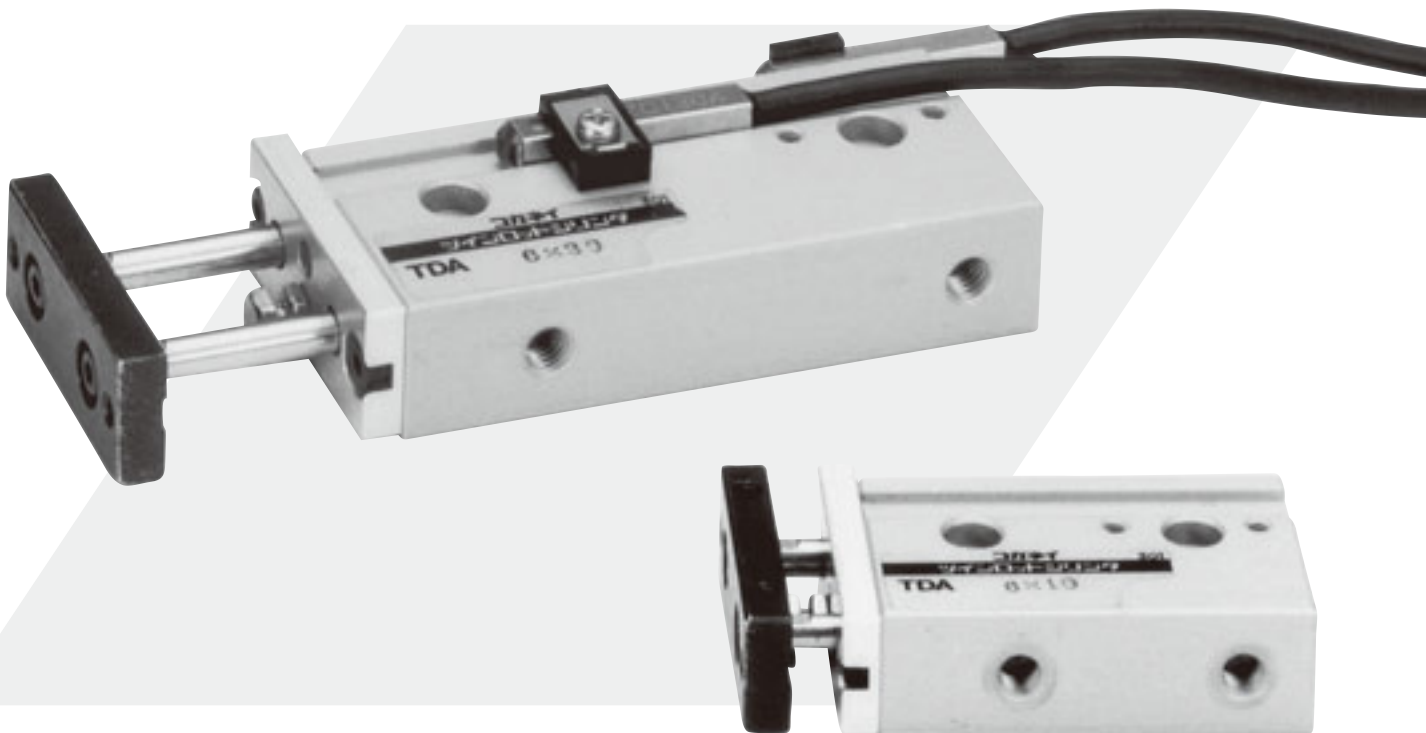


## TWIN ROD CYLINDERS $\phi$ 6

*A square style, a compact design that needs no guides, and direct mounting makes the mechanical devices more compact!*

*Non-rotating accuracy is  $\pm 0.45^\circ$ .*

*Moreover, cylinder thrust is twice that of conventional cylinders.*



## Selection Chart

Item Operation type	Bore size mm	Strokes mm	Sensor switches		Non-ion specification
			Solid state type	Reed switch type	
Double acting type	6	10, 20, 30, 40, 50	ZC130 ZC153	CS5T CS11T	None

## Cylinder Thrust

Select a suitable cylinder bore size considering the load and air pressure to obtain the required thrust.

