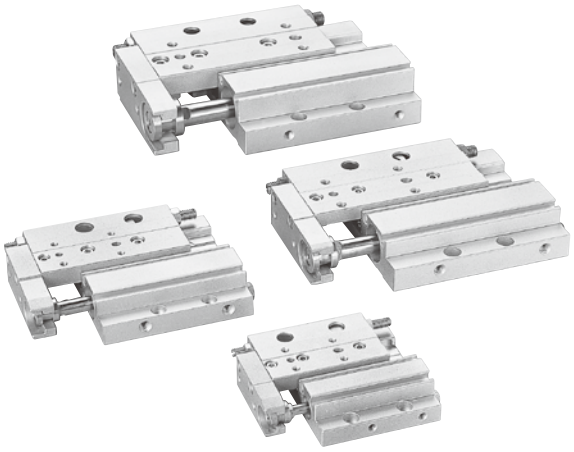
MCSF series ø8~ø20

LOW PROFILE SLIDE CYLINDER



Features

- Parallel mounting of guide to cylinder gives slim compact unit.
- Flush fitting sensor groove.
- Magnetic as standard.

Specification

Model	MCSF	
Acting type	Double acting	
Tube I.D. (mm)	8	12, 16, 20
Port size	M3×0.5	M5×0.8
Medium	Air	
Operating pressure range	0.15~0.7 MPa	
Proof pressure	1 MPa	
Ambient temperature	-10~+60°C (No freezing)	
Available speed range	50~500 mm/sec	
Lubricator	Not required	
Cushion	Rubber bumper	
Stroke length tolerance	$^{+1.0}_{0}$	
Stroke adjuster range	Extend 5mm / Retract 5mm	
Sensor switch (*)	RCE, RCE1	

* RCE, RCE1 specification, please refer to page 8-12, 13.

Table for standard stroke

Tube I.D.	Stroke (mm)
ø8	10, 20, 30
ø12	20, 30, 50
ø16	30, 50, 75
ø20	30, 50, 75, 100

* Made to order.

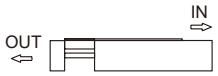
Order example

MCSF — 12 — 50 — X11

- MCSF — MODEL
- 12 — TUBE I.D.
- 50 — STROKE
- X11 — STROKE ADJUSTABLE
  - Blank: 5mm
  - **X11**: 15mm
  - **X12**: 25mm

* **X12** (adjustable range 25mm) is not available in series **MCSF-8 / MCSF-12**.

Theoretical force



Unit: N

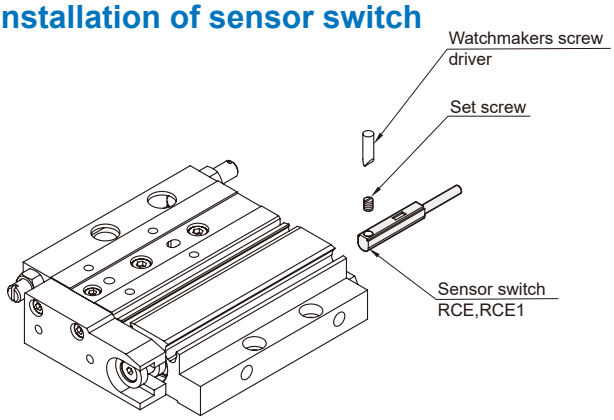
Tube I.D. (mm)	Piston rod (mm)	Operating direction	Piston area (mm^2)	Operating pressure (MPa)					
				0.2	0.3	0.4	0.5	0.6	0.7
8	4	OUT	50	10	15	20	25	30	35
		IN	38	8	11	15	19	23	27
12	6	OUT	113	23	34	45	57	68	79
		IN	85	17	26	34	43	51	60
16	8	OUT	201	40	60	80	101	121	141
		IN	151	30	45	60	76	91	106
20	10	OUT	314	63	94	126	157	188	220
		IN	236	47	71	94	118	142	165

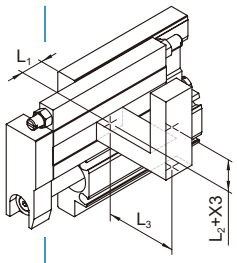
Cylinder weight

Unit: g

Stroke (mm)	Tube I.D.			
	ø8	ø12	ø16	ø20
10	125	–	–	–
20	132	212	–	–
30	171	248	372	608
50	–	357	522	775
75	–	–	696	1,053
100	–	–	–	1,351

Installation of sensor switch



Model selection steps	Formula / Data	Selection example
1. Operating conditions List the operating conditions considering the mounting position and workpiece configuration. Check that the load weight does not exceed the max. allowable load weight and that the average operating speed does not exceed the operating speed range.	• Model to be used. • Type of cushion. • Workpiece mounting position. • Average operating speed Va (mm/s) • Load mass W (kg): Fig 1, Table 2 • Overhang Ln(mm): Fig 2	 Cylinder: MCSF-8-10 Cushion: Rubber bumper Workpiece table mounting Mounting: Horizontal wall mounting Average operating speed: Va = 100 mm/s Load mass: W = 0.2 kg L_1 = 2mm L_2 = 3mm L_3 = 4mm
2. Kinetic energy Find the kinetic energy E (J) of the load. Find the allowable kinetic energy Ea (J). Confirm that the kinetic energy of the load does not exceed the allowable kinetic energy.	$E = \frac{1}{2} \cdot W \left(\frac{V}{1000}\right)^2$ Collision speed V = 1.4* • Va * Correction factor (Reference values) Ea = K • Emax Workpiece mounting coefficient K: Fig 3 Max. allowable kinetic energy Emax: Table 1 Kinetic energy (E) ≤ Allowable kinetic energy (Ea)	$E = \frac{1}{2} \cdot 0.2 \left(\frac{140}{1000}\right)^2 = 0.002$ V = 1.4 • 100 = 140 Ea = 1 • 0.023 = 0.023 Can be used based on E = 0.002 ≤ Ea = 0.023

