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℃ (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	

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.

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	○	○	×	○	○

Standard Stroke Range

Unit: mm

Bore / Type	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				

Product Lineup

Unit: mm

Series Variation	Type	ϕ20	ϕ25	ϕ32
General purpose type	Double acting single rod	Standard type 35Z-1	●	●	●
		Switch Set 35Z-1R	●	●	●

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/split 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.

	Type ❶	Seal material ❷	Mounting style ❸	Cylinder bore ❹	Cushioning ❺	Stroke ❻	Sensor symbol ❼	Sensor quantity ❽	Rod end attachment ❾	Bracket ❿
●Standard type	35Z-1	1	LB	20	N	100			– S	B
●Switch Set	35Z-1R	1	LB	20	N	100	– AH	2	– S	B

1 Nitrile rubber

Mounting style

Bore (mm)
ϕ20·ϕ25·ϕ32

No cushion

Cylinder stroke (mm)

Sensor symbol
Note) Select applicable sensors out of the Sensor List.

Sensor quantity (1, 2, to n)

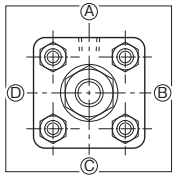
S Rod eye with spherical bearing (S-end)
Y Rod clevis (Y-end)
F Floating joint (F-end)

Bracket can be fitted.
Mounting style: CB

❗ Notes on ordering Switch Set

- When no sensor is required, specify 0 for the sensor symbol ❼ and the sensor quantity ❽.
- Sensors are not mounted on cylinders at delivery.

✪ Standard specifications



- No cushion on both ends
- Port position Ⓐ

✪ Change of port position

The standard port position is Ⓐ. 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

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.

End Lock Nut Part Number

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

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 mm², 2-core, outer dia. ϕ4 mm, rear wiring	1.5 m	Small relay, programmable controller
	AG AX105CE							5 m	
	AH AX111CE				Provided			1.5 m	
	AJ AX115CE							5 m	
	AE AX125CE	DC: 30 V or less AC: 120 V or less	DC: 40 mA or less AD: 20 mA or less		None	None		5 m	
	AK AX11ACE	AC: 5 to 120 V	5 to 20 mA	2 VA	Provided	LED (Lights in red when sensing)	4-pin connector type, rear wiring	0.5 m	
	AL AX11BCE	DC: 5 to 30 V	5 to 40 mA	1.5 W				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 mm², 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 mm², 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 mm², 2-core, outer dia. ϕ4 mm, rear wiring	1.5 m	Small relay, programmable controller
	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					LED (two-LED type in red/green)	0.3 mm², 2-core, outer dia. ϕ4 mm, rear wiring	1.5 m	
	CU AX215CE-1							5 m	
	CV AX21BCE-1						4-pin connector type, rear wiring	0.5 m	
	CW AZ211CE-1						0.3 mm², 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	

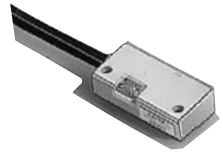
Notes)
- For the sensors without a protective circuit, be sure to provide a protective circuit (SK-100) with the load when using any induction load (relay, etc.).
- The output logic of AX135CE is B contact. When the piston is detected, the sensor contact turns off (the lamp turns on).
- For handling 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

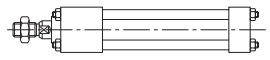
Connector type

SR type sensor

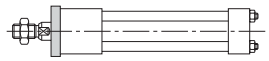


Mounting Style

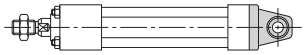
SD SD style (basic style)



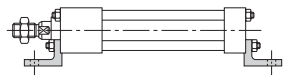
FA FA style (rod flange)



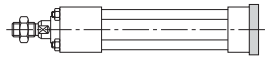
CA CA style (cap eye)



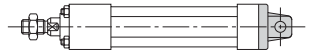
LB LB style (end angles)



FB FB style (cap flange)