Since the figures in the table are calculated values, select a bore size that results in a load ratio (load ratio =  $\frac{\text{Load}}{\text{Calculated value}}$ ) of 70% or less (50% or less for high speed application).

Bore size mm [in.]	Rod size mm [in.]	Operation	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]	
6 [0.236]	4 [0.157]	Double acting type	Push side	56 [0.087]	—	11.2 [2.52]	16.8 [3.78]	22.4 [5.04]	28 [6.29]	33.6 [7.55]	39.2 [8.81]
			Pull side	31 [0.048]	—	6.2 [1.39]	9.3 [2.09]	12.4 [2.79]	15.5 [3.48]	18.6 [4.18]	21.7 [4.88]

Note: Minimum operating pressure is 0.2MPa.

## Air Flow Rate and Air Consumption

While the twin rod cylinder's air flow rate and air consumption can be found through the following calculations, the quick reference chart below provides the answers more conveniently.

$$\text{Air flow rate } Q_1 = \frac{\pi D^2}{4} \times L \times \frac{60}{t} \times \frac{P + 0.1013}{0.1013} \times 10^{-6} \times 2$$

$$\text{Air consumption } Q_2 = \frac{\pi D^2}{4} \times L \times 2 \times n \times \frac{P + 0.1013}{0.1013} \times 10^{-6} \times 2$$

Q<sub>1</sub>: Required air flow rate for cylinder ℓ /min (ANR)  
 Q<sub>2</sub>: Air consumption of cylinder ℓ /min (ANR)  
 D: Cylinder bore diameter mm  
 L: Cylinder stroke mm  
 t: Time required for cylinder to travel one stroke s  
 n: Number of cylinder reciprocations per minute times/min  
 P: Air pressure MPa

$$\text{Air flow rate } Q_1' = \frac{\pi D'^2}{4} \times L' \times \frac{60}{t} \times \frac{P' + 14.696}{14.696} \times \frac{1}{1728} \times 2$$

$$\text{Air consumption } Q_2' = \frac{\pi D'^2}{4} \times L' \times 2 \times n \times \frac{P' + 14.696}{14.696} \times \frac{1}{1728} \times 2$$

Q<sub>1</sub>': Required air flow rate for cylinder ft.<sup>3</sup>/min. (ANR)\*  
 Q<sub>2</sub>': Air consumption of cylinder ft.<sup>3</sup>/min. (ANR)\*  
 D': Cylinder bore diameter in.  
 L': Cylinder stroke in.  
 t: Time required for cylinder to travel one stroke sec.  
 n: Number of cylinder reciprocations per minute times/min.  
 P': Air pressure psi.

\* Refer to p.54 for an explanation of ANR.

## Air consumption for each 1mm [0.0394in.] stroke

cm<sup>3</sup> [in.<sup>3</sup>]/Reciprocation (ANR)

Bore size mm [in.]	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]
6 [0.236]	(0.22 [0.0134])	0.34 [0.0207]	0.45 [0.0275]	0.56 [0.0342]	0.67 [0.0409]	0.78 [0.0476]	0.89 [0.0543]

The figures in the table show the air flow rate and air consumption when a Twin Rod cylinder makes 1 reciprocation with stroke of 1mm [0.0394in.].

The air flow rate and air consumption actually required is found by the following calculations.

- Finding the air flow rate (for selecting F.R.L., valves, etc.)

