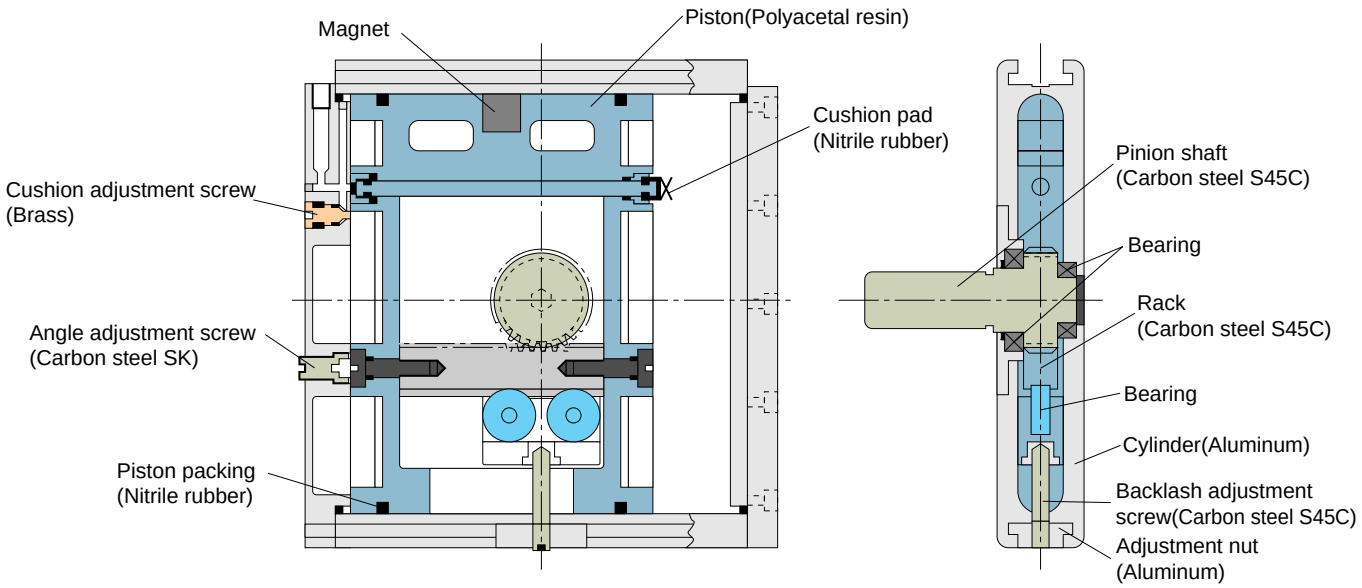
Harmo Pobot Parts

Rotary Actuator

Features

- Small thickness and high power are achieved by oval cylinder.
- Backlash can be avoided by adjustment of angle, air cushion, and rack pinion.
- System can be controled by magnetic sensor(option).
- Flat back side is convenient for layout.
- Rotary disk type takes an advantage of small thickness and optimal for compact design. (rotary disk type)

Construction



Specifications

Type	HR 200-90(D)	HR 400-90(D)	HR 400-180(D)	HR 600-90(D)	HR 600-180(D)
Operation type	Double acting(Rack pinion type)				
Fluid admitted	Compressed air(no lubrication)				
Service pressure range	42.6~113.6psi (0.3~0.8MPa)				
Service temperature range	41~140°F (5~60°C)				
Effective torque	196N · cm	588N · cm		932N · cm	
Rotational angle	90°	90°	180°	90°	180°
Angle adjustment range	0~+5°				
Cushion	Air cushion type				
Port size	M5×0.8mm				
Cylinder cross sectional area	1.07in.^{2} (6.9cm^2)	2.00in.^{2} (12.9cm^2)		3.04in.^{2} (19.6cm^2)	
Stroke	0.55in. (1.4cm)	0.87in. (2.2cm)	1.65in. (4.2cm)	0.90in. (2.3cm)	1.69in. (4.3cm)
Shaft dia.(pinion shaft type)	0.39in. (10mm)	0.59in. (15mm)		0.67in. (17mm)	
Allowable radial loading	26.5N	45.1N		64.7N	
Allowable thrust loading	26.5N	26.5N		56.9N	
Allowable motion energy	0.98N · cm	1.47N · cm		1.96N · cm	

