

Precision Cylinder Series *MTS*

ø8, ø12, ø16, ø20, ø25, ø32, ø40



MK/MK2

RS

RE

REC

C..X

MTS

C..S

MQ

RHC

CC



Size ø8 newly introduced to Series MTS!

Precision Cylinder

Precision Cylinder

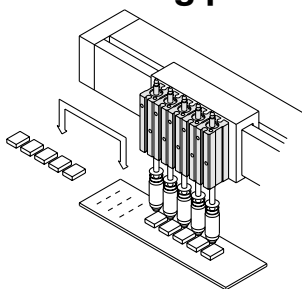
Non-rotating accuracy:
0.1° or less

(0.2° or less for $\phi 8$, within allowable torque values)

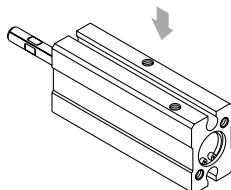
MTS8

Small size $\phi 8$ introduced to series

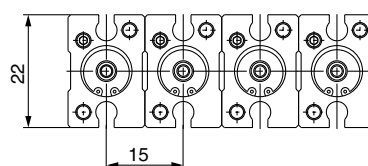
- Rod through hole allows vacuum piping (order made)
Lifting and transfer of small electronic parts is possible with short mounting pitch



- Piping is possible from two directions



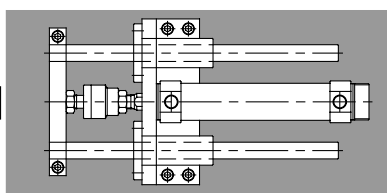
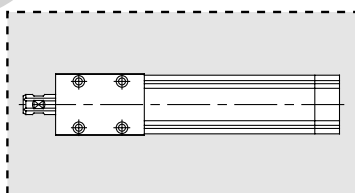
- Short mounting pitch: 15mm



- Uses new type compact auto switches ($\phi 8$ only)
Two auto switches can be mounted even with the minimum 5mm stroke



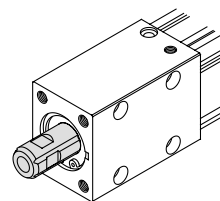
Mounting space reduced



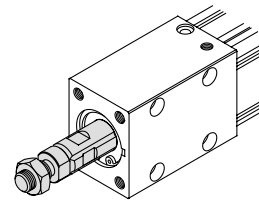
Two types of rod end configuration

Standard: Rod end female threads

Optional: Rod end male threads (using stud bolt)



Rod end female threads



Rod end male threads

Auto switch capable on four sides
(two sides for $\phi 8$)

Three types of mounting possible

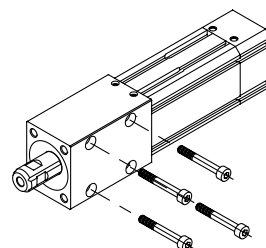
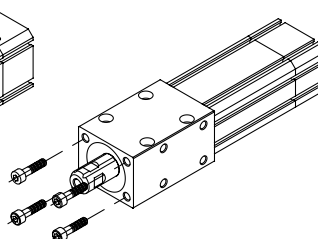
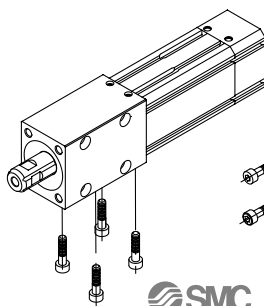
Tapped holes

Through holes

Bottom mount

Front mount

Side mount (both sides)



(Side mounting is not possible for size $\phi 8$.)

with Internal Guide Function

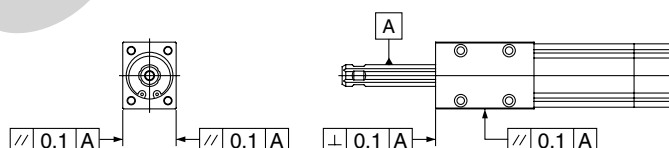
Series MTS

Deflection:
0.1mm or less

(for MTS12-25, within allowable lateral load values)

**Reduced labour for design
and assembly**

High precision mounting



Parallelism of mounting surfaces (side, bottom) to rod: 0.1mm or less
Squareness of mounting surface (front) to rod: 0.1mm or less

Air cushion standardised
(ø8 equipped with rubber bumper)

**Rear end lock type added
to series (ø12 to ø40)**



**Sealing and durability equivalent to
conventional round rod models have
been achieved with a specially
configured rod seal**

Stroke adjustment mechanism
Order made specifications

Stroke adjustment is possible on the rod extension side.

Stroke adjustment range: 0 to 10mm (ø8)

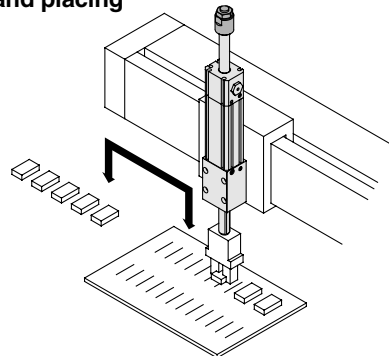
: 0 to 25mm (ø12 to ø40)

Series variations

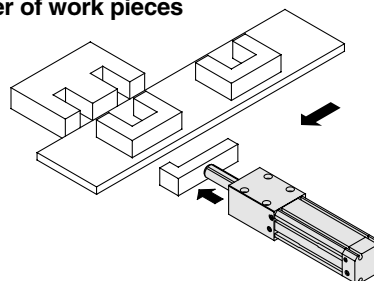
Model	Standard stroke (mm)													Rod end configuration	Cushion	Options		
	5	10	15	20	25	30	50	75	100	125	150	175	200			End lock	Rod through hole	Variable stroke Extension adjustment
MTS8	●	●	●	●	●	●								Female threads (standard) Male threads (optional)	Rubber bumper		●	●
MTS12					●		●	●	●						Air cushion	●		●
MTS16					●		●	●	●							●		●
MTS20					●		●	●	●	●	●	●	●			●		●
MTS25					●		●	●	●	●	●	●	●			●		●
MTS32					●		●	●	●	●	●	●	●			●		●
MTS40					●		●	●	●	●	●	●	●			●		●

Applications

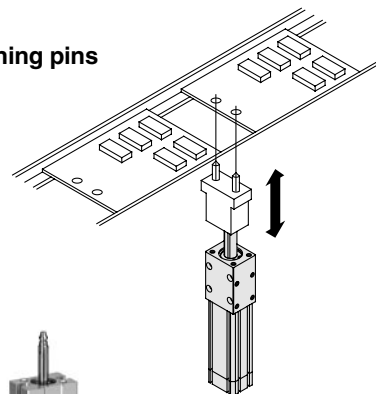
• Picking and placing



• Transfer of work pieces



• Positioning pins



MK/MK2

RS

RE

REC

C..X

MTS

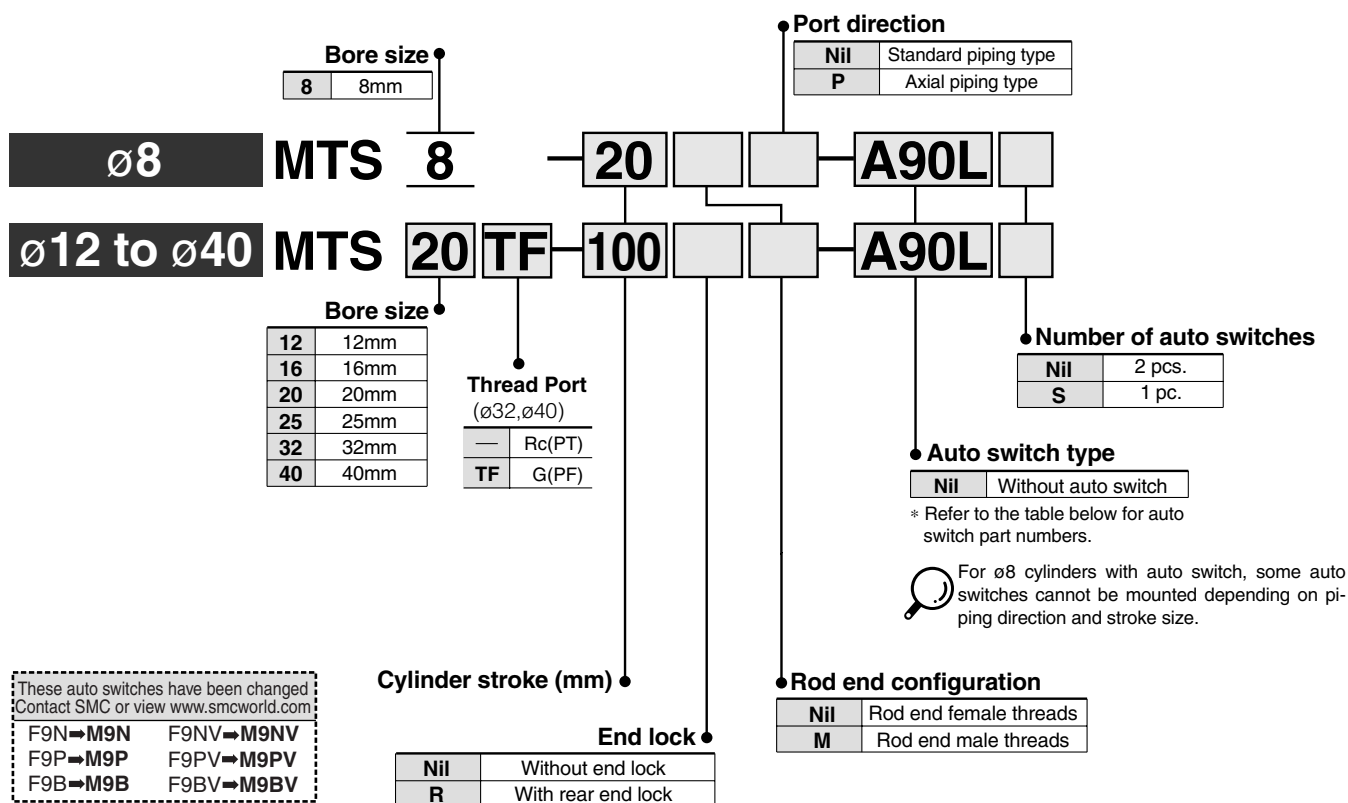
C..S

MQ

RHC

CC

How to Order



Applicable auto switches

Type	Special functions	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch model		Lead wire length (m)			Applicable load			
								Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)				
					DC		AC	Perpendicular	In-line							
Reed switch	—	Grommet	No	2 wire	24V	5V 12V	100V or less	A90V	A90	●	●	—	IC circuit	Relay, PLC		
			Yes	12V		100V	A93V	A93	●	●	—	—				
				3 wire (NPN equiv.)	—	5V	—	A96V	A96	●	●	—		—		
Solid state switch	—	Grommet	Yes	3 wire (NPN)	24V	5V 12V	—	F9NV	F9N	●	●	○	IC circuit	Relay, PLC		
				3 wire (PNP)				F8N**	—	●	●	○				
				2 wire				F9PV	F9P	●	●	○				
								F8P**	—	●	●	○				
				Diagnostic indication (2 colour indicator)	Grommet	Yes		2 wire	5V 12V	F9BV	F9B	●	●		○	IC circuit
								3 wire (NPN)		F8B**	—	●	●		○	
	3 wire (PNP)	F9NWV	F9NW				●	●		○						
	2 wire	12V	F9PWV	F9PW	●	●	○	—								
	F9BWV	F9BW	●	●	○	—										

* Lead wire length symbols 0.5m Nil (Ex.) A93
3m L (Ex.) A93L
5m Z (Ex.) F9NWZ

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

** D-F8□ type auto switches are only applicable to ø8 cylinders.

Precision Cylinder *Series MTS*

Specifications



Bore size (mm)		8	12	16	20	25	32	40
Spline rod size (mm)		4	6	8	10	13	16	20
Fluid		Air						
Min. operating pressure	Without end lock	0.15MPa	0.12MPa		0.1MPa			
	With end lock *	—	0.17MPa		0.15MPa			
Maximum operating pressure		0.7MPa						
Proof pressure		1.0MPa						
Ambient and fluid temperature		-10 to 60°C (with no freezing)						
Bearing type		Ball spline						
Cushion		Rubber bumper	Air cushion					
Effective cushion length (mm)		—	9	10	11	12	17	17
Lubrication		Non-lube						
Auto switches		Reed switch: D-A9 Solid state switch: D-F9 D-F8	Reed switch: D-A9 Solid state switch: D-F9					
Stroke tolerance		+1.0 0 mm						
Non-rotating accuracy		0.2° or less (within allowable torque values)	0.1° or less (within allowable torque values)					
Port size		M3	M5	M5	M5	M5	1/8	1/8

* Except for lock unit: 0.12MPa for ø12 and 16; 0.10MPa for ø20 to 40

Piston Speed

Bore size (mm)	8	12	16	20	25	32	40
Piston speed (mm/s)	50 to 500	50 to 800					
Allowable kinetic energy J	0.02	0.19	0.32	0.55	0.78	1.6	2.8

End Lock Specifications

Bore size (mm)	12	16	20	25	32	40
Lock position	Rear end only					
Holding force (max.) N	29	53	82	125	211	329
Backlash	1mm					
Manual unlocking	Non-locking type only					



Order Made Specifications

Standard Strokes

Bore size (mm)	Standard stroke (mm)
8	5, 10, 15, 20, 25, 30
12, 16	25, 50, 75, 100
20, 25, 32, 40	25, 50, 75, 100, 125, 150, 175, 200

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

Stud Bolt Part Numbers

Bore size (mm)	Part no.
8	MT-S8
12	MT-S12
16	MT-S16
20	MT-S20
25	MT-S25
32	MT-S32
40	MT-S40

* Replacement parts for rod end male threads.
* Rod end nuts are included.

