# MRX series (Linear Guides)
MAGNETIC RODLESS CYLINDER
Operating specification and Ordering expression

New

CHELIC PNEUMATIC

◎ Internal structure
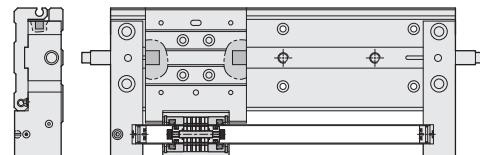
◎ Specification

Item \ Bore size (mm)	10	15	20	25
Operation	Double acting			
Fluid	Air			
Pressure range Kgf/cm² (Kpa)	1.5 ~ 4.5 (150~450)	1.5 ~ 6 (150 ~ 600)		
Max. service pressure Kgf/cm² (Kpa)	5.0(500)	6.5 (650)		
Operating ambient temperature range ℃	0 ~ 60			
Range of service speed mm/sec	50 ~ 500			
Lubrication	Free			
Port size	M5			

◎ Standard stroke (MRX series)

Unit : mm

Bore size	Stroke	Max. stroke
Ø10	50、100、150、200、250、300	300
Ø15	50、100、150、200、250、300、350、400、450、500	500
Ø20	50、100、150、200、250、300、350、400、450、500	800
Ø25	50、100、150、200、250、300、350、400、450、500、550、600	800

◎ How to order
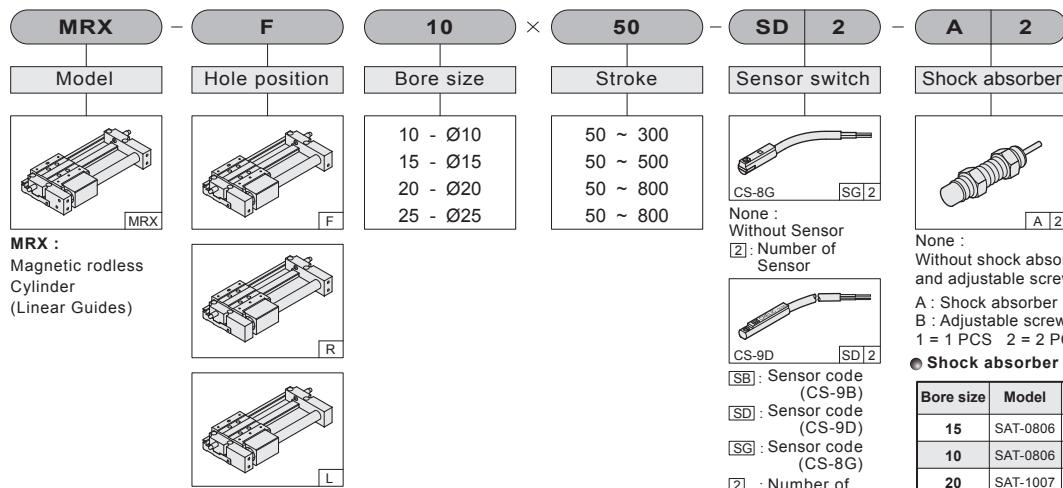
MRX	–	F	10	×	50	–	SD	2	–	A	2
Model		Hole position	Bore size		Stroke		Sensor switch			Shock absorber	

MRX :
Magnetic rodless
Cylinder
(Linear Guides)

Hole position:
F
R
L

Bore size:
10 - Ø10
15 - Ø15
20 - Ø20
25 - Ø25

Stroke:
50 ~ 300
50 ~ 500
50 ~ 800
50 ~ 800

Sensor switch:
CS-8G — SG 2
None :
Without Sensor
2 : Number of Sensor

CS-9D — SD 2
SB : Sensor code (CS-9B)
SD : Sensor code (CS-9D)
SG : Sensor code (CS-8G)
2 : Number of Sensor
1 = 1 PCS 2 = 2 PCS

Shock absorber:
A 2
None :
Without shock absorber
and adjustable screw
A : Shock absorber
B : Adjustable screw
1 = 1 PCS 2 = 2 PCS

● **Shock absorber list** (Option)

Bore size	Model	Max. absorber
15	SAT-0806	0.3 Kgf・m
10	SAT-0806	0.3 Kgf・m
20	SAT-1007	0.6 Kgf・m
25	SAT-1007	0.6 Kgf・m

◎ Hole position expression
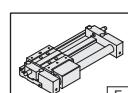
F — Hole display in position ③ and ④
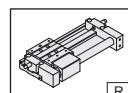
R — Hole display in position ⑤ and ⑥
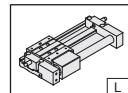
L — Hole display in position ① and ②

◎ Limit for Cylinder pressure

Unit : Kgf/cm²

Bore size	Min operating pressure	Max service pressure
10	1.5	5
15	1.5	6.5
20	1.5	6.5
25	1.5	6.5

◎ Packing and O-Ring list

| Item	Piston packing	Rod packing	Cushion O-ring
Bore size mm ╲ No.	2	2	2
Ø10	PPY−10	PDU−11×16.7	Ø2.8 × Ø1.9
Ø15	DYP−15	PDU−17×22.4	Ø10 × Ø1.5
Ø20	DYP−20	PDU−21×28.3	−
Ø25	PPY−25	PDU−26×34.4	−

🔍 Note : Piston packing and rod packing all adopt import parts. (Mitsubishi, Sakagami and same grade)