Example 1. When operating a Twin Rod cylinder with bore size of 6mm [0.236in.] at speed of 300mm/s [11.8in./sec.], under air pressure of 0.5MPa [73psi.]

$$0.67 \times \frac{1}{2} \times 300 \times 10^{-3} = 0.1 \text{ ℓ /s [0.00353ft.<sup>3</sup>/sec.]} \text{ (ANR)*}$$

$$\text{(At this time, the flow rate per minute is } 0.67 \times \frac{1}{2} \times 300 \times 60 \times 10^{-3} = 6.03 \text{ ℓ /min [0.213ft.<sup>3</sup>/sec.]} \text{ (ANR))}$$

- Finding the air consumption

Example 1. When operating a Twin Rod cylinder with bore size of 6mm [0.236in.] and stroke of 50mm [1.97in.], under air pressure of 0.5MPa [73psi.], for 1 reciprocation

$$0.67 \times 50 \times 10^{-3} = 0.0335 \text{ ℓ [0.00118ft.<sup>3</sup>]/Reciprocation (ANR)}$$

Example 2. When operating a twin rod cylinder with bore size of 6mm [0.236in.] and stroke of 50mm [1.97in.], under air pressure of 0.5MPa [73psi.], for 10 reciprocations per minute

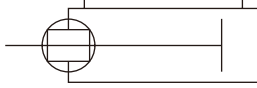
$$0.67 \times 50 \times 10 \times 10^{-3} = 0.335 \text{ ℓ /min [0.0118ft.<sup>3</sup>/min.]} \text{ (ANR)}$$

\* Refer to p.54 for an explanation of ANR.

# TWIN ROD CYLINDERS $\phi$ 6

## $\phi$ 6 Double Acting Type

### Symbol



### Specifications

Item	Bore size mm [in.]	6 [0.236]
Operation type		Double acting type
Media		Air
Mounting type		Side mount
Operating pressure range MPa [psi.]		0.2~0.7 [29~102]
Proof pressure MPa [psi.]		1.03 [149]
Operating temperature range °C [°F]		0~60 [32~140]
Operating speed range mm/s [in./sec.]		100~500 [3.9~19.7]
Cushion		None
Lubrication		Not required
Non-rotating accuracy		$\pm 0.45^\circ$
Stroke adjusting range mm [in.]		-5~0 [-0.197~0] (To the specification stroke)
Port size		M5 $\times$ 0.8

### Bore Size and Stroke

Bore size	Standard strokes	Maximum available stroke	mm
			Pull side stroke adjusting range
6	10, 20, 30, 40, 50	70	-5~0

Note: Consult us for delivery of strokes that exceed the standard strokes.

### Order Codes

**TDA 6 $\times$  10** — [ ] [ ] [ ]

**Twin rod cylinder double acting type** Note

**Bore size**  
6 —  $\phi$  6

**Stroke**

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

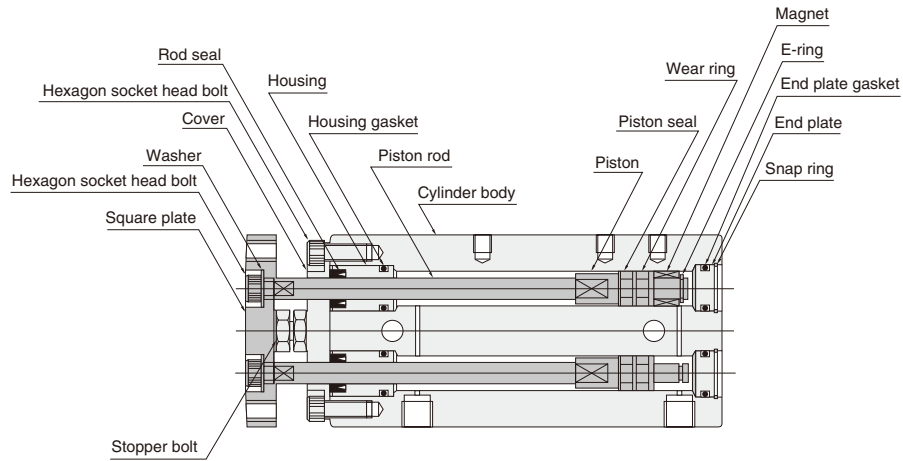
**Number of sensor switches**  
1 — With 1 sensor switch  
2 — With 2 sensor switches

**Sensor switch**  
Blank — No 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.1544.

Note: In the standard cylinder, a magnet for sensor switch is built-in.