Theoretical Output

Bore size (mm)	Operating direction	Piston area (mm ²)	Operating pressure (MPa)					
			0.2	0.3	0.4	0.5	0.6	0.7
8	OUT	50	10	15	20	25	30	35
	IN	37	8	11	15	19	22	26
12	OUT	113	23	34	45	57	68	79
	IN	84	17	25	34	42	50	59
16	OUT	201	40	60	80	101	121	141
	IN	150	30	45	60	75	90	105
20	OUT	314	63	94	126	157	188	220
	IN	235	47	71	94	118	141	165
25	OUT	490	98	147	196	245	294	343
	IN	358	72	107	143	179	215	251
32	OUT	804	161	241	322	402	482	563
	IN	603	121	181	241	302	362	422
40	OUT	1,256	251	377	502	628	754	879
	IN	942	188	283	377	471	565	659

⚠ **Caution** Do not apply a load that is 50% or more of the theoretical output.

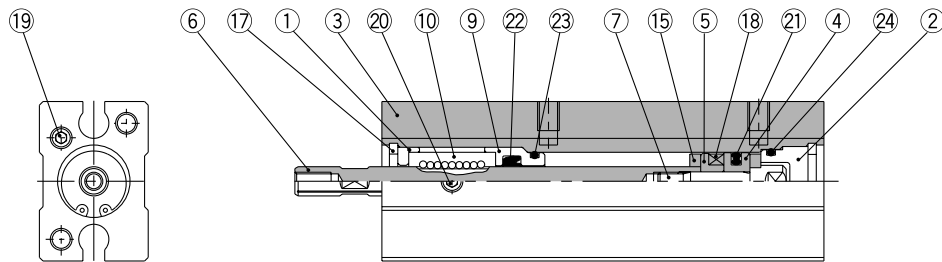
Weights

Model	Standard stroke (mm)													End lock additional weight
	5	10	15	20	25	30	50	75	100	125	150	175	200	
MTS8	36	40	44	48	52	56	—	—	—	—	—	—	—	—
MTS12	—	—	—	—	138	—	157	175	194	—	—	—	—	29
MTS16	—	—	—	—	186	—	222	258	294	—	—	—	—	34
MTS20	—	—	—	—	350	—	400	450	500	549	599	649	699	42
MTS25	—	—	—	—	487	—	547	608	669	729	790	851	912	55
MTS32	—	—	—	—	918	—	1,000	1,083	1,165	1,247	1,330	1,412	1,495	90
MTS40	—	—	—	—	1,420	—	1,533	1,645	1,758	1,870	1,983	2,095	2,208	133

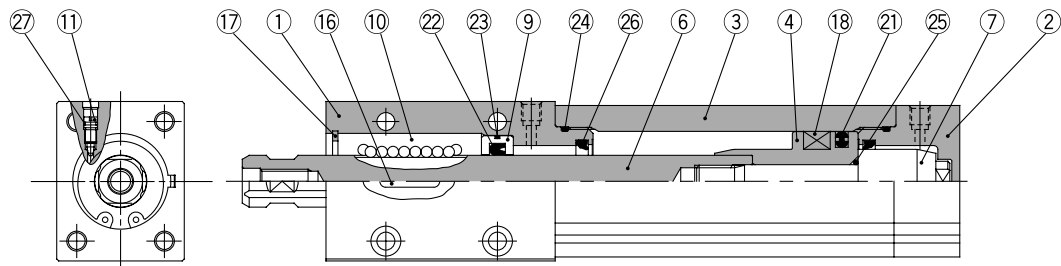
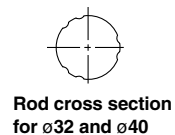
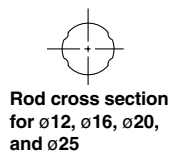
Series MTS

Construction

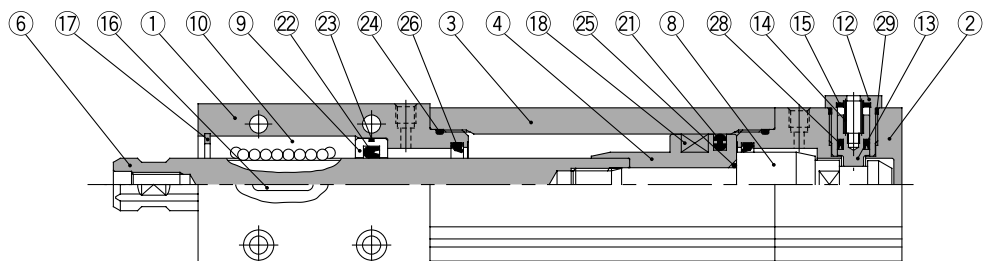
Basic type ø8



ø12 to ø40



With end lock ø12 to ø40



Parts list

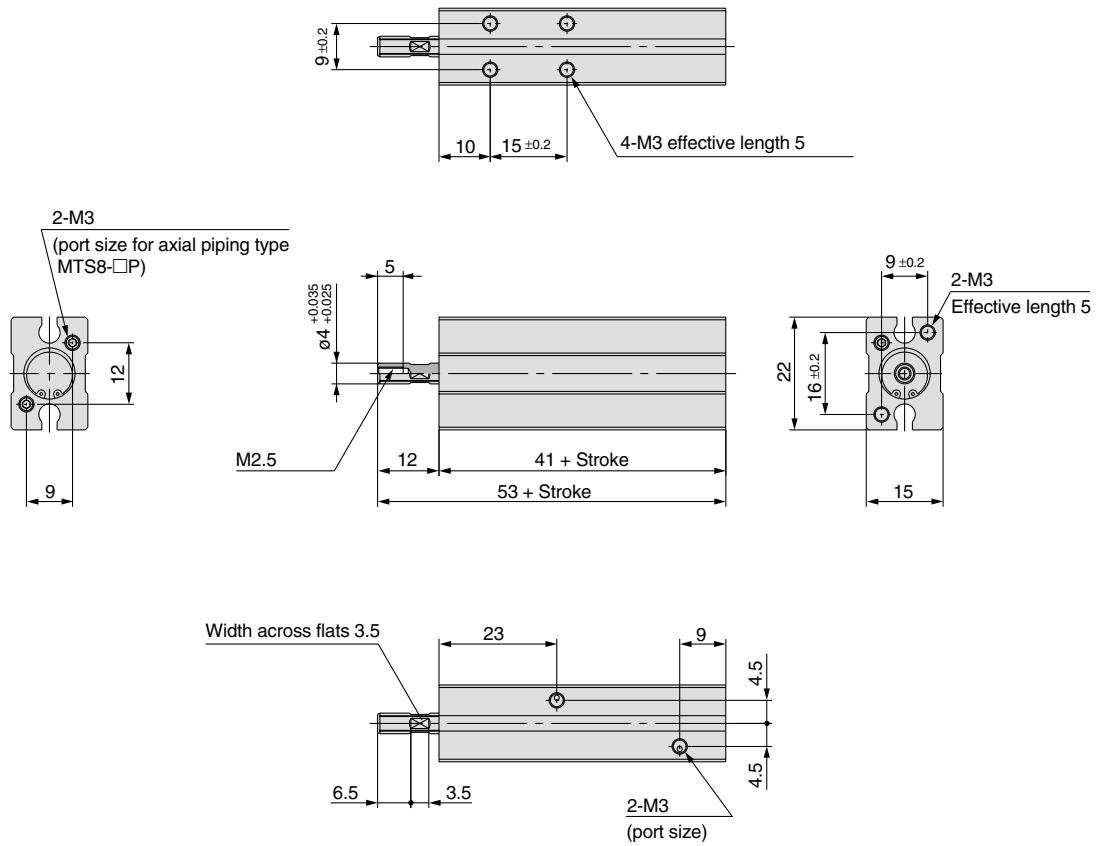
No.	Description	Material	Qty.	Note
1	Rod cover	Aluminium alloy	1	Clear anodized
2	Head cover	Aluminium alloy	1	Clear anodized
3	Cylinder tube	Aluminium alloy	1	Hard anodized
4	Piston	Aluminium alloy	1	Chromated
5	Spacer for switch type	Aluminium alloy	1	Chromated
6	Spline rod	Stainless steel	1	ø8: Quenched
		Carbon steel	1	ø12 to ø40: Quenched/Hard chrome plated
7	Cushion bolt	Stainless steel	1	ø8 to ø16
		Carbon steel	1	ø20 to ø40: Zinc chromated
8	End lock bolt	Carbon steel	1	Quenched/Zinc chromated
9	Collar	Aluminium alloy	1	Chromated
10	Spline nut	—	1	
11	Cushion needle	Carbon steel	2	Nickel plated
12	Cap	Bronze alloy	1	Nickel plated
13	Lock piston	Carbon steel	1	Quenched/Hard chrome plated
14	Lock spring	Steel wire	1	Zinc chromated

No.	Description	Material	Qty.	Note
15	Bumper	Urethane	2	ø8
			1	ø12 to ø40
16	Key	Carbon steel	1	
17	C type snap ring for hole	Carbon tool steel	2	ø8: Nickel plated
			1	ø12 to ø40: Nickel plated
18	Magnet	—	1	
19	Plug	Alloyed steel	3	Nickel plated
20	Hexagon socket head set screw	Alloyed steel	1	Black zinc chromated
21	Piston seal	NBR	1	
22	Spline seal	NBR	1	Rod seal for ø8
23	Collar gasket	NBR	1	
24	Tube gasket	NBR	1	ø8
			2	ø12 to ø40
25	Piston gasket	NBR	1	
26	Cushion seal	Urethane	2	
27	Needle gasket	NBR	2	
28	Piston seal for lock	NBR	1	
29	Cap gasket	NBR	1	

