- The rotary actuators come in five cylinder bores from 32 to 80 mm and three mounting styles, SD, FA and FB.
- The unique backlash eliminating mechanism prevents backlash at the rotating ends.
- The rotating angle can be adjusted in the range of ±5° by the rotation angle fine adjustment mechanism.
- Versatile magnetic proximity sensors of AX and AZ types are standardized.
- The external dimensions and mounting dimensions are completely identical with those of 35RP.
- Since the piston contains a magnet, a sensor can be mounted after installation. (The same sensors as those of 35H-3R can be used.)

Main Body Specifications

Type	35RP2
Series Variation	Rack and pinion type
Bore (mm)	φ32·φ40·φ50·φ63·φ80
Rotating angle	90°·180°
Angle adjustment	±5°
Rated torque (at 3.5 MPa)	φ32: 60N·m φ40: 106N·m φ50: 220N·m φ63: 436N·m φ80: 840N·m
Maximum allowable pressure	3.5 MPa
Proof test pressure	5 MPa
Minimum operating pressure	0.5 MPa
Working temperature range	+10 to +60℃ (ambient/fluid temperature)
Adaptable fluid	Petroleum-based fluid (When using another fluid, refer to the table of fluid adaptability.)
Gear oil	JIS 2219, Class 2 (gear oil equivalent to ISO VG680)
Tolerance for thread	JIS 6g/6H
Mounting style	SD, FA, FB

Terminologies

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.

Minimum operating pressure
Minimum pressure at which cylinder installed horizontally operates under no load.

Adaptability of Fluid

Adaptable fluid				
Petroleum-based fluid	Water-glycol fluid	Phosphate ester fluid	Water in oil fluid	Oil in water fluid
○	×	×	△	△

Note) ○: Applicable, ×: Inapplicable. Consult us before using the △-marked items.

Amount of Fluid Necessary for Rotation

Unit: mℓ

Bore mm \ Rotating angle	90°	180°
φ32	28.3	53.4
φ40	51.9	99.5
φ50	104.3	202.6
φ63	203.8	399.9
φ80	410.5	788.3

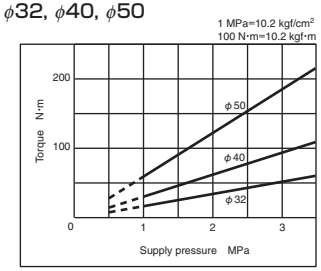
Product Lineup

Unit: mm

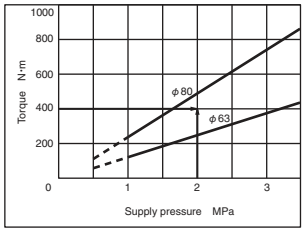
Series Variation	Type	φ32	φ40	φ50	φ63	φ80
General purpose type	Rack and pinion type	Standard type 35RP2	●	●	●	●	●
		Switch Set 35RP2	●	●	●	●	●

Theoretical Output Torque Charts

● Bore φ32, φ40, φ50



● Bore φ63, φ80



How to read the graph

When a torque of 400 N·m is required at a working pressure of 2 MPa, determine the intersection of the lines extended from the vertical axis of supply pressure and the horizontal axis of torque. Find the bore above this intersection, and the bore of 80 mm can be selected.

Note) Determine the effective torque based on the following data.
When the inertia force is low: 60 to 80%
When the inertia force is high: 25 to 35%

Weight Table

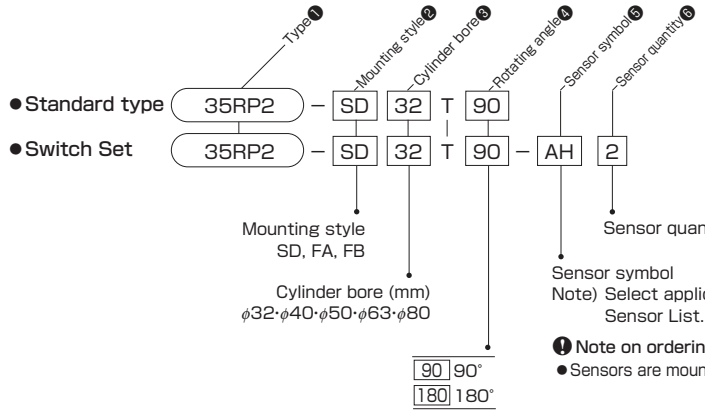
Unit: kg

Bore / Rotating angle	Basic weight (SD style) Standard type	Mounting accessory weight FA style FB style	Sensor additional weight 1 piece
φ32-90°	5.0	0.94	AX/AZ type Cord length 1.5 m: 0.05 Cord length 5 m: 0.13 With connector: 0.04 SR405 Cord length 5 m: 0.22
φ32-180°	5.2		
φ40-90°	8.8	1.57	
φ40-180°	9.2		
φ50-90°	13.9	2.09	
φ50-180°	14.7		
φ63-90°	24.2	3.56	
φ63-180°	25.8		
φ80-90°	41.0	6.54	
φ80-180°	44.1		

