

# Koganei Clean System products provide complete support for the maintenance of a clean environment inside the cleanroom.

Koganei Clean System products meet the needs of the ultra-clean production environment. In everything from actuators and valves to air preparation and auxiliary equipment, anti-corrosion materials processing and other Koganei-developed design concepts serve to prevent particle contamination within the cleanroom. These perfectly designed mechanisms, which resolve even the slightest leaks to the outside during operations, have already won a high level of reliability.

## Koganei Cleanliness

There is currently no standard in JIS or elsewhere for methods of evaluating cleanliness for pneumatic equipment in the cleanroom specifications. Therefore, to measure the effects of cleanroom contamination by pneumatic equipment, Koganei has decided to use "number of particles generated per 10 operations," rather than particle density. Koganei has also developed classifications for application classes in cleanroom, based on JIS and other upper limit density tables, and on the company's own experience.



- Remarks:
1. In the above table, product performance in terms of the number of particles generated per 10 operations is expressed as the upper limit of particles corresponding to the equivalent JIS or ISO class.
  2. In the above table, values in the JIS, ISO, and FED-STD upper limit density tables are calculated as upper density per liter.
  3. The classes shown are clean levels as classified in JIS and ISO.

From the above definitions, the Koganei clean level classes can be viewed as the level of average contamination per liter of surrounding air over a period of 10 operations in cleanroom. Air ventilation in cleanrooms is usually faster than 1 cycle per minute, and clean volumetric capacity is usually larger than 1 liter, which should provide a sufficient safety margin in practice.

Caution: The above conclusions are based on an ideal situation in which air ventilation is being implemented. For specific cases where air ventilation is not ensured, caution is needed since the clean classes cannot be maintained.

**The clean system diagrams shown here are for Class 5 equivalent products. For Class 4 or Class 3 equivalent products, consult us.**

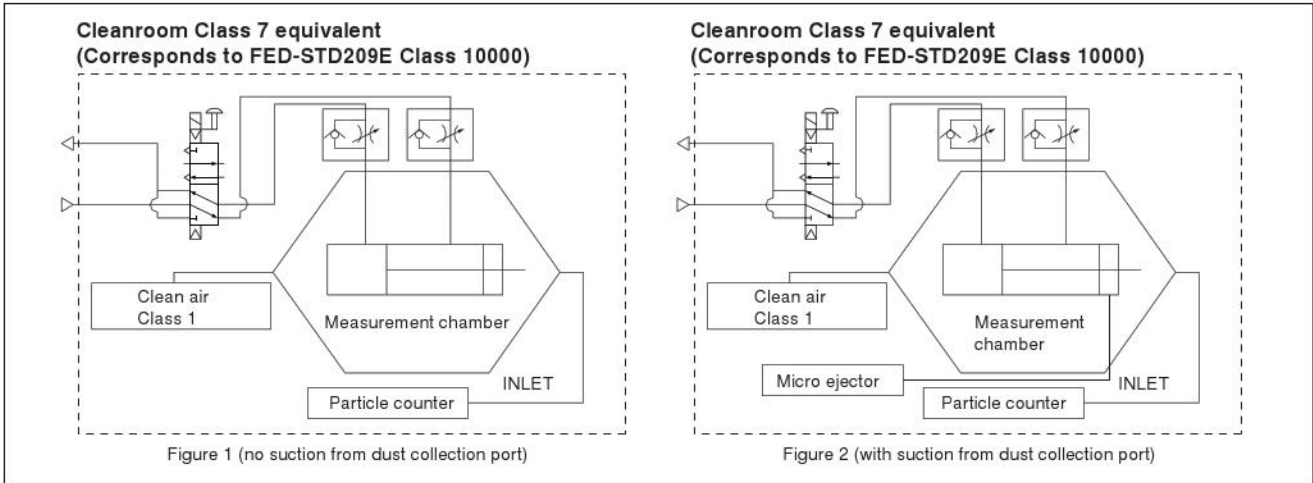
# Evaluations of Cleanliness

Koganei has therefore specified its in-house measurement methods, to conduct evaluations on the cleanroom rating.

The number of particles of the Air Cylinder Cleanroom Specification is measured as shown in the method below.

## 1. Measurement conditions

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



1-2 Operating conditions of tested cylinder

Operating frequency: 1Hz

Average speed: 500mm/s [20in./sec.]

Applied pressure: 0.5MPa [73psi.]

