UNIVER

SERIES RT01 - ROTARY ACTUATORS

Pressures

1 bar (0.1 MPa)
8 bar (0.8 MPa)

Temperature

0 °C (Not frozen)
+ 60 °C

Cylinder Weight

Ø					
10	20	30	50	70	100
530	990	1290	2080	2880	4090

(Unit: g)

Bores

Ø					
10	20	30	50	70	100
15	18	20	25	28	32

(Unit: g)

Adjustment angle per rotation of angle adjustment screw

Ø					
10	20	30	50	70	100
10,2°	7,2°	6,5°	8,2°	7,0°	6,1°

(Unit: g)

Sensors recommended

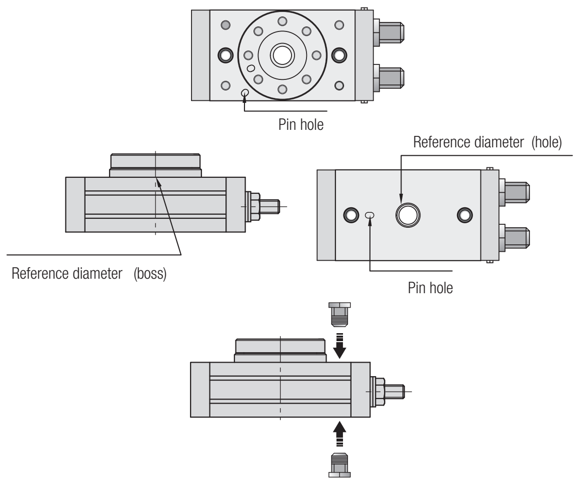
DC 02 PM8 - DC 02 P2M - DC 03 PM8 - DC 03 P2M
DC 04 PM8 - DC 04 P2M - DC 05 PM8 - DC 05 P2M

Sensors adapter

DC 00 001

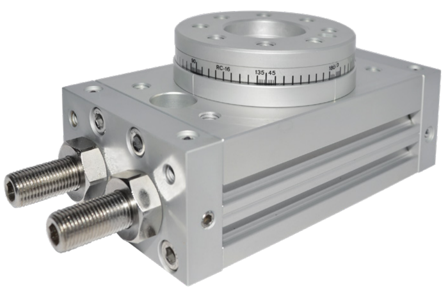
Reference Standard

1907/2006 REACH | 2011/65/CE RoHS | SILICON FREE



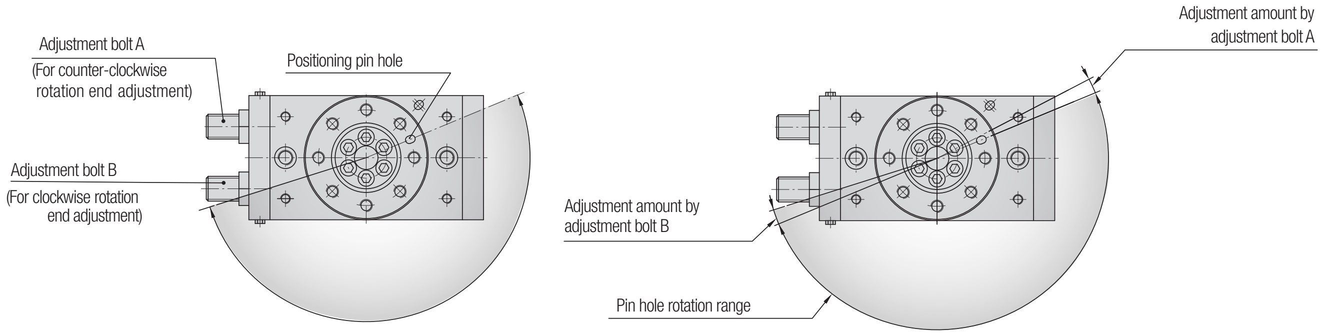
CHARACTERISTICS

Fluids: Air (Lubrication not necessary)	
Screw angle adjustment range: 0÷190°. Possible replacement with internal shock absorber 2 to 5 times more kinetic energy (compared to adjustment bolt).	
Positioning pin hole	
Table I.D/O.D tolerances I.D: H9 - O.D: h9 for alignment of rotation center and workpiece	
Bearing for high axial load	
Hallow axis	