Calculation formula : Weight of rotary actuator (kg) =basic weight+mounting accessory weight +sensor additional weight× sensor quantity

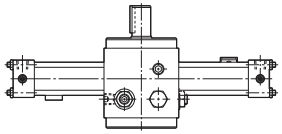
Calculation example: Standard type, bore φ40, rotating angle 180°, FA style, 2 pcs of AX215 (cord length 5 m) 9.2+1.57+0.13x2=11.03kg

● How to order

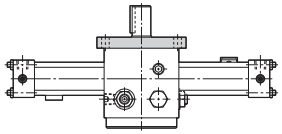


Mounting Style

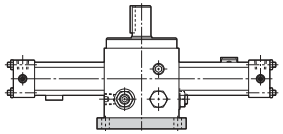
SD SD style (basic style)



FA FA style



FB FB style



Sensor List

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	
	AP AZ101CE	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, upper wiring	1.5 m	
	AR AZ105CE							5 m	
	AS AZ111CE				Provided			1.5 m	
	AT AZ115CE							5 m	
	AN AZ125CE	DC: 30 V or less AC: 120 V or less	DC: 40 mA or less AD: 20 mA or less		None	None		5 m	
	AU AZ11ACE	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	
	AW AZ11BCE	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	
	AY AZ135CE						0.3 mm², 2-core, outer dia. ϕ4 mm, upper 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 30V	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 (2-LED type in red/green)		1.5 m	
	CF AX215CE-1							5 m	
	BM AZ201CE-1					LED (Lights in red when sensing)	0.3 mm², 2-core, outer dia. ϕ4 mm, upper wiring	1.5 m	
	BN AZ205CE-1							5 m	
	CM AZ211CE-1					LED (2-LED type in red/green)		1.5 m	
	CN AZ215CE-1							5 m	
	CT AX211CE-1					LED (2-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 AX and AZ135CE is B contact. When the piston is detected, the sensor contact turns off (the lamp turns on).
● The cutting oil proof WR and WS type sensors can be mounted. (However, the rotary actuator bodies are not cutting oil proof.) For the details of the 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.

● General purpose type

AX type sensor

Cord type

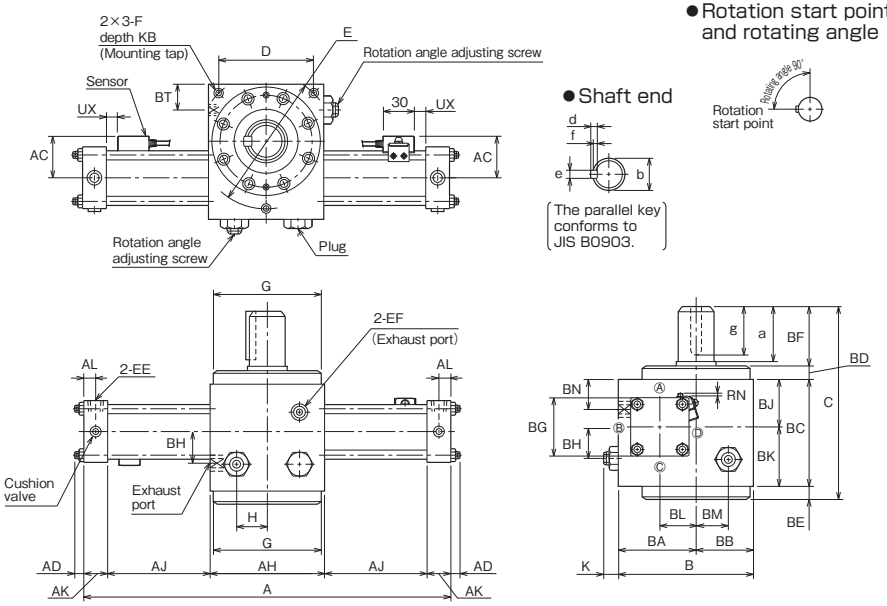
Connector type

SR type sensor

35RP2/T35RP2 Bore CAD/DATA is available.

SD

35RP2 – SD Bore T90 – Sensor symbol Sensor quantity



● Rotation start point and rotating angle

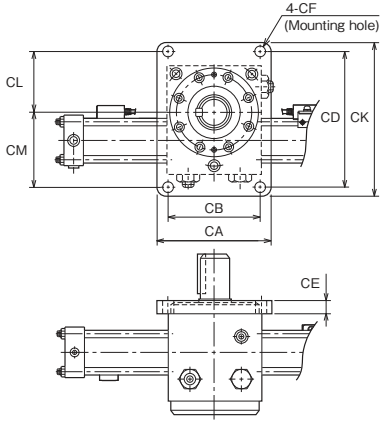
● Shaft end

The parallel key conforms to JIS B0903.