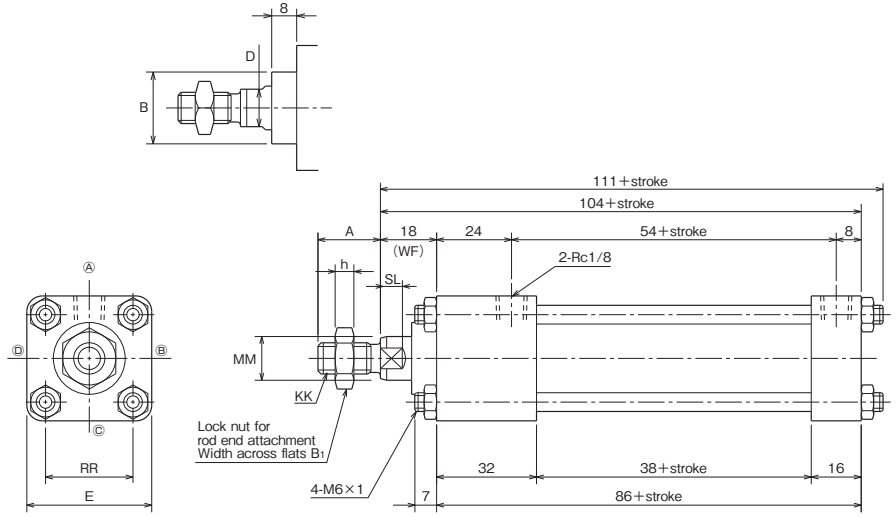
CB CB style (cap clevis) (with pin)



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

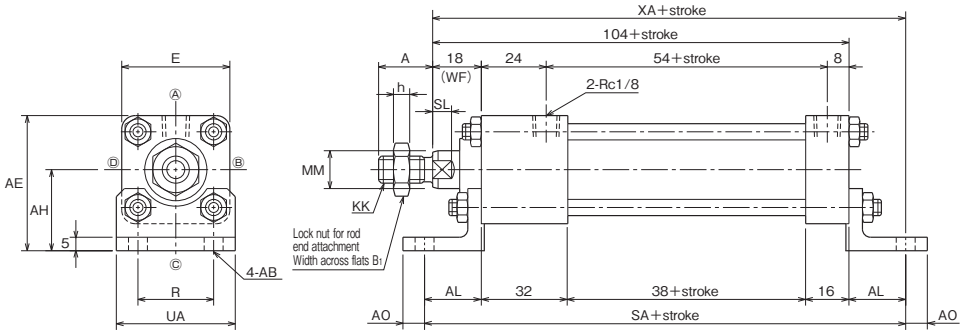
SD

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

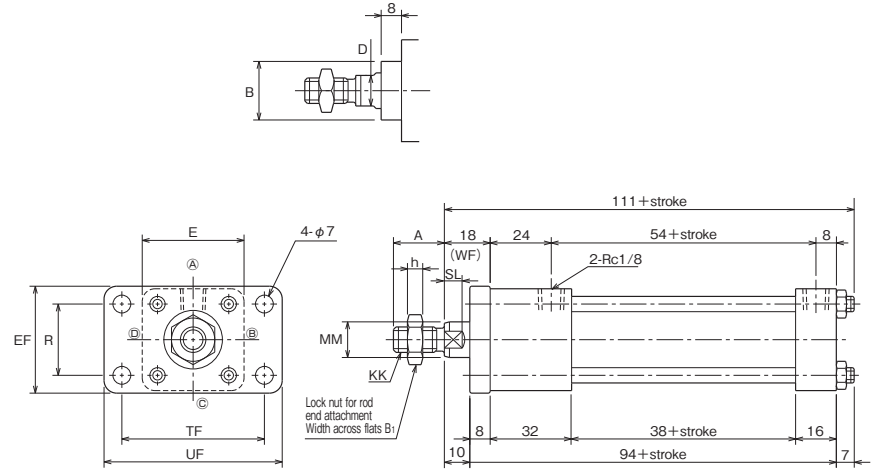
Symbol / Bore	A	AB	AE	AH	AL	AO	B	B1	D	E	h	KK	MM	R	RR	SA	SL	UA	XA
ϕ20	20(17)	ϕ7	46.5	28	21	8	ϕ21f9	17	10	□37	6	M10×1.25	ϕ12	25	□25	128	7	41	125
ϕ25	20(17)	ϕ7	50	30	21	8	ϕ23f9	17	12	□40	6	M10×1.25	ϕ14	28	□28	128	7	44	125
ϕ32	24(21)	ϕ9	55.5	33	23	10	ϕ30f9	19	13	□45	7	M12×1.25	ϕ16	33	□33	132	8	54	127

●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.

