

**KOGANEI**

Air Cylinder

---

**MINIBIT CYLINDER**

**INSTRUCTION MANUAL** Ver.1.0

# Handling Instructions and Precautions

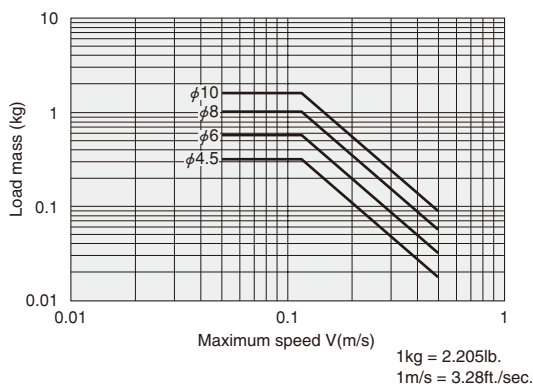


## General Precautions

### Allowable kinetic energy

When carrying an inertial load, operate the cylinder at a kinetic energy at or below the allowable limit.

Bore size	mm [in.]	4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
Piston speed	m/s [in./sec.]	0.05~0.5 [2~20]			
Allowable kinetic energy	J [ft·lbf]	$2.23 \times 10^{-3}$ [1.64 × 10 <sup>-3</sup> ]	$3.96 \times 10^{-3}$ [2.92 × 10 <sup>-3</sup> ]	$7.04 \times 10^{-3}$ [5.19 × 10 <sup>-3</sup> ]	$10.9 \times 10^{-3}$ [8.04 × 10 <sup>-3</sup> ]



### Mounting

When mounting the Mini Bit Cylinder, tighten the bolts within the range of the tightening torque.

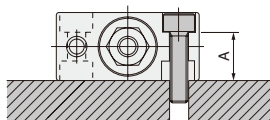
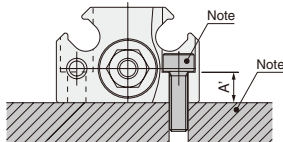
#### ● Mini Bit Cylinder mounting

The Mini Bit Cylinder can be mounted in two directions.

#### 1. Mounting using the through holes on the body

##### Cylinder with magnet

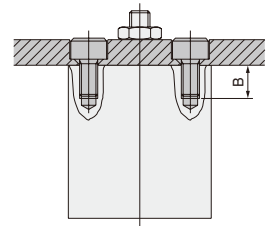
##### Standard cylinder



(Note: Do not use magnetic materials for the mounting bracket of the cylinder with magnet.)

Model	Bolt	Maximum tightening torque N·m [in·lbf]	A dimension mm [in.]	A' dimension mm [in.]
MB□A(S) 4.5	M2×0.4	0.27 [2.39]	3.8 [0.150]	2.5 [0.098]
MB□A(S) 6	M2×0.4	0.27 [2.39]	5.8 [0.228]	4 [0.157]
MB□A(S) 8	M2.5×0.45	0.58 [5.13]	7 [0.276]	4.5 [0.177]
MB□A(S) 10	M2.5×0.45	0.58 [5.13]	9 [0.354]	5.5 [0.217]

#### 2. Mounting by using bolts in the axial direction



Model	Bolt	Maximum tightening torque N·m [in·lbf]	B dimension mm [in.]
MB□A(S) 4.5	M2.5×0.45	0.32 [2.83]	3 [0.118]
MB□A(S) 6	M3×0.5	0.59 [5.22]	4 [0.157]
MB□A(S) 8	M3×0.5	0.59 [5.22]	4 [0.157]
MB□A(S) 10	M3×0.5	0.59 [5.22]	4 [0.157]

### Piping

1. Always thoroughly blow off (use compressed air) the tubing before connecting it to the Mini Bit Cylinder. Entering chips, sealing tape, rust, etc., generated during piping work could result in air leaks or other defective operation.
2. Observe the following tightening torques when screwing piping or fittings into the Mini Bit Cylinder ports.

Connecting thread	Tightening torque N·m [in·lbf]
M3×0.5	0.59 [5.22]

### Media

1. Use air for media. For the use of any other media, consult us.
2. For the air used in the cylinder, use clean air that does not contain deteriorated compressor oil. Install a filter (filtration rating of a minimum 40 μm) near the cylinder or valve to remove collected liquid or dust. Also, clean out the collected liquid of the air filter on a regular basis. Letting liquid or dust inside the cylinder could result in defective operation.

### Lubrication

This product can be used without lubrication, if lubrication is required, use Turbine Oil Class 1 (ISO VG32) or equivalent. Avoid using spindle oil or machine oil.

### Atmosphere

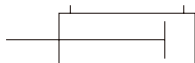
If using in locations subject to dripping water, dripping oil, etc., use a cover to protect the unit.

