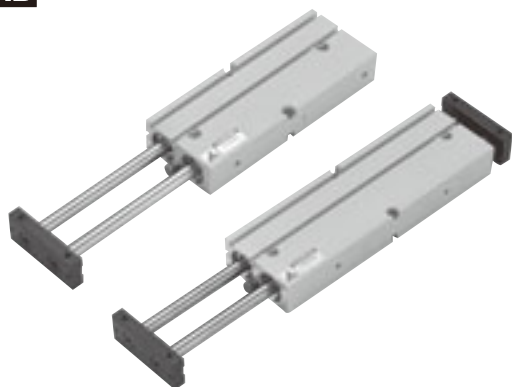




CAD drawing data catalog
is available.



KOGANEI

ACTUATORS GENERAL CATALOG



alpha series

TWIN ROD CYLINDERS B SERIES CONTENTS

ALPHA TWIN ROD CYLINDERS B SERIES

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Caution

Before use, be sure to read the "Safety Precautions" on p. 57.

Plus precision



We have added advanced positioning precision and high rigidity to the pneumatic actuator.

The Koganei Alpha Series further enhances the drive module concept, supporting superior applications in FA line design, labor savings in manufacturing, and higher performance.

TWIN ROD CYLINDERS B SERIES

Linear ball bearings are used for the rod bearing.

The use of linear ball bearings for the rod bearing and high carbon chrome bearing steel for the piston rod assures high rod end deflection precision even during full strokes. In addition, this eliminates bearing wear and maintains the initial inherent accuracy.



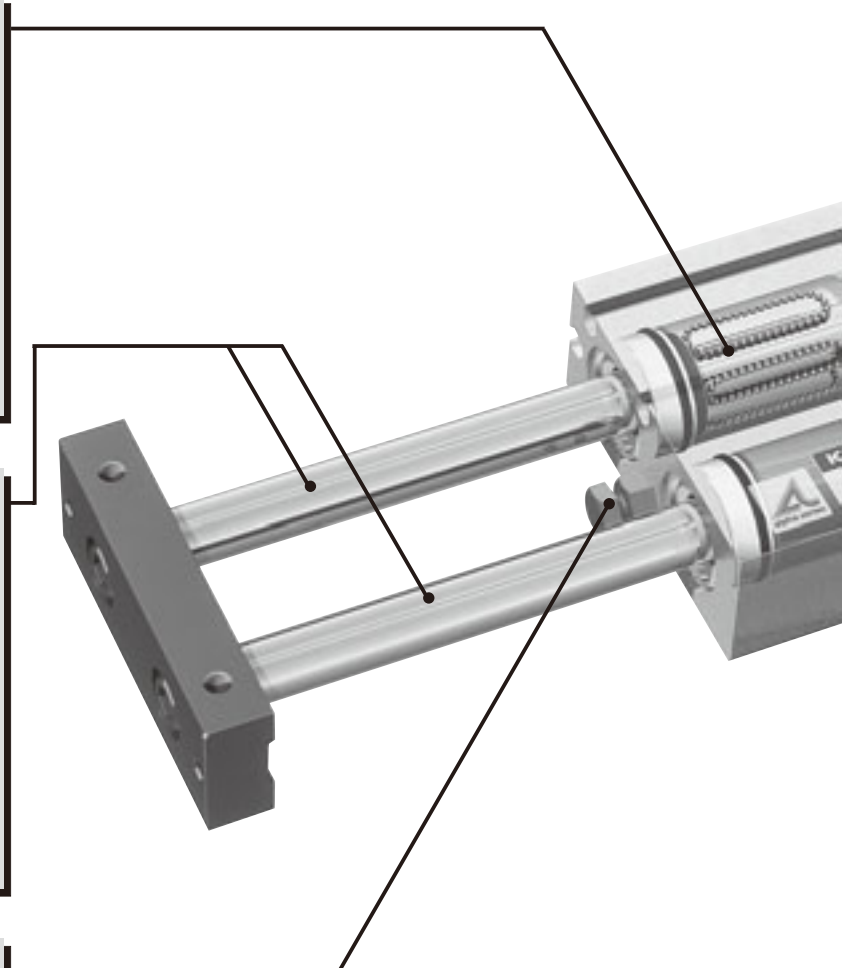
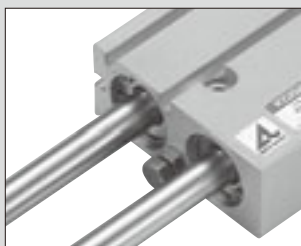
Two rods achieve non-rotating accuracy of $\pm 0.1^\circ$.

Rational construction features 2 piston rods that prevent rotation and work together as guides.



Stopper bolt allows for stroke adjusting even after mounting.

Adjusting the stopper bolt makes stroke adjustment possible within a range of $-5 \sim 0$ mm [$-0.197 \sim 0$ in.] (one side). Boosts operating efficiency when mounting and adjusting.



**FLAT
SQU
P**

SINGLE ROD TYPEATBDA Bore size × Stroke

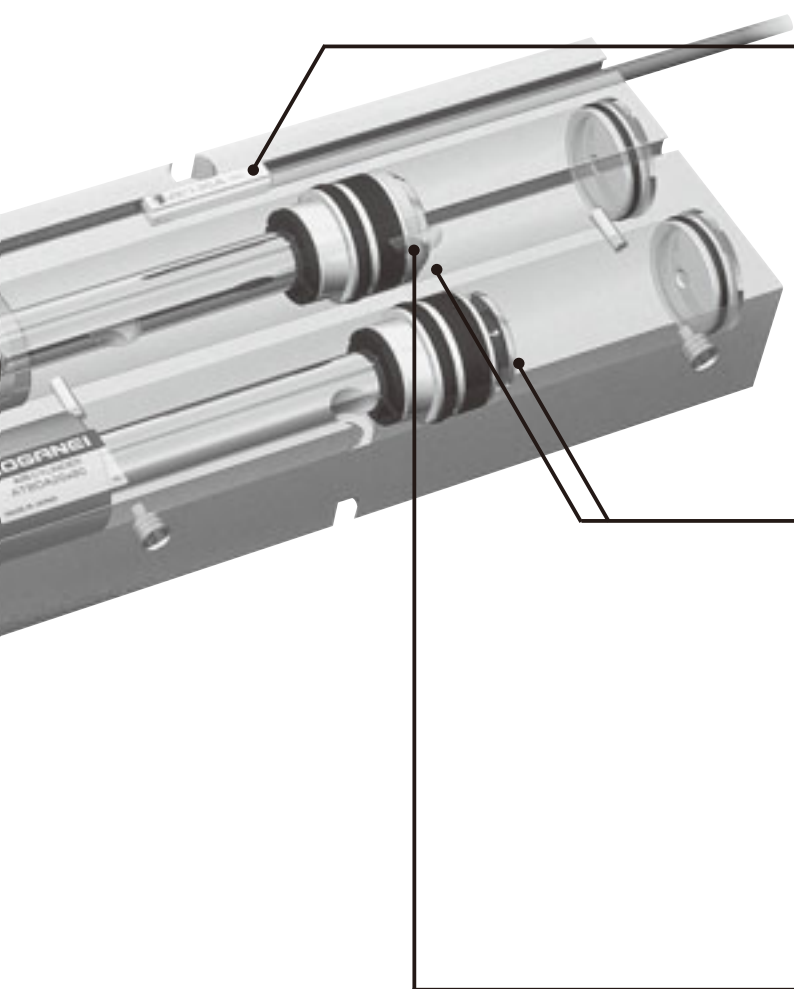
※ Features 2 linear ball bearings for the rod bearing.

DOUBLE ROD TYPEATBDAD Bore size × Stroke

※ Features linear ball bearings (total of 4) for the rod bearing on both sides of the body.

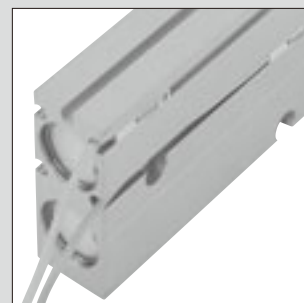
DOUBLE ROD TYPE (With sub-plate)ATBDAD Bore size × Stroke -P

※ Features linear ball bearings (total of 4) for the rod bearing on both sides of the body.

**Embedded sensor switch**

The embedded sensor switch is mountable. Moreover, mounting grooves are located in 5 locations on 3 surfaces of the body for various mounting requirements.

※ Sensor switch is optional.

**Double-piston construction**

Uses a double-piston construction to double the thrust of single piston cylinders, and achieve a space-efficient, flat, square body. It works in conjunction with a rational non-rotating construction to contribute to more compact, lightweight mechanical devices.

**The magnet for sensor switch is standard equipment.**

In the standard type, the magnet for sensor switch is built-in. Mounting a sensor switch will enable use in sensor switch applications.



ARE POWERFUL

ALPHA SERIES TWIN ROD CYLINDERS B SERIES

Single Rod Type

Specifications

Bore size mm [in.]		10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
Item						
Operation type		Double acting type				
Media		Air				
Mounting type		Side mount				
Operating pressure range	MPa [psi.]	0.2~0.7 [29~102]	0.15~0.7 [22~102]			
Proof pressure	MPa [psi.]	1.05 [152]				
Operating temperature range	°C [°F]	0~60 [32~140]				
Operating speed range	mm/s [in./sec.]	100~500 [3.9~19.7]				
Cushion		Rubber bumper				
Lubrication		Not required (If lubrication is required, use Turbine Oil Class 1 [ISO VG32] or equivalent.)				
Non-rotating accuracy		±0.1° (At applying no load)				
Stroke adjusting range	mm [in.]	-5~0 [-0.197~0] (To the specification stroke)				
Port size		M5×0.8				Rc1/8

Order Codes

ATBDA 10×70 -

Alpha series
Twin rod cylinder B series

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.]

