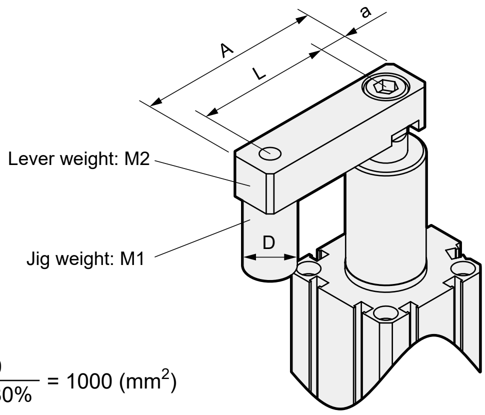
Technical data (selection example)

[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.

$$\text{Required pressurized area (mm}^2\text{)} = \frac{\text{Required clamping force (N)}}{\text{Working pressure (MPa)} \times \text{Efficiency}} = \frac{400}{0.5 \times 80\%} = 1000\ (\text{mm}^2)$$

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

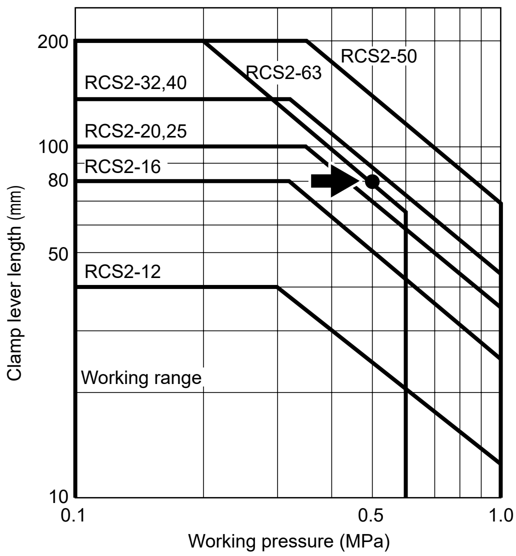
2. Select the cylinder size from the pressurized area (retracted side) given in the specifications list.

ø40 pressurized area: 1055 (mm^2) > required pressurized area: 1000 (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 for concentrated load on page 24)

$$\text{Moment of inertia } I = M_1 (R_1^2 + K_1^2) + \frac{M_2 R_2^2}{3}$$

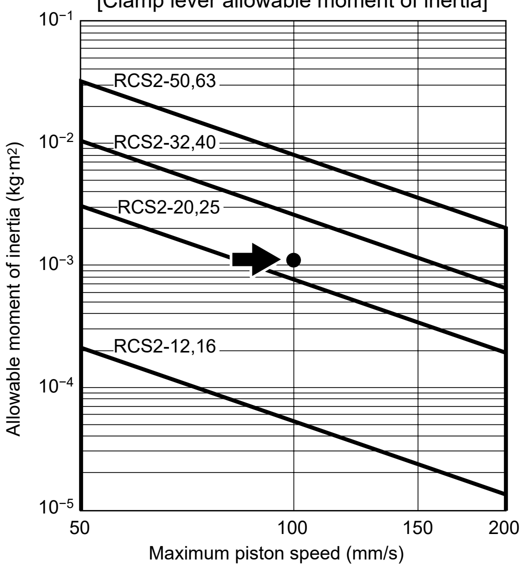
$$R_1 = L,\ R_2 = A - a,\ K_1^2 = \frac{D^2}{8}$$

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

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

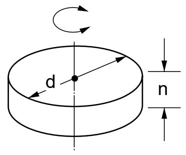
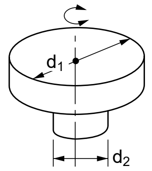
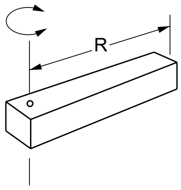
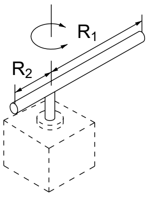
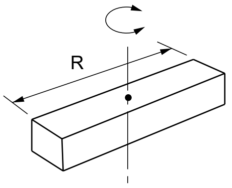
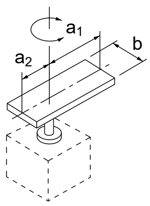
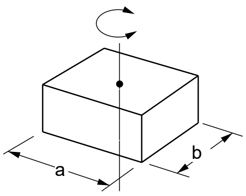
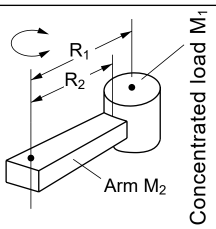
Moment of inertia 1.10×10^{-3} kg·m^2
Maximum piston speed   100 mm/s
→ Within usable range

[Clamp lever allowable moment of inertia]



From the above the size ø40 is selected.

Figure for moment of inertia calculation

Shape	Sketch	Requirements	Moment of inertia I kg·m²	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 specific mounting direction
Circular stepped plate		● Diameter d_1 (m) d_2 (m) ● Weight d_1 Part M_1 (kg) d_2 Part M_2 (kg)	$I = \frac{1}{8}(M_1 d_1^2 + M_2 d_2^2)$	$\frac{d_1^2 + d_2^2}{8}$	● 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)	$I = \frac{MR^2}{3}$	$\frac{R^2}{3}$	● The mounting direction is horizontal
Thin rod		● Bar length R_1 R_2 ● Weight M_1 M_2	$I = \frac{M_1 \cdot R_1^2}{3} + \frac{M_2 \cdot R_2^2}{3}$	$\frac{R_1^2 + R_2^2}{3}$	● The mounting direction is horizontal
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 specific mounting direction
Thin rectangle plate (rectangular parallelepiped)		● Plate length a_1 a_2 ● Side length b ● Weight M_1 M_2	$I = \frac{M_1}{12}(4a_1^2 + b^2) + \frac{M_2}{12}(4a_2^2 + b^2)$	$\frac{(4a_1^2 + b^2) + (4a_2^2 + b^2)}{12}$	● The 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 specific 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)	$I = M_1(R_1^2 + k_1^2) + \frac{M_2 R_2^2}{3}$	Calculate k_1^2 according to shape of concentrated load	● The mounting direction is horizontal ● When M_2 is extremely small compared to M_1, it may be calculated as $M_2 = 0$