# MINI BIT CYLINDERS

Double Acting Type, Single Acting Push Type

## Symbols

● Double acting type (MBDA) ● Single acting push type (MBSA)



## Specifications

Bore size mm [in.]		4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
Item					
Media		Air			
Operating pressure range MPa [psi.]	Double acting type	0.15~0.7 [22~102]			0.1~0.7 [15~102]
	Single acting push type	0.3~0.7 [44~102]		0.2~0.7 [29~102]	
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0~60 [32~140]			
Operating speed range mm/s [in./sec.]		50~500 [2.0~19.7]			
Cushion		None			
Lubrication		Not required (If lubrication is required, use Turbine Oil Class 1 (ISO VG32) or equivalent.)			
Port size		M3			
Stroke tolerance mm [in.]		$\begin{smallmatrix} +0.5 \\ 0 \end{smallmatrix} \begin{smallmatrix} [ \\ +0.020 \end{smallmatrix}$			

## Cylinder Thrust

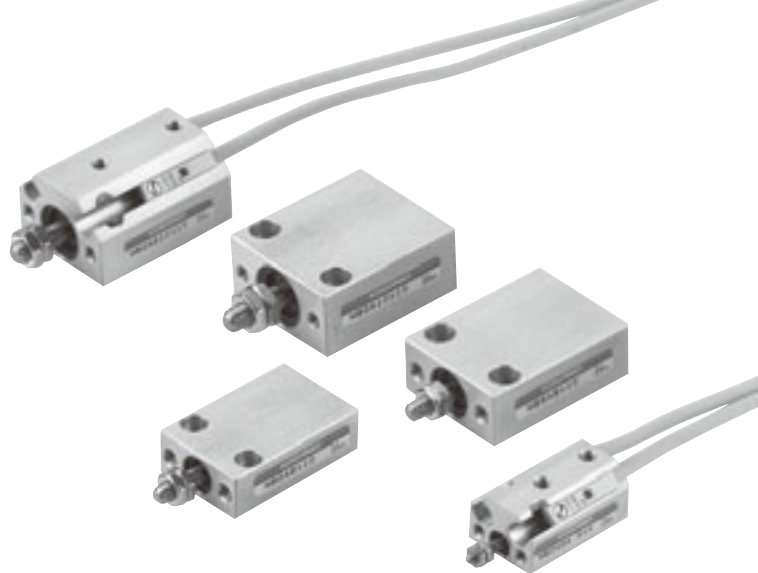
					N [lbf.]						
Bore size mm [in.]	Piston rod diameter mm [in.]	Operating type	Operating direction	Pressure area mm <sup>2</sup> [in. <sup>2</sup> ]	Air pressure MPa [psi.]						
					0.1 [15]	0.2 [29]	0.3 [44]	0.4 [58]	0.5 [73]	0.6 [87]	0.7 [102]
4.5 [0.177]	2 [0.079]	Double acting type	Push side	15.9 [0.0246]	—	3.2 [0.72]	4.8 [1.08]	6.4 [1.44]	8.0 [1.80]	9.5 [2.14]	11.1 [2.50]
			Pull side	12.8 [0.0198]	—	2.6 [0.58]	3.8 [0.85]	5.1 [1.15]	6.4 [1.44]	7.7 [1.73]	9.0 [2.02]
		Single acting push type		15.9 [0.0246]	—	—	1.9 [0.43]	3.5 [0.79]	5.1 [1.15]	6.6 [1.48]	8.2 [1.84]
6 [0.236]	3 [0.118]	Double acting type	Push side	28.2 [0.0437]	—	5.6 [1.26]	8.5 [1.91]	11.3 [2.54]	14.1 [3.17]	16.9 [3.80]	19.7 [4.43]
			Pull side	21.2 [0.0329]	—	4.2 [0.94]	6.4 [1.44]	8.5 [1.91]	10.6 [2.38]	12.7 [2.85]	14.8 [3.33]
		Single acting push type		28.2 [0.0437]	—	—	5.1 [1.15]	7.9 [1.78]	10.7 [2.41]	13.5 [3.03]	16.3 [3.66]
8 [0.315]	3 [0.118]	Double acting type	Push side	50.3 [0.0780]	—	10.1 [2.27]	15.1 [3.39]	20.1 [4.52]	25.2 [5.66]	30.2 [6.79]	35.2 [7.91]
			Pull side	43.2 [0.0670]	—	8.6 [1.93]	13.0 [2.92]	17.3 [3.89]	21.6 [4.86]	25.9 [5.82]	30.2 [6.79]
		Single acting push type		50.3 [0.0780]	—	5.0 [1.12]	10.0 [2.25]	15.0 [3.37]	20.1 [4.52]	25.1 [5.64]	30.1 [6.77]
10 [0.394]	4 [0.157]	Double acting type	Push side	78.5 [0.1216]	7.9 [1.78]	15.7 [3.53]	23.6 [5.31]	31.4 [7.06]	39.3 [8.83]	47.1 [10.59]	55.0 [12.36]
			Pull side	65.9 [0.1021]	6.6 [1.48]	13.2 [2.97]	19.8 [4.45]	26.4 [5.93]	33.0 [7.42]	39.5 [8.88]	46.1 [10.36]
		Single acting push type		78.5 [0.1216]	—	8.0 [1.80]	15.9 [3.57]	23.7 [5.33]	31.6 [7.10]	39.4 [8.86]	47.3 [10.63]

