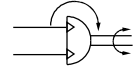




# Rotary table cylinder—HRQ Series

Specification: 2, 3, 7, 10, 20, 30, 50, 70, 100, 200



## Ordering code

**HRQ 30 A T**

① ② ③ ④

### ① Model

HRQ: Rotary Table/Rack & Pinion Style

### ② Specification

2 3 7 10 20 30 50 70 100 200

### ③ Cushion type

Specification	Cushion type
2 3 7	Blank: With adjustment bolt
10 20 30 50	Blank: With adjustment bolt
70 100 200	A: With internal shock absorber

[Note] HRQ series are all attached with magnet.

### ④ Thread type

Specification	Thread type
2 3 7 10 20	No this code
30 50 70 100 200	T: NPT

## Product feature

1. Rack and pinion design, stable functioning.
2. Double cylinder structure, double output could be achieved.
3. The manufacturing precision of working platform is high, and is easy for installation, and is of precise orientation.
4. The center of working platform has a through hole, and pipe can be located and passed through this hole;
5. Guide hole is designed on the both side of the cylinder body (10~200) or undersurface (2~7), which is simply to install.
6. Two modes of buffer could be chosen, adjustment bolt buffer and internal shock absorber, the maximum buffer energy of internal shock absorber is 3-5 times that of adjustment bolt buffer.

## Maximum allowed movement energy and rotation times

Model	Maximal allowed energy (J)		Rotation times (s/90°)	
	With adjustment bolt	With internal shock absorber	With adjustment bolt	With internal shock absorber
HRQ2	0.0015	-	0.2~0.7	-
HRQ3	0.002	-	0.2~0.7	-
HRQ7	0.006	-	0.2~1.0	-
HRQ10	0.01	0.04	0.2~1.0	0.2~0.7
HRQ20	0.025	0.12	0.2~1.0	0.2~0.7
HRQ30	0.05	0.12	0.2~1.0	0.2~0.7
HRQ50	0.08	0.30	0.2~1.0	0.2~0.7
HRQ70	0.24	1.1	0.2~1.5	0.2~1.0
HRQ100	0.32	1.6	0.2~2.0	0.2~1.0
HRQ200	0.56	2.9	0.2~2.5	0.2~1.0

[Note] 1: The movement energy should not exceed the allowed maximum energy, or the inner accessories of product would be damaged;  
2: When the rotation times of with shock absorber is larger than the allowed tolerance, the bigger effect will be lost.



# Rotary table cylinder

**AIRTAC**

## HRQ Series

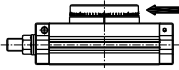
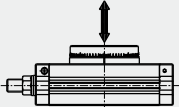
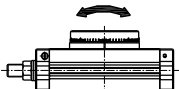
Specification: 2, 3, 7, 10, 20, 30, 50, 70, 100, 200

### Specification

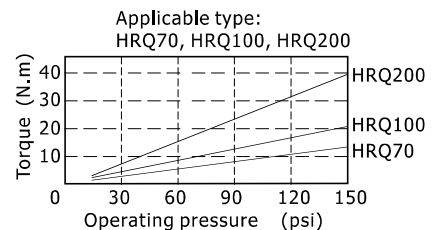
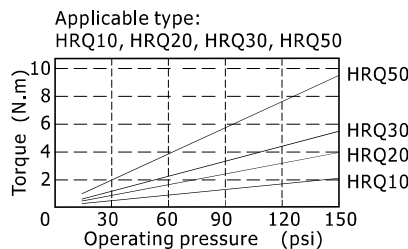
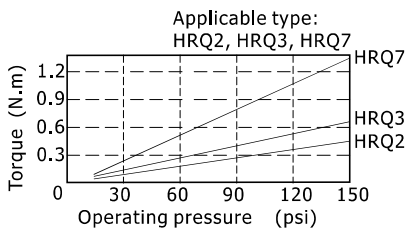
Specification		2	3	7	10	20	30	50	70	100	200	
Acting type		Double rack and pinion(Double acting)										
Fluid		Air(to be filtered by 40μm filter element)										
Operating pressure	With adjustment bolt	37~100psi(0.25~0.7MPa)			29~100psi(0.2~0.7MPa)			22~100psi(0.15~0.7MPa)				
	With internal shock absorber	-			-			22~100psi(0.15~0.7MPa)				
Proof pressure		175psi(1.2MPa)										
Temperature		-20~70°C										
Angle adjustment range		0~190°							0~190°			
Repeatable precision	With adjustment bolt	0.2°										
	With internal shock absorber	-			0.05°							
Theoretic moment (Nm)(0.5MPa)		0.2	0.33	0.63		1.1	2.2	2.8	5.0	7.5	11.0	22.0
Cushion type	With adjustment bolt	Rubber bumper										
	With internal shock absorber	-			Shock absorber							
Port size	End ports	M5×0.8					1/8" [Note1]					
	Side ports	M5×0.8										
Weight g		120	175	270		535	940	1260	2060	2890	4100	7650