● Order codes for sensor switch only

 ATBDA

With mounting screw for alpha series twin rod cylinder B series

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

ZE135
ZE235
ZE155
ZE255
ZE101
ZE201
ZE102
ZE202

Sensor switch

Blank : No sensor switch

ZE135 : 2-lead wire Solid state type with indicator lamp	Horizontal lead wire	DC10 ~28V
ZE235 : 2-lead wire Solid state type with indicator lamp	Vertical lead wire ^{Note}	DC10 ~28V
ZE155 : 3-lead wire Solid state type with indicator lamp	Horizontal lead wire	DC4.5~28V
ZE255 : 3-lead wire Solid state type with indicator lamp	Vertical lead wire ^{Note}	DC4.5~28V
ZE101 : 2-lead wire Reed switch type without indicator lamp	Horizontal lead wire	DC5~28V, AC85~115V
ZE102 : 2-lead wire Reed switch type with indicator lamp	Horizontal lead wire	DC10~28V, AC85~115V
ZE201 : 2-lead wire Reed switch type without indicator lamp	Vertical lead wire ^{Note}	DC5~28V, AC85~115V
ZE202 : 2-lead wire Reed switch type with indicator lamp	Vertical lead wire ^{Note}	DC10~28V, AC85~115V

Note: In the vertical lead wire type, the lead wire protrudes perpendicular to the sensor switch.

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

Bore Size and Stroke

mm			
Bore size	Standard strokes	Maximum available stroke ^{Note}	Pull side stroke adjusting range
10	10, 20, 30, 40, 50, 60, 70	140	-5~0
16	10, 20, 30, 40, 50, 60 ,70, 80, 90 ,100	200	
20			
25			
32			

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

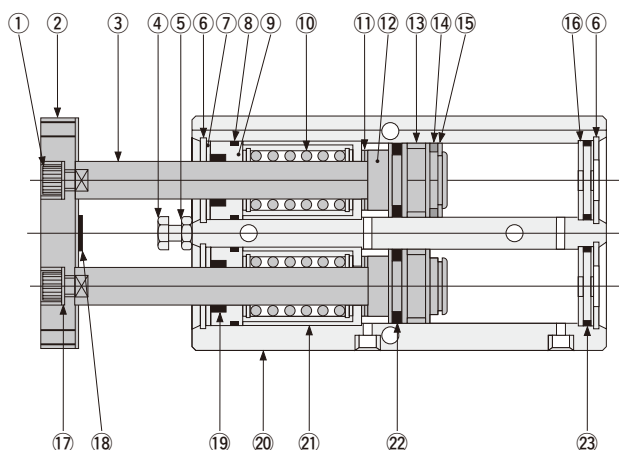
Mass

g [oz.]

Bore size mm [in.]	Zero stroke mass	Additional mass for each 10mm [0.394in.] stroke	Additional mass	
			Mass of 1 sensor switch	
			ZE□□□A	ZE□□□B
10 [0.394]	132 [4.66]	18 [0.63]	15 [0.53]	35 [1.23]
16 [0.630]	312 [11.01]	24 [0.85]		
20 [0.787]	477 [16.83]	33 [1.16]		
25 [0.984]	762 [26.88]	50 [1.76]		
32 [1.260]	1630 [57.50]	91 [3.21]		

Remarks: 1. Values in the above table show the mass for the standard stroke.
2. The mass of the magnet for sensor switch is included into the zero stroke mass.

Inner Construction



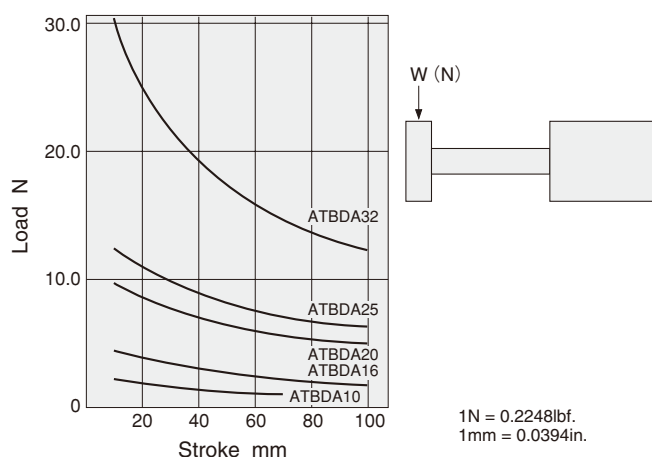
No.	Parts	Materials
①	Hexagon socket head bolt	Steel (φ 10, 20, 25 nickel plated; φ 16, 32 black oxide)
②	Square plate	Mild steel (nickel plated)
③	Piston rod	Steel (quenched)
④	Stopper bolt	Steel (zinc plated)
⑤	Lock nut	Steel (zinc plated)
⑥	Snap ring	Steel (nickel plated)
⑦	Seal holder	Mild steel (nickel plated)
⑧	O-ring	Synthetic rubber (NBR)
⑨	Housing	Aluminum alloy (chromic acid anodic oxide coating)
⑩	Bearing	Made by NSK ^{Note1}
⑪	Bumper (B) ^{Note2}	Synthetic rubber (NBR)
⑫	Piston	Aluminum alloy (chromic acid anodic oxide coating)
⑬	Wear ring	Plastic
⑭	Magnet	Plastic magnet
⑮	E-ring	Stainless steel
⑯	End plate	Plastic (only φ 32 is an aluminum alloy [anodized])
⑰	Washer	Steel (nickel plated)
⑱	Bumper (A) ^{Note2}	Synthetic rubber (NBR)
⑲	Rod seal	Synthetic rubber (NBR)
⑳	Cylinder body	Aluminum alloy (anodized)
㉑	Sleeve ^{Note2}	Brass
㉒	Piston seal	Synthetic rubber (NBR)
㉓	O-ring	Synthetic rubber (NBR)

Notes: 1. Bearing types in use
For φ 10: LB6NY, For φ 16: LB8NY, For φ 20: LB10NY,
For φ 25: LB12NY, For φ 32: LB16NY
2. Not available in a bore size of 10mm [0.394in.].

Allowable Lateral Load for ATBDA

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

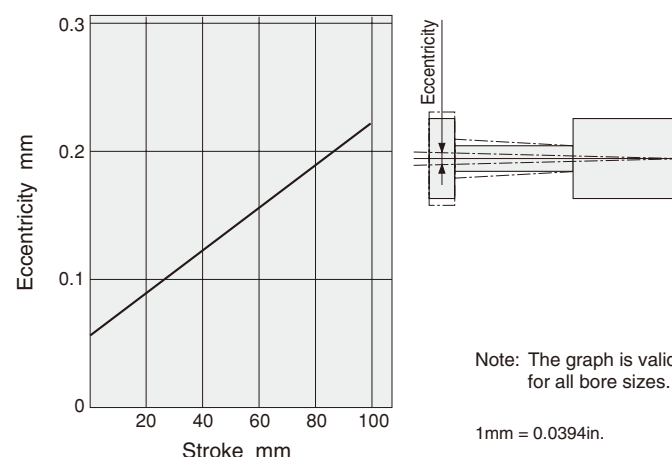
● φ 10, φ 16, φ 20, φ 25, φ 32



Allowable Eccentricity at Square Plate for ATBDA

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

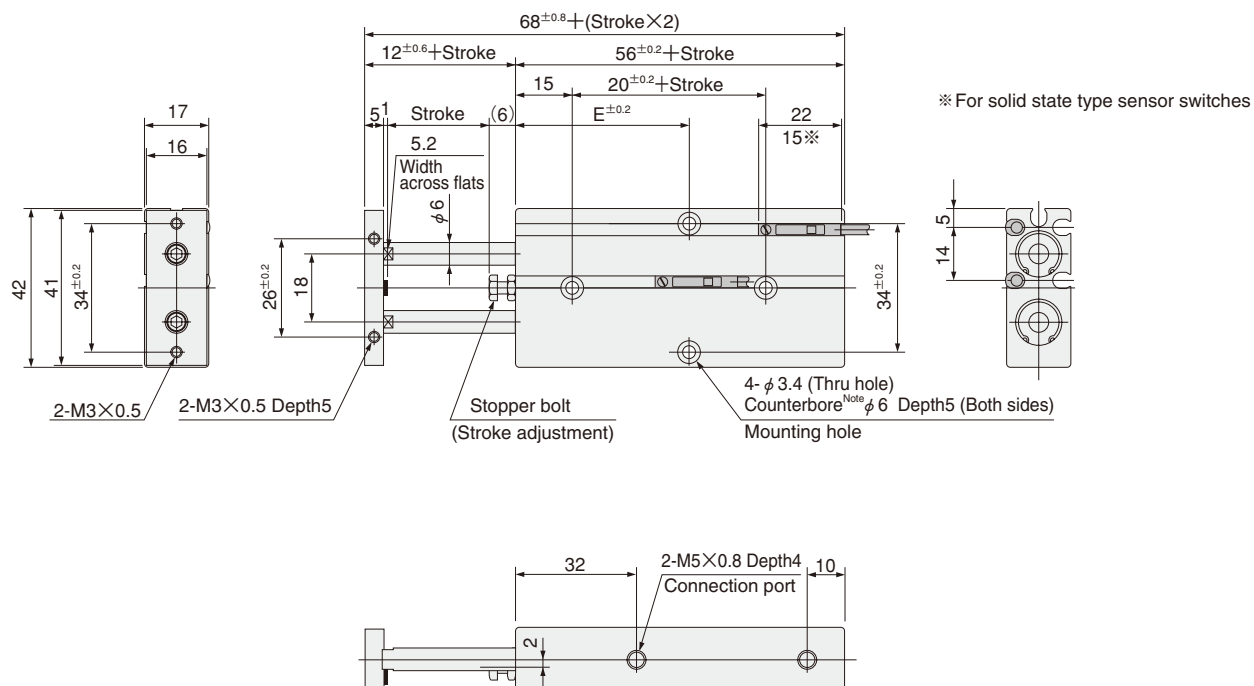
● φ 10, φ 16, φ 20, φ 25, φ 32



Dimensions of ATBDA (mm)

● $\phi 10$ ● Double acting type

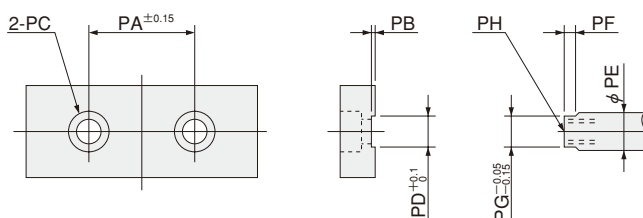
CAD ATBDA10



Code	E						
Stroke Bore mm [in.]	10	20	30	40	50	60	70
10 [0.394]	40	40	45	50	55	60	65

Note: The counterbore depth is measured from the upper surface of the body.