◎ Internal structure
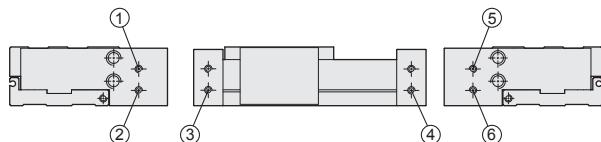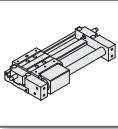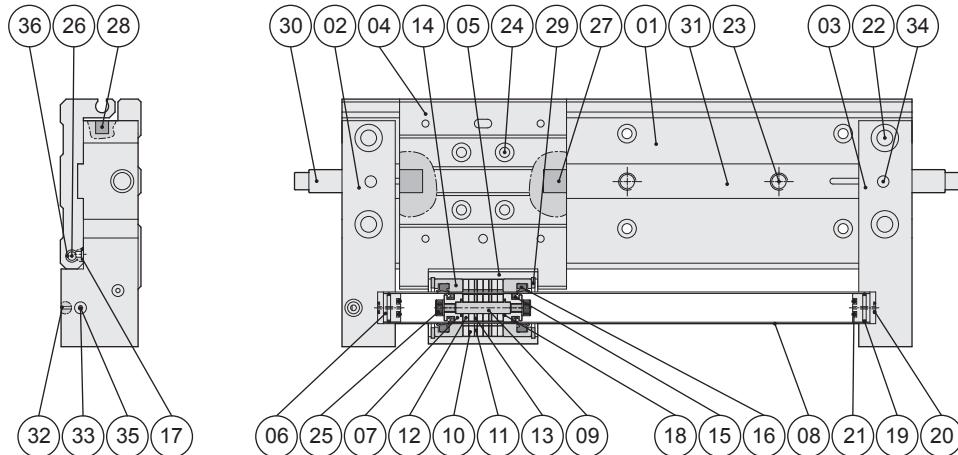
◎ Components and Material list

No.	Item	Material	No.	Item	Material	No.	Item	Material
01	Slide rail base	Aluminum alloy	13	Piston magnetic yoke	Iron	25	Mounting screw	Stainless steel
02	Cover (left)	Aluminum alloy	14	Rod packing base	Plastic steel	26	Screw	Alloy steel
03	Cover (right)	Aluminum alloy	15	Piston packing	NBR	27	Stopper	Bearing steel
04	Plate	Aluminum alloy	16	Rod packing	NBR	28	Magnet	Rare earth metals
05	Body	Aluminum alloy	17	O-Ring	NBR	29	C type snap ring	Alloy steel
06	Cushion rod	Aluminum alloy	18	O-Ring	NBR	30	Shock absorber	Medium carbon steel
07	Piston	Plastic steel	19	O-Ring _ 1	NBR	31	Slide set	Custom
08	Rod	Stainless steel	20	O-Ring _ 2	NBR	32	Steel ball	Stainless steel
09	Piston joiner	Stainless steel	21	Cushion O-Ring	NBR	33	Screw	Alloy steel
10	Body magnet	Rare earth metals	22	Mounting screw	Alloy steel	34	Position pin	Bearing steel
11	Body magnetic yoke	Iron	23	Mounting screw	Alloy steel	35	Cushion rubber	NBR
12	Piston magnet	Rare earth metals	24	Mounting screw	Alloy steel	36	O-Ring	NBR
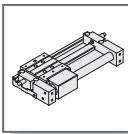
MRX series (Linear Guides)
MAGNETIC RODLESS CYLINDER
Design and Installation reference

�‣ Theoretical force

Bore size	Action	Piston area	Air pressure (kgf/cm²)						
mm		cm²	1	2	3	4	5	6	7
10	Push	1.5	—	1.6	2.4	3.2	4	4.7	5.5
15	Push	1.76	—	3	5	7	8	10	12
20	Push	3.14	—	6	9	12	15	18	21
25	Push	4.90	—	9	14	19	24	29	34

🔍 Note : Above are theoretical date ; please take into consideration the frictional resistance and the mechanical efficiency of value should be added calculation before using. (About 70%~80%)

PRU
Rodless
Cylinder

PRF
Rodless
Cylinder

PRUT
Rodless
Cylinder

�‣ Load and Moment allowable

$M_1 = F_1 \times L_1$

$M_2 = F_2 \times L_2$

$M_3 = F_3 \times L_3$

MRD
Magnetic
Rodless
Cylinder

MRB
Magnetic
Rodless
Cylinder

MRX
Magnetic
Rodless
Cylinder

MRU
Magnetic
Rodless
Cylinder

MRH
Magnetic
Rodless
Cylinder

Bore size	Max. moment allowable (N·m)			Max. load allowable (kg)			
(mm)	M1	M2	M3	W1	W2	W3	W4
10	1	2	1	2	2	2	1.4
15	1.5	3	1.5	5	5	5	2
20	8	12	8	8	8	8	8
25	14	20	14	12	12	12	12

◌ Max. load and Moment allowable

Select the moment from within the range of operating limits shown in the graphs. Note that the maximum allowable load value may sometimes be exceeded even within the operating limits. Therefore, also check the allowable load and moment.

◌ Vertical operation for Max. load allowable

In vertical operation, observe the maximum load mass (W4) to prevent a drop due to slipping off of magnet couplings.

