
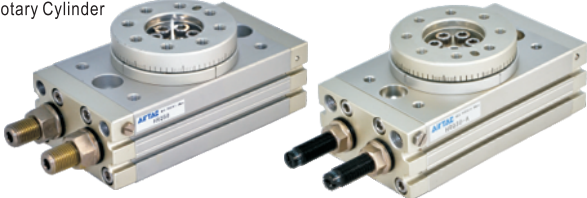
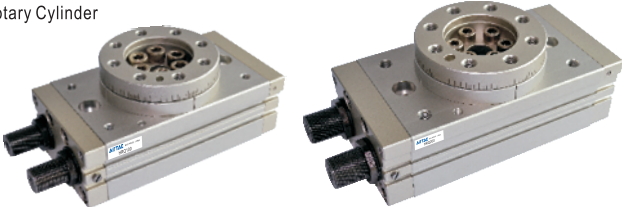




Rotary table cylinder——HRQ Series

Product series

HRQ Series		Acting type	Bore size	Collocation of sensor switch DS1-H
Mini Rotary Cylinder		Double acting	2	●
			3	●
			7	●
Middle-sized Rotary Cylinder		Double acting	10	●
			20	●
			30	●
			50	●
Large-sized Rotary Cylinder		Double acting	70	●
			100	●
			200	●
Page	370			419

Installation and application

1. Dirty substances in the pipe must be eliminated before cylinder is connected with pipeline to prevent the entrance of impurities into the cylinder.
2. The medium used by cylinder shall be filtered to 40 μm or below.
3. Anti-freezing measure shall be adopted under low temperature environment to prevent moisture freezing.
4. If the cylinder is dismantled and stored for a long time, pay attention to conduct anti-rust treatment to the surface. Anti-dust caps shall be added in air inlet and outlet ports.



HRQ



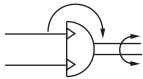
Rotary table cylinder



HRQ Series



Symbol

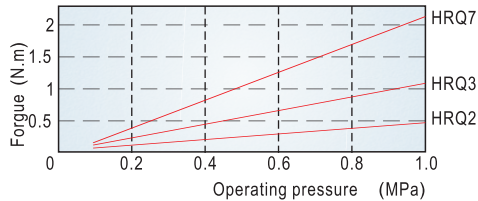


Product feature

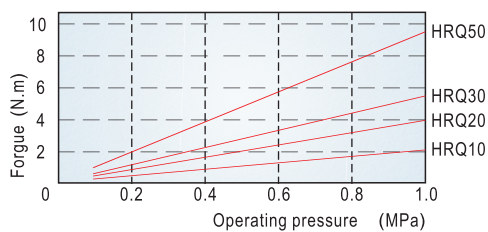
1. Rack and pinion design, stable functioning.
2. Double cylinder structure, double output could be achieved.
3. The manufacturing precision of working platform is high, and is easy for installation, and is of precise orientation.
4. The center of working platform has a through hole, and pipe can be 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.

Actual forgue output

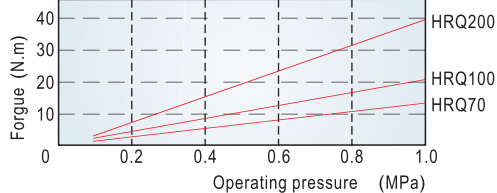
Applicable type: HRQ2, HRQ3, HRQ7



Applicable type: HRQ10, HRQ20, HRQ30, HRQ50



Applicable type: HRQ70, HRQ100, HRQ200



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 40 μm filter element)										
Operating pressure	With adjustment bolt	0.1~0.7MPa(15~100psi)(1.0~7.0bar)			0.1~1.0MPa(15~145psi)(1.0~10.0bar)						
	With internal shock absorber	-			0.1~0.6MPa(15~87psi)(1.0~6.0bar)						
Proof pressure	1.5MPa(218psi)(15.0bar)										
Temperature °C	0~60										
Angle adjustment range	0~190°			0~200°							
	Repeatability	0.2°									
precision	With adjustment bolt	-			0.05°						
	With internal shock absorber	-			-						
Theoretic moment (Nm)(0.5MPa)	0.2	0.33	0.63	1.1	2.2	2.75	5.15	7.54	11.25	21.98	
Cushion type	With adjustment bolt	Rubber bumper									
	With internal shock absorber	Shock absorber									
Port size	End ports	M5 × 0.8								1/8" (1)	
	Side ports	-								M5 × 0.8	
Weight g	120	175	270	535	940	1260	2060	2890	4100	7650	