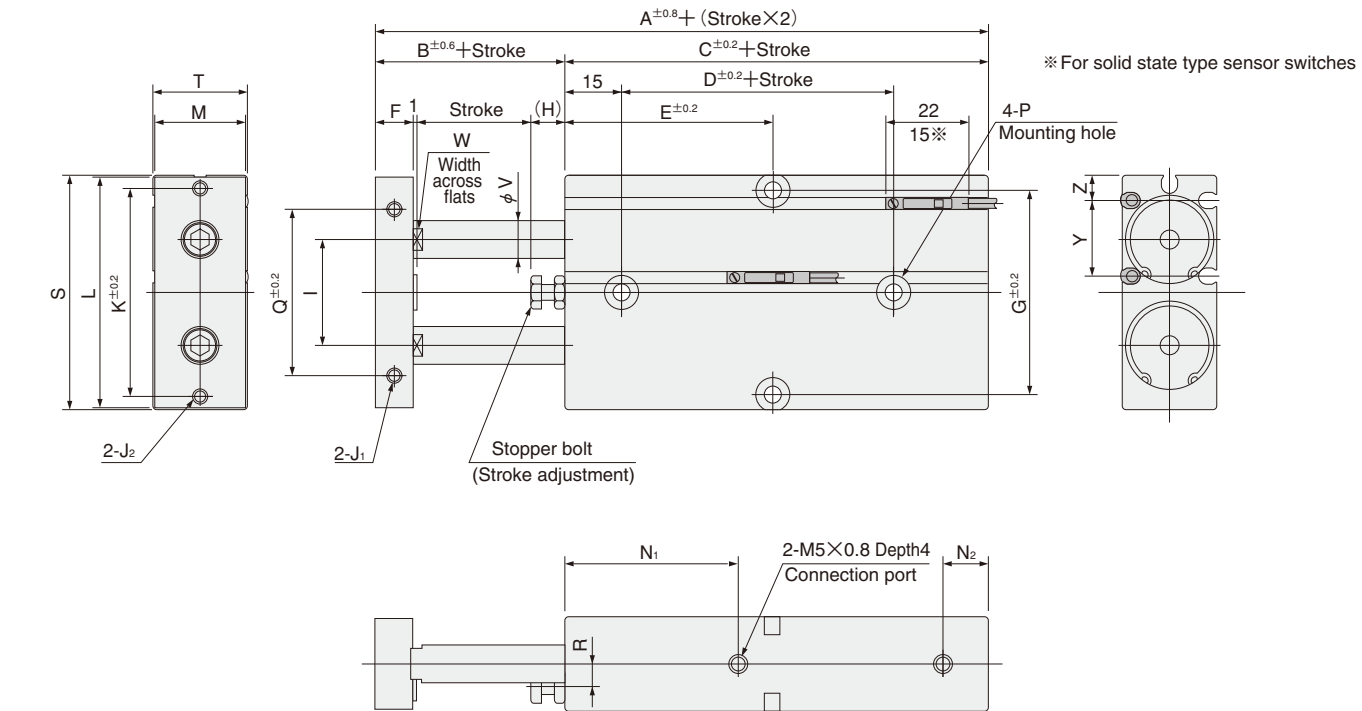
Dimensions of Rod End Portion



Code	PA	PB	PC	PD	PE	PF	PG	PH
Bore mm [in.]								
10 [0.394]	18	0.5	φ 3.3 Counterbore φ 6.2 Depth3.5	5.2	6	3	5.2	M3×0.5 Depth6
16 [0.630]	24	1	φ 4.3 Counterbore φ 7.8 Depth4.6	6.2	8	3	6.2	M4×0.7 Depth8
20 [0.787]	28	1	φ 6.5 Counterbore φ 11 Depth6.8	8.2	10	3	8.2	M6×1 Depth9
25 [0.984]	34	1	φ 6.5 Counterbore φ 11 Depth6.8	10.2	12	3	10.2	M6×1 Depth9
32 [1.260]	42	2	φ 11 Counterbore φ 17 Depth12	14	16	4	14	M10×1.5 Depth14

Dimensions of ATBDA (mm)

● $\phi 16$, $\phi 20$, $\phi 25$ ● Double acting type



Code Stroke Bore mm [in.]	A	B	C	D	E										F	G	H	I	J ₁	J ₂	K
					10	20	30	40	50	60	70	80	90	100							
16 [0.630]	88	15	73	40	50	50	50	55	60	65	70	75	80	85	8	47	6	24	M4×0.7 Depth5	M4×0.7	47
20 [0.787]	100	20	80	40	55	55	55	60	65	70	75	80	85	90	10	55	9	28	M4×0.7 Depth5	M4×0.7	55
25 [0.984]	103	19	84	50	55	55	55	60	65	70	75	80	85	90	10	66	8	34	M5×0.8 Depth6	M4×0.7	66

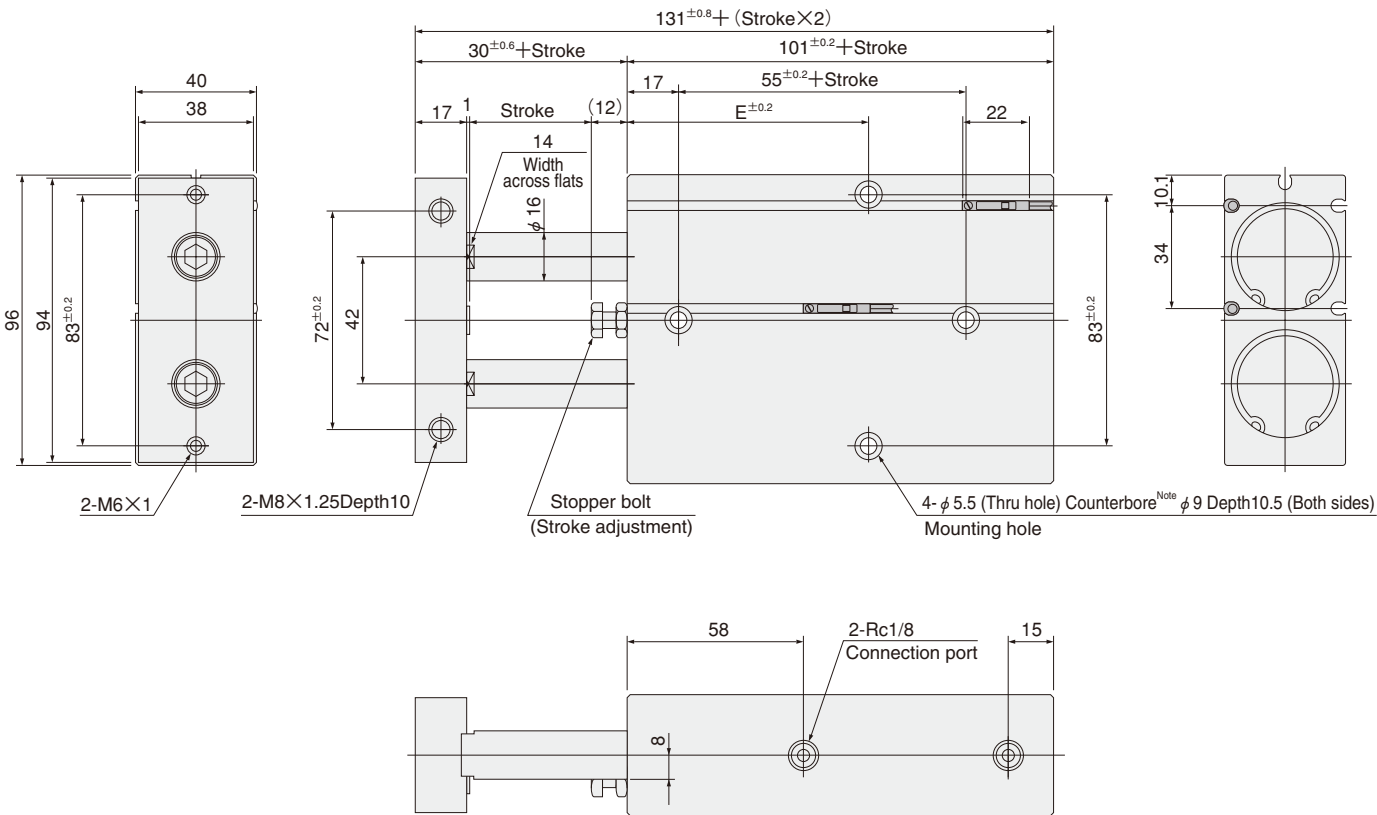
Code Bore mm [in.]	L	M	N ₁	N ₂	P Note	Q	R	S	T	V	W	Y	Z
16 [0.630]	53	20	39	10	$\phi 4.5$ (Thru hole) Counterbore $\phi 8$ Depth5.5 (Both sides)	34	4	54	21	8	6.2	18.5	5.7
20 [0.787]	61	24	46	12	$\phi 4.5$ (Thru hole) Counterbore $\phi 8$ Depth5.5 (Both sides)	44	6	62	25	10	8.2	20	6.8
25 [0.984]	72	29	48	12	$\phi 4.5$ (Thru hole) Counterbore $\phi 9$ Depth6.0 (Both sides)	56	7	73	30	12	10.2	22.5	8.3

Note: The counterbore depth is measured from the upper surface of the body.

