LCM
LCR
LCG
LCW
LCX
STM
STG
STS/STL
STR2
UCA2
ULK*
JSK/M2
JSG
JSC3/JSC4
USSD
UFCD
USC
UB
JSB3
LMB
LML
HCM
HCA
LBC
CAC4
UCAC2
CAC-N
UCAC-N
RCS2
RCC2
PCC
SHC
MCP
GLC
MFC
BBS
RRC
GRC
RV3*
NHS
HRL
LN
Hand
Chuk
MecHnd/Chuk
ShkAbs
FJ
FK
SpdContr
Ending

Selection guide of rotary actuator

Step 1 Oscillating time check

Use an oscillating time within the specified range of the table below. Unit: S

Oscillating angle (degree) / Model No.	90	180	270
RRC-8	0.015 to 0.151	0.030 to 0.302	0.045 to 0.452
RRC-32	0.038 to 0.377	0.075 to 0.754	0.113 to 1.131
RRC-63	0.073 to 0.440	0.147 to 0.880	0.220 to 1.320

* The oscillating time in the table is the time for the oscillating to end after movement begins.

Step 2 Size selection

● When simple static pushing force is required for clamp, etc.

Static load

(1) Determine the working pressure. P(MPa)
(2) Determine the required force. F(N)
(3) Length of arm from rotary actuator is determined. ℓ(m)

➡ Calculation of required torque

$T = F\ell$ (N·m)

➡

● To move load

Resistance load

When applying force (resistance load) including frictional force, gravity or other external forces.
(1) Determine the working pressure. P(MPa)
(2) Determine the required force. F_R(N)
(3) Length of arm from rotary actuator is determined. ℓ(m)

➡ Calculation of resistance torque
$T_R = K \times F_R \times \ell$ (N·m)
K: Slack coefficient
If no load fluctuation K = 2
If load fluctuates K = 5
(When resistance torque caused by gravity operates)
If load fluctuates when K < 5, the change in angular speed increases.

⬇

Required torque $T = T_R + T_A$

➡ Determine size of rotary actuator according to output torque graph.

Inertia load

When the object is rotated.
(1) Oscillating angle/oscillating time and working pressure are determined.
Oscillating angle θ (rad)
Oscillating time t(s)
Working pressure P(MPa)
90°=1.5708(rad)
180°=3.1416(rad)
270°=4.7124(rad)
(2) Calculate the load moment of the inertia according to the load shape and weight. Refer to moment of inertia table for the calculation formula.
I (kg·m²)
(3) Calculate the max. angular acceleration speed.
$\alpha = \frac{2\theta}{t^2}$ (rad/s²)
θ: Oscillating angle (rad)
t: Oscillating time (s)

➡ Calculation of acceleration torque
$T_A = 5 \times I \times \alpha$ (N·m)
T_A is the required torque to accelerate inertia load until set speed.

⬆ (to Required torque)

Step 3 Check of allowable energy

When using an inertial load, keep the load energy lower than the rotary actuator's allowable energy.

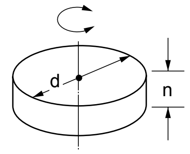
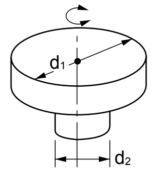
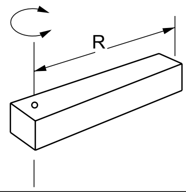
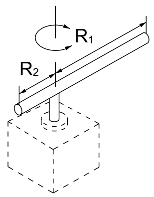
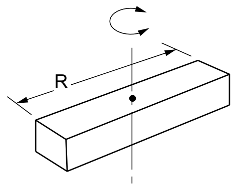
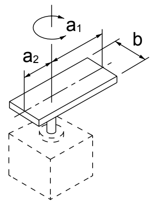
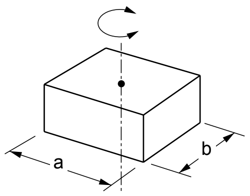
(1) Angular speed at oscillation edge $\omega = \frac{2\theta}{t}$ (rad/s)
θ: Oscillating angle (rad) t: Oscillating time (s)

