

2) Calculations for Compressed Spring Washers (Reference)

(1) Load and Stress Calculations of Curved Washer

If the Curved Washer is assumed to be a free-supported beam, the following formulas are given:

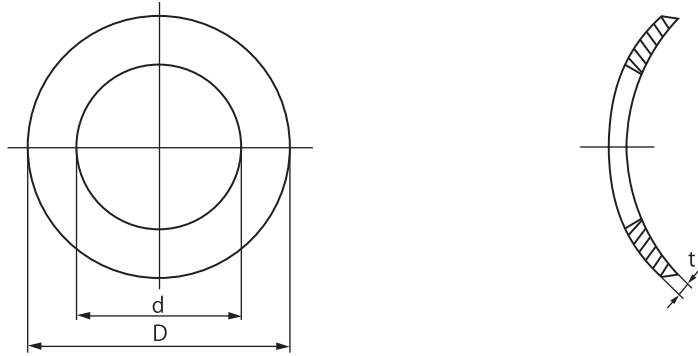


Fig. 1 Curved washer

Load

$$P = \frac{4K_1 Et^3 \delta}{D^2} \quad (1)$$

Stress

$$S = \frac{1.5P}{K_1 t^2} \quad (2)$$

P : Load (N)

S : Stress (N/ mm²)

D : Diameter of outer periphery (mm)

d : Diameter of inner periphery (mm)

t : Plate thickness (mm)

δ : Amount of deflection (mm)

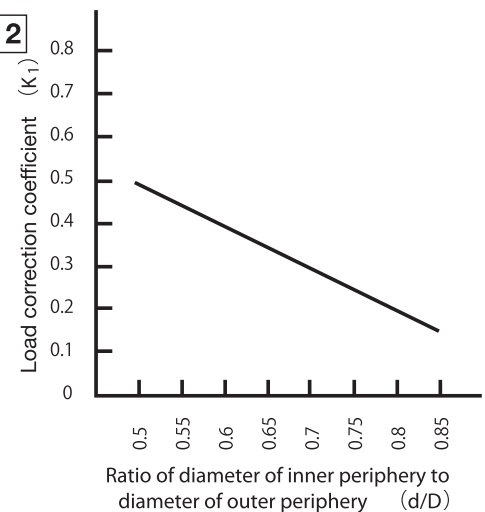
E : Longitudinal elastic modulus (N/ mm²)
Table 1

K₁ : Load correction coefficient [=1-d/D]
Table 2

Table 1 Longitudinal elastic moduli of main materials (E)(N/ mm²)

Material	Longitudinal elastic modulus
Carbon spring steel	206000
Stainless steel for spring	181000

Table 2



Notes

There are differences between the calculated and measured values for the formula of deflection and load. Substitution of conditions such as diameters of outer and inner peripheries gives a first-order equation of deflection and load which is plotted as a straight line.

However, the actual load curve will not be a simple straight line but a curve.