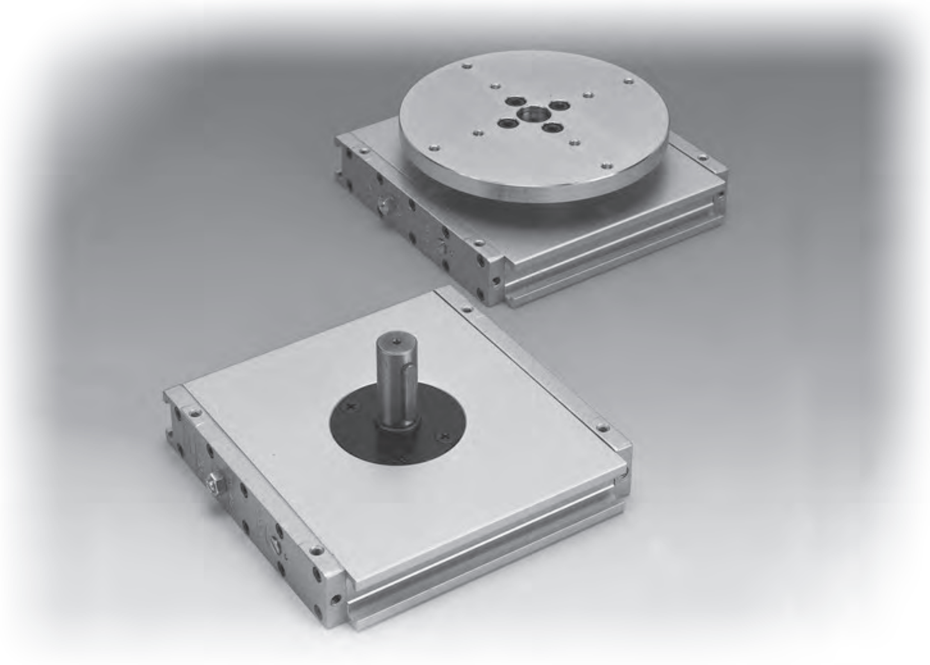


by Harmo

Rotary Actuator

● ***Ultra-low profile*** *with high torque on account of the use of an elliptic cylinder*

● *Equipped with an angle, air-cushion and backlash adjusting mechanisms*

● *Optional sensor switch is available*

● *The body with a flat bottom makes the machine design easier*

● *E xtra thin cylinder realizes the low-profile machine design.*

Model Designation (Example)

HR 400 - 90 D ABC

- HR: Rotary Actuator
- ① 400: Cylinder bore area
- ② 90: Rotating angle
- ③ D: Rotary type
- ④ ABC: Options

①. Cylinder bore area

Code	200	400
Area (cm²)	6.9	12.9

②. Rotating angle

Code	90	180
Angle	90°	180°

③. Rotary type

Code	No Entry	D
Rotary type	Shaft type	Disc type

④. Options

Code	A (Magnetic sensor)	B (Mounting brackets)	C (Flow Control Valves)
HR200	○	—	○
	—	○	
HR400	○	○	○

※ . In case of HR200, A : magnetic sensor and B : Mounting brackets can not be combined as option.

※ . C: Flow control valves are same as PISCO model : JSS4-M5A

Specification

Model	HR 200-90(D)	HR 400-90(D)	HR 400-180(D)
Actuating method	Double acting (Rack and pinion type)		
Fluid medium	Compressed air (no lubrication)		
Operating pressure range	43 ~ 116psi (0.3 ~ 0.8MPa)		
Operating temp. range	41 ~ 140°F (5 ~ 60°C)		
Effective torque	2N·m	6N·m	
Rotating angle	90º	90º	180º
Angle adjustment range	0～＋5º		
Cushion	Air cushion		
Port size	M5 × 0.8mm		
Cylinder sectional area	$6.9cm^2$	$12.9cm^2$	
Cylinder stroke	1.4cm	2.2cm	4.2cm
Shaft dia. (pinion shaft type)	10mm	15mm	
Maximum radial load	26.46N	45.08N	
Maximum thrust load	26.46N	26.46N	
Maximum kinetic energy	0.01N·m	0.015N·m	

Option

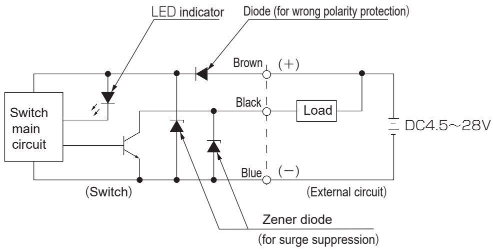
Option	HR 200-90(D)		HR 400-90(D)	HR 400-180(D)
A：Magnetic sensor	○	–	○	○
B：Mounting bracket	–	○	○	○
C：Flow Controller	○		○	○