# Inner Construction and Major Parts



TWIN ROD CYLINDERS φ6

## Major Parts and Materials

Parts	Materials
Cylinder body	Aluminum alloy (anodized)
Piston	Aluminum alloy (anodized)
Cover	Steel (nickel plated)
Wear ring	Plastic
Piston rod	Stainless steel
Gasket	Synthetic rubber (NBR)
Housing	Aluminum alloy (special wear-resistant treatment)
End plate	Plastic
Seal	Synthetic rubber (NBR)
Snap ring	Steel (nickel plated)
Magnet	Sintered alloy magnet
E-ring	Stainless steel
Washer	Steel (nickel plated)
Square plate	Mild steel (special surface treatment)
Stopper bolt	Mild steel (zinc plated)

Remark: Non-ion specification is not available.

## Seals

Parts	Rod seal	Piston seal	End plate gasket	Housing gasket
Quantity	2	2	2	2
Bore	6	6	6	6
	MYR-4	COP-6L	1×6	1×6

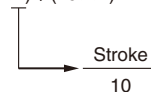
## Mass

Bore size		Zero stroke mass <sup>Note1</sup>	Additional mass	
mm [in.]	Standard specification		Additional mass of each 10mm [0.394in.] stroke	Mass of 1 sensor switch <sup>Note2</sup>
6 [0.236]	Standard specification	55 [1.94]	12 [0.42]	20 [0.71]

- Notes: 1. The above table is for the standard strokes.  
 2. There are 2 types of sensor switch lead wire lengths.  
 A: 1000mm [39in.], B: 3000mm [118in.]  
 The sensor switch mass in the table above is for Type A.

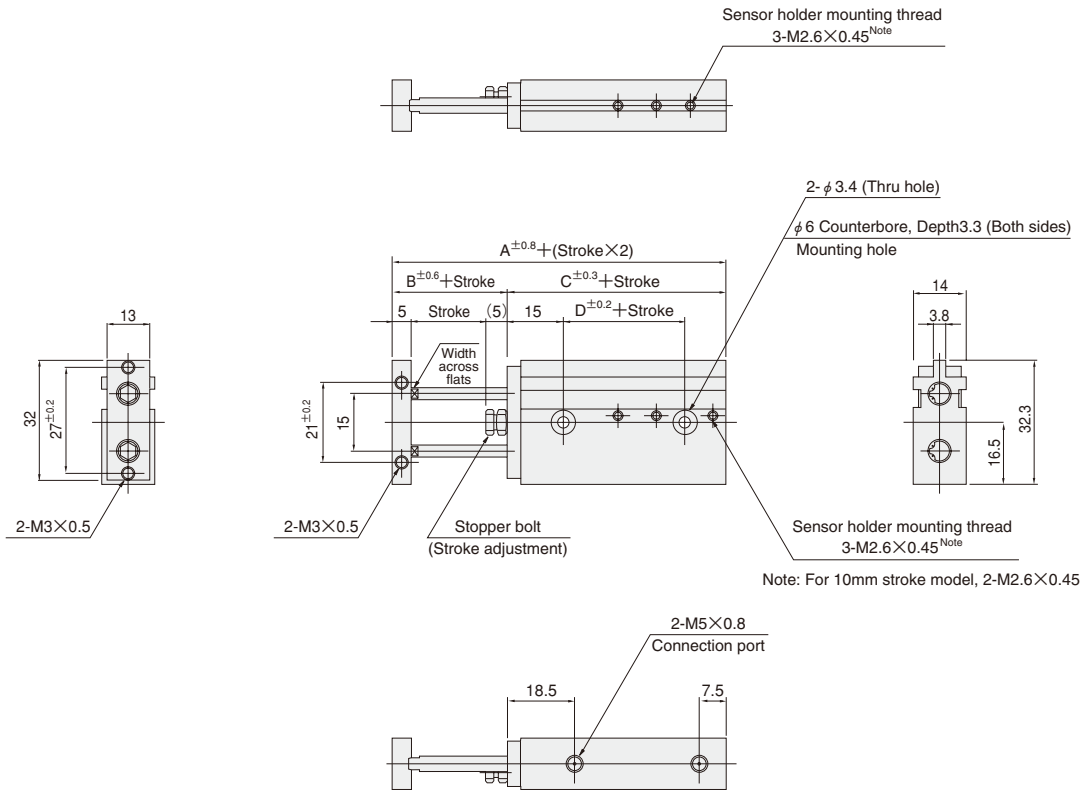
Calculation example: The mass for bore size of 6mm and stroke of 40mm with 2 sensor switches (CS5TA),