◉ **Load and Moment allowable**

1 **MRX / M₁**
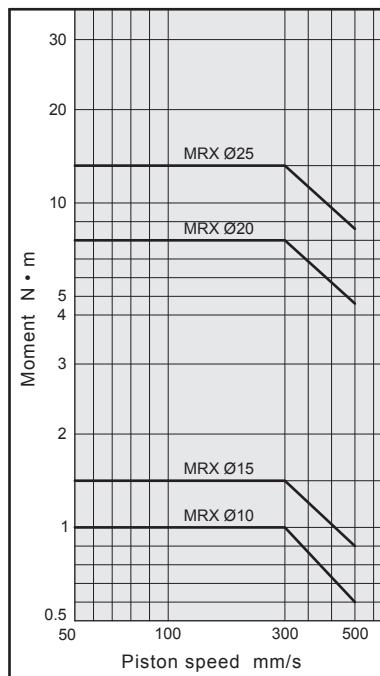
2 **MRX / M₂**
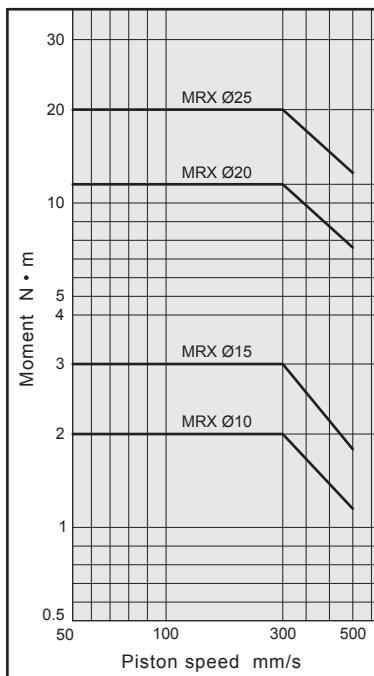
3 **MRX / M₃**
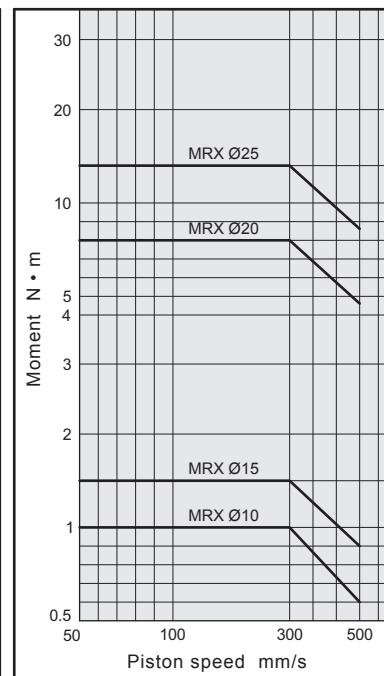
4 **MRX / W₁**

5 **MRX / W₂**

6 **MRX / W₃**

7 **MRX / W₄**

◎ Selection calculation

The selection calculation finds the load factor (α_n) of the items blow, where the total ($\sum \alpha_n$) does not exceed 1. $\sum \alpha_n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$

Item	Load factor α_n	Note
[1] Maximum load mass	$\alpha_1 = W / W_{max}$	Review W W max is the maximum load mass at $\mathcal{U}_a$
[2] Static moment	$\alpha_2 = M / M_{max}$	Review M1、M2、M3 M max is the allowable moment at $\mathcal{U}_a$
[3] Dynamic moment	$\alpha_3 = M_E / M_{E\ max}$	Review M1E、M2E、M3E ME max is the allowable moment at $\mathcal{U}_a$

$\mathcal{U}$: Collision speed ; $\mathcal{U}_a$: Average speed

PRU
Rodless
Cylinder

PRF
Rodless
Cylinder
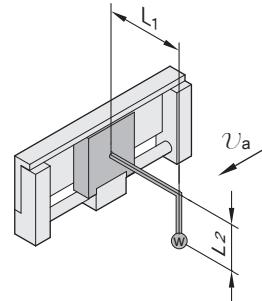
PRUT
Rodless
Cylinder

◎ Calculation example ①

Operating conditions

Cylinder : MRX Ø15
Terminal butter mechanism : Standard (Shock absorber)
Mounting : Side mounting

Speed (Average) : $\mathcal{U}_a$ = 300 (mm/s)
Load mass : W = 0.5 (kg)
Excluding mass of arm section
L1 = 50 (mm)   L2 = 40 (mm)

MRD
Magnetic
Rodless
Cylinder

MRB
Magnetic
Rodless
Cylinder

MRX
Magnetic
Rodless
Cylinder

MRU
Magnetic
Rodless
Cylinder

MRH
Magnetic
Rodless
Cylinder

Item	Load factor	Note
[1] **Load mass**	$\alpha_1 = W / W_{max}$ $= 0.5 / 5$ $= 0.1$	Investigate W Find the value of W max at 300 mm/s in graph [6] for W3
[2] **Static moment**	$M_2 = W \times g \times L_1$ $= 0.5 \times 9.8 \times 0.05$ $= 0.245 (N \cdot m)$ $\alpha_2 = M_2 / M_{2\ max}$ $= 0.245 / 3$ $= 0.082$	Investigate M2 Find the value of M2 max at 300 mm/s in graph [2]
[3] **Dynamic moment**	$M_{1E} = 1 / 3 \times F_E \times L_1$ $= 0.05 \times \mathcal{U}_a \times W \times L_1$ $= 0.05 \times 300 \times 0.5 \times 0.05$ $= 0.375 (N \cdot m)$ $\alpha_{3A} = M_{1E} / M_{1E\ max}$ $= 0.375 / 1.07$ $= 0.35$	$\mathcal{U} = 1.4 \times \mathcal{U}_a$ $= 1.4 \times 300$ $= 420$ (mm/s) Find the value of M1E max at 420 mm/s in graph [1]
$F_E = 1.4 / 100 \times \mathcal{U}_a \times g \times W$	$M_{3E} = 1 / 3 \times F_E \times L_2$ $= 0.05 \times \mathcal{U}_a \times W \times L_2$ $= 0.05 \times 300 \times 0.5 \times 0.04$ $= 0.3 (N \cdot m)$ $\alpha_{3B} = M_{3E} / M_{3E\ max}$ $= 0.3 / 1.07$ $= 0.28$	From above, find the value of M3E max at 420 mm/s in graph [3]

$\sum \alpha_n = \alpha_1 + \alpha_2 + \alpha_{3A} + \alpha_{3B} = 0.1 + 0.082 + 0.35 + 0.28 = 0.812$ $\sum \alpha_n = 0.812 \leq 1$
From above, selection cylinder match the request of MRX Ø15 operating
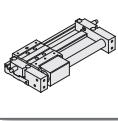
◗ Calculation example ②