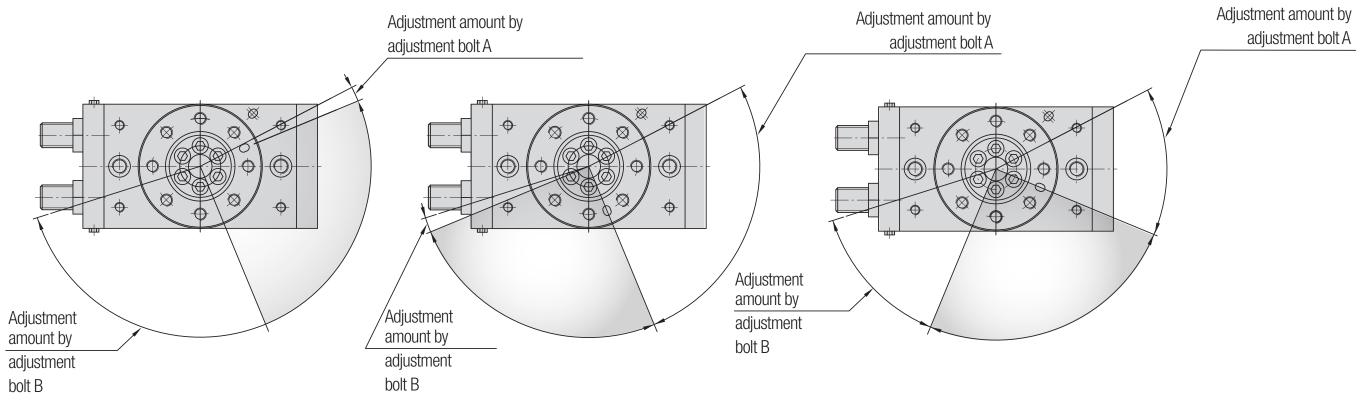
Series	Ø mm
R T 0 1	0 1 0
	010 020 030 050 070 100

