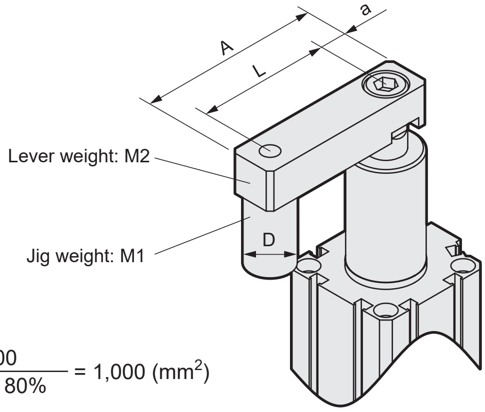
Technical data (selection example)

[Specifications]

- Required clamping force: 400 N
- Working pressure: 0.5 MPa
- Maximum piston speed: 100 mm/s
- Lever shape
  M2: 0.31 kg L: 0.08 m
  A: 0.1 m a: 0.01 m
- Jig shape
  M1: 0.04 kg D: 0.02 m



1. Calculate the required pressurized area.

$$\text{Required pressurized area (mm}^2\text{)} = \frac{\text{Required clamping force (N)}}{\text{Working pressure (MPa) x efficiency}} = \frac{400}{0.5 \times 80\%} = 1{,}000\ (\text{mm}^2)$$

Note) Efficiency varies depending on the shape and material of the clamp lever.

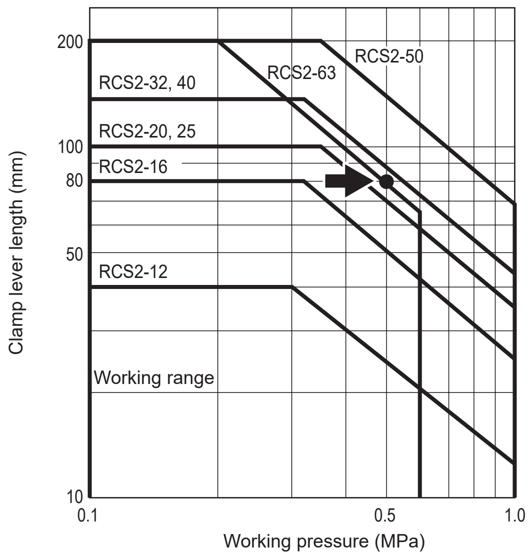
2. Select the cylinder size from the pressurized area (retracted side) given in the specifications list.

ø40 pressurized area: 1,055 (mm^2) > required pressurized area: 1,000 (mm^2)

3. Confirm the allowable length for the clamp lever.

Working pressure 0.5 MPa, clamp lever length 80 mm
⇒ Within usable range

[Clamp lever allowable length]



4. Confirm the allowable moment of inertia for the clamp lever.

Calculating moment of inertia
(Use the formula of concentrated load on page 1091)

$$\text{Moment of inertia } I = M_1 (R_1^2+K_1^2)+\frac{M_2R_2^2}{3}$$

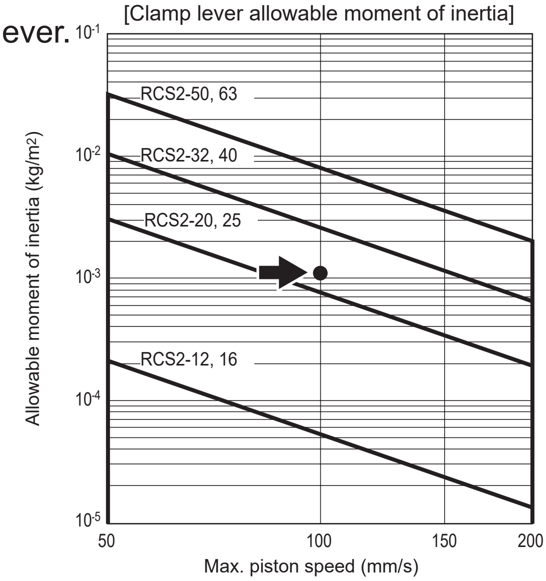
$$R_1 = L,\ R_2 = A - a,\ K_1^2 = \frac{D^2}{8}$$

$$I = 0.04\times(0.08^2+\frac{0.02^2}{8}) + \frac{0.31\times(0.1 - 0.01)^2}{3}$$

$$= 1.10 \times 10^{-3}\ \text{kg/m}^2$$

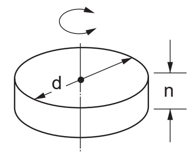
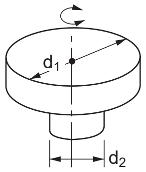
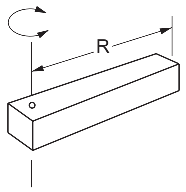
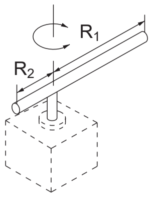
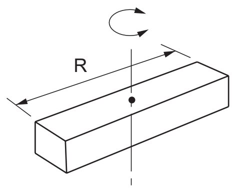
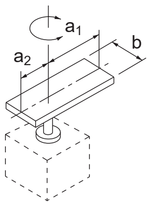
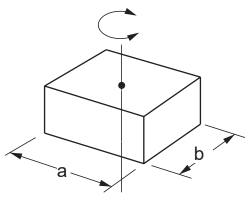
Moment of inertia 1.10×10^{-3} kg/m^2
Maximum piston speed 100 mm/s
⇒ Within usable range

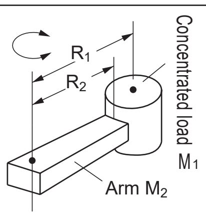
[Clamp lever allowable moment of inertia]



Based on the above, size ø40 is selected.

Figure for moment of inertia calculation

Shape	Sketch	Requirements	Moment of inertia I kg/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
Stepped dial 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
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
Bar (center of rotation at CG)		● Bar length R (m) ● Weight M (kg)	$I = \frac{MR^2}{12}$	$\frac{R^2}{12}$	● No mounting direction
Thin 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
Rectangular parallelepiped		● Side length a (m) ● Weight b (m) M (kg)	$I = \frac{M}{12}(a^2+b^2)$	$\frac{a^2+b^2}{12}$	● No mounting direction

Concentrated load		● Shape of concentrated load ● Length to center of gravity of concentrated load R_1 ● 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 $M_2 = 0$