Dimensions of ATBDA (mm)

● $\phi 32$ ● Double acting type

ATBDA32



Code	E									
Stroke Bore mm [in.]	10	20	30	40	50	60	70	80	90	100
32 [1.260]	70	70	75	80	85	90	95	100	105	110

Note: The counterbore depth is measured from the upper surface of the body.

ALPHA SERIES TWIN ROD CYLINDERS B SERIES

Double Rod Type

Specifications

Item	Bore size mm [in.]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type		
Media		Air		
Mounting type		Side mount		
Operating pressure range	MPa [psi.]	0.15~0.7 [22~102]		
Proof pressure	MPa [psi.]	1.05 [152]		
Operating temperature range	°C [°F]	0~60 [32~140]		
Operating speed range	mm/s [in./sec.]	100~500 [3.9~19.7]		
Cushion		Rubber bumper		
Lubrication		Not required (If lubrication is required, use Turbine Oil Class 1 [ISO VG32] or equivalent.)		
Non-rotating accuracy		±0.1° (At applying no load)		
Stroke adjusting range	mm [in.]	-10~0 [-0.394~0] (To the specification stroke)		
Port size		M5×0.8		

Order Codes

ATBDAD 16×70 -

Alpha series
Twin rod cylinder B series
double rod type

Bore size×Stroke

Sub-plate
P : With sub-plate
Blank : No sub-plate

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

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

● **Order codes for sensor switch only**

ATBDA

With mounting screw for alpha series twin rod cylinder B series

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

ZE135
ZE235
ZE155
ZE255
ZE101
ZE201
ZE102
ZE202

Sensor switch
Blank : No sensor switch

ZE135 : 2-lead wire Solid state type with indicator lamp	Horizontal lead wire	DC10~28V
ZE235 : 2-lead wire Solid state type with indicator lamp	Vertical lead wire ^{Note}	DC10~28V
ZE155 : 3-lead wire Solid state type with indicator lamp	Horizontal lead wire	DC4.5~28V
ZE255 : 3-lead wire Solid state type with indicator lamp	Vertical lead wire ^{Note}	DC4.5~28V
ZE101 : 2-lead wire Reed switch type without indicator lamp	Horizontal lead wire	DC5~28V, AC85~115V
ZE102 : 2-lead wire Reed switch type with indicator lamp	Horizontal lead wire	DC10~28V, AC85~115V
ZE201 : 2-lead wire Reed switch type without indicator lamp	Vertical lead wire ^{Note}	DC5~28V, AC85~115V
ZE202 : 2-lead wire Reed switch type with indicator lamp	Vertical lead wire ^{Note}	DC10~28V, AC85~115V

Note: In the vertical lead wire type, the lead wire protrudes perpendicular to the sensor switch.

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

Bore Size and Stroke

Bore size	Standard strokes	Maximum available stroke ^{Note}	Pull side stroke adjusting range
16	10, 20, 30, 40, 50, 60, 70, 80, 90, 100	200	-10~0
20			
25			

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

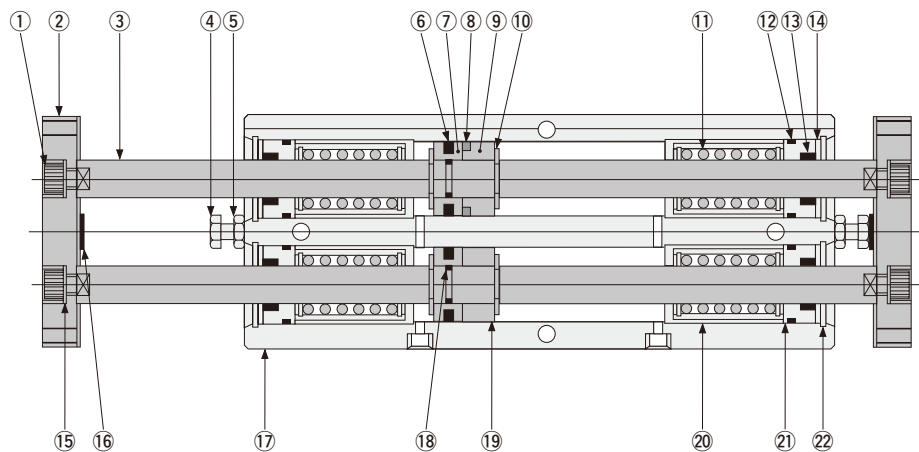
Mass

g [oz.]

Bore size mm [in.]	Zero stroke mass	Additional mass			
		Additional mass for each 10mm [0.394in.] stroke	Mass of 1 sensor switch		Mass of sub-plate (For with sub-plate option)
			ZE□□□A	ZE□□□B	
16 [0.630]	410 [14.46]	44 [1.55]	15 [0.53]	35 [1.23]	164+(2.23×Stroke) [5.78+(0.0787×Stroke)]
20 [0.787]	855 [30.16]	47 [1.66]			272+(3.2×Stroke) [9.59+(0.1129×Stroke)]
25 [0.984]	1330 [46.91]	67 [2.36]			332+(3.8×Stroke) [11.71+(0.1340×Stroke)]

Remarks: 1. Values in the above table show the mass for the standard strokes.
 2. The mass of the magnet for sensor switch is included into the zero stroke mass.
 3. The unit of the stroke is 1mm [0.0394in.] for the calculation of the mass of the sub-plate.

Inner Construction



No.	Parts	Materials
①	Hexagon socket head bolt	Steel (φ 10, 20, 25 nickel plated; φ 16, 32 black oxide)
②	Square plate	Mild steel (nickel plated)
③	Piston rod	Steel (quenched)
④	Stopper bolt	Steel (zinc plated)
⑤	Lock nut	Steel (zinc plated)
⑥	Piston seal	Synthetic rubber (NBR)
⑦	Piston	Aluminum alloy (anodized)
⑧	Magnet	Plastic magnet
⑨	Holder	Aluminum alloy (anodized)
⑩	E-ring	Stainless steel
⑪	Bearing	Made by NSK ^{Note}
⑫	O-ring	Synthetic rubber (NBR)
⑬	Rod seal	Synthetic rubber (NBR)
⑭	Seal holder	Mild steel (nickel plated)
⑮	Washer	Steel (nickel plated)
⑯	Bumper (A)	Synthetic rubber (NBR)
⑰	Cylinder body	Aluminum alloy (anodized)
⑱	O-ring	Synthetic rubber (NBR)
⑲	Spacer	Aluminum alloy (anodized)
⑳	Sleeve	Brass
㉑	Housing	Aluminum alloy (chromic acid anodic oxide coating)
㉒	Snap ring	Steel (nickel plated)

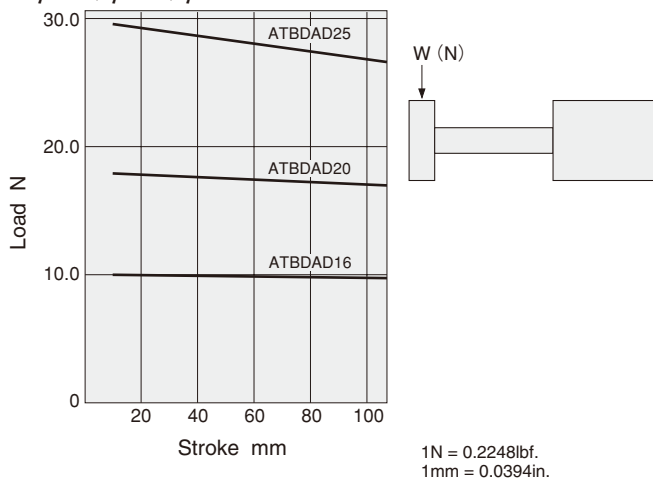
Note : Bearing types in use For φ 16----LB8NY
 For φ 20----LB10NY
 For φ 25----LB12NY

※ The sub-plate material is aluminum alloy (black anodized).