Operating conditions	

Cylinder : MRX Ø25
Terminal butter mechanism : Standard (Shock absorber)
Mounting : Vertical mounting

Speed (Average) : υ_a = 300 (mm/s)
Load mass : W = 3 (kg)
Excluding mass of arm section
L_1 = 50 (mm) L_2 = 40 (mm)

| Item	Load factor	Note
1 Load mass	α_1 = W / W max = 3 / 12 = 0.25	Investigate W Find the value of W max at 300 mm/s in graph **7** for W_4
2 Static moment	M_1 = W × g × L_1 = 3 × 9.8 × 0.05 = 1.47 (N • m) α_{2a} = M_1 / M_1 max = 1.47 / 14 = 0.105	Investigate M_1 Find the value of M_1 max at 300 mm/s in graph **1**
	M_3 = W × g × L_2 = 3 × 9.8 × 0.04 = 1.176 (N • m) α_{2b} = M_3 / M_3 max = 1.176 / 14 = 0.084	Investigate M_3 Find the value of M_3max at 300 mm/s in graph **3**
3 Dynamic moment	M_{1E} = 1 / 3 × F_E ×L_1 = 0.05 × υ_a × W × L_1 = 0.05 × 300 × 3 × 0.05 = 2.25 (N•m) α_{3A} = M_{1E} / M_{1E} max = 2.25 / 10 = 0.225	υ = 1.4 × υ_a = 1.4 × 300 = 420 (mm/s) Find the value of M_{1E} max at 420 mm/s in graph **1**
F_E = 1.4 / 100 × υ_a× g × W	M_{3E} = 1 / 3 × F_E ×L_2 = 0.05 × υ_a × W × L_2 = 0.05 × 300 × 3 × 0.04 = 1.8 (N•m) α_{3B} = M_{3E} / M_{3E} max = 1.8 / 10 = 0.18	From above, find the value of M_{3E} max at 420 mm/s in graph **3**
$\sum\alpha_n$ = α_1 + α_2 + α_{3A} + α_{3B} = 0.25 + 0.105 + 0.084 + 0.225 + 0.18 = 0.844 $\sum\alpha_n$ = 0.844 ≤ 1 From above, selection cylinder match the request of MRX Ø25 operating		
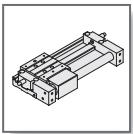
◯ Caution for installation

1. Long stroke operation causes deflection of the path table or cylinder tube. In such a case, provide an intermediate support.

2. As the figure, provide an intermediate support with the mounting holes on the center of the path table if the load of mass (W) exceed distance between supports (L).

3. If the counter surface lacks precision, malfunction may result so adjust the level at the same time.

4. Providing an intermediate support with the mounting holes on the center of the path table if cylinder device in the section which is shock and strike easily.

5. In case the product is installed on the ceiling, regard the mounting bolt pitch as L.
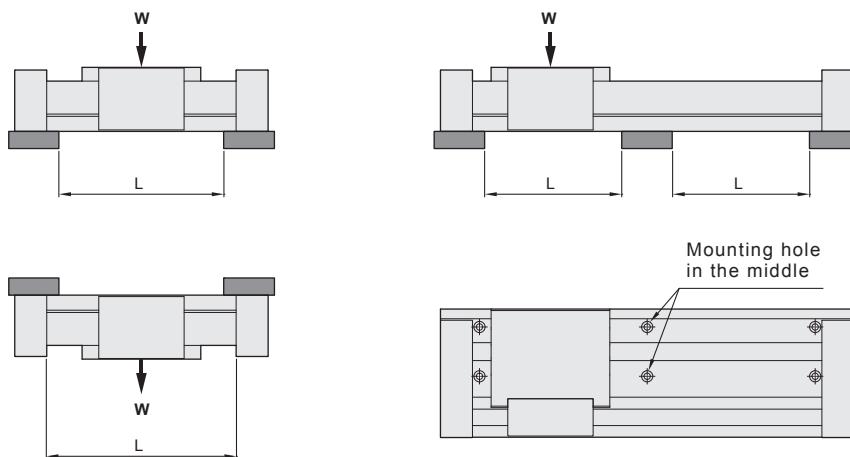
◯ Distance between load and Supports
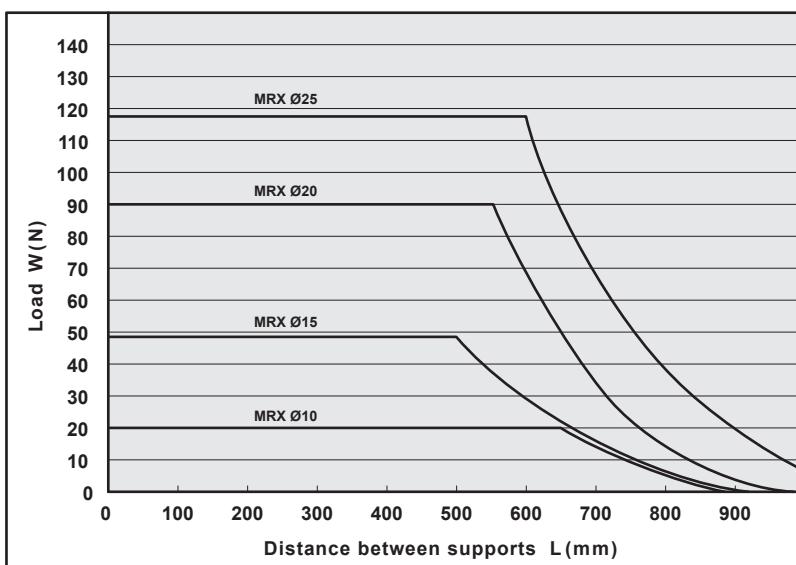
In vertical operation, observe the maximum load mass (W4) to prevent a drop due to slipping off of magnet couplings.