## Spring Return Force (for single acting type only)

N [lbf.]					
Bore size mm [in.]	State of cylinder	Stroke mm [in.]			
		4 [0.157]	6 [0.236]	8 [0.315]	10 [0.394]
4.5 [0.177]	Zero stroke	2.04 [0.459]	1.59 [0.357]	1.13 [0.254]	—
	Stroke end	2.95 [0.663]	2.95 [0.663]	2.95 [0.663]	—
6 [0.236]	Zero stroke	2.54 [0.571]	2.15 [0.483]	1.76 [0.396]	—
	Stroke end	3.43 [0.771]	3.43 [0.771]	3.43 [0.771]	—
8 [0.315]	Zero stroke	3.76 [0.845]	3.07 [0.690]	2.39 [0.537]	1.71 [0.384]
	Stroke end	5.13 [1.153]	5.13 [1.153]	5.13 [1.153]	5.13 [1.153]
10 [0.394]	Zero stroke	5.48 [1.232]	4.39 [0.987]	3.29 [0.740]	2.19 [0.492]
	Stroke end	7.74 [1.740]	7.74 [1.740]	7.74 [1.740]	7.74 [1.740]

## Operation Type, Bore Size, and Stroke

mm		
Operation type	Bore size	Standard strokes
Double acting type	4.5	4, 6, 8, 10
	6	4, 6, 8, 10, 15
	8	4, 6, 8, 10, 15, 20
	10	
Single acting push type	4.5	4, 6, 8
	6	
	8	4, 6, 8, 10
	10	



Mass

Double acting type				g [oz.]	
Bore size mm	Stroke mm	Standard cylinder	Cylinder with magnet	Additional mass	
				Sensor switch (1 switch)	
				ZE□□□A	ZE□□□B
4.5	4	5.1 [0.180]	8.0 [0.282]	15 [0.529]	35 [1.235]
	6	5.6 [0.198]	8.6 [0.303]		
	8	6.1 [0.215]	9.2 [0.325]		
	10	6.6 [0.233]	9.8 [0.346]		
6	4	8.5 [0.300]	11.3 [0.399]	15 [0.529]	35 [1.235]
	6	9.2 [0.325]	12.1 [0.427]		
	8	9.9 [0.349]	12.9 [0.455]		
	10	10.6 [0.374]	13.7 [0.483]		
	15	12.4 [0.437]	15.7 [0.554]		
8	4	11.7 [0.413]	15.2 [0.536]	15 [0.529]	35 [1.235]
	6	12.7 [0.448]	16.3 [0.575]		
	8	13.7 [0.483]	17.4 [0.614]		
	10	14.7 [0.519]	18.5 [0.653]		
	15	17.2 [0.607]	21.3 [0.751]		
	20	19.7 [0.695]	24.1 [0.850]		
10	4	16.4 [0.578]	20.3 [0.716]	15 [0.529]	35 [1.235]
	6	17.7 [0.624]	21.7 [0.765]		
	8	19.0 [0.670]	23.1 [0.815]		
	10	20.3 [0.716]	24.5 [0.864]		
	15	23.6 [0.832]	28.0 [0.988]		
	20	26.9 [0.949]	31.5 [1.111]		

Single acting push type				g [oz.]	
Bore size mm	Stroke mm	Standard cylinder	Cylinder with magnet	Additional mass	
				Sensor switch (1 switch)	
				ZE□□□A	ZE□□□B
4.5	4	5.7 [0.201]	8.8 [0.310]	15 [0.529]	35 [1.235]
	6	6.2 [0.219]	9.4 [0.332]		
	8	6.7 [0.236]	10.0 [0.353]		
6	4	9.4 [0.332]	12.3 [0.434]	15 [0.529]	35 [1.235]
	6	10.1 [0.356]	13.1 [0.462]		
	8	10.8 [0.381]	13.9 [0.490]		
8	4	13.0 [0.459]	16.7 [0.589]	15 [0.529]	35 [1.235]
	6	14.0 [0.494]	17.8 [0.628]		
	8	15.0 [0.529]	18.9 [0.667]		
	10	16.0 [0.564]	20.0 [0.705]		
10	4	18.2 [0.642]	22.2 [0.783]	15 [0.529]	35 [1.235]
	6	19.5 [0.688]	23.6 [0.832]		
	8	20.8 [0.734]	25.0 [0.882]		
	10	22.1 [0.780]	26.4 [0.931]		

Order Codes

MB

X

-

-

-

Mini Bit Cylinder Series

Bore size  
×  
Stroke

Cylinder specifications  
Blank : Standard cylinder  
S : Cylinder with magnet

Operation type  
DA : Double acting type  
SA : Single acting push type

Port location (for cylinder with magnet only)  
Blank : Top surface  
R : Right side when viewed from rod  
L : Left side when viewed from rod


Piston rod specifications (for φ 4.5 only)  
Blank : Male thread  
N : Plain rod

Number of sensor switches  
1 : With 1 sensor switch  
2 : With 2 sensor switches  
⋮  
n : With n sensor switches

Lead wire length  
A : 1000mm [39in.]  
B : 3000mm [118in.]

Sensor switch type  
Blank : No sensor switch  
ZE135 : 2-lead wire, solid state type  
ZE155 : 3-lead wire, solid state type  
ZE235 : 2-lead wire, solid state type  
ZE255 : 3-lead wire, solid state type

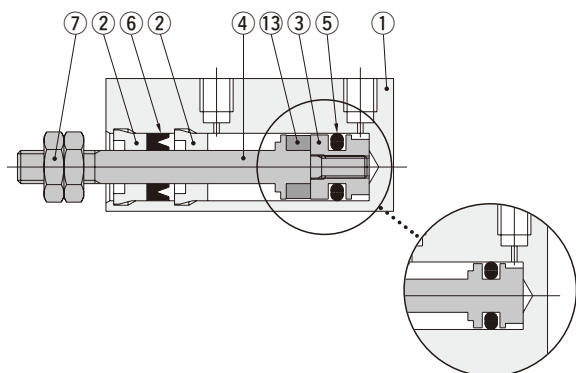
● For sensor switch details, see p.1544.



