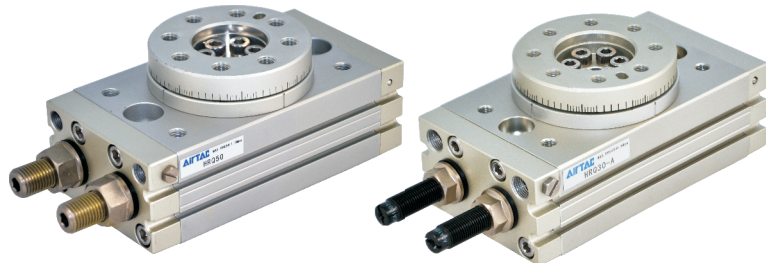




Rotary table cylinder——HRQ Series

Product series

Series name		Acting type	Bore size	Collocation of sensor switch		
HRQ Series		Double acting		DS1-H		
			10	●		
			20	●		
			30	●		
			50	●		
Page	354			403		

Installation and application

1. Dirty substances in the pipe must be cleared away before cylinder is connected with pipeline to prevent the entrance of sundries into the cylinder.
2. The medium used by cylinder shall be filtered by the filter core of above 40 μ m.
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 surf-ace. Anti-dust jam cap shall be added in air intake and outlet orifices.



HRQ

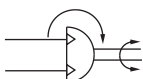
Rotary table cylinder

HRQ Series

AirTAC



Symbol



Product feature

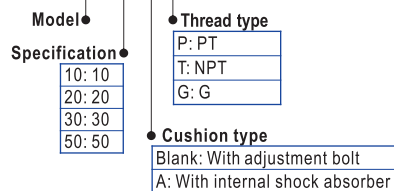
1. Rack and pinion design, stable functioning.
2. Double cylinder structure, double output could be achieved.
3. The manufacturing precision of working platform is high, and is easy for installation, and is of precise orientation.
4. The center of working platform has a through hole, and pipe can be located and passed through this hole;
5. Two sides of cylinder have orientation holes, to facilitate installation.
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.

Ordering code

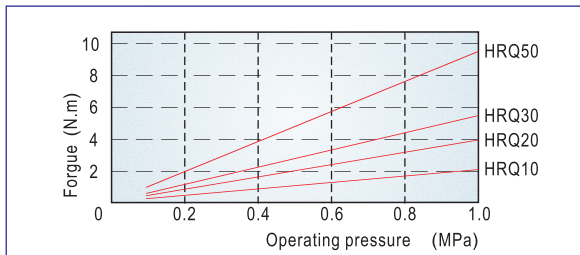
Model can to be changed Ordering code. Example:
Production type: HRQ
Specification: 50
Buffer type: Internal shock absorber
Thread type: NPT

Model: HRQ50-A-T

Ordering code: HRQ 50 A T



Actual forgue output



Specification

Specification		10	20	30	50
Acting type		Double rack and pinion(Double acting)			
Fluid		Air(to be filtered by 40 μ m filter element)			
Operating pressure	With adjustment bolt	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	℃	0~60			
Angle adjustment range		0~190°			
Repeatable precision	With adjustment bolt	0.2°			
	With internal shock absorber	0.05°			
Theoretic moment (Nm)(0.5MPa)		1.1	2.2	2.75	5.15
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	535	940	1260	2060

① PT thread、NPT and G thread are available.

Add) QCK series are all attached with magnet, please refer to Page 403~426 for the specific content of sensor switch.

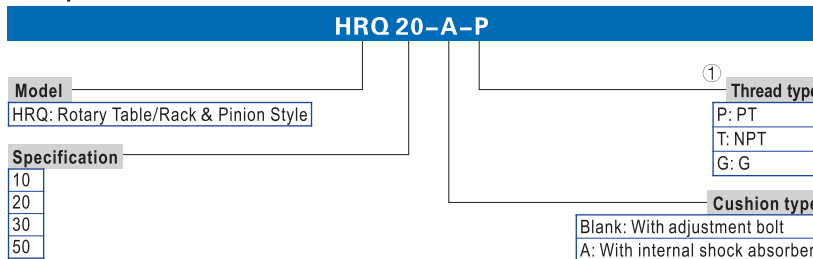
Maximum allowed movement energy and rotation times

Model	Maximal allowed energy (J)		Rotation times (s/90°)	
	With adjustment bolt	With internal shock absorber	With adjustment bolt	With internal shock absorber
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

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.

Explain of model



Note ①: When it is 10,20 specification, thread type is M5, it is blank here.

Add) HRQ series are all attached with magnet.