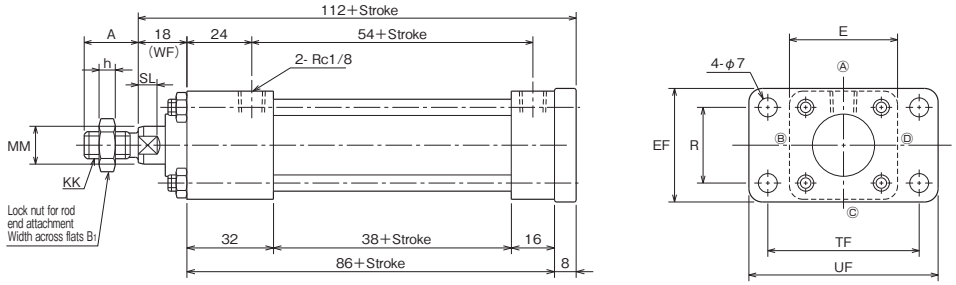
FA

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

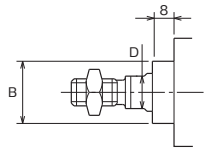
Symbol / Bore	A	B	B1	D	E	EF	h	KK	MM	R	SL	TF	UF
ϕ20	20(17)	ϕ21f9	17	10	□37	39	6	M10×1.25	ϕ12	25	7	54	68
ϕ25	20(17)	ϕ23f9	17	12	□40	42	6	M10×1.25	ϕ14	28	7	56	70
ϕ32	24(21)	ϕ30f9	19	13	□45	47	7	M12×1.25	ϕ16	33	8	58	72

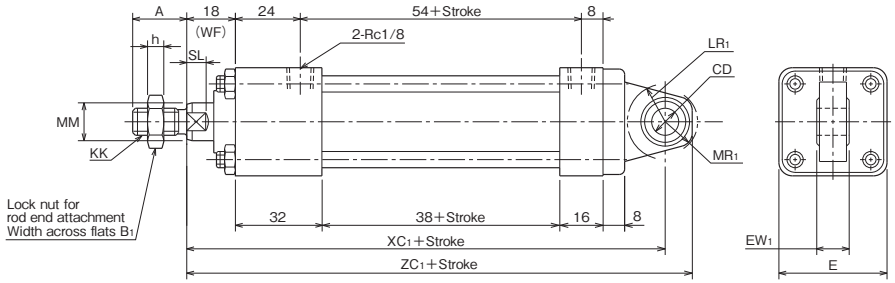
●The parenthesized values of dimension A are the lengths of threaded portions.
●The tolerance of MM is f8.