Rotation range example



190° (Maximum) Rotation

180° Rotation

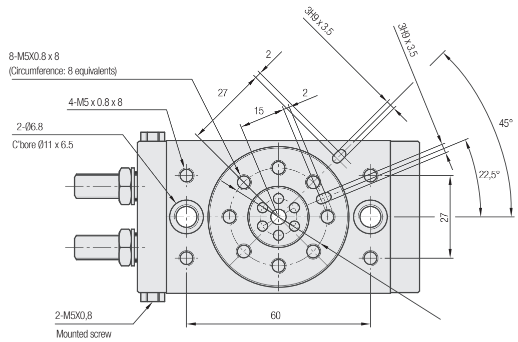


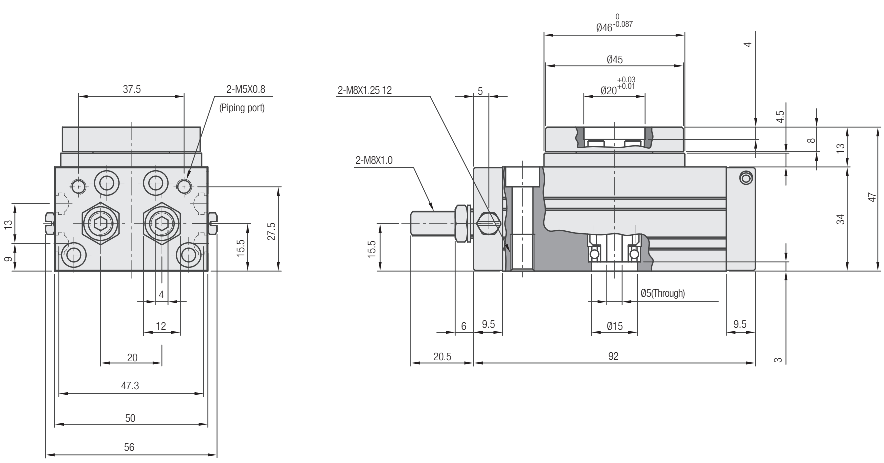
90° Rotation

90° Rotation

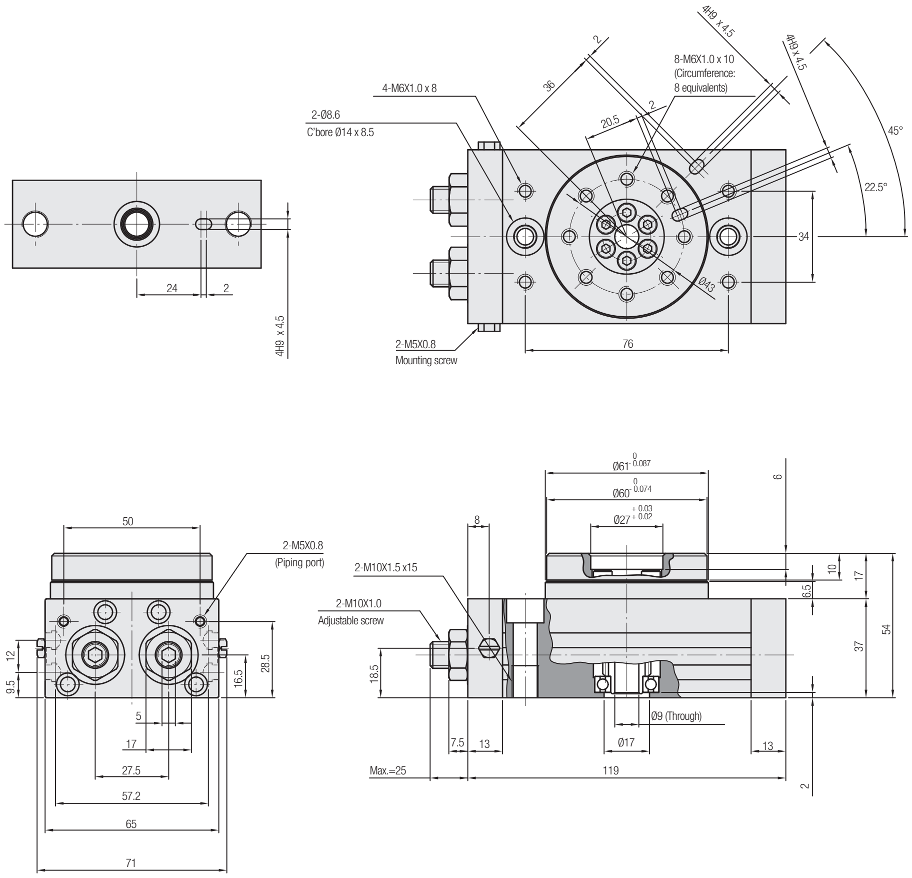
90° Rotation

RT01 - 10

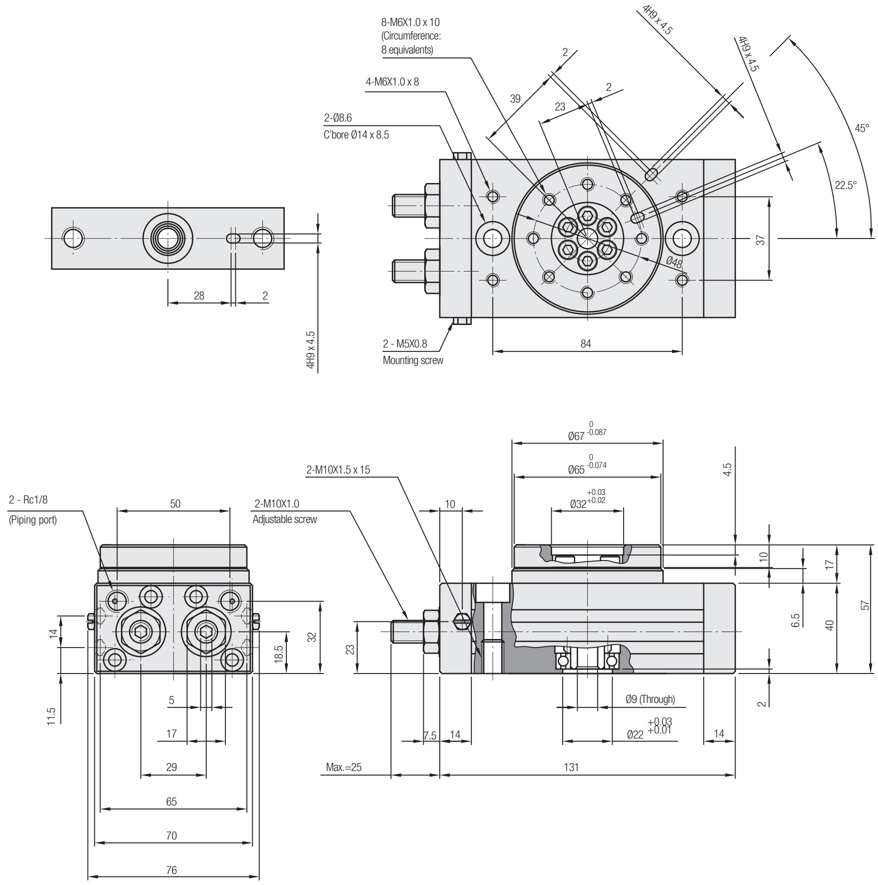




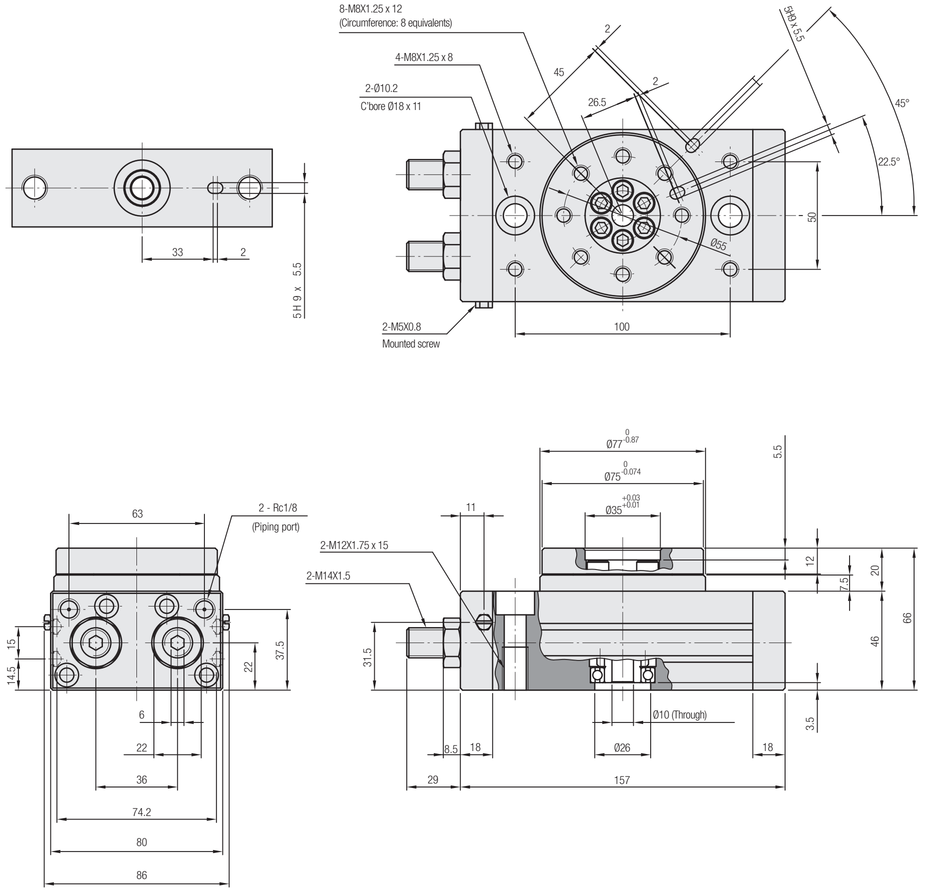
RT01 - 20



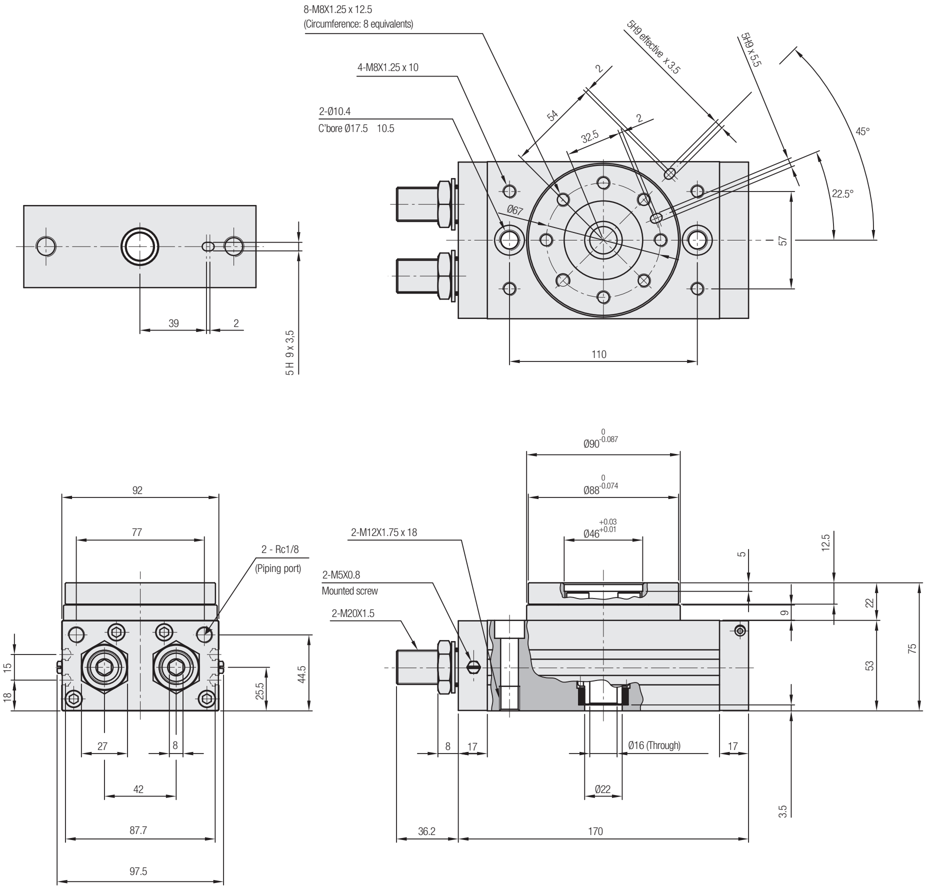
RT01 - 30



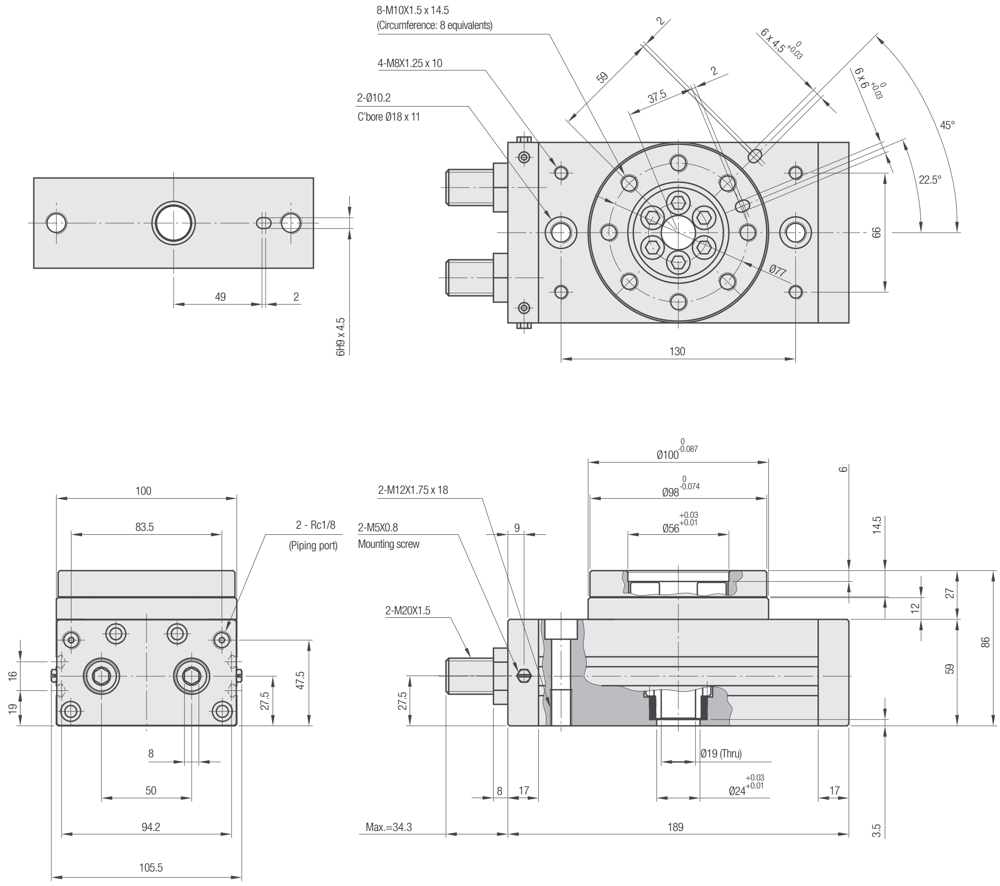
RT01 - 50



RT01 - 70



RT01 - 100

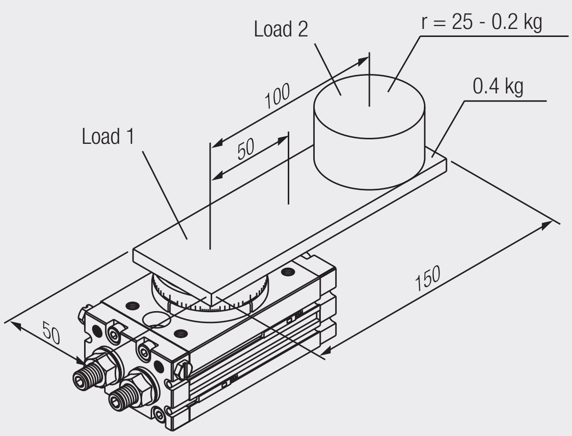

8-M10X1.5 x 14.5
(Circumference: 8 equivalents)
4-M8X1.25 x 10
2-Ø10.2
C'bore Ø18 x 11
59
2
37.5
2
6 x 4.5 0 +0.03
6 x 6 +0.03 0
45°
22.5°
66
Ø77