## Inner Constructions

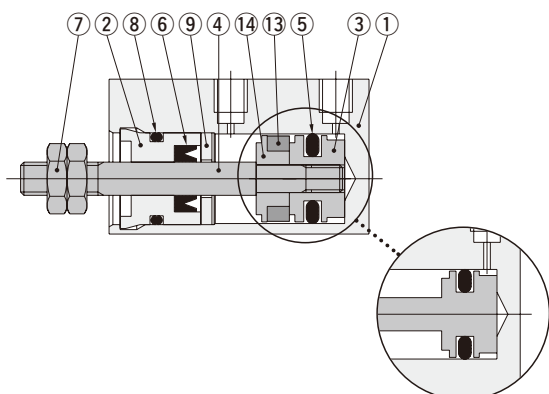
### ● Double acting type

#### MBDAS4.5, 6



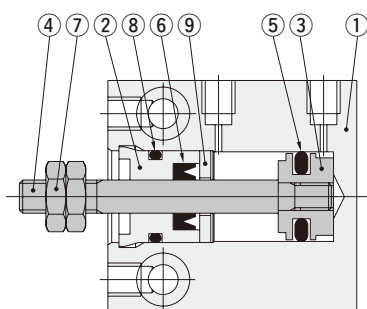
MBDA4.5, 6

#### MBDAS8, 10



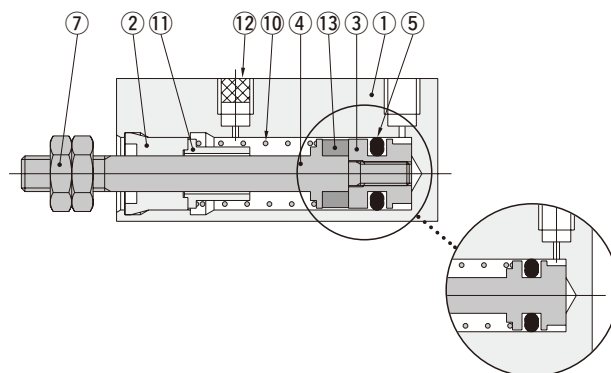
MBDA8

#### MBDA10



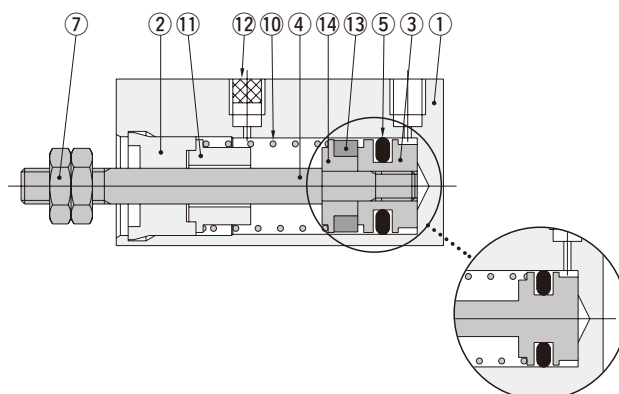
### ● Single acting push type

#### MBSAS4.5, 6



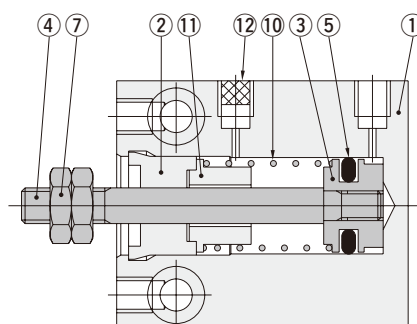
MBSA4.5, 6

#### MBSAS8, 10



MBSA8

#### MBSA10



## Major Parts and Materials

mm [in.]					
No.	<div>Bore size Parts</div>	4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
①	Body	Aluminum alloy (anodized)			
②	Rod cap	Oil impregnated plastic bushing (polyacetal)			
③	Piston <sup>Note</sup>	Aluminum alloy (special rust prevention treatment)			
④	Piston rod	Stainless steel			
⑤	Piston seal	Synthetic rubber (NBR)			
⑥	Rod seal	Synthetic rubber (NBR)			
⑦	Rod end nut	Stainless steel	Mild steel (nickel plated)		
⑧	O-ring				

		mm [in.]			
No.	Parts	Bore size	4.5 [0.177]	6 [0.236]	8 [0.315] 10 [0.394]
⑨	Seal holder		—		Aluminum alloy (special rust prevention treatment)
⑩	Spring		Steel (zinc plated)		
⑪	Stopper		Aluminum alloy (special rust prevention treatment)		
⑫	Filter		Foamed metal		
⑬	Magnet		Neodymium magnet		
⑭	Support		—		Aluminum alloy (special rust prevention treatment)

Note: Material for **MBDA4.5, 6, 8** and **MBSA4.5, 6, 8** is stainless steel, and the piston is one-piece construction with the piston rod.

