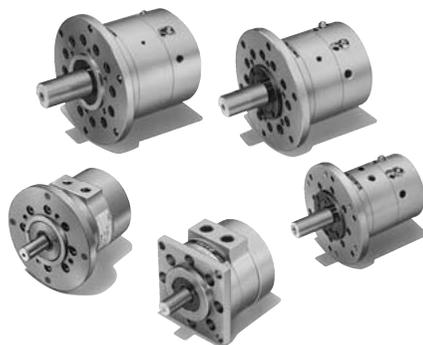# Vane type actuators with max. working pressure of 7 MPa

- Single vane and double vane type rotary actuators are standardized.
- Available the cushion model.
- The shaft parallel key (single key) .

Specifications: Standard type

Model / Item	Vane type	Rotating angle	Port size	Internal volume cm³	nternal leakage rate cm³/min (at 40℃)	Allowable inertia energy J	Radial load	Thrust load	Weight kg	Rema-rks
70RV 10	Single	270° $^{+3}_{0}$	Rc1/8	10	10	0.013	9.81	4.90	1	
	Double	90° $^{+3}_{0}$		6.5	20					
70RV 15	Single	270° $^{+3}_{0}$	Rc1/8	17	15	0.025	19.6	9.81	2	
	Double	90° $^{+3}_{0}$		11	30					
70RV 20	Single	270° $^{+3}_{0}$	Rc1/8	24	20	0.046	49.0	24.5	3	Standard
	Double	90° $^{+3}_{0}$		16	40					
70RV 30	Single	270° $^{+3}_{0}$	Rc1/8	51	30	0.088	78.5	39.2	4.3	
	Double	90° $^{+3}_{0}$		34	60				4.5	
70RV 100	Single	270° $^{+3}_{0}$	Rc1/4	111	50	0.255	147	68.6	10.2	
	Double	90° $^{+3}_{0}$		74	100				10.4	
70RV 200	Single	270° $^{+3}_{0}$	Rc3/8	221	100	0.510	294	137	20.0	Order made
	Double	90° $^{+3}_{0}$		147	200				20.5	
70RV 400	Single	270° $^{+3}_{0}$	Rc3/8	435	100	0.755	343	167	32	
	Double	90° $^{+3}_{0}$		290	200				33	
70RV 700	Single	270° $^{+3}_{0}$	Rc1/2	780	100	0.912	343	167	41	
	Double	90° $^{+3}_{0}$		520	200				43	

Common conditions

- Adaptable fluids: Petroleum-based fluid (When using another fluid, specify the fluid.) Recommended fluid: ISO VG32 to 56 (ISO viscosity grade)
- Nominal pressure: 7 MPa
- Minimum operating pressure: 1 MPa
- Proof test pressure: 10.5 MPa
- Hydraulic fluid temperature: 0 to +60℃ (No freezing)
- Use the actuators indoors.
- Do not use them in a place where they are exposed to considerable dust or vibration.
Notes) ● For the internal structure, refer to the sectional drawings at the end of this catalog.
● The hydraulic pressure generated in an actuator due to the inertia of load must be lower than the proof test pressure.

Adaptability of Fluid

Adaptable fluid				
Petroleum-based fluid	Water-glycol fluid	Phosphate ester fluid	Water in oil fluid	Oil in water fluid
○	○	×	×	×

Specifications: With cushion

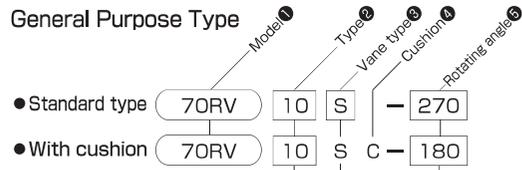| Model / Item	Vane type	Rotating angle	Port size	Internal volume cm³	nternal leakage rate cm³/min (at 40℃)	Radial load	Thrust load	Weight kg
70RV 10	Single	180° $^{+3}_{0}$	Rc1/8	6.5	10	9.81	4.90	1.2
		90° $^{+3}_{0}$		3.3				
70RV 15	Single	180° $^{+3}_{0}$	Rc1/8	11	15	19.6	9.81	2.4
		90° $^{+3}_{0}$		5.5				
70RV 20	Single	180° $^{+3}_{0}$	Rc1/8	16	20	49.0	24.5	3.3
		90° $^{+3}_{0}$		8				
70RV 30	Single	180° $^{+3}_{0}$	Rc1/8	34	30	78.5	39.2	4.7
		90° $^{+3}_{0}$		17				4.8
70RV 100	Single	180° $^{+3}_{0}$	Rc1/4	74	50	147	68.6	13.5
		90° $^{+3}_{0}$		37				13.8
70RV 200	Single	180° $^{+3}_{0}$	Rc3/8	147	100	294	137	25.7
		90° $^{+3}_{0}$		73.5				26.4
70RV 400	Single	180° $^{+3}_{0}$	Rc3/8	290	100	343	167	34
		90° $^{+3}_{0}$		145				35
70RV 700	Single	180° $^{+3}_{0}$	Rc1/2	520	100	343	167	44
		90° $^{+3}_{0}$		260				46

Cushion Specifications

Model / Item	Max. inertia moment kg·m²	Max. inrush angular speed rad/s	Cushion angle rad	Max. absorbed energy Working pressure MPa 2	3	4	5	6	7
70RV 10	0.098	10.4	0.349(20°)	2.06	1.77	1.47	1.18	0.883	0.588
70RV 15	0.196	10.4	0.436(25°)	4.81	4.12	3.43	2.75	2.06	1.37
70RV 20	0.294	10.4	0.436(25°)	7.55	6.47	5.39	4.31	3.24	2.16
70RV 30	0.588	10.4	0.436(25°)	15.1	12.9	10.8	8.63	6.47	4.31
70RV 100	1.47	8.7	0.436(25°)	30.9	26.5	22.1	17.7	13.2	8.83
70RV 200	3.92	6.9	0.436(25°)	78.9	67.7	56.4	45.1	33.8	22.6
70RV 400	6.86	5.2	0.436(25°)	137	118	98.1	78.5	58.8	39.2
70RV 700	13.7	4.3	0.436(25°)	251	215	179	143	107	71.6

Note) From the viewpoint of the torque efficiency, the working pressure should be 2 MPa or more. If the actuator is used at a pressure of less than 2 MPa for unavoidable reasons, the max. absorbed energy is the same as that at a working pressure of 2 MPa.

