

## Small-bore hydraulic cylinders

- Tie rod type small-bore hydraulic cylinders.
- Slipper seal is used as the piston seal.
- Copper alloy bushing, and wear ring fitted to piston.
- Reed sensors or solid state sensors can be selected.

Solid state sensors which can be easily set in the optimum positions through visual check are available.

Note) Slipper Seal is the registered trade mark of Nippon Valqua Industries, Ltd.



### Standard Specifications

Type	Standard type	Switch Set
Nominal pressure	3.5 MPa	
Maximum allowable pressure	4 MPa	
Proof test pressure	5 MPa	
Working speed range	0.1 to 300 mm/s	
Working temperature range (ambient/fluid temperature)	- 10 to + 70°C (No freezing)	
Structure of cushioning	None	
Adaptable fluid	Petroleum-based fluid (When using another fluid, refer to the table of fluid adaptability.)	
Tolerance for thread	JIS 6g/6H	
Tolerance of stroke	0 to 250 mm $^{+1.0}_0$ 251 to 600 mm $^{+1.4}_0$	
Mounting style	SD, LB, FA, FB, CA, CB with pin	
Accessories	Rod end attachments	Rod eye (S-end), rod clevis (Y-end), floating joint (F-end)
	Others	CB bracket

### Adaptability of Fluid to Seal Material

Seal material	Adaptable fluid				
	Petroleum-based fluid	Water-glycol fluid	Phosphate ester fluid	Water in oil fluid	Oil in water fluid
Nitrile rubber	○	○	×	○	○

### Sensor Mountable Minimum Stroke Unit: mm

Bore	With one sensor		With two sensors	
	AX/AZ type	SR type	AX/AZ type	SR type
φ20	10		20	
φ25				
φ32				

### Terminologies

#### Nominal pressure

Pressure given to a cylinder for convenience of naming. It is not always the same as the working pressure (rated pressure) that guarantees performance under the specified conditions.

#### Maximum allowable pressure

Maximum allowable pressure generated in a cylinder (surge pressure, etc.)

#### Proof test pressure

Test pressure against which a cylinder can withstand without unreliable performance at the return to nominal pressure.

Notes) ● The hydraulic pressure generated in a cylinder due to the inertia of load must be lower than the maximum allowable pressure.  
● For the internal structure, refer to the sectional drawings at the end of this catalog.

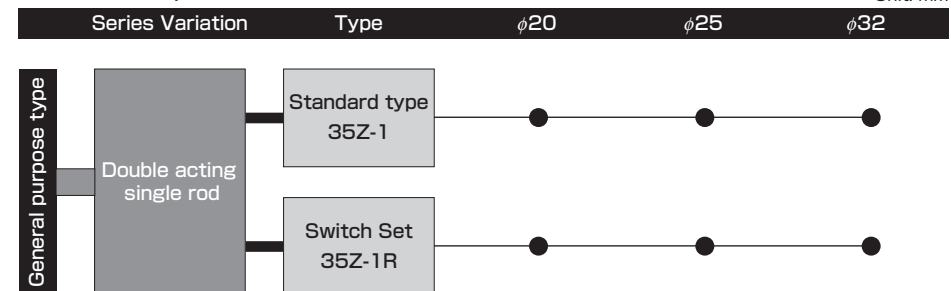
### Standard Stroke Range Unit: mm

Type	Bore		
	φ20	φ25	φ32
Standard type	400	500	600
Switch Set	400	500	600

- The above strokes indicate the maximum available strokes for the standard type.
- For the rod buckling, check with the buckling chart in the selection materials. Contact us for longer strokes.

### Product Lineup

Unit: mm



- Notes) ● When using a sensor, use a Switch Set Cylinder.  
● No sensor can be mounted onto the standard type cylinder.