① PT thread, NPT and G thread are available.

Add) HRQ series are all attached with magnet, please refer to Page 419~442 for the specific content of sensor switch.

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.

Ordering code

HRQ 20 A

- Model**: HRQ: Rotary Table/Rack & Pinion Style
- Specification**: 2 3 7 10 20 30 50 70 100 200
- Thread type** ①:
 - Blank: PT
 - T: NPT
 - G: G
- 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 ①: When it is 2,3,7,10,20 specification, thread type is M5, it is blank here.

Add) HRQ series are all attached with magnet.

Maximum allowed loading

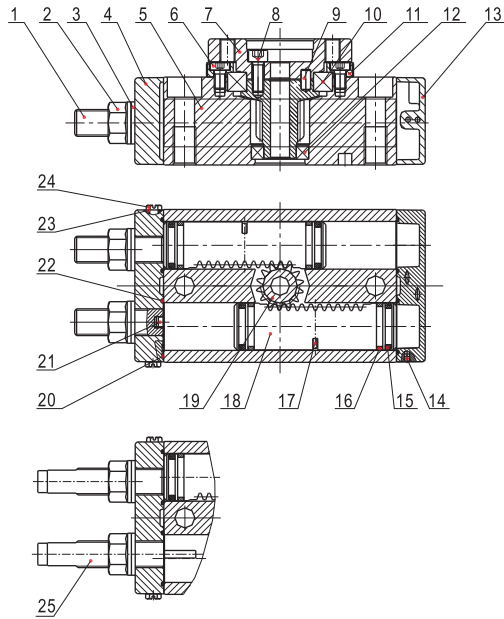
Loading type	Model									
	HRQ2	HRQ3	HRQ7	HRQ10	HRQ20	HRQ30	HRQ50	HRQ70	HRQ100	HRQ200
Maximal allowed radial loading (N)	18	30	50	80	150	200	300	330	390	540
Maximal allowed axial loading (N)	35	50	70	80	150	200	300	300	500	740
Maximal allowed bending moment (Nm)	0.8	1.1	1.5	2.5	4.0	5.5	10.0	12.0	18.0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