(Continued)

Table 1: Max. allowable kinetic energy: Emax (J)

Tube I.D. (mm)	Allowable kinetic energy
	Rubber bumper
ø8	0.023
ø12	0.050
ø16	0.104
ø20	0.153

Fig 1: Load mass: W (kg)

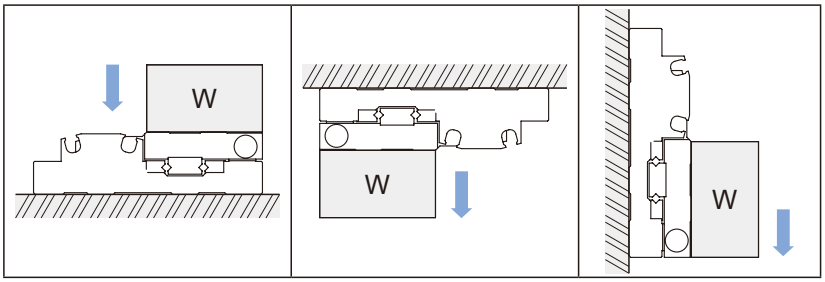


Table 2: Max. allowable load mass: Wmax (kg)

Tube I.D. (mm)	Max. allowable load mass
ø8	0.5
ø12	0.9
ø16	1.8
ø20	3.6

Fig 2: Overhang: Ln (mm), Correction value of moment center position distance: Xn (mm)

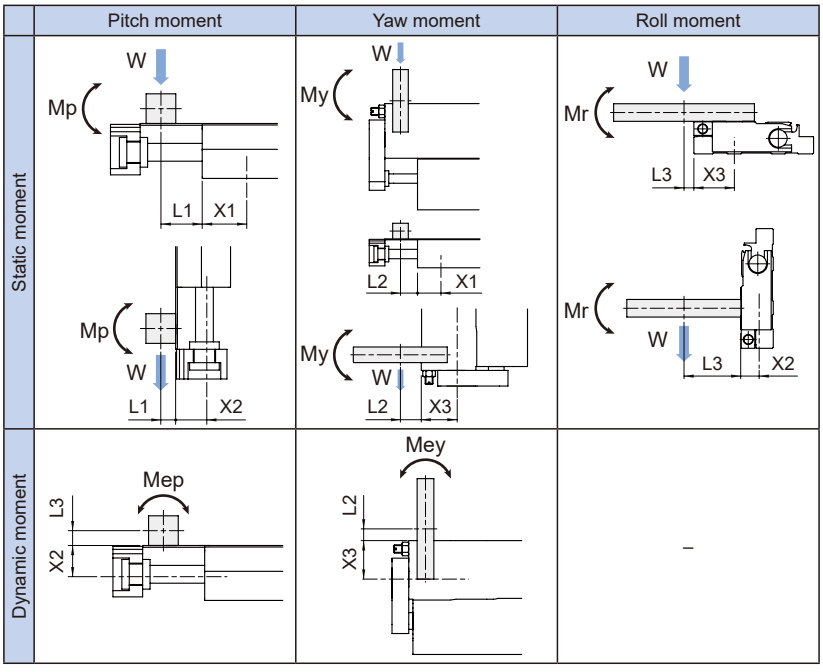
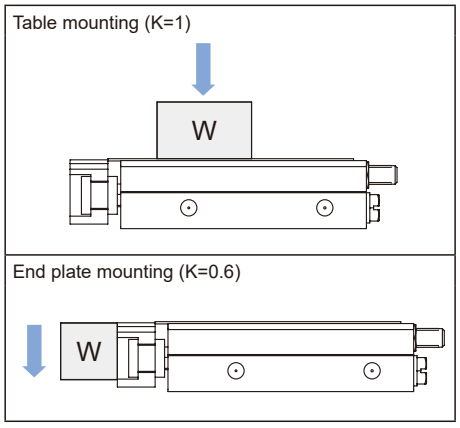


Fig 3: Workpiece mounting coefficient: K



Note. Static moment: Moment generated by gravity.
Dynamic moment: Moment generated by impact when colliding with stopper.