Suction condition: Microejector ME05, Primary side: 0.5MPa [73psi.] applied, Tube:  $\phi 6$  [0.236in.]

Mounting direction: Vertical

Chamber volume: 8.3  $\ell$  [0.293ft<sup>3</sup>]

## 2. Particle counter

Manufacturer/model: RION/KM20

Suction flow rate: 28.3  $\ell$  /min [1ft<sup>3</sup>/min.]

Particle diameter: 0.1  $\mu\text{m}$ , 0.2  $\mu\text{m}$ , 0.3  $\mu\text{m}$ , 0.5  $\mu\text{m}$ , 0.7  $\mu\text{m}$ , 1.0  $\mu\text{m}$

## 3. Measurement method

3-1 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 the measurement sample, and confirmed the measured number of particle is 1 piece or less.

3-2 Measurement under operation

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

3-3 Reconfirmation

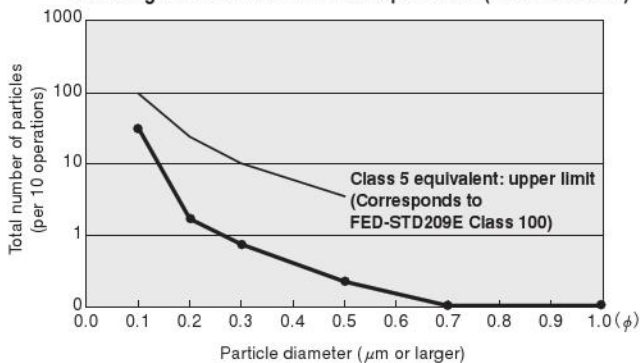
Performed the measurement in 3-1 again, to reconfirm the number of particles in the measurement system.

## 4. Measurement results

### ● Cleanroom specification

Jig Cylinder (no suction from dust collection port)

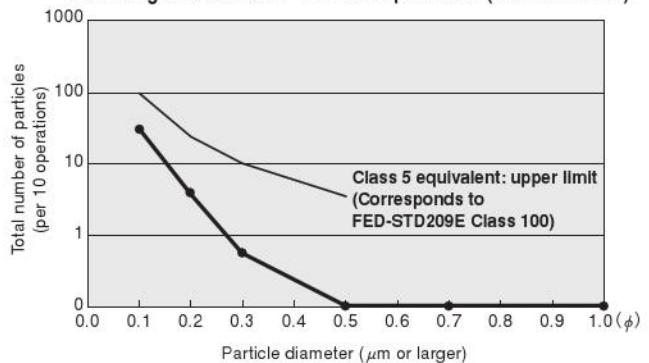
Particle generation over 1 million operations (CS-CDA16 $\times$ 30)



### ● Cleanroom specification

Slim Cylinder (with suction from dust collection port)

Particle generation over 1 million operations (CS-DA20 $\times$ 100)



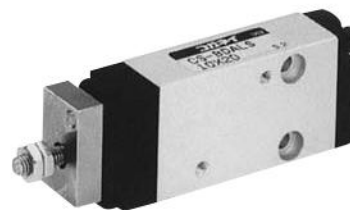
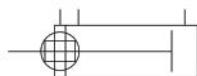
For "safety precautions" listed in the Clean System Product Drawings, see the materials below.

- For actuators, see "Safety Precautions" on p. 45 of the Actuators General Catalog .
- For valves, see "Safety Precautions" on p. 31 of the Valves General Catalog.
- For air treatment and auxiliary equipment, see "Safety Precautions" on p.31 of the General Catalog of Air Treatment, Auxiliary, Vacuum.

# MULTI MOUNT CYLINDERS

## Non-rotating Double Acting Type

### Symbol



### Specifications

Item	Bore size mm [in.]		
	6 [0.236]	10 [0.394]	16 [0.630]
Operating type	Non-rotating double acting type		
Media	Air		
Operating pressure range MPa [psi.]	0.2~0.7 [29~102]	0.15~0.7 [22~102]	0.1~0.7 [15~102]
Proof pressure MPa [psi.]	1.03 [149]		
Operating temperature range °C [°F]	0~60 [32~140]		
Operating speed range mm/s [in./sec.]	50~300 [2.0~11.8]		
Cushion	Rubber bumper		
Lubrication	Not required		
Non-rotating accuracy	±2°	±1.5°	±1°
Port size	M5×0.8		
Stroke tolerance mm [in.]	+1 [0.039] 0 [0]		