◉ **MRX Ø10** — ▢

MRX ▢ × ▢ ST

19

M8×1.0P
Mounting hole
(Both sides)

86

57.5

19.5
13.5

6.5   13

2-M5×0.8P×6dp
Piping hole
(Both sides)

1.5   58
40
30
4
3⁺⁰·⁰¹

4-M4×0.7P×6dp
4-M3×0.5P×6dp

40

29

Ø3⁺⁰·⁰¹ ×3dp

2-M5×0.8P×6dp
Piping hole
(Both sides)

27.9
26.9
13
6.9

9
18.5

A

9
18.5

8
3.5

M5×0.8P

Ø7.5
Ø4.2

SECTON C-C'

C →

33

12

23

B

23

C' →
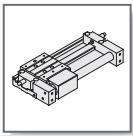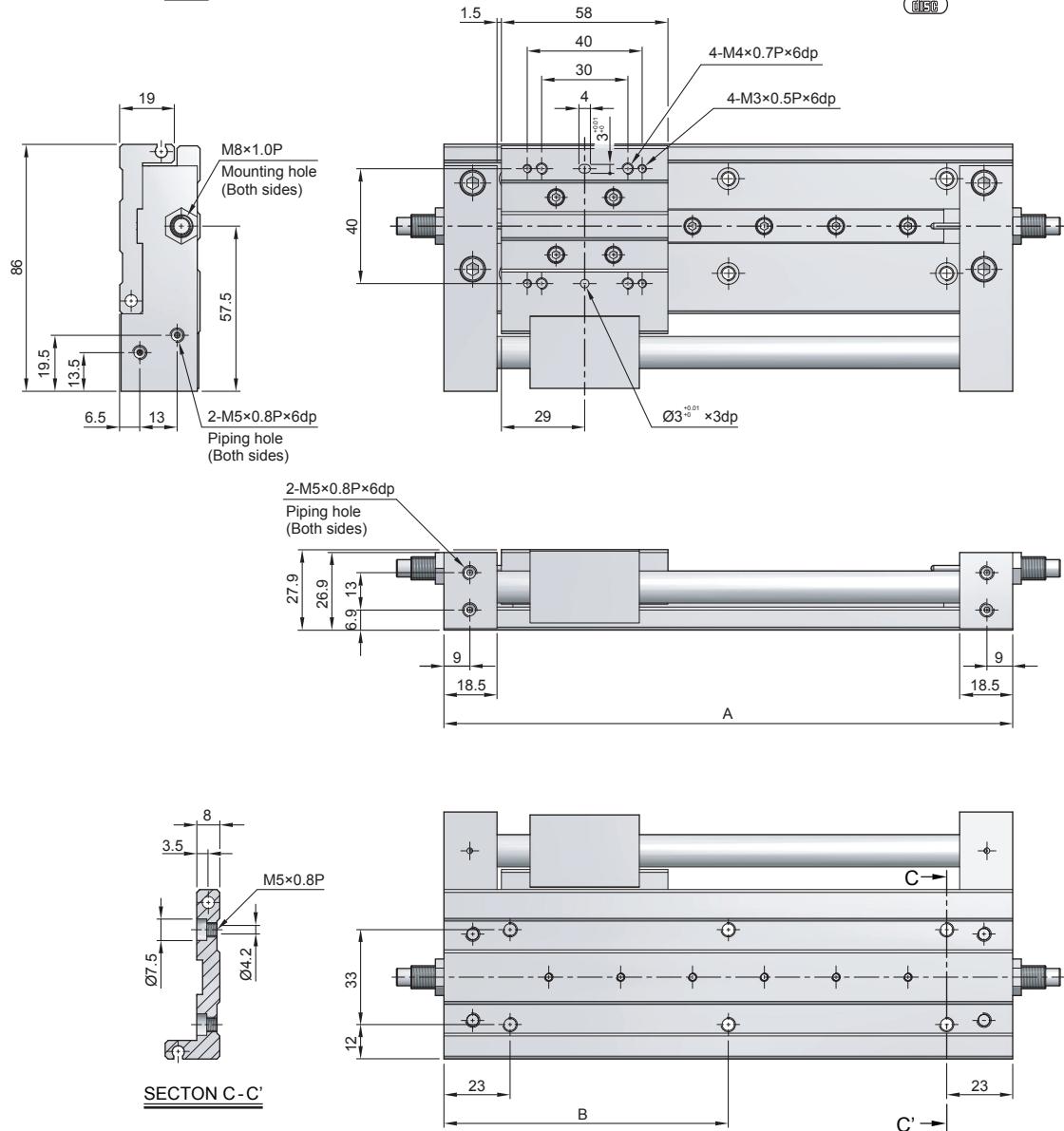
◉ **Dimension**

Stroke Code	50	100	150	200	250	300	Non-standard stroke length
A	148	198	248	298	348	398	98 + Stroke length
B	74	99	124	149	174	199	A / 2

◉ **Shock absorber**
(Option)
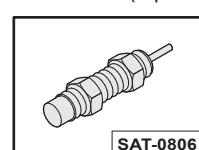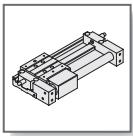
SAT-0806

▶ **MRX - Ø15** — ☐

🔘 **MRX ☐ × ☐ ST**

4-M5x0.8P×12dp

4-M3×0.5P×8dp

2-M8×1.0P
Mounting hole
(Both sides)

2-M5×0.8P×6dp
Piping hole
(Both sides)

Ø3$_{-0}^{-0.01}$ × 4dp

4-M5×0.8P×6dp
Piping hole
(Both sides)