[Note1] NPT thread is available. Add) Refer to P530 for detail of sensor.

### Maximum allowed loading

Loading type	Model									
	HRQ2	HRQ3	HRQ7	HRQ10	HRQ20	HRQ30	HRQ50	HRQ70	HRQ100	HRQ200
Maximum allowed radial loading (N) 	18	30	50	80	150	200	300	330	390	540
Maximum allowed axial loading (N) 	35	50	70	80	150	200	300	300	500	740
Maximum allowed bending moment (Nm) 	0.8	1.1	1.5	2.5	4.0	5.5	10.0	12.0	18.0	25.0

### Actual torque output

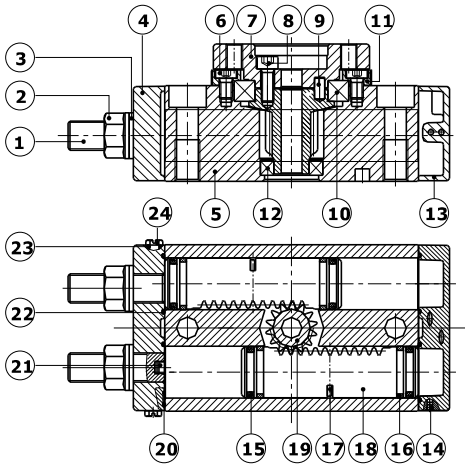


# Rotary table cylinder

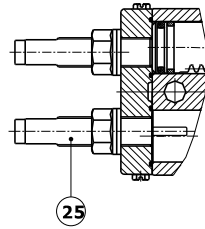
## HRQ Series

Specification: 2, 3, 7, 10, 20, 30, 50, 70, 100, 200

### Inner structure



HRQ□-A  
(With internal shock absorber)



NO.	Item
1	Adjustment bolt
2	Hexagon nut
3	Seal washer
4	Front cover
5	Body
6	Hexagon socket head cap bolt
7	Table
8	Hexagon socket head cap bolt
9	Guide pin/flat key
10	Deep-groove bearing
11	Bearing retainer
12	Deep-groove bearing/Needle bearing
13	Back cover
14	Steel ball
15	Piston seal
16	Wear ring
17	Magnet
18	Rack
19	Pinion
20	O-ring
21	Bumper
22	O-ring
23	O-ring
24	Hexagon screw
25	Shock absorber

Note: inner structure & material data sheet is based on certain bore size.  
Please contact AirTAC if you need inner structure & material data sheet for specific bore size.