● How to order

General Purpose Type

① Model ② Type ③ Vane type ④ Cushion ⑤ Rotating angle

● Standard type 70RV 10 S — 270

● With cushion 70RV 10 S C — 180

Standard type
10·15·20·30·100·200·400·700

Standard type

| 270 | 270° (only single vane type) |
| 90 | 90° (only double vane type) |

With cushion

| 90 | 90° |
| 180 | 180° |

S Single vane
D Double vane

Output Characteristic Charts (Theoretical torque)

1MPa=10.2kgf/cm²
10N·m=1.02kgf·m
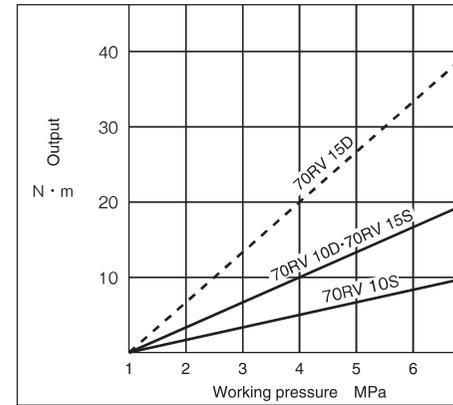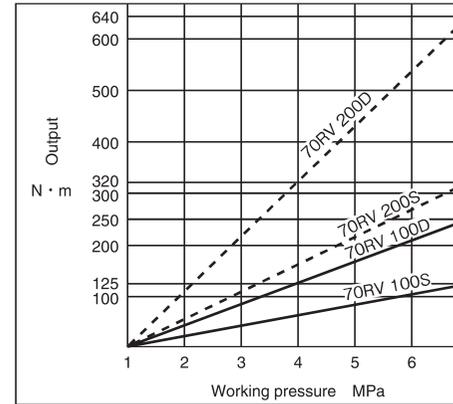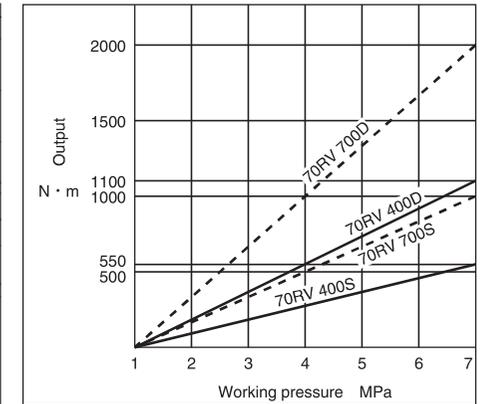

70RV 10·15

70RV 20·30
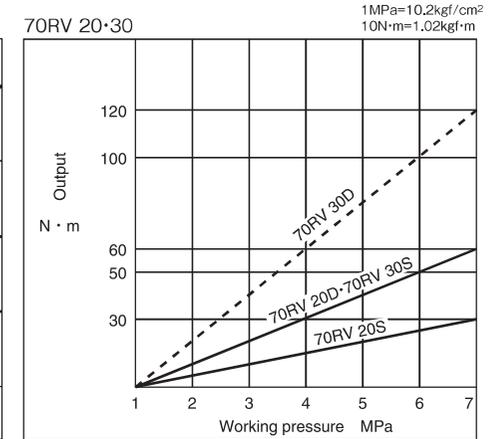
70RV 100·200

70RV 400·700

● These charts are common to the standard type and the type with cushion.

70RV 10 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

CAD/DATA
70RV/T70RV Bore is available.

● The tolerances of the dimensions of the key conform to JIS B1301.

70RV 15 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

● The tolerances of the dimensions of the key conform to JIS B1301.

70RV 20 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)
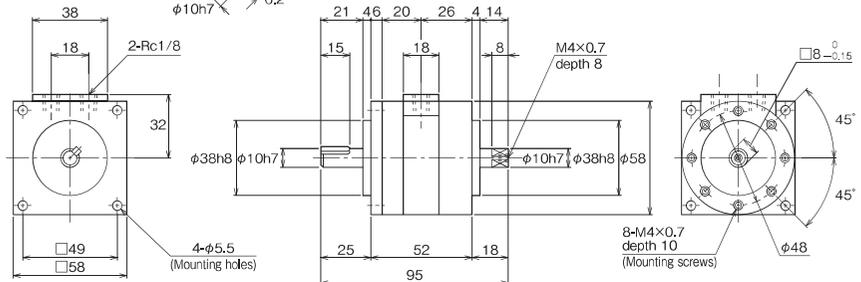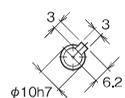
● The tolerances of the dimensions of the key conform to JIS B1301.

70RV 30 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

CAD/DATA
70RV/T70RV Bore is available.

● The tolerances of the dimensions of the key conform to JIS B1301.
● The double vane type rotary actuator is provided with two parallel keys.