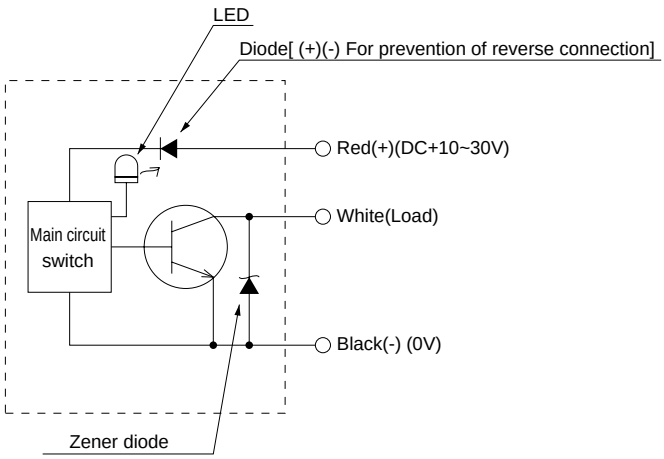
Option

Model	HR 200-90(D)		HR 400-90(D)	HR 400-180(D)	HR 600-90(D)	HR 600-180(D)
A : Magnetic sensor(CS7G)	○	–	○	○	○	○
B : Mounting holder	–	○	○	○	○	○
C : Speed controller	○		○	○	○	○

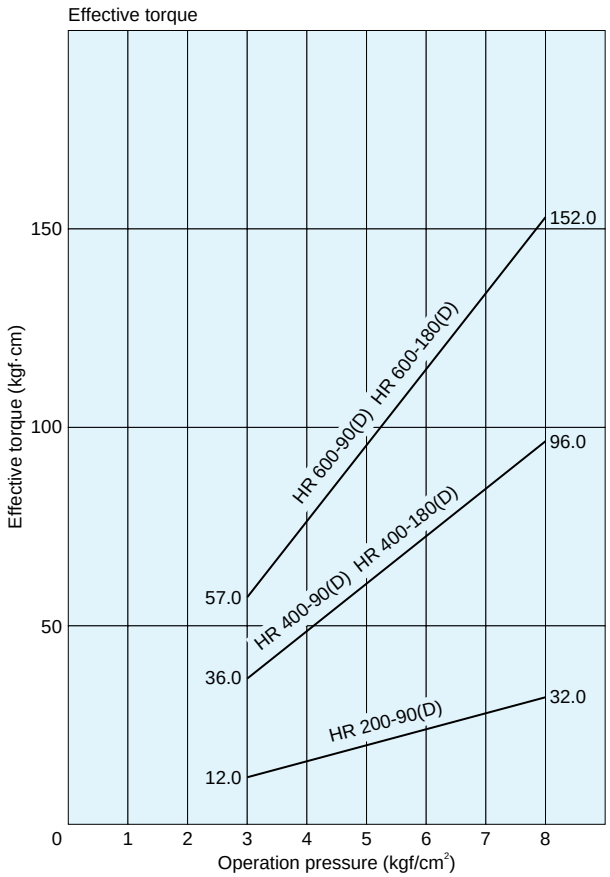
Sensor specification

Operation type	Direct current magnetic induction type
Operation voltage range	DC 10~30V
Operation current range	200mA. MAX.
Current consumption(inactivated state)	2.5mA. MAX(DC 24V)
Current consumption(activated state)	15mA. MAX(DC 24V)
Delay time	12~24V DC
Insulation resistance	Activated 1.5m sec .MAX. Inactivated 10m sec. MAX.
Proof voltage	50MΩ. MIN(Between cable and case)
Impact resistance	AC 500V. MIN(Between cable and case)
Vibration resistance	30G
Service temperature range	32~140°F (0~60°C)
Storage temperature range	-4~158°F (-20~70°C)
Protection structure	IEC Standard. IP 67
Operation indicator	LED indicator lights up during ON
Lead wire	PVC cabtyre cable 0.3SQ × 3 wire × 3000
Mass	39g