### Double acting single rod



Standard type (35Z-1)



Switch Set (35Z-1R)

### Weight Table Unit: kg

Bore mm	Basic weight			Mounting accessory weight					Rod end attachment weight		
	Basic style 35Z-1	Switch Set 35Z-1R	Additional weight per mm of stroke	LB style	FA style FB style	CA style	CB style with pin/spill pin	CB style with bracket	Rod eye (S-end)	Rod clevis (Y-end) with pin	Floating joint (F-end)
φ20	0.390	0.395	0.00223	0.135	0.130	0.105	0.105	0.350	0.075	0.10	0.11
φ25	0.473	0.480	0.00265	0.150	0.145	0.120	0.125	0.350	0.075	0.10	0.11
φ32	0.632	0.638	0.00316	0.200	0.155	0.180	0.165	0.465	0.110	0.17	0.19

### Sensor Additional Weight Unit: kg

Bore mm	Sensor	AX/AZ type			SR type
		Cord length 1.5 m	Cord length 5 m	With connector	Cord length 5 m
φ20		0.05	0.13	0.04	0.22
φ25					
φ32					

[Calculation formula] Cylinder weight (kg)=basic weight+(cylinder stroke (mm)×additional weight per mm of stroke)+(sensor additional weight×sensor quantity)+mounting accessory weight+rod end attachment weight

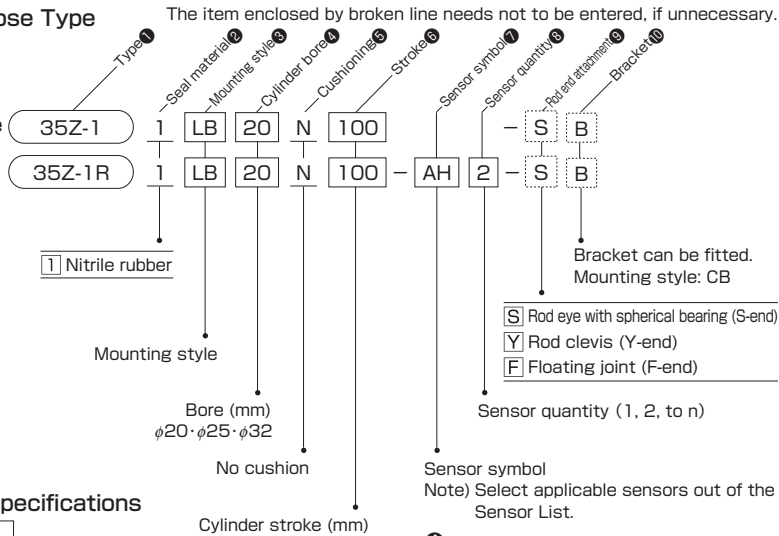
[Calculation example] 35Z-1R, bore φ32, cylinder stroke 300 mm, 2 pcs of AX101 (cord length 1.5 m), LB style, rod eye (S-end) 0.638+(300×0.00316)+(0.05×2)+0.200+0.110=1.996kg

### How to order

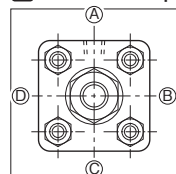
#### General Purpose Type

The item enclosed by broken line needs not to be entered, if unnecessary.

#### Standard type



#### Standard specifications



- No cushion on both ends
- Port position A

#### Change of port position

The standard port position is A. When modifying the positions, enter the symbol shown in the dimensional drawings.

Example) 35Z-1R 1LB20N100 - B 0 AH 2  
 Port position (A, B, C, D) | No cushion

#### Adaptability of Fluid to Seal Material

Seal material	Adaptable fluid				
	Petroleum-based fluid	Water-glycol fluid	Phosphate ester fluid	Water in oil fluid	Oil in water fluid
Nitrile rubber	○	○	×	○	○

Note) ○: Applicable ×: Inapplicable

#### End Lock Nut Part Number

Bore	Part number
φ20	LNA-10B-H
φ25	
φ32	LNA-12B-H

#### Standard Stroke Range

Unit: mm

Type	Bore		
	φ20	φ25	φ32
Standard type	400	500	600
Switch Set	400	500	600

- The above strokes indicate the maximum available strokes for the standard type.
- For the rod buckling, check with the buckling chart in the selection materials. Contact us for longer strokes.