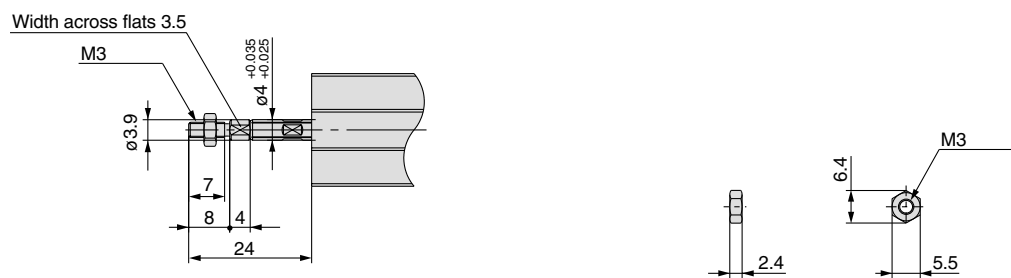
Dimensions/Ø8

MTS8

Basic type



Rod end male threads



Stud bolt part number: MT-S8

Rod end nut part number: NTJ-006A

MK/MK2

RS

RE

REC

C..X

MTS

C..S

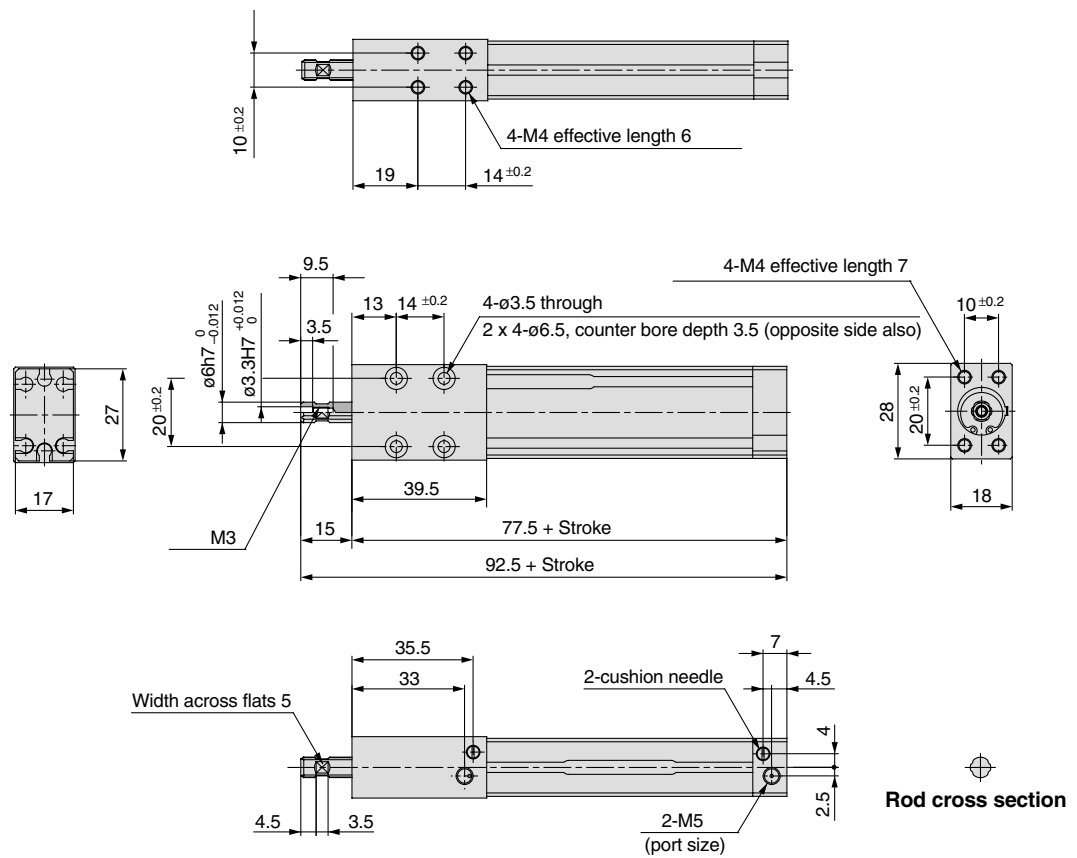
MQ

RHC

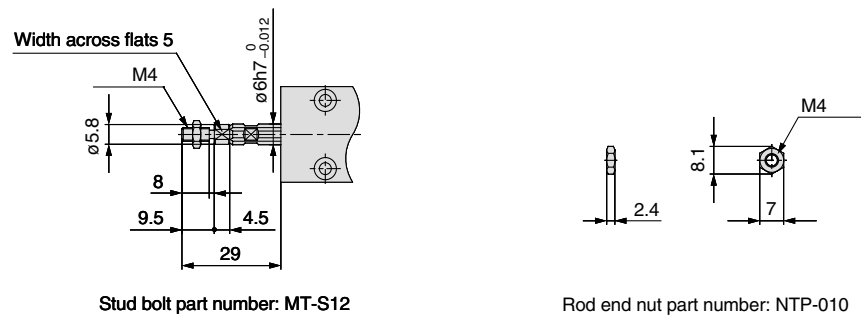
CC

MTS12

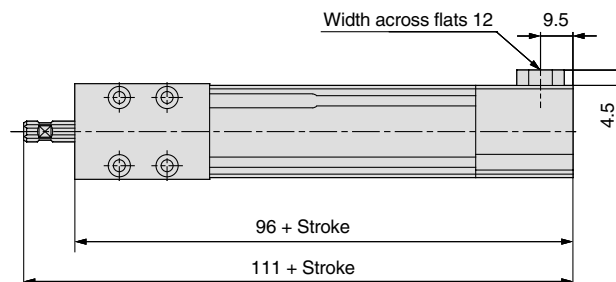
Basic type



Rod end male threads



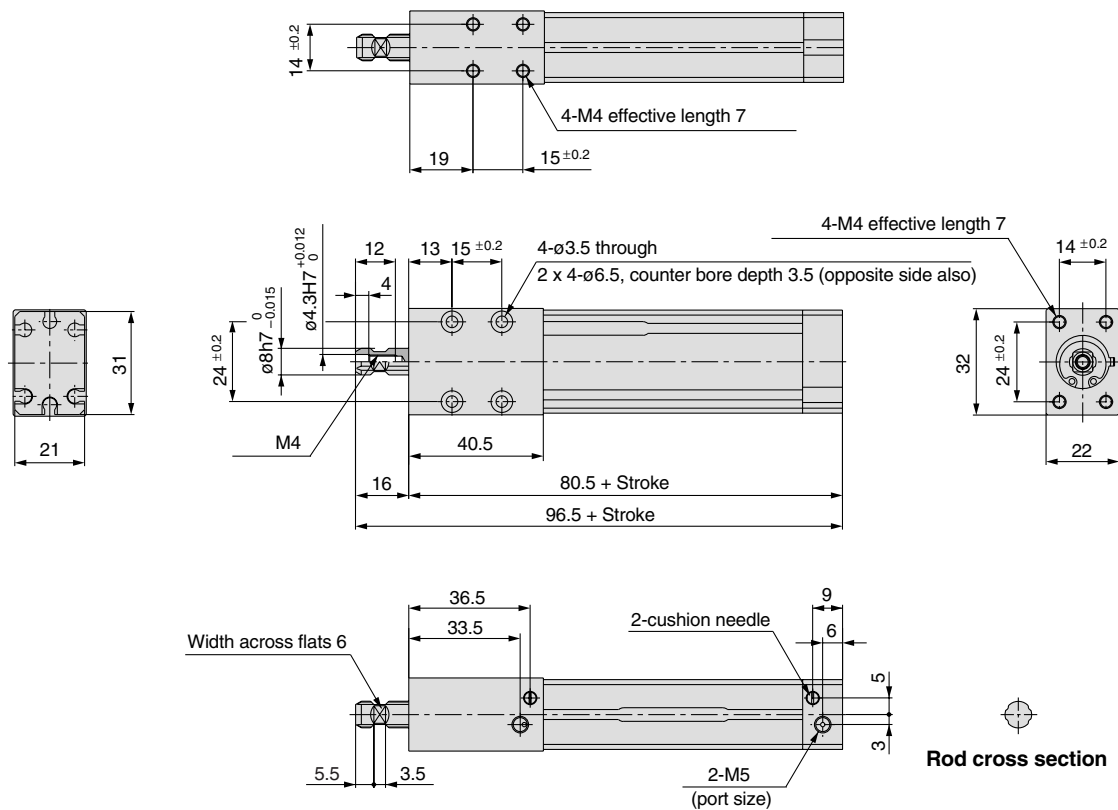
With end lock



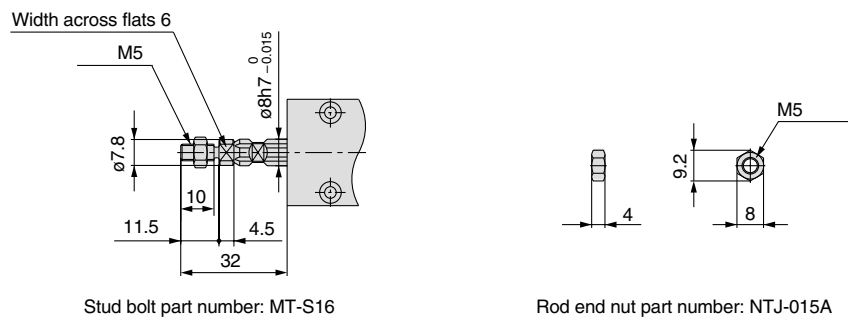
Dimensions/ $\varnothing 16$

MTS16

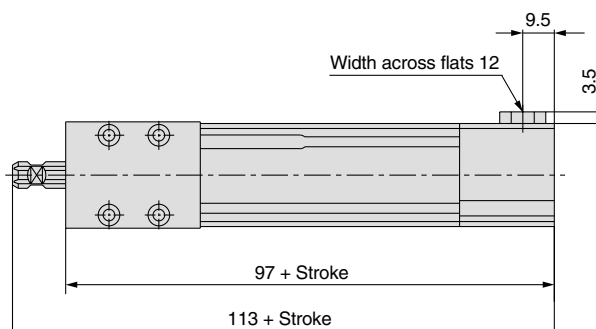
Basic type



Rod end male threads

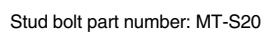


With end lock



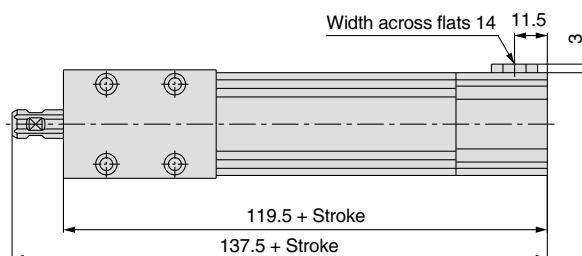
Dimensions/Ø20

Basic type



Rod end nut part number: NT-015A

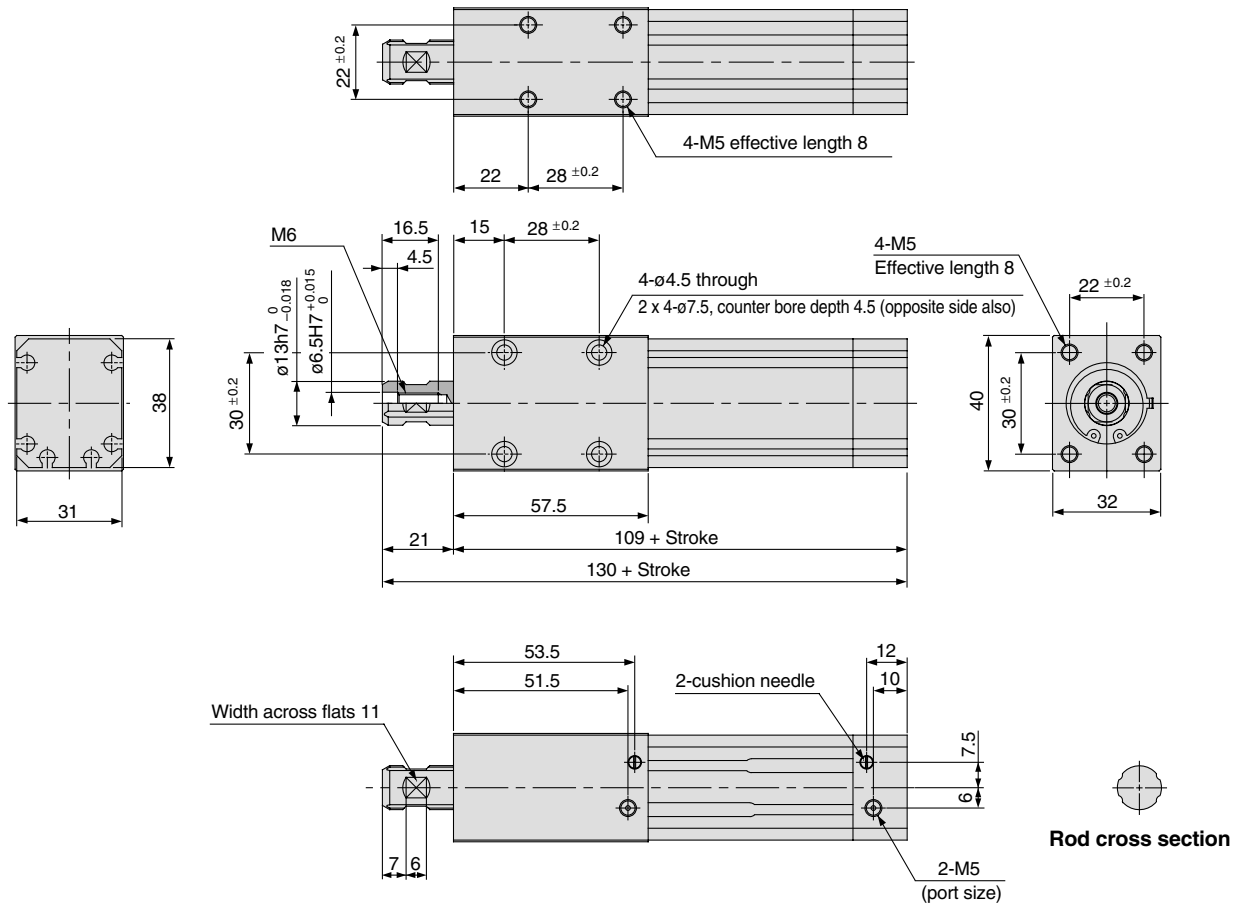
With end lock



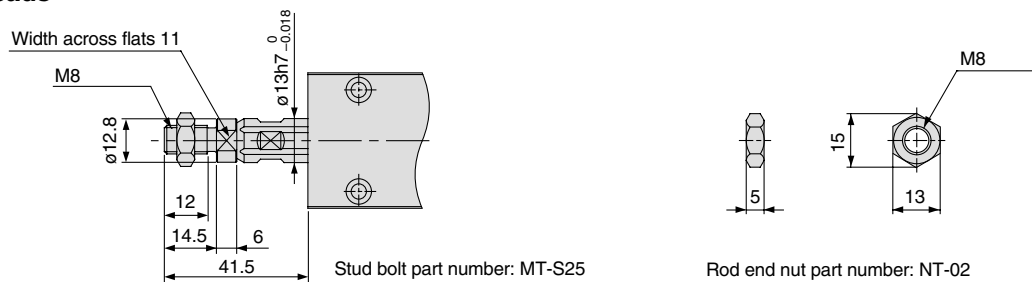
Dimensions/Ø25

MTS25

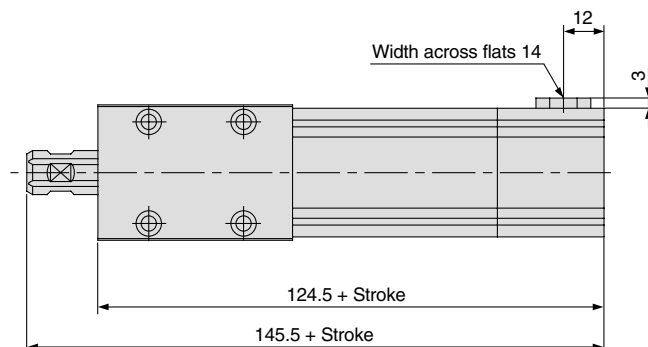
Basic type



Rod end male threads



With end lock



MK/MK2

RS

RE

REC

C..X

MTS

C..S

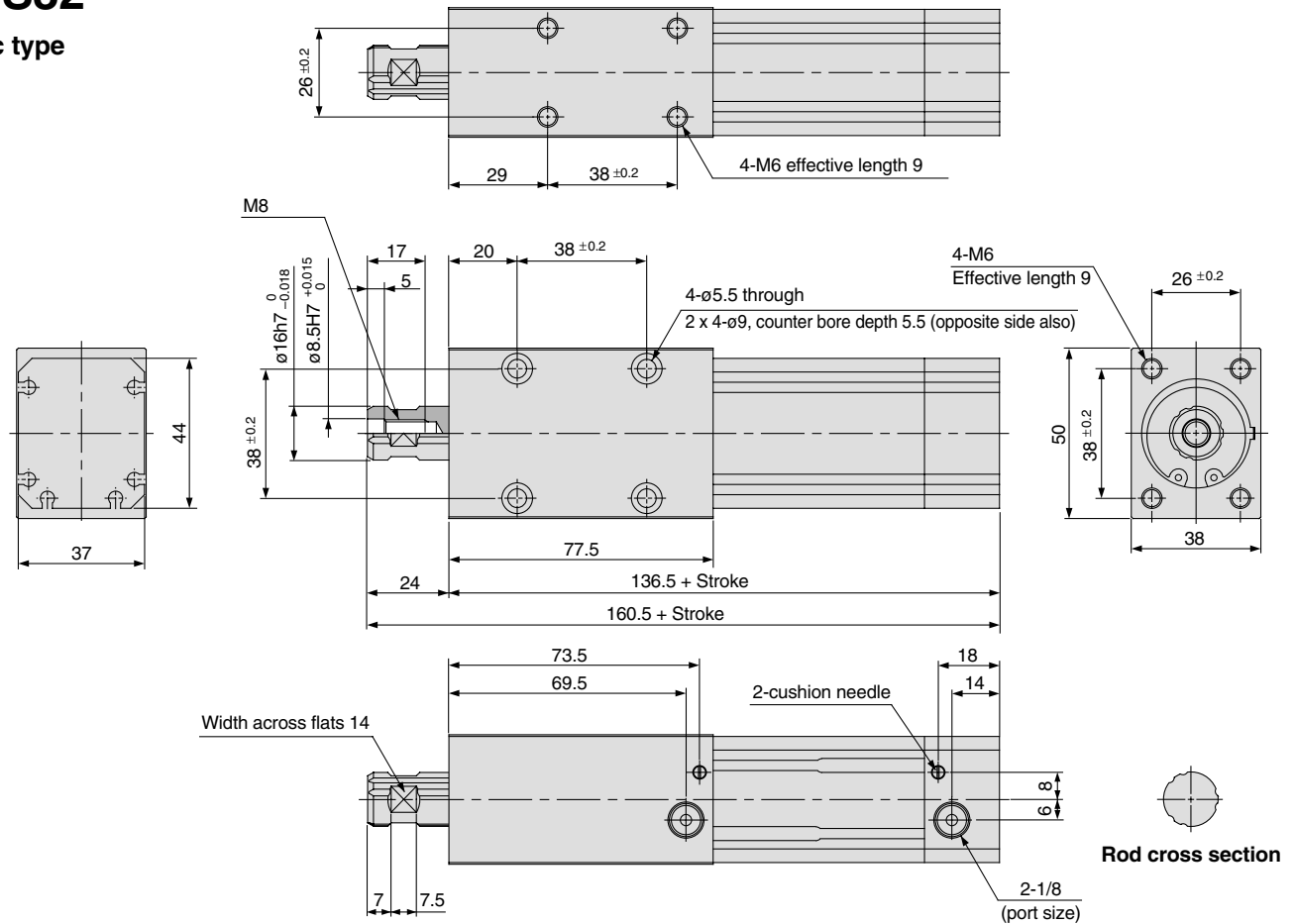
MQ

RHC

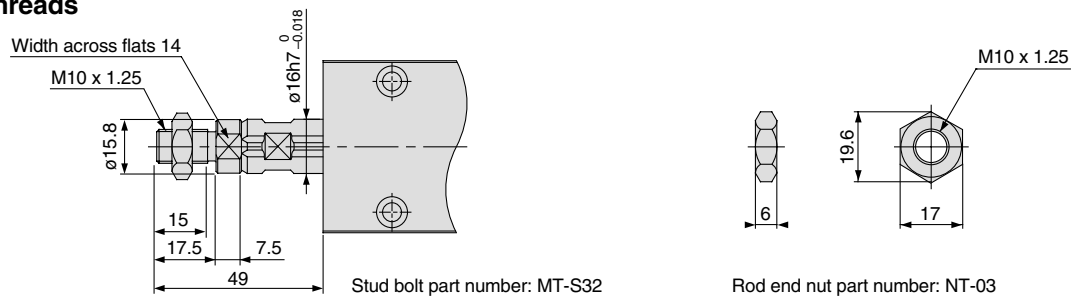
CC

MTS32

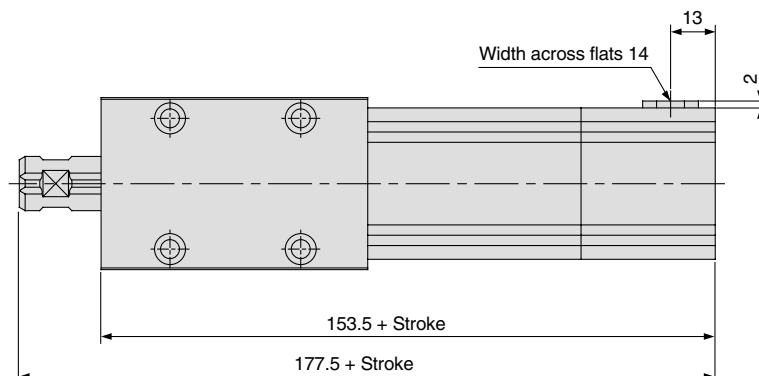
Basic type



Rod end male threads



With end lock



Basic type



Width across flats 17

M12 x 1.25

ø19.8

18

20.5

8.5

55

ø20h7 -0.021

Stud bolt part number: MT-S40

8

25.4

22

M12 x 1.25

Rod end nut part number: MCN-NT-04

Technical drawing of a cylinder head assembly. The drawing shows a cross-section of the head with four mounting holes. Dimensions are provided for the overall length and the width across the flats. The overall length is labeled as $198 + \text{Stroke}$. The width across the flats is labeled as 16. The distance from the mounting holes to the end of the head is labeled as $172 + \text{Stroke}$. The distance from the mounting holes to the end of the head is also labeled as 15.5. The distance from the mounting holes to the end of the head is also labeled as 15.5.

Series MTS

Proper Auto Switch Mounting Positions for Stroke End Detection