### Bore Size and Stroke

Bore size	Standard strokes
6 [0.236]	5, 10, 15, 20, 25, 30
10 [0.394]	
16 [0.630]	

### Order Codes

**CS** — **BDAL** 10×30 —      

**Clean system product**

**Multi mount cylinder**  
Non-rotating double acting type

**Cylinder specification**  
Blank — Standard cylinder  
S — Cylinder with magnet

**Bore size**  
×  
**Stroke**

**Number of sensor switches**  
1 — With 1 sensor switch  
2 — With 2 sensor switches

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

**Sensor switch**  
Blank — Without sensor switch  
ZC130 — 2-lead wire Solid state type with indicator lamp (DC10~28V)  
ZC153 — 3-lead wire Solid state type with indicator lamp (DC4.5~28V)  
CS5T — 2-lead wire Reed switch type without indicator lamp (DC5~28V, AC85~115V)  
CS11T — 2-lead wire Reed switch type with indicator lamp (DC10~28V)

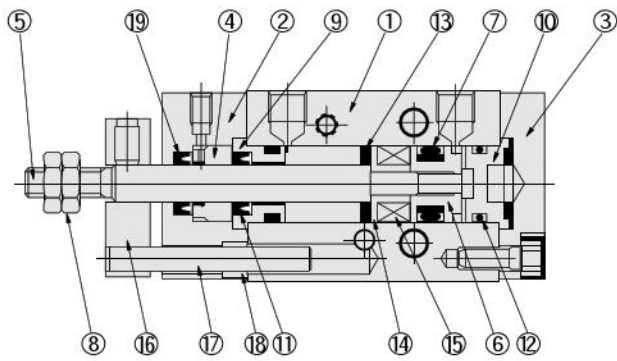
● For details of sensor switches, see p.111~121.

### ● Shield Plate Model

Bore size mm [in.]	Stroke	
	5, 10, 15	20, 25, 30
6 [0.236]	CS-BS061	CS-BS062
10 [0.394]	CS-BS101	CS-BS102
16 [0.630]	CS-BS161	CS-BS162

## Inner Construction and Major Parts

### ● CS-BDALS



### Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy (anodized)
②	Rod cover	Aluminum alloy (black anodized)
③	Head cover	Aluminum alloy (black anodized)
④	Rod bushing	Oil impregnated bronze
⑤	Piston rod	Stainless steel
⑥	Piston	Brass
⑦	Piston seal	Synthetic rubber(NBR)
⑧	Rod end nut	Steel (electric nickel plated)
⑨	Seal case	Brass
⑩	Cap	Plastic
⑪	Rod seal	Synthetic rubber (NBR)
⑫	O-ring	Synthetic rubber (NBR)
⑬	Bumper	Urethane rubber
⑭	Support	Brass
⑮	Magnet	φ 6: Sintered alloy magnet φ 10, φ 16: Plastic magnet
⑯	Plate	Brass (electric nickel plated)
⑰	Guide pin	Stainless steel
⑱	Bushing	Plastic
⑲	Dust leak prevention seal	Synthetic rubber(NBR)

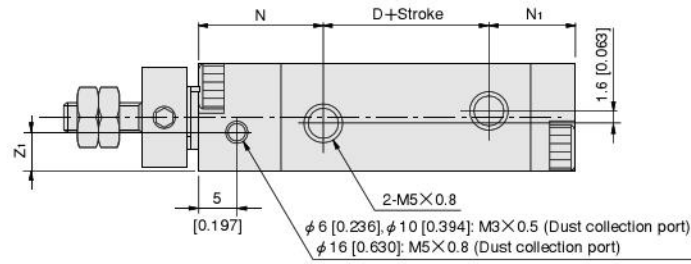
### Seals

Bore size mm	Parts Qty	Rod seal	Piston seal	O-ring	Dust leak prevention seal
		1	1	2	1
6		NY-6×3×2	PPH-6	8.4×6×1.2	NY-6×3×2
10		NY-8×5×2	PPH-10	10×7.6×1.2	NY-8×5×2
16		NY-9×6×2	PPH-16	16×13×1.5	NY-9×6×2

