflow of the unlocking pressure.

2. Install speed controllers for meter-out control.

Malfunction may occur if meter-in control is used.

3. Be careful of reverse exhaust pressure flow from a common exhaust type valve manifold.

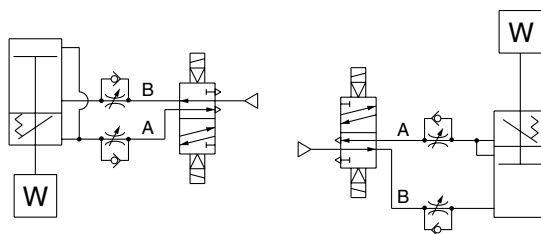
Since the lock may be released due to reverse exhaust pressure flow, use an individual exhaust type manifold or single type valve.

4. Branch off the compressed air piping for the lock unit between the cylinder and the speed controller.

Use of an external branch may cause a reduction in service life.

5. Perform piping so that the side going from the piping junction to the lock unit is short.

If it is long, this may cause unlocking malfunction and reduce the lock's service life, etc.



F: Extension locking direction

B: Retraction locking direction



Series MLU

Specific Product Precautions 2

Be sure to read before handling.

Refer to pages 12 through 17 for safety instructions, actuator precautions and auto switch precautions.

Mounting

⚠ Caution

1. Be sure to connect the load to the rod end with the cylinder in an unlocked condition.
If this is done when in a locked condition, it may cause damage to the lock mechanism.
2. When fixing a work piece at the end of the piston rod, first retract the piston rod to the back end. Use the spanner hook at the end of the rod to keep the torque below the allowable tightening torque.
3. Always apply the piston rod load in the axial direction. Avoid operation where rotational torque is applied. If it is the only possible way, be sure to use it within the allowable range shown in the table below.

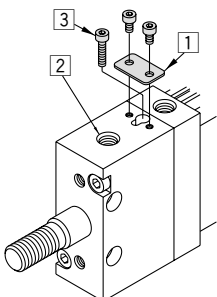
Allowable rotational torque (N·m)				
Size	25	32	40	50
Allowable rotational torque	0.25	0.25	0.55	1.25
Allowable torque for work piece mounting	1.7	1.9	2.0	4.9

4. The piston speed may exceed the maximum operating speed of 500mm/s if the piping is directly connected to the cylinder. Please use speed controllers by SMC to adjust the piston speed so that it will not exceed 500mm/s.

Preparing for Operation

⚠ Warning

1. When starting operation from the locked position, be sure to restore air pressure to the B line in the pneumatic circuit.
It is very dangerous to apply pressure to the A line with the B line in an unpressurized state, because the cylinder will move suddenly when unlocked.
2. Shipped in the unlocked condition maintained by the unlocking bolt. Be sure to remove the unlocking bolt following the procedures below before operation.
The locking mechanism will not be effective without the removal of the unlocking bolt.



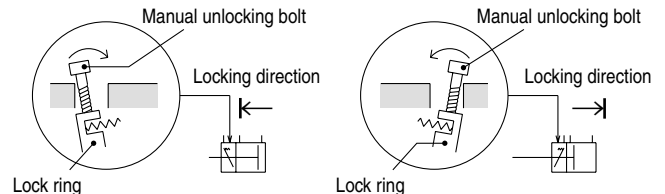
- 1) Confirm that there is no air pressure inside the cylinder, and remove dust cover [1].
- 2) Supply air pressure of 0.2MPa or more to unlocking port [2] shown in the drawing on the left.
- 3) Use a hexagon wrench (ø25, ø32: Width across flats 2.5, ø40, ø50: Width across flats 3) to remove unlocking bolt [3].

Manual Unlocking

⚠ Warning

1. Do not perform unlocking when an external force such as a load or spring force is being applied.
This is very dangerous because the cylinder will move suddenly. Take the following steps.
 - 1) The lock after restoring the air pressure in the B line of the pneumatic circuit to operating pressure, and then reduce the pressure gradually.
 - 2) In case air pressure cannot be used, release the lock after preventing cylinder movement with a lifting device such as a jack.
2. After confirming safety, operate the manual release following the steps shown below.
Carefully confirm that no one is inside the load movement range, etc., and that there is no danger even if the load moves suddenly.

Manual unlocking



Extension locking direction

- 1) Remove the dust cover.

- 2) Screw a manual unlocking bolt (a conventional bolt of ø25, ø32: M3 x 0.5 x 25 or more, ø40, ø50: M4 x 0.7 x 35 or more) into the lock ring threads as shown above, and lightly push the bolt in the direction of the arrow (head side) to unlock.

Retraction locking direction

- 1) Remove the dust cover.

- 2) Screw a manual unlocking bolt (a conventional bolt of ø25, ø32: M3 x 0.5 x 25 or more, ø40, ø50: M4 x 0.7 x 35 or more) into the lock ring threads as shown above, and lightly push the bolt in the direction of the arrow (rod side) to unlock.

Maintenance

⚠ Caution

1. In order to maintain good performance, operate with clean unlubricated air.
If lubricated air, compressor oil or drainage, etc., enter the cylinder, there is a danger of sharply reducing the locking performance.
2. Do not apply grease to the piston rod.
There is a danger of sharply reducing the locking performance.
3. Never disassemble the lock unit.
It contains a heavy duty spring which is dangerous. There is also a danger of reducing the locking performance.