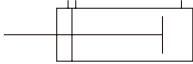
# MINI BIT CYLINDERS

## Cylinders for Clean Systems



### Symbol

#### ● Double acting type (CS-MBDA)



### Specifications

Item		Bore size mm [in.]	4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
Media			Air			
Operating pressure range MPa [psi.]	Double acting type		0.15~0.7 [22~102]			0.1~0.7 [15~102]
Proof pressure	MPa [psi.]		1.05 [152]			
Clean room rating			Class 4 or its equivalent (Corresponds to FED-STD 209E Class 10) (In the case of vacuum suction from a dust collection port; by in-house standards. For details, see p.73.)			
Operating temperature range	°C [°F]		0~60 [32~140]			
Operating speed range	mm/s [in./sec.]		50~500 [2.0~19.7]			
Cushion			None			
Lubrication			Prohibited			
Port size			M3			
Stroke tolerance	mm [in.]		$^{+0.5}_{0}$ [ $^{+0.020}_{0}$ ]			

### Cylinder Thrust

					N [lbf.]						
Bore size mm [in.]	Piston rod diameter mm [in.]	Operation type	Operating direction	Pressure area mm <sup>2</sup> [in. <sup>2</sup> ]	Air pressure MPa [psi.]						
					0.1 [15]	0.2 [29]	0.3 [44]	0.4 [58]	0.5 [73]	0.6 [87]	0.7 [102]
4.5 [0.177]	2 [0.079]	Double acting type	Push side	15.9 [0.0246]	—	3.2 [0.72]	4.8 [1.08]	6.4 [1.44]	8.0 [1.80]	9.5 [2.14]	11.1 [2.50]
			Pull side	12.8 [0.0198]	—	2.6 [0.58]	3.8 [0.85]	5.1 [1.15]	6.4 [1.44]	7.7 [1.73]	9.0 [2.02]
6 [0.236]	3 [0.118]	Double acting type	Push side	28.2 [0.0437]	—	5.6 [1.26]	8.5 [1.91]	11.3 [2.54]	14.1 [3.17]	16.9 [3.80]	19.7 [4.43]
			Pull side	21.2 [0.0329]	—	4.2 [0.94]	6.4 [1.44]	8.5 [1.91]	10.6 [2.38]	12.7 [2.85]	14.8 [3.33]
8 [0.315]	3 [0.118]	Double acting type	Push side	50.3 [0.0780]	—	10.1 [2.27]	15.1 [3.39]	20.1 [4.52]	25.2 [5.66]	30.2 [6.79]	35.2 [7.91]
			Pull side	43.2 [0.0670]	—	8.6 [1.93]	13.0 [2.92]	17.3 [3.89]	21.6 [4.86]	25.9 [5.82]	30.2 [6.79]
10 [0.394]	4 [0.157]	Double acting type	Push side	78.5 [0.1216]	7.9 [1.78]	15.7 [3.53]	23.6 [5.31]	31.4 [7.06]	39.3 [8.83]	47.1 [10.59]	55.0 [12.36]
			Pull side	65.9 [0.1021]	6.6 [1.48]	13.2 [2.97]	19.8 [4.45]	26.4 [5.93]	33.0 [7.42]	39.5 [8.88]	46.1 [10.36]

### Operation Type, Bore Size, and Stroke

			mm
Operation type	Bore size	Standard strokes	
Double acting type	4.5	4, 6, 8, 10	
	6	4, 6, 8, 10, 15	
	8	4, 6, 8, 10, 15, 20	
	10		

Mass

CS specification (double acting type)

g [oz.]

Bore size mm	Stroke mm	Standard cylinder	Cylinder with magnet	Additional mass	
				Sensor switch (1 switch)	
				ZE□□□A	ZE□□□B
4.5	4	6.0 [0.212]	9.2 [0.325]	15 [0.529]	35 [1.235]
	6	6.5 [0.229]	9.8 [0.346]		
	8	7.0 [0.247]	10.4 [0.367]		
	10	7.5 [0.265]	11.0 [0.388]		
6	4	9.9 [0.349]	12.9 [0.455]	15 [0.529]	35 [1.235]
	6	10.6 [0.374]	13.7 [0.483]		
	8	11.3 [0.399]	14.5 [0.511]		
	10	12.0 [0.423]	15.3 [0.540]		
	15	13.8 [0.487]	17.3 [0.610]		
8	4	13.8 [0.487]	17.6 [0.621]	15 [0.529]	35 [1.235]
	6	14.7 [0.519]	18.7 [0.660]		
	8	15.7 [0.554]	19.8 [0.698]		
	10	16.7 [0.589]	20.9 [0.737]		
	15	19.2 [0.677]	23.7 [0.836]		
	20	21.7 [0.765]	26.5 [0.935]		
10	4	19.3 [0.681]	23.4 [0.825]	15 [0.529]	35 [1.235]
	6	20.6 [0.727]	24.8 [0.875]		
	8	21.9 [0.772]	26.2 [0.924]		
	10	23.2 [0.818]	27.6 [0.974]		
	15	26.6 [0.938]	31.1 [1.097]		
	20	29.9 [1.055]	34.6 [1.220]		

Order Codes

CS

-

MB

X

-

-

-

Cylinder for clean systems

Mini Bit Cylinder Series

Operation type  
DA : Double acting type

Cylinder specifications  
Blank : Standard cylinder  
S : Cylinder with magnet

Bore size  
×  
Stroke

Piston rod specifications (for ø 4.5 only)  
Blank : Male thread  
N : Plain rod

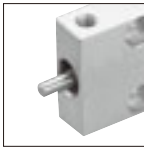
Port location  
(for cylinder with magnet only)  
Blank : Top surface  
R : Right side when viewed from rod  
L : Left side when viewed from rod

Sensor switch type  
Blank : No sensor switch  
ZE135 : 2-lead wire, solid state type  
ZE155 : 3-lead wire, solid state type  
ZE235 : 2-lead wire, solid state type  
ZE255 : 3-lead wire, solid state type

Lead wire length  
A : 1000mm [39in.]  
B : 3000mm [118in.]