Allowable Lateral Load for ATBDAD□

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

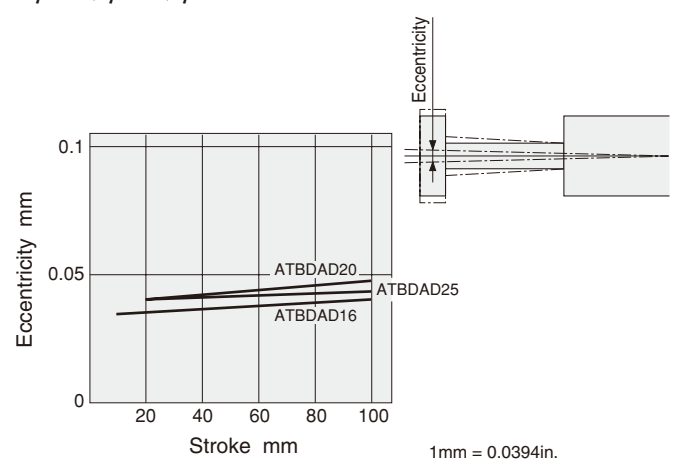
● φ 16, φ 20, φ 25



Allowable Eccentricity at Square Plate for ATBDAD□

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

● φ 16, φ 20, φ 25

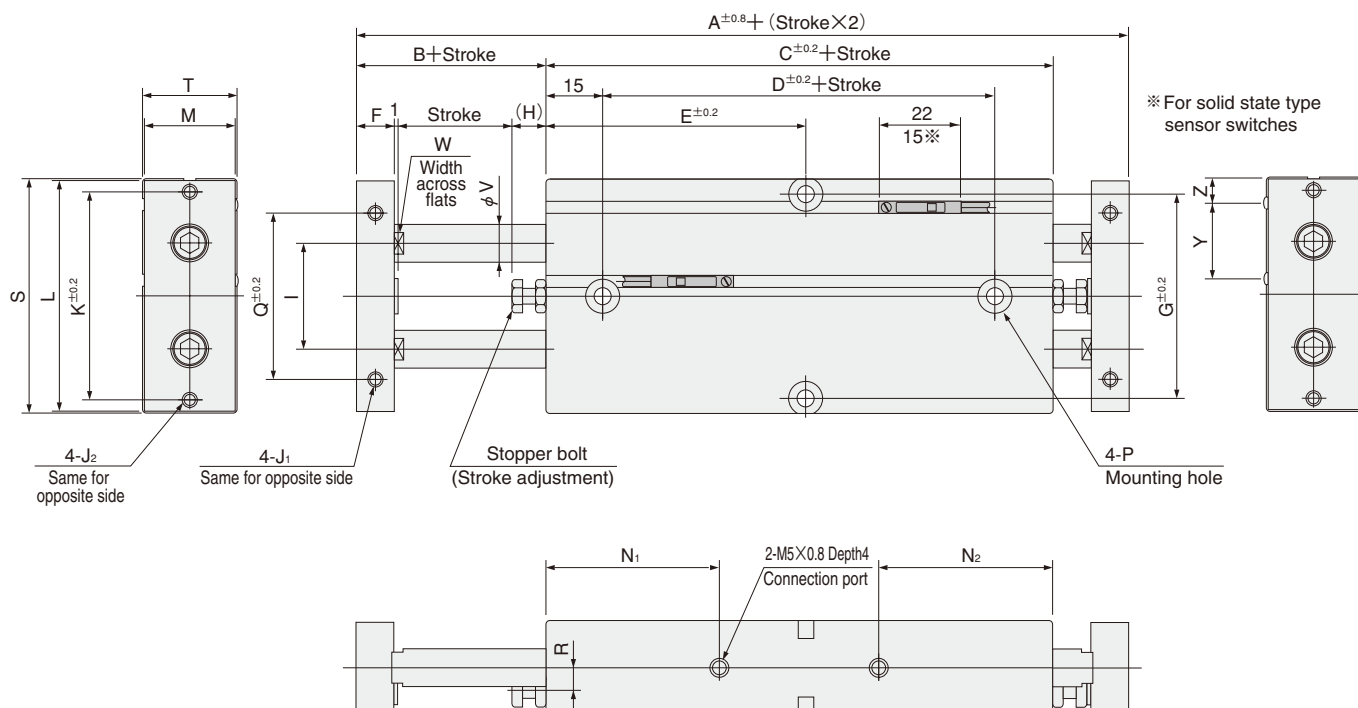


Dimensions of ATBDAD (mm)

● $\phi 16$, $\phi 20$, $\phi 25$ ● Double acting type ● No sub-plate



ATBDAD Bore size



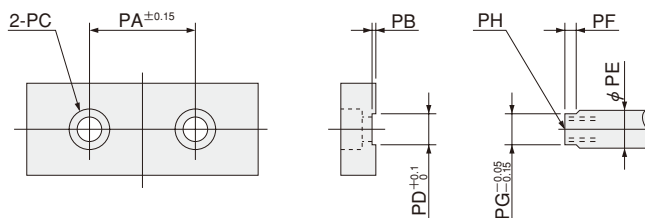
ALPHA TWIN ROD CYLINDERS B SERIES

Code Stroke Bore mm [in.]	A	B	C	D	E										F	G	H	I	J ₁	J ₂	K
	10	20	30	40	50	60	70	80	90	100											
16 [0.630]	135	15	105	75	60	65	70	75	80	85	90	95	100	105	8	47	6	24	M4×0.7 Depth5	M4×0.7	47
20 [0.787]	156	20	116	85	65	70	75	80	85	90	95	100	105	110	10	55	9	28	M4×0.7 Depth5	M4×0.7	55
25 [0.984]	162	19	124	90	65	70	75	80	85	90	95	100	105	110	10	66	8	34	M5×0.8 Depth6	M4×0.7	66

Code Bore mm [in.]	L	M	N ₁	N ₂	P Note					Q	R	S	T	V	W	Y	Z
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
16 [0.630]	53	20	39	39	$\phi 4.5$ (Thru hole) Counterbore $\phi 8$ Depth5.5 (Both sides)					34	4	54	21	8	6.2	18.5	5.7
20 [0.787]	61	24	46	46	$\phi 4.5$ (Thru hole) Counterbore $\phi 8$ Depth5.5 (Both sides)					44	6	62	25	10	8.2	20	6.8
25 [0.984]	72	29	48	48	$\phi 4.5$ (Thru hole) Counterbore $\phi 9$ Depth6.0 (Both sides)					56	7	73	30	12	10.2	22.5	8.3

Note: The counterbore depth is measured from the upper surface of the body.

Dimensions of Rod End Portion



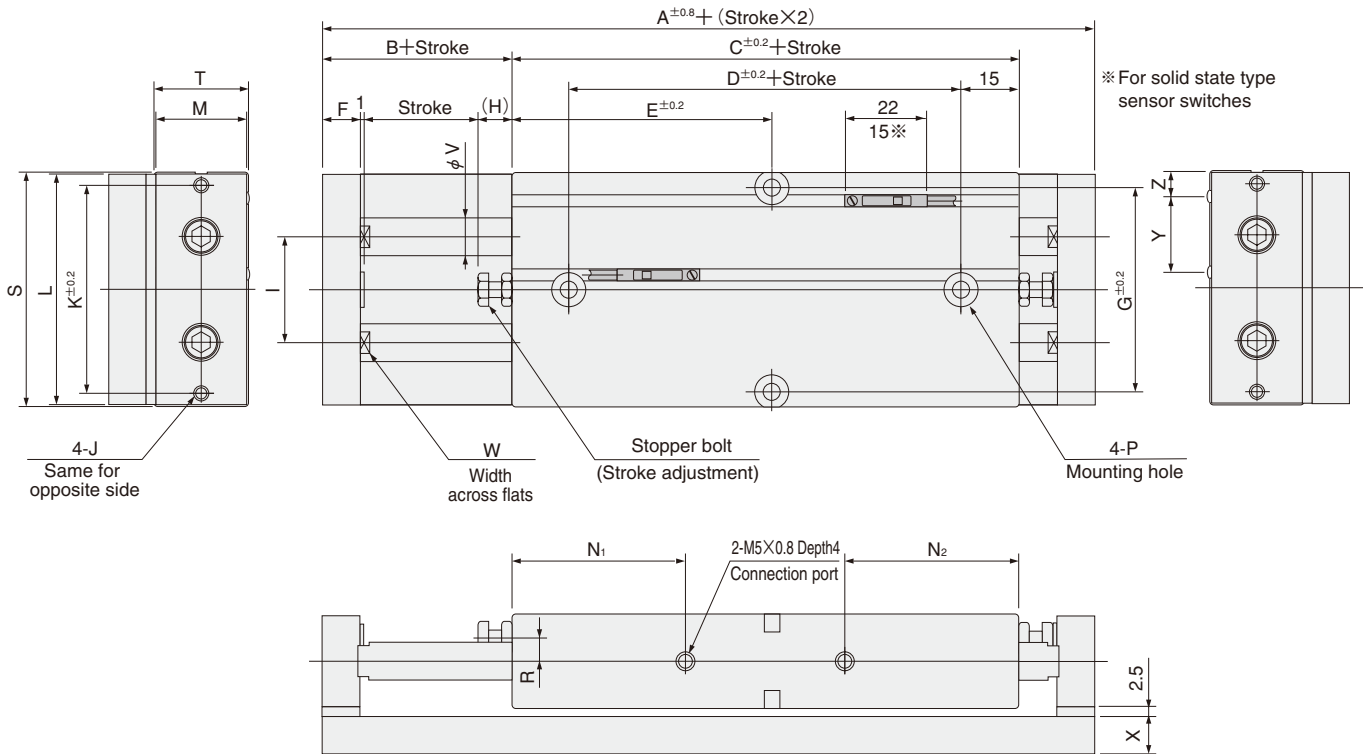
Code Bore mm [in.]	PA	PB	PC	PD	PE	PF	PG	PH
	10	20	30	40	50	60	70	80
16 [0.630]	24	1	$\phi 4.3$ Counterbore $\phi 7.8$ Depth4.6	6.2	8	3	6.2	M4×0.7 Depth8
20 [0.787]	28	1	$\phi 6.5$ Counterbore $\phi 11$ Depth6.8	8.2	10	3	8.2	M6×1 Depth9
25 [0.984]	34	1	$\phi 6.5$ Counterbore $\phi 11$ Depth6.8	10.2	12	3	10.2	M6×1 Depth9



Dimensions of ATBDAD (mm)

● $\phi 16$, $\phi 20$, $\phi 25$ ● Double acting type ● With sub-plate

ATBDAD Bore size

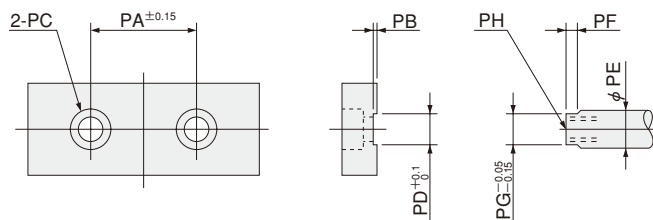


Code Stroke Bore mm [in.]	A	B	C	D	E										F	G	H	I	J	K
	10	20	30	40	50	60	70	80	90	100										
16 [0.630]	135	15	105	75	60	65	70	75	80	85	90	95	100	105	8	47	6	24	M4×0.7	47
20 [0.787]	156	20	116	85	65	70	75	80	85	90	95	100	105	110	10	55	9	28	M4×0.7	55
25 [0.984]	162	19	124	90	65	70	75	80	85	90	95	100	105	110	10	66	8	34	M4×0.7	66

Code Bore mm [in.]	L	M	N ₁	N ₂	P ^{Note}				R	S	T	V	W	X	Y	Z
16 [0.630]	53	20	39	39	$\phi 4.5$ (Thru hole) Counterbore $\phi 8$ Depth5.5 (Both sides)				4	54	21	8	6.2	8	18.5	5.7
20 [0.787]	61	24	46	46	$\phi 4.5$ (Thru hole) Counterbore $\phi 8$ Depth5.5 (Both sides)				6	62	25	10	8.2	10	20	6.8
25 [0.984]	72	29	48	48	$\phi 4.5$ (Thru hole) Counterbore $\phi 9$ Depth6.0 (Both sides)				7	73	30	12	10.2	10	22.5	8.3

Note: The counterbore depth is measured from the upper surface of the body.