130
49
2
6H9 x 4.5
100
83.5
2 - Rc1/8
(Piping port)
16
19
27.5
47.5
8
50
94.2
105.5
Ø100 0 -0.087
Ø98 0 -0.074
Ø56 +0.03 +0.01
2-M12X1.75 x 18
2-M5X0.8
Mounting screw
9
2-M20X1.5
27.5
6
14.5
12
27
59
86
Ø19 (Thru)
Ø24 +0.03 +0.01
8
17
17
Max.=34.3
189
3.5

model selection steps - Select a model and follow next steps

KEY

P (MPa)	Working pressureo	m (kg)	Mass of the load	ω (rad/s2)	Angular acceleration
T (Nm)	Load type	μ	Friction coefficient	ω (rad/s)	Angular speed
Ts (Nm)	Static Load	t (sec)	Rotation Time		
Tf (Nm)	Resistance Load	θ (rad)	Rotation Angle		
Ta (Nm)	Inertial Load	M (Nm)	Permitted Load		
Tc (Nm)	Tf+Ta Total Load	I (kgm2)	Moment of Inertia		

Temporary selected Model: **RT01 010**
Working Pressure: 3 bar
Mounting position: Verticale
t = 6 s
θ = 180°



1 Calculation of Inertial Moment I

Calculate the model of the total inertial load

I (kg·m²) = I1 + I2 + I3 +...

EXAMPLE

$$I_1 = 0{,}4 \cdot \frac{0{,}15^2 \cdot 0{,}05^2}{12} + 0{,}4 \cdot 0{,}05^2 = 0{,}001833\ Kg \cdot m^2$$

$$I_2 = 0{,}2 \cdot \frac{0{,}025^2}{2} + 0{,}2 \cdot 0{,}1^2 = 0{,}002063\ Kg \cdot m^2$$

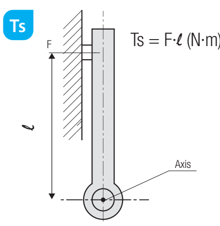
$$I_{tot} = I_1 + I_2 = 0{,}003896\ Kg \cdot m^2$$

2 Calculation of Torque

Check Torque T necessary and correspondent to the load type and make sure it stays the effective torque range.