M6×1.0P

SECTON C - C'
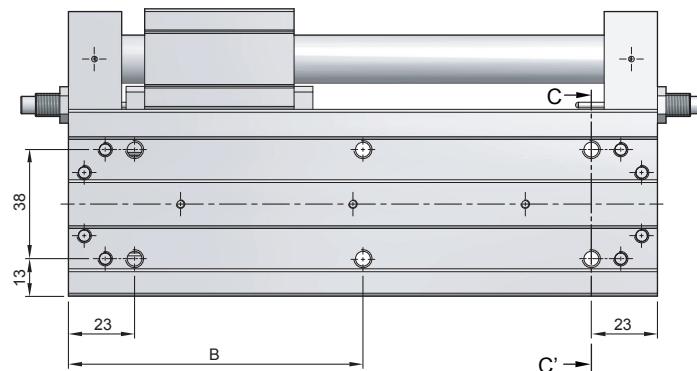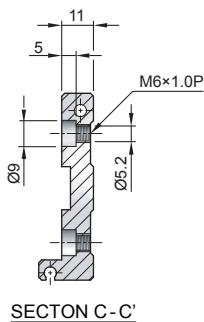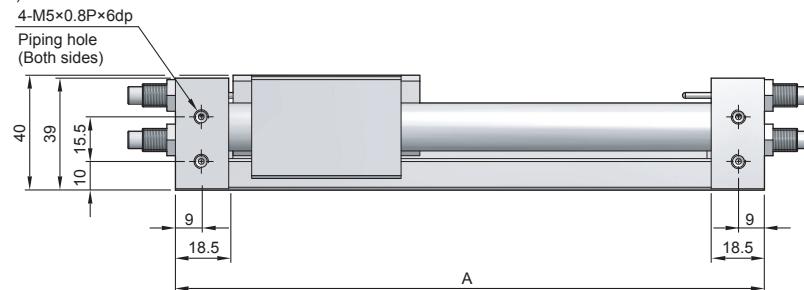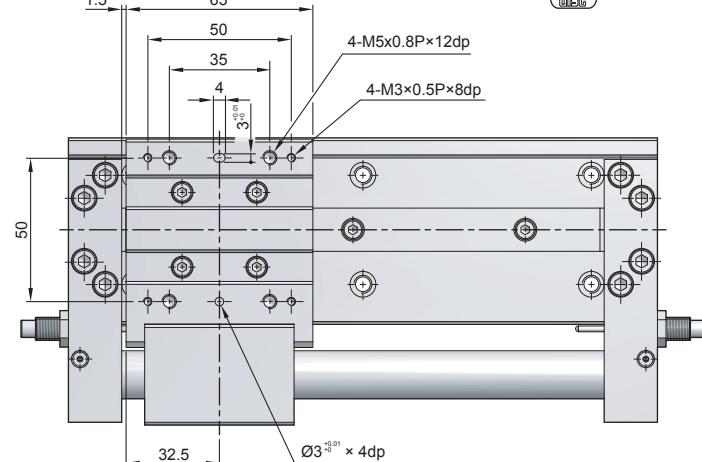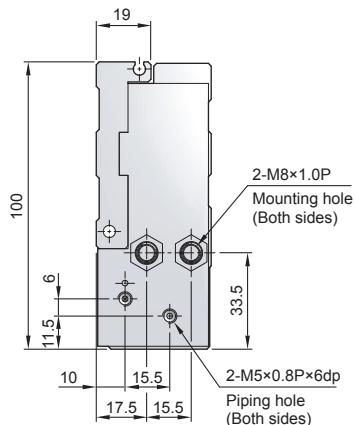
▶ **Dimension**

Stroke Code	50	100	150	200	250	300	350	400	450	500	Non-standard stroke length
A	155	205	255	305	355	405	455	505	555	605	105 + Stroke length
B	—	102.5	127.5	152.5	177.5	202.5	227.5	252.5	277.5	302.5	A / 2

▶ **Shock absorber**
(Option)
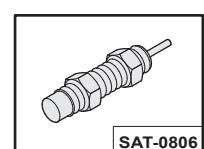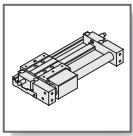
SAT-0806

�‣ MRX - Ø20 ‒ ☐

MRX ☐ × ☐ ST

2-M10×1.0P
Mounting hole
(Both sides)

2-M5×0.8P×6dp
Piping hole
(Both sides)

4-M5×0.8P×6dp
Piping hole (Both sides)

