

SPIRAL SPRING

Spiral springs also known as constant force spring or Clock spring. This type of spring is usually a coiled ribbon of spring steel used for functions such as counter balancing, retrieving, maintaining constant loads, transmitting motion, and clamping. It requires nearly the same force, no matter how long the extension. Spiral Springs, produced from flat steel, are characterized by the requirement that their coils do not touch during operation. This type of spring will exert a rotational torque, usually through 360 Degree rotation or less. The inner end of the spring is typically bent to attach to an arbor or hub. The outer end is then attached to the object that is rotating or utilizing the torque of the spring.

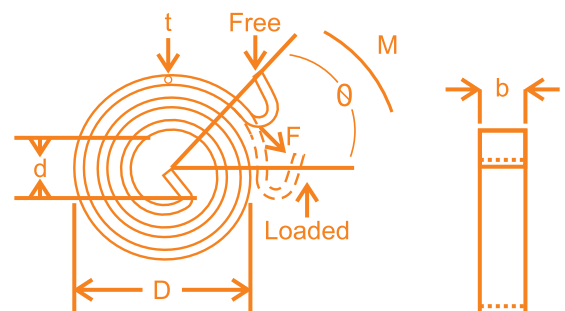
How to Design a Spiral Spring

Spiral Torsion Springs also known as clock springs, flat spiral spring or spiral torsion springs, they are typically manufactured from high carbon steel or stainless steel that wound in the flat state, and are characterized by the condition that their coils do not contact during operation, the inner end of these springs are fixed and the other end attached to the other components that is rotating the spring torque. This design offers reduced force, also reduce friction to zero (coil friction free) when installed correctly.

Spiral Torsion Springs are the most commonly used type of flat spring and are sometimes used in place of the traditional torsion spring as they rotate in circular movements, the torque deliver per revolution is linear for the first 360 degree, at greater angular rotation, the coils begin to close on the arbor and the torque per turn increases rapidly also per revolution on nonlinear when closer to the axis, thus these type of springs are ideally suited for applications requiring less than 360° of angular rotation.

Design Formulae

- The spring rate k is defined as the torque (Nm) per unit angular deflection (θ)
- $k = M / \theta$
- Length of Strip, $L = \pi n(D+d) / 2$
- Spring Rate, $k = E.b.t^3 / 12.L$
- Spring surface stress, $\sigma = 6.M / b.t^2$
- Torque, $M = \pi Ebt^3\theta / 6L$



List of Parameters

| | | |
|---|--|---|
| D - Outside Diameter of Spring (m) | M - Moment / Torque on Spring = $F.D / 2$ (Nm) | y - Distance from Neutral Axis to Outer Fibre of Wire/Strip = $y/2$ (m) |
| b - Width of Spring Strip (m) | L - Length of Strip (m) | θ - Deflection (radians) |
| d - Inside Diameter of Spring (m) | G - Modulus of Rigidity (N/m ²) | α - Tensile / Compressive Stress Resulting from Spring Deflection = N/m ² |
| t - Thickness of Spring Strip (m) | I - Second Moment of Inertia of Spring Strip (m ⁴) | |
| n - Number of turns of spring | F - Force to Deflect Spring (N) | |
| k - Spring Rate = M / θ Nm/rad | | |
| E - Young's Modulus (N/m ²) | | |

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Key Parameters

Torque is the key parameter in spiral spring. Torque is a twisting or turning force that tends to cause rotation around an axis, which might be a center of mass or a fixed point.

Material

- C80 Grade cold rolled annealed steel strips
- C75 Grade cold rolled annealed steel strips
- 304 Grade stainless steel strips

Finish

Can be supplied in various plating.

Manufacturing Process

Spiral Springs are manufactured on imported CNC Spring forming Machines or on SPM to maintain its criticality in applications.

Testing & Certification Process

Each spring manufactured goes through a series of rigorous tests conducted on in house testing facilities such as Computerized Load Testing, UTS Testing, Torsion testing, Profile Projector amongst others. All springs are supplied with ROHS raw material compliant report.

Common Applications

Spiral springs are used in electrical motor contact brushes that require short rotation (less than 360 degrees of rotation). They obtain a large amount of torque through a small amount of rotation. They are also used in Seat Belts, Door Handles, Door Closers, Car Windows, Motors, Point of Purchase Displays, Counter balances, Office Equipment's, Carbon Brush, Clocks, Toys, Rewind Devices, among others.

Reference Standards

- **IS: 7226 – 1974** – Specification for cold-rolled medium, high carbon and low alloy steel strip
- **IS: 5522 – 1992** – Stainless steel sheets and strips for utensils - Specification

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