ø8

Reed switch: D-A90/A93/A96

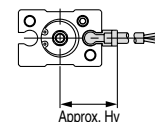
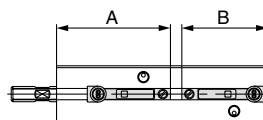
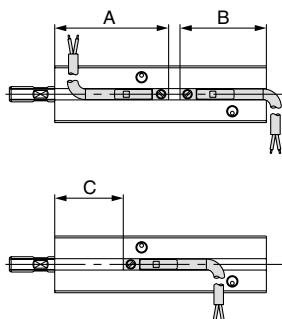
Solid state switch: D-F9N/F9P/F9B

2 colour indication solid state switch: D-F9NW/F9PW/F9BW

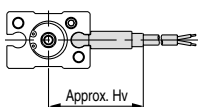
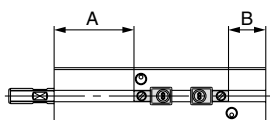
Reed switch: D-A90V/A93V/A96V

Solid state switch: D-F9NV/F9PV/F9BV

2 colour indication solid state switch: D-F9NWV/F9PWV/F9BWV



Solid state switch: D-F8N/F8P/F8B



Proper auto switch mounting positions

(mm)

Bore size (mm)	Reed switch						Solid state switch						2 colour indication solid state switch					
	D-A90/A93/A96			D-A90V/A93V/A96V			D-F9N/F9P/F9B			D-F9NV/F9PV/F9BV			D-F8N/F8P/F8B			D-F9NW/F9PW/F9BW		
	A	B	C	A	B	Hv	A	B	C	A	B	Hv	A	B	Hv	A	B	C
8	36	25	16	36	25	15	32	21	20	32	21	17.5	18	7	25	32	21	20

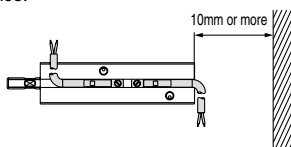
Auto Switch Mounting Strokes for ø8

Piping direction	Mounting condition	Applicable auto switch	Stroke (mm)						Note
			5	10	15	20	25	30	
Standard piping type Note 1) 	2 pcs. on same side 	D-A9□	X	X	X	○	○	○	Note 2)
		D-F9□, D-F9□W	X	X	○	○	○	○	Note 2)
		D-A9□V	X	X	X	○	○	○	
	1 pc. each on 2 sides 	D-A9□	X	○	○	○	○	○	Note 2)
		D-F9□, D-F9□W	○	○	○	○	○	○	Note 2)
		D-A9□V	X	○	○	○	○	○	
Axial piping type 	2 pcs. on same side 	D-A9□	X	X	X	○	○	○	Note 2)
		D-F9□, D-F9□W	X	X	○	○	○	○	Note 2)
		D-A9□V	X	X	X	○	○	○	
		D-F9□V, D-F9□WV	X	X	○	○	○	○	
		D-F8□	○	○	○	○	○	○	
	1 pc. each on 2 sides 	D-A9□	X	○	○	○	○	○	Note 2)
		D-F9□, D-F9□W	○	○	○	○	○	○	Note 2)
		D-A9□V	X	○	○	○	○	○	
		D-F9□V, D-F9□WV	○	○	○	○	○	○	
		D-F8□	○	○	○	○	○	○	

Note 1) With the standard piping type, solid state switches D-F8□, D-F9□V, and D-F9□WV with perpendicular electrical entry cannot be mounted due to the interference of the fitting and speed controller.

○ ... Mountable
X Not mountable

Note 2) When mounting auto switches with in-line electrical entry, allow a space of 10mm or more at the rear end to prevent lead wire interference.



