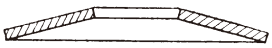
Disc Springs

TAIYO Stainless Spring Co., Ltd.

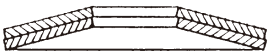
Disc springs (Belleville washers) are formed springs with a center hole. Disc springs are able to withstand heavy loads within a small area. Disc springs may be used independently or in combination to achieve desired loading capacities and spring characteristics.

1. Usage Examples

1) Single usage

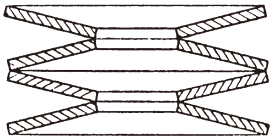


2) Stacking in parallel

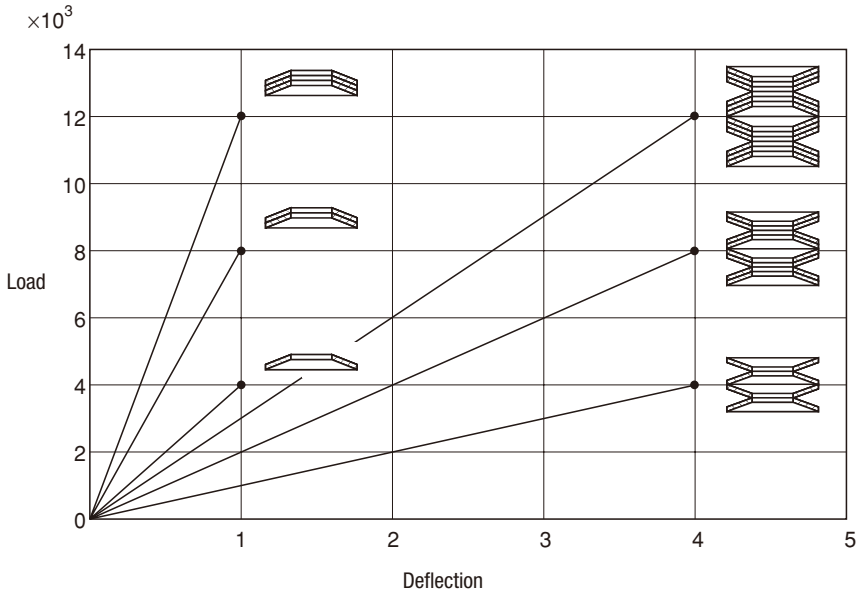


Suitable for applications that require high loading capacity with small deflection. Loading capacity increases in proportion to the number of disc springs stacked.

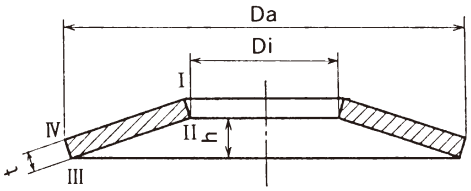
3) Stacking in series



Suitable for applications that require lower loading capacity with greater deflection. Deflection increases in proportion to the number of disc springs stacked.



Load/deflection characteristics of disc spring stacking



2. Disc Spring Calculation

1) Load and deflection calculations

$$P = \frac{4E}{1-\mu^2} \cdot \frac{t^4}{\alpha Da^2} \cdot \frac{f}{t} \left\{ \left(\frac{h}{t} - \frac{f}{t}\right)\left(\frac{h}{t} - \frac{f}{2t}\right) + 1 \right\}$$

$$= 905{,}000 \quad \frac{t^4}{\alpha Da^2} \cdot \frac{f}{t} \left\{ \left(\frac{h}{t} - \frac{f}{t}\right)\left(\frac{h}{t} - \frac{f}{2t}\right) + 1 \right\} \text{ N}$$

$$\alpha = \frac{1}{\pi} \cdot \frac{\left(\frac{\delta-1}{\delta}\right)^2}{\frac{\delta+1}{\delta-1} - \frac{2}{\log_e \delta}}$$

	(Spring Steels)
E : Young's modulus	206,000 N/mm²
μ : Poisson's ratio	0.3
$4E/1-\mu^2$:	905,000 N/mm²

f : Deflection

α : Calculation coefficient of the diameter ratio Da/Di

δ : Da/Di