● The standard type and Switch Set Cylinders have the same external dimensions.
● UX is the sensor mounting dimension for detection of rotating end.

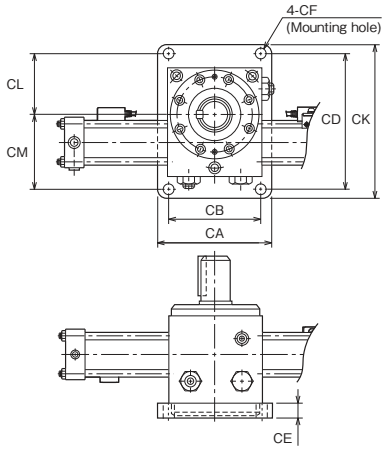
FA

35RP2 – FA Bore T90 – Sensor symbol Sensor quantity



FB

35RP2 – FB Bore T90 – Sensor symbol Sensor quantity



Dimensional Table

Bore \ Symbol	A	AC	AD	AH	AJ	AK	AL	B	BA	BB	BC	BD	BE	BF	BG	BH	BJ	BK
ϕ 32	302	37 or less	7	88	82	25	11	102	58	44	82	12	12	38	□44	24	36	46
ϕ 40	333	40 or less	7	106	88.5	25	11	125	72	53	97	13	14	60	□50	30	43	54
ϕ 50	383	45 or less	9	120	106.5	25	11	140	80	60	112	15	15	60	□62	34	50	62
ϕ 63	455	51 or less	10	144	130.5	25	11	168	96	72	133	14	16	84	□76	40	60	73
ϕ 80	518	59 or less	10	168	143	32	14	200	116	84	156	18	20	84	□94	53	68	88

Bore \ Symbol	BL	BM	BN	BT	C	CA	CB	CD	CE	CF	CK	CL	CM	D	E	EE
ϕ 32	24	20	24.5	24	144	105	85	125	13	ϕ9	145	55	70	71.4	101	Rc1/4
ϕ 40	30	27	27	26	184	125	100	150	15	ϕ9	180	65	85	86.3	122	Rc3/8
ϕ 50	40	33	30	27	202	145	120	170	16	ϕ11	195	75	95	98.3	139	Rc3/8
ϕ 63	50	40	34	32	247	175	140	210	18	ϕ14	240	90	120	116.7	165	Rc3/8
ϕ 80	59	48	35	36	278	210	170	250	22	ϕ16	290	110	140	137.9	195	Rc1/2

Bore \ Symbol	EF	F	G	H	K	KB	RN	Shaft end					
								a	b	d	e	f	g
ϕ 32	Rc1/4	M8×1.25	ϕ83h7	20	10	16	7 or less	36	ϕ22h6	6	6	3.5	32
ϕ 40	Rc3/8	M8×1.25	ϕ104h7	27	12	16	5 or less	58	ϕ30h6	7	8	4	50
ϕ 50	Rc3/8	M10×1.5	ϕ117h7	33	14	20	4 or less	58	ϕ38h6	8	10	5	50
ϕ 63	Rc1/2	M12×1.75	ϕ140h7	40	16	18	4 or less	82	ϕ50h6	9	14	5.5	70
ϕ 80	Rc1/2	M14×2	ϕ164h7	48	19	21	3 or less	82	ϕ55h6	10	16	6	70