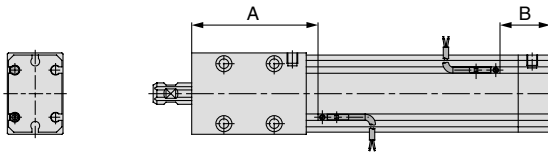
Proper Auto Switch Mounting Positions for Stroke End Detection

ø12 to ø40

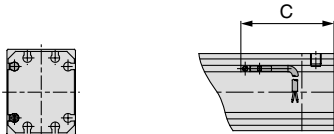
Reed switch: D-A90/A93/A96

Solid state switch: D-F9N/F9P/F9B

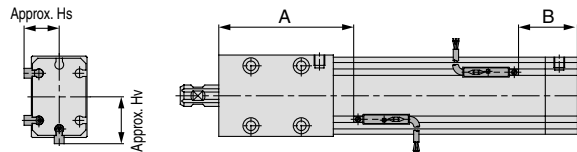
2 colour indication solid state switch: D-F9NW/F9PW/F9BW



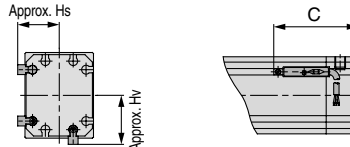
For ø12, 16, 20



For ø25, 32, 40



For ø12, 16, 20

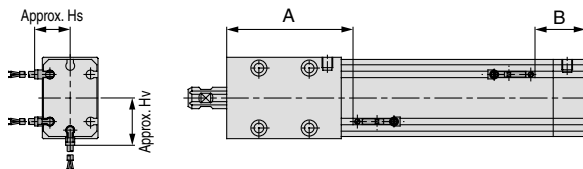


For ø25, 32, 40

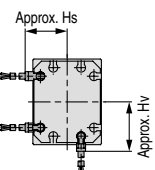
Reed switch: D-A90V/A93V/A96V

Solid state switch: D-F9NV/F9PV/F9BV

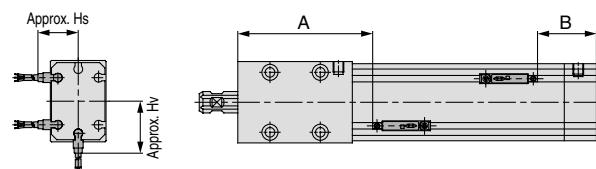
2 colour indication solid state switch: D-F9NWV/F9PWV/F9BWV



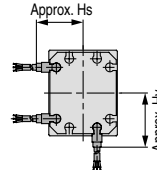
For ø12, 16, 20



For ø25, 32, 40



For ø12, 16, 20



For ø25, 32, 40

Proper auto switch mounting positions

(mm)

Bore size (mm)	Reed switch							Solid state switch							2 colour indication solid state switch								
	D-A90/A93/A96			D-A90V/A93V/A96V				D-F9N/F9P/F9B			D-F9NV/F9PV/F9BV				D-F9NW/F9PW/F9BW					D-F9NWV/F9PWV/F9BWV			
	A	B	C	A	B	Hs	Hv	A	B	C	A	B	Hs	Hv	A	B	C	Hs	Hv	A	B	Hs	Hv
12	42	15.5	35.5	42	15.5	13	18	46	19.5	31.5	46	19.5	15	20	45	18.5	32.5	12.5	17.5	45	18.5	15	20
16	43.5	17	37	43.5	17	15	20	47.5	21	33	47.5	21	17	22	46.5	20	34	14.5	19.5	46.5	20	17	22
20	59.5	23	43	59.5	23	17	22.5	63.5	27	39	63.5	27	19	24.5	62.5	26	40	16.5	22	62.5	26	19	24.5
25	63	26	46	63	26	20	23.5	67	30	42	67	30	22	25.5	66	29	43	19.5	23	66	29	22	25.5
32	84.5	32	52	84.5	32	23	26.5	88.5	36	48	88.5	36	25	28.5	87.5	35	49	22.5	26	87.5	35	25	28.5
40	98.5	32.5	52.5	98.5	32.5	28	28	102.5	36.5	48.5	102.5	36.5	30	30	101.5	35.5	49.5	27.5	27.5	101.5	35.5	30	30

Auto Switch Mounting

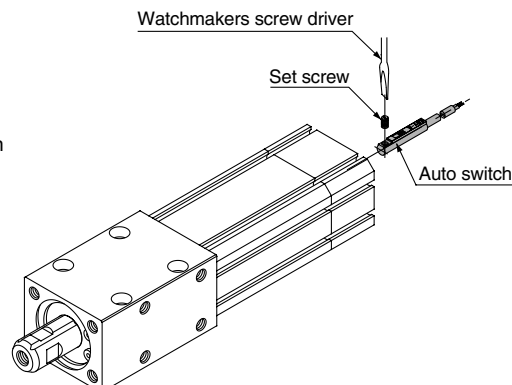
⚠ Caution

Auto switch mounting tools

When tightening the set screw (included with auto switches), use a watchmakers screw driver with a handle about 5 to 6mm in diameter.

Tightening torque

Tighten with a torque of 0.10 to 0.20 N·m.

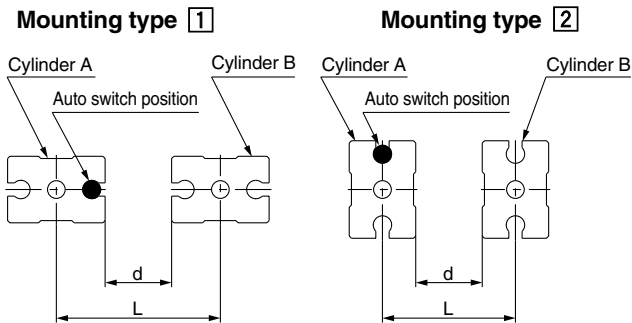


Using Cylinders in Close Proximity to One Another

⚠ Caution

- When cylinders are used in close proximity to one another as in mounting patterns 1 through 4, the magnetic force of the auto switch magnets in cylinder B may have an effect on the operation of the auto switches on cylinder A. The mounting pitch of cylinders should be at least the values given in the table below.

ø8

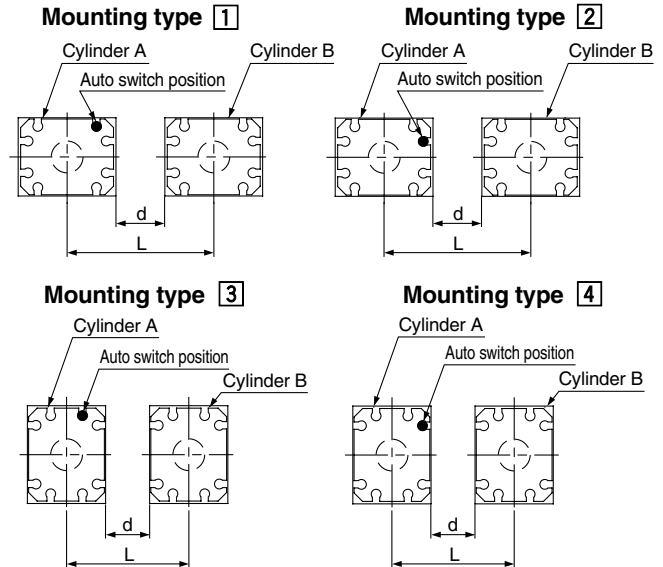


Dimensions by mounting type

Bore size (mm)	Auto switch model	1		2	
		L	d	L	d
8	D-A9□, D-A9□V	25 (37)	3 (15)	15	0
	D-F9□, D-F9□V	25 (39)	3 (17)	15	0
	D-F8□	47	25	15	0
	D-F9□W, D-F9□WV	25 (39)	3 (17)	15	0

Values inside () are for models D-A9□V, D-F9□V and D-F9□WV.

ø12 to ø40



Dimensions by mounting type

Bore size (mm)	Auto switch model	1		2		3		4	
		L	d	L	d	L	d	L	d
12	D-A9□, D-A9□V	28	0	28 (43)	0 (15)	18	0	18 (33)	0 (15)
	D-F9□, D-F9□V	28	0	33 (45)	5 (17)	18	0	28 (35)	10 (17)
	D-F9□W, D-F9□WV	28	0	33 (45)	5 (17)	18	0	28 (35)	10 (17)
16	D-A9□, D-A9□V	32	0	32 (47)	0 (15)	22	0	22 (37)	0 (15)
	D-F9□, D-F9□V	32	0	37 (49)	5 (17)	22	0	32 (39)	10 (17)
	D-F9□W, D-F9□WV	32	0	37 (49)	5 (17)	22	0	32 (39)	10 (17)
20	D-A9□, D-A9□V	38	0	38 (53)	0 (15)	26	0	26 (41)	0 (15)
	D-F9□, D-F9□V	38	0	38 (55)	0 (17)	26	0	31 (43)	5 (17)
	D-F9□W, D-F9□WV	38	0	38 (55)	0 (17)	26	0	36 (43)	10 (17)
25	D-A9□, D-A9□V	40	0	40 (55)	0 (15)	32	0	32 (47)	0 (15)
	D-F9□, D-F9□V	40	0	50 (57)	10 (17)	32	0	42 (49)	10 (17)
	D-F9□W, D-F9□WV	40	0	50 (57)	10 (17)	32	0	47 (49)	15 (17)
32	D-A9□, D-A9□V	50	0	50 (62)	0 (12)	38	0	38 (53)	0 (15)
	D-F9□, D-F9□V	50	0	55 (64)	5 (14)	38	0	48 (55)	10 (17)
	D-F9□W, D-F9□WV	50	0	55 (64)	5 (14)	38	0	48 (55)	10 (17)
40	D-A9□, D-A9□V	54	0	54 (66)	0 (12)	48	0	48 (63)	0 (15)
	D-F9□, D-F9□V	54	0	59 (68)	5 (14)	48	0	58 (65)	10 (17)
	D-F9□W, D-F9□WV	54	0	59 (68)	5 (14)	48	0	58 (65)	10 (17)

Values inside () are for models D-A9□V, D-F9□V and D-F9□WV.
If cylinders are used with a mounting pitch less than shown above, they must be shielded with iron plates or the separately sold magnetic shielding plate (part no. MU-S025). Contact SMC for further information.

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

Series MTS Order Made Specifications

Contact SMC for detailed dimensions, specifications and lead times.

1 Variable Stroke Cylinder/Adjustable Extension Type -XC8

Basic type MTS Bore size - Stroke - XC8

With end lock MTS Bore size - Stroke R - XC8
(ø12 to ø40)



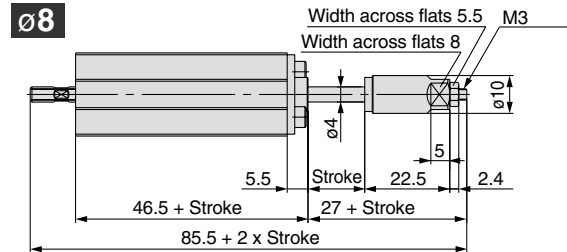
Stroke adjustment is possible on the rod extension side.
Stroke adjustment range: 0 to 10mm (ø8)
0 to 25mm (ø12 to ø40)

Specifications

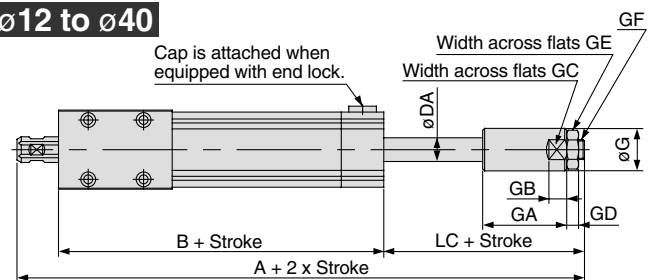
Bore size (mm)	8	12	16	20	25	32	40
Minimum operating pressure	Without end lock 0.15MPa	0.12MPa			0.1MPa		
	With end lock *	—	0.17MPa		0.15MPa		
Piping direction	Standard piping type						
Rod end configuration	Female threads, Male threads						
Stroke adjustment method	Stopper adjustment						
Stroke adjustment range	0 to 10mm	0 to 25mm					

* Except lock unit: 0.12MPa for ø12 and 16
0.10MPa for ø20 to 40

Dimensions



ø12 to ø40



Basic type

Bore size (mm)	A	B	LC	DA	G	GA	GB	GC	GD	GE	GF
12	145	80.5	49.5	6	13.5	42.5	6	11	4	8	M5
16	149.5	83	50.5	8	15.5	42.5	7	13	5	10	M6
20	175	106.5	50.5	10	19.5	42.5	8.5	17	5	13	M8
25	187	114.5	51.5	12	21.5	42.5	9	19	6	17	M10 x 1.25
32	222.5	142.5	56	16	27.5	45	10.5	24	8	22	M14 x 1.5
40	240	155	59	20	32.5	45	11.5	27	11	27	M18 x 1.5

With end lock

Bore size (mm)	A	B
12	163	98.5
16	165.5	99
20	191.5	123
25	201.5	129
32	238.5	158.5
40	258.5	173.5

* Other dimensions are the same as the standard type.

