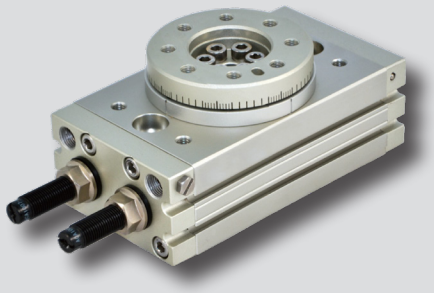
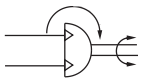
# KRQ series



Symbol



## Features

- Rack & Pinion type
- Double-cylinder structure doubles output
- Easy handling of wiring with hollow shaft
- Choose from 2 cushions

## How to order

KRQ ① | 20 ② | A ③

① Series

| | |
|---|---|
| KRQ | Rotary table cylinder |

② Size

| |
|---|
| 2 |
| 3 |
| 7 |
| 10 |
| 20 |
| 30 |
| 50 |
| 70 |
| 100 |
| 200 |

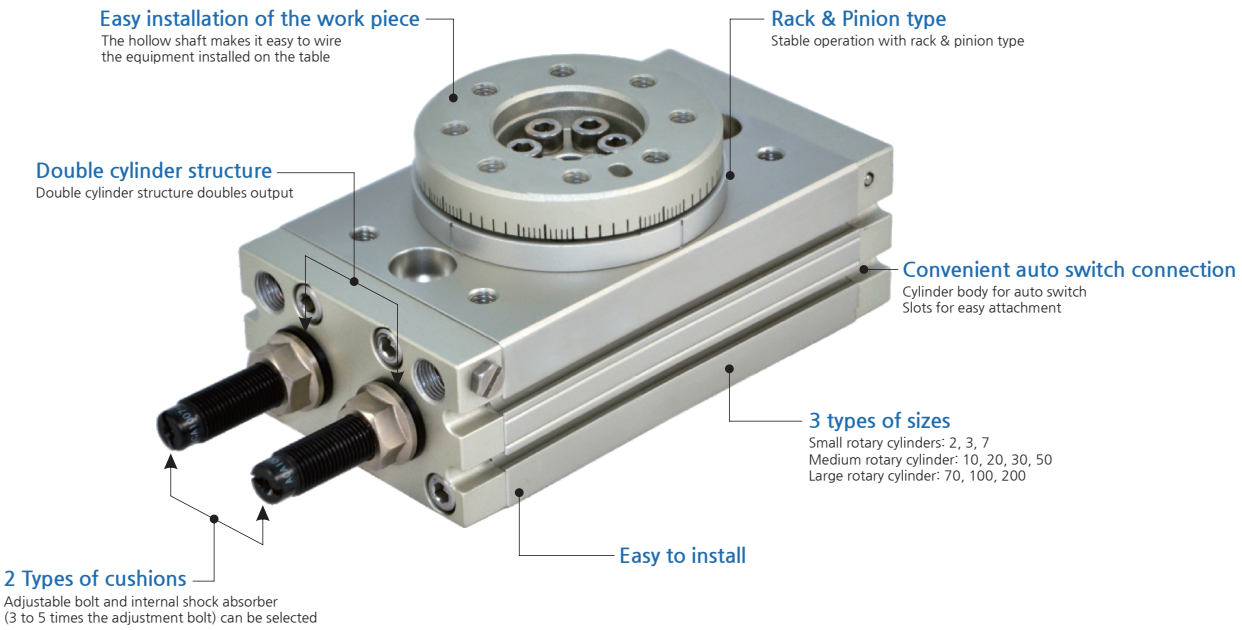
③ Type

| | |
|---|---|
| Nil | With adjustment bolt |
| A | With internal shock absorber (Only sizes 10-200 can be attached) |

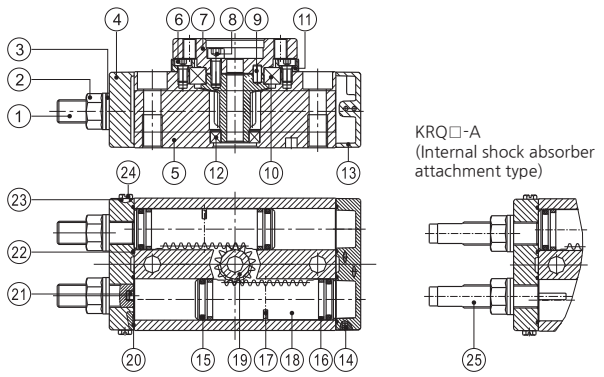
## Specifications

| Item/ Inner diameter (mm) | | 2 | 3 | 7 | 10 | 20 | 30 | 50 | 70 | 100 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Acting type | | Rack & Pinion (Double acting) | | | | | | | | | |
| Fluid | | Air | | | | | | | | | |
| Operating pressure | | 0.15~0.7MPa | | | | | | | | | |
| Proof pressure | | 1.2MPa | | | | | | | | | |
| Ambient & fluid temperature | | -20~70℃ | | | | | | | | | |
| Angle adjustment range | | 0~190° | | | | | | | | | |
| Repeat precision | With adjustment bolt | 0.2° | | | | | | | | | |
| | With shock absorber | - | - | - | 0.05° | | | | | | |
| Cushion type | With adjustment bolt | Rubber bumper | | | | | | | | | |
| | With shock absorber | - | - | - | Shock absorber | | | | | | |
| Port size | End port | M5x0.8 | | | | | 1/8 | | | | |
| | Side port | | | | | | M5x0.8 | | | | |
| Magnet | | Built-in magnet | | | | | | | | | |
| Weight(g) | | 120 | 175 | 270 | 535 | 940 | 1260 | 2060 | 2890 | 4100 | 7650 |