$$55 + (12 \times 4) + (20 \times 2) = 143\text{g [5.04oz.]}$$



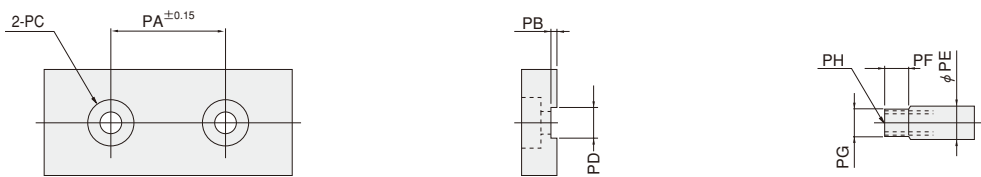
# Dimensions of Double Acting Type (mm)

TDA 6 × Stroke



Bore mm [in.]	Code	A	B	C	D
6 [0.236]		49	10	39	13

# Dimensions of Rod End Portion (mm)

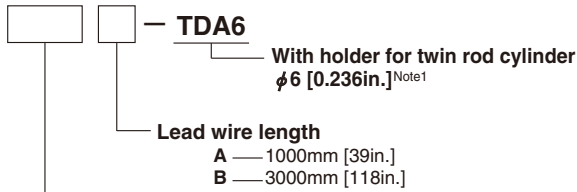


Bore mm [in.]	Code	PA	PB	PC	PD	PE	PF	PG	PH
6 [0.236]		15	0.5	φ 3 Counterbore φ 5 Depth 3.2	3.5 <sup>+0.15</sup> / <sub>+0.03</sub>	4	3	3.5 <sup>0</sup> / <sub>-0.15</sub>	M2.6 × 0.45 Depth 5

# SENSOR SWITCHES

## Solid State Type, Reed Switch Type

### Order Codes



#### Sensor switch

ZC130	— Solid state type	with indicator lamp	DC10~28V
ZC153	— Solid state type	with indicator lamp	DC4.5~28V
CS5T	— Reed switch type	without indicator lamp	DC5~28V
CS11T	— Reed switch type	with indicator lamp	AC85~115V
			DC10~28V

#### ● Order code of sensor holder only

#### C1-TDA6 Note2

- Notes: 1. Two sensor holders (one for the A, C surface and one for the B surface) come with 1 sensor switch.  
 2. One set consists of 2 sensor holders (1 each for the A, C surface and for the B surface).

Remark : For the mounting surfaces, see p.751.

● For details of sensor switches, see p.1544.

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

#### ● Operating range: $l$

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

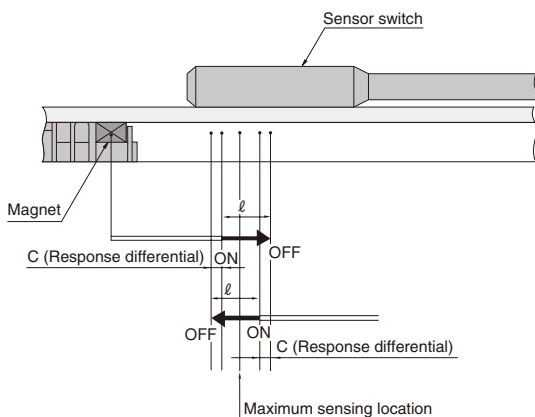
#### ● Response differential: C

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.