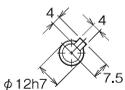### 70RV 100 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

● The tolerances of the dimensions of the key conform to JIS B1301.
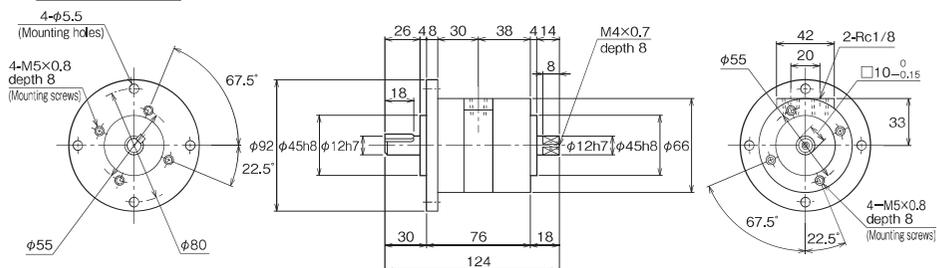● The double vane type rotary actuator is provided with two parallel keys.

70RV 200 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

● The tolerances of the dimensions of the key conform to JIS B1301.
● The double vane type rotary actuator is provided with two parallel keys.

HM 22

70RV

7 MPa Vane Type Rotary Actuator
Standard Type   Unit: mm

7 MPa Vane Type Rotary Actuator
Unit: mm   **With Cushion**   **70RV**

HM 23

CAD/DATA
70RV/T70RV Bore is available.

70RV 400 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

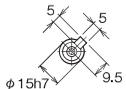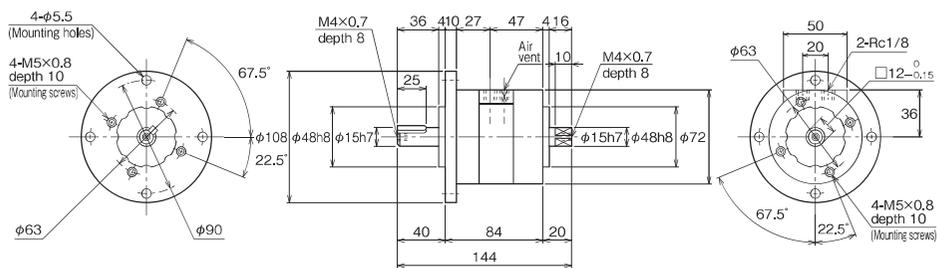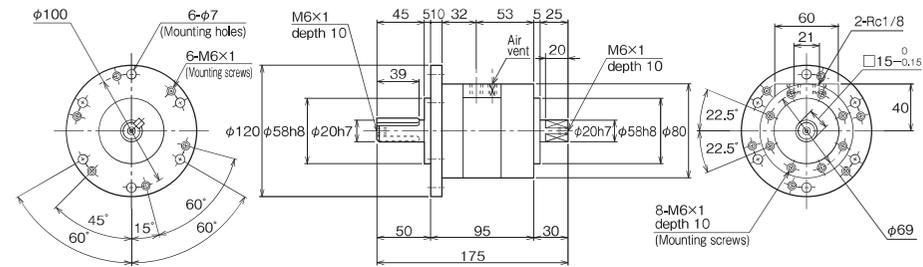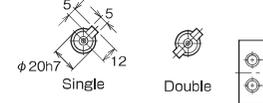●The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key

Single

9 14
φ45h7 26

φ120 φ206
6−φ14 (Mounting holes)
6-M12×1.75 depth 18 (Mounting screws)

M8×1.25 depth 16
86 616 55 89 636
30 25 M8×1.25 depth 16
70
φ230 φ102h8 φ45h7 φ45h7 φ102h8 φ177
Air vent
92 160 42
294

φ120 40 2-Rc3/8
□35 0−0.2
83.5
6-M12×1.75 depth 18 (Mounting screws)
15° 45°
60° 15° 60°
45°
60° 60°

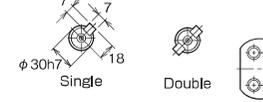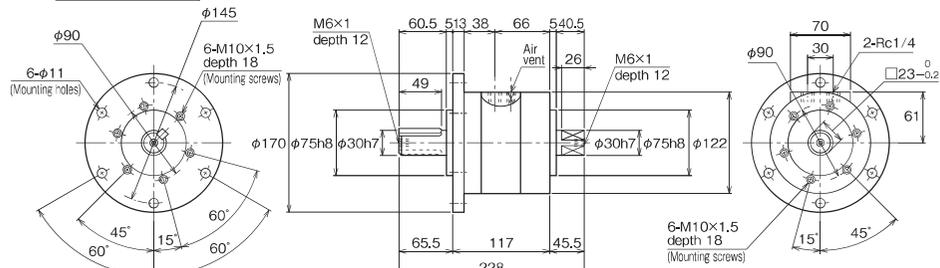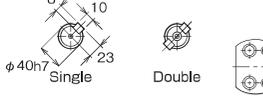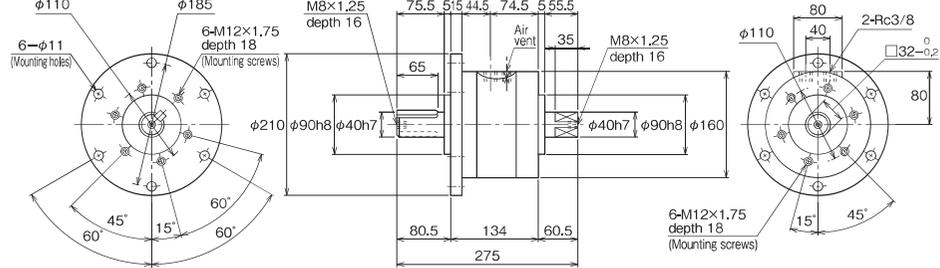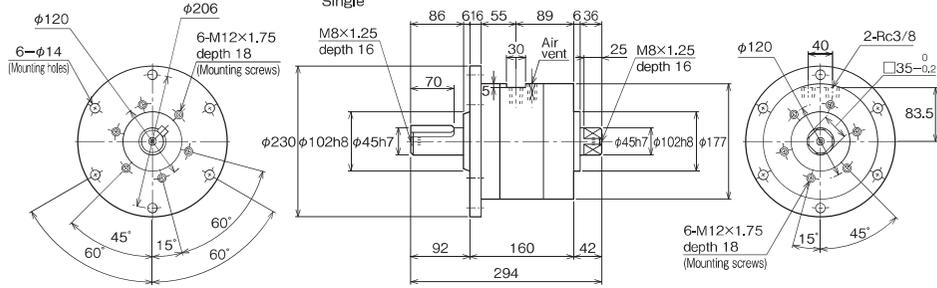## 70RV 700 ＊－＊