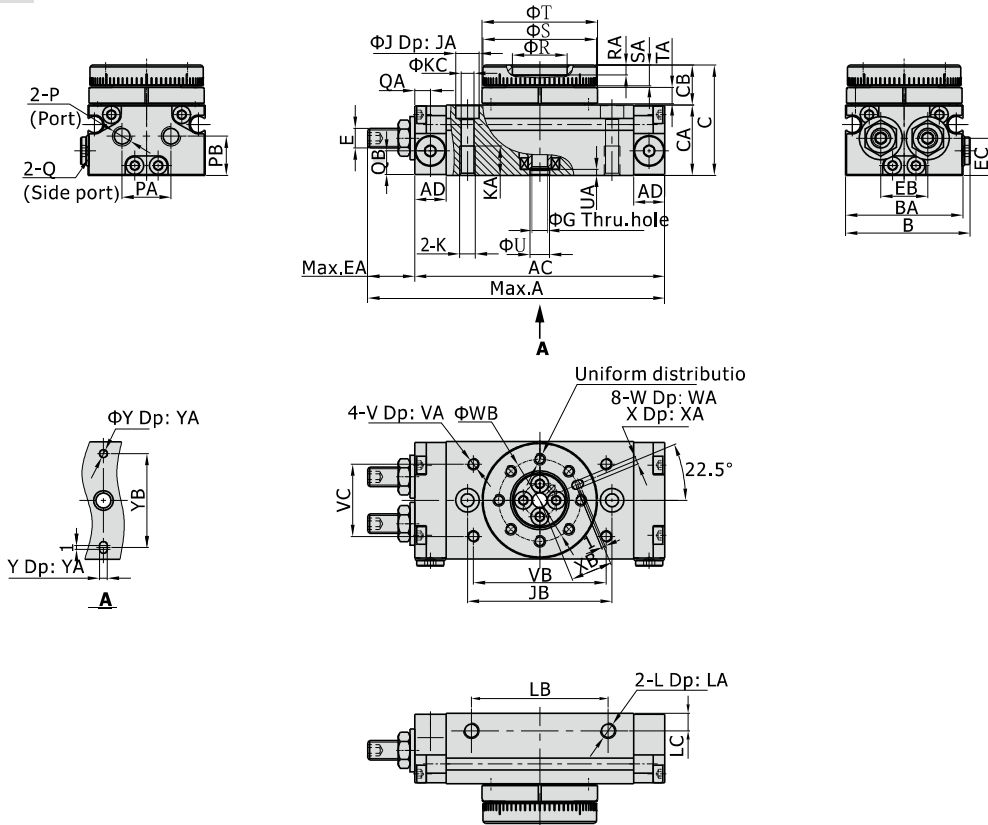
# Rotary table cylinder

## HRQ Series

Specification: 2, 3, 7, 10, 20, 30, 50, 70, 100, 200

### Dimensions

#### HRQ2/3/7



[Unit: mm]

Type\Item	A	AC	AD	B	BA	C	CA	CB	E	EA	EB	EC	G
2	76	64	8	32	30	28	18	10	M5×0.8	12	12	9.5	4
3	82	70	8	36.5	34.5	30.5	20.5	10	M5×0.8	12	15.5	10.5	5
7	94.5	79.5	8	43	41	34.5	23	11.5	M6×1.0	15	18.5	12	6

Type\Item	J	JA	JB	K	KA	KC	L	LA	LB	LC	P	PA
2	6	3.5	37	M4×0.7	7.5	3.5	M4×0.7	4	35	4.5	M5×0.8	12.5
3	7.5	4.5	43	M5×0.8	8.5	4.5	M4×0.7	4	40	4.5	M5×0.8	15.5
7	7.5	4.5	50	M5×0.8	8.5	4.5	M5×0.8	5	50	5	M5×0.8	18.5

Type\Item	PB	Q	QA	QB	R	RA	S	SA	T	TA	U	UA
2	10	M5×0.8	4	6	14(H9)	2.5	29(h9)	5.5	29.5	4	5(H9)	1.5
3	12	M5×0.8	4	7.5	17(H9)	2.5	33(h9)	5.5	34	4	6(H9)	1.5
7	14	M5×0.8	4	9	20(H9)	3	39(h9)	6.5	40	4.5	7(H9)	1.5