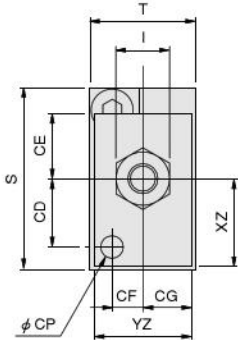
### Mass

Bore size mm [in.]	Stroke mm	Mass of side mount		Additional mass g [oz.]			
		Standard cylinder	Cylinder with magnet	With 1 sensor switch (Only for cylinder with magnet)			
				ZC130□	ZC153□	CS5T□	CS11T□
6 [0.236]	5	33 [1.16]	36 [1.27]	20 [0.71]			
	10	36 [1.27]	39 [1.38]				
	15	39 [1.38]	42 [1.48]				
	20	42 [1.48]	45 [1.59]				
	25	45 [1.59]	48 [1.69]				
	30	48 [1.69]	51 [1.80]				
10 [0.394]	5	55 [1.94]	61 [2.15]	20 [0.71]			
	10	59 [2.08]	65 [2.29]				
	15	63 [2.22]	69 [2.43]				
	20	67 [2.36]	73 [2.57]				
	25	71 [2.50]	77 [2.72]				
	30	75 [2.65]	81 [2.86]				
16 [0.630]	5	109 [3.84]	122 [4.30]	20 [0.71]			
	10	116 [4.09]	129 [4.55]				
	15	123 [4.34]	136 [4.80]				
	20	130 [4.59]	143 [5.04]				
	25	137 [4.83]	150 [5.29]				
	30	144 [5.08]	157 [5.54]				

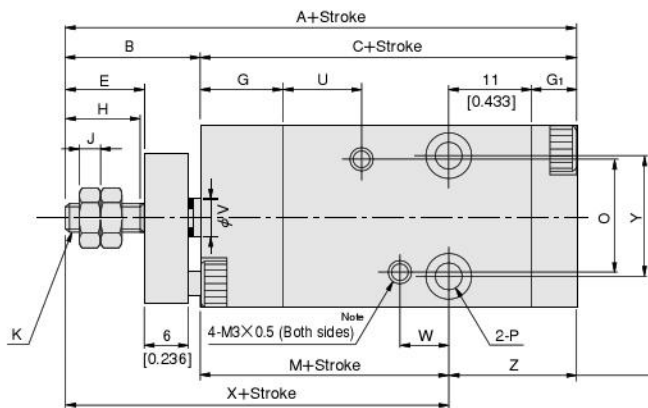
# Dimensions mm [in.]



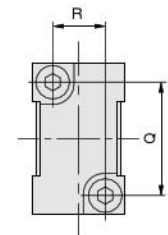
$\phi 10 [0.394]$ ,  
 $\phi 16 [0.630]$



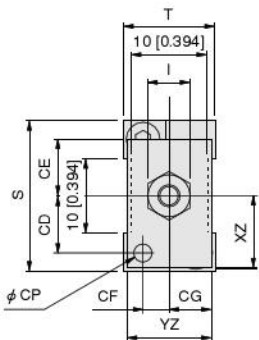
$\phi 10 [0.394]$ ,  
 $\phi 16 [0.630]$



$\phi 6 [0.236]$



$\phi 6 [0.236]$



Type Code Bore size	Standard cylinder					Cylinder with magnet					B	E	G	I	J	K
	A	C	D	M	X	A	C	D	M	X						
<b>6 [0.236]</b>	48 [1.890]	33 [1.299]	8 [0.315]	17 [0.669]	32 [1.260]	53 [2.087]	38 [1.496]	13 [0.512]	22 [0.866]	37 [1.457]	15 [0.591]	7.5 [0.295]	10 [0.394]	5.5 [0.217]	1.8 [0.071]	M3x0.5
<b>10 [0.394]</b>	53 [2.087]	35 [1.378]	7 [0.276]	18 [0.709]	36 [1.417]	58 [2.283]	40 [1.575]	12 [0.472]	23 [0.906]	41 [1.614]	18 [0.709]	10.5 [0.413]	11 [0.433]	7 [0.276]	2.4 [0.094]	M4x0.7
<b>16 [0.630]</b>	58 [2.283]	38 [1.496]	8 [0.315]	20 [0.787]	40 [1.575]	63 [2.480]	43 [1.693]	13 [0.512]	25 [0.984]	45 [1.772]	20 [0.787]	12.5 [0.492]	12 [0.472]	8 [0.315]	3.2 [0.126]	M5x0.8