Sensor Mounting Dimension

Bore	UX	
	AX/AZ type	SR type
ϕ 32	8	0
ϕ 40	9	0
ϕ 50	12	5
ϕ 63	13	7
ϕ 80	22	14

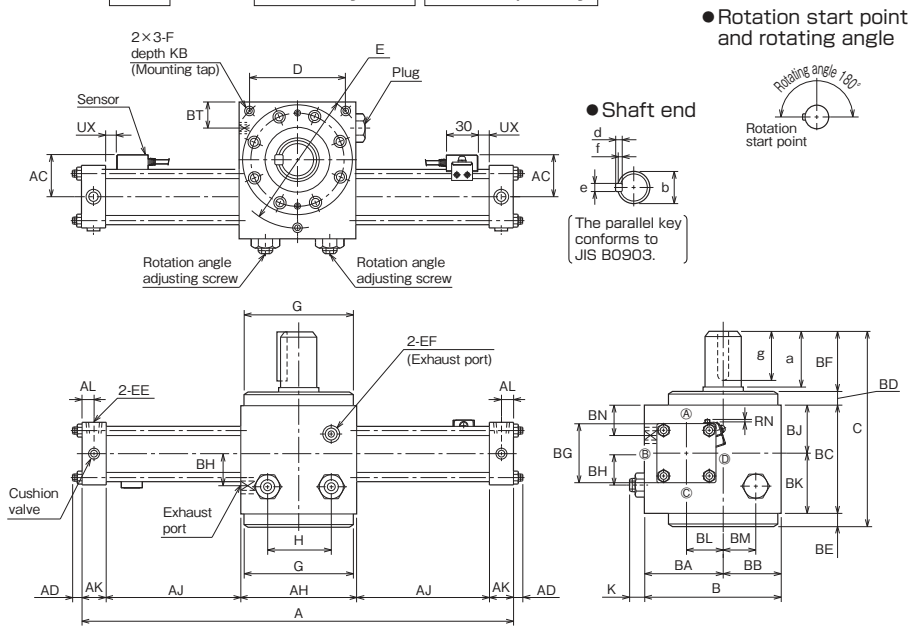
Operating Range and Hysteresis

Bore	Reed sensor				Solid state sensor	
	AX/AZ type		SR type		AX/AZ type	
	Operating range	Hysteresis	Operating range	Hysteresis	Operating range	Hysteresis
ϕ 32	5 to 9	1 or less	7 to 10	2 or less	3 to 5	1 or less
ϕ 40	5 to 9	1.5 or less	5 to 7		3 to 5	
ϕ 50	5 to 10	1 or less	7 to 11		4 to 6	
ϕ 63	5 to 10	1 or less	7 to 11		4 to 6	
ϕ 80	5 to 11	1 or less	8 to 12		4 to 6	

35RP2/T35RP2 Bore CAD/DATA is available.

SD

35RP2 – SD Bore T180 – Sensor symbol Sensor quantity



● Rotation start point and rotating angle

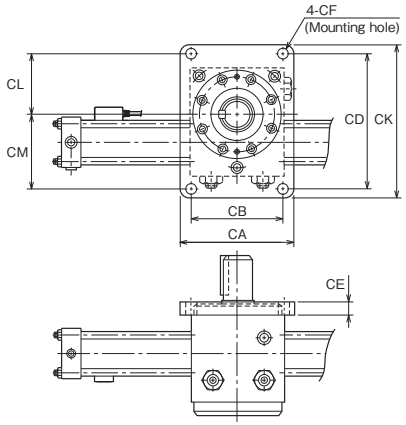
● Shaft end

The parallel key conforms to JIS B0903.

- The standard type and Switch Set Cylinders have the same external dimensions.
- UX is the sensor mounting dimension for detection of rotating end.

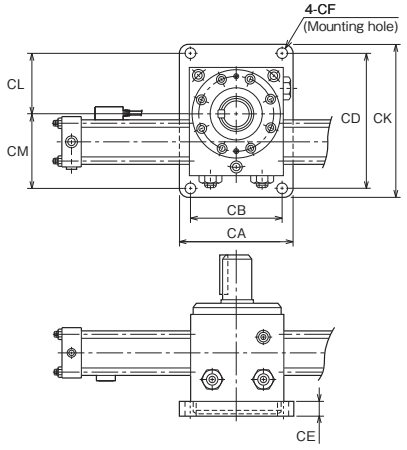
FA

35RP2 – FA Bore T180 – Sensor symbol Sensor quantity



FB

35RP2 – FB Bore T180 – Sensor symbol Sensor quantity



Dimensional Table

Bore \ Symbol	A	AC	AD	AH	AJ	AK	AL	B	BA	BB	BC	BD	BE	BF	BG	BH	BJ	BK
ϕ 32	364	37 or less	7	88	113	25	11	102	58	44	82	12	12	38	□44	24	36	46
ϕ 40	409	40 or less	7	106	126.5	25	11	125	72	53	97	13	14	60	□50	30	43	54
ϕ 50	483	45 or less	9	120	156.5	25	11	140	80	60	112	15	15	60	□62	34	50	62
ϕ 63	581	51 or less	10	144	193.5	25	11	168	96	72	133	14	16	84	□76	40	60	73
ϕ 80	668	59 or less	10	168	218	32	14	200	116	84	156	18	20	84	□94	53	68	88

Bore \ Symbol	BL	BM	BN	BT	C	CA	CB	CD	CE	CF	CK	CL	CM	D	E	EE
ϕ 32	24	20	24.5	24	144	105	85	125	13	ϕ9	145	55	70	71.4	101	Rc1/4
ϕ 40	30	27	27	26	184	125	100	150	15	ϕ9	180	65	85	86.3	122	Rc3/8
ϕ 50	40	33	30	27	202	145	120	170	16	ϕ11	195	75	95	98.3	139	Rc3/8
ϕ 63	50	40	34	32	247	175	140	210	18	ϕ14	240	90	120	116.7	165	Rc3/8
ϕ 80	59	48	35	36	278	210	170	250	22	ϕ16	290	110	140	137.9	195	Rc1/2