Sensor Specification

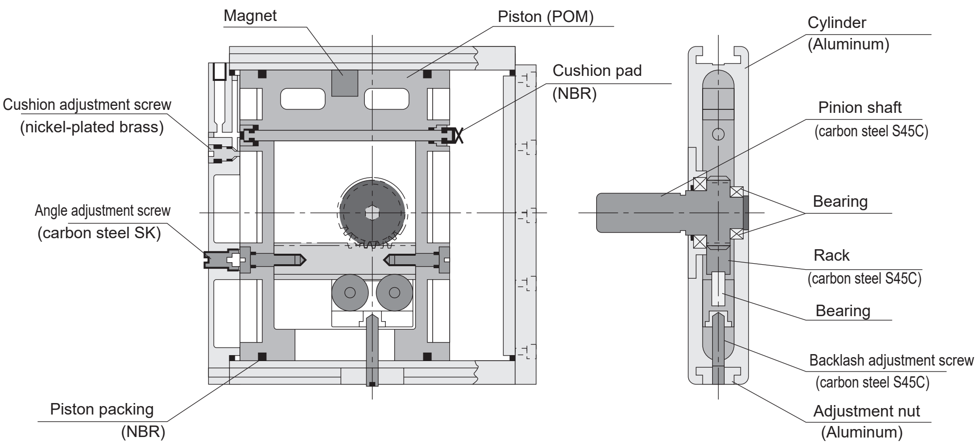
Wiring method	3 wire type
Power requirment	4.5 ~ 28VDC
Load voltage	4.5 ~ 28VDC
Load current	100mA max.
Current consumption	10mA max. (24VDC)
Internal descending voltage (*1)	0.5V max. (with load current at 50mA)
Leakage current	50μA max. (24VDC)
Response	1m·s max.
Insulation resistance	100MΩ min. (between case and lead wire terminal at 500VDC)
Withstand voltage	for **1**minuite (between case and lead wire terminal at **500**VDC (50/60Hz))
Impact resistance (*2)	$294.2m/s^2$(30G) (No repeat)
Vibration resistance (*2)	$88.3m/s^2$(9G) (Condensing amplitude: 1.5mm • 10 ~ 55Hz)
Protective structure	IP67 (IEC standard), JIS C0920 (Water tight type)
Operational indication	Red LED lighting up when pressure is ON
Lead wire	PVC 0.2SQ × 3cores × 3,000mm
Operating temp. range	32 ~ 140°F (0 ~ 60°C)
Storage temp. range	14 ~ 158°F (-10 ~ 70°C)
Weight	50 g

*1. Internal voltage drop differs by the load current.
*2. PISCO testing standard

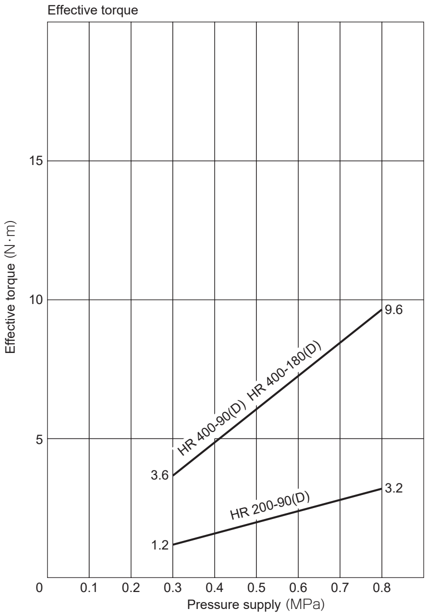
Sensor Internal circuit

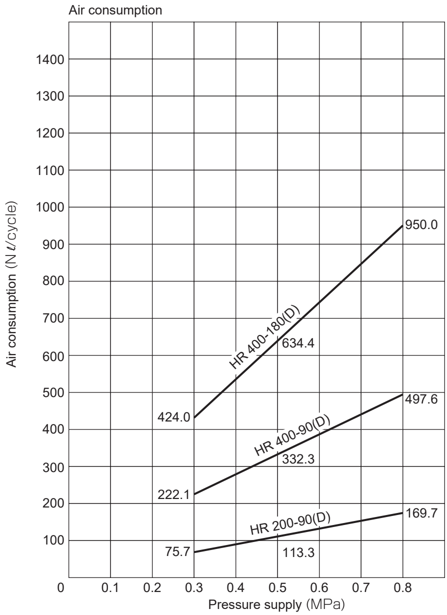


Construction



Data





1. Enough tolerance on torque should be taken into consideration.
2. Heavy load of inertia force may cause damages or malfunction. Select a model taking loads of inertia moment and kinetic energy into consideration and set up the rotation time according to the chart 1.
3. Avoid the direct loads to the rotating axis or disc. In case of no dynamic loads, the loads in the chart to is allowable.
4. The air consumption of the above chart is of per cycle.