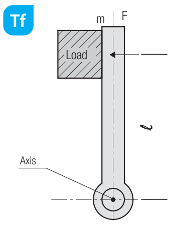
T = Ta x 10 *or* T = Tf x (3÷5) + Ta x 10 T (Nm) < Effective torque OK

Ts



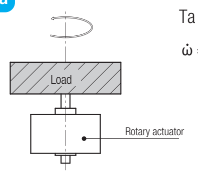
Ts = F·ℓ (N·m)

Tf



Tf = F · ℓ (N·m)
F = μmg
g = 9,8 m/s²

Ta



Ta = I · ω (N·m)

$\dot{\omega} = \frac{2\,\theta}{t}$ (rad/s²)

EXAMPLE

$$T_c = T_a \cdot 10 \qquad T_a = 0{,}003896 \cdot \left(\frac{2\pi}{4}\right) = 0{,}0015\ Nm$$

$$T_a = I_{tot} \cdot \omega \qquad T_c = 0{,}0015 \cdot 10 = 0{,}015\ Nm$$

$$\dot{\omega} = \frac{2 \cdot \theta}{t^2} \cdot \frac{rad}{s^2}$$

3 Rotation Time

It must respect times as per TAB.3. In the calculation, if time is longer than 2sec to make 90°, consider anyway a time of 2 sec to make 90°. Convert alwayss into 90° to compare.
For example,6 sec/180° converted into 3sec/90°.

4 Calculation Kinetic Energy

Kinetic Energy of Load must respect the permissible values.

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

E (J) < Permissible energy OK

EXAMPLE

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

$$\omega = \frac{2 \cdot \theta}{t}$$

$$E = \frac{1}{2} \cdot 0{,}003896 \cdot \left(\frac{2\pi}{4}\right) = 0{,}048\ J = 48\ mmJ$$

5 Permissible Load Control

Check if Load applied to product respects the permissible range.
M < Permissible load OK

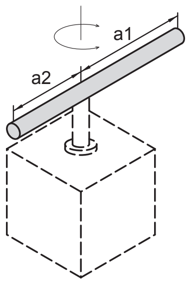
EXAMPLE

$$M = T_{b1} + T_{b2} = (0{,}4 \cdot 9{,}8 \cdot 0{,}05) + (0{,}2 \cdot 9{,}8 \cdot 0{,}1) = 0{,}392\ Nm$$

1 Calculation of Inertial Moment I

1 Shaft

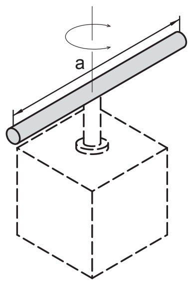
Position of rotational axis:
Perpendicular to the shaft through one end.



$$I = m1 \cdot \frac{a1^2}{3} + m2 \cdot \frac{a2^2}{3}$$

2 Shaft

Position of rotational axis:
Through the shaft's center of gravity.

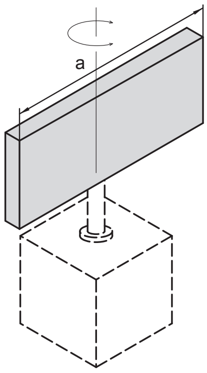


$$I = m1 \cdot \frac{a^2}{12}$$

1

3 Rectangular plate

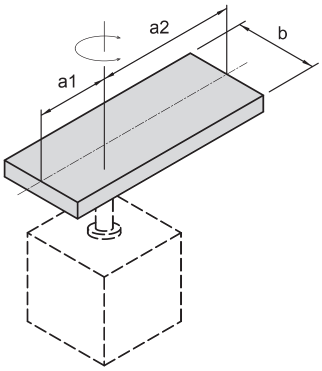
Position of rotational axis:
Through the plate's center of gravity



$$I = m \cdot \frac{a^2}{12}$$

4 Rectangular plate

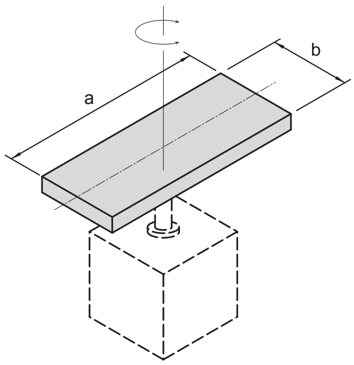
Position of rotational axis:
Perpendicular to the plate through one end (also the same in case of a thicker plate).



$$I = m1 \cdot \frac{4a1^2 + b^2}{12} + \frac{4a2^2 + b^2}{12}$$

5 Rectangular plate

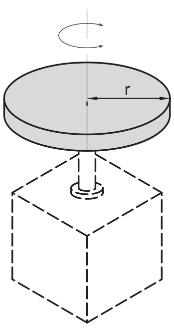
Position of rotational axis:
Through the center of gravity and perpendicular to the plate (also the same in case of a thicker plate).



$$I = m1 \cdot \frac{a^2 + b^2}{12}$$

6 Cylinder

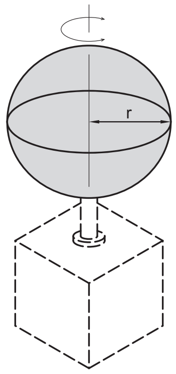
Position of rotational axis: Central axis.



$$I = m \cdot \frac{r^2}{2}$$

7 Solid Sphere

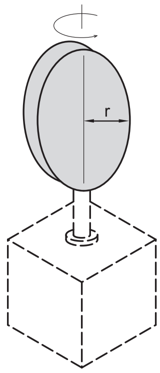
Position of rotational axis: diameter.