Vane type
S: Single
D: Double

Rotating angle
270° (only single vane type)
90° (only double vane type)

●The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key

Single

9 14
φ50h7 28.5

φ130
6−φ14 (Mounting holes)
φ215
6-M12×1.75 depth 18 (Mounting screws)

M10×1.5 depth 20
89 620 83 103 643
46 30 M10×1.5 depth 20
80
9
φ245 φ110h8 φ50h7 φ50h7 φ110h8 φ182
Air vent
95 206 49
350

φ130 60 2-Rc1/2
□40 0−0.2
82
6-M12×1.75 depth 18 (Mounting screws)
60° 60°
60°
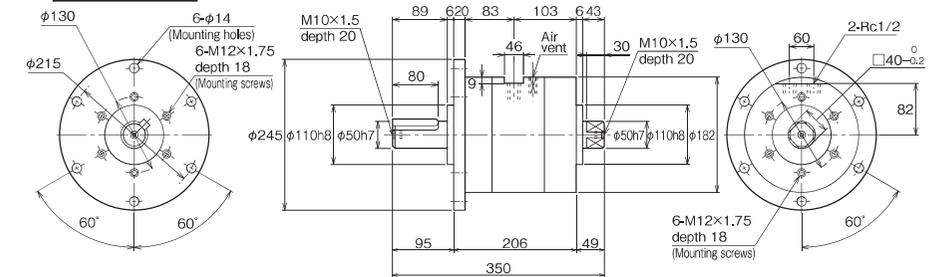
Rotation start point and rotating angle viewed from the front: Standard type

Port 45°
Rotation start point
270°
Rotating angle

When the rotating angle is 270°

45°
Rotation start point
90°
Rotating angle

When the rotating angle is 90°
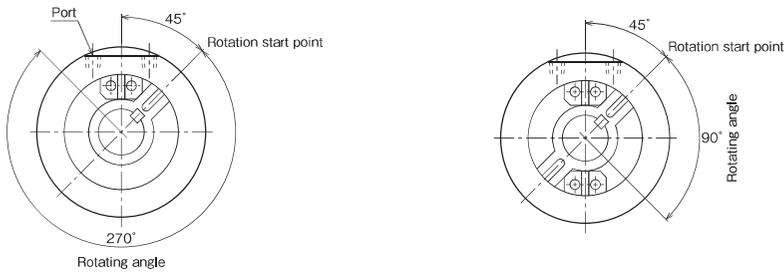
●The position at 45° from the port (position of the parallel key) is the rotation start point.

CAD/DATA
70RV/T70RV Bore is available.

70RV 10SC ＊

Rotating angle
90°・180°

●The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key

3
φ10h7 3
6.2

21 Cushion
15
φ38h8 φ10h7
□49
□58
4-φ5.5 (Mounting holes)

21 4 6 6.5 4 14
8 M4×0.7 depth 8
10
17
φ10h7 φ38h8
25 60 18
103
□8 0−0.15
8-M4×0.7 depth 10 (Mounting screws)

2-Rc1/8
45°
45°
φ48

70RV 15SC ＊

Rotating angle
90°・180°

●The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key

4
φ12h7 4
7.5

φ80
4-φ5.5 (Mounting holes)
4-M5×0.8 depth 8 (Mounting screws)
φ92 φ45h8 φ12h7
φ55
22.5° 67.5°

26 48 21.5 4 14
18 8 M4×0.7 depth 8
33
φ12h7 φ45h8 φ66
30 90 18
138
□10 0−0.15

25 Cushion
2-Rc1/8
28° (Port)
28° (Port)
φ55
67.5° 22.5°
4-M5×0.8 depth 8 (Mounting screws)

70RV 20SC ＊

Rotating angle
90°・180°

●The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key

5
φ15h7 5
9.5

φ90
4-φ5.5 (Mounting holes)
4-M5×0.8 depth 10 (Mounting screws)
φ63
φ108 φ48h8 φ15h7
67.5°
22.5°

M4×0.7 depth 8
36 4 10 19 4 16
25 10 M4×0.7 depth 8
29
Air vent
φ15h7 φ48h8 φ72
40 93 20
153
□12 0−0.15

27 Cushion
2-Rc1/8
28° (Port)
28° (Port)
φ63
67.5° 22.5°
4-M5×0.8 depth 10 (Mounting screws)

70RV 30SC *

Rotating angle
90° · 180°

CAD/DATA
70RV/T70RVC Bore is available.
● The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key
φ20h7 5 5 12

φ100 6-φ7 (Mounting holes) 6-M6×1 (Mounting screws)
M6×1 depth 10 45 5 10 22.5 15
39 Air vent 13 M6×1 depth 10
φ120 φ58h8 φ20h7 32 φ20h7 φ58h8 φ80
45° 15° 60° 60° 60° 50 105 20
175 □15 0 -0.15

φ69 33 Cushion 8-M6×1 depth 10 (Mounting screws)
2-Rc1/8 28°(Port) 28°(Port)
45° 45°
22.5 22.5

70RV 100SC *

Rotating angle
90° · 180°

● The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key
φ30h7 7 7 18

φ145 6-φ11 (Mounting holes) 6-M10×1.5 depth 18 (Mounting screws)
φ90
M6×1 depth 12 60.5 5 13 25 5 26.5
49 Air vent 20 M6×1 depth 12
φ170 φ75h8 φ30h7 41 φ30h7 φ75h8 φ122
60° 60° 65.5 131 31.5
228 □23 0 -0.2