Chart 1. Max. allowable Kinetic Energy

Model	Allowable Energy
HR 200-90(D)	0.01N·m
HR 400-90(D)	0.015N·m
HR 400-180(D)	

Chart 2. Max. allowable Load

Model	Allowable Radial Load	Allowable Thrust Load
HR 200-90(D)	26.46N	26.46N
HR 400-90(D)	45.08N	26.46N
HR 400-180(D)		

Calculation of Kinetic Energy

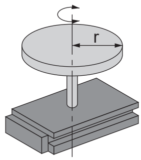
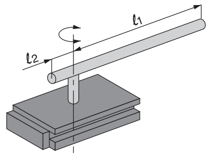
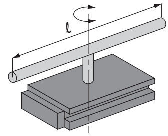
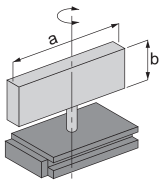
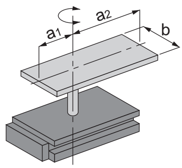
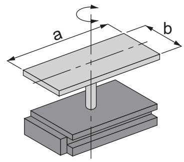
$$E=\frac{1}{2}\ell\omega^2$$

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

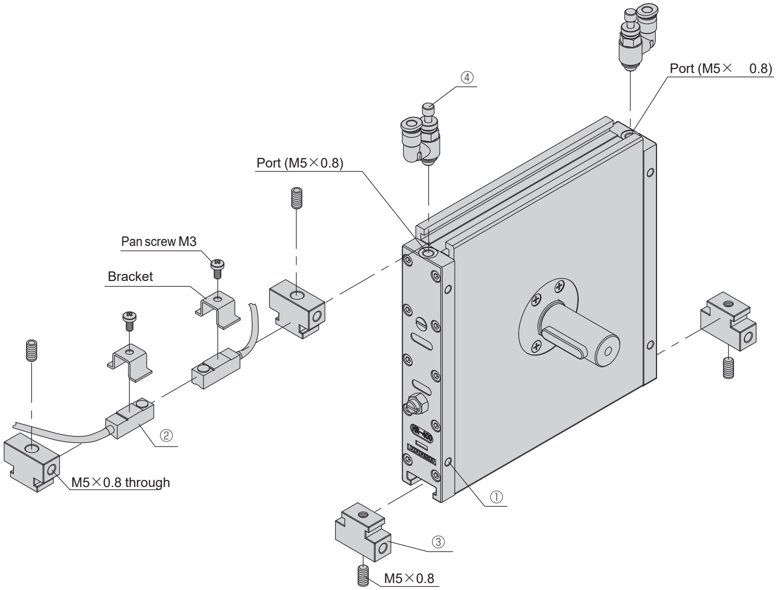
E : Kinetic energy (N · m)
ℓ : Moment of inertia (N·m · s^2)
ω : Angular velocity (rad/s)
θ : Angle of rotation (rad)
t : Rotation time (s)

Calculation of Mass Moment of Inertia

I : Mass Moment of Inertia (kgf·cm·s²) W : Mass Load (kgf) g : Acceleration due to Gravity (980cm/s²)

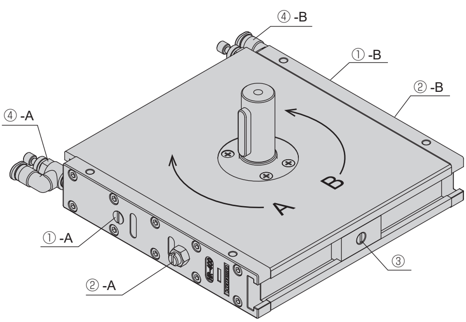
Column (incl. thin disc)	Slender rod I	Slender rod II
Axis of rotation : Mounted on center	Axis of roation : Mounted off center	Axis of rotation : Mounted on center
		
$I = \frac{W}{g} \cdot \frac{r^2}{2}$	$I = \frac{W_1}{g} \cdot \frac{\ell_1^2}{3} + \frac{W_2}{g} \cdot \frac{\ell_2^2}{3}$	$I = \frac{W}{g} \cdot \frac{\ell^2}{12}$
Cubic shape I	**Rectangular plate I**	**Rectangular plate II**
Axis of rotaton : End mounted on center	Axis of rotation : Mounted off center	Axis of rotation : Mounted off center (Same as thicker cubic shape)
		
$I = \frac{W}{g} \cdot \frac{a^2}{12}$	$I = \frac{W_1}{g} \cdot \frac{4a_1^2 + b^2}{12} + \frac{W_2}{g} \cdot \frac{4a_2^2 + b^2}{12}$	$I = \frac{W}{g} \cdot \frac{a^2 + b^2}{12}$

How to install



①. Use M4 threads to fix the actuator body. Refer to the dimensions to figure out the installing pitch.
②. Install two sensor switches (option A) into the mounting groove on the side symmetrically.
③. Use the mounting brackets (option B), which goes into the T-slot, for special use such as fixing the actuator body firmly.
④. Flow controllers (option C) are to be mounted after sensors or mounting brackets are installed.