2 Vacuum Specification/Rod Through Hole Type -XC38

MTS8 - Stroke (P) - XC38

Axial piping type

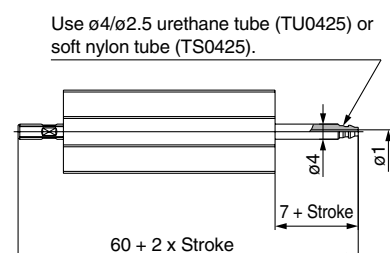
Vacuum specification
Rod through hole type



Specifications

Bore size (mm)	8
Piping direction	Standard piping type, Axial piping type
Rod end configuration	Female threads

Dimensions



Series MTS Model Selection



Caution

Theoretical output must be confirmed separately.

Selection Conditions: Follow the tables below in order to determine selection conditions and choose one selection graph.

Vertical mounting

Mounting orientation								
Max. speed mm/s		to 100	to 200	to 300	to 400	to 500	to 600	to 800
Stroke mm		All strokes common						
Selection graph	ø8	1	—	2	—	3	—	—
	ø12 to ø40	—	4	—	5	—	6	7

Horizontal mounting

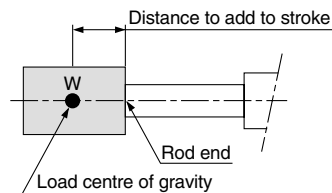
Mounting orientation															
		* Direction for L can be up, down, left, right, or diagonal.													
Max. speed mm/s		to 300			to 500			to 600				to 800			
Stroke mm		to 10	to 20	to 30	to 10	to 20	to 30	to 50	to 100	to 150	to 200	to 50	to 100	to 150	to 200
Selection graph	ø8	8	9	10	11	12	13	—	—	—	—	—	—	—	—
	ø12 to ø40	—	—	—	—	—	—	14	15	16	17	18	19	20	21

* L: Overhang The distance between the cylinder's central axis and the load centre of gravity



Caution

- In case of horizontal mounting, when the load centre of gravity is beyond the rod end, add that distance to the stroke to select a graph.



Selection Examples

- Selection conditions
 - Mounting: Vertical
 - Maximum speed: 800mm/s
 - Overhang: 50mm
 - Load weight: 2kg

Refer to graph **7** based on vertical mounting and the maximum speed of 800mm/s. On graph **7**, find the intersecting point for the overhang of 50mm and the load weight of 2kg to determine ø32.

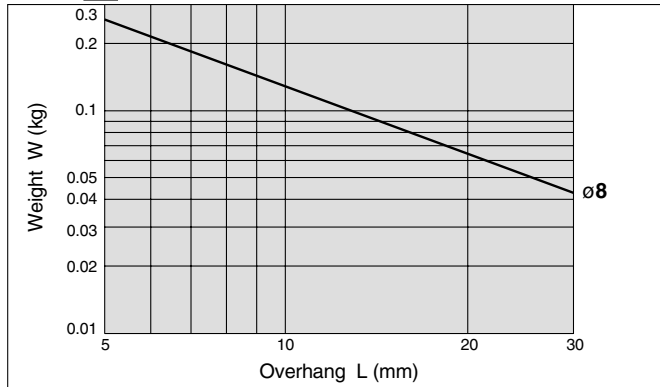
- Selection conditions
 - Mounting: Horizontal
 - Maximum speed: 600mm/s
 - Stroke: 125mm
 - Overhang: 80mm
 - Load weight: 0.7kg

Refer to graph **16** based on horizontal mounting, the maximum speed of 600mm/s, and 125mm stroke. On graph **16**, find the intersecting point for the overhang of 80mm and the load weight of 0.7kg to determine ø25.

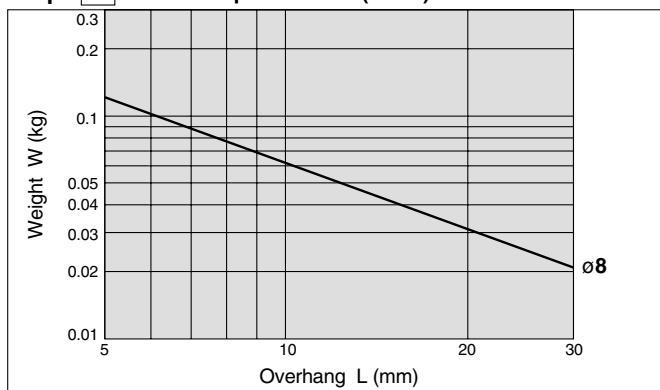
Horizontal Mounting

ø8

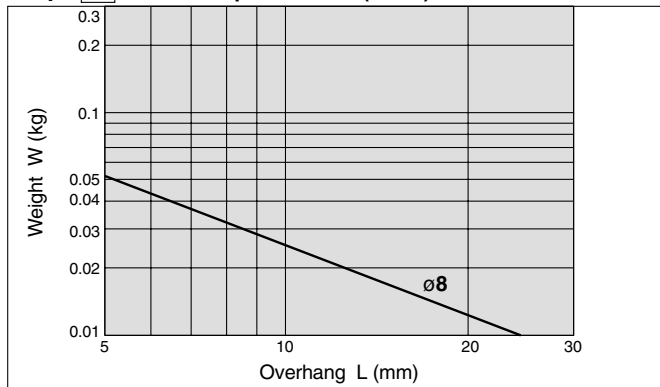
Graph 1 Maximum speed: to 100 (mm/s)



Graph 2 Maximum speed: to 300 (mm/s)

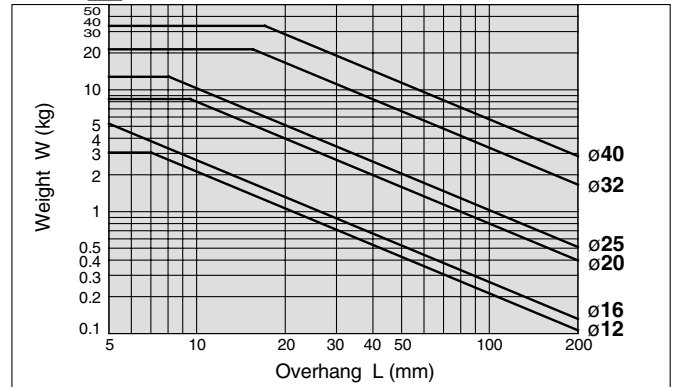


Graph 3 Maximum speed: to 500 (mm/s)

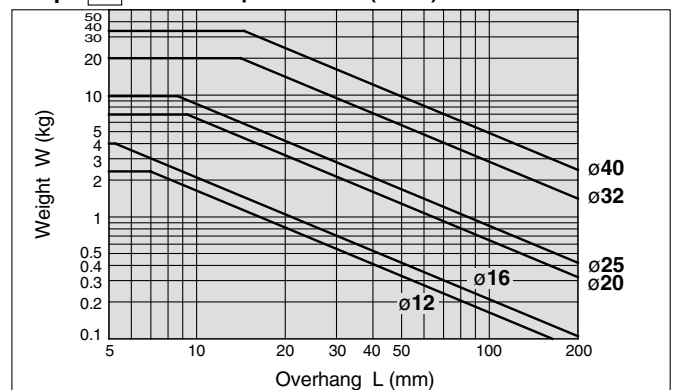


ø12 to ø40

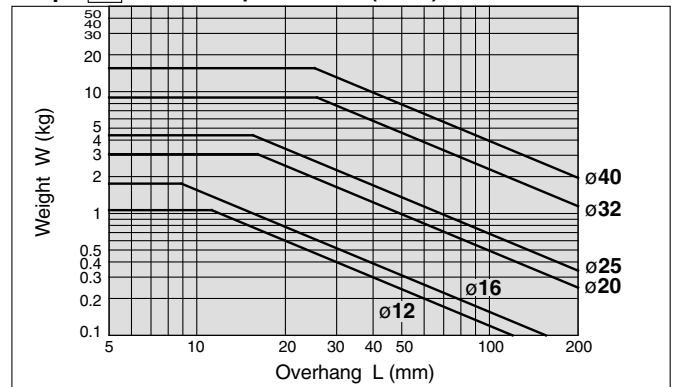
Graph 4 Maximum speed: to 200 (mm/s)



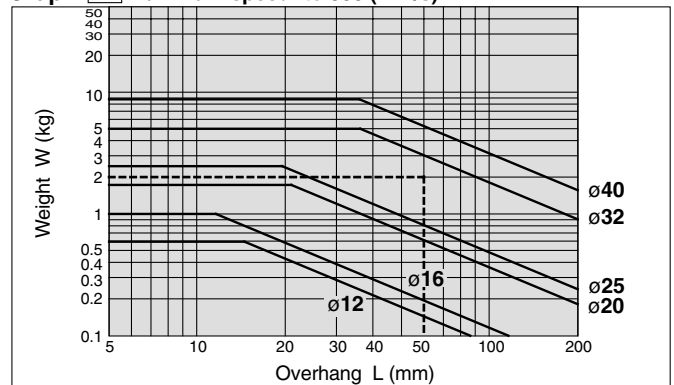
Graph 5 Maximum speed: to 400 (mm/s)



Graph 6 Maximum speed: to 600 (mm/s)



Graph 7 Maximum speed: to 800 (mm/s)



