

## Spring, cylindrical compression spring

### 01 Compression Spring

Changed on	25.09.2024, 18:03:11
Changed by	Kadkraft-Simufact


Description	KISSsoft example
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Non commercial version for demo and support purposes only ! (914)  
KISSsoft Release 2024

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## 1 Messages

 Calculation is consistent.

## 2 Overview

Calculation method: DIN EN 13906-1:2013

## 3 Inputs

### 3.1 Spring geometry

Wire diameter (mm)	[d]	2.500
Tolerance according to DIN 2076 C:1990 (mm)	[Tol_d]	0.020
Coil diameter (mm)	[D]	12.500
Inner diameter (mm)	[Di]	10.000
External diameter (mm)	[De]	15.000
Length of relaxes spring (mm)	[L0]	32.000
Effective coils	[n]	5.500
Stiff coils	[nu]	2.000
Total number of coils	[nt]	7.500
Spring ends, ground even		
Bearings coefficient		0.500

### 3.2 Material

Material	wire C (DIN 17223-1)	
cold shaped		
shot peened		
shear modulus at 20°C (N/mm²)	[G20]	81500.000
Tensile strength (N/mm²)	[Rm]	1899.000
Shear modulus depending on temperature (1/°C)	[αE]	-0.00028

### 3.3 Load

Lower spring force (N)	[F1]	50.000
Higher spring force (N)	[F2]	200.000
Shear load		
Shear spring force (N)	[FQ]	0.000
Operating temperature (°C)	[TB]	20.000
dynamic loading		

## 4 Results

Spring rate (N/mm)	[R]	37.045
Maximal useable length (mm)	[Ln]	21.736
Maximum spring travel (mm)	[sn]	10.264
Sum of minimal distance	[Sa]	2.836
Shear stress at Fn (N/mm²)	[τn]	774.613
Force for maximal spring-travel (N)	[Fn]	380.237
Theoretical force at length of block (N)	[Fcth]	485.295
Block length (mm)	[Lc]	18.900 (- 0.150 )
Shear stress at block length (N/mm²)	[τc]	988.636
Permissible shear stress at block length (N/mm²)	[τc_zul]	1064.000
Stress coefficient	[κ]	1.294
Travel tension	[τkh]	395.453
Permissible travel tension (N/mm²)	[τkh_zul]	472.999
The spring is safe for buckling for all loads		
Shear modulus at service temperature (N/mm²)	[G]	81500.000
Diameter increase (mm)	[ΔD]	0.103

Eigen frequency (Hz)	[fe]	1055.240
Mass (g)	[mass]	11.406

#### 4.1 Load 1

Spring force (N)	[F1]	50.000
Spring travel (mm)	[s1]	1.350
Spring length (mm)	[L1]	30.650
Shear stress (N/mm <sup>2</sup> )	[τ1]	101.859
Adjusted shear stress (N/mm <sup>2</sup> )	[τ1k]	131.818

#### 4.2 Load 2

Spring force (N)	[F2]	200.000
Spring travel (mm)	[s2]	5.399
Spring length (mm)	[L2]	26.601
Shear stress (N/mm <sup>2</sup> )	[τ2]	407.437
Adjusted shear stress (N/mm <sup>2</sup> )	[τ2k]	527.271
Relaxation (F2,48h) (%)	[Rx]	0.407
Spring force after 48h (N)	[F2Rx]	199.186

Utilization of static shear stress		0.383
Utilization of dynamic shear stress		0.836

#### 4.3 Tolerances

Geometry:  
according to DIN EN 15800:2009 quality standard  
1

Permissible deviation from		
Coil diameter (mm)	[AD]	0.150
Spring length (mm)	[AL0]	0.440
Perpendicular line (mm)	[e1]	0.960
Parallel line (mm)	[e2]	0.220

Forces:  
according to DIN EN 15800:2009 quality standard  
1

Permissible deviation from		
Lower spring force (N)	[AF1]	16.600
Higher spring force (N)	[AF2]	18.000

Reference values:		
Largest diameter of working mandrel (mm)	[Dd]	9.352
Smallest diameter of working bush (mm)	[Dh]	15.583