Model selection steps	Formula / Data	Selection example
3. Load factor		
3-1 Load factor of load mass Find the allowable load mass Wa (kg). Note: There is no need to consider this load factor in the case of using perpendicularly in a vertical position. (Define $\alpha_1 = 0$.) Find the load factor of the load mass α_1.	Wa = K • β • Wmax Workpiece mounting coefficient K: Fig 3 Allowable load mass coefficient β: Fig 4 Max. allowable load mass Wmax: Table 2 α_1 = W/Wa	Wa = 1 • 1 • 0.5 = 0.5 K = 1 β = 1 Wmax = 0.5 α_1 = 0.2/0.5 = 0.4
3-2 Load factor of static moment Find the static moment M (N·m). Find the allowable static moment Ma (N·m). Find the load factor α_2 of the static moment.	M = W • 9.8(Ln+Xn) / 1000 Correction value of moment center position distance Xn: Table 3 Ma = K • γ • Mmax Workpiece mounting coefficient K: Fig 3 Allow load mounting coefficient γ: Fig 4 Max. allowable moment Mmax: Table 4 α_2 = M/Ma	Yawing Examine My. My = 0.2 • 9.8(2+27)/1000 = 0.06 X_1 = 27 May = 1 • 1 • 0.5 = 0.5 Mymax = 0.5 K = 1 γ = 1 α_2 = 0.06/0.5 = 0.114 Rolling Examine Mr. Mr = 0.2 • 9.8(4+9.5)/1000 = 0.026 X_2 = 9.5 Mar = 0.5 (Same value as May) α'_2 = 0.026/0.5 = 0.053
3-3 Load factor of dynamic moment Find the dynamic moment Me (N·m). Find the allowable dynamic moment Mea (N·m). Find the load factor α_3 of the dynamic moment.	Me = 1/3 • We • 9.8 $\frac{(Ln+Xn)}{1000}$ Correction equivalent to impact We = δ • W • V δ: Bumper coefficient With urethane bumper (Standard) = 4/100 With shock absorber = 1/100 Correction value of moment center position distance Xn: Table 3 Mea = K • γ • Mmax Workpiece mounting coefficient K: Fig 3 Allowable mounting coefficient γ: Fig 4 Max. allowable moment Mmax: Table 4 α_3 = Me/Mea	Pitching Examine Mep. Mep = 1/3 • 1.12 • 9.8 • $\frac{(4+9.5)}{1000}$ = 0.05 We = 4/100 • 0.2 • 140 = 1.12 X_2 = 9.5 Meap = 1 • 1 • 0.5 = 0.5 K = 1 γ = 1 Mpmax = 0.5 α_3 = 0.05/0.5 = 0.099 Yawing Examine Mey. Mey = 1/3 • 1.12 • 9.8 • $\frac{(3+21)}{1000}$ = 0.088 We = 1.12 X_3 = 21 Meay = 0.5 (Same value as Meap) α'_3 = 0.088/0.5 = 0.176
3-4 Sum of load factors Possible to use if the sum of the load factors does not exceed 1.	$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$	$\Sigma\alpha_n = \alpha_1 + \alpha_2 + \alpha'_2 + \alpha_3 + \alpha'_3 \leq 1$ $\Sigma\alpha_n$ = 0.4 + 0.114 + 0.053 + 0.099 + 0.176 = 0.841 ≤ 1 Add it is possible to use.

Table 3: Correction value of moment center position distance: Xn (mm)

Tube I.D. (mm)	X1, Stroke (mm)						X2	X3
	10	20	30	50	75	100		
ø8	27	32	39.5	–	–	–	9.5	21
ø12	–	34.5	41	64.5	–	–	10.5	23
ø16	–	–	44	66.5	96.5	–	11	27.5
ø20	–	–	44	66.5	99.5	129	15	33.5

Table 4: Max. allowable moment: Mmax (N·m)

Tube I.D. (mm)	Stroke (mm)					
	10	20	30	50	75	100
ø8	0.5	0.7	0.88	–	–	–
ø12	–	1.49	2	3.01	–	–
ø16	–	–	3.07	5.12	7.16	–
ø20	–	–	5.99	8.23	12.33	16.44

Fig 3: Workpiece mounting coefficient: K

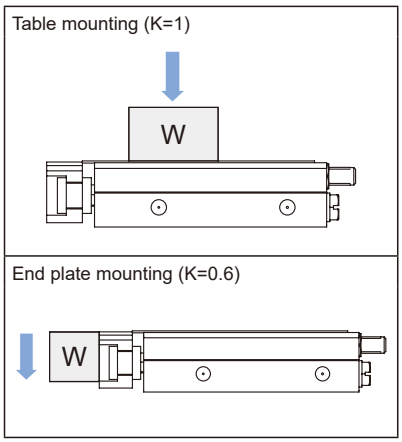
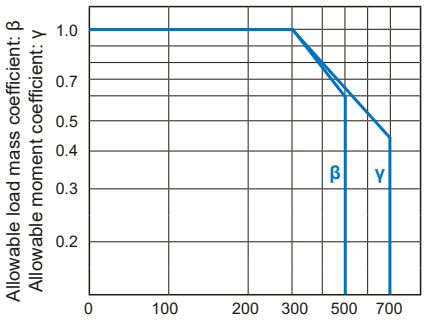


Fig.4: Allowable load mass coefficient: β
Allowable moment coefficient: γ

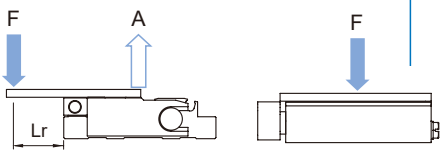


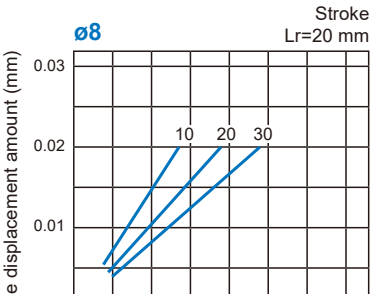
γ note: Use the average operating speed when calculating static moment. Use the collision speed when calculating dynamic moment.

Table deflection (Reference values)

Table displacement due to roll moment load

Table displacement of section A when loads are applied to the section F with theslide table retracted.





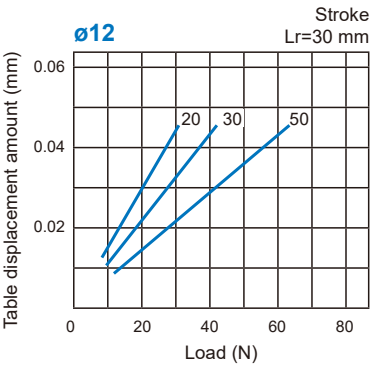
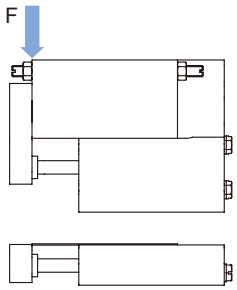
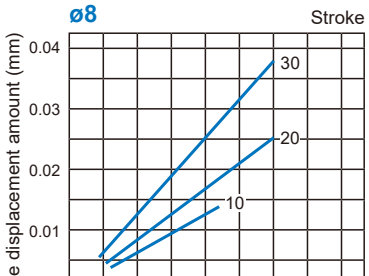


Table displacement due to yaw moment load

Table displacement when loads are applied to the section marked with the arrow at the full stroke.