Code Bore size	N	N <sub>1</sub>	O	P	Q	R	S	T	U	V	W	Y	Z	Z <sub>1</sub>
	<b>6 [0.236]</b>	15 [0.591]	10 [0.394]	14 [0.551]	$\phi 3.5 [0.138]$ , Counterbore $\phi 6 [0.236]$ Depth 4.2 [0.165] (Both sides)	15 [0.591]	7 [0.276]	20 [0.787]	12 [0.472]	10.5 [0.413]	3 [0.118]	6.5 [0.256]	12 [0.472]	16 [0.630]
<b>10 [0.394]</b>	16.5 [0.650]	11.5 [0.453]	15 [0.591]	$\phi 3.5 [0.138]$ , Counterbore $\phi 6 [0.236]$ Depth 3.2 [0.126] (Both sides)	18 [0.709]	8 [0.315]	24 [0.945]	14 [0.551]	5 [0.197]		16 [0.630]		17 [0.669]	5 [0.197]
<b>16 [0.630]</b>	17.5 [0.689]	12.5 [0.492]	19 [0.748]	$\phi 4.5 [0.177]$ , Counterbore $\phi 7.6 [0.299]$ Depth 4.2 [0.165] (Both sides)	25 [0.984]	12 [0.472]	33 [1.299]	20 [0.787]	6 [0.236]		7.5 [0.295]	24 [0.945]	18 [0.709]	7 [0.276]

Code Bore size	CD	CE	CF	CG	CP	XZ	YZ
	<b>6 [0.236]</b>	7.5 [0.295]	7.5 [0.295]	3.5 [0.138]	5.5 [0.217]	2.5 [0.098]	9.5 [0.374]
<b>10 [0.394]</b>	9 [0.354]	8.5 [0.335]	4 [0.157]	6.5 [0.256]	3 [0.118]	11.5 [0.453]	13 [0.512]
<b>16 [0.630]</b>	12.5 [0.492]	9 [0.354]	6 [0.236]	9.5 [0.374]	4 [0.157]	16 [0.630]	19 [0.748]

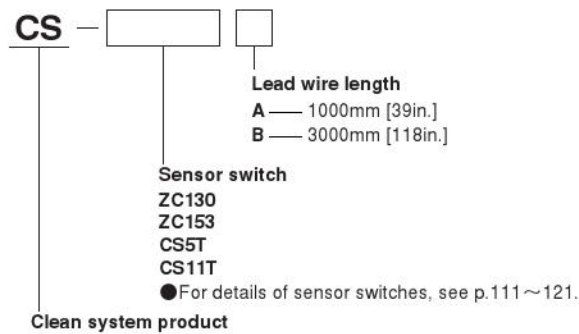
Note: The 4-M3x0.5 female thread (for sensor switch mounting) in the drawing should not be used for mounting the cylinder. Moreover, it is not available with the cylinder body of a standard 5mm [0.197in.] stroke cylinder.