Circuit



Model selection



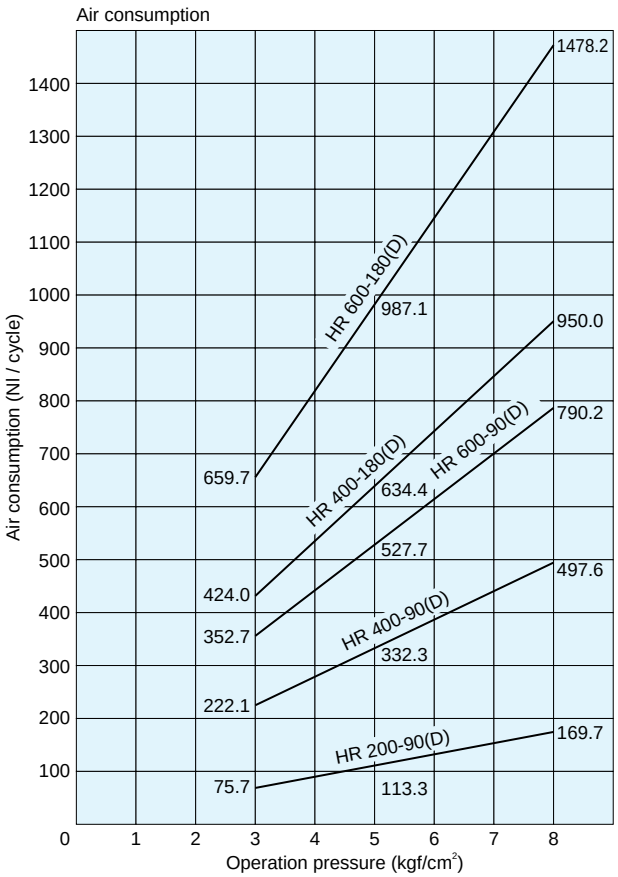


Table 1. Allowable motion energy

Type	Allowable motion energy
HR 200-90(D)	0.98N·cm
HR 400-90(D)	1.47N·cm
HR 400-180(D)	
HR 600-90(D)	1.96N·cm
HR 600-180(D)	

Table 2. Allowable load

Type	Allowable radial load	Allowable thrust load
HR 200-90(D)	26.5N	26.5N
HR 400-90(D)	45.1N	26.5N
HR 400-180(D)		
HR 600-90(D)	64.7N	56.9N
HR 600-180(D)		

Note 1 : Please use it within the maximum torque on each usage.

Note 2 : Force of inertia with too heavy load may cause failures. Set the rotation time within the range of the kinetic energy given in Table 1 by giving consideration to the moment of inertia and the kinetic energy of the load shown on page 16.

Note 3 : Keep the shaft and the disk away from direct loads. When no dynamic load is generated, the loads given in Table 2 can be applied.

Note 4 : The air consumption per cycle is given in the graph "Air consumption".

Calculation of motion energy

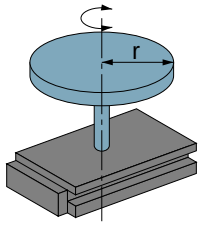
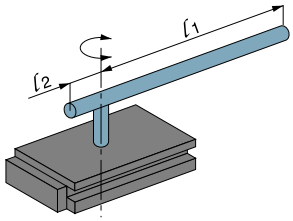
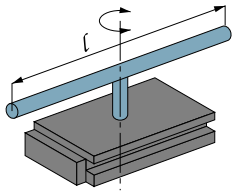
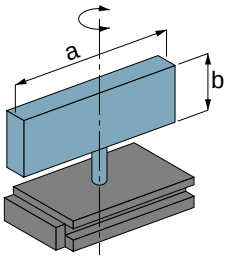
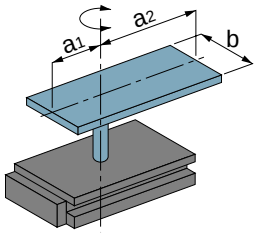
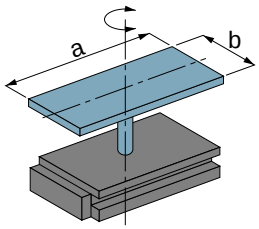
$$E = \frac{1}{2} I \omega^2$$

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

E : Moiton energy N·cm)
I : Inertial moment (N·cm·sec^2)
ω : Angular velocity (rad/sec)
θ : Rotational angle (rad)
t : Rotational time (sec.)

