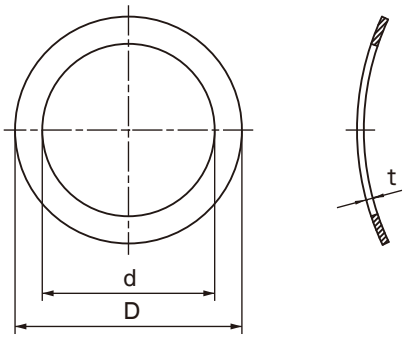
Calculations for Compressed Spring Washers (Reference)

2 Load and Stress Calculations of Curved Washer

Fig. 1 Curved Washer



Load

$$P = \frac{4K_1Et^3\delta}{D^2} \quad (1)$$

Stress

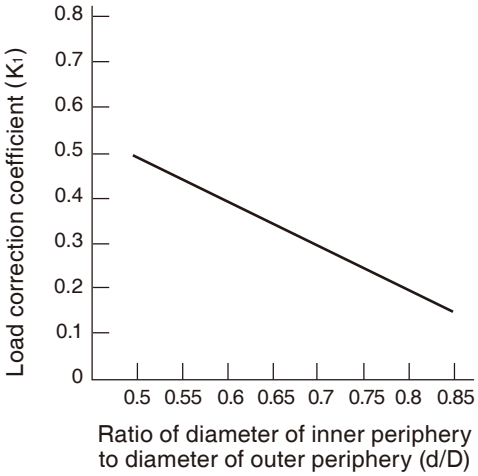
$$S = \frac{1.5P}{K_1t^2} \quad (2)$$

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)
K_1 : Load correction coefficient [= 1 - d/D] (Table 2)

Table 1 Longitudinal elastic modulus of main materials (E)

Material	Longitudinal elastic modulus (N/mm²)
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.