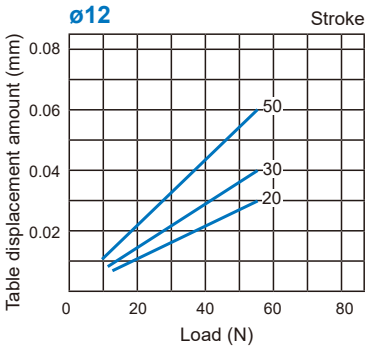
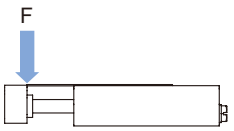
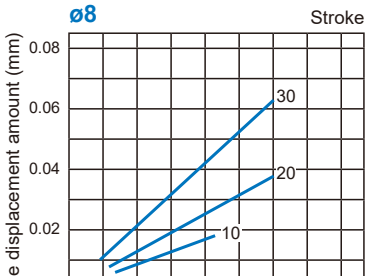


Table displacement due to pitch moment load

Table displacement when loads are applied to the section marked with the arrow at the full stroke.





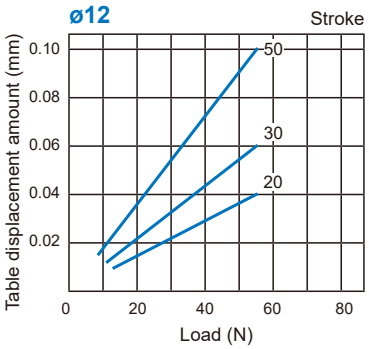
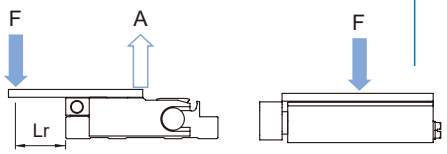
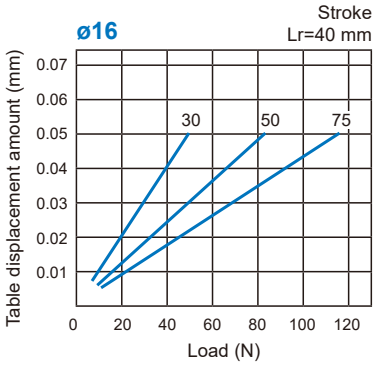


Table deflection (Reference values)

Table displacement due to roll moment load

Table displacement of section A when loads are applied to the section F with theslide table retracted.





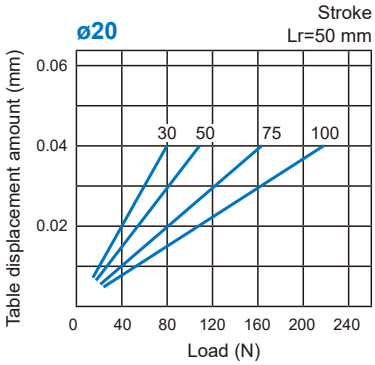
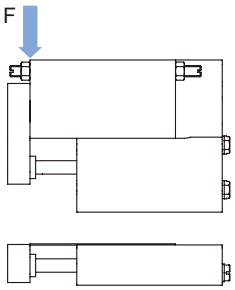
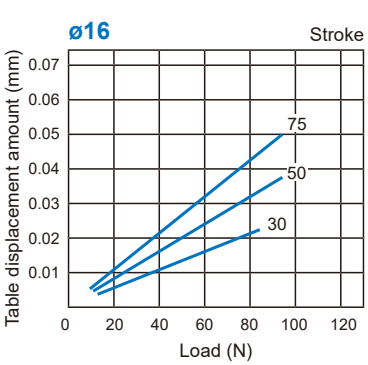


Table displacement due to yaw moment load

Table displacement when loads are applied to the section marked with the arrow at the full stroke.





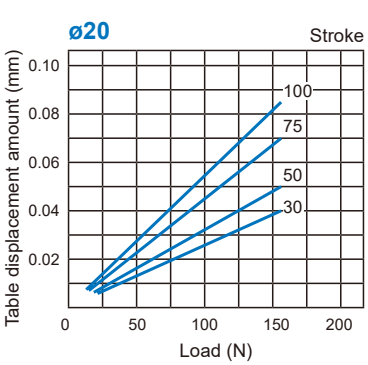
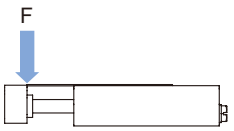
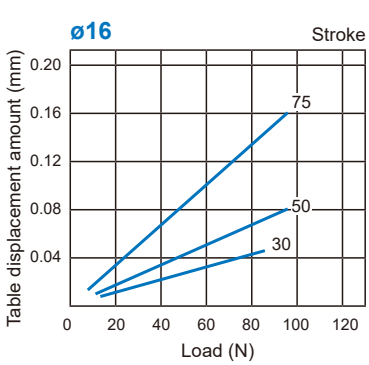
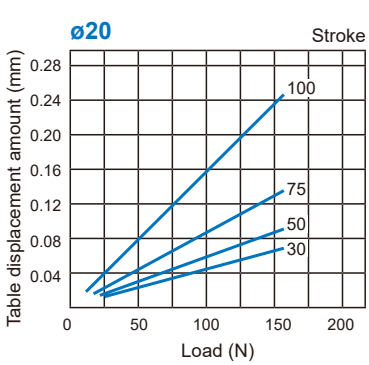


Table displacement due to pitch moment load

Table displacement when loads are applied to the section marked with the arrow at the full stroke.



