TECHNICAL INFORMATION

Shot peening

After coiling, a spring contains stresses at the wire surface on the inside diameter of the spring. For dynamic loaded springs, these stresses do not allow the material properties to be fully exploited. By shot peening the spring, i.e. bombarding the spring with small, round, steel balls, the following improvements with regard to fatigue strength can be achieved:

-Tension in the surface
- Reduction of notch fatigue factor as any small surface defects are closed up.
- Harder surface finish due to cold working by peening.

By shot peening, the life of the spring can be increased by more than 100%. Conversely, an increase in performance of up to 50% can be achieved with the same life. We particularly recommend this method of treatment for compression springs which are exposed to fatigue, where long life is required.

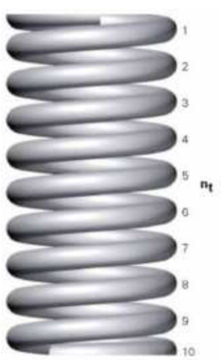
Close coiled extension and torsion springs are not normally shot peened, due to the practical difficulties (limited space for the shot inside the spring). Also, the advantages cannot be realized, compared with compression springs. Generally, compression springs should have a wire diameter of at least 1,5 mm. For thinner wire diameters, the effect is lower and there is a further risk of deformation.

Pre setting

Pre setting is a plastic deformation, which is accomplished by loading the spring beyond the actual working range. In this way, tension in the surface is obtained in the opposite direction to the load tension. This leads to non or strongly reduced setting when the spring is working. We recommend pre setting for highly stressed springs. Normally, pre setting is carried out cold. Springs working in increased temperatures should be pre set warm.

Breaking strength

This diagram is used to indicate spring breakage possibilities.
For values below curve B: No risk of breakage
For values between curves A and B: The spring should have internal location plus ground ends.
For values above curve A: There is a risk of breakage. The spring should have internal location.



Coil counting

This figure shows how the total number of coils is counted. In this case, nt = 10.

TOLERANCES AND TESTING

Due to the characteristics of the material it is impossible to make identical springs. Material hardness, dimensions and physical properties can vary, which influences the consistency of the spring. It is therefore important to set tight tolerances when necessary. Typical tolerances for spring loads are ± 5, ±7 or 10%. For the initial force (F_0) on extension springs, the tolerance is ±15%. The tolerances are normally controlled by spot checks.

When a very tight tolerance is required, a tolerance of ±2% can be maintained by a hundred percent load control. The tolerances are valid for springs with a relationship of:

For the end coil of the compression springs, the values of the table should be doubled. Where two load values are stated, tolerances for free length should not be indicated. The tolerances are valid for compression as well as extension springs. Normally, the complete tolerance range is not required e.g. most standard springs are produced within tolerance.

$D_m = D_y - D_t = D_i + D_t$

Tolerances for angle deviation SS 2386

The deviation A of the generating line from the vertical line must not be larger than 0,05 L_0 (2,9°). The deviation from parallelism A1 must not be larger than 0,03 D_y (1,7°).

Tolerances for spring diameter SS 2384 Basic measure ment, D_m Tolerance

- 2,5 ±0,15
(2,5)- 4 ±0,2
(4) - 6,3 ±0,25
(6,3)- 10 ±0,3
(10) - 16 ±0,35
(16) - 25 ±0,45
(25) - 32 ±0,5
(32) - 40 ±0,6
(40) - 50 ±0,8
(50) - 63 ±1
(63) - 80 ±1,2
(80) -100 ±1,5
(100) -125 ±1,9
(125) -160 ±2,3
(160)