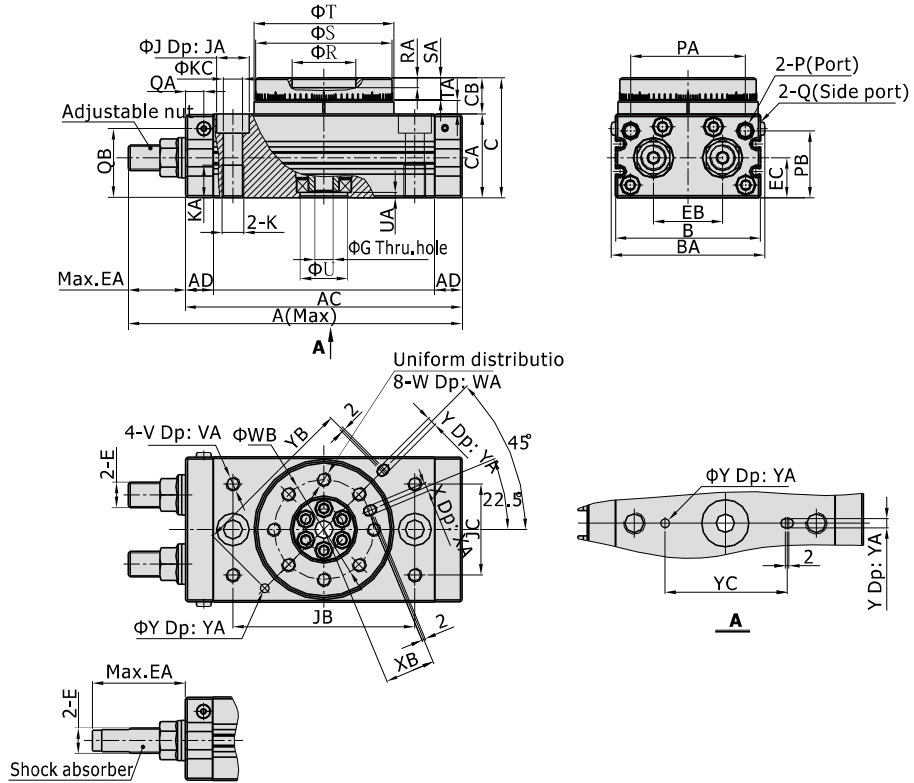
Type\Item	V	VA	VB	VC	W	WA	WB	X	XA	XB	Y	YA	YB
2	M3×0.5	3.5	34	18.5	M3×0.5	5.5	21	2(H9)	2	10.5	2(H9)	2	24
3	M3×0.5	3.5	38	23	M3×0.5	5.5	25	2(H9)	2	12.5	2(H9)	2	28
7	M4×0.7	4.5	45	30	M4×0.7	6.5	29	3(H9)	3	14.5	3(H9)	3	32

# Rotary table cylinder

## HRQ Series

Specification: 2, 3, 7, 10, 20, 30, 50, 70, 100, 200

### HRQ10~50



HRQ□-A (With internal shock absorber)

[Unit: mm]

Type\Item	A(With internal shock absorber)	A(With adjustment bolt)	AC	AD	B	BA	C	CA	CB
10	123	112	92	9.5	50	54	47	34	13
20	169	145	117	11	65	69	54	37	17
30	178.5	154.5	127	11.5	70	74	57	40	17
50	212	186	152	15	80	84	66	46	20

Type\Item	E	EA(With internal shock absorber)	EA(With adjustment bolt)	EB	EC	G	J	JA
10	M10×1.0	31	20	20.5	15	5	11	6.5
20	M12×1.0	52	28	27.5	16	9	14	8.5
30	M12×1.0	51.5	27.5	29	18.5	9	14	8.5
50	M14×1.5	60	34	38	22	10	17.5	12

Type\Item	JB	JC	K	KA	KC	P	PA	PB	Q	QA	QB	R	RA	S	SA
10	60	27	M8×1.25	12	6.5	M5×0.8	34.5	28	M5×0.8	4.5	29	20(H9)	4.5	45(h9)	8
20	76	34	M10×1.5	15	8.5	M5×0.8	47	30	M5×0.8	6	30	28(H9)	6.5	60(h9)	10
30	84	37	M10×1.5	15	8.5	1/8"	50	32	M5×0.8	6.5	34	32(H9)	5	65(h9)	10
50	100	50	M12×1.75	18	10.5	1/8"	63	38	M5×0.8	10	38	35(H9)	5.5	75(h9)	12

