



## Permitted shear stress ( $\tau$ ) at static load

The material in wire springs is normally exposed to shear stress. When designing springs, the shear strength and modulus of shear of the wire is therefore of great importance. For a spring with established dimensions, the following applies:

- the higher the permitted shear stress, ( $\tau$ ), the higher spring force
- the higher modulus of shear ( $G$ ), the higher spring force for a given deflection.

The diagram above shows the highest permitted shear stress for a static loaded spring or one where the number of load oscillations during the expected life of the spring does not exceed 10 000.

The strength of an extension spring is determined largely by its loop design. With a normal loop, bent from the body of the spring, a strength loss of about 10–15% should be expected as the loop is weaker than the rest of the spring.

The life of a spring is significantly reduced by factors such as corrosion, increased working temperature, damage to the surface of the material, e t c . Shot peening usually extends spring life considerably (See section on shot peening). Spring life is also dependent on the stress reversals in application, i. e. long deflection – shorter life and short deflection – longer life.

In order to estimate the life ( $N_L$ ) of a spring exposed to a dynamic stress, the following reference values for maximum permitted shear stress may be used:

50 000 oscillations	Table value x 0.9
100 000 oscillations	Table value x 0.85
1 000 000 oscillations	Table value x 0.7
10 000 000 oscillations	Table value x 0.6