Bore \ Symbol	EF	F	G	H	K	KB	RN	Shaft end					
								a	b	d	e	f	g
ϕ 32	Rc1/4	M8×1.25	ϕ83h7	40	10	16	7 or less	36	ϕ22h6	6	6	3.5	32
ϕ 40	Rc3/8	M8×1.25	ϕ104h7	54	12	16	5 or less	58	ϕ30h6	7	8	4	50
ϕ 50	Rc3/8	M10×1.5	ϕ117h7	66	14	20	4 or less	58	ϕ38h6	8	10	5	50
ϕ 63	Rc1/2	M12×1.75	ϕ140h7	80	16	18	4 or less	82	ϕ50h6	9	14	5.5	70
ϕ 80	Rc1/2	M14×2	ϕ164h7	96	19	21	3 or less	82	ϕ55h6	10	16	6	70

Sensor Mounting Dimension

Bore	UX	
	AX/AZ type	SR type
ϕ 32	8	0
ϕ 40	9	0
ϕ 50	12	5
ϕ 63	13	7
ϕ 80	22	14

Operating Range and Hysteresis

Bore	Reed sensor				Solid state sensor	
	AX/AZ type		SR type		AX/AZ type	
	Operating range	Hysteresis	Operating range	Hysteresis	Operating range	Hysteresis
ϕ 32	5 to 9	1 or less	7 to 10	2 or less	3 to 5	1 or less
ϕ 40	5 to 9	1.5 or less	5 to 7		3 to 5	
ϕ 50	5 to 10	1 or less	7 to 11		4 to 6	
ϕ 63	5 to 10	1 or less	7 to 11		4 to 6	
ϕ 80	5 to 11	1 or less	8 to 12		4 to 6	

Selection Materials

To select a type in 35RP2 Series, it is necessary to determine the following conditions.

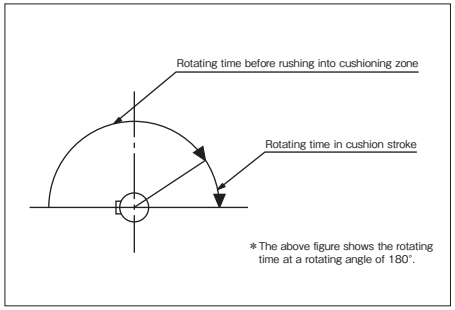
- Supply pressure
- Magnitude and condition of load
- Rotating angle
- Rotating speed
- Frequency of operation
- Ambient conditions
- Place of use
- Existence of external stopper

Although 35RP2 Series has a built-in cushioning mechanism, energy which can be absorbed by the internal cushion is limited as in the case of cylinders.
When the kinetic energy of a load is absorbed by the internal cushion without an external stopper, the energy which can be absorbed depends on the inertia moment and the angular speed at the rotating end. In other words, the angular speed at the rotating end depends on the rotating time.
The kinetic energy E of a load at the rotating end is expressed by the following formula:

$$E=\frac{1}{2}I\omega^2(J) \quad \left\{\begin{array}{l} I: \text{inertia moment } (kg\cdot m^2) \\ \omega: \text{angular speed at rotating end } (rad/s)\end{array}\right.$$

To correctly use 35RP2 Series, utilize the graph shown right.
For the inertia moment, see the calculation table.

Rotating time



Working Rotating Time (not incl. cushioning zone) Unit: s

Bore mm \ Rotating angle	90°	180°
ϕ32	0.2 to 4	0.3 to 7
ϕ40	0.2 to 5	0.3 to 8
ϕ50	0.3 to 8	0.4 to 12
ϕ63	0.4 to 11	0.5 to 16
ϕ80	0.4 to 13	0.6 to 19

Setting of rotating time

⚠CAUTION

Use the actuator within the range of rotating time shown in the above table. If it is used for more than the specified rotating time, smooth operation cannot be obtained due to stick-slip, etc. If the rotating time is less than the specified time, the actuator may be damaged.