#### Sensor Mountable Minimum Stroke

Unit: mm

Bore	With one sensor		With two sensors	
	AX/AZ type	SR type	AX/AZ type	SR type
φ20	10		20	
φ25				
φ32				

### Sensor List

■ Semi-standard

Type	Sensor symbol	Load voltage range	Load current range	Max. switching capacity	Protective circuit	Indicating lamp	Wiring method	Cord length	Applicable load
Reed sensor	AF AX101CE	DC: 5 to 30 V AC: 5 to 120 V	DC: 5 to 40 mA AC: 5 to 20 mA	DC: 1.5 W AC: 2 VA	None	LED (Lights in red when sensing)	0.3 mm <sup>2</sup> , 2-core, outer dia. φ4 mm, rear wiring	1.5 m	Small relay, programmable controller
	AG AX105CE							5 m	
	AH AX111CE				1.5 m				
	AJ AX115CE				5 m				
	AE AX125CE	DC: 30 V or less AC: 120 V or less	DC: 40 mA or less AC: 20 mA or less	2 VA	None	None	4-pin connector type, rear wiring	5 m	
	AK AX11ACE	AC: 5 to 120 V	5 to 20 mA					0.5 m	
	AL AX11BCE	DC: 5 to 30 V	5 to 40 mA	1.5 W	Provided	LED (Lights in red when sensing)	4-pin connector type, rear wiring	0.5 m	
	AM AX135CE	AC/DC: 90 to 240 V	5 to 300 mA	B contact output	Provided	LED (Lights in red when not sensing)	0.3 mm <sup>2</sup> , 2-core, outer dia. φ4 mm, rear wiring	5 m	
	S SR405	AC: 80 to 220 V	2 to 300 mA	30 VA	Provided	Neon lamp (Lights when not sensing)	0.5 mm <sup>2</sup> , 2-core, outer dia. φ6 mm, rear wiring	5 m	
	Solid state sensor	BE AX201CE-1	DC: 5 to 30 V	5 to 40 mA	—	Provided	LED (Lights in red when sensing)	0.3 mm <sup>2</sup> , 2-core, outer dia. φ4 mm, rear wiring	
BF AX205CE-1		5 m							
CE AX211CE-1		LED (two-LED type in red/green)					1.5 m		
CF AX215CE-1		5 m							
CT AX211CE-1		0.3 mm <sup>2</sup> , 2-core, outer dia. φ4 mm, rear wiring					1.5 m		
CU AX215CE-1		4-pin connector type, rear wiring					0.5 m		
CW AZ211CE-1		0.3 mm <sup>2</sup> , 2-core, outer dia. φ4 mm, upper wiring					1.5 m		
CX AZ215CE-1		5 m							
CY AZ21BCE-1		4-pin connector type, upper wiring					0.5 m		

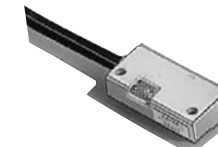
- Notes) • For the sensors without a protective circuit, be sure to provide a protective circuit (SK-100) with the load when using any induction load (relay, etc.).  
 • The output logic of AX135CE is B contact. When the piston is detected, the sensor contact turns off (the lamp turns on).  
 • For handling of sensors, be sure to see the sensor specifications at the end of this catalog.  
 • We recommend AND Unit (AU series) for multiple sensors connected in series.  
 For details, refer to AND Unit at the end of this catalog.