CS5T □			CS11T □			ZC130 □, ZC153 □		
Operating range	Response differential	Maximum sensing location	Operating range	Response differential	Maximum sensing location	Operating range	Response differential	Maximum sensing location
5~7 [0.197~0.276]	1.3 [0.051] or less	7 [0.276]	5~7 [0.197~0.276]	1.3 [0.051] or less	10.5 [0.413]	2~3 [0.079~0.118]	0.3 [0.012] or less	8.5 [0.335]

Note: The maximum sensing location is the length measured from the switch's opposite end side to the lead wire.

Remark: The above table shows reference values.

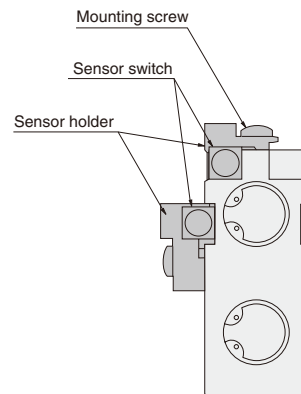


### Minimum Cylinder Strokes When Using Sensor Switches

Type of sensor switch	2 pcs. mounting			1 pc. mounting
	1-surface mounting		2-surface mounting	
	One groove on each A surface and B surface	Two grooves on B surface		
CS □ T □	40	10	10	10
ZC □ □	40	10	10	10

Remark : For the mounting surfaces, see p.751.

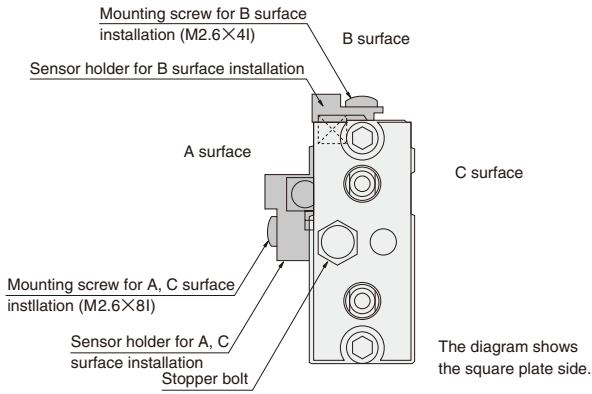
### Moving Sensor Switch



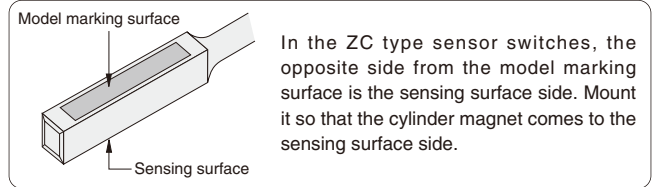
The diagram shows a view of the end plate side.

- Loosening 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 0.3N·m [2.7in·lbf] or less.

## Sensor Switch Mounting Surface



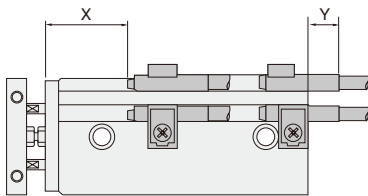
### Caution at mounting



- Mounting on either 1 or 2 surfaces of the A, B, or C surfaces allows detection of the rod side and head side stroke end.
- Since 2 sensor holders and 2 mounting screws (one for the A, C surface and one for the B surface) are provided for each sensor switch, use in accordance with the required mounting surface.