## Structure




## Structure

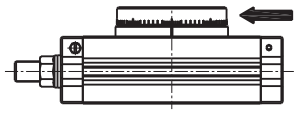
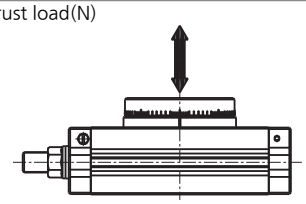
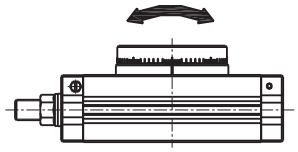



| No. | Parts | Material | No. | Parts | Material |
|---|---|---|---|---|---|
| 1 | Adjustment bolt | Carbon steel | 14 | Metal ball | Stainless steel |
| 2 | Hex nut | Carbon steel | 15 | Piston seal | NBR |
| 3 | Seal washer | Carbon steel & Rubber | 16 | Wear ring | Wear-resistant material |
| 4 | Front cover | Aluminum alloy | 17 | Magnet | Rare earth |
| 5 | Body | Aluminum alloy | 18 | Rack | Stainless/ Carbon steel |
| 6 | Hex head bolt | Carbon steel | 19 | Pinion | Chromium molybdenum steel |
| 7 | Table | Aluminum alloy | 20 | O-Ring | NBR |
| 8 | Hex head bolt | Carbon steel | 21 | Bumper | NBR |
| 9 | Parallel pins | Carbon steel | 22 | O-Ring | NBR |
| 10 | Deep groove bearings | Subassembly | 23 | O-Ring | NBR |
| 11 | Bearing retainer | Aluminum alloy | 24 | Hex screw | Stainless steel |
| 12 | Deep groove bearings | Subassembly | 25 | Shock absorber | Subassembly |
| 13 | Back cover | Aluminum alloy | | | |

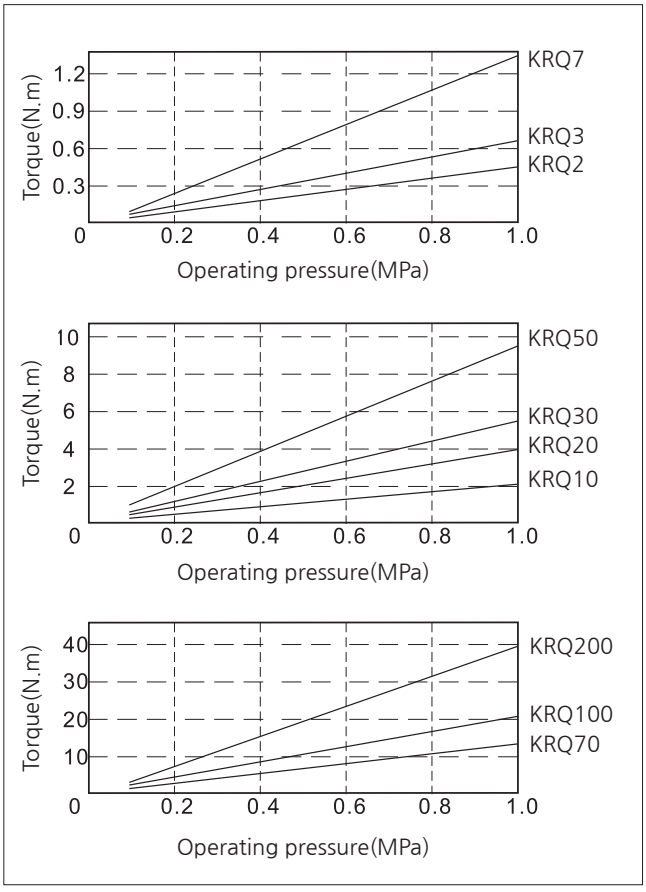
## Max. allowable kinetic energy and rotation time

| Model | Max. allowable energy(J) | | Rotation time(s/90°) | |
|---|---|---|---|---|
| | With adjustment bolt | With shock absorber | With adjustment bolt | With shock absorber |
| KRQ2 | 0.0015 | - | 0.2~0.7 | - |
| KRQ3 | 0.002 | - | 0.2~0.7 | - |
| KRQ7 | 0.006 | - | 0.2~1.0 | - |
| KRQ10 | 0.01 | 0.04 | 0.2~1.0 | 0.2~0.7 |
| KRQ20 | 0.025 | 0.12 | 0.2~1.0 | 0.2~0.7 |
| KRQ30 | 0.05 | 0.12 | 0.2~1.0 | 0.2~0.7 |
| KRQ50 | 0.08 | 0.30 | 0.2~1.0 | 0.2~0.7 |
| KRQ70 | 0.24 | 1.1 | 0.2~1.5 | 0.2~1.0 |
| KRQ100 | 0.32 | 1.6 | 0.2~2.0 | 0.2~1.0 |
| KRQ200 | 0.56 | 2.9 | 0.2~2.5 | 0.2~1.0 |