#### AX type sensor

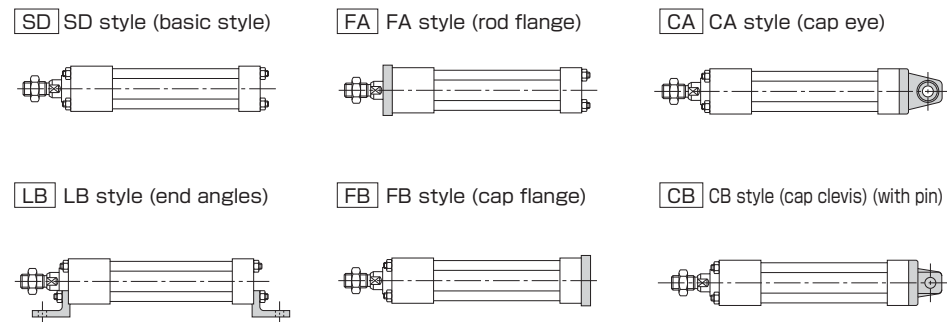
Cord type Connector type



#### SR type sensor



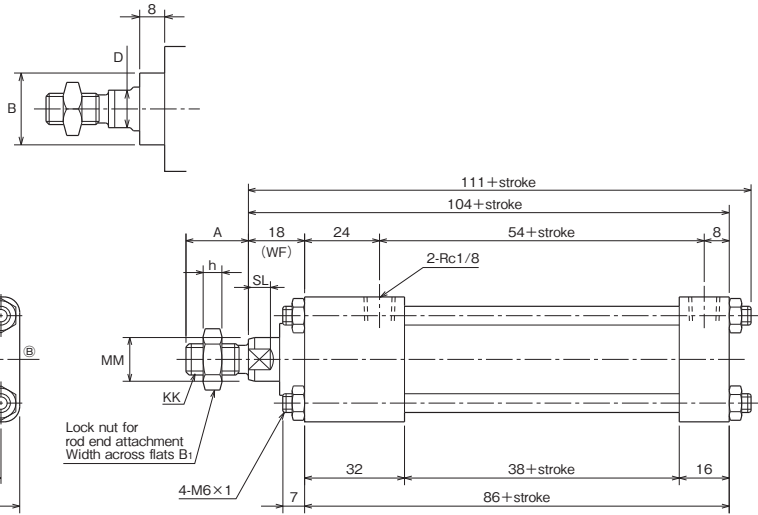
#### Mounting Style



35Z-1/THZ35 [Bore] CAD/DATA is available.

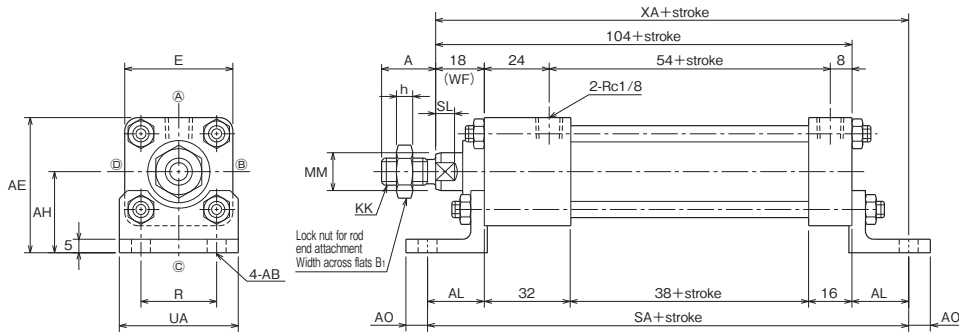
### SD

35Z-1 1SD [Bore] N [Stroke]



### LB

35Z-1 1LB [Bore] N [Stroke]



● For the mounting of sensors, refer to the dimensional drawings of Switch Set.

#### Dimensional Table

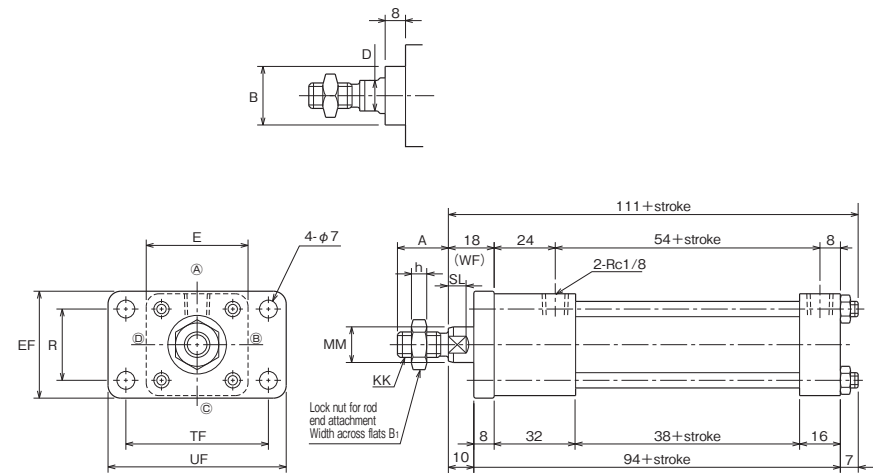
Symbol	A	AB	AE	AH	AL	AO	B	B <sub>1</sub>	D	E	h	KK	MM	R	RR	SA	SL	UA	XA
φ20	20(17)	φ7	46.5	28	21	8	φ21f9	17	10	□37	6	M10×1.25	φ12	25	□25	128	7	41	125
φ25	20(17)	φ7	50	30	21	8	φ23f9	17	12	□40	6	M10×1.25	φ14	28	□28	128	7	44	125
φ32	24(21)	φ9	55.5	33	23	10	φ30f9	19	13	□45	7	M12×1.25	φ16	33	□33	132	8	54	127