Dimensions of Rod End Portion

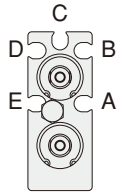


Code Bore mm [in.]	PA	PB	PC	PD	PE	PF	PG	PH
16 [0.630]	24	1	$\phi 4.3$ Counterbore $\phi 7.8$ Depth4.6	6.2	8	3	6.2	M4×0.7 Depth8
20 [0.787]	28	1	$\phi 6.5$ Counterbore $\phi 11$ Depth6.8	8.2	10	3	8.2	M6×1 Depth9
25 [0.984]	34	1	$\phi 6.5$ Counterbore $\phi 11$ Depth6.8	10.2	12	3	10.2	M6×1 Depth9

Mountable or Unmountable Sensor Switch at End of Stroke

There are restrictions on the number and positions of body mounting holes used, and cylinder strokes when the sensor switch is installed.

● Sensor switch mounting surface



Mounting a sensor switch in any of the grooves A~E allows detection at either the head side or the rod side stroke end. The diagram shows the rod side with the square plate removed.

Note: Detection in an intermediate position may sometimes not be possible due to interference between the sensor switch and the body mounting bolt.

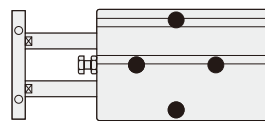
● How to read the table

Example: In the table below, when using either the A or E sensor groove (solid state type) with a bore size of $\phi 10$ and a 20mm stroke, the sensor switch can be mounted on either the head side or the rod side. When using the B, D or C groove, the sensor switch can be mounted only on the head side.

■ When the body is secured via 4 mounting holes or 3 head side mounting holes

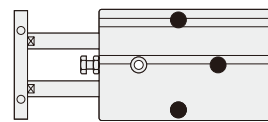
● ATBDA (Single rod type)

Note: When the body is secured via 4 mounting holes and a sensor switch is installed in the A or E groove's rod extended side (the rod side of the body), ensure that the sensor switch is installed inside the groove between body mounting holes before tightening mounting bolts of the body, to avoid interference between the sensor switch and the bolts. This procedure is not necessary for $\phi 25$ [0.984in.] and $\phi 32$ [1.260in.], where no interference occurs.



Rod side

Head side



Rod side

Head side



● Solid state type (ZE135, ZE155, ZE235, ZE255)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size ϕ 10				Bore size ϕ 16				Bore size ϕ 20				Bore size ϕ 25				Bore size ϕ 32			
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D		Stroke		E	D	
10	Head side	○	○	○	10	Head side	×	○	○	10	Head side	○	△	△	10	Head side	○	○	△
	Rod side	×	×	×		Rod side	○	×	×		Rod side	×	×	△		Rod side	○	○	△
20	Head side	○	○	○	20	Head side	×	○	○	20	Head side	○	△	△	20	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	△	△		Rod side	○	○	○
30	Head side	○	○	○	30	Head side	×	○	○	30	Head side	○	○	○	30	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○		Rod side	○	○	○
40	Head side	○	○	○	40	Head side	×	○	○	40	Head side	○	○	○	40	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	×
50~140	Head side	○	○	○	50	Head side	×	○	○	50	Head side	○	○	○	50	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×
				60~200	Head side	×	○	○	60	Head side	○	○	○	60	Head side	○	○	○	
					Rod side	○	○	○		Rod side	○	×	○		Rod side	○	×	×	
								70~200	Head side	○	○	○	70	Head side	○	○	○		
					Rod side	○	○		○	Rod side	○	×		×					
												80~200	Head side	○	○	○			
										Rod side	○		○	○					

● Rod switch type (Z5101, Z5102, Z5001, Z5002)

● Reed switch type (ZE101, ZE102, ZE201, ZE202)

○ : Mountable △ : Either head side or rod side × : Unmountable

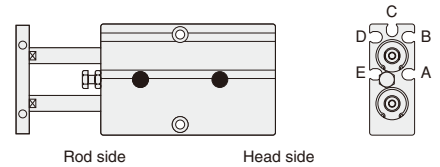
Bore size ϕ 10				Bore size ϕ 16				Bore size ϕ 20				Bore size ϕ 25				Bore size ϕ 32								
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C					
		E	D				E	D				E	D				E	D						
Stroke					Stroke					Stroke					Stroke									
10	Head side	×	○	○	10	Head side	×	○	○	10	Head side	×	○	△	10	Head side	△	△	△	10	Head side	○	○	△
	Rod side	×	×	×		Rod side	○	×	×		Rod side	○	×	△		Rod side	△	△	△		Rod side	○	○	△
20	Head side	×	○	○	20	Head side	×	○	○	20	Head side	×	○	△	20	Head side	○	○	○	20	Head side	○	○	△
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	△		Rod side	○	○	○		Rod side	○	○	△
30	Head side	×	○	○	30	Head side	×	○	○	30	Head side	×	○	○	30	Head side	○	○	○	30	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	○		Rod side	○	○	○		Rod side	○	○	×
40	Head side	×	○	○	40	Head side	×	○	○	40	Head side	×	○	○	40	Head side	○	○	○	40	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○		Rod side	○	○	×
50~140	Head side	×	○	○	50	Head side	×	○	○	50	Head side	×	○	○	50	Head side	○	○	○	50~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○
				60~200	Head side	×	○	○	60	Head side	×	○	○	60	Head side	○	○	○						
					Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×						
								70~200	Head side	×	○	○	70	Head side	○	○	○							
					Rod side	○	○		○	Rod side	○	○		○	Rod side	○	×	×						
												80~200	Head side	○	○	○								
										Rod side	○		○	○	Rod side	○	○	○						

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■ When the body is secured via 2 mounting holes on the center line

● ATBDA (Single rod type)

Note: When the body is secured via 2 mounting holes on its center line and a sensor switch is installed in the A or E groove's rod extended side (the rod side of the body), ensure that the sensor switch is installed inside the groove between body mounting holes before tightening mounting bolts of the body, to avoid interference between the sensor switch and the bolts. This procedure is not necessary for $\phi 25$ [0.984in.] and $\phi 32$ [1.260in.], where no interference occurs.



● Solid state type (ZE135, ZE155, ZE235, ZE255)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size $\phi 10$				Bore size $\phi 16$				Bore size $\phi 20$				Bore size $\phi 25$				Bore size $\phi 32$			
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D		Stroke		E	D	
10	Head side	○	○	○	10~200	Head side	×	○	○	10	Head side	○	○	○	10~200	Head side	○	○	○
	Rod side	×	○	○		Rod side	○	○	○		Rod side	×	○	○		Rod side	○	○	○
20~140	Head side	○	○	○	20~200	Head side	○	○	○	20~200	Head side	○	○	○	20~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○

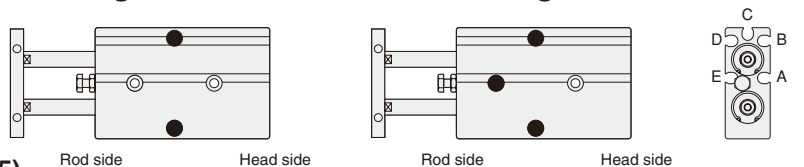
● Reed switch type (ZE101, ZE102, ZE201, ZE202)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size $\phi 10$				Bore size $\phi 16$				Bore size $\phi 20$				Bore size $\phi 25$				Bore size $\phi 32$			
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D		Stroke		E	D	
10	Head side	×	△	△	10	Head side	×	△	△	10	Head side	×	△	△	10	Head side	△	△	△
	Rod side	×	△	△		Rod side	○	△	△		Rod side	○	△	△		Rod side	△	△	△
20~140	Head side	×	○	○	20~200	Head side	×	○	○	20~200	Head side	×	○	○	20~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○

■ When the body is secured via 2 side mounting holes or 3 rod side mounting holes

● ATBDA (Single rod type)



● Solid state type (ZE135, ZE155, ZE235, ZE255)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size $\phi 10$				Bore size $\phi 16$				Bore size $\phi 20$				Bore size $\phi 25$				Bore size $\phi 32$			
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D		Stroke		E	D	
10	Head side	○	○	○	10	Head side	○	○	○	10	Head side	○	△	△	10	Head side	○	○	△
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	△	△		Rod side	○	○	△
20	Head side	○	○	○	20	Head side	○	○	○	20	Head side	○	△	△	20	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	△	△		Rod side	○	○	○
30	Head side	○	○	○	30	Head side	○	○	○	30	Head side	○	○	○	30	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○		Rod side	○	○	×
40	Head side	○	○	○	40	Head side	○	○	○	40	Head side	○	○	○	40	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○		Rod side	○	○	×
50~140	Head side	○	○	○	50	Head side	○	○	○	50	Head side	○	○	○	50~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○
60~200	Head side	○	○	○	60	Head side	○	○	○	60	Head side	○	○	○	60	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×
70~200	Head side	○	○	○	70	Head side	○	○	○	70	Head side	○	○	○	70	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×
80~200	Head side	○	○	○	80~200	Head side	○	○	○	80~200	Head side	○	○	○	80~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○