2-Rc1/4 φ90 48 Cushion 6-M10×1.5 depth 18 (Mounting screws)
28°(Port) 28°(Port)
60° 60°

70RV 200SC *

Rotating angle
90° · 180°

● The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key
φ40h7 8 10 23

φ185 6-φ11 (Mounting holes) 6-M12×1.75 depth 18 (Mounting screws)
φ110
M8×1.25 depth 16 75.5 5 15 28.5 5 39.5
65 Air vent 35 M8×1.25 depth 16
φ210 φ90h8 φ40h7 43.5 φ40h7 φ90h8 φ160
60° 60° 80.5 150 44.5
275 □32 0 -0.2

φ110 62 Cushion 6-M12×1.75 depth 18 (Mounting screws)
2-Rc3/8 28°(Port) 28°(Port)
60° 60°

70RV 400SC *

Rotating angle
90° · 180°

CAD/DATA
70RV/T70RVC Bore is available.
● The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key
φ45h7 9 14 26

φ206 6-φ14 (Mounting holes) 6-M12×1.75 depth 18 (Mounting screws)
φ120
M8×1.25 depth 16 86 6 16 34 6 36
70 Air vent 25 M8×1.25 depth 16
φ230 φ102h8 φ45h7 54 φ45h7 φ102h8 φ177
60° 60° 92 181 42
315 □35 0 -0.2

φ120 70 Cushion 6-M12×1.75 depth 18 (Mounting screws)
2-Rc3/8 28°(Port) 28°(Port)
60° 60°

70RV 700SC *

Rotating angle
90° · 180°

● The tolerances of the dimensions of the key conform to JIS B1301.

Dimensions of key
φ50h7 9 14 28.5

φ215 6-φ14 (Mounting holes) 6-M12×1.75 depth 18 (Mounting screws)
φ130
M10×1.5 depth 20 89 6 20 34 6 43
80 Air vent 30 M10×1.5 depth 20
φ245 φ110h8 φ50h7 51 φ50h7 φ110h8 φ182
60° 60° 95 227 49
371 □40 0 -0.2

φ130 74 Cushion 6-M12×1.75 depth 18 (Mounting screws)
2-Rc1/2 28°(Port) 28°(Port)
60° 60°

Rotation start point and rotating angle viewed from the front: With cushion

Cushion valve Port 90° Rotation start point 180° Rotating angle

Cushion valve Port 90° Rotation start point 90° Rotating angle

When the rotating angle is 180°   When the rotating angle is 90°

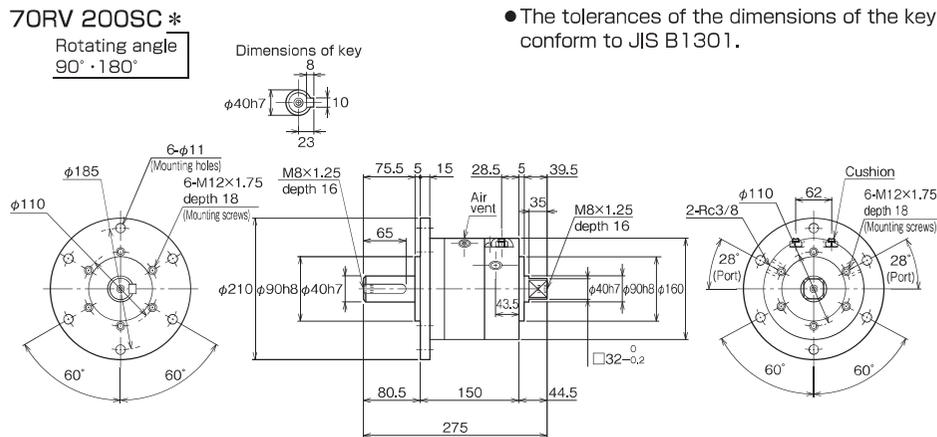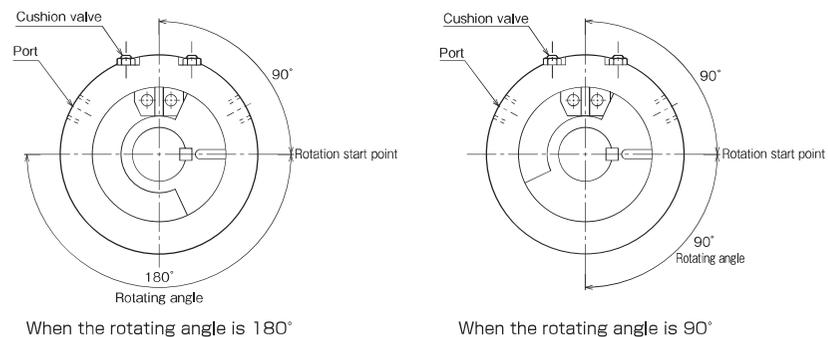● The position at 90° from the cushion valve (position of the parallel key) is the rotation start point.

1. Selection of size

To obtain simple static force for clamping, etc.

①Determine the working pressure.　P(MPa)
②Determine the required force.　F(N)
③Determine the arm length
　from the rotary actuator.　L(m)

→

Calculation of required torque
$T_S = F \times L(N \cdot m)$

→

Determine the rotary actuator size which ensures $T_S \leqq T_H$ from the output characteristic charts.
T_H: effective torque of rotary actuator

To move a load

Resistance load

When frictional force, gravity or other external force (resistance force) is applied
①Determine the working pressure.　P(MPa)
②Determine the required force.　F_R(N)
③Determine the arm length
　from the rotary actuator.　L(m)

→

Calculation of resistance torque
$T_R = K \times F_R \times L(N \cdot m)$
　K: allowance coefficient
When the load does not fluctuate: K=2
When the load fluctuates: K=3
(When the resistant moment caused by gravity acts)
If K is less than 3 when the load fluctuates, the angular speed will significantly change.