● The parenthesized values of dimension A are the lengths of threaded portions.  
● The tolerance of MM is f8.

35Z-1/THZ35 [Bore] CAD/DATA is available.

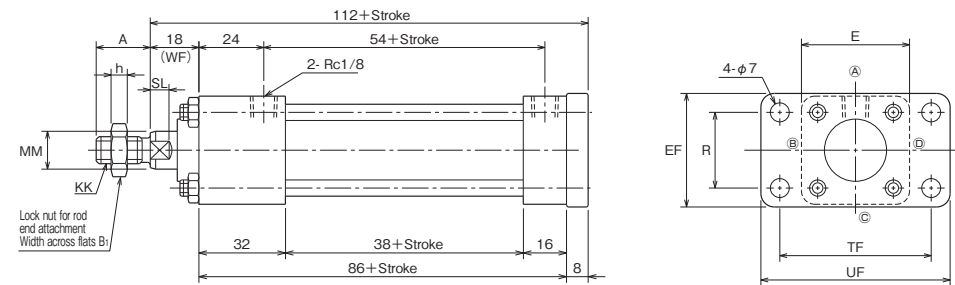
### FA

35Z-1 1FA [Bore] N [Stroke]



### FB

35Z-1 1FB [Bore] N [Stroke]



● For the mounting of sensors, refer to the dimensional drawings of Switch Set.

#### Dimensional Table

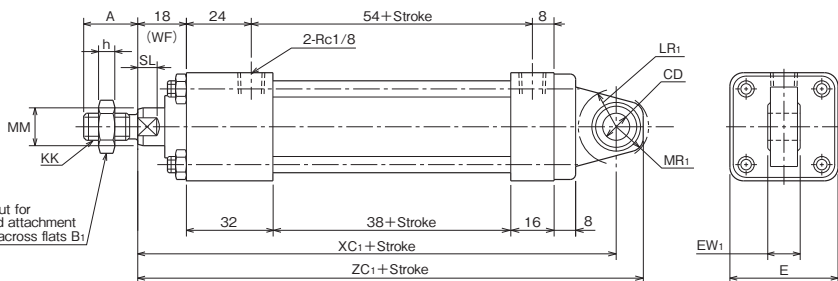
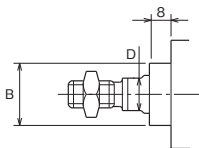
Symbol	A	B	B <sub>1</sub>	D	E	EF	h	KK	MM	R	SL	TF	UF
φ20	20(17)	φ21f9	17	10	□37	39	6	M10×1.25	φ12	25	7	54	68
φ25	20(17)	φ23f9	17	12	□40	42	6	M10×1.25	φ14	28	7	56	70
φ32	24(21)	φ30f9	19	13	□45	47	7	M12×1.25	φ16	33	8	58	72

● The parenthesized values of dimension A are the lengths of threaded portions.  
● The tolerance of MM is f8.

35Z-1/THZ35 [Bore] CAD/DATA is available.