# MULTI MOUNT CYLINDERS

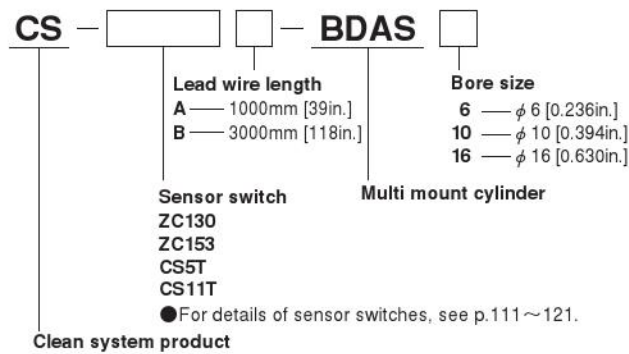
## Sensor Switches

### Order Codes (for Sensor Switches Only)

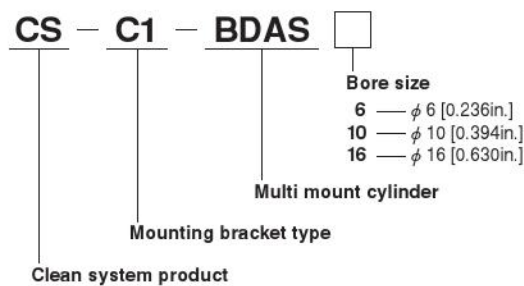
#### ● Sensor switches only



#### ● Sensor switch and Mounting bracket (Sensor switch with mounting bracket)



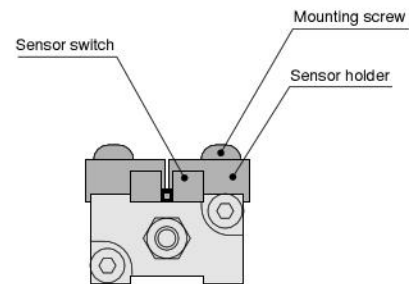
#### ● Mounting bracket only



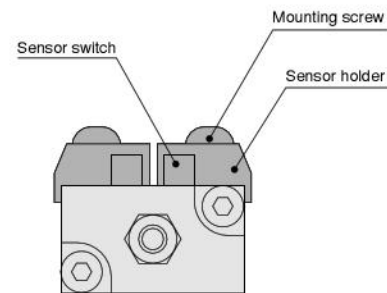
### Moving Sensor Switch

- Loosening the mounting screw allows the sensor switch to be moved freely in the cylinder's axial direction.
- Tighten the mounting screw with a tightening torque of 19.6N·cm [1.73in·lbf] or less.

#### ● $\phi$ 6



#### ● $\phi$ 10,16



### Minimum Cylinder Strokes When Mounting Sensor Switches

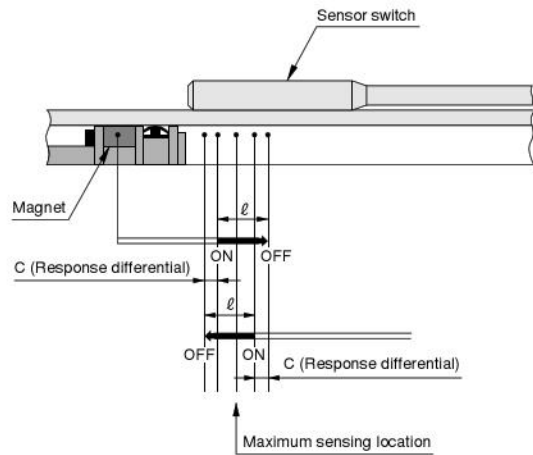
Bore size	mm [in.]			
	Solid state type sensor switch		Reed switch type sensor switch	
	2 pcs. mounting	1 pc. mounting	2 pcs. mounting	1 pc. mounting
<b>6 [0.236]</b>				
<b>10 [0.394]</b>	5 [0.197]	5 [0.197]	10 [0.394]	5 [0.197]
<b>16 [0.630]</b>				

Remark: Two sensor switches cannot be mounted on a cylinder with flange B mount.

Mount 1 sensor switch on the head side when the flange B mount is used on the rod side, and mount 1 sensor switch on the rod side when the flange B mount is used on the head side.

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

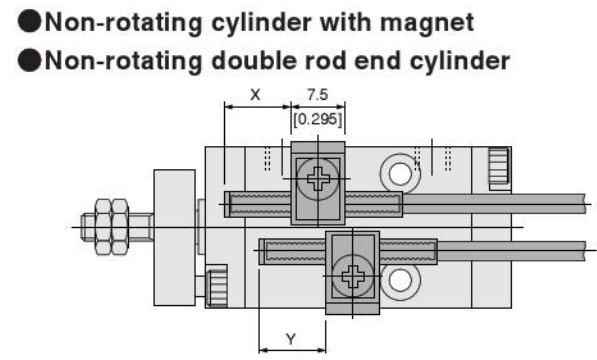
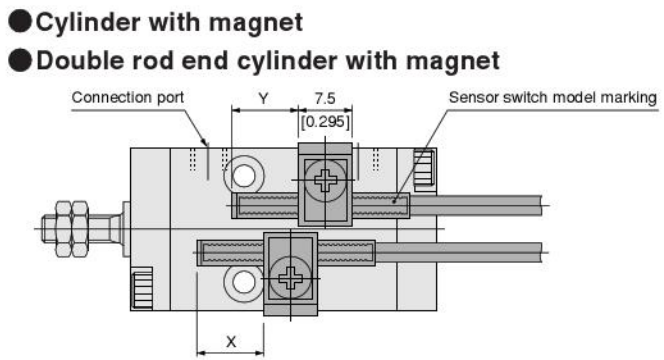
- Operating range:  $\ell$   
The distance the piston travels in one direction, while the switch is in the ON position.
- Response differential: C  
The distance between the point where the piston turns the switch ON and the point where the switch is turned OFF as the piston travels in the opposite direction.