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

CA

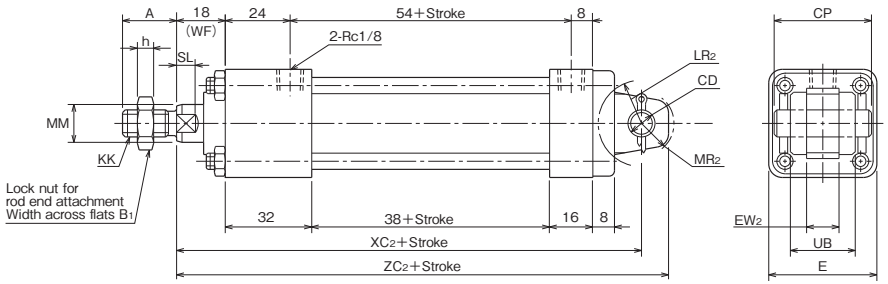
35Z-1 1CA Bore N Stroke





CB

35Z-1 1CB Bore N Stroke



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

Dimensional Table

Bore \ Symbol	A	B	B1	Notes) CD	CP	D	E	EW1	EW2	h	KK	LR1	LR2	MM	MR1	MR2	SL	UB	XC1	XC2	ZC1	ZC2
ϕ20	20(17)	ϕ21f9	17	ϕ10 H9/f8	36	10	□37	12 0 −0.058	12 +0.7 +0.5	6	M10×1.25	R14	R16	ϕ12	R12	R12	7	24	127	122	137	132
ϕ25	20(17)	ϕ23f9	17	ϕ10 H9/f8	36	12	□40	12 0 −0.058	12 +0.7 +0.5	6	M10×1.25	R14	R16	ϕ14	R12	R12	7	24	127	122	137	132
ϕ32	24(21)	ϕ30f9	19	ϕ12 H9/f8	46	13	□45	16 0 −0.070	16 +0.7 +0.5	7	M12×1.25	R16	R18	ϕ16	R14	R15	8	32	129	123	141	136

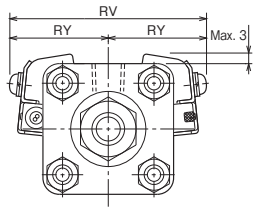
Notes) ● f8 is the pin size.
● The parenthesized values of dimension A are the lengths of threaded portions.
● The tolerance of MM is f8.

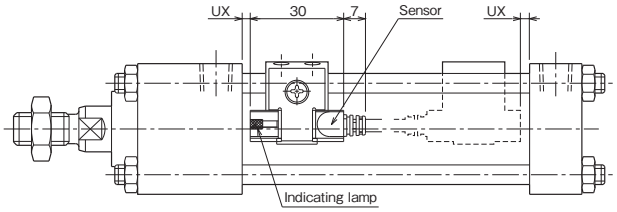
35Z-1/THZ35 Bore CAD/DATA is available.

Switch Set

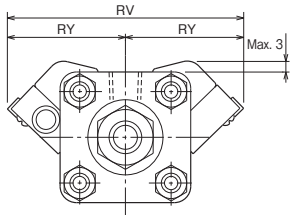
35Z-1R 1 SD Bore N Stroke – Sensor symbol Sensor quantity

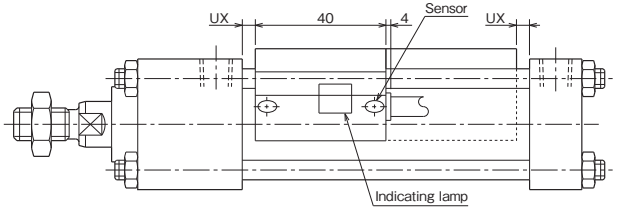
● AX1∗∗, AZ1∗∗ (reed sensor)・AX2∗∗, AZ2∗∗ (solid state sensor)





● SR type (reed sensor)





Dimensional Table

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

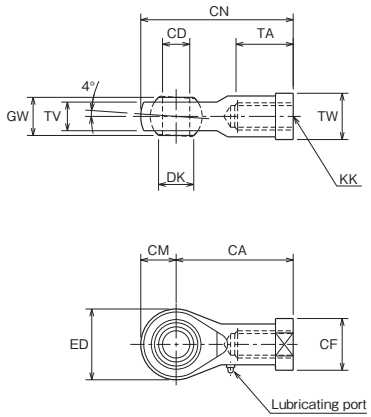
Note) Dimension UX indicates the optimum sensor mounting position for detection of stroke end.

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						
ϕ32			6 to 10	3 or less		

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

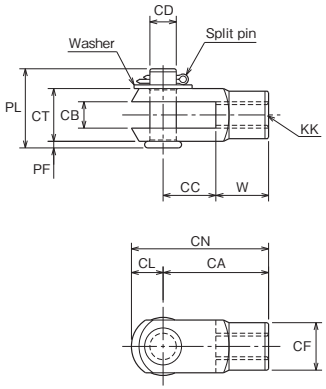
●Rod eye with spherical bearing (S-end)