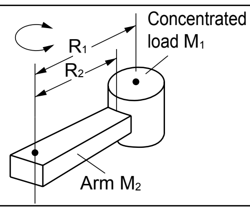
(2) Calculation of load inertia energy
$E = \frac{1}{2} \times I \times \omega^2$ (J)
I: Load moment of inertia (kg·m²)

(3) Confirm that the load inertia energy E is equal to or less than the allowable energy of the rotary actuator.
When exceeding the allowable energy, an external shock absorber, etc., will be required.

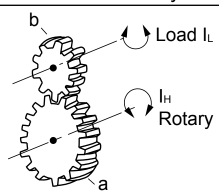
Figure for moment of inertia calculation

● When rotary shaft passes through the workpiece

Shape	Sketch	Requirements	Moment of inertia I $kg\cdot m^2$	Radius of rotation K_1^2	Remarks
Dial plate		● Diameter d(m) ● Weight M(kg)	$I = \frac{Md^2}{8}$	$\frac{d^2}{8}$	● No mounting direction ● For sliding use, contact CKD.
Circular stepped plate		● Diameter d_1(m) d_2(m) ● Weight d_1 section M_1(kg) d_2 section M_2(kg)	$I = \frac{1}{8}(M_1d_1^2+M_2d_2^2)$	$\frac{d_1^2+d_2^2}{8}$	● Ignore when the d_2 section is extremely small compared to the d_1 section
Bar (center of rotation at end)		● Bar length R(m) ● Weight M(kg)	$I = \frac{MR^2}{3}$	$\frac{R^2}{3}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Thin rod		● Bar length R_1 R_2 ● Weight M_1 M_2	$I = \frac{M_1/R_1^2}{3} + \frac{M_2/R_2^2}{3}$	$\frac{R_1^2+R_2^2}{3}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Bar (center of rotation at center of gravity)		● Bar length R(m) ● Weight M(kg)	$I = \frac{MR^2}{12}$	$\frac{R^2}{12}$	● No mounting direction
Thin rectangle plate (rectangular parallelepiped)		● Plate length a_1 a_2 ● Side length b ● Weight M_1 M_2	$I = \frac{M_1}{12}(4a_1^2+b^2) = \frac{M_2}{12}(4a_2^2+b^2)$	$\frac{(4a_1^2+b^2)+(4a_2^2+b^2)}{12}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Rectangular parallelepiped		● Side length a(m) b(m) ● Weight M(kg)	$I = \frac{M}{12}(a^2+b^2)$	$\frac{a^2+b^2}{12}$	● No mounting direction ● For sliding use, contact CKD.

Shape	Sketch	Requirements	Moment of inertia	Radius of rotation	Remarks
Concentrated load		● Shape of concentrated load ● Length to center of gravity of concentrated load R_1(m) ● Arm length R_2(m) ● Concentrated load weight M_1(kg) ● Arm weight M_2(kg)	$I = M_1(R_1^2+k_1^2) + \frac{M_2R_2^2}{3}$	Calculate k_1^2 according to shape of concentrated load	● Mounting direction is horizontal ● When M_2 is extremely small compared to M_1, it may be calculated as $M_2 = 0$

How to convert load J_L to rotary actuator shaft rotation when using with gear

Shape	Sketch	Requirements	Moment of inertia	Radius of rotation	Remarks
Gear		● Gear - Rotary side (tooth number) a, Load side (tooth number) b ● Load moment of inertia N·m	Load moment of inertia for the rotary actuator's shaft rotation $I_H = \left(\frac{a}{b}\right)^2 I_L$		● When gear shape is larger, gear moment of inertia should be considered.