↓

Required torque　$T = T_R + T_A$

↑

Inertia load

To rotate an article
①Determine the rotating angle, rotating time and working pressure.
　Rotating angle　θ(rad)
　Rotating time　t(s)
　Working pressure　P(MPa)
　　　　90°=1.5708 rad
　　　180°=3.1416 rad
　　　270°=4.7124 rad
②Calculate the inertia moment of the load from the shape and weight of the load. For the calculation formula, see the Inertia Moment Calculation Table.
　　$I(kg \cdot m^2)$
③Calculate the average angular acceleration.
　　$\alpha = \dfrac{\theta}{t^2}(rad/s^2)$
　　　θ: rotating angle (rad)
　　　t: rotating time (s)

Note) In the case that the cushion is equipped, use the angle (θc) before entry to the cushion stroke as the rotating angle θ, and use the time (tc) before entry to the cushion stroke as the rotating time t.
　　θc=rotating angle (θ)−cushion angle (θt)
　　$\alpha = \dfrac{\theta c}{tc^2}(rad/s^2)$

→

Calculation of accelerating torque
$T_A = 5 \times I \times \alpha(N \cdot m)$
T_A is the torque required to accelerate the inertia load to a certain speed.

→

Determine the size of the rotary actuator which ensures $T \leqq T_H$ from the output characteristic charts.
T_H: effective torque of rotary actuator

2. Check of allowable inertia energy

In the case of inertia load, keep the load inertia energy lower than the allowable inertia energy of the rotary actuator.
①Calculation of average angular speed　　$\omega = \dfrac{\theta}{t}(rad/s)$
　　θ: rotating angle (rad)　　t=rotating time (s)
②Calculate the impact angular speed ω_0
　　$\omega_0 = 1.2\omega(rad/s)$
③Calculation of load inertia energy
　　$E = 1/2 I \omega_0^2(J)$
　　I: load inertia moment (kg·m²)
④Make sure that the load inertia energy E is less than the allowable inertia energy of the rotary actuator.
　　If E exceeds the allowable inertia energy, select a larger rotary actuator or a rotary actuator with cushion.

3. Confirmation of cushion performance (in the case of rotary actuator with cushion)

Determine the inertia moment I from the shape and weight of the load, and make sure that the inertia moment is within the load range.　$I \leqq Imax$　$I(kg \cdot m^2)$

↓

Make sure that the impact angular speed for rushing into the cushion is less than the max. impact angular speed.
$\omega = \dfrac{\theta c}{tc}(rad/s)$
$\omega_0 \fallingdotseq 1.2\omega(rad/s)$　　$\omega_0 \leqq \omega max$

θc: angle before entry to cushion stroke (rad)
tc: time before entry to cushion stroke (s)
ω : average angular speed (rad/s)
ω_0: impact angular speed (rad/s)

↓

Determine the impact energy from the load inertia moment and impact angular speed.
$E_1 = \frac{1}{2} I \omega_0^2(J)$　　I=inertia moment (kg·m²)　　ω_0=impact angular speed (rad/s)

↓

Determine the energy of external force applied during cushion stroke.
$E_2 = (Mg + Mf)\theta t(J)$　　　　E_2: energy of external force
　Mg: gravity moment caused by unbalanced load (N·m)
　　　$Mg = L \times Fg$　　Fg: force caused by load gravity (N)
　　　In the case of a balanced load or motion on a horizontal surface, Mg=0.
　Mf: moment generated by other thrust forces (for example, when the cylinder force acts) (N·m)
　　　$Mf = L \times Ff$　　Ff: thrust force (N)
　　　When there are no other thrust forces, Mf=0.
　θt: cushion angle (rad)

↓

Make sure that $E_1 + E_2$ is less than the max. absorbed energy.

↓

When all requirements stated above are met, the rotary actuator is acceptable. If any of them is not met, the rotary actuator cannot be used.
A shock absorber with higher absorbing performance is necessary.
See "TAIYO General Catalog of Shock Absorbers".

Inertia Moment Calculation Table

| Shape	Sketch	Requirements	Inertia moment I (kg·m²)	Radius of rotation K_1^2	Remarks
Disc		Diameter d(m) Weight M(kg)	$I=M\cdot\dfrac{d^2}{8}$	$\dfrac{d^2}{8}$	
Stepped disc		Diameter d_1(m) d_2(m) Weight Part d_1 M_1(kg) Part d_2 M_2(kg)	$I=M_1\cdot\dfrac{d_1^2}{8}+M_2\cdot\dfrac{d_2^2}{8}$		When part d_2 is significantly small as compared to part d_1, it is allowed to ignore d_2.
Bar (rotation center at end)		Length of bar ℓ(m) Weight M(kg)	$I=M\cdot\dfrac{\ell^2}{3}$	$\dfrac{\ell^2}{3}$	When the width of the bar is 30% or more of the length (ℓ), regard the bar as a rectangular solid.
Rectangular solid		Length of side a(m) b(m) Distance to center of gravity ℓ(m) Weight M(kg)	$I=M\left(\ell^2+\dfrac{a^2+b^2}{12}\right)$	$\ell^2+\dfrac{a^2+b^2}{12}$	
Bar (rotation center at center)		Length of bar ℓ(m) Weight M(kg)	$I=M\cdot\dfrac{\ell^2}{12}$	$\dfrac{\ell^2}{12}$	When the width of the bar is 30% or more of the length (ℓ), regard the bar as a rectangular solid.
Rectangular solid		Length of side a(m) b(m) Weight M(kg)	$I=M\cdot\dfrac{a^2+b^2}{12}$	$\dfrac{a^2+b^2}{12}$	
Lumped load		Shape of lumped load: Disc Diameter of disc d(m) Length of arm ℓ(m) Weight of lumped load M_1(kg) Weight of arm M_2(kg)	$I=M_1\cdot\ell^2+M_1\cdot K_1^2+M_2\cdot\dfrac{\ell^2}{3}$ In case of disc $K_1^2=\dfrac{d^2}{8}$	For other shapes, see K_1^2 shown above.	When M_2 is significantly small as compared to M_1, it is allowed to consider M_2 to be 0.