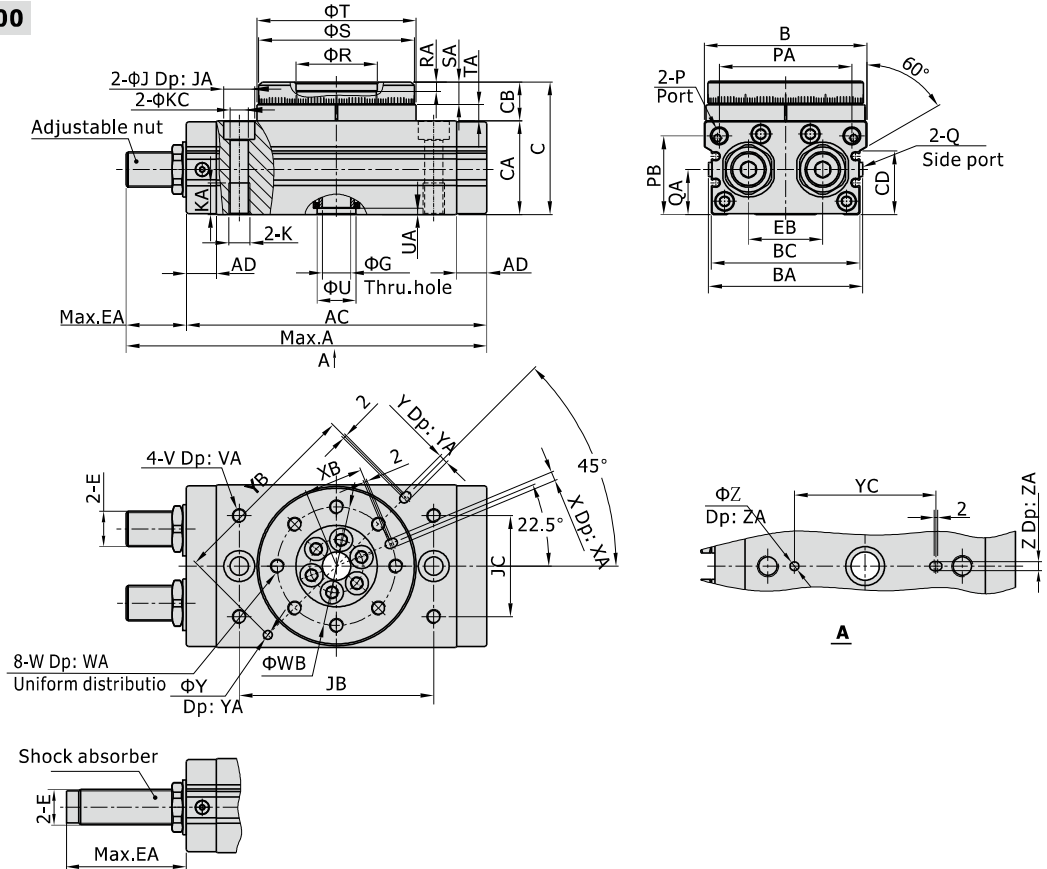
Type\Item	T	TA	U	UA	V	VA	W	WA	WB	X	XA	XB	Y	YA	YB	YC
10	46	4.5	15(H9)	3	M5×0.8	8	M5×0.8	8	32	3(H9)	3.5	16	3(H9)	3.5	56	40
20	61	6.5	17(H9)	2.5	M6×1.0	8	M6×1.0	10	43	4(H9)	4.5	21.5	4(H9)	4.5	74	50
30	67	6.5	22(H9)	3	M6×1.0	8	M6×1.0	10	48	4(H9)	5	24	4(H9)	4.5	80	58
50	77	7.5	26(H9)	3	M8×1.25	8	M8×1.25	12	55	5(H9)	6	27.5	5(H9)	5.5	92	68

# Rotary table cylinder

## HRQ Series

Specification: 2, 3, 7, 10, 20, 30, 50, 70, 100, 200

### HRQ70~200



HRQ=A( With internal shock absorber)

[Unit: mm]

Type\Item	A(With adjustment bolt)	A(With internal shock absorber)	AC	AD	B	BA	BC	C	CA	CB
70	207	244	170	17	92	88	84	75	53	22
100	225.5	263	189	17	102	99	95	86	59	27
200	279.5	316.5	240	24	120	117	113	106	74	32

Type\Item	CD	E	EA(With adjustment bolt)	EA(With internal shock absorber)	EB	G	J	JA	JB
70	36	M20×1.5	37	74	42	16	17.5	12	110
100	42	M20×1.5	37	74	50	19	17.5	12	130
200	57	M27×1.5	39.5	76.5	60	24	20	12.5	150

Type\Item	JC	K	KA	KC	P	PA	PB	Q	QA	R	RA	S	SA	T	TA	U	UA
70	57	M12×1.75	18	10.5	1/8"	75	44.5	M5×0.8	25.5	46(h9)	5	88(h9)	12.5	90	9	22(H9)	3.5
100	66	M12×1.75	18	10.5	1/8"	85	50.5	M5×0.8	29.5	56(h9)	6	98(h9)	14.5	100	12	24(H9)	3.5
200	80	M16×2.0	25	14	1/8"	103	63	M5×0.8	36.5	64(h9)	9	116(h9)	16.5	118	15	32(H9)	5.5