MK/MK2

RS

RE

REC

C..X

MTS

C..S

MQ

RHC

CC

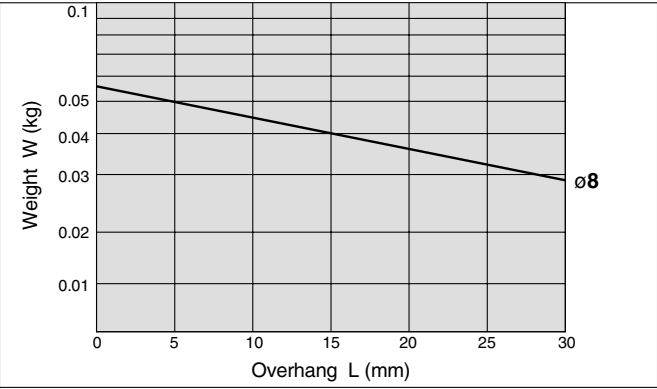
Series MTS

Horizontal Mounting

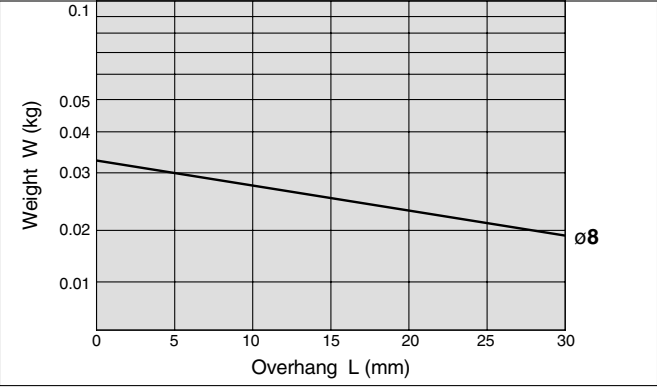
ø8

Maximum speed: to 300mm/s

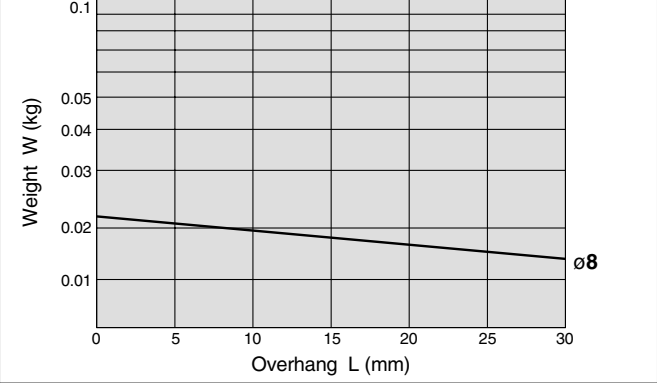
Graph 8 Stroke: to 10mm



Graph 9 Stroke: to 20mm

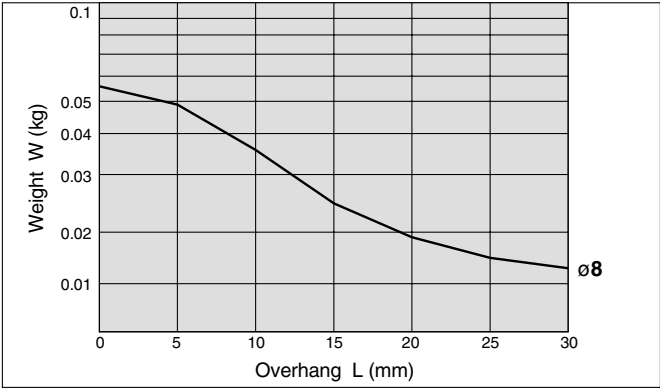


Graph 10 Stroke: to 30mm

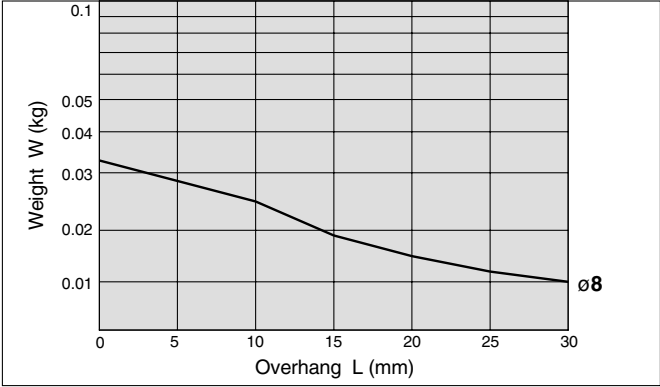


Maximum speed: to 500mm/s

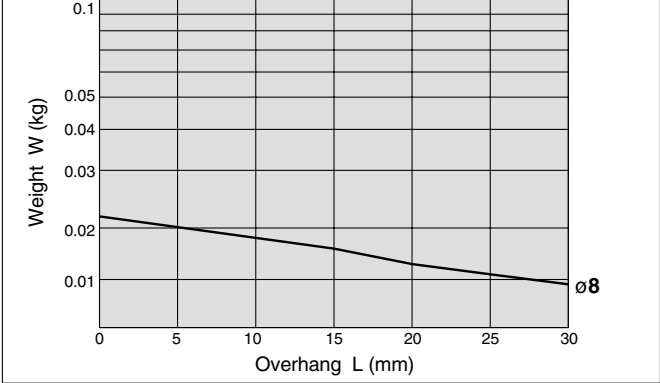
Graph 11 Stroke: to 10mm



Graph 12 Stroke: to 20mm



Graph 13 Stroke: to 30mm

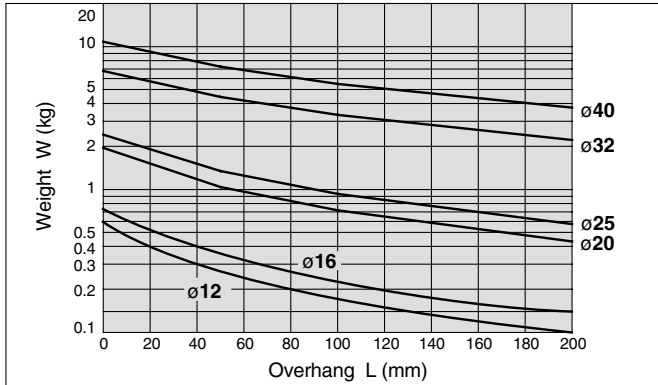


Horizontal Mounting

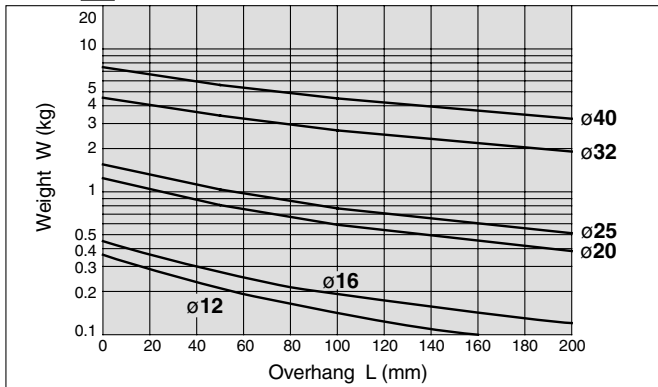
ø12 to ø40

Maximum speed: to 600mm/s

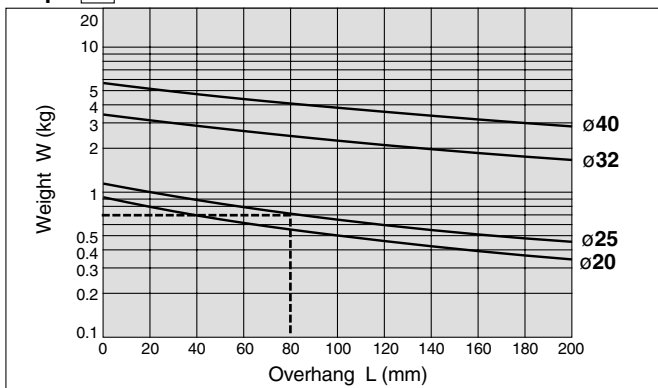
Graph 14 Stroke: to 50mm



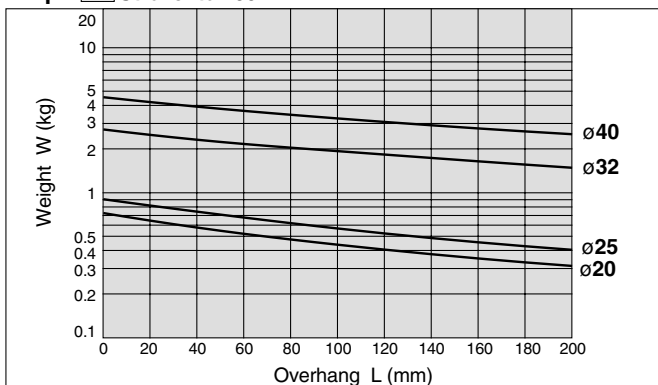
Graph 15 Stroke: to 100mm



Graph 16 Stroke: to 150mm

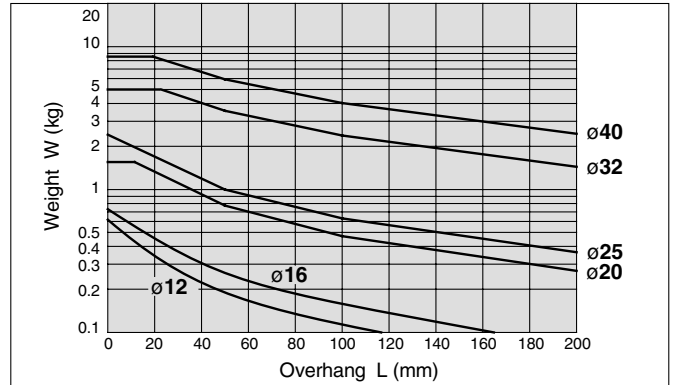


Graph 17 Stroke: to 200mm

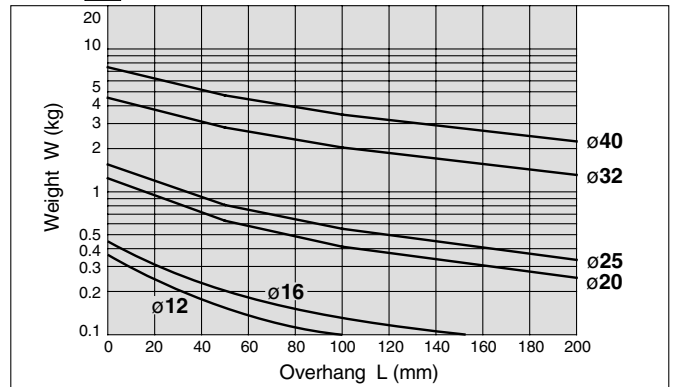


Maximum speed: to 800mm/s

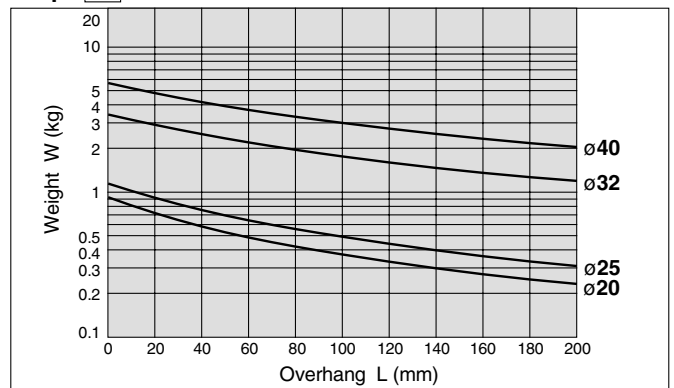
Graph 18 Stroke: to 50mm



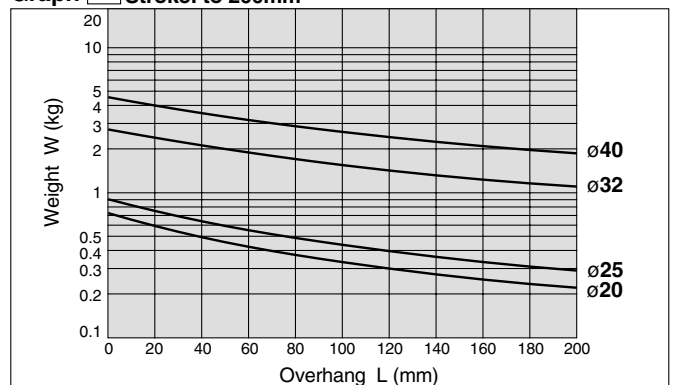
Graph 19 Stroke: to 100mm



Graph 20 Stroke: to 150mm



Graph 21 Stroke: to 200mm



MK/MK2

RS

RE

REC

C..X

MTS

C..S

MQ

RHC

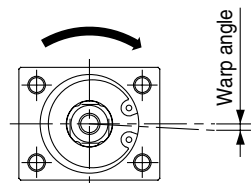
CC

Series MTS Spline Rod Displacement

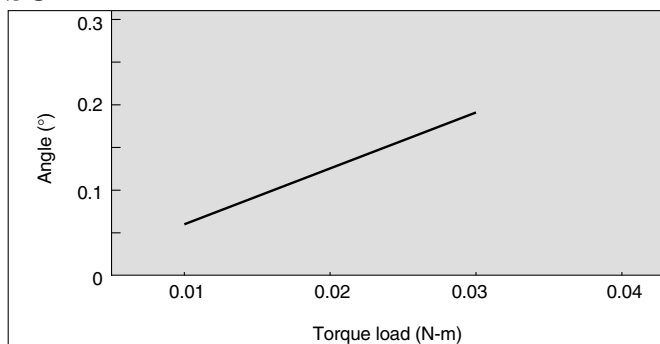
Warp Angle

Displacement angle of spline rod due to torque load

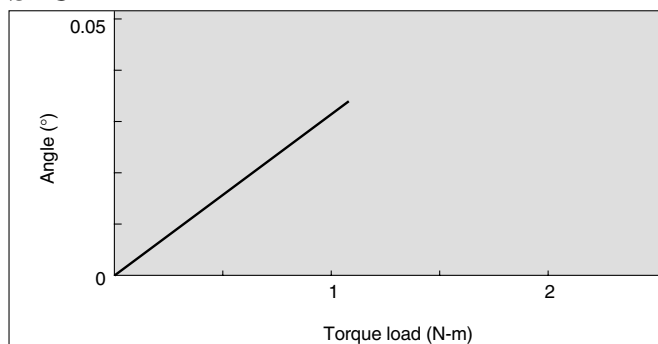
The displacement angle when a static load is applied in the direction of the arrow, with the spline rod retracted.