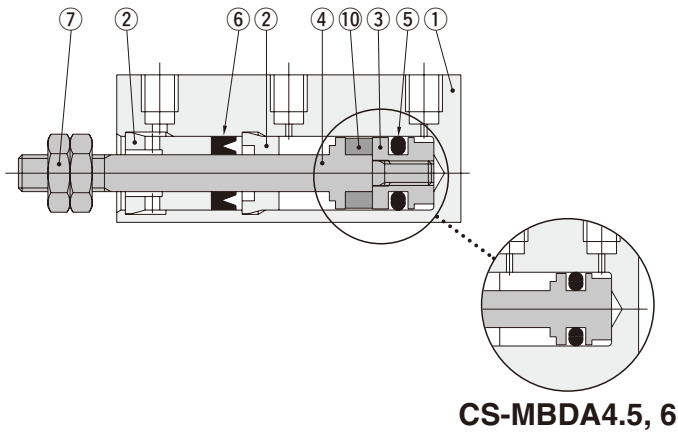
Number of sensor switches  
1 : With 1 sensor switch  
2 : With 2 sensor switches  
⋮  
n : With n sensor switches

● For sensor switch details, see p.1544.



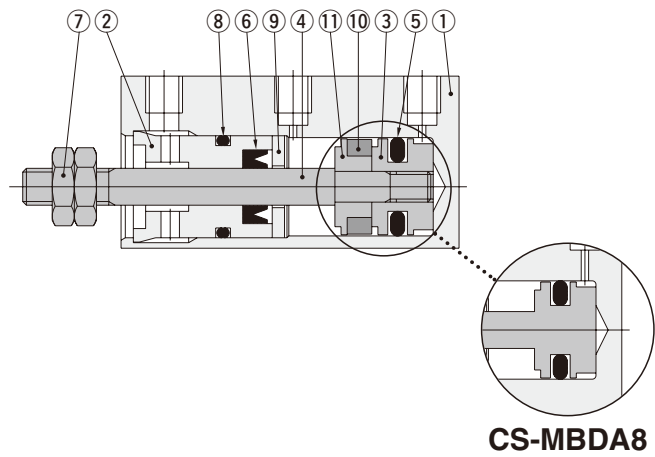
Inner Constructions

●Double acting type for CS  
CS-MBDAS4.5, 6



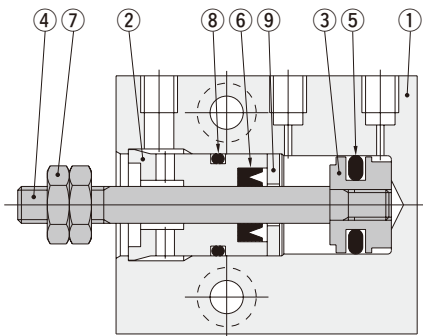
CS-MBDA4.5, 6

CS-MBDAS8, 10



CS-MBDA8

CS-MBDA10



Major Parts and Materials

		mm [in.]			
No.	Parts	Bore size	4.5 [0.177]	6 [0.236]	8 [0.315] 10 [0.394]
①	Body		Aluminum alloy (anodized)		
②	Rod cap		Oil impregnated plastic bushing (polyacetal)		
③	Piston <sup>Note</sup>		Aluminum alloy (special rust prevention treatment)		
④	Piston rod		Stainless steel		
⑤	Piston seal		Synthetic rubber (NBR)		
⑥	Rod seal		Synthetic rubber (NBR)		
⑦	Rod end nut		Stainless steel	Mild steel (nickel plated)	
⑧	O-ring		—		Synthetic rubber (NBR)
⑨	Seal holder		—		Aluminum alloy (special rust prevention treatment)
⑩	Magnet		Neodymium magnet		
⑪	Support		—		Aluminum alloy (special rust prevention treatment)

Note: Material for CS-MBDA4.5, 6, 8 is stainless steel, and the piston is one-piece construction with the piston rod.



# Evaluating Clean Room Rating

At present, there is no standard at JIS or elsewhere for methods of evaluating the clean room rating in the clean room specification pneumatic equipment. Koganei has therefore specified its in-house measurement methods, to conduct evaluations on the clean room rating.