Type\Item	V	VA	W	WA	WB	X	XA	XB	Y	YA	YB	YC	Z	ZA
70	M8×1.25	10	M8×1.25	12.5	67	5(H9)	5.5	33.5	5(H9)	3.5	110	80	5(H9)	3.5
100	M8×1.25	10	M10×1.5	14.5	77	6(H9)	6.5	38.5	6(H9)	4.5	120	100	6(H9)	4.5
200	M12×1.75	13	M12×1.75	16.5	90	8(H9)	8.5	45	8(H9)	4.5	140	110	8(H9)	6.5



### How to select product

1. Determine the following working conditions according to the actual situation:

- 1.1) Rotation angle  $\theta$ : The actual rotation angle must be within the maximum allowed range of rotation angle of cylinder.
- 1.2) Rotation time  $t$ : The rotation time must be within the maximum allowed range of rotation time of cylinder.
- 1.3) Installation position of cylinder: Allow enough installation space, so as to ensure leaving adequate space for rotation of cylinder and workpieces.
- 1.4) Determination of loading mass and loading shape.

2. Calculation of necessary torque needed when loading rotation (T(N.m):

Calculate the necessary moment required for loading rotation according to the formula below, and combine with the torque diagram of actual effect, to choose pneumatic cylinder with suitable torque output.

2.1) Calculation method of moment of inertia in different conditions

$T = K \times I \times \omega$ $\omega = \frac{2\theta}{t^2}$	<p>T: Necessary torque required for loading rotation (N.m)</p> <p>K: Coefficient of allowance, K is defined as 5</p> <p>I: Moment of inertia (kg.m<sup>2</sup>)</p> <p><math>\omega</math>: Angular acceleration (rad/s<sup>2</sup>)</p> <p><math>\theta</math>: Rotation Angle (rad)</p> <p>t: Rotation time (s)</p>
--	---

Diagram	Description	Calculation formula of moment of inertia	Rotation radius
	d: Diameter (m) m: Mass (kg)	$I = \frac{md^2}{8}$	$\frac{d^2}{8}$
Note: no special installation direction			
	d <sub>1</sub> : Diameter (m) d <sub>2</sub> : Diameter (m) m <sub>1</sub> : d <sub>1</sub> Mass (kg) m <sub>2</sub> : d <sub>2</sub> Mass (kg)	$I = \frac{m_1 d_1^2 + m_2 d_2^2}{8}$	$\frac{d_1^2 + d_2^2}{8}$
Note: compare d <sub>1</sub> with d <sub>2</sub> , disregard d <sub>1</sub> if d <sub>1</sub> is extremely tiny			
	d: Diameter (m) m: Mass (kg)	$I = \frac{md^2}{16}$	$\frac{d^2}{16}$
Note: no special installation direction			
	r: Radius (m) m: Mass (kg)	$I = \frac{2mr^2}{5}$	$\frac{2r^2}{5}$
Note: no special installation direction			
	a <sub>1</sub> : Length of stick (m) a <sub>2</sub> : Length of stick (m) m <sub>1</sub> : a <sub>1</sub> Mass (kg) m <sub>2</sub> : a <sub>2</sub> Mass (kg)	$I = \frac{m_1 a_1^2 + m_2 a_2^2}{3}$	$\frac{a_1^2 + a_2^2}{3}$
Note: 1. horizontal installation. 2. pay attention to the change of movement time when vertical installation.			
	a <sub>1</sub> : Sheet length (m) a <sub>2</sub> : Sheet length (m) b: Length of side (m) m <sub>1</sub> : a <sub>1</sub> Mass (kg) m <sub>2</sub> : a <sub>2</sub> Mass (kg)	$I = \frac{m_1(4a_1^2 + b^2) + m_2(4a_2^2 + b^2)}{12}$	$\frac{2a_1^2 + 2a_2^2 + b^2}{6}$
Note: 1. horizontal installation. 2. pay attention to the change of movement time when vertical installation.			