Series MLU

Specific Product Precautions 3

Be sure to read before handling.

Refer to pages 12 through 17 for safety instructions, actuator precautions and auto switch precautions.

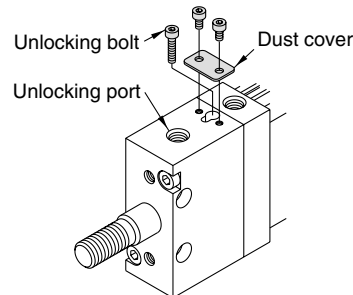
Holding the Unlocked Condition

Warning

1. Sizes MLU can hold the unlocked condition.

<Holding the unlocked condition>

- 1) Remove the dust cover.
- 2) Supply air pressure of 0.2MPa or more to the unlocking port, and set the lock ring to the perpendicular position.
- 3) Screw the unlocking bolt which is included (hexagon socket head screw $\phi 25$, $\phi 32$: M3 x 12 ϕ , $\phi 40$, $\phi 50$: M4 x 16 ϕ) into the lock ring to hold the unlocked condition.



2. To use the locking mechanism again, be sure to remove the unlocking bolt.

The locking mechanism will not function with the unlocking bolt screwed-in. Remove the unlocking bolt according to the procedures described in the section "Preparing for Operation".

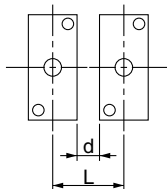
Auto Switch Handling Precautions

Warning

1. If two or more cylinders are used in close proximity, the auto switches may malfunction affected by the magnets built in the nearby cylinder.

Please keep the cylinder mounting pitch larger than the values in the table below.

Minimum cylinder mounting pitch

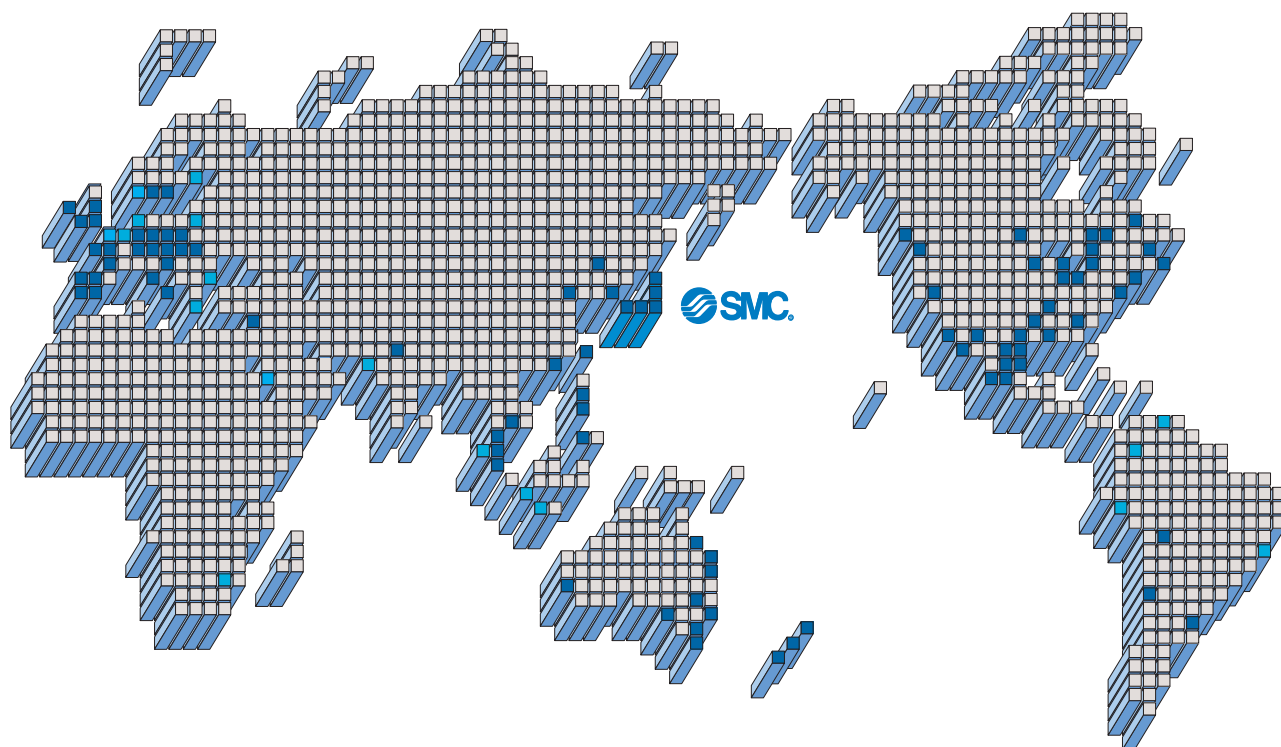


(mm)				
Size	25	32	40	50
L (d)	33 (10)	32 (5)	36 (5)	38 (0)

When the mounting pitch is equal to or smaller than the value shown above, it has to be shielded by an iron plate or a magnetic shielding plate (Part No. MU-S025) purchased separately. Please contact SMC for more information.



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SMC Corporation

1-16-4 Shimbashi, Minato-ku, Tokyo 105-8659, JAPAN

Tel: 03-3502-2740 Fax: 03-3508-2480

URL <http://www.smcworld.com>

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