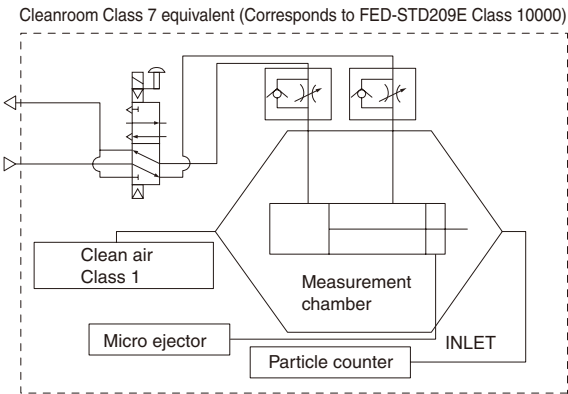
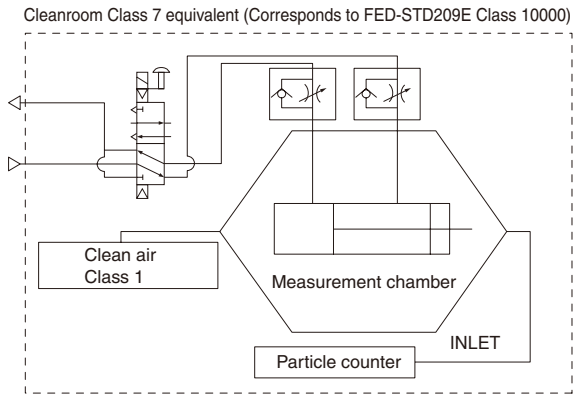
The number of particles of the Mini Bit Cylinder Clean Specification is measured as shown in the method below.

## 1. Measurement sample

φ4.5×6, φ6×6, φ8×6, φ10×6 3 units each, for total of 12 units

## 2. Measurement conditions

2-1 Test circuit: Figure 1 (no suction), Figure 2 (with suction)



2-2 Operating conditions of tested cylinders

Operating frequency: 1Hz

Average speed: 500mm/s [19.7in./sec.]

Applied pressure: 0.5MPa [73psi.]

Suction condition: Microejector ME05, 0.5MPa [73psi.] applied at primary side, φ6 tube

Mounting direction: Vertical

Chamber volume: 8.3 ℓ [0.29ft<sup>3</sup>]

## 3. Particle counter

Manufacturer/model: RION/KM20

Suction rate: 28.3 ℓ /min [1ft<sup>3</sup>/min]

Particle diameter: 0.1 μm, 0.2 μm, 0.3 μm, 0.5 μm, 0.7 μm, 1.0 μm

## 4. Measurement method

4-1 Confirmation of number of particles in the measurement system

Under the conditions in the above 1 and 2, using a particle counter to measure the sample for 9 minutes without operating it, and confirmed the measured particle is 1 piece or less.

4-2 Actual measurement

Under the conditions in the above 1 and 2, operating the sample for 36 minutes, and measured the total values in the latter half of 18 minutes test.

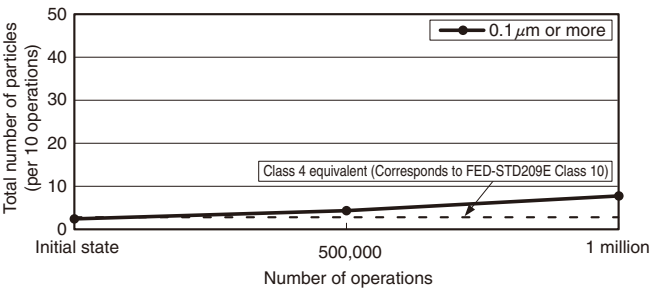
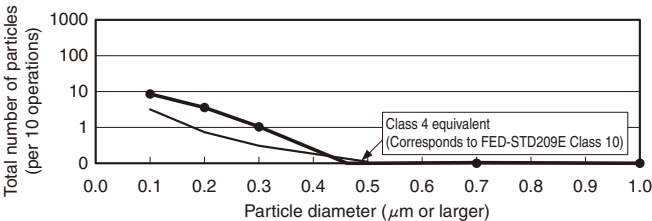
4-3 Reconfirmation

Performed the measurement in 4-1 again, to reconfirm the number of particles in the measurement system.

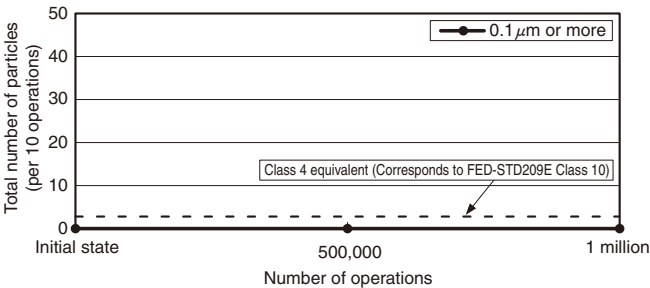
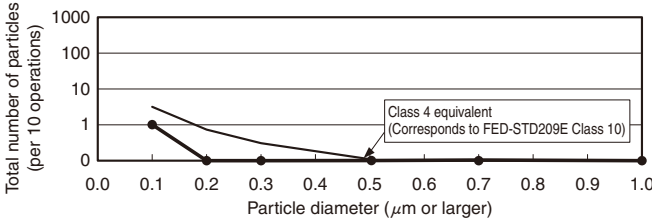
## 5. Measurement results (for φ10×6)

Note: The following graphs were obtained by measurements after 1 million product operations.