Diagram	Description	Calculation formula of moment of inertia	Rotation radius
	a: Sheet length (m) b: Length of side (m) m: Mass (kg)	$I = \frac{m(a^2 + b^2)}{12}$	$\frac{a^2 + b^2}{12}$
Note: no special installation direction			
	a: Sheet length (m) m: Mass (kg)	$I = \frac{ma^2}{12}$	$\frac{a^2}{12}$
Note: no special installation direction			
	a: Sheet length (m) m: Mass (kg)	$I = \frac{ma^2}{3}$	$\frac{a^2}{3}$
Note: 1. horizontal installation. 2. pay attention to the change of movement time when vertical installation.			
	a: Sheet length (m) b: Distance between the rotation axis and the gravity center of loading (m) m: Mass (kg)	$I = \frac{ma^2}{12} + mb^2$	$\frac{a^2}{12} + b^2$
Note: the cuboids are same too.			
	a: Tooth number of gear b: Tooth number of loading gear	$I_3 = \left(\frac{a}{b}\right)^2 I_b$	
	a <sub>1</sub> : Vertical distance between the rotation axis and the concentrated loading (m) a <sub>2</sub> : Length of arm (m) m <sub>1</sub> : Mass of concentrated loading (kg) m <sub>2</sub> : Mass of arm (kg)	$I = m_1 a_1^2 + \frac{m_2 a_2^2}{3} + m_1 K$	
Note: 1. horizontal installation. 2. compared with m, disregard if m is extremely tiny. 3. calculate K according to the shape of concentrated loading row by row. For example, when the loading is spheroid, $K = 2r^2/5$			

### 3. Calculation of maximum movement energy $E_{max}$ (J):

Calculate the maximum movement energy  $E_{max}$  according to the formula below, and make sure that the maximum movement energy is within allowed energy angle of the chosen pneumatic cylinder, excessive large movement energy would lead to damage of inner parts, please choose rotation cylinder attached with shock absorber when the movement energy is fairly large.

$$E_{max} = \frac{1}{2} I \omega_{max}^2 \quad \omega_{max} = \frac{2\theta}{t} \quad \omega_{max}: \text{Maximal angular velocity (rad/s)}$$

### 4. Calculation of loading rate

Calculate the loading rate according to the formula below, and the loading rate must not be more than 1.

$$\text{Loading rate} = \frac{W_s}{\text{Maximal allowed axial loading}} + \frac{W_r}{\text{Maximal allowed radial loading}} + \frac{M}{\text{Maximal allowed bending moment of working platform}} \leq 1$$

W<sub>s</sub>: Actual axial loading    W<sub>r</sub>: Actual radial loading    M: Actual loaded bending moment of working platform

### 5. Determination method

It could be used only when the chosen pneumatic cylinder must meet the requirements of article 2, 3 and 4 simultaneously.

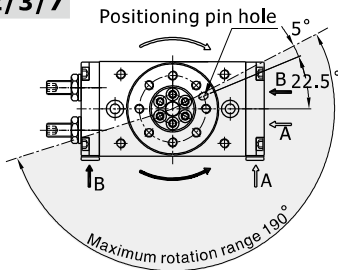


### Installation and application

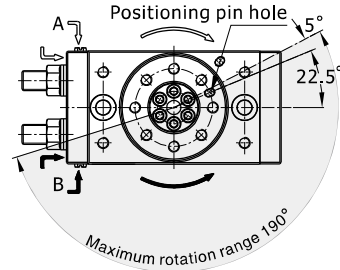
#### 1. Rotation Direction and Rotation Angle

##### 1.1) Rotation Direction

###### HRQ2/3/7



###### HRQ10~200



A) By adjusting the adjustment bolt, the rotation end can be set within the range shown in the up drawing:

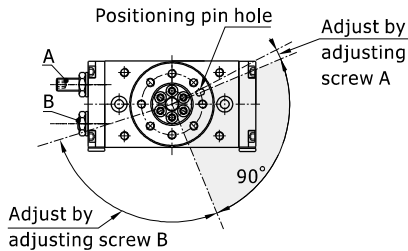
Maximum rotation is 190°;

B) The rotary table turns in the clockwise direction when the A port is pressurized, and in the counter-clockwise direction when the B port is pressurized.