## Max. allowable load

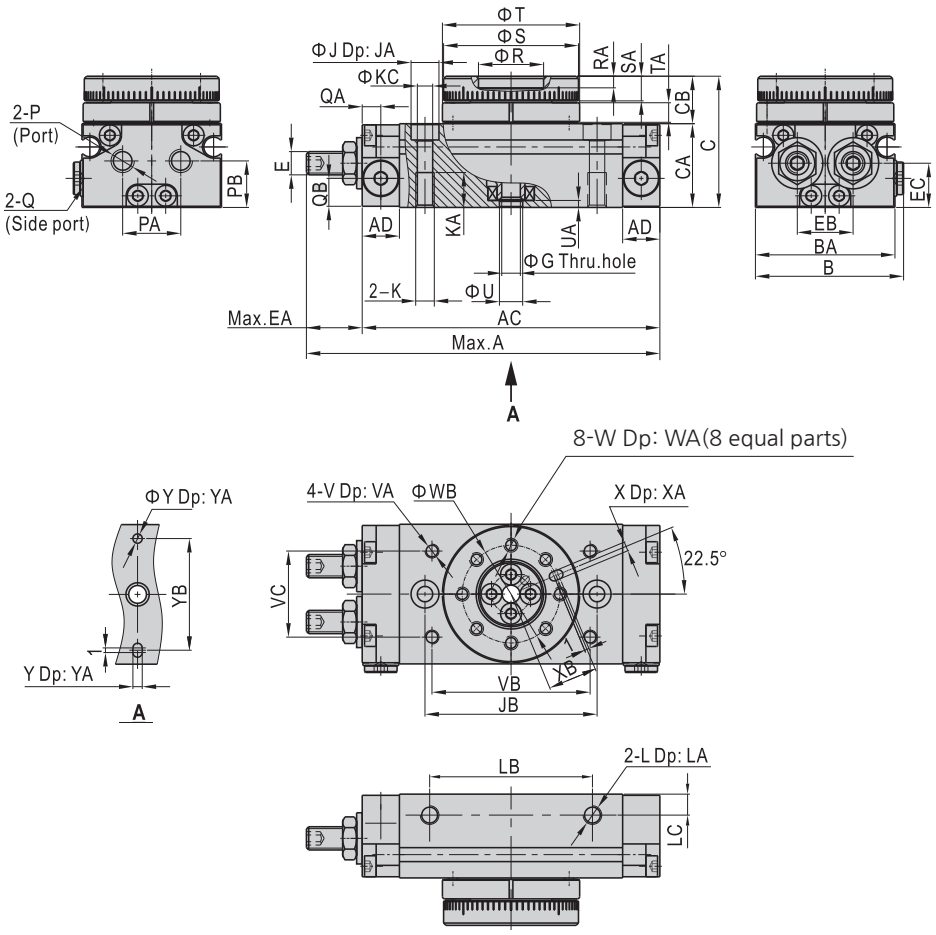
| Load type | Model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | KRQ2 | KRQ3 | KRQ7 | KRQ10 | KRQ20 | KRQ30 | KRQ50 | KRQ70 | KRQ100 | KRQ200 |
| Radial load(N)  | 18 | 30 | 50 | 80 | 150 | 200 | 300 | 330 | 390 | 540 |
| Trust load(N)  | 35 | 50 | 70 | 80 | 150 | 200 | 300 | 300 | 500 | 740 |
| Bending moment(N.m)  | 0.8 | 1.1 | 1.5 | 2.5 | 4.0 | 5.5 | 10.0 | 12.0 | 18.0 | 25.0 |