1. Relationship between inertia moment and rotating time (not incl. cushioning zone) $1kg\cdot m^2=10.2kgf\cdot cm\cdot sec^2$

Chart A -1
Rotating angle 90°/Bore ϕ32, ϕ40, ϕ50

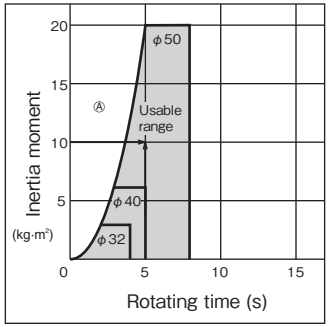


Chart A -2
Rotating angle 90°/Bore ϕ63, ϕ80

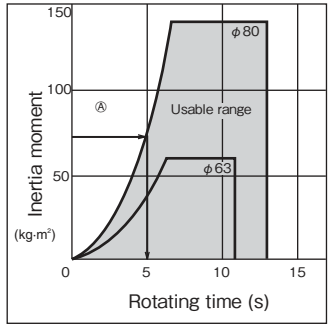


Chart A -3
Rotating angle 180°/Bore ϕ32, ϕ40, ϕ50

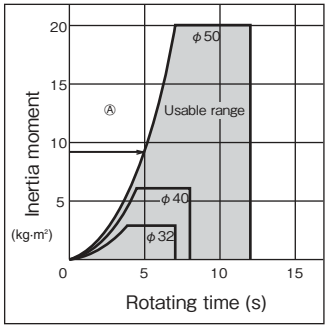
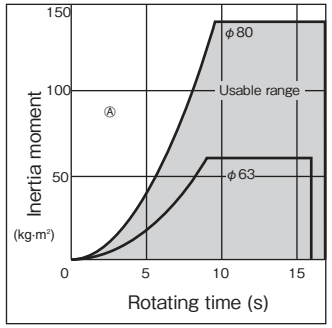


Chart A -4
Rotating angle 180°/Bore ϕ63, ϕ80



2. Relationship between inertia moment and rotating time (cushioning zone)

Chart B -1
Bore ϕ32, ϕ40, ϕ50

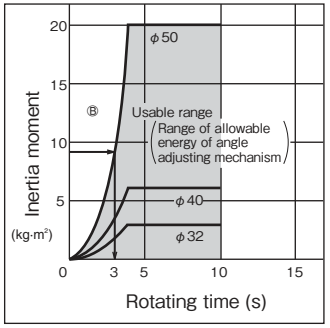
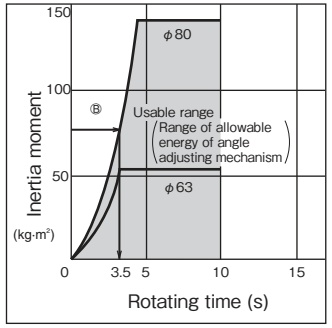
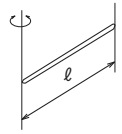
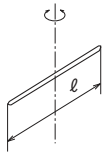
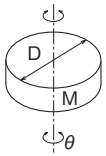
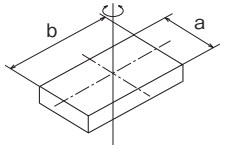
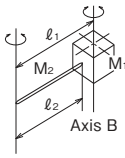


Chart B -2
Bore ϕ63, ϕ80



Inertia Moment Calculation Table

Outline	I: Inertia moment	Outline	I: Inertia moment
●When the axis is at the bar end 	$I=\frac{M\ell^2}{3}$	●When the axis is in the center of bar  Note)The axis passes through the center of gravity.	$I=\frac{M\ell^2}{12}$
●In the case of cylinder solid (incl. disc)  Note)The axis passes through the center of gravity.	$I=\frac{MD^2}{8}$	●In the case of rectangular solid  Note)The axis passes through the center of gravity.	$I=\frac{M}{12}(a^2+b^2)$
●In the case of arm (rotating around axis A)  M_1: weight of weight M_2: weight of arm ℓ_1: distance from axis A to weight center ℓ_2: arm length Axis A Axis B	$I=M_1\ell_1^2+I_1+\frac{M_2\ell_2^2}{3}$ I_1: inertia moment of the weight based on the axis (axis B) passing through the center of gravity of the weight	I (I_1): inertia moment kg·m² M (M_1, M_2): weight kg ℓ, a, b: length m D: diameter m	

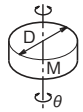
●Example

Select a type to rotate a 140-kg and ϕ2-m load 90°.

Weight of disc M=140 kg

Diameter of disc D=2 m

Rotating angle θ=90°=1.5708 rad



①Determine the inertia moment.

$I=\frac{MD^2}{8}=\frac{140\times2^2}{8}=70$ kg·m²

The rotating time at an inertia moment of 70 kg·m² is 5 seconds (ϕ80) according to Graph Ⓐ-2.

The rotating time in the cushioning zone is 3.5 seconds (ϕ80) according to Graph Ⓑ-2.

Therefore, adjust the flow control valve to obtain a rotating time of 5 seconds or more, and adjust the cushion to set the rotating time in the cushioning zone to 3.5 seconds.

②Determine the necessary torque.

θ_1=cushion angle θ_1 of 80 mm bore actuator is 18° (0.3142 rad).

Angular acceleration $\alpha=\frac{\theta-\theta_1}{t^2}=\frac{1.5708-0.3142}{5^2}=0.05$ rad/s²

The effective torque is 25 to 35% when the inertia force is high.
Therefore, the effective torque is regarded as 35%.

Required torque $T=\frac{I\alpha}{0.35}=\frac{70\times0.05}{0.35}=10$ kgf·m=98 N·m

According to the theoretical output torque charts, an 80 mm bore actuator is usable. Then, select 35RP2-SD80T90.

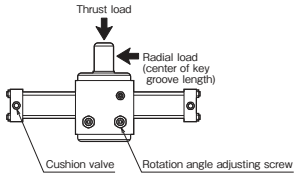
Notes) ●If the obtained intersection is in area Ⓐ, the kinetic energy of the load can be effectively absorbed if an external stopper and an external shock absorber are used.
●When an external shock absorber is used, use the actuator with the internal cushion fully open.

Precautions for use

⚠CAUTION

●To install the rotary actuator, use hex. head bolts (JIS B1180, strength class 10.9 or over) or hex. socket head cap screws (JIS B1176, strength class 10.9 or over).
1) Secure the actuator using all mounting holes.
2) Take care not to tighten the bolts unevenly. Tighten them to the tightening torque specified for the bolts used.
3) Take care not to apply any external load other than the main body load to the bolts. (Use durable mounting materials.)

●Take care that loads other than the following will not be applied directly to the shaft.



Allowable Radial and Thrust Loads

Unit: N

Bore mm \ Load	Radial load	Thrust load
ϕ32	686	392
ϕ40	1420	785
ϕ50	1860	1080
ϕ63	2450	1470
ϕ80	2940	1770

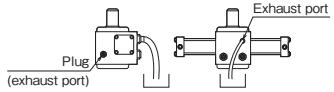
●At the rotating end of the rotary actuator, bring the shaft into contact with the rotation angle adjusting screw under the condition of sufficient cushioning effect. If the cushion is not effective, the rotation angle adjusting screw may be damaged.

Cushion Stroke Angle

Bore	Cushion angle
ϕ32	37°
ϕ40	31°
ϕ50	22°
ϕ63	17°
ϕ80	18°

●If the kinetic energy is so large that the cushion cannot absorb the energy, the rack and pinion or the key groove may be damaged. In this case, use a shock absorber.

●Before shipment, both exhaust ports are plugged to prevent leakage of gear oil during transportation.
Before starting the test run, remove the plug of the upper one of the two exhaust ports in the body, and connect a pipe to avoid accumulation of pressure in the body (to open to the atmosphere). If pressure is accumulated in the body, the oil seals may be damaged.



●Use gear oil equivalent to ISO VG680. Change the oil 500,000 times of actuation after the start of use and, after this, every 1,000,000 times. (The actuator has been charged with the above gear oil for a single time before shipment.)

●Pour the gear oil from the port to be used as an exhaust port.
(The oil quantity is shown in the following table.)

Oil Quantity

Unit: mℓ

Bore mm \ Rotating angle	90°	180°
ϕ32	80	90
ϕ40	180	190
ϕ50	270	300
ϕ63	430	490
ϕ80	740	850

Notes on installation

●To install the rotary actuator, use hex. head bolts (JIS B1180, strength class 10.9 or over) or hex. socket head cap screws (JIS B1176, strength class 10.9 or over).

●Use durable mounting materials.

Operation procedures

①When operating the rotary actuator for the first time, discharge air from the actuator at a low pressure. After the completion of discharge, start the actuator at a reduced pressure, and gradually increase the pressure to the working pressure. However, keep the pinion rotation speed (under no load) at about 1 sec at 90° or about 2 sec at 180° while increasing the pressure.

②Before starting the test run or adjusting the rotating speed or the cushion deceleration, loosen the rotation angle adjusting screw about five turns to avoid application of excessive load or impact to the rotation angle fine adjustment mechanism.

③Adjust the cushion while gradually increasing the rotation speed. (The cushion has not been adjusted before shipment.) If the rotation speed is increased at the beginning of operation, abnormal surge pressure may occur and damage the rotary actuator or machine.

④Adjust the rotating angle.
Before adjusting the rotating angle, turn the seal (Daithread) to separate it from the body end face, and after the completion of adjustment, turn it again to bring it into close contact with the body end face. Then, tighten the locknut.

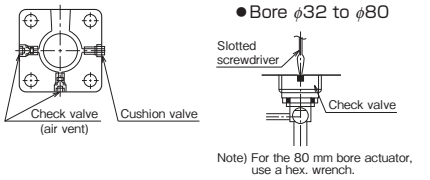
When overhauling the rotary actuator, replace all seals (seals and gaskets).

How to discharge air

⚠CAUTION

- If the check valve is loosened excessively during discharging of air, the valve may come off the cylinder, and it may fly out or the fluid may spout out.

[Position of check valve] [Detailed drawing of check valve]

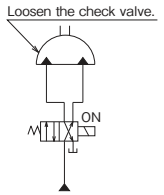


- Feed the fluid at a low pressure (minimum operating pressure: approx. 0.5 MPa) to the rotary actuator, loosen the check valve one or two turns (turn counterclockwise) to discharge air.

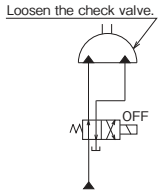
Note) Repeat these operations until air is completely discharged.

- After discharging air, tighten the check valve to the specified torque, and make sure that the fluid does not leak. [Specified torque: 8 to 10 N·m]

- When the rotary actuator turns clockwise



- When the rotary actuator turns counterclockwise



- Discharge air not only from the rotary actuator, but also from the piping. If air is left in the piping, the following operation failures may occur.

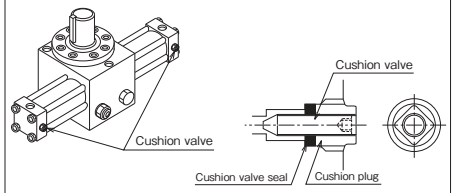
Phenomena

- The cylinder causes stick-slip.
- Smooth speed control cannot be made.
- Temperature rise caused by adiabatic compression can damage the seals.
- Shock and vibration are given to the outside.

How to adjust cushion

⚠CAUTION

- If the cushion valve or plug is excessively loosened while adjusting the cushion, the cushion valve or plug may come off the cylinder, and it may fly out, or the fluid may spout out.



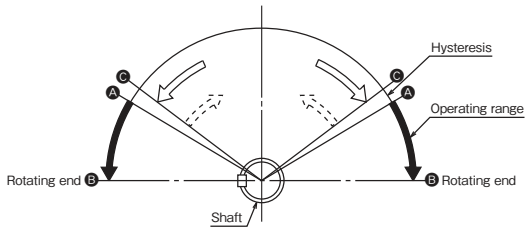
1) Loosen the cushion plug approx. 1/4 turn with a spanner.
2) Turn the cushion valve with a hex. wrench to adjust the speed.
   - Turn clockwise, and the cushion stroke speed will be decreased.
   - Turn counterclockwise, and the cushion stroke speed will be increased.

<Caution>

If the valve is excessively turned counterclockwise, the cushion will not be effective. If it is excessively turned clockwise, the cushion will work so effectively that the piston may not operate full stroke.
In addition, abnormal surge pressure may occur and damage the rotary actuator.

3) After the completion of adjustment of the cushion valve, secure the cushion valve with a hex. wrench, and tighten the cushion valve to the specified torque. [Specified torque: 12 to 15 N·m]
   Make sure that oil does not leak from any part. (If the tightening torque is insufficient, the fluid may leak.)
   - In the following cases, the cushioning effect cannot be obtained.
     - When the rotating speed is extremely low
     - When the rotating speed is high
     - When the inertia moment is large

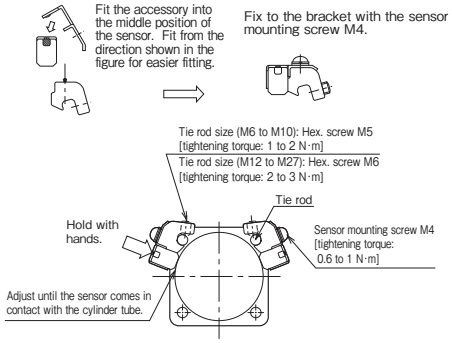
Operating Range and Hysteresis



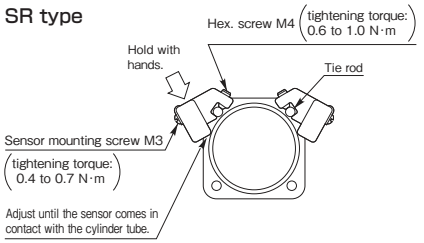
If the shaft rotates in the arrow ⇦ direction, the sensor turns on when the shaft reaches the sensor operating position Ⓐ. The sensor is kept on in the range from Ⓐ to Ⓑ. This range is called the operating range.
If the shaft turns in the reverse direction ⇨ after the shaft reaches the position Ⓐ and the sensor turns on, the sensor is kept on until the shaft reaches the position Ⓒ.
The distance between Ⓐ and Ⓒ is called hysteresis.

Setting method of sensor detecting position

AX type



SR type



1. Loosen the two set screws with an allen wrench, and move the sensor 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).