4-M6×1.0P×14dp

4-M4×0.7P×9dp

Ø4 $^{+0.01}_{+0}$ × 4dp

M6×1.0P

SECTON C-C'
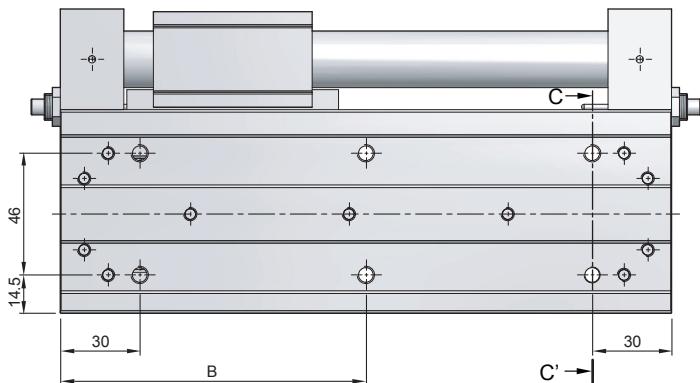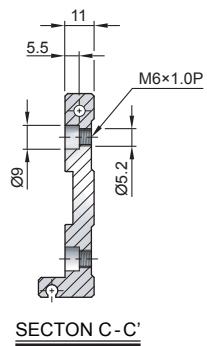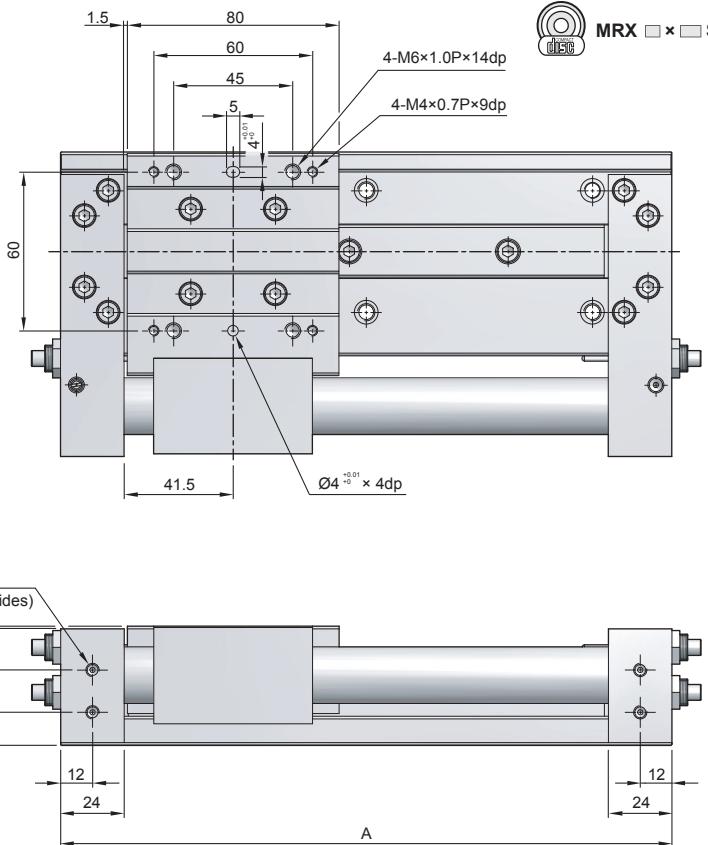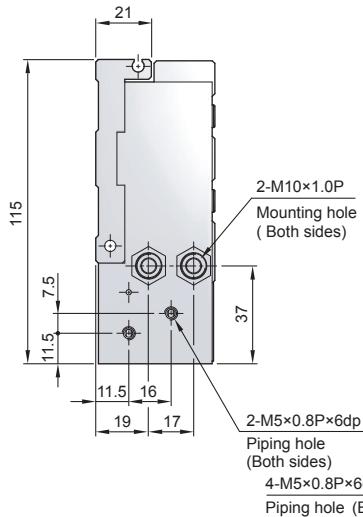
◗ Dimension

Stroke Code	50	100	150	200	250	300	350	400	450	500	Non-standard stroke length
A	181	231	281	331	381	431	481	531	581	631	131 + Stroke length
B	—	115.5	140.5	165.5	190.5	215.5	240.5	265.5	290.5	315.5	A / 2

◗ Shock absorber
(Option)
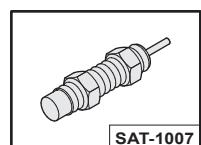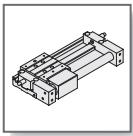
SAT-1007

▶ **MRX - Ø25 —** ☐

MRX ☐ × ☐ ST

4-M8×1.25P×14dp
4-M5×0.8P×9dp

2-M10×1.0P
Mounting hole
(Both sides)

2-M5×0.8P×6dp
Piping hole
(Both sides)

2-M5×0.8P×6dp
Piping hole (Both sides)

Ø5 $^{+0.01}_{0}$ × 5dp

M6×1.0P

SECTION C - C'
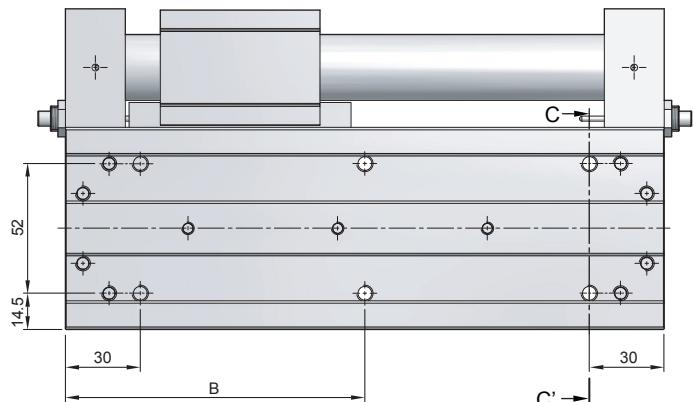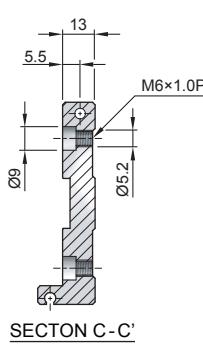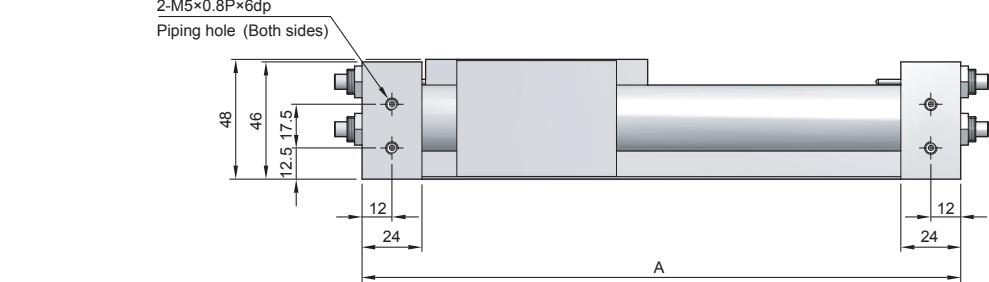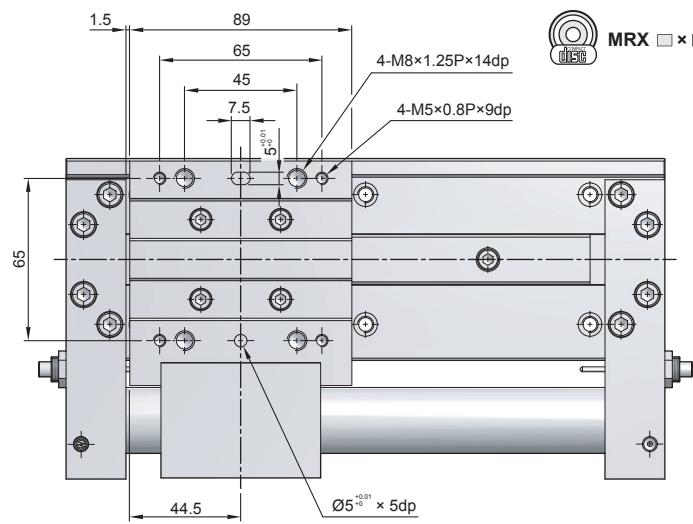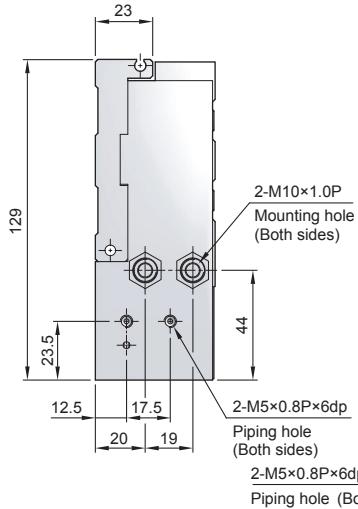
▶ **Dimension**