## Mounting Location of End of Stroke Detection Sensor Switch

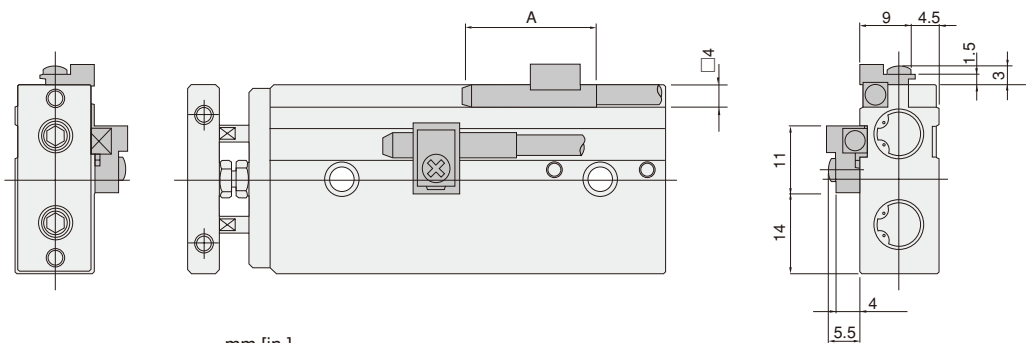
- When the sensor switch is mounted in the locations shown below (the figures in the tables are reference values), the magnet comes to the maximum sensing location of the sensor switch at the end of the stroke.



Mounting location	Sensor switch type		
	CS5T□	CS11T□	ZC130□, ZC153□
X	23 [0.906]	19.5 [0.768]	22 [0.866]
Y	6 [0.236]	6.5 [0.256]	8 [0.315]

Remark: Mount the sensor switch so that the surface showing the model faces up.

## Dimensions of Sensor Switch



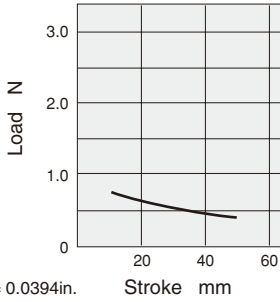
		mm [in.]			
Sensor switch Code	CS5T□	CS11T□	ZC130□	ZC153□	
A	22 [0.866]	26 [1.024]	25 [0.984]		



## Mounting and adjustment

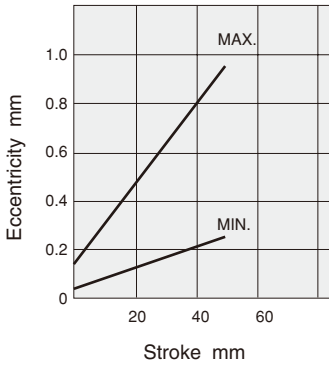
### Allowable lateral load

The lateral (side) load on the rod bearing should be at or below the graph values shown below.



### Plate eccentricity

For the eccentricity of the plate without load, use the graph values shown below as guides.



## Sensor switch

### Mounting

1. While any mounting direction is allowed, the mounting surface should always be flat. Twisting or bending during mounting may disturb the accuracy and may also result in air leaks or improper operation.
2. Care should be taken that scratches or dents on the cylinder's mounting surface may damage its flatness.
3. The hexagon socket head bolt on the rod end square plate has been mounted with a conical washer. Always confirm that the rod end square plate and hexagon socket head bolts are secured before using the cylinder.

### Stroke adjustment

On the Twin Rod cylinder, stroke adjusting is easy within a range of  $-5 \sim 0$ mm [ $-0.197 \sim 0$  in.]. Turn the stopper to the left (counterclockwise) to shorten the stroke.

Use a lock nut to tighten and secure the stopper in place after adjustment. Do not tighten the bolt to the right (clockwise) beyond the standard position. The stroke at shipping is set to the standard stroke. Do not adjust it to larger than the standard stroke.

### Cylinder speed

Use the cylinder at or below a speed of 500mm/s [19.7in./sec.] (use a speed controller for adjustment). For high speeds (500mm/s [19.7in./sec.]), install an external stopper, etc., to prevent direct shocks to the cylinder. Consult us if the situation will not permit installation of an external stopper, etc.

1. In the standard cylinder, the magnet for sensor switch is built-in. Mounting a sensor switch will enable use in sensor switch applications
2. When placing cylinders with 2 or more sensors in close for installation, the proximity of the magnetic fields may interfere with each other resulting in erratic operation.  
For this type of mounting configuration, consult us.