Calculation of inertial moment

I : Intertial moment (N·cm·sec^2) W : Load (N) g : Gravitational acceleration (980cm/sec^2)

Cylinder(Including disk)	Slender rod I	Slender rod II
Position of center of rotation:Center shaft	Position of center of rotation: Perpendicular to the either end of rod	Position of center of rotation: Perpendicular to the center of mass of rod
		
$I = \frac{W}{g} \cdot \frac{r^2}{2}$	$I = \frac{W_1}{g} \cdot \frac{\ell_1^2}{3} + \frac{W_2}{g} \cdot \frac{\ell_2^2}{3}$	$I = \frac{W}{g} \cdot \frac{\ell^2}{12}$
Block I	**Block II**	**Block III**
Position of center of rotation: Parallel to side b and through the center of mass	Position of center of rotation: Perpendicular to the either end of block	Position of center of rotation: Perpendicular to the block and through the center of mass
		
$I = \frac{W}{g} \cdot \frac{a^2}{12}$	$I = \frac{W_1}{g} \cdot \frac{4a_1^2 + b^2}{12} + \frac{W_2}{g} \cdot \frac{4a_2^2 + b^2}{12}$	$I = \frac{W}{g} \cdot \frac{a^2 + b^2}{12}$

Model designation (Example)

HR 400 (1) — 90 (2) D (3) ABC (4)

(1)Cylinder cross sectional area

Code	200	400	600
Cylinder cross sectional area	1.07in.^{2} (6.9cm^2)	2.00in.^{2} (12.9cm^2)	3.04in.^{2} (19.6cm^2)

(2)Rotational angle

Code	90	180
Rotational angle	90°	180°

(3)Rotation type

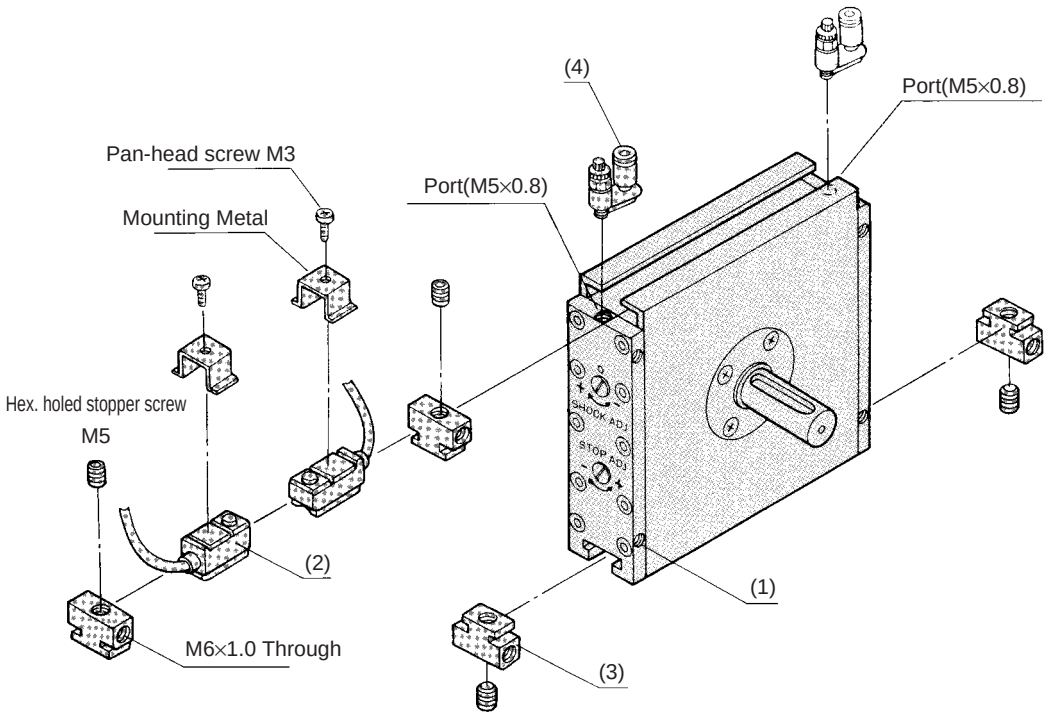
Code	No code	D
Rotation type	Pinion shaft type	Rotationary disk type