Method of converting load J_L to the load around the rotary actuator axis when a gear is used

| Gear | | No. of teeth
Rotary actuator side a
Load side b
Inertia moment of load I_L(kg·m²) | Inertia moment of load around rotary actuator axis
$I_H=\left(\dfrac{a}{b}\right)^2 I_L$ | | When the gear is larger, the inertia moment of the gear must be taken into consideration. |

Example of selection of vane type rotary actuator

1. To use for a clamp
- Length of arm　　　$L=0.2$m
- Clamp force　　　　$F=500$N
- Working pressure　$P=7$MPa
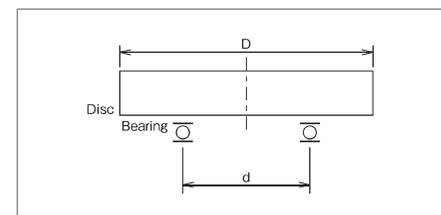
<To use for a clamp>
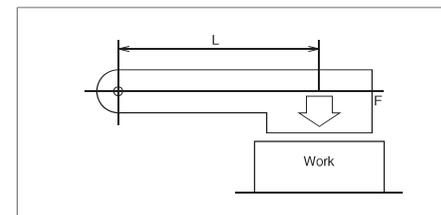
<Selection of size>
Static torque $T_S=$
According to the Output Characteristic Charts (Theoretical torque), the rotary actuator 70RV-30D or larger model can be used.

2. To rotate a circular table
- Weight of table　　　　　　　　　$M=50$kg
- Diameter of table　　　　　　　　$D=1$m
- Center diameter of plain bearing　$d=0.3$m
- Friction coefficient of plain bearing　$\mu=0.05$
- Rotating angle　　　　　　　　　$\theta=180°$
- Rotating time　　　　　　　　　$t=3$s
- Working pressure　　　　　　　$t=7$MPa

<To rotate a circular table>

<Selection of size>
① Determine the resistance torque T_R.
　$T_R=K\times F_R\times L$
　Consider that the allowance coefficient K is 2.
　Resistance force　$F_R=\mu\times M=0.05\times50\times9.8=24.5$(N)
　Therefore, $T_R=2\times24.5\times0.3/2=7.35$(N·m)
② Determine the accelerating torque T_A.
　$T_A=5\times I\times\alpha$(N·m)
　Inertia moment I(kg·m²)
　Since the load has the shape of a disc,
　$I=M\cdot D^2/8=50\times1^2/8=6.25$(kg·m²)
　Calculation of angular acceleration　α(rad/s²)
　$\alpha=\theta/t^2=3.1416/3^2=0.35$(rad/s²)
　$T_A=5\times6.25\times0.35=10.94$(N·m)

③ Determine the required torque T.
　$T=T_R+T_A=7.35+10.94=18.29$(N·m)
　According to the Output Characteristic Charts (Theoretical torque), the rotary actuator 70RV-15S or larger model can be used.

<Check of allowable inertia energy>
① To stop with the stopper in the rotary actuator
　Calculation of average angular speed
　$\omega=\theta/t=3.141/3=1.05$(rad/s)
　Calculation of impact angular speed ω_0
　$\omega_0=1.2\omega=1.2\times1.05=1.26$(rad/s)
　Calculation of load inertia energy E
　$E=1/2 I\omega_0^2=1/2\times6.25\times1.26^2=4.96$(J)
　Judging from the allowable inertia energy, there is no usable rotary actuator.
② To use a cushion
　Judging from the max. absorbed energy and max. inertia moment, the rotary actuator 70RV-200SC or larger model can be used.

<Selection of size based on torque and allowable inertia energy>
　Use 70RV-100SC, and rotate the load only by the rotary actuator.

<Check of rotating time, radial load and thrust load>
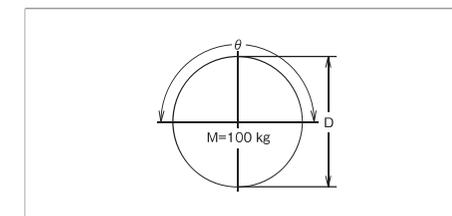　Rotating time: 3 sec
　Radial load: 0 kg
　Thrust load: 0 kg (because of use of a bearing)
　Therefore, the rotary actuator 70RV-200SC or larger model can be used.

3. To rotate a disc
- Weight of disc　　　$M=100$kg
- Diameter of disc　　$D=0.5$m
- Rotating angle　　　$\theta=180°$
- Rotating time　　　$t=5$s
- Working pressure　$P=7$MPa

<To rotate a disc>

**<Selection of size>**
① Determine the resistance torque T_R.
　Since no external force acts on the disc, the resistance torque T_R is 0.

②Determine the accelerating torque T_A.
$T_A=5×I×\alpha(N·m)$
Calculation of inertia moment $I(kg·m^2)$
Since the load has the shape of a disc,
$I=M·D_2/8=100×0.5^2/8=3.13(kg·m^2)$
Calculation of angular acceleration $\alpha(rad/s^2)$
$\alpha=\theta/t^2=3.1416/5^2=0.13(rad/s^2)$
$T_A=5×3.13×0.13=2.03(N·m)$
③Determine the required torque T.
$T=T_R+T_A=0+2.03=2.03(N·m)$
According to the Output Characteristic
Charts (Theoretical torque),
the rotary actuator 70RV-10S or larger
model can be used.

