



Tech-Spring Report 10 EFFECT OF SPEED OF PRODUCTION

Two batches of Compression Springs made from EN 10270-3 1.4310 NS wire was supplied with the design shown in Figure 1. The springs were made on a Wafios FSR32 at a usual fast speed of 5000 per hour in one batch and the same design was made at a very slow speed of 1000 per hour in order to ascertain whether the speed of production would make any difference to any parameter of these springs.

The dimensional test results were expressed as the mean and standard deviation of ten springs that were measured and load tested with high precision:

| Batch | Do / mm | Total coils | Lo / mm | P1 @ 36.2 mm / N | P2 @ 23.0 mm / N | Rate / N/mm |
|----------------|---------|-------------|---------|------------------|------------------|-------------|
| 1000 mean | 13.62 | 8.78 | 41.83 | 26.54 | 91.38 | 4.91 |
| 1000 s.d. | 0.007 | 0 | 0.091 | 0.23 | 0.33 | 0.01 |
| 5000 mean | 13.66 | 8.78 | 42.125 | 27.64 | 91.78 | 4.86 |
| 5000 s.d. | 0.014 | 0 | 0.115 | 0.42 | 0.38 | 0.01 |
| 2095 Gr 1 tol. | 0.15 | - | 0.67 | 3.56 | 4.17 | - |

Both batches would be much better than required if grade 1 tolerances to DIN 2095 were requested by the customer for these springs.

Conclusion

Production speed has had a small effect upon the tolerance control achieved when making these springs. To investigate why the tolerance control is less good at high speed it is proposed to use a high speed camera to see exactly what happens at the two speeds.



INSTITUTE OF SPRING TECHNOLOGY

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Identifier: Speed of production
 Details: 810

Spring Type Round Wire Compression

Designed To: EN 13906-1: 2002
 Tolerance Standard: DIN 2095 / 2096

Calculated Data

Solid Length: 14.05 mm
 Min. Length (static): 16.11 mm
 Min. Length (dynamic): 17.15 mm
 Solid Load: 136.23 N
 Solid Stress: 1019.7 N/mm²
 Stress Factor: 1.18
 Active Coils: 6.98
 Spring Index: 7.53
 Helix Angle: 8.39 Deg
 Buckling Possible: STABLE
 Buckling Definite: STABLE
 Spring Pitch: 5.58 mm
 Inside Diameter: 10.44 mm
 Mean Coil Dia.: 12.04 mm
 Wire Length: 335.02 mm
 Weight / 100: 0.532 Kg
 Natural Freq: 32458 RPM

Material

EN 10270 Pt3 Aust. Stainless
 Youngs Mod (E): 185000 N/mm²
 Rigidity Mod (G): 73000 N/mm²
 Density: .00000790 Kg/mm³
 Unprestress: 0-45 %
 Prestress: 45-56 %

End Type: Closed and Ground
 Dead Coils: 1.80
 Tip Thickness: 50.00 %
 End Fixation: Both Ends Fixed and Guided

Design Parameters

Wire Diameter: 1.60 mm
 Outside Diameter: 13.64 mm
 Total Coils: 8.78
 Spring Rate: 4.91 N/mm (Calculated)
 Free Length: 41.80 mm

Stress Data

| | Lower Tensile | Solid | Operating Positions | |
|-----------|---------------|-------|---------------------|-------------|
| | | | % Tensile 1 | % Tensile 2 |
| NS | 1750 | 58 O | 12 U | 39 U |
| HS | 1900 | 54 P | 11 U | 36 U |
| Specified | | | | |

Operating Data

| | Operating Positions | |
|-----------------------------|---------------------|-------|
| | 1 | 2 |
| Length (mm) | 36.20 | 23.00 |
| Load (N) | 27.49 | 92.29 |
| Deflection (mm) | 5.60 | 18.80 |
| Stress (N/mm ²) | 206 | 691 |
| Stress % Solid | 20 | 68 |
| Load Tol. Grade 1 (N) | 3.56 | 4.17 |
| Load Tol. Grade 2 (N) | 5.65 | 6.62 |
| Load Tol. Grade 3 (N) | 9.04 | 10.59 |
| O.D. Expansion (mm) | 0.0393 | 0.132 |

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Figure 1