(4)Option

Code	A	B	C
Option	Magnetic sensor	Mounting holder	Speed controller

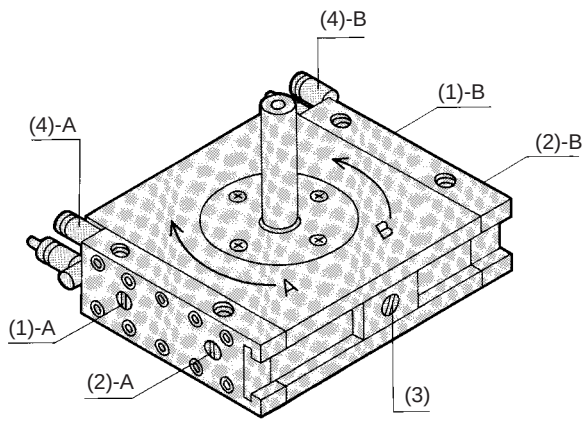
*Enter only when necessary
*Any combination of A, B, and C is possible

Mounting of sensor



1.Use M4 screw to secure the unit. For the mounting pitch, see the dimensional drawing on-page 18.
2.Fix tow sensor switches (option a) on the mounting slot on the unit each in the opposit direction, and secure them middle of the slot width.
3.The mounting holder (option b) is available when strong fixation is needed.
4.Attach the speed controller (option c) after attachment of the sensor switch and the mounting holder.

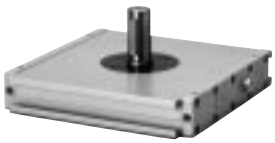
Adjustment

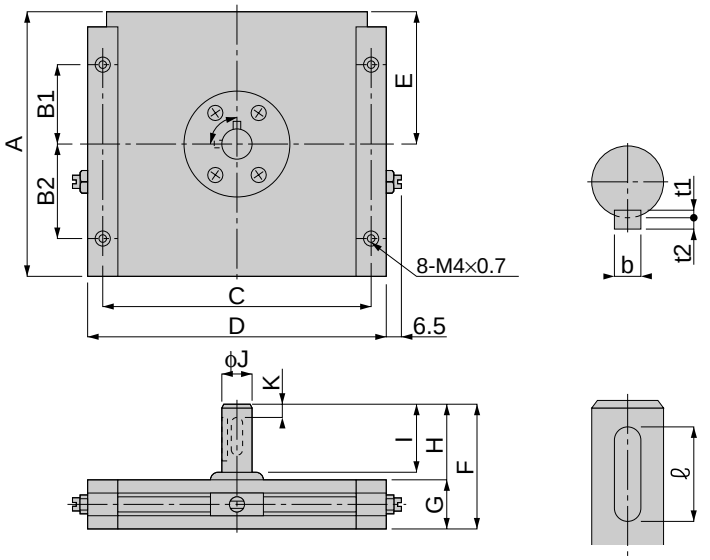


1. Cushion adjustment screw
   The air cushion is to be controlled by the screw adjusting the flow rate.
   (1)-A : Cushion adjustment for rotation A
   (1)-B : Cushion adjustment for rotation B
2. Angle adjustment screw
   The rotational angle should be adjusted between 0˚and 5˚ in each case of 90˚ and 180˚.
   (2)-A : Angle adjustment for rotation A
   (2)-B : Angle adjustment for rotation B
3. Backlash adjustment screw
   When backlash occurs in the shaft or the disk, tighten the screw to eliminate the backlash.
4. Speed controller
   (4)-A : Speed adjustment for rotation A
   (4)-B : Speed adjustment for rotation B