Rotary table cylinder

HRQ Series

Inner structure and material of major parts

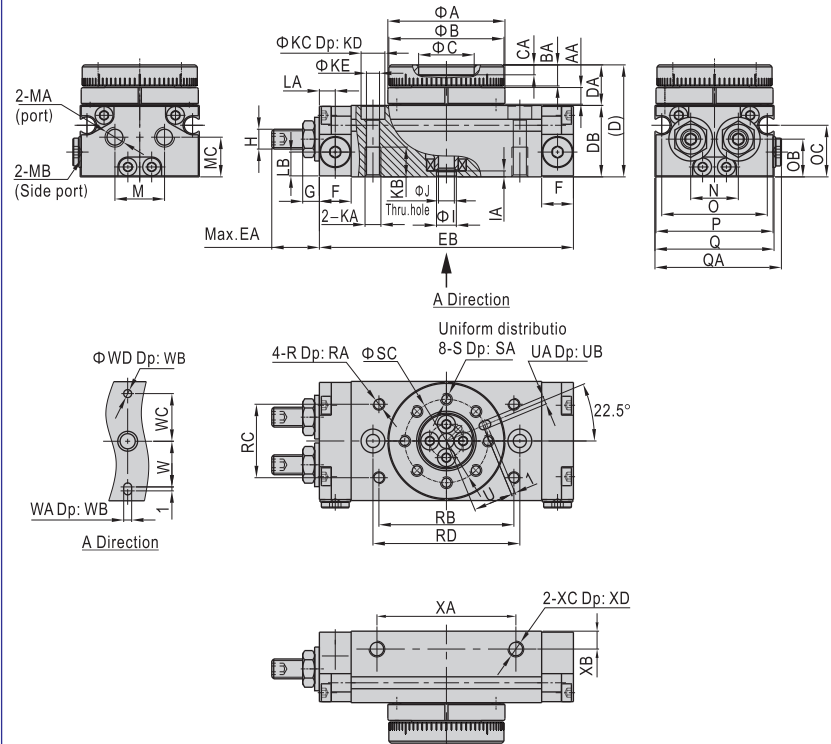


HRQ□-A (With internal shock absorber)

NO.	Item	Material
1	Adjustment bore	Carbon steel
2	Hexagon nut	Carbon steel
3	Seal washer	Carbon steel & Rubber
4	Front cover	Aluminum alloy
5	Body	Aluminum alloy
6	Hexagon socket head set bore	Carbon steel
7	Table	Aluminum alloy
8	Hexagon socket head set bore	Carbon steel
9	Guide pin/flat key	Carbon steel
10	Deep-groove bearing	Subassembly
11	Bearing retainer	Aluminum alloy
12	Deep-groove bearing/Needle bearing	Subassembly
13	Back cover	Aluminum alloy
14	Steel ball	Stainless steel
15	Piston seal	NBR
16	Wear ring	Wear resistant material
17	Magnet	Rare earths
18	Rack	Stainless steel
19	Pinion	Chrome molybdenum steel
20	O-ring	NBR
21	Bumper	NBR
22	O-ring	NBR
23	O-ring	NBR
24	Hexagon screw	Stainless steel
25	Shock absorber	Subassembly

Dimensions

HRQ2,3,7



Type\Item	A	AA	B	BA	C	CA	D	DA	DB	EA	EB	F	G
2	29.5(h9)	4.2	29(h9)	5.3	14(H9)	2.5	28.2	10.2	18	12	64	8	4.2
3	34(h9)	4.2	33(h9)	5.3	17(H9)	2.5	30.5	10	20.5	12	70	8	4.2
7	40(h9)	4.5	39(h9)	6.5	20(H9)	3	34.5	11.5	23	15	79.5	8	4.2

Type\Item	H	I	IA	J	KA	KB	KC	KD	KE	LA	LB	M
2	M5 × 0.8	5(H9)	1.5	3.8	M4 × 0.7	7.5	6	3.5	3.3	4	6	12.5
3	M5 × 0.8	6(H9)	1.5	5	M5 × 0.8	8.5	7.5	4.5	4.2	4	7.5	15.5
7	M6 × 1.0	7(H9)	1.5	6	M5 × 0.8	8.5	7.5	4.5	4.2	4	8.7	18.5

Type\Item	MA	MB	MC	N	O	OB	OC	P	Q	QA	R	RA	RB
2	M5 × 0.8	M5 × 0.8	10	12	26.6	9.5	13	29.5	30	31.8	M3 × 0.5	3.5	34
3	M5 × 0.8	M5 × 0.8	12.2	15.5	31.3	10.5	15	34	34.5	36.3	M3 × 0.5	3.5	38
7	M5 × 0.8	M5 × 0.8	14	18.5	37.8	12	16	40.5	41	42.8	M4 × 0.7	4.5	45

Type\Item	RC	RD	S	SA	SC	U	UA	UB	W	WA	WB	WC	WD
2	18.5	37	M3 × 0.5	5.3	21	10	2(H9)	2	11.5	2(H9)	2	12	2(H9)
3	23	43	M3 × 0.5	5.3	25	12	2(H9)	2	13.5	2(H9)	2	14	2(H9)
7	30	50	M4 × 0.7	6.5	29	14	3(H9)	3	15.5	3(H9)	3	16	3(H9)