<Check of allowable energy>
①To stop with the stopper in the rotary actuator
Calculation of average angular speed
$\omega=\theta/t=3.1416/5=0.63(rad/s)$
Calculation of impact angular speed ω_0
$\omega_0=1.2\omega=1.2×0.63=0.76(rad/s)$
Calculation of load inertia energy E
$E=1/2I\omega_0^2=1/2×3.13×0.76^2=0.90(J)$
Judging from the allowable inertia energy, the rotary
actuator 70RV-700S or larger model can be used.
②To use a cushion
Judging from the max. absorbed energy and
max. inertia moment, the rotary actuator
70RV-200SC or larger model can be used.

<Selection of size based on torque and allowable inertia energy>
Use 70RV-400SC, and rotate the load only
by the rotary actuator.
<Check of rotating time, radial load and thrust load>
Rotating time 5 sec
Radial load 100 kg
Thrust load 0 kg
Therefore, 70RV-200SC or larger model
can be used.

Working Rotating Time

Standard type
Unit: s

	90°	270°
70RV 10	0.22 to 6	0.54 to 18
70RV 15	0.22 to 6	0.54 to 18
70RV 20	0.23 to 6	0.54 to 18
70RV 30	0.5 to 9	0.54 to 27
70RV 100	0.6 to 9	0.67 to 27
70RV 200	0.75 to 9	0.81 to 27
70RV 400	1 to 18	1.08 to 54
70RV 700	1.8 to 18	1.35 to 54

With cushion (not incl. cushioning zone)
Unit: s

	90°	180°
70RV 10	0.18 to 6	0.36 to 12
70RV 15	0.18 to 6	0.36 to 12
70RV 20	0.18 to 6	0.36 to 12
70RV 30	0.18 to 9	0.36 to 18
70RV 100	0.22 to 9	0.45 to 18
70RV 200	0.27 to 9	0.54 to 18
70RV 400	0.36 to 18	0.72 to 36
70RV 700	0.45 to 18	0.9 to 36

Setting of Rotating Time

⚠CAUTION

Use the actuator within the range of
rotating time shown in the above table. If
the rotary actuator is used longer than
the above rotating time, smooth operation
or cushioning effect cannot be obtained
due to stick-slip, etc. If the rotating time
is shorter than the above time, the rotary
actuator may be damaged.

Precautions for use

⚠CAUTION

●To install the body, use bolts of strength
class 8.8 or over in the specified size. When
installing, observe the following instructions.
1) Secure the actuator using all mounting holes.
2) Take care not to tighten the bolts unevenly. Tighten
them to the tightening torque specified for the bolts used.
3) Take care not to apply any external load
other than the main body load to the bolts.
(Use durable mounting materials.)

Fig. 1
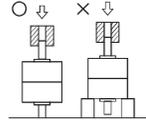
●When attaching a load
or a joint to the shaft of
the vane type rotary
actuator, attach it in
such a way that its force
is not applied to the
body as shown in Fig. 1.

Fig. 2 <Thrust load>
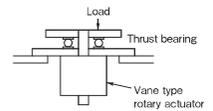
●A load in the axial direction
(thrust load) on the shaft of
the vane type rotary actuator
can cause operation failure.
Avoid applying such a load to
the actuator. Use a thrust
bearing as shown in Fig. 2 so
that the thrust load is not
applied to the rotary actuator.

Fig. 3 <Radial load>
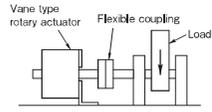
●Application of a bending load
(radial load) to the shaft end
of the vane type rotary
actuator can cause operation
failure. Avoid applying such a
load to the actuator. If this
cannot be avoided, provide
the rotary actuator with a
mechanism as shown in Fig.
3 to convey only the rotating
force to the actuator.

●When the weight of the load is large and the
operating speed is high, shock may be
caused by the inertia force, and it may not be
absorbed only by the internal shock receiver,
thereby resulting in damage to the equipment.
In this case, provide a shock absorber to
absorb the inertia energy.
●When installing the vane type rotary actuator
or starting it after a long-term suspension,
discharge air from it. Insufficient discharge
of air may cause operation failure.

⚠CAUTION

If you have any questions about repair or maintenance,
consult us. Never disassemble the actuator.

Notes on piping work

●Take care that dirt and pipe cuttings do not
enter the piping.
●Take care that air does not accumulate in
the piping.
●When connecting the actuator with a rubber
hose, do not bend the hose in a radius lower
than the specified radius.
●Be sure to flush the piping. After flushing,
connect the piping to the rotary actuator. If
the piping is not flushed, contaminants in
the piping may cause operation failure of the
rotary actuator or fluid leak.
●The vane type rotary actuators cause
internal leak. Also, the solenoid valves used
on the control circuits cause internal leak.
Therefore, they cannot be stopped in the
middle of operation under load torque. To
suspend any of the actuators in the middle
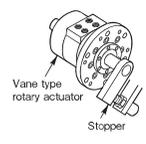for a long time, provide it with an external
mechanical stopper.

External stopper

Fig. 4
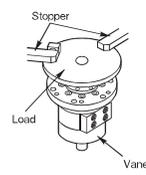
●Attach an external stopper in
such a way that the stopper
directly receives the inertia
energy of the load. (Fig. 4)
●An adjustable external
stopper is convenient for
angle adjustment.

Fig. 5

●When the actuator must
be stopped more
accurately, provide an
external stopper.
●An adjustable external
stopper is convenient for
angle adjustment. To
ensure the stopping
accuracy, it is recommended
to attach the stopper to a
position with as large radius
as possible. (Fig. 5)

Fig. 6
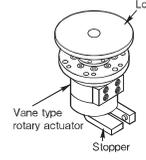
●When the load is driven on
the key groove side and an
external stopper is provided
on the square shaft side,
make sure that the load is
less than the allowable
energy. If the load exceeds
the allowable energy, the
shaft may be broken. (Fig. 6)