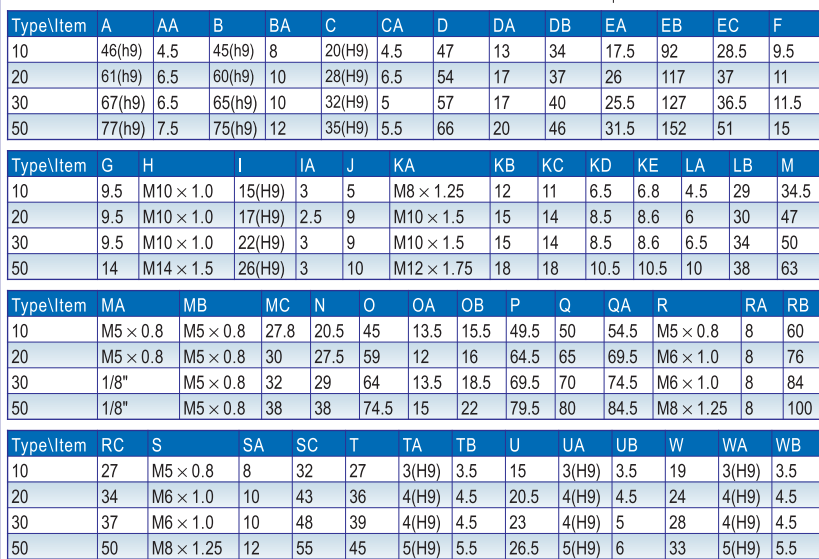
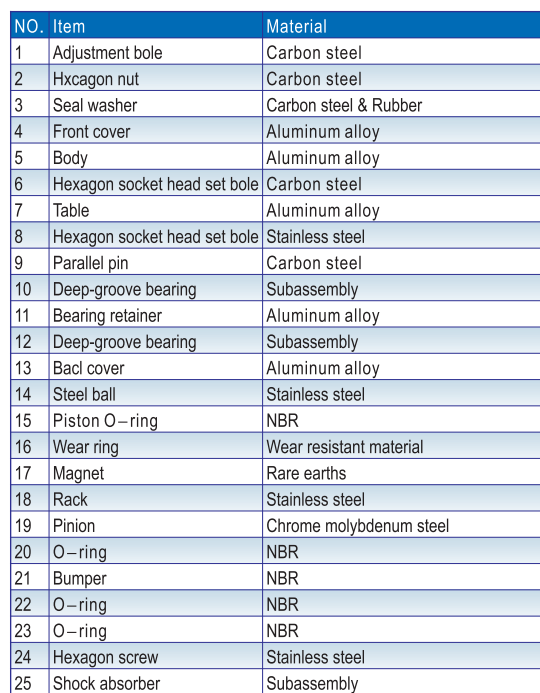
Maximum allowed loading

Loading type	Model			
	HRQ10	HRQ20	HRQ30	HRQ50
Maximal allowed radial loading (N)	80	150	200	300
Maximal allowed axial loading (N)	80	150	200	300
Maximal allowed bending moment (Nm)	2.5	4.0	5.5	10.0



HRQ Series

■ Dimensions



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 forgue 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.

$T = K \times I \times \omega$	T: Necessary forgue required for loading rotation (N.m)
$\omega = \frac{2\theta}{t^2}$	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

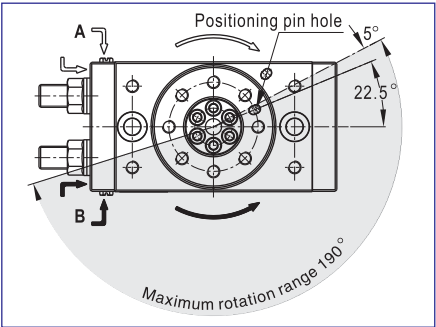
Rotary table cylinder

HRQ Series



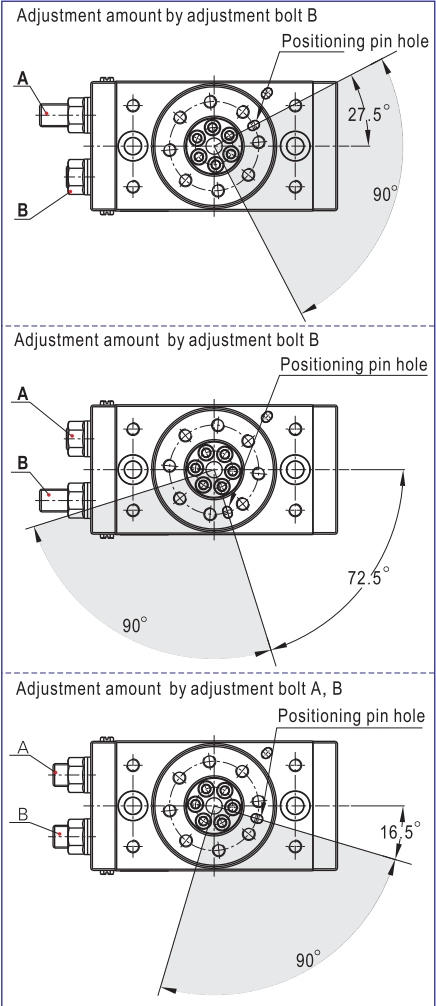
■ Installation and application

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 (adjustment screw or shock absorber)
HRQ10	10.2°
HRQ20	6.5°
HRQ30	6.5°
HRQ50	8.2°

2. The range of rotation angle has been adjusted to the maximum in the factory, please do not enlarge the rotation angle any more.
3. The movement energy should not exceed the allowed maximum energy, or the inner parts will be damaged.
4. The rotary parts need no lubrication.
5. 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.)
6. Refer to the table below for tightening torques of the shock absorber setting nut.

Shock absorber size	Max. tightening torque(Nm)
M10	3.5
M14	11.0

7. Never loosen the bottom screw of the shock absorber. (It is not an adjustment screw.) That may cause oil leakage.
8. 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	ACA1007-A
HRQ50	ACA1412-A



HRQ