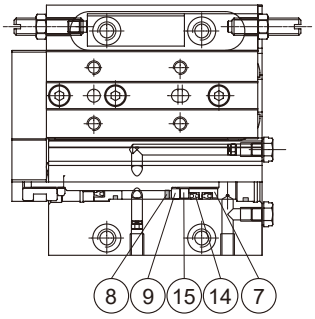




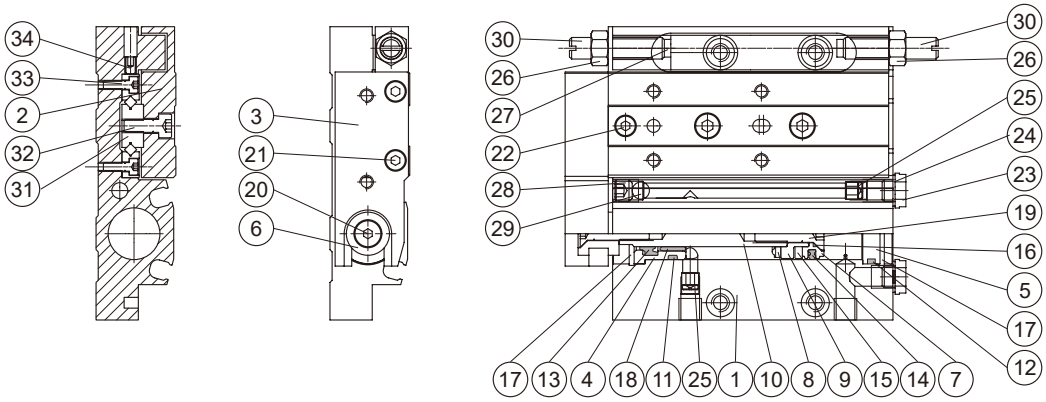
MCSF Inside structure & Parts list ø8~ø20

LOW PROFILE SLIDE CYLINDER

ø8



ø12, ø16, ø20



Material

No.	Tube I.D. / Part name	8	12~20	Q'y	Repair kits (inclusion)
1	Body	Aluminum alloy		1	
2	Table	Aluminum alloy		1	
3	Plate	Aluminum alloy		1	
4	Rod cover	Aluminum alloy		1	
5	Head cover	Aluminum alloy		1	
6	Floating connector	Stainless steel		1	
7	Piston	*2	*1	1	
8	Cushion pad	NBR		1	●
9	Piston	*2	*1	1	
10	Piston rod	Stainless steel		1	
11	Cover ring	NBR		1	●
12	Cover ring	NBR		1	●
13	Rod packing	NBR		1	●
14	Piston packing	NBR		1 or 2	●
15	Magnet ring	Magnet material		1	
16	Gasket	—	NBR	1	●
17	Stop ring	Stainless steel		2	
18	Rod bush	—	Bearing alloy	1	
19	Piston bolt	—	*2	1	
20	Floating connector bolt	—	*2	1	
21	Bolt	Stainless steel		2	

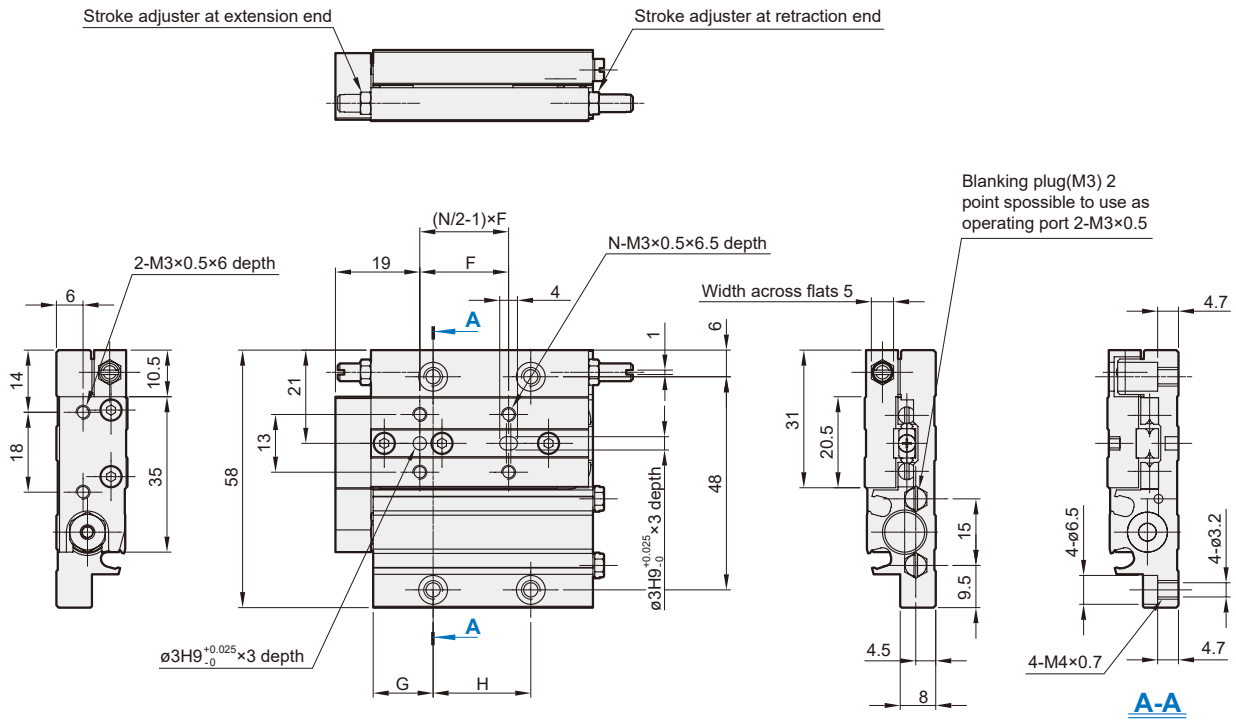
* Item 14. Tube I.D. ø8 (Q'y: 2pcs); Tube I.D. ø12~20 (Q'y: 1pc).