HR 200-400-600

Rotary Actuator
Pinion Shaft Type



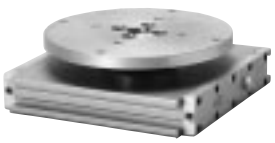


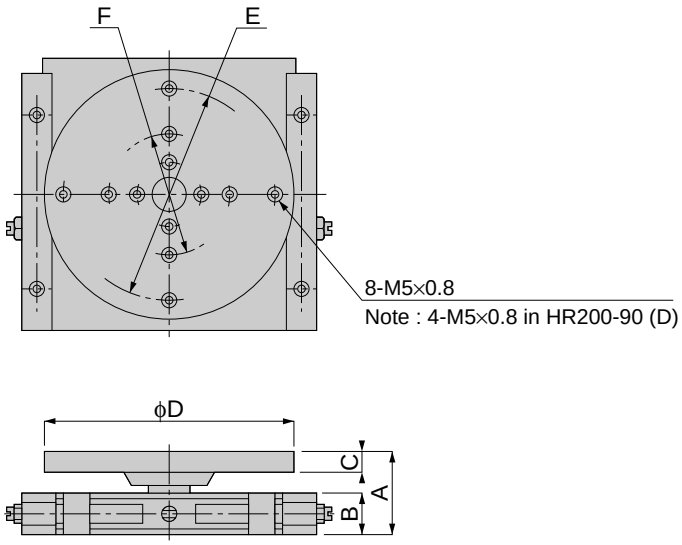
unit:mm

Model	A	B1	B2	C	D	E	F	G	H	I	J (g6)	K	b	t 1	t 2	ℓ	Mass (g)
HR 200-90	80	18.5	31.5	72	81	33.5	56.5	27	29.5	28	10	7.5	3	1.8	1.2	13	400
HR 400-90	130	45	45	122	130	65	59	24	35	35.5	15	5.0	5	3	3	25	850
HR 400-180				162	170												1050
HR 600-90	130	45	45	122	130	65	75	34	41	38.5	17	5.0	6	3.5	2.5	30	1200
HR 600-180				162	170												1450

HR 200-400-600

Rotary Actuator
Disk Type





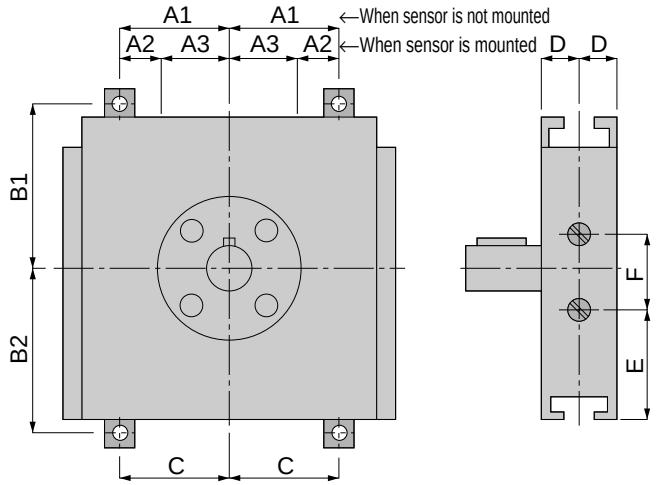
unit:mm

Model	A	B	C	ϕD	E	F	Mass (g)
HR 200-90D	44	27	8	64	50	-	600
HR 400-90D	44	24	8	120	106	60	1600
HR 400-180D							1800
HR 600-90D	54	34	8	120	106	60	1900
HR 600-180D							2200

Main body dimensions are same as those of pinion shaft type.

HR
200·400·600

Rotary Actuator
Sensor Switch



unit:mm

Model	Without sensor	With sensor		B1	B2	C	D	E	F
	A1	A2	A3						
HR 200-90(D)	5~25.5		0~4	38.5	51.5	17.5~25.5	12	35	18
HR 400-90(D)	5~50	37.5~50	0~1	70	70	17.5~50	11.5	47.5	40.5
HR 400-180(D)	5~70		0~10.5			17.5~70			47.5
HR 600-90(D)	5~50	37.5~50	0~1	70	70	17.5~50	16.5	47.5	40
HR 600-180(D)	5~70		0~10.5			17.5~70			47.5