Type\Item	XA	XB	XC	XD
2	35	4.5	M4 × 0.7	4
3	40	4.5	M4 × 0.7	4
7	50	5	M5 × 0.8	5

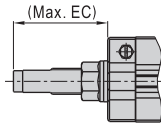


HRQ

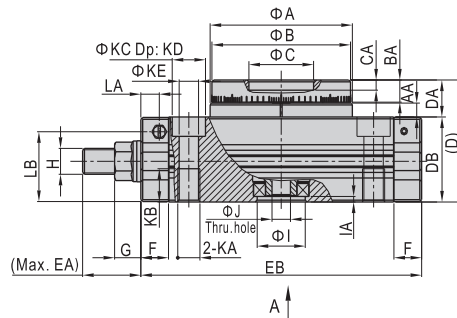
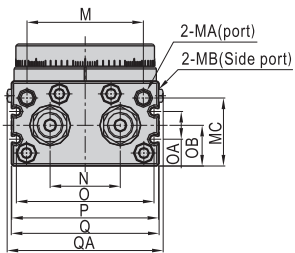
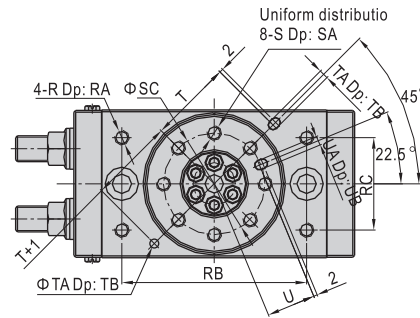
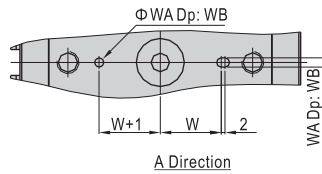
Rotary table cylinder

HRQ Series

HRQ10~50



HRQ□-A (With internal shock absorber)



Type\Item	A	AA	B	BA	C	CA	D	DA	DB	EA	EB	EC	F
10	46(h9)	4.5	45(h9)	8	20(H9)	4.5	47	13	34	17.5	92	28.5	9.5
20	61(h9)	6.5	60(h9)	10	28(H9)	6.5	54	17	37	26	117	39.1	11
30	67(h9)	6.5	65(h9)	10	32(H9)	5	57	17	40	25.5	127	38.4	11.5
50	77(h9)	7.5	75(h9)	12	35(H9)	5.5	66	20	46	31.5	152	51	15

Type\Item	G	H	I	IA	J	KA	KB	KC	KD	KE	LA	LB	M
10	9.5	M10 × 1.0	15(H9)	3	5	M8 × 1.25	12	11	6.5	6.8	4.5	29	34.5
20	9.5	M12 × 1.0	17(H9)	2.5	9	M10 × 1.5	15	14	8.5	8.6	6	30	47
30	9.5	M12 × 1.0	22(H9)	3	9	M10 × 1.5	15	14	8.5	8.6	6.5	34	50
50	14	M14 × 1.5	26(H9)	3	10	M12 × 1.75	18	18	10.5	10.5	10	38	63

Type\Item	MA	MB	MC	N	O	OA	OB	P	Q	QA	R	RA	RB
10	M5 × 0.8	M5 × 0.8	27.8	20.5	45	13.5	15.5	49.5	50	54.5	M5 × 0.8	8	60
20	M5 × 0.8	M5 × 0.8	30	27.5	59	12	16	64.5	65	69.5	M6 × 1.0	8	76
30	1/8"	M5 × 0.8	32	29	64	13.5	18.5	69.5	70	74.5	M6 × 1.0	8	84
50	1/8"	M5 × 0.8	38	38	74.5	15	22	79.5	80	84.5	M8 × 1.25	8	100