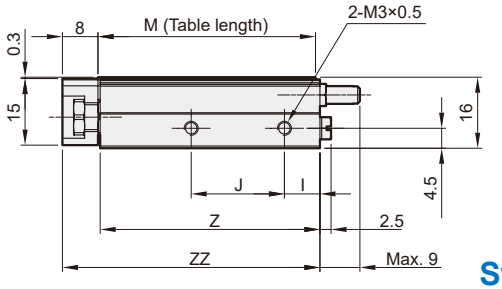
No.	Tube I.D. / Part name	8	12~20	Q'y	Repair kits (inclusion)
22	Bolt	Stainless steel		1	
23	Plug	Copper		2	
24	Plug gasket	POM		2	
25	Orifice	Stainless steel		2	
26	Nut	Copper/Stainless steel		2	
27	End cushion	PU		2	●
28	Plug	—	*2	1	
29	Ball	—	*2	1	
30	Adjuster bolt	Copper/Stainless steel		2	
31	Slide way	Bearing steel		1	
32	Bolt	Stainless steel		*3	
33	Bolt	Stainless steel		*3	
34	Bolt	Stainless steel		*3	

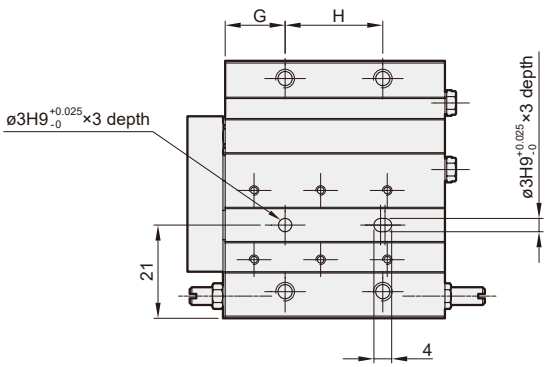
*1. Aluminum alloy
*2. Stainless steel
*3. Quantity varies depending on the stroke length.

Order example of repair kits

Tube I.D.	Repair kits
ø8	**PS-MCSF-8**
ø12	**PS-MCSF-12**
ø16	**PS-MCSF-16**
ø20	**PS-MCSF-20**