$$I = m \cdot \frac{2r^2}{5}$$

8 Round plate

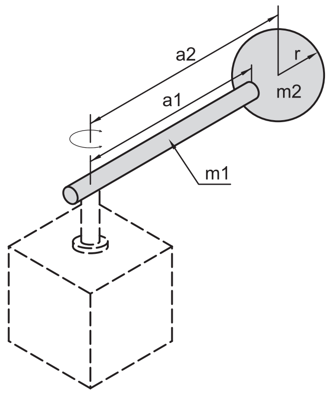
Position of rotational axis: diameter.



$$I = m \cdot \frac{r^2}{4}$$

9 Carico alla fine della leva

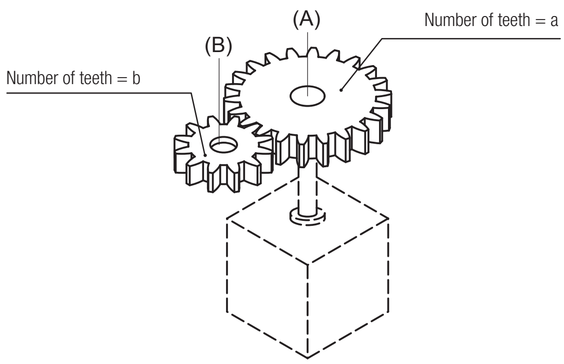
When shape of m2 is a sphere refer to 7, and $K = M2 \cdot \frac{2r^2}{5}$



$$I = m1 \cdot \frac{a1^2}{3} + m2 \cdot a2^2 + K$$

10 Gear Transmission

- Find the inertial moment IB for the rotation of shaft (B).
- Next, IB is entered to find IB to find IA the inertial moment for the rotation of shaft (A) as $I_A = \left(\frac{a}{B}\right) \cdot I_B$



$$I = m \cdot \frac{r^2}{5}$$

2

Torque Calculation

SERIES RT01

Ø	Operating Pressure Bar 1	2	3	4	5	6	7	8	9	10
10	0,18	0,36	0,53	0,71	0,89	1,07	1,25	1,42	1,60	1,78
20	0,37	0,73	1,10	1,47	1,84	2,20	2,57	2,93	3,29	3,66
30	0,55	1,09	1,64	2,18	2,73	3,19	3,82	4,37	4,91	5,45
50	0,9	1,85	2,78	3,71	4,64	5,57	6,50	7,43	8,35	9,28
70	1,36	2,72	4,07	5,43	6,79	8,15	9,50	10,9	12,2	13,6
100	2,03	4,05	6,08	8,11	10,1	12,2	14,2	16,2	18,2	20,3

(Unit: N • m)

SERIES RT03

Ø	Operating Pressure Bar 1	2	3	4	5	6	7	8	9	10
10	-	0,09	0,18	0,2	0,30	0,36	0,42	-	-	-
15	-	0,22	0,45	0,60	0,75	0,90	1,04	-	-	-
20	0,37	0,55	1,10	1,47	1,84	2,20	2,57	2,93	3,29	3,66
30	0,62	0,94	1,87	2,49	3,11	3,74	4,37	4,99	5,60	6,24

(Unit: N • m)

3

4

Rotation Time - Allowable Kinetic Energy

SERIES RT01

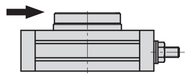
Ø	Allowable Kinetic Energy (mJ)	Rotation time adjustment range for stable operation (s/90°)
10	7	0,2 ÷ 1,0
20	25	
30	48	
50	81	
70	240	0,2 ÷ 1,5
100	320	0,2 ÷ 2,0

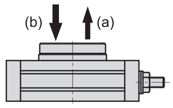
SERIES RT03

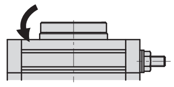
Ø	Allowable Kinetic Energy (mJ) without cushion	rubber cushion	Rotation time adjustment range for stable operation (s/90°)
10	7	0,25	0,2 ÷ 0,7
15	25	0,39	0,2 ÷ 0,7
20	48	-	0,2 ÷ 1
30	81	-	0,2 ÷ 1

5 Effective Load

SERIES RT01

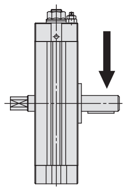


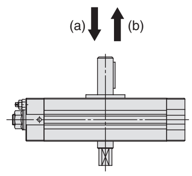




ø	Allowable radial load	Allowable thrust load		Allowable moment
	N	(a) N	(b)	N • m
10	78	74	78	2,4
20	147	137	137	4,0
30	196	197	363	5,3
50	314	296	451	9,7
70	333	296	476	12,0
100	390	493	708	18,0

SERIES RT03

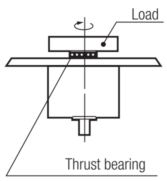


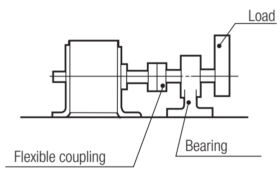


ø	Allowable radial load	Allowable thrust load	
	N	(a) N	(b)
10	14,7	15,7	7,8
15	19,6	19,6	9,8
20	49	49	29,4
30	78	98	49

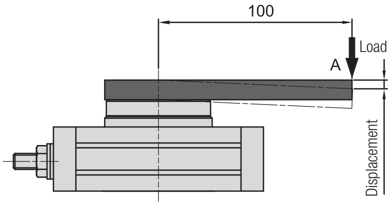
Do not allow the load and moment applied to the table to exceed the allowable values shown in the tables.
(Operation above the allowable values can cause adverse effects on service life, such as play in the table and loss of accuracy).