### CA

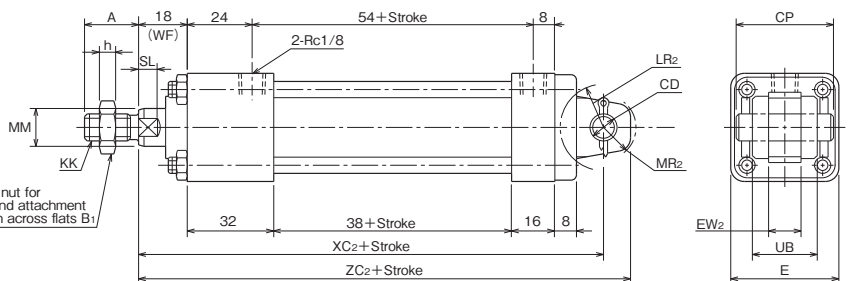
35Z-1 1CA [Bore] N [Stroke]



Lock nut for rod end attachment  
Width across flats B<sub>1</sub>

### CB

35Z-1 1CB [Bore] N [Stroke]



Lock nut for rod end attachment  
Width across flats B<sub>1</sub>

● For the mounting of sensors, refer to the dimensional drawings of Switch Set.

#### Dimensional Table

Symbol	A	B	B <sub>1</sub>	Notes	CD	CP	D	E	EW <sub>1</sub>	EW <sub>2</sub>	h	KK	LR <sub>1</sub>	LR <sub>2</sub>	MM	MR <sub>1</sub>	MR <sub>2</sub>	SL	UB	XC <sub>1</sub>	XC <sub>2</sub>	ZC <sub>1</sub>	ZC <sub>2</sub>
φ20	20(17)	φ21f9	17	φ10 <sup>H9</sup> / <sub>f8</sub>	36	10	□37	12 <sup>-0</sup> / <sub>-0.058</sub>	12 <sup>+0.7</sup> / <sub>+0.5</sub>	6	M10×1.25	R14	R16	φ12	R12	R12	7	24	127	122	137	132	
φ25	20(17)	φ23f9	17	φ10 <sup>H9</sup> / <sub>f8</sub>	36	12	□40	12 <sup>-0</sup> / <sub>-0.058</sub>	12 <sup>+0.7</sup> / <sub>+0.5</sub>	6	M10×1.25	R14	R16	φ14	R12	R12	7	24	127	122	137	132	
φ32	24(21)	φ30f9	19	φ12 <sup>H9</sup> / <sub>f8</sub>	46	13	□45	16 <sup>-0</sup> / <sub>-0.070</sub>	16 <sup>+0.7</sup> / <sub>+0.5</sub>	7	M12×1.25	R16	R18	φ16	R14	R15	8	32	129	123	141	136	

Notes) ● f8 is the pin size.

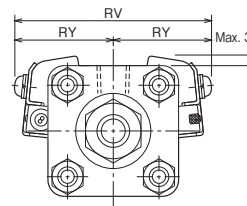
- The parenthesized values of dimension A are the lengths of threaded portions.
- The tolerance of MM is f8.

35Z-1/THZ35 [Bore] CAD/DATA is available.

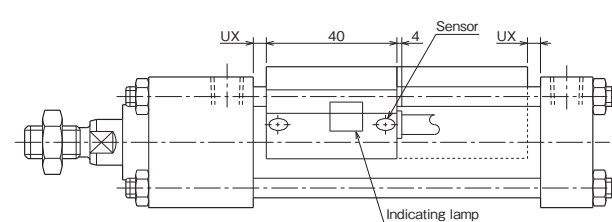
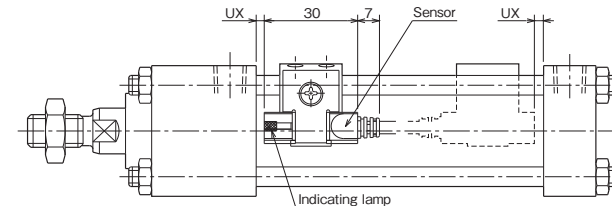
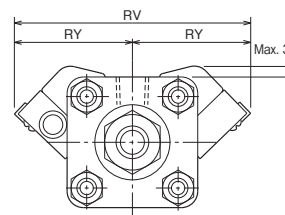
### Switch Set