Dimensional Table

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

●Rod clevis (Y-end) with pin

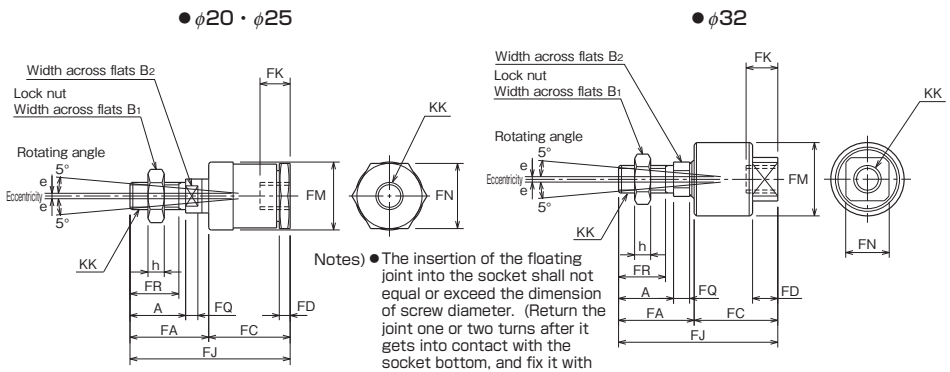


Dimensional Table

Symbol / Bore	Part number	CA	CB	CC	CD	CF	CL	CN	CT	KK	PF	PL	W
ϕ20 / ϕ25	RYA-10-H	40	$10^{+0.4}_{+0.1}$	20	$\phi10^{H8}_{f8}$	ϕ18	12	52	□20	M10×1.25	2.5	30	20
ϕ32	RYA-12-H	48	$12^{+0.4}_{+0.1}$	24	$\phi12^{H8}_{f8}$	ϕ20	14	62	□24	M12×1.25	3	36.5	24

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

●Floating joint (F-end)

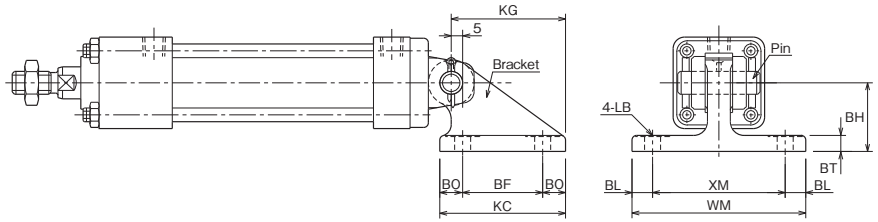


Notes) ●The insertion of the floating joint into the socket shall not equal or exceed the dimension of screw diameter. (Return the joint one or two turns after it gets into contact with the socket bottom, and fix it with a lock nut.) Excessive insertion can cause operation failure.
●DO NOT use together with CA and CB accessories.

Dimensional Table

Symbol / Bore	Part number	A	B_1	B_2	e	FA	FC	FD	FJ	FK	FM	FN	FQ	FR	h	KK
ϕ20 / ϕ25	RFH-10	20.5	17	10	1	29	30	4	59	11	ϕ25	24	4.5	18	6	M10×1.25
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

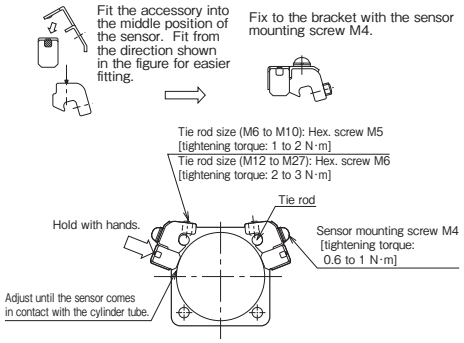


Dimensional Table

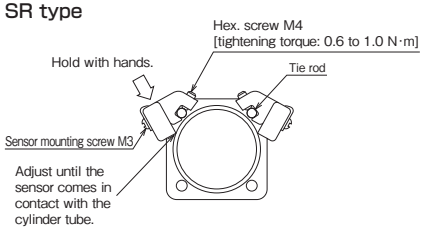
Symbol / Bore	Part number	BF	BH	BL	BO	BT	KC	KG	LB	WM	XM
ϕ20 / ϕ25	BCA-10-H	35	30	9	10	7	55	50	ϕ7	76	58
ϕ32	BCA-12-H	40	35	10	11.5	8	63	56.5	ϕ9	85	65

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).