Adjustment



①. Cushion adjusting screw
Control the air cushion by air flow adjusted by the screw.
- ①-A Adjusting air cushion in A circuit
- ①-B Adjusting air cushion in B circuit

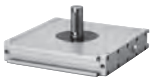
②. Angle adjusting screw
Adjust rotation angle from 0 ～ 5º respectively for 90° and 180°
- ②-A Adjusting angle in A circuit
- ②-B Adjusting angle in B circuit

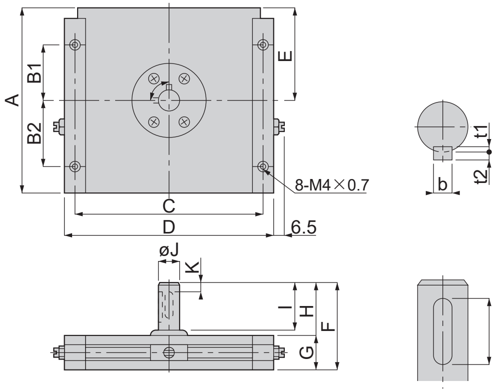
③. Backlash adjusting screw
When backlash occurs on the shaft or disc, tightening the screw eliminates the backlash.

④. Flo w controller
- ④-A Adjusting rotating speed in A circuit
- ④-B Adjusting rotation speed in B circuit

HR Rotary Actuator Shaft type

RoHS Compliance



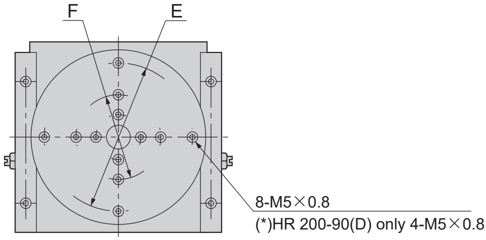


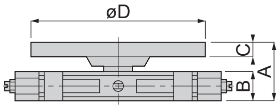
Unit：mm

<table>
<tr><th>Model</th><th>A</th><th>B1</th><th>B2</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th><th>I</th><th>J (g6)</th><th>K</th><th>B</th><th>t1</th><th>t2</th><th>I</th><th>Weight (g)</th></tr>
<tr><td>HR200-90</td><td>80</td><td>18.5</td><td>31.5</td><td>73</td><td>81</td><td>33.5</td><td>56.5</td><td>27</td><td>29.5</td><td>28</td><td>10</td><td>7.5</td><td>3</td><td>1.8</td><td>1.2</td><td>13</td><td>400</td></tr>
<tr><td>HR400-90</td><td rowspan="2">130</td><td rowspan="2">45</td><td rowspan="2">45</td><td>122</td><td>130</td><td rowspan="2">65</td><td rowspan="2">59.5</td><td rowspan="2">24</td><td rowspan="2">35</td><td rowspan="2">35.5</td><td rowspan="2">15</td><td rowspan="2">5.0</td><td rowspan="2">5</td><td rowspan="2">3</td><td rowspan="2">3</td><td rowspan="2">25</td><td>850</td></tr>
<tr><td>HR400-180</td><td>162</td><td>170</td><td>1050</td></tr>
</table>

HR Rotary Actuator Disc type

RoHS Compliance



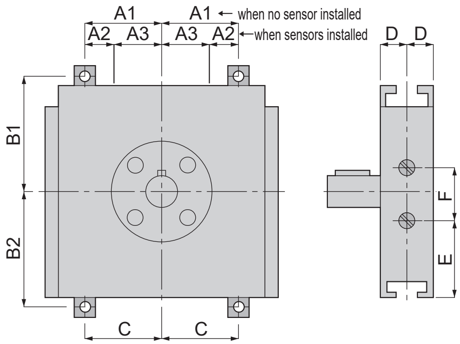


Unit：mm

Model	A	B	C	øD	E	F	Weight (g)
HR200-90D	46	27	8	64	50	–	600
HR400-90D	44.5	24	9	120	106	60	1600
HR400-180D							1800

※ . The dimensions of main body are same as the pinion shaft type.

HR Dimensions after sensor switches being installed



Unit：mm

Model	No sensor mounted	Sensor installed		B1	B2	C	D	E	F
	A1	A2	A3						
HR200-90(D)	5～25.5	–	–	39	52	17.5～25.5	12	35	18
HR400-90(D)	5～50	37.5～50	0～1	70.5	70.5	17.5～50	11.5	47.5	40.5
HR400-180(D)	5～70	37.5～70	0～10.5			17.5～70			47.5