35Z-1R 1 [SD] [Bore] N [Stroke] - [Sensor symbol] [Sensor quantity]

● AX1 \*\*, AZ1 \*\* (reed sensor) · AX2 \*\*, AZ2 \*\* (solid state sensor)



● SR type (reed sensor)



#### Dimensional Table

Type	AX/AZ type			SR type		
	Bore Symbol	RV	RY	UX	RV	RY
φ20	58	29	9	68	34	4
φ25	61	30.5	9	72	36	4
φ32	66	33	9	78	39	5

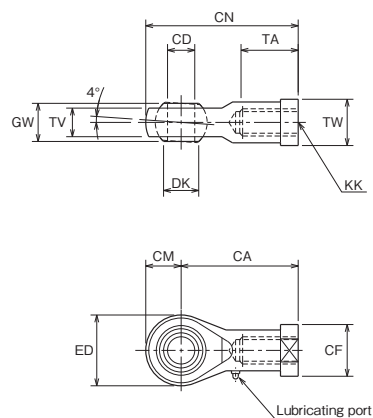
Note) Dimension UX indicates the optimum sensor mounting position for detection of stroke end.

#### Operating Range and Hysteresis

Bore mm	Reed sensor				Solid state sensor	
	AX1**·AZ1**		SR type		AX2**·AZ2**	
	Operating range	Hysteresis	Operating range	Hysteresis	Operating range	Hysteresis
φ20	5 to 10	1 or less	7 to 10	2 or less	3 to 7	2 or less
φ25			6 to 10	3 or less		
φ32						

35Z-1/THZ35 [Bore] CAD/DATA is available. 

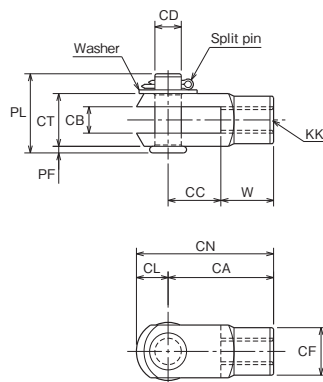
## ● Rod eye with spherical bearing (S-end)



Dimensional Table

Symbol Bore	Part number	CA	CD	CF	CM	CN	DK	ED	GW	KK	TA	TV	TW
φ20	RSA-10-H	43	φ10H9	φ19	13	56	φ12.9	26	14 <sup>0</sup> <sub>-0.1</sub>	M10×1.25	21	10.5±0.1	17
φ25													
φ32	RSA-12-H	50	φ12H9	φ22	15	65	φ15.4	30	16 <sup>0</sup> <sub>-0.1</sub>	M12×1.25	24	12±0.1	19