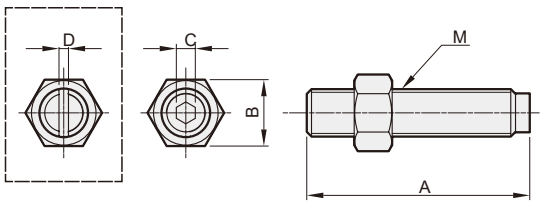




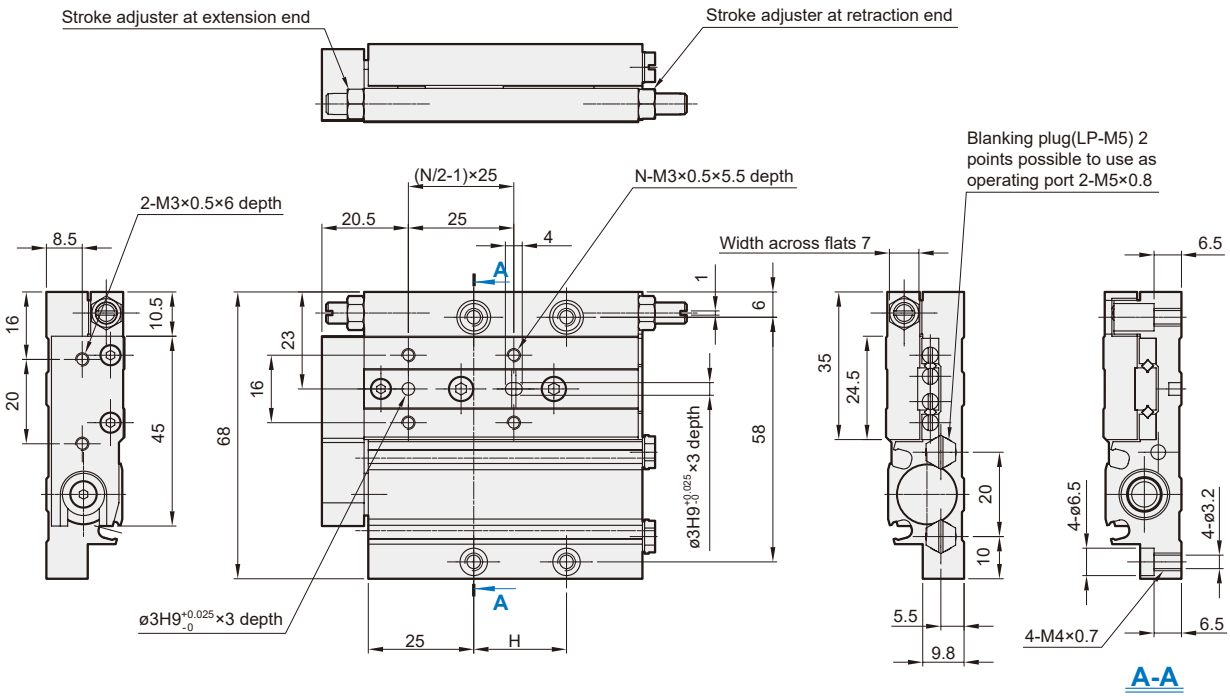


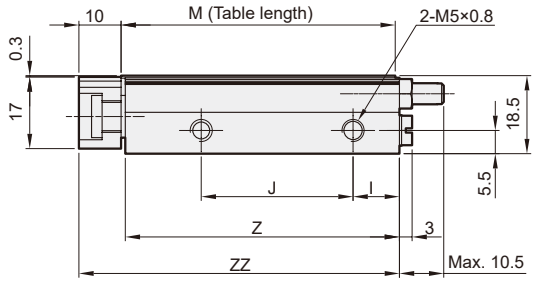
Code / Stroke	F	G	H	I	J	M	N	Z	ZZ
10	20	13.5	22	8	21	49	4	49.5	58
20	26	14.5	26	6.5	28	54	4	54.5	63
30	26	14.5	40	8	41	69	6	69.5	78

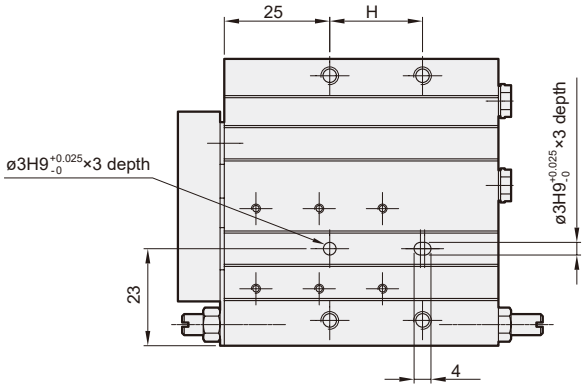
Stroke adjuster bolt ø8~ø20



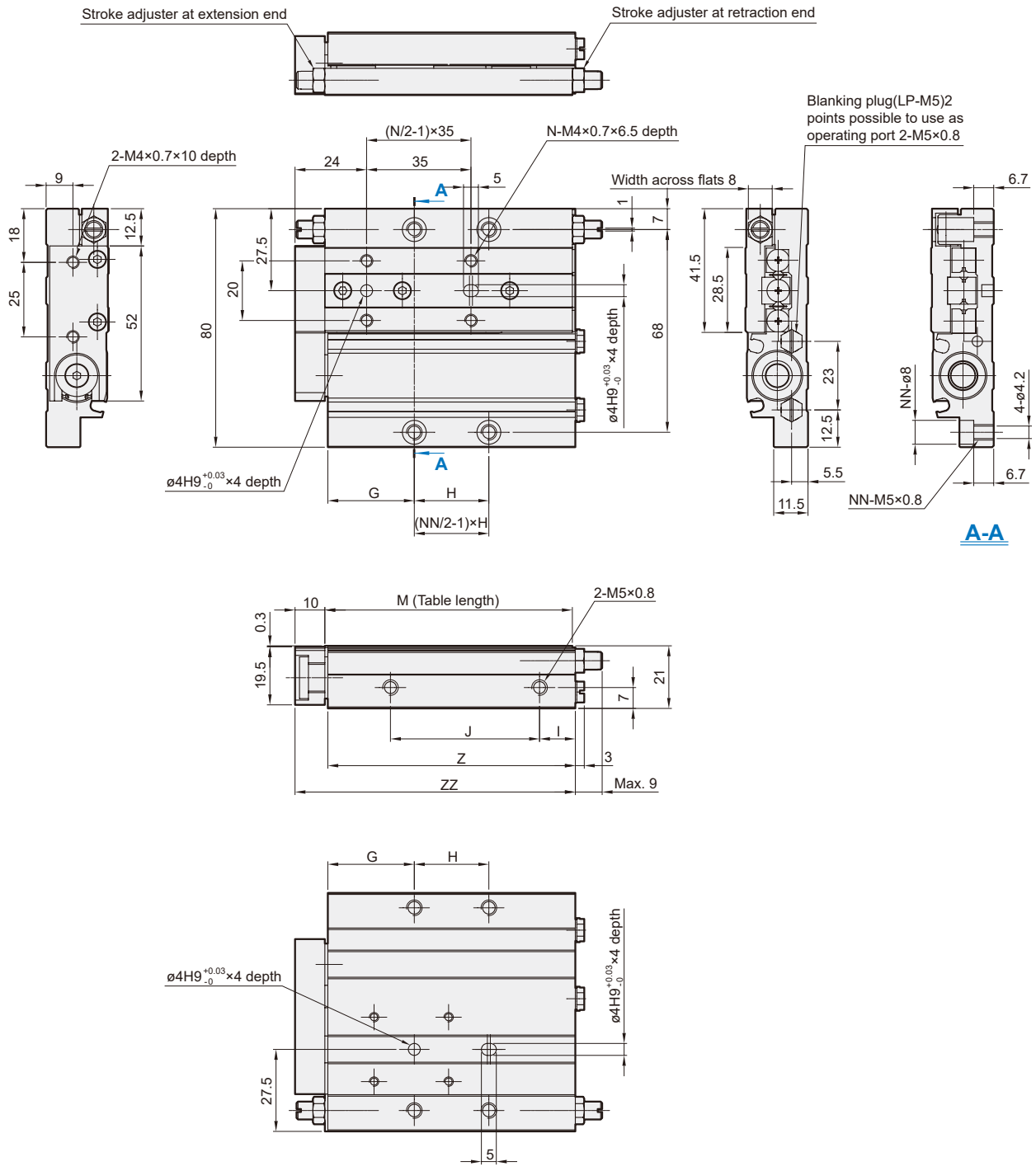
Tube I.D.	Order code	Adjustable stroke range (mm)	A	B	C	D	M
8	MCSF-8	5	17	5	—	1	M4×0.7
	MCSF-8-X11	15	27				
12	MCSF-12	5	23.5	7	—	1	M5×0.8
	MCSF-12-X11	15	33.5				
16	MCSF-16	5	26.5	8	3	—	M6×1
	MCSF-16-X11	15	36.5				
	MCSF-16-X12	25	46.5		—	1	
20	MCSF-20	5	30	11	4	—	M8×1
	MCSF-20-X11	15	40				
	MCSF-20-X12	25	50		—	1.5	