| Stroke Code	50	100	150	200	250	300	350	400	450	500	550	600	Non-standard stroke length
A	190	240	290	340	390	440	490	540	590	640	690	740	140 + Stroke length
B	—	120	145	170	195	220	245	270	295	320	345	370	A / 2

▶ **Shock absorber**
(Option)
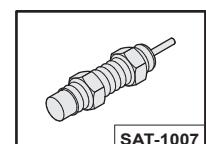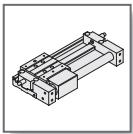
SAT-1007

◎ Shock absorber and Sensor switch mounting

- A **With shock absorber**
- B **With adjustable screw**

● Shock absorber list (Option)

Bore size	Model	Max. absorber
10	SAT-0806	0.3 Kgf • m
15	SAT-0806	0.3 Kgf • m
20	SAT-1007	0.6 Kgf • m
25	SAT-1007	0.6 Kgf • m

Shock absorber

Sensor switch

CS-8G refer to P.22-1.13 sensor switch formulation

CS-9D(B) refer to P.22-1.15 sensor switch formulation

Shock absorber
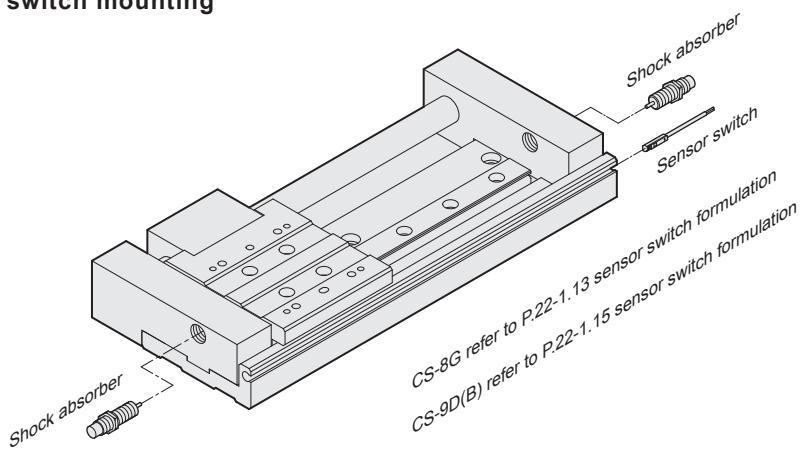
◎ Sensor switch setting and Operating range

● CS-9D(B)

Sensor switch —
Magnet

LED
Fixed screw

Sensing range(G)

② ① ②

① Operating range(F)
② Response differential (R)

Idea sensing location
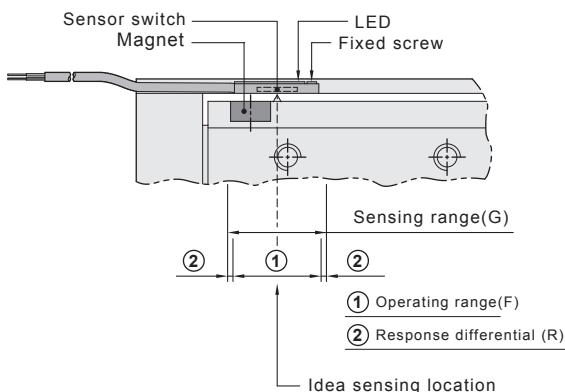
◎ Sensing range

Sensor switch is fixed on the cylinder body. The magnetic piston head will activate the Sensor switch when it enters the operating range. It has 0.5mm differential.

◎ Operating range

When piston head moves the switch setting and adjustment will be based on the responding range generated by the magnetic field and the switch. (Please refer to the below table)

Model	CS-9D(B)		CS-8G	
Bore size	Operating range (F)	Response differential(R)	Operating range (F)	Response differential(R)
Ø10	8	1	10	1
Ø15	8	1	10	1
Ø20	8	1.2	9	1.2
Ø25	11	1.2	13	1.2

◎ Connector type

White (+)
Block (−)
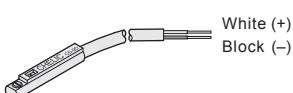
CS-9D Voltage : DC 4 ~ 120 V
                AC 4 ~ 120 V

White (+)
Block (−)

CS-9B Voltage : DC 4 ~ 120 V
                AC 4 ~ 120 V