● Reed switch type (ZE101, ZE102, ZE201, ZE202)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size $\phi 10$				Bore size $\phi 16$				Bore size $\phi 20$				Bore size $\phi 25$				Bore size $\phi 32$			
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D		Stroke		E	D	
10	Head side	△	○	○	10	Head side	△	○	○	10	Head side	△	○	△	10	Head side	○	○	△
	Rod side	△	×	×		Rod side	△	×	×		Rod side	△	×	△		Rod side	○	○	△
20	Head side	○	○	○	20	Head side	○	○	○	20	Head side	○	○	△	20	Head side	○	○	△
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	△		Rod side	○	○	△
30	Head side	○	○	○	30	Head side	○	○	○	30	Head side	○	○	○	30	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○		Rod side	○	○	×
40	Head side	○	○	○	40	Head side	○	○	○	40	Head side	○	○	○	40	Head side	○	○	○
	Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	×
50~140	Head side	○	○	○	50	Head side	○	○	○	50	Head side	○	○	○	50~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	○	○
60~200	Head side	○	○	○	60	Head side	○	○	○	60	Head side	○	○	○	60	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×		Rod side	○	×	×
70~200	Head side	○	○	○	70	Head side	○	○	○	70	Head side	○	○	○	70	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	○	○		Rod side	○	×	×		Rod side	○	×	×
80~200	Head side	○	○	○	80~200	Head side	○	○	○	80~200	Head side	○	○	○	80~200	Head side	○	○	○
	Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○		Rod side	○	○	○

■ When the body is secured via 4 mounting holes

When the body is secured via 2 side mounting holes

When either the extended side or the retracted side of the body is secured via 3 mounting holes

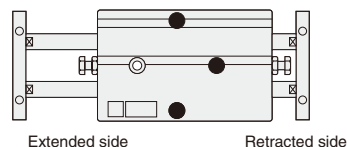
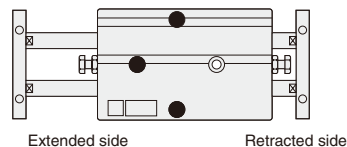
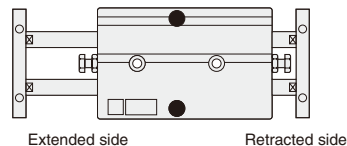
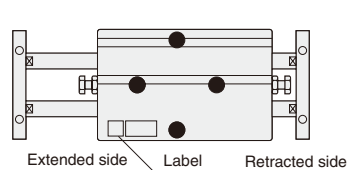
● ATBDAD (Double rod type)

Note: When the body is secured via 4 mounting holes and a sensor switch is installed in the A or E groove, ensure that the sensor switch is installed inside the groove between body mounting holes before tightening mounting bolts of the body, to avoid interference between the sensor switch and the bolts. This procedure is not necessary for $\phi 25$ [0.984in.], where no interference occurs.

● Solid state type (ZE135, ZE155, ZE235, ZE255)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size ϕ 16				Bore size ϕ 20				Bore size ϕ 25								
Mounting groove Stroke		A	B	C	Mounting groove Stroke		A	B	C	Mounting groove Stroke		A	B	C		
		E	D				E	D				E	D			
10	Extended side	○	×	○	10	Extended side	○	×	×	10	Extended side	○	×	×		
	Retracted side	○	×	×		Retracted side	○	×	×		Retracted side	○	○	○		
20~200	Extended side	○	○	○	20~200	Extended side	○	○	○	20	Extended side	○	×	×		
	Retracted side	○	○	○		Retracted side	○	○	○		Retracted side	○	○	○		
							30~200									
							Extended side							○	○	○
							Retracted side							○	○	○



● Reed switch type (ZE101, ZE102, ZE201, ZE202)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size ϕ 16				Bore size ϕ 20				Bore size ϕ 25						
Mounting groove Stroke		A	B	C	Mounting groove Stroke		A	B	C	Mounting groove Stroke		A	B	C
		E	D				E	D				E	D	
10	Extended side	$\triangle$	$\times$	$\times$	10	Extended side	$\triangle$	$\times$	$\times$	10	Extended side	$\triangle$	$\times$	$\times$
	Retracted side	$\triangle$	$\times$	$\times$		Retracted side	$\triangle$	$\times$	$\times$		Retracted side	$\triangle$	$\circ$	$\circ$
20	Extended side	$\circ$	$\circ$	$\circ$	20	Extended side	$\circ$	$\circ$	$\circ$	20	Extended side	$\circ$	$\times$	$\times$
	Retracted side	$\circ$	$\times$	$\circ$		Retracted side	$\circ$	$\times$	$\circ$		Retracted side	$\circ$	$\circ$	$\circ$
30~200	Extended side	$\circ$	$\circ$	$\circ$	30~200	Extended side	$\circ$	$\circ$	$\circ$	30~200	Extended side	$\circ$	$\circ$	$\circ$
	Retracted side	$\circ$	$\circ$	$\circ$		Retracted side	$\circ$	$\circ$	$\circ$		Retracted side	$\circ$	$\circ$	$\circ$

■ When the body is secured via 2 mounting holes on the center line

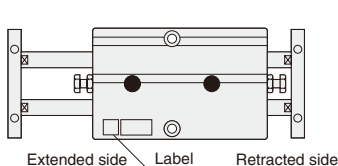
● ATBDAD (Double rod type)

Note: When the body is secured via 2 mounting holes on its center line and a sensor switch is mounted in the A or E groove, ensure that the sensor switch is installed inside the groove between body mounting holes before tightening mounting bolts of the body, to avoid interference between the sensor switch and the bolts. This procedure is not necessary for $\phi 25$ [0.984in.], where no interference occurs.

● Solid state type (ZE135, ZE155, ZE235, ZE255)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size ϕ 16				Bore size ϕ 20				Bore size ϕ 25						
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D	
10~200	Extended side	○	○	○	10~200	Extended side	○	○	○	10~200	Extended side	○	○	○
	Retracted side	○	○	○		Retracted side	○	○	○		Retracted side	○	○	○



● Reed switch type (ZE101, ZE102, ZE201, ZE202)

○ : Mountable △ : Either head side or rod side × : Unmountable

Bore size ϕ 16				Bore size ϕ 20				Bore size ϕ 25						
Mounting groove		A	B	C	Mounting groove		A	B	C	Mounting groove		A	B	C
Stroke		E	D		Stroke		E	D		Stroke		E	D	
10	Extended side	$\triangle$	$\triangle$	$\triangle$	10	Extended side	$\triangle$	$\triangle$	$\triangle$	10	Extended side	$\triangle$	$\triangle$	$\triangle$
	Retracted side	$\triangle$	$\triangle$	$\triangle$		Retracted side	$\triangle$	$\triangle$	$\triangle$		Retracted side	$\triangle$	$\triangle$	$\triangle$
20~200	Extended side	$\bigcirc$	$\bigcirc$	$\bigcirc$	20~200	Extended side	$\bigcirc$	$\bigcirc$	$\bigcirc$	20~200	Extended side	$\bigcirc$	$\bigcirc$	$\bigcirc$
	Retracted side	$\bigcirc$	$\bigcirc$	$\bigcirc$		Retracted side	$\bigcirc$	$\bigcirc$	$\bigcirc$		Retracted side	$\bigcirc$	$\bigcirc$	$\bigcirc$

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.

● Solid state type

Item	Bore size Mounting surface	mm [in.]				
	A surface C surface	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
Operating range : ℓ	A surface	2.5~6 [0.098~0.236]	2.5~6 [0.098~0.236] (2~5 [0.079~0.197])	2.5~6.5 [0.098~0.256] (2~5.5 [0.079~0.217])	2.5~6.5 [0.098~0.256] (2~5.5 [0.079~0.217])	5~12 [0.197~0.472]
	B surface	2.5~4 [0.098~0.157]	2~4.5 [0.079~0.177] (1.5~4 [0.059~0.157])	2.5~5.5 [0.098~0.217] (2~4.5 [0.079~0.177])	2.5~5.5 [0.098~0.217] (2~4.5 [0.079~0.177])	4~9 [0.157~0.354]
Response differential : C	—	1.0 [0.039] or less	1.2 [0.047] or less	1.5 [0.059] or less	2.0 [0.079] or less	2.0 [0.079] or less
Max. sensing location ^{Note}	—	6 [0.236]				

Figures in parentheses () are for the double rod type.

Note: The above table shows reference values.

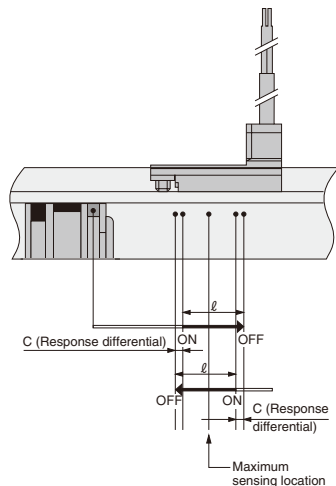
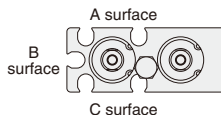
● Reed switch type

Item	Bore size	mm [in.]				
	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]	
Operating range : ℓ	6~8.5 [0.236~0.335]	6~8.5 [0.236~0.335] (3~6 [0.118~0.236])	6~8 [0.236~0.315] (3.5~7.5 [0.138~0.295])	7~9.5 [0.276~0.374] (4~8.5 [0.157~0.335])	12~16.5 [0.472~0.650]	
Response differential : C	1.5 [0.059] or less					2.5 [0.098] or less
Max. sensing location ^{Note}	10 [0.394]					

Figures in parentheses () are for the double rod type.

