Selection guide

Conditions...stroke length χ = 300 mm, load weight m = 15 kg, eccentricity L_2 = 50 mm, distance to the center of gravity from end b = 50 mm, force F applied to rod end = m x g (N) (g = gravity acceleration 9.8 m/s^2)

(1) First, calculate lateral load moment F·L.

* Calculate dimension a by first substituting 34 (mm) of temporarily selected ø63.

L = 34 + 300 + 50 = 384(mm) = 0.384(m)
F = 15 × 9.8 = 147(N)
F·L = 147 × 0.384 = 56.4 (N·m)

(2) Calculate self-weight moment M caused by the piston rod, etc.

$$M = \frac{\chi^2}{2} \times C \times g + (a + \chi) \times D \times g$$
$$= \frac{300^2}{2} \times 4.3 \times 10^{-3} \times 9.8 +$$
$$(34 + 300) \times 0.24 \times 9.8$$
$$= 2682 \text{ (N·mm) is approximately } 2.7 \text{ (N·m)}$$

(3) The total of (1) and (2) is lateral load moment.

F·L + M = 56.4 + 2.7 = 59.1 (N·m)

(4) Next, calculate the rotation torque F·L_2.

L_2 = 50(mm) = 0.05(m)
F = 147(N)
F·L_2 = 147 × 0.05 = 7.35 (N·m)

(5) Refer to the allowable lateral load moment table and allowable torque table on the right to check if each allowable moment value is equal to or less than the values in the tables.

Lateral load moment this time 59.1 (N·m)
Rotation torque 7.35 (N·m)

Allowable lateral load moment
ø50···92.8 N·m ····· OK
ø63···144.6 N·m ····· OK
Allowable torque
ø50···4.2 N·m ····· NG
ø63···8.8 N·m ····· OK

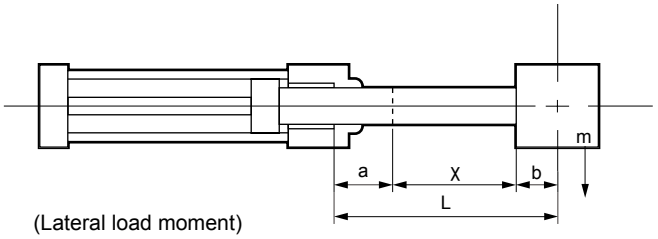
In this case, ø50 may be good for lateral load moment, but ø63 should be used since torque exceeds allowable values.

Make a selection such that both the lateral load moment and rotation torque are within the allowable values.

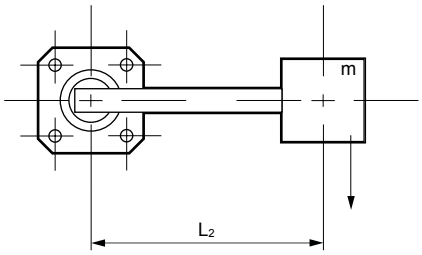
(6) The min. working pressure is the sum of the rotation torque and lateral load moment.

0.18 MPa + 0.23 MPa = 0.41 MPa

Find the operating pressure according to the graph on the following page.



(Lateral load moment)

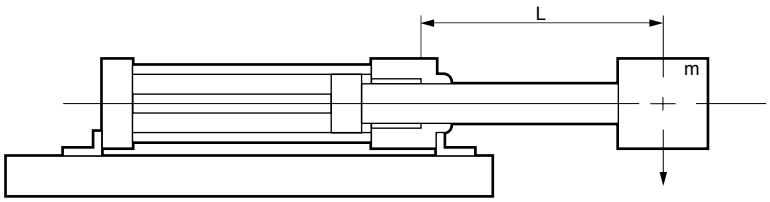


(Rotation torque)

m	:	Load weight			kg
L	=	a + χ + b			mm
χ	:	Stroke length			mm
b	:	Distance from top to load center			mm
a	:	Dimensions of projecting section			mm
M	:	Self-weight moment = $\frac{\chi^2}{2}$ x C x g + (a + χ) x D x g			
g	:	Gravity acceleration 9.8			m/s^2
C	:	Piston rod weight per unit length			kg/mm
D	:	End cap weight			kg

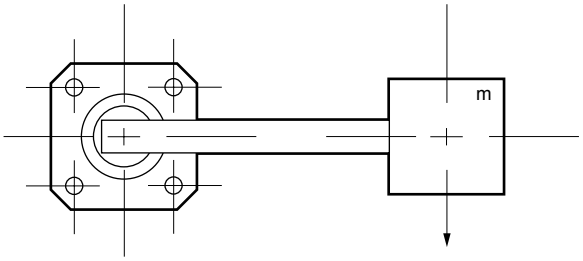
	ø40	ø50	ø63	ø80	ø100
a	32	34	34	36	39
C	1.3 x 10^{-3}	3.7 x 10^{-3}	4.3 x 10^{-3}	7.4 x 10^{-3}	9.7 x 10^{-3}
D	0.06	0.17	0.24	0.35	0.68

Allowable lateral load moment



Bore size	Allowable lateral load moment
ø40	54.6 N.m
ø50	92.8 N.m
ø63	144.6 N.m
ø80	275.0 N.m
ø100	468.1 N.m

Allowable torque



Bore size	Allowable torque
ø40	2.4 N.m
ø50	4.2 N.m
ø63	8.8 N.m
ø80	13.8 N.m
ø100	19.9 N.m