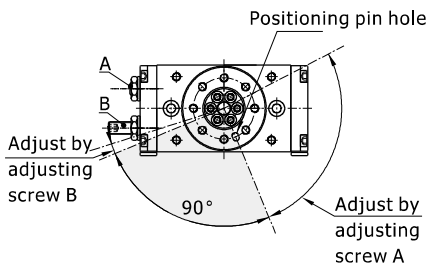
##### 1.2) Rotation Range Example(90° Rotation)

###### HRQ2/3/7

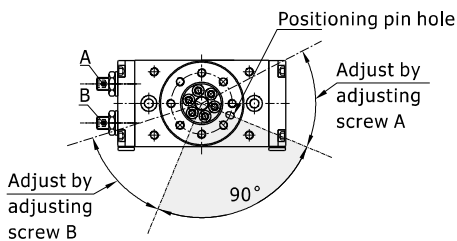
Adjustment amount by adjustment bolt B



Adjustment amount by adjustment bolt A

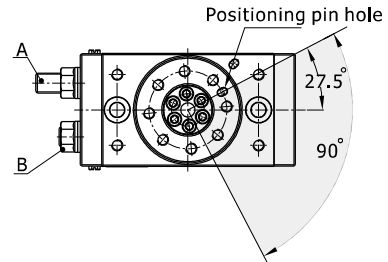


Adjustment amount by adjustment bolt A, B

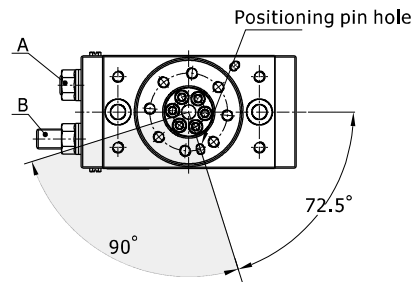


###### HRQ10~200

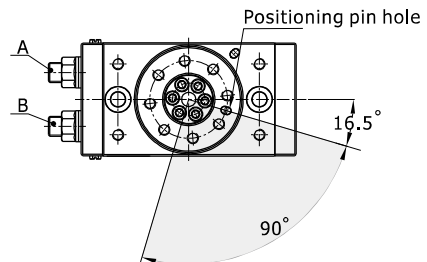
Adjustment amount by adjustment bolt B



Adjustment amount by adjustment bolt A



Adjustment amount by adjustment bolt A, B



1.3) The rotation angle can also be set on a type with internal absorber.

Model	Adjustment angle per rotation of angle(adjustment screw)
HRQ2	11.5°
HRQ3	10.9°
HRQ7	10.2°
Model	Adjustment angle per rotation of angle(adjustment screw or shock absorber)
HRQ10	10.2°
HRQ20	6.5°
HRQ30	6.5°
HRQ50	8.2°
HRQ70	7.0°
HRQ100	6.1°
HRQ200	4.9°

- The range of rotation angle has been adjusted to the maximum in the factory, please do not enlarge the rotation angle any more.
- The movement energy should not exceed the allowed maximum energy, or the inner parts will be damaged.
- The rotary parts need no lubrication.
- Series HRQ is equipped with a rubber bumper or shock absorber. Therefore, perform rotation adjustment in the pressurized condition(minimum operation pressure: 0.1 Mpa or more for adjustment bolt and internal shock absorber types, and 0.2 MPa or more for external shock absorber type.)
- Refer to the table below for tightening torques of the shock absorber setting nut.

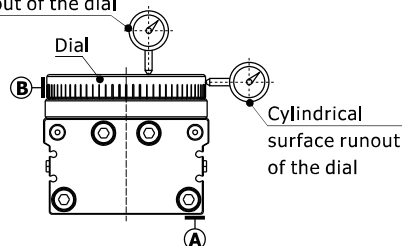
Shock absorber size	Max. tightening torque(Nm)
M10	3.5
M12	8.0
M14	11.0
M20	24.0
M27	63.0

- Never loosen the bottom screw of the shock absorber. (It is not an adjustment screw.) That may cause oil leakage.
- Shock absorbers are consumable parts.  
When a decrease in energy absorption capacity is noticed, it must be replaced.

Rotary table cylinder	Shock absorber
HRQ10	ACA1006-A
HRQ20\HRQ30	ACA1215-A
HRQ50	ACA1416-A
HRQ70\HRQ100	ACA2020-A
HRQ200	ACA2725-A

9. Strictly control run out and parallelism of the dial according to the requirements of the following table.

Plane parallelism and runout of the dial



Items	Specific requirements	Relative datum
Plane parallelism of the dial	0.1	A
Plane runout of the dial	0.1	A
Cylindrical surface runout of the dial	0.1	B