Type\Item	RC	S	SA	SC	T	TA	TB	U	UA	UB	W	WA	WB
10	27	M5 × 0.8	8	32	27	3(H9)	3.5	15	3(H9)	3.5	19	3(H9)	3.5
20	34	M6 × 1.0	10	43	36	4(H9)	4.5	20.5	4(H9)	4.5	24	4(H9)	4.5
30	37	M6 × 1.0	10	48	39	4(H9)	4.5	23	4(H9)	5	28	4(H9)	4.5
50	50	M8 × 1.25	12	55	45	5(H9)	5.5	26.5	5(H9)	6	33	5(H9)	5.5



HRQ

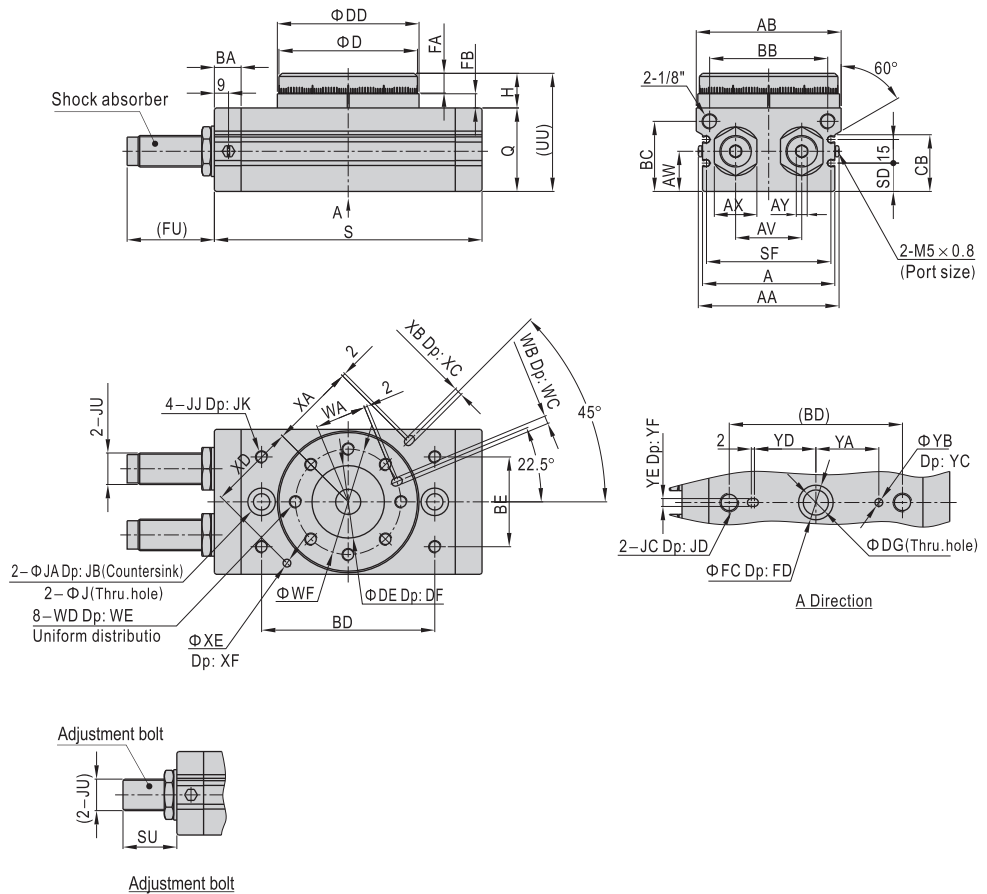


Rotary table cylinder



HRQ Series

HRQ70~200



Type\Item	AA	AB	A	AV	AW	AX	AY	BA	BB	BC	BD	BE	CB	D	DD
70	88	92	84	42	25.5	29	8	17	75	44.5	110	57	36	88	90
100	99	102	95	50	29.5	29	8	17	85	50.5	130	66	42	98	100
200	117	120	113	60	36.5	36	10	24	103	63	150	80	57	116	118