In order to further improve the operating conditions, a method such as that shown in below drawing is recommended so that a direct load is not applied to the shaft.



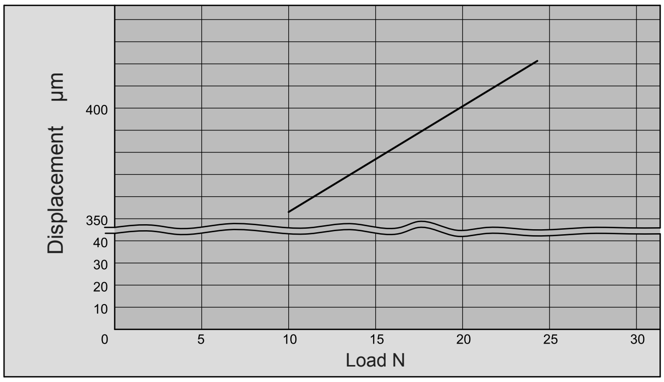


RT01 - Table displacement (reference values)

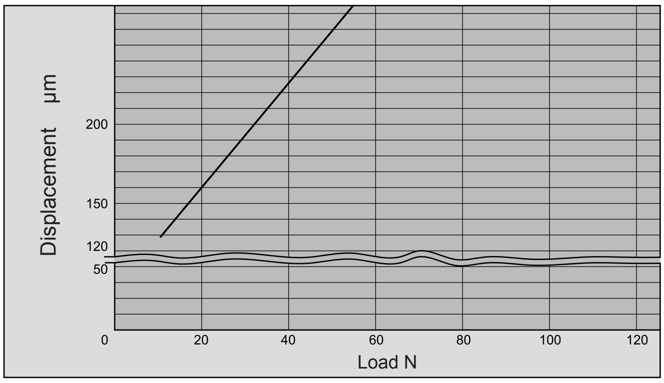


The fallowing graphs show the displacement at point A, which is 100 mm apart from the center tof rotation, where the load is applied.

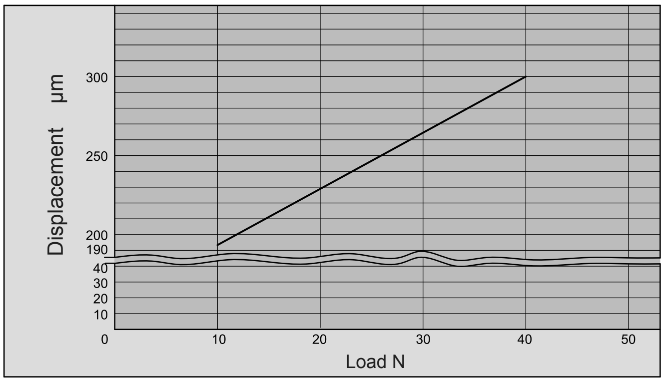
RT01 010



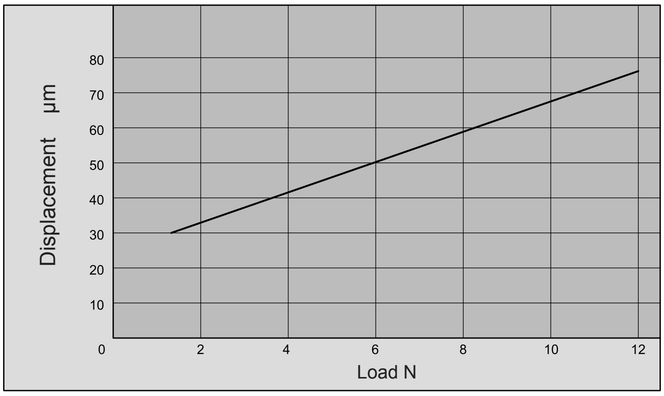
RT01 050



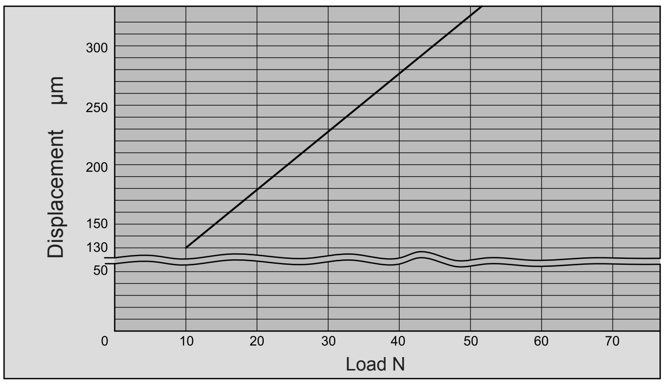
RT01 020



RT01 070



RT01 030



RT01 100