Bore size	ZC130□, ZC153□		CS5T□, CS11T□	
	Operating range	Response differential	Operating range	Response differential
6 [0.236]	2.0~3.0 [0.079~0.118]	0.3 [0.012] or less	4.8~7.2 [0.189~0.283]	1.3 [0.051] or less
10 [0.394]	2.0~3.0 [0.079~0.118]	0.3 [0.012] or less	5.8~8.3 [0.228~0.327]	2.0 [0.079] or less
16 [0.630]	2.5~4.0 [0.098~0.157]	0.3 [0.012] or less	7.5~9.4 [0.295~0.370]	2.5 [0.098] or less

Remark: The above table shows reference values.

## Mounting Location of End of Stroke Detection Sensor Switch



■ Double acting type (Including double rod end cylinders) mm [in.]

Bore size	Mounting location	Sensor switch model		
		ZC130□, ZC153□	CS5T□	CS11T□
6 [0.236]	X	13.0 [0.512]	11.5 [0.453]	15 [0.591]
10 [0.394]	Y	8.0 [0.315]	6.5 [0.256]	10 [0.394]
16 [0.630]	X	14.0 [0.551]	12.5 [0.492]	16 [0.630]
	Y	9.0 [0.354]	7.5 [0.295]	11 [0.433]

■ Double acting type (Including double rod end cylinders) mm [in.]

Bore size	Mounting location	Sensor switch model		
		ZC130□, ZC153□	CS5T□	CS11T□
6 [0.236]	X	6.0 [0.236]	4.5 [0.177]	8 [0.315]
10 [0.394]	Y	1.0 [0.039]	-0.5 [-0.020]	3 [0.118]
16 [0.630]	X	7.0 [0.276]	5.5 [0.217]	9 [0.354]
	Y	2.0 [0.079]	0.5 [0.020]	4 [0.157]

■ Single acting push type mm [in.]

Bore size	Mounting location	Sensor switch model		
		ZC130□, ZC153□	CS5T□	CS11T□
6 [0.236]	X	8.0 [0.315]	6.5 [0.256]	10 [0.394]
10 [0.394]	Y	8.0 [0.315]	6.5 [0.256]	10 [0.394]
16 [0.630]	X	9.0 [0.354]	7.5 [0.295]	11 [0.433]
	Y	9.0 [0.354]	7.5 [0.295]	11 [0.433]

■ Single acting push type mm [in.]

Bore size	Mounting location	Sensor switch model		
		ZC130□, ZC153□	CS5T□	CS11T□
6 [0.236]	X	1.0 [0.039]	-0.5 [-0.020]	3 [0.118]
10 [0.394]	Y	1.0 [0.039]	-0.5 [-0.020]	3 [0.118]
16 [0.630]	X	2.0 [0.079]	0.5 [0.020]	4 [0.157]
	Y	2.0 [0.079]	0.5 [0.020]	4 [0.157]

■ Single acting pull type mm [in.]

Bore size	Mounting location	Sensor switch model		
		ZC130□, ZC153□	CS5T□	CS11T□
6 [0.236]	X	13.0 [0.512]	11.5 [0.453]	15 [0.591]
10 [0.394]	Y	13.0 [0.512]	11.5 [0.453]	15 [0.591]
16 [0.630]	X	14.0 [0.551]	12.5 [0.492]	16 [0.630]
	Y	14.0 [0.551]	12.5 [0.492]	16 [0.630]

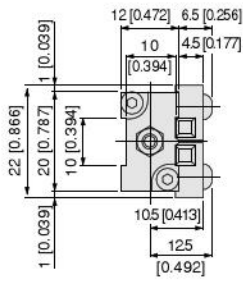
■ Single acting pull type mm [in.]

Bore size	Mounting location	Sensor switch model		
		ZC130□, ZC153□	CS5T□	CS11T□
6 [0.236]	X	6.0 [0.236]	11.5 [0.453]	8 [0.315]
10 [0.394]	Y	6.0 [0.236]	11.5 [0.453]	8 [0.315]
16 [0.630]	X	7.0 [0.276]	12.5 [0.492]	9 [0.354]
	Y	7.0 [0.276]	12.5 [0.492]	9 [0.354]

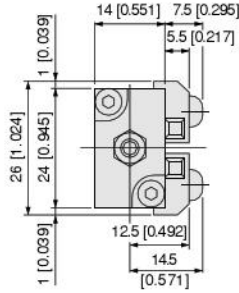
- Remarks:
1. The above tables give reference values for the standard strokes. For the procedure to find-out the best sensing position, see p.23.
  2. The above figures are obtained when the piping connection port turned to face upward.
  3. Use the distance between the cylinder mounting hole and the rod cover to confirm the mounting location of the end of stroke detection sensor switch on the double rod end cylinder.
  4. Mount the sensor switch so that the surface showing the sensor switch model marking faces up.