Type\Item	DE	DF	DG	FA	FB	FC	FD	H	J	JA	JB	JC	JD	JK
70	46(h9)	5	16	12.5	9	22(H9)	3	22	10.4	17.5	10.5	M12 × 1.75	18	10
100	56(h9)	5	19	14.5	12	24(H9)	3	27	10.4	17.5	10.5	M12 × 1.75	18	10
200	64(h9)	8	24	16.5	15	32(H9)	5	32	14.2	20	12.5	M16 × 2.0	25	13

Type\Item	JJ	JU	Q	S	SD	SF	SU	UU	WA	WB	WC	WD
70	M8 × 1.25	M20 × 1.5	53	170	18	79	35	75	32.5	5(H9)	5.5	M8 × 1.25
100	M8 × 1.25	M20 × 1.5	59	189	22	90	35	86	37.5	6(H9)	6.5	M10 × 1.5
200	M12 × 1.75	M27 × 1.5	74	240	29	108	41	106	44	8(H9)	8.5	M12 × 1.75

Type\Item	WE	WF	XA	XB	XC	XD	XE	XF	YA	YB	YC	YD	YE	YF	FU
70	12.5	67	54	5(H9)	3.5	55	5(H9)	3.5	40	5(H9)	3.5	39	5(H9)	3.5	69
100	14.5	77	59	6(H9)	4.5	60	6(H9)	4.5	50	6(H9)	4.5	49	6(H9)	4.5	69
200	16.5	90	69	8(H9)	4.5	70	8(H9)	4.5	55	8(H9)	4.5	54	8(H9)	4.5	76



HRQ



Rotary table cylinder

HRQ Series

How to select product

- Determine the following working conditions according to the actual situation:
 - Rotation angle θ : The actual rotation angle must be within the maximum allowed range of rotation angle of cylinder.
 - Rotation time t : The rotation time must be within the maximum allowed range of rotation time of cylinder.
 - Installation position of cylinder: Allow enough installation space, so as to ensure leaving adequate space for rotation of cylinder and workpieces.
 - Determination of loading mass and loading shape.
- 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 forgue diagram of actual effect, to choose pneumatic cylinder with suitable forgue output.

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

2.1. Calculation method of moment of inertia in different conditions

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

Diagram	Description	Calculation formula of moment of inertia	Rotation radius
	a: Sheet length (m) m: Mass (kg)	$I = \frac{ma^2}{12}$ Note: no special installation direction	$\frac{a^2}{12}$
	a: Sheet length (m) m: Mass (kg)	$I = \frac{ma^2}{3}$ Note: 1. horizontal installation. 2. pay attention to the change of movement time when vertical installation.	$\frac{a^2}{3}$
	a: Sheet length (m) b: Distance between the rotation axis and the gravity center of loading (m) m: Mass (kg)	$I = \frac{ma^2}{12} + mb^2$ Note: the cuboids are same too.	$\frac{a^2}{12} + b^2$
	a ₁ : Vertical distance between the rotation axis and the concentrated loading (m) a ₂ : Length of arm (m) m ₁ : Mass of concentrated loading (kg) m ₂ : Mass of arm (kg)	$I = m_1 a_1^2 + \frac{m_2 a_2^2}{3} + m_2 K$ 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, $K = \frac{2r^2}{5}$	
	a: Tooth number of gear b: Tooth number of loading gear	$I_s = (\frac{a}{b})^2 I_b$	

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 range 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_s: Actual axial loading W_r: 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.