## Effective torque



## Dimensions

**KRQ2, 3, 7**



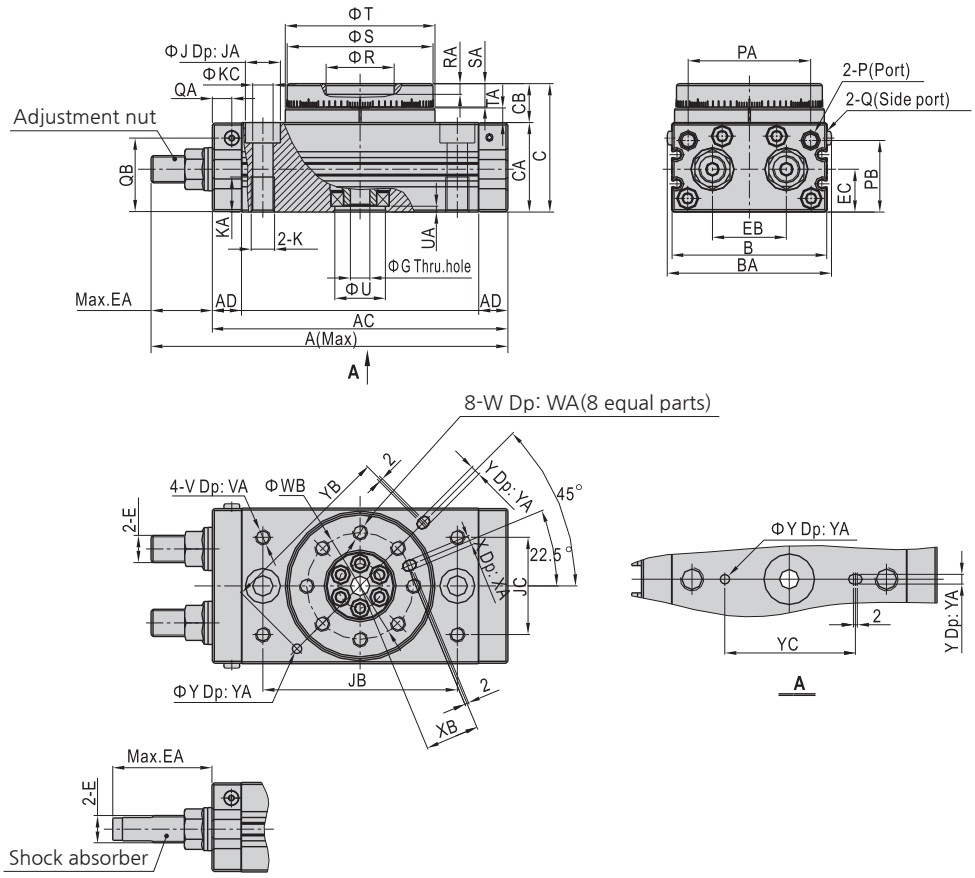

Unit:mm

| Model | A | AC | AD | B | BA | C | CA | CB | E | EA | EB | EC | G | J | JA | JB | K | KA | KC | L | LA | LB | LC | P | PA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ2 | 76 | 64 | 8 | 32 | 30 | 28 | 18 | 10 | M5x0.8 | 12 | 12 | 9.5 | 4 | 6 | 3.5 | 37 | M4x0.7 | 7.5 | 3.5 | M4x0.7 | 4 | 35 | 4.5 | M5x0.8 | 12.5 |
| KRQ3 | 82 | 70 | 8 | 36.5 | 34.5 | 30.5 | 20.5 | 10 | M5x0.8 | 12 | 15.5 | 10.5 | 5 | 7.5 | 4.5 | 43 | M5x0.8 | 8.5 | 4.5 | M4x0.7 | 4 | 40 | 4.5 | M5x0.8 | 15.5 |
| KRQ7 | 94.5 | 79.5 | 8 | 43 | 41 | 34.5 | 23 | 11.5 | M6x1.0 | 15 | 18.5 | 12 | 6 | 7.5 | 4.5 | 50 | M5x0.8 | 8.5 | 4.5 | M5x0.8 | 5 | 50 | 5 | M5x0.8 | 18.5 |

| Model | PB | Q | QA | QB | R | RA | S | SA | T | TA | U | UA | V | VA | VB | VC | W | WA | WB | X | XA | XB | Y | YA | YB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ2 | 10 | M5x0.8 | 4 | 6 | 14(H9) | 2.5 | 29(h9) | 5.5 | 29.5(h9) | 4 | 5(H9) | 1.5 | M3x0.5 | 3.5 | 34 | 18.5 | M3x0.5 | 5.5 | 21 | 2(H9) | 2 | 10.5 | 2(H9) | 2 | 24 |
| KRQ3 | 12 | M5x0.8 | 4 | 7.5 | 17(H9) | 2.5 | 33(h9) | 5.5 | 34(h9) | 4 | 6(H9) | 1.5 | M3x0.5 | 3.5 | 38 | 23 | M3x0.5 | 5.5 | 25 | 2(H9) | 2 | 12.5 | 2(H9) | 2 | 28 |
| KRQ7 | 14 | M5x0.8 | 4 | 9 | 20(H9) | 3 | 39(h9) | 6.5 | 40(h9) | 4.5 | 7(H9) | 1.5 | M4x0.7 | 4.5 | 45 | 30 | M4x0.7 | 6.5 | 29 | 3(H9) | 3 | 14.5 | 3(H9) | 3 | 32 |

## Dimensions

**KRQ10~50**




KRQ□-A(Internal shock absorber attachment type)