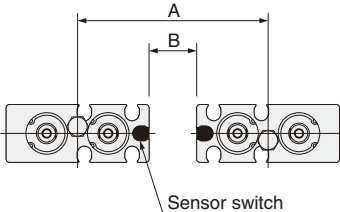
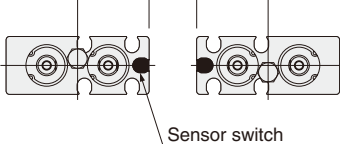
Note: The above table shows reference values.

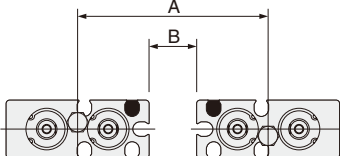
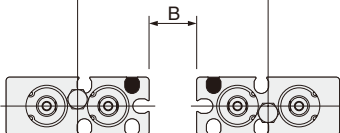
● Sensor switch mounting surface



When Mounting Cylinders with Sensor Switches in Close Proximity

When mounting cylinders with magnets in close proximity, install the cylinders with magnets so that it should not be below the values shown in the following table.

Status of installation in close proximity	Code	Bore size Type	mm [in.]				
			10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
	A	Solid state type	53 [2.09]	66 [2.60]	73 [2.87]	87 [3.43]	119 [4.69]
		Reed switch type	48 [1.89]	60 [2.36]	68 [2.68]	81 [3.19]	109 [4.29]
	B	Solid state type	11 [0.43]	12 [0.47]	11 [0.43]	14 [0.55]	23 [0.91]
		Reed switch type	6 [0.24]			8 [0.31]	13 [0.51]

	A	Solid state type	47 [1.85]	59 [2.32]	65 [2.56]	77 [3.03]	107 [4.21]
		Reed switch type	42 [1.65]	54 [2.13]	62 [2.44]	73 [2.87]	96 [3.78]
	B	Solid state type	5 [0.20]			3 [0.12]	4 [0.16]
		Reed switch type	0				

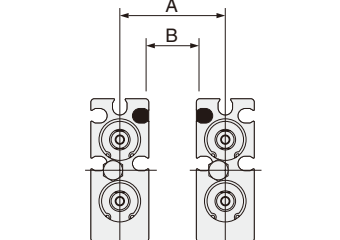
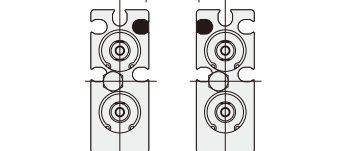
	A	Solid state type	28 [1.10]	33 [1.30]	36 [1.42]	44 [1.73]	65 [2.56]
		Reed switch type	22 [0.87]	27 [1.06]	30 [1.18]	37 [1.46]	53 [2.09]
	B	Solid state type	11 [0.43]	12 [0.47]	11 [0.43]	14 [0.55]	25 [0.98]
		Reed switch type	5 [0.20]	6 [0.24]	5 [0.20]	7 [0.28]	13 [0.51]

Diagram A shows two cylindrical components positioned side-by-side. Each cylinder has a central vertical axis with a circular feature in the middle. Dimension A is the distance between the centers of the two cylinders. Dimension B is the distance between the centers of the two circular features on the same cylinder.

A	Solid state type	21 [0.83]	24 [0.94]	25 [0.98]	30 [1.18]	44 [1.73]
	Reed switch type	17 [0.67]	21 [0.83]	25 [0.98]	30 [1.18]	40 [1.57]
B	Solid state type	4 [0.16]	3 [0.12]	0		4 [0.16]
	Reed switch type	0				

Remark: For mounting in configurations other than the above, consult us.

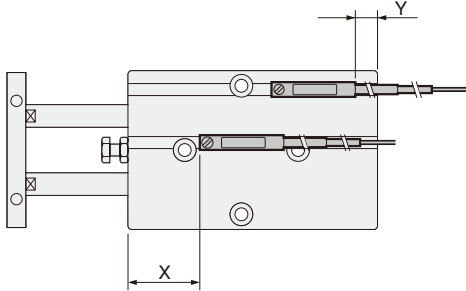
Mounting Location of End of Stroke Detection Sensor Switch

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.

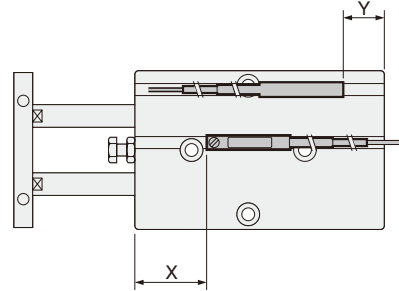
Caution: For the mountabilities of sensor switches, see p.838 ~ 840.

● ATBDA

■ When the lead wires are pulled from the head side.



■ When the lead wire of the head side detection sensor switch only is pulled from the rod side.



● Solid state type mm [in.]

Code \ Bore size	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
X	36.5 [1.437]	48 [1.890]	57 [2.244]	62 [2.441]	71 [2.795]
Y	4.5 [0.177]	10 [0.394]	8 [0.315]	7 [0.276]	15 [0.591]

● Reed switch type mm [in.]

Code \ Bore size	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
X	32.5 [1.280]	44 [1.732]	53 [2.087]	58 [2.283]	67 [2.638]
Y	1.5 [0.059]	7 [0.276]	5 [0.197]	4 [0.157]	12 [0.472]

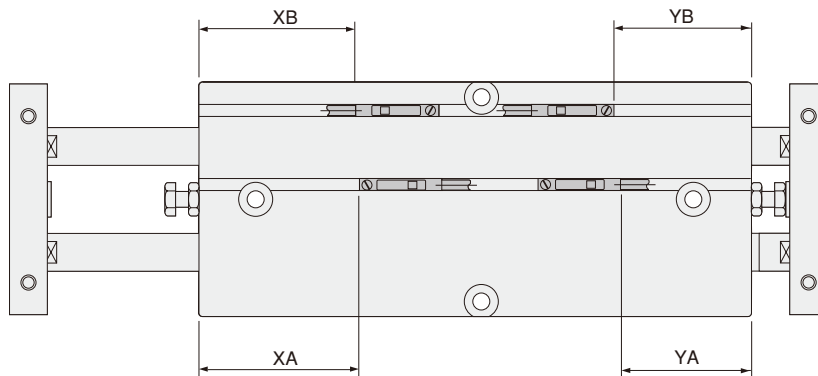
● Solid state type mm [in.]

Code \ Bore size	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
X	36.5 [1.437]	48 [1.890]	57 [2.244]	62 [2.441]	71 [2.795]
Y	7.5 [0.295]	13 [0.512]	11 [0.433]	10 [0.394]	18 [0.709]

● Reed switch type mm [in.]

Code \ Bore size	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]	32 [1.260]
X	32.5 [1.280]	44 [1.732]	53 [2.087]	58 [2.283]	67 [2.638]
Y	3.5 [0.138]	9 [0.354]	7 [0.276]	6 [0.236]	14 [0.551]

● ATBDAD



● Solid state type mm [in.]

Code \ Bore size	16 [0.630]	20 [0.787]	25 [0.984]
XA	47 [1.85]	53 [2.09]	58 [2.28]
XB	44 [1.73]	50 [1.97]	55 [2.17]
YA	43 [1.69]	48 [1.89]	51 [2.01]
YB	46 [1.81]	51 [2.01]	54 [2.13]

● Reed switch type mm [in.]

Code \ Bore size	16 [0.630]	20 [0.787]	25 [0.984]
XA	43 [1.69]	49 [1.93]	54 [2.13]
XB	41 [1.61]	47 [1.85]	52 [2.05]
YA	40 [1.57]	45 [1.77]	48 [1.89]
YB	42 [1.65]	47 [1.85]	50 [1.97]



Mounting and adjustment

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 $-5 \sim 0\text{mm}$ [$-0.197 \sim 0\text{in.}$] (in the double rod end type, $-10 \sim 0$ [$-0.394 \sim 0\text{in.}$]). 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 screw the bolt to the right (clockwise) beyond the standard position. The stroke at delivery is set to the standard stroke. Do not adjust it to larger than the standard stroke.

Caution: Never use with the stopper bolt removed.

Cylinder speed

Use the cylinder at or below the 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 applying direct shocks to the cylinder. Consult us if the situation will not permit installation of an external stopper, etc.

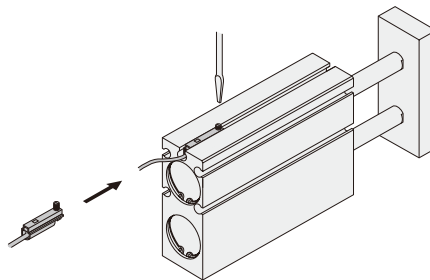


Sensor switch

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. Do not use the body mounting hole to secure the sensor switch with its mounting screw. The sensor switch mounting screw could fall out.

Moving sensor switch

- Loosening the mounting screw allows the sensor switch to be moved along the switch mounting groove of the cylinder body.
- Tighten the mounting screw with a tightening torque of $0.1 \sim 0.2\text{N}\cdot\text{m}$ [$0.9 \sim 1.8\text{in}\cdot\text{lbf}$].



General precautions

Piping

Always thoroughly blow off (use compressed air) the tubing before piping. Entering chips, sealing tape, rust, etc., generated during piping work could result in air leaks or other defective operation.

Media

1. Use air for the media. For the use of any other media, consult us.
2. Air used for the cylinder should be clean air that contains no deteriorated compressor oil, etc. Install an air filter (filtration of a minimum $40\text{ }\mu\text{m}$) near the cylinder or valve to remove collected liquid or dust. In addition, drain the air filter periodically. Collected liquid or dust entering the cylinder may cause improper operation.

Lubrication

The 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

1. If using in locations subject to dripping water, dripping oil, etc., or to large amounts of dust, use a cover to protect the unit.
2. The product cannot be used when the media or ambient atmosphere contains any of the substances listed below.
Organic solvents, phosphate ester type hydraulic oil, sulphur dioxide, chlorine gas, or acids, etc.