### ● No suction from dust collection port



### ● With suction from dust collection port



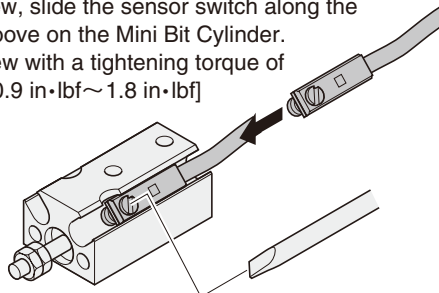
# SENSOR SWITCHES

## Solid State Type



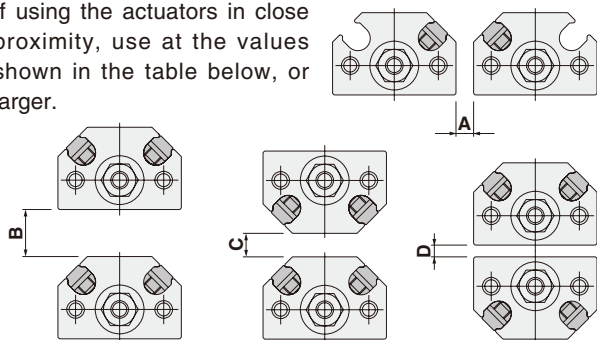
### Moving Sensor Switch

- Loosen the set screw, slide the sensor switch along the switch mounting groove on the Mini Bit Cylinder.
- Tighten the set screw with a tightening torque of 0.1N·m~0.2N·m [0.9 in·lbf~1.8 in·lbf]



### When Mounting Sensor Switches in Close Proximity

If using the actuators in close proximity, use at the values shown in the table below, or larger.



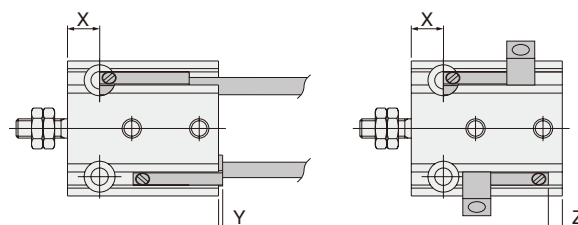
Bore size	Item	mm [in.]			
		A	B	C	D
4.5 [0.177]		2 [0.079]	6 [0.236]	1 [0.039]	2 [0.079]
6 [0.236]		4 [0.157]	9 [0.354]	5 [0.197]	3 [0.118]
8 [0.315]		3 [0.118]	8 [0.315]	4 [0.157]	2 [0.079]
10 [0.394]		2 [0.079]	8 [0.315]	4 [0.157]	1 [0.039]

### Minimum Cylinder Stroke When Using Sensor Switch

● Solid state type					mm [in.]
Item	Bore size	4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
Mounting 1 switch			1.5 [0.059]		
Mounting 2 switches			3 [0.118]		

### Mounting Location of Stroke End Detection Sensor Switch

If mounting a sensor switch in the positions shown in the diagram below (figures in the table are reference values), the magnet comes to the maximum sensing location of the sensor switch at the end of stroke.



● Solid state type					mm [in.]
Item	Bore size	4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
Double acting type	X	6 [0.236]	5.5 [0.217]	5 [0.197]	5 [0.197]
	Y	1.5 [0.059]	1 [0.039]	1.5 [0.059]	1 [0.039]
	Z	2 [0.079]	2 [0.079]	2 [0.079]	2.5 [0.098]
Single acting push type	X	8 [0.315]	7.5 [0.295]	7 [0.276]	7 [0.276]
	Y	1.5 [0.059]	1 [0.039]	1.5 [0.059]	1 [0.039]
	Z	2 [0.079]	2 [0.079]	2 [0.079]	2.5 [0.098]
CS specifications	X	10 [0.394]	9.5 [0.374]	9 [0.354]	9 [0.354]
	Y	1.5 [0.059]	1 [0.039]	1.5 [0.059]	1 [0.039]
	Z	2 [0.079]	2 [0.079]	2 [0.079]	2.5 [0.098]

Sensor Switch Operating Range, Response Differential, and Maximum Sensing Location

●Operating range:  $\ell$

The distance the piston travels in one direction, while the switch is in the ON position.

●Response differential: C

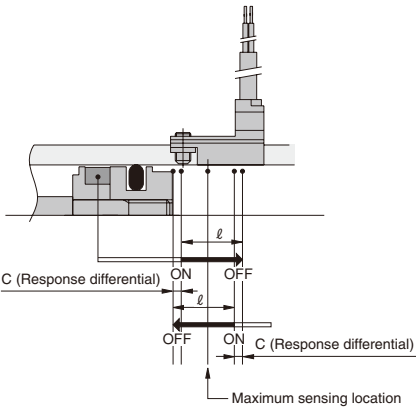
The distance between the point where the piston turns the switch ON and the point where the switch is turned OFF as the piston travels in the opposite direction.

●Solid state type

		mm [in.]			
Item	Bore size	4.5 [0.177]	6 [0.236]	8 [0.315]	10 [0.394]
Operating range: $\ell$		1.6~2.8 [0.063~0.110]	1.8~3.0 [0.071~0.118]	1.8~3.0 [0.071~0.118]	2.0~3.2 [0.079~0.126]
Response differential: C		0.2 [0.008] or less			
Maximum sensing location	Note	6 [0.236]			

Remark: The above table shows reference values.

Note: This is the length measured from the switch's opposite end side to the lead wire.



Order Codes

- MBDAS

Mini Bit Cylinder Series

Lead wire length  
A : 1000mm [39in.]  
B : 3000mm [118in.]

Sensor switch type  
ZE135  
ZE155  
ZE235  
ZE255