Unit:mm

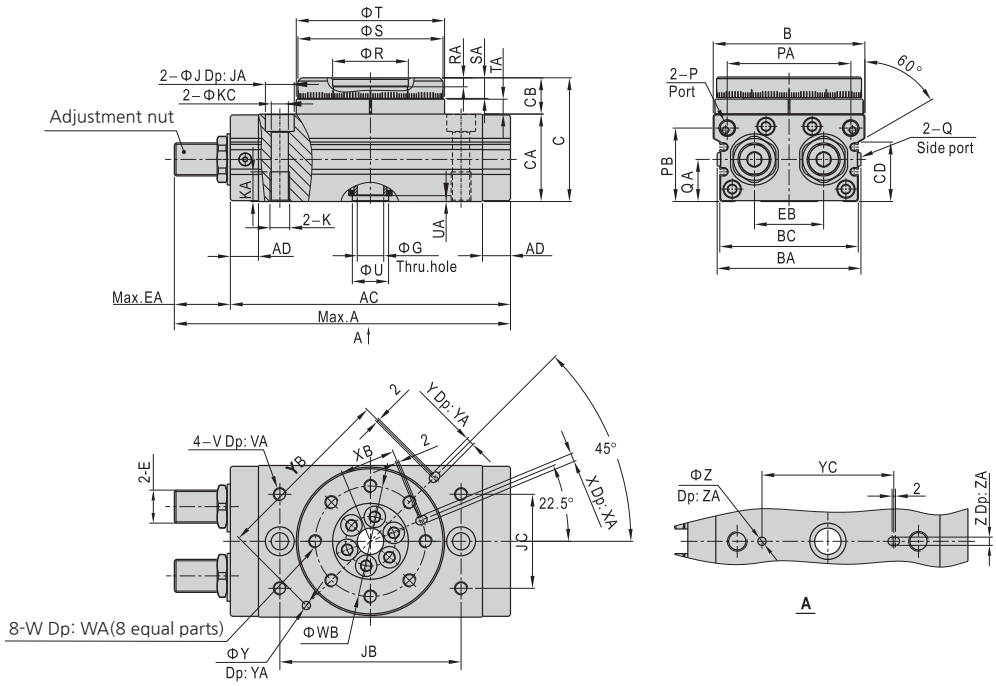
| Model | A (With shock absorber) | A (Adjustment bolt mounting) | AC | AD | B | BA | C | CA | CB | E | EA (With shock absorber) | EA (Adjustment bolt mounting) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ10 | 123 | 112 | 92 | 9.5 | 50 | 54 | 47 | 34 | 13 | M10x1.0 | 31 | 20 |
| KRQ20 | 169 | 145.3 | 117 | 11 | 65 | 69 | 54 | 37 | 17 | M12x1.0 | 52 | 28.3 |
| KRQ30 | 178.5 | 154.5 | 127 | 11.5 | 70 | 74 | 57 | 40 | 17 | M12x1.0 | 51.5 | 27.5 |
| KRQ50 | 212 | 185.9 | 152 | 15 | 80 | 84 | 66 | 46 | 20 | M14x1.5 | 60 | 33.9 |

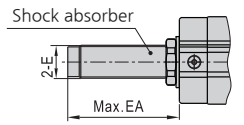
| Model | EB | EC | G | J | JA | JB | JC | K | KA | KC | P | PA | PB | Q | QA | QB | R | RA | S | SA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ10 | 20.5 | 14 | 5 | 11 | 6.5 | 60 | 27 | M8x1.25 | 12 | 6.5 | M5x0.8 | 34.5 | 28 | M5x0.8 | 4.5 | 29 | 20(H9) | 4.5 | 45(h9) | 8 |
| KRQ20 | 27.5 | 16 | 9 | 14 | 8.5 | 76 | 34 | M10x1.5 | 15 | 8.5 | M5x0.8 | 47 | 30 | M5x0.8 | 6 | 30 | 28(H9) | 6.5 | 60(h9) | 10 |
| KRQ30 | 29 | 18.5 | 9 | 14 | 8.5 | 84 | 37 | M10x1.5 | 15 | 8.5 | 1/8" | 50 | 32 | M5x0.8 | 6.5 | 34 | 32(H9) | 5 | 65(h9) | 10 |
| KRQ50 | 38 | 22 | 10 | 17.5 | 12 | 100 | 50 | M12x1.75 | 18 | 10.5 | 1/8" | 63 | 38 | M5x0.8 | 10 | 38 | 35(H9) | 5.5 | 75(h9) | 12 |

| Model | T | TA | U | UA | V | VA | W | WA | WB | X | XA | XB | Y | YA | YB | YC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ10 | 46(h9) | 4.5 | 15(H9) | 3 | M5x0.8 | 8 | M5x0.8 | 8 | 32 | 3(H9) | 3.5 | 16 | 3(H9) | 3.5 | 56 | 40 |
| KRQ20 | 61(h9) | 6.5 | 17(H9) | 2.5 | M6x1.0 | 8 | M6x1.0 | 10 | 43 | 4(H9) | 4.5 | 21.5 | 4(H9) | 4.5 | 74 | 50 |
| KRQ30 | 67(h9) | 6.5 | 22(H9) | 3 | M6x1.0 | 8 | M6x1.0 | 10 | 48 | 4(H9) | 5 | 24 | 4(H9) | 4.5 | 80 | 58 |
| KRQ50 | 77(h9) | 7.5 | 26(H9) | 3 | M8x1.25 | 8 | M8x1.25 | 12 | 55 | 5(H9) | 6 | 27.5 | 5(H9) | 5.5 | 92 | 68 |