## ● Rod clevis (Y-end) with pin

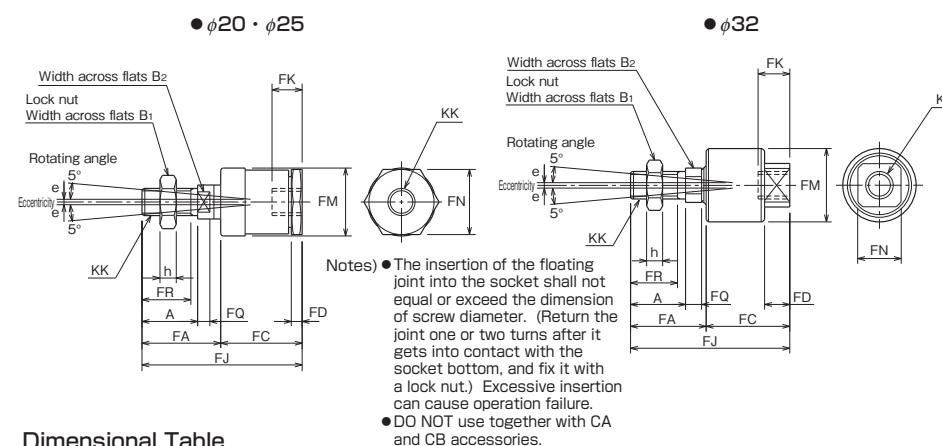


Dimensional Table

Symbol Bore	Part number	CA	CB	CC	CD	CF	CL	CN	CT	KK	PF	PL	W
φ20	RYA-10-H	40	10 <sup>+0.4</sup> <sub>+0.1</sub>	20	φ10 <sup>H8</sup> <sub>f8</sub>	φ18	12	52	□20	M10×1.25	2.5	30	20
φ25													
φ32	RYA-12-H	48	12 <sup>+0.4</sup> <sub>+0.1</sub>	24	φ12 <sup>H8</sup> <sub>f8</sub>	φ20	14	62	□24	M12×1.25	3	36.5	24

35Z-1/THZ35 [Bore] CAD/DATA is available. 

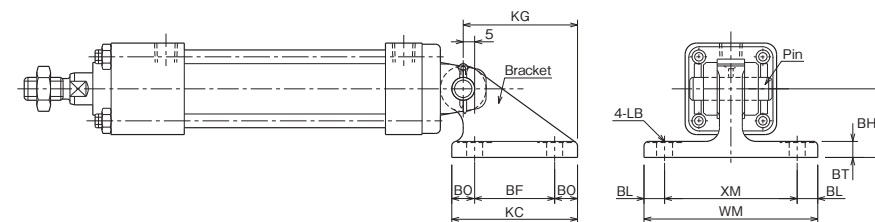
## ● Floating joint (F-end)



Dimensional Table

Symbol Bore	Part number	A	B <sub>1</sub>	B <sub>2</sub>	e	FA	FC	FD	FJ	FK	FM	FN	FQ	FR	h	KK
φ20	RFH-10	20.5	17	10	1	29	30	4	59	11	φ25	24	4.5	18	6	M10×1.25
φ25																
φ32	RFH-12	24	19	13	1	33	36.5	11	69.5	13.5	φ32	19	7	20.5	7	M12×1.25

## ● Bracket for CB style

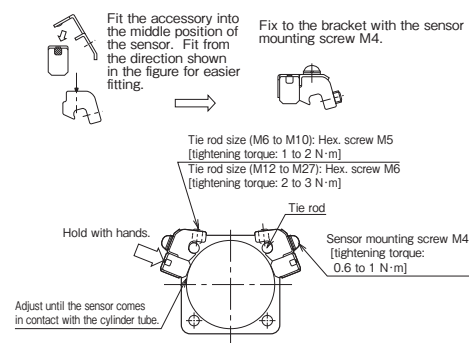


Dimensional Table

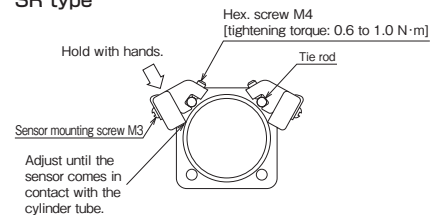
Symbol Bore	Part number	BF	BH	BL	BO	BT	KC	KG	LB	WM	XM
φ20	BCA-10-H	35	30	9	10	7	55	50	φ7	76	58
φ25											
φ32	BCA-12-H	40	35	10	11.5	8	63	56.5	φ9	85	65

## Setting method of sensor detecting position

## AX type



## SR type



1. Loosen the two hex. screws with a hex. wrench, and move them along the tie rod.
2. Adjust the detecting position (for the 2-LED type, the position where the green lamp lights up) 2 to 5 mm (about half of the operating range is appropriate) before the required position where the sensor indicator lamp starts to light up (ON). Then, gently hold the top of the sensor so that the cylinder tube contacts the detecting face of the sensor, and clamp the hex. screw to an appropriate tightening torque.  
Note) Inappropriate tightening torque may cause the off-center of the sensor position.
3. The indicating lamp lights up when the sensor is set to the ON position.  
(The lamp of SR405 goes out when the sensor turns on.)
4. Sensors can be mounted to any of four tie rods and on the most suitable position depending on the mounting space of the cylinder and wiring method.
5. Mount a sensor to the most suitable position to detect the stroke end with the "sensor mounting dimension" (dimension UX).