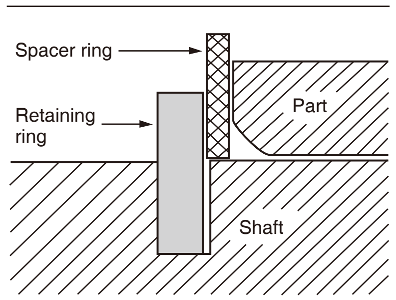
The above formula assumes that retained parts have sharp corners. For retained parts having corner radii, care must be taken as the thrust load is reduced.
If the thrust load does not satisfy the requirement because of retained parts having corner radii or chamfers, the thrust load can be improved by inserting a spacer ring like a rigid flat washer in the groove.



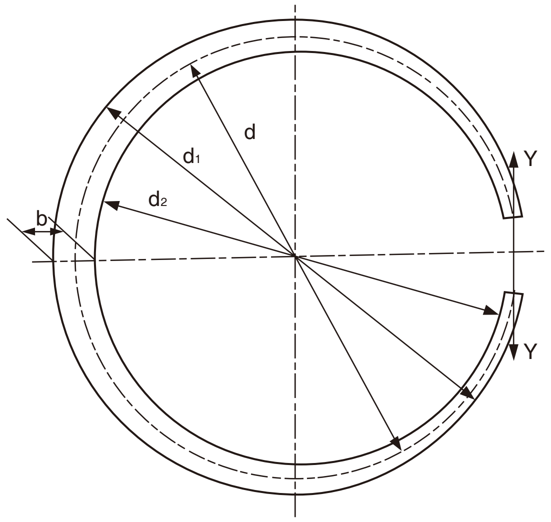
2 Calculation of Stress

This section calculates the maximum stress where a retaining ring is fit.

Basic Ring

When the retaining ring (Basic External Ring) that is circumscribed by two eccentric circles is to be spread in the Y directions as shown in the figure:

- M: Bending moment (N·mm)
- E: Longitudinal elastic modulus (Carbon spring steel: $206000 N/mm^2$)
- I: Second moment of area (mm^4)
- r: Average curvature radius (mm)
- ρ: Average curvature radius after (mm)
- ξ: Rate of change
- d: Average diameter (mm)
- d_1: Diameter of outer periphery (mm)
- d_2: Diameter of inner periphery (mm)
- Z: Section modulus
- t: Plate thickness (mm)
- b: Maximum rim width (mm)



If the average curvature radius in the free condition is changed to ρ by spreading the ring in the Y directions as shown in the figure, this relationship is given by the following equation.

$$\frac{1}{r} - \frac{1}{\rho} = \frac{M}{EI}$$

Here, if I is the maximum second moment of area in the section having the maximum width and t is the plate thickness, the value I can be expressed as $tb^3/12$.
In the above equation, assume that $\rho = r(1+\xi)$ (ξ : Rate of change from r to ρ).
From the equation of the maximum stress, $\sigma max = M/Z$, M is given to be $\sigma maxZ$.
From the equation of the section modulus, $Z=tb^2/6$, substituting these relations into the above equation yields:

$$\sigma max = \frac{\xi}{1+\xi} \cdot \frac{Eb}{d}$$

For the Internal Ring, assume that $\frac{1}{\rho} - \frac{1}{r} = \frac{M}{EI}$ and $\rho = r(1-\xi)$.
Substituting these relations in the same manner indicates the maximum stress by following formula:

$$\sigma max = \frac{\xi}{1-\xi} \cdot \frac{Eb}{d}$$

RETAINING RINGS | PUSH NUTS | WAVE WASHERS AND OTHERS | SCREW TYPE PLATE NUTS | SPRING PINS | SNAP PINS | JOINT CLIPS | ASSEMBLY TOOLS