# Dimensions of Sensor Switch Mounting mm [in.]

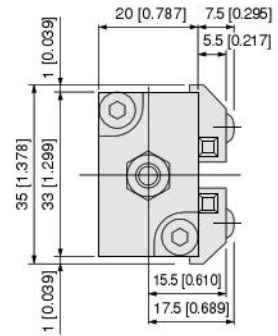
●  $\phi$  6 [0.236]



●  $\phi$  10 [0.394]

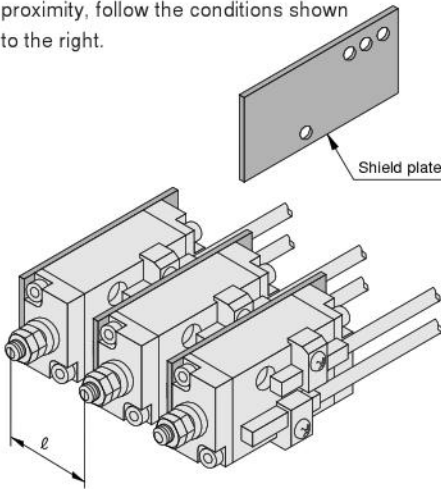


●  $\phi$  16 [0.630]



## Precautions for Mounting Cylinders with Magnets

When mounting 2 or more Multi Mount Cylinders with sensor switches in close proximity, follow the conditions shown to the right.



Bore size mm [in.]	Without shield plate		With shield plate
	$l$	$l$	$l$
6 [0.236]	25mm [0.984] or longer	23mm [0.906] or longer	22mm [0.866] or longer
10 [0.394]	29mm [1.142] or longer	31mm [1.220] or longer	25mm [0.984] or longer
16 [0.630]	35mm [1.378] or longer	39mm [1.535] or longer	31mm [1.220] or longer

Remark: Except the above, there are no particular limitations in mounting.

## Shield Plate Model (Order Code)

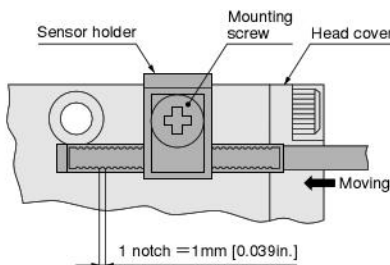
Operating type Stroke mm Bore size mm [in.]	Applicable shield plate model			
	Double acting type, Double acting double rod end type		Single acting push/pull type	
	5, 10, 15	20, 25, 30	5, 10	15
6 [0.236]	CS-BS061	CS-BS062	CS-BS061	CS-BS062
10 [0.394]	CS-BS101	CS-BS102	CS-BS101	CS-BS102
16 [0.630]	CS-BS161	CS-BS162	CS-BS161	CS-BS162

Remarks: 1. All shield plates come with 2 mounting screws.  
2. Order shield plates separately.

## Procedure for finding the best sensing position

### ● Setting the head side stroke end

1. Push piston rod to the fully retracted position.
2. Install a sensor switch in a holder without tightening a mounting screw all the way, move the switch from head side to rod side until it turns ON (for ZC130□, ZC153□ and CS11T□, when the LED lights up), then move the switch 1 notch (=1mm [0.039in.]) for ZC130□ and ZC153□, or 2 notches (=2mm [0.079in.]) for CS5T□ and CS11T□ toward the rod side, and tighten the mounting screw.



### ● Setting the rod side stroke end

- Conduct the same procedure as the head side, but on the reversed way.
1. Pull piston rod to the fully extended position.
  2. Install a sensor switch in a holder without tightening a mounting screw all the way, move the switch from rod side to head side until it turns ON, then move the switch 1 notch (=1mm [0.039in.]) for ZC130□ and ZC153□, or 2 notches (=2mm [0.079in.]) for CS5T□ and CS11T□ toward the head side, and tighten the mounting screw.

### ● Caution when installing sensor switches on the cylinder