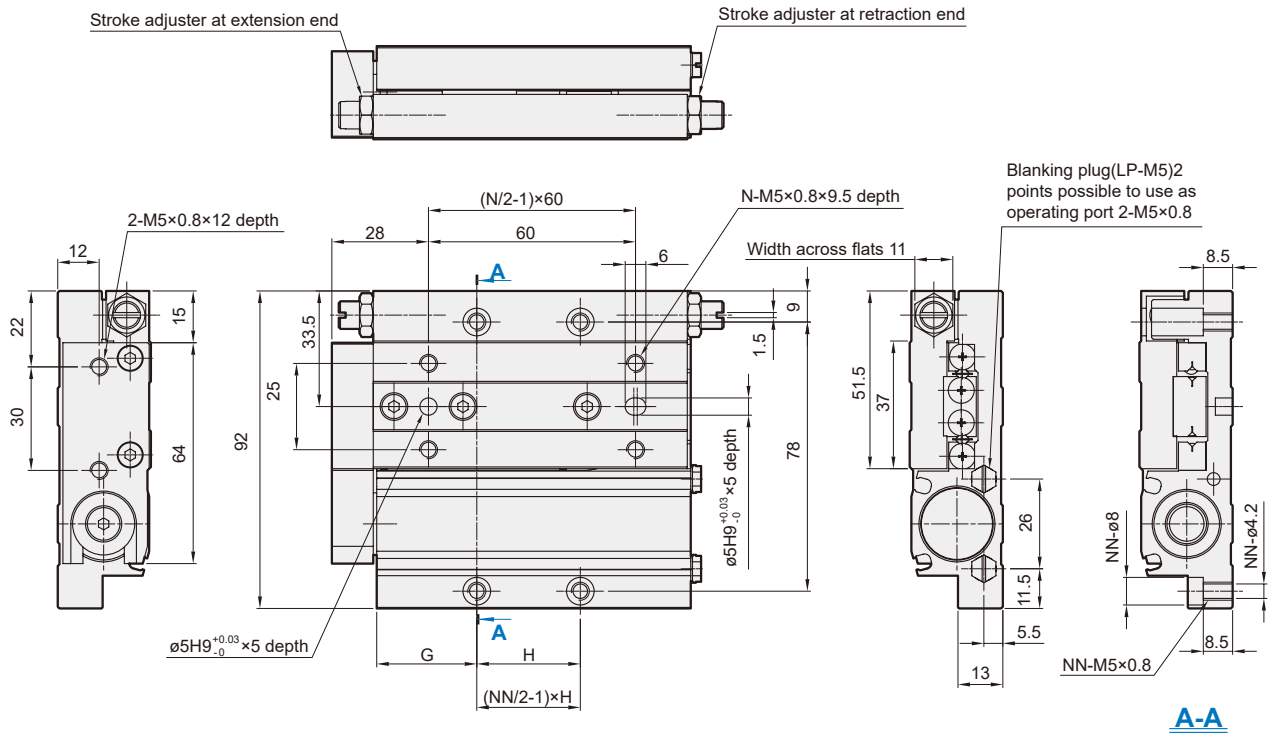


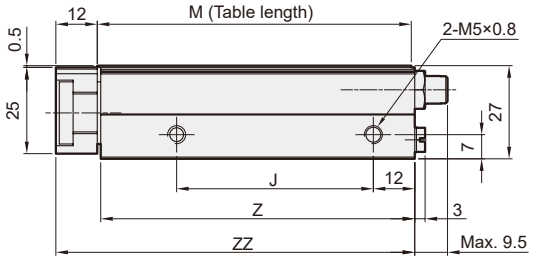


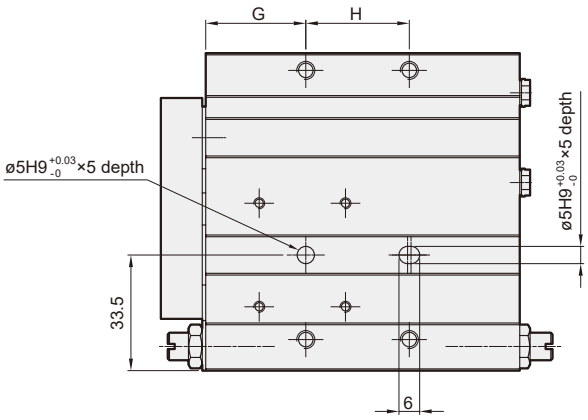
Code / Stroke	H	I	J	M	N	Z	ZZ
20	22	11	36	65	4	65	76
30	30	12	45	75	4	75	86
50	65	13	80	111	6	111	122



Code / Stroke	G	H	I	J	M	N	NN	Z	ZZ
30	29	25	12	50	83	4	4	83	94
50	29	55	12	80	113	6	4	113	124
75	39	45	13	125	159	6	6	159	170







Code / Stroke	G	H	J	M	N	NN	Z	ZZ
30	29	30	57	91	4	4	91	104
50	36	45	77	113	4	4	113	126
75	40	45	125	162	6	6	162	175
100	59	60	175	211	6	6	211	224