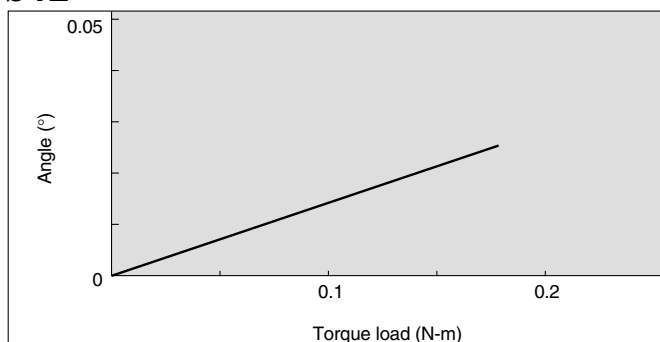
ø8



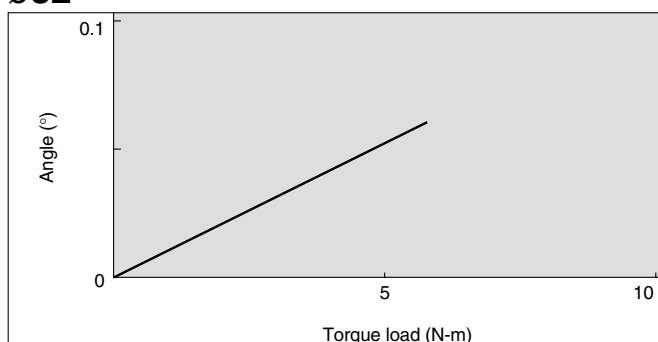
ø25



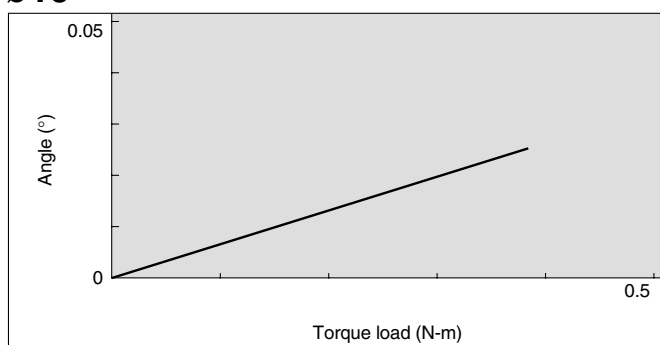
ø12



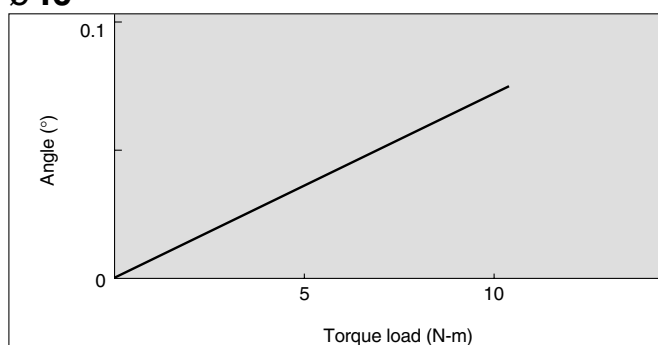
ø32



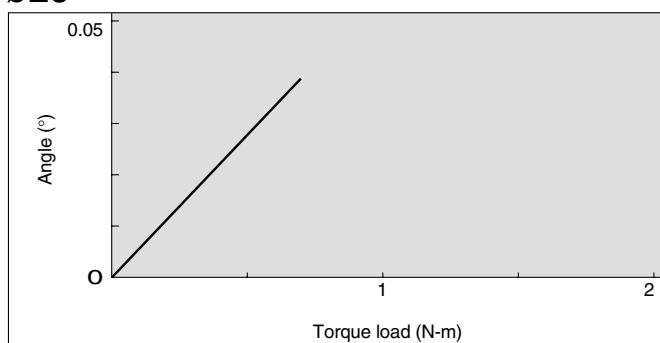
ø16



ø40



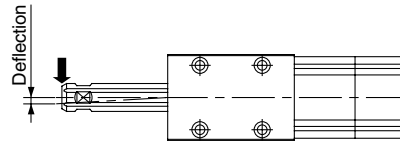
ø20



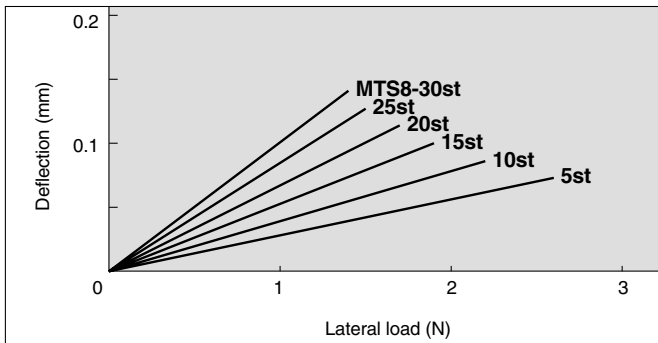
Deflection

Displacement of spline rod due to pitch moment load

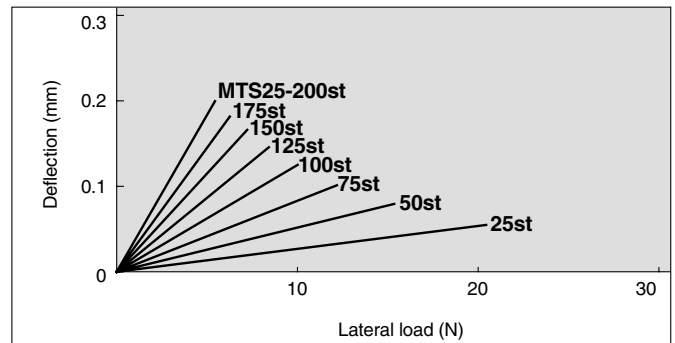
Displacement of the rod end when a static load is applied in the direction of the arrow, with the spline rod fully extended.



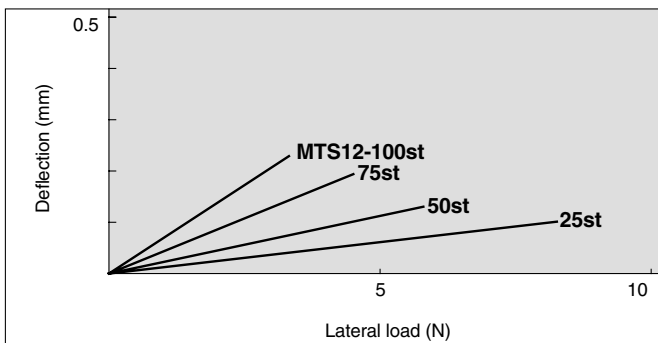
ø8



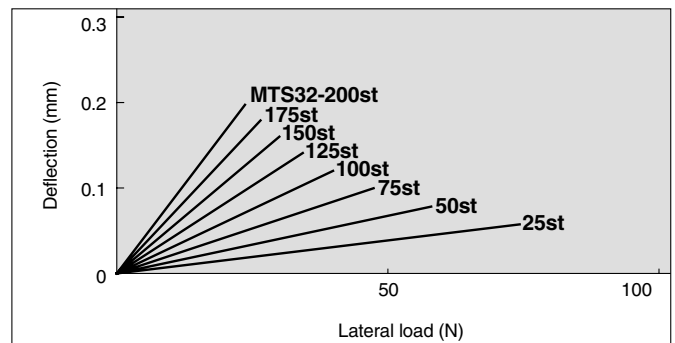
ø25



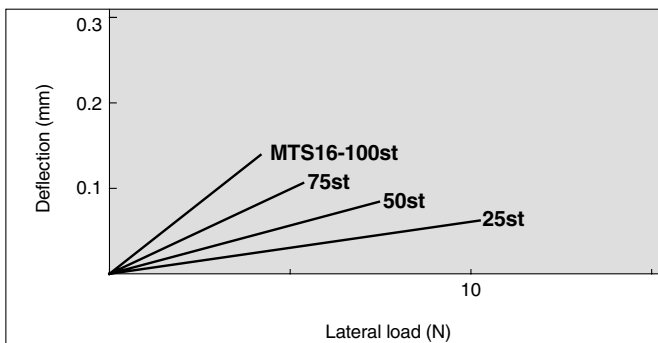
ø12



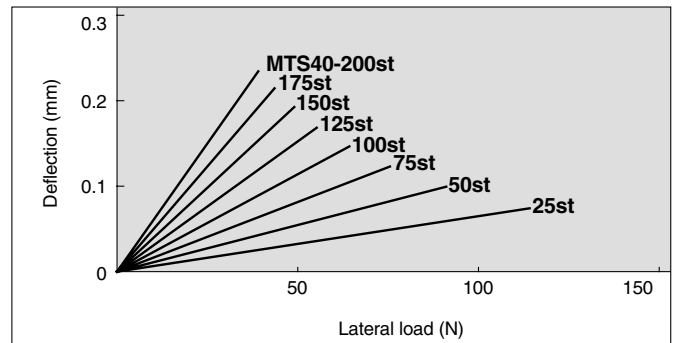
ø32



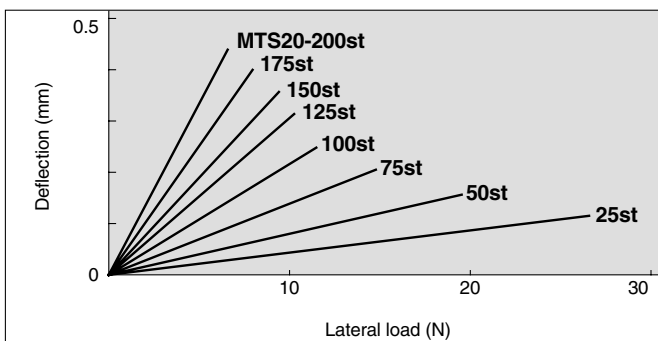
ø16



ø40



ø20



Design

⚠ Caution

1. Displacement may increase after an impact load has been applied.

If an impact load is applied to the spline rod, the guide unit may be permanently deformed and displacement may increase.

MK/MK2

RS

RE

REC

C..X

MTS

C..S

MQ

RHC

CC



Series MTS Specific Product Precautions

Be sure to read before handling.

Use of the End Lock Type

Operation

⚠ Caution

1. Do not use 3 position solenoid valves.

Avoid use in combination with 3 position solenoid valves (especially closed centre metal seal types). If pressure is trapped in the port on the lock mechanism side, the cylinder cannot be locked.

Furthermore, even after being locked, the lock may be released after some time, due to air leaking from the solenoid valve and entering the cylinder.

2. Back pressure is required when releasing the lock.

Before starting operation, be sure to control the system so that air is supplied to the side without the lock mechanism. There is a possibility that the lock may not be released. (Refer to the section on releasing the lock.)

3. Release the lock when mounting or adjusting the cylinder.

If mounting or other work is performed when the cylinder is locked, the lock unit may be damaged.

4. Operate with a load ratio of 50% or less.

If the load ratio exceeds 50%, this may cause problems such as failure of the lock to release, or damage to the lock unit.

5. Do not operate multiple synchronized cylinders.

Avoid applications in which two or more end lock cylinders are synchronized to move one workpiece, as one of the cylinder locks may not be able to release when required.

6. Use a speed controller with meter-out control.

It may not be possible to release the lock with meter-in control.

7. Be sure to operate completely to the cylinder stroke end on the side with the lock.

If the cylinder piston does not reach the end of the stroke, locking and unlocking may not be possible.

Operating Pressure

⚠ Caution

1. Apply air pressure of at least that shown in the table below to the port on the lock mechanism side. This is necessary to release the lock.

Bore size (mm)	Operating pressure MPa
12, 16	0.17
20, 25, 32, 40	0.15

Exhaust Speed

⚠ Caution

1. Locking will occur automatically if the pressure applied to the port on the lock mechanism side falls to 0.05MPa or less. In cases where the piping on the lock mechanism side is long and thin, or the speed controller is separated at some distance from the cylinder port, the exhaust speed will be reduced. Take note that some time may be required for the lock to engage. In addition, clogging of a silencer mounted on the solenoid valve EXH. port will also produce the same effect.

Relationship with the Cushion

⚠ Caution

1. When the cushion valve on the lock mechanism side is closed or nearly closed, the spline rod may not reach the stroke end, and consequently the lock may not engage.

Moreover, if the lock does engage when the cushion valve is nearly closed, it may not be possible for the lock to release. Therefore, the cushion valve should be adjusted properly.

Releasing the Lock

⚠ Warning

1. Before releasing the lock, be sure to supply air to the side without the lock mechanism, so that there is no load applied to the lock mechanism when it is released. If the lock is released when the port on the other side is in an exhaust state, and with a load applied to the lock unit, the lock unit may be subjected to an excessive force and be damaged.

Furthermore, sudden movement of the spline rod is very dangerous.

Manual Release

⚠ Caution

1. Insert the bolt, screw it into the lock piston, and then pull it to release the lock. If you stop pulling the bolt, the lock will return to an operational state. Thread sizes, pulling forces and strokes are as shown below.

Bore size (mm)	Thread size	Pulling force N	Stroke (mm)
12, 16	M2 x 15ℓ or more	2	1.5
20, 25, 32	M3 x 30ℓ or more	3	2
40	M3 x 30ℓ or more	4	3

* Remove the bolt for normal operation.
It can cause lock malfunction or faulty release.