HRQ



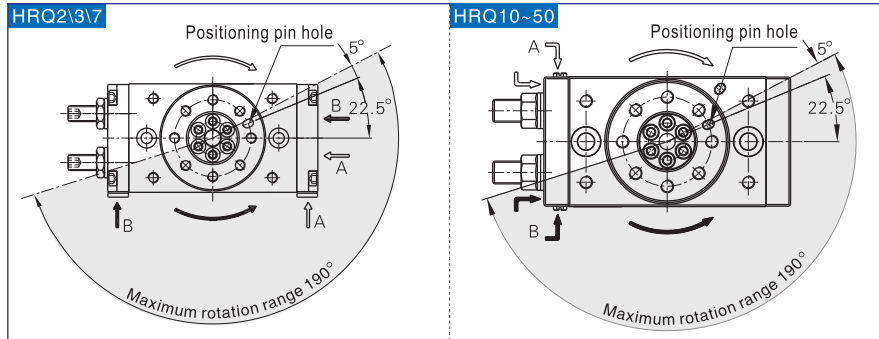
Rotary table cylinder

HRQ Series

Installation and application

1. Rotation Direction and Rotation Angle

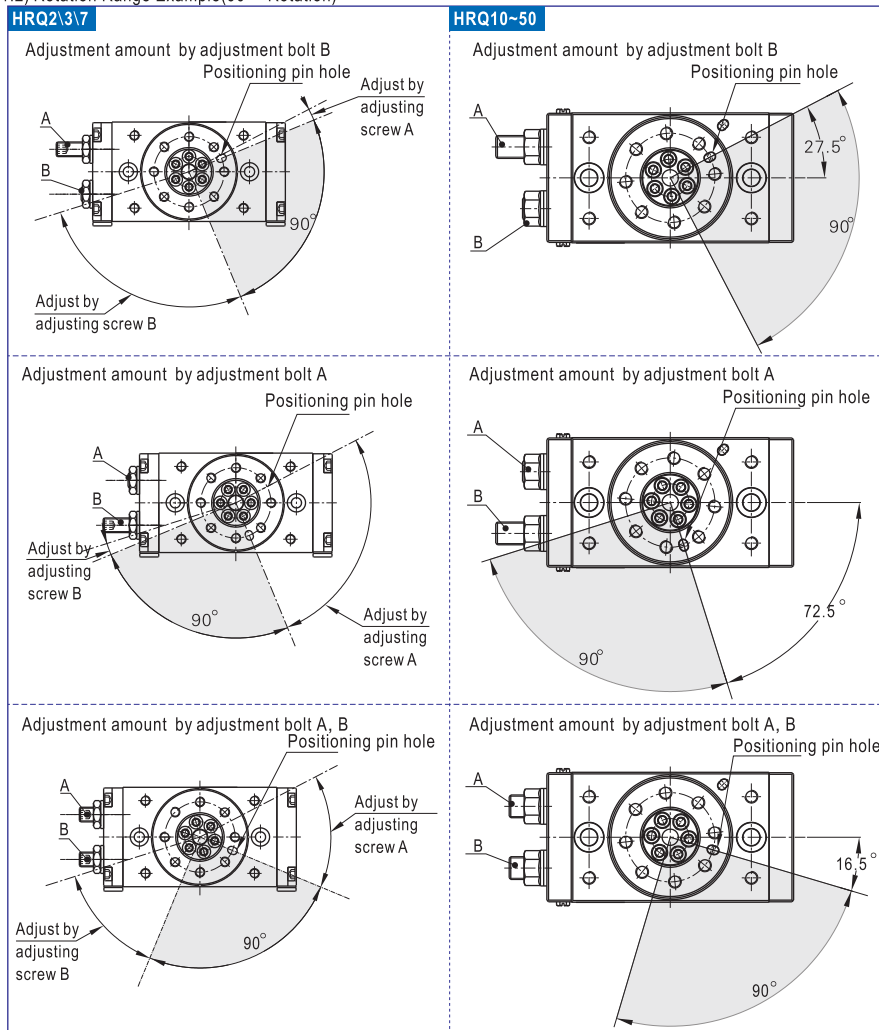
1.1) Rotation Direction



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)



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

Model	Adjustment angle per rotation of angle (adjusting screw)	Model	Adjustment angle per rotation of angle (adjustment screw or shock absorber)
HRQ2	11.5°	HRQ10	10.2°
HRQ3	10.9°	HRQ20	6.5°
HRQ7	10.2°	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	ACA1209-A
HRQ50	ACA1412-A
HRQ70\HRQ100	ACA2020-A
HRQ200	ACA2725-A



HRQ