## Dimensions

**KRQ70~200**




KRQ□-A(Internal shock absorber attachment type)

Unit:mm

| Model | A (With shock absorber) | A (Adjustment bolt mounting) | AC | AD | B | BA | BC | C | CA | CB | CD | E | EA (With shock absorber) | EA (Adjustment bolt mounting) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ70 | 206.8 | 244 | 170 | 17 | 92 | 88 | 84 | 75 | 53 | 22 | 36 | M20x1.5 | 36.8 | 74 |
| KRQ100 | 225.7 | 263 | 189 | 17 | 102 | 99 | 95 | 86 | 59 | 27 | 42 | M20x1.5 | 36.7 | 74 |
| KRQ200 | 279.5 | 316.5 | 240 | 24 | 120 | 117 | 113 | 106 | 74 | 32 | 57 | M27x1.5 | 39.5 | 76.5 |

| Model | EB | G | J | JA | JB | JC | K | KA | KC | P | PA | PB | Q | QA | R | RA | S | SA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ70 | 42 | 16 | 17.5 | 12 | 110 | 57 | M12x1.75 | 18 | 10.5 | 1/8" | 75 | 44.5 | M5x0.8 | 25.5 | 46(H9) | 5 | 88(h9) | 12.5 |
| KRQ100 | 50 | 19 | 17.5 | 12 | 130 | 66 | M12x1.75 | 18 | 10.5 | 1/8" | 85 | 50.5 | M5x0.8 | 29.5 | 56(H9) | 6 | 98(h9) | 14.5 |
| KRQ200 | 60 | 24 | 20 | 12.5 | 150 | 80 | M16x2.0 | 25 | 14 | 1/8" | 103 | 63 | M5x0.8 | 36.5 | 64(H9) | 9 | 116(h9) | 16.5 |

| Model | T | TA | U | UA | V | VA | W | WA | WB | X | XA | XB | Y | YA | YB | YC | Z | ZA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KRQ70 | 90(h9) | 9 | 22(H9) | 3.5 | M8x1.25 | 10 | M8x1.25 | 12.5 | 67 | 5(H9) | 5.5 | 335 | 5(H9) | 3.5 | 110 | 80 | 5(H9) | 3.5 |
| KRQ100 | 100(h9) | 12 | 24(H9) | 3.5 | M8x1.25 | 10 | M10x1.5 | 14.5 | 77 | 6(H9) | 6.5 | 38.5 | 6(H9) | 4.5 | 120 | 100 | 6(H9) | 4.5 |
| KRQ200 | 118(h9) | 15 | 32(H9) | 5.5 | M12x1.75 | 13 | M12x1.75 | 16.5 | 90 | 8(H9) | 8.5 | 45 | 8(H9) | 4.5 | 140 | 110 | 8(H9) | 6.5 |

## How to select a model

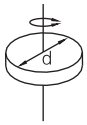
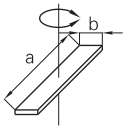
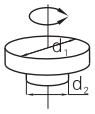
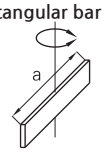
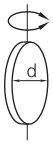
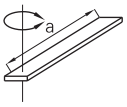
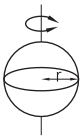
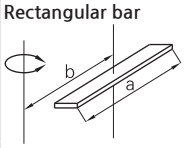
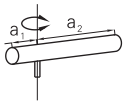
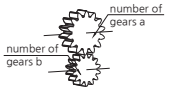
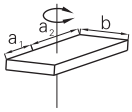
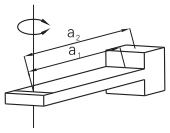
1. The usage conditions are listed according to the situation, such as the mounting position and the shape of the workpiece.
 1) Rotation angle θ: The rotation angle must be within the maximum allowable rotation angle of the cylinder.
 2) Rotation time t: Rotation time must be set within the range specified in the catalog.
 3) Cylinder installation location: Secure enough space for cylinder and workpiece rotation.
 4) Determination of load mass and shape

$T = K \times I \times \omega$

$\omega = \frac{2\theta}{t^2}$

T: Calculate the required torque
K: Safety factor (to be 5 or more)
I: Moment of inertia (kg.m2)
ω: Angular acceleration (rad/s2)
θ: Rotation angle (rad)
t: Rotation time (s)

2. Calculate the required torque(T(N.m)):
 Calculate the moment of inertia according to the formula below and select a cylinder by combining it with a formula suitable for the shape.
 1) How to calculate moment of inertia according to shape

| Shape | Explain | Moment of inertia | Turning radius | Shape | Explain | Moment of inertia | Turning radius |
|---|---|---|---|---|---|---|---|
| Disk  | d: Diameter(m)<br>m: Weight(kg) | $I=\frac{md^2}{8}$ | $\frac{d^2}{8}$ | Rectangular bar  | a: Length(m)<br>b: Side length(m)<br>m: Weight(kg) | $I=\frac{m(a^2+b^2)}{12}$ | $\frac{a^2+b^2}{12}$ |
| | | Irrespective of the mounting direction | | | | Irrespective of the mounting direction | |
| End sticking disk  | $d_1$: Diameter(m)<br>$d_2$: Diameter(m)<br>$m_1$: $d_1$ Weight(kg)<br>$m_2$: $d_2$ Weight(kg) | $I=\frac{m_1d_1^2+m_2d_2^2}{8}$ | $\frac{d_1^2+d_2^2}{8}$ | Rectangular bar  | a: Length(m)<br>m: Weight(kg) | $I=\frac{ma^2}{12}$ | $\frac{a^2}{12}$ |
| | | If d2 is very small compared to d1, it is negligible | | | | Irrespective of the mounting direction | |
| Disk  | d: Diameter(m)<br>m: Weight(kg) | $I=\frac{md^2}{16}$ | $\frac{d^2}{16}$ | Rectangular bar  | a: Length(m)<br>m: Weight(kg) | $I=\frac{ma^2}{3}$ | $\frac{a^2}{3}$ |
| | | Irrespective of the mounting direction | | | | Mounting direction: horizontality<br>Rotation time changes when the mounting direction is vertical | |
| Orb  | r: Radius(m)<br>m: Weight(kg) | $I=\frac{2mr^2}{5}$ | $\frac{2r^2}{5}$ | Rectangular bar  | a: Length(m)<br>b: Distance from the axis of rotation to the center of load (m)<br>m: Weight(kg) | $I=\frac{ma^2}{12}+mb^2$ | $\frac{a^2}{12}+b^2$ |
| | | Irrespective of the mounting direction | | | | The cube is the same | |
| Thin rod  | $a_1$: Length(m)<br>$a_2$: Length(m)<br>$m_1$: $a_1$ Weight(kg)<br>$m_2$: $a_2$ Weight(kg) | $I=\frac{m_1a_1^2+m_2a_2^2}{3}$ | $\frac{a_1^2+a_2^2}{3}$ | Gear  | a: Number of gears on the rotary side(m)<br>b: Number of gears on the load side(m)<br>m: Weight(kg) | $I_a=(\frac{a}{b})^2 I_b$ | |
| | | Mounting direction: horizontality<br>Rotation time changes when the mounting direction is vertical | | | | | |
| Rectangular plate  | $a_1$: Length(m)<br>$a_2$: Length(m)<br>b: Side length(m)<br>$m_1$: $a_1$ Weight(kg)<br>$m_2$: $a_2$ Weight(kg) | $I=\frac{m_1(4a_1^2+b^2)+m_2(4a_2^2+b^2)}{12}$ | $\frac{2a_1^2+2a_2^2+b^2}{6}$ | Concentrated load  | $a_1$: Length to center of concentrated load<br>$a_2$: Arm length(m)<br>b: Side length(m)<br>$m_1$: Concentrated load weight(kg)<br>$m_2$: Weight of arm(kg) | $I=m_1a_1^2+\frac{m_2a_2^2}{3}+m_1K$ | |
| | | Mounting direction: horizontality<br>Rotation time changes when the mounting direction is vertical | | | | Mounting direction: horizontal<br>If m2 is very small compared to m1, m2 is 0. can be calculated | |

3. Calculation of maximum kinetic energy Emax(J):
 Calculate the maximum kinetic energy according to the formula below and check that the kinetic energy is within the allowable kinetic energy range of the selected cylinder. Exceeding the allowable range may cause damage to the cylinder. If the kinetic energy is large, select a cylinder equipped with a shock absorber, etc.

$E_{max}=\frac{1}{2} I\omega^2_{max}$ $\omega^2_{max}=\frac{2\theta}{t^2}$ $\omega_{max}$=maximum angular acceleration

4. Calculation of load factor:
 Calculate the load factor according to the formula below, and the sum of the load factors should not exceed 1.

$$\text{Load factor}=\frac{W_s}{\text{Max. allowable axial load}}+\frac{W_r}{\text{Max. allowable radial load}}+\frac{M}{\text{Max. allowable bending moment}} \le 1$$

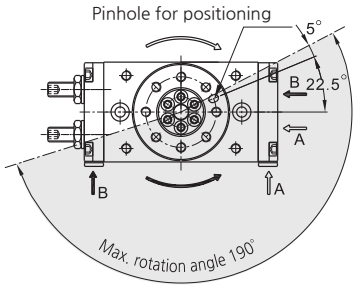
$W_s$ = Axial load $W_r$= Radial load M= Bending moment

5. Selection method:
 The selected cylinder must satisfy all conditions 2, 3 and 4 to be used.

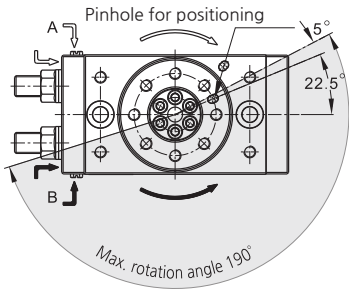
## Installation and application method

Direction of rotation and angle of rotation:

**KRQ2,3,7**



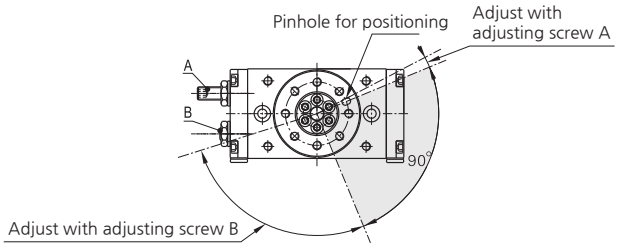

**KRQ10~200**



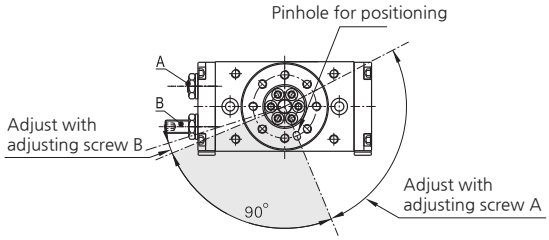

By adjusting with the adjusting bolt, the rotary end can be set within the range shown in the figure below. (Max. rotation angle 190°) The rotary table rotates clockwise when pressurizing port A and counterclockwise when pressurizing port B.
Rotation range example (90° rotation)

**KRQ2,3,7**

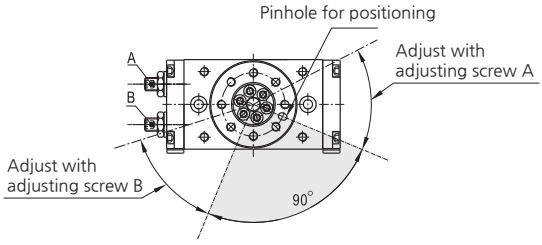
Adjustable width with adjusting bolt B




Adjustable width with adjusting bolt A

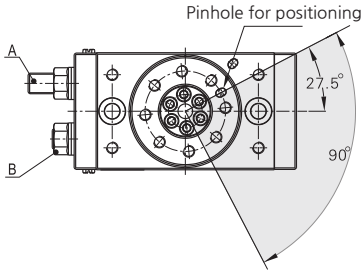



Adjustable width with adjusting bolt A, B

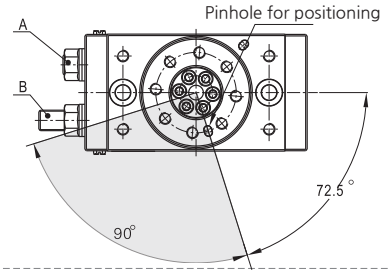



**KRQ10~200**

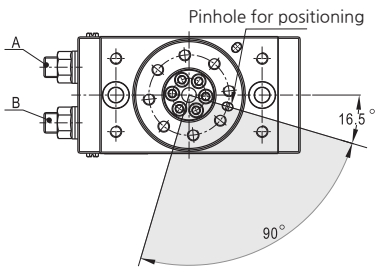
Adjustable width with adjusting bolt B




Adjustable width with adjusting bolt B




Adjustable width with adjusting bolt A, B




The rotation angle can also be adjusted for the type with absorber bar attached inside.

| Model | Adjustment angle per rotation (adjustment screw type) | Model | Adjustment angle per rotation (adjustment screw or shock absorber type) |
|---|---|---|---|
| KRQ2 | 11.5° | KRQ10 | 10.2° |
| KRQ3 | 10.9° | KRQ20 | 6.5° |
| KRQ7 | 10.2° | KRQ30 | 6.5° |
| | | KRQ50 | 8.2° |
| | | KRQ70 | 7.0° |
| | | KRQ100 | 6.1° |
| | | KRQ200 | 4.9° |

The rotation angle range is adjusted to the maximum from the factory, so do not forcibly enlarge the rotation angle.
If the kinetic energy exceeds the allowable range, the cylinder is damaged.
The rotating parts do not require lubrication.
The KRQ series is equipped with shock absorbers such as rubber bumpers and shock absorbers. Therefore, adjust the rotation under pressure.
(Minimum operating pressure: 0.1 MPa or more for adjustment bolt type and internal shock absorber type.)
Refer to the table below for the proper tightening torque when fixing the shock absorber.

| Shock absorber size | Max. tightening torque (Nm) |
|---|---|
| M10 | 3.5 |
| M12 | 8.0 |
| M14 | 11.0 |
| M20 | 24.0 |
| M27 | 63.0 |

Do not loosen the screws (not adjusting screws) on the underside of the shock absorber. It may cause leakage.
The shock absorber is a consumable item and must be replaced when a decrease in the amount of shock absorption is confirmed.

| Cylinder model | Shock absorber |
|---|---|
| KRQ10 | ACA1006-A |
| KRQ10,30 | ACA1215-A |
| KRQ50 | ACA1416-A |
| KRQ70,100 | ACA2020-A |
| KRQ200 | ACA2725-A |

Do not loosen the screws (not adjusting screws) on the underside of the shock absorber. It may cause leakage.
The shock absorber is a consumable item and must be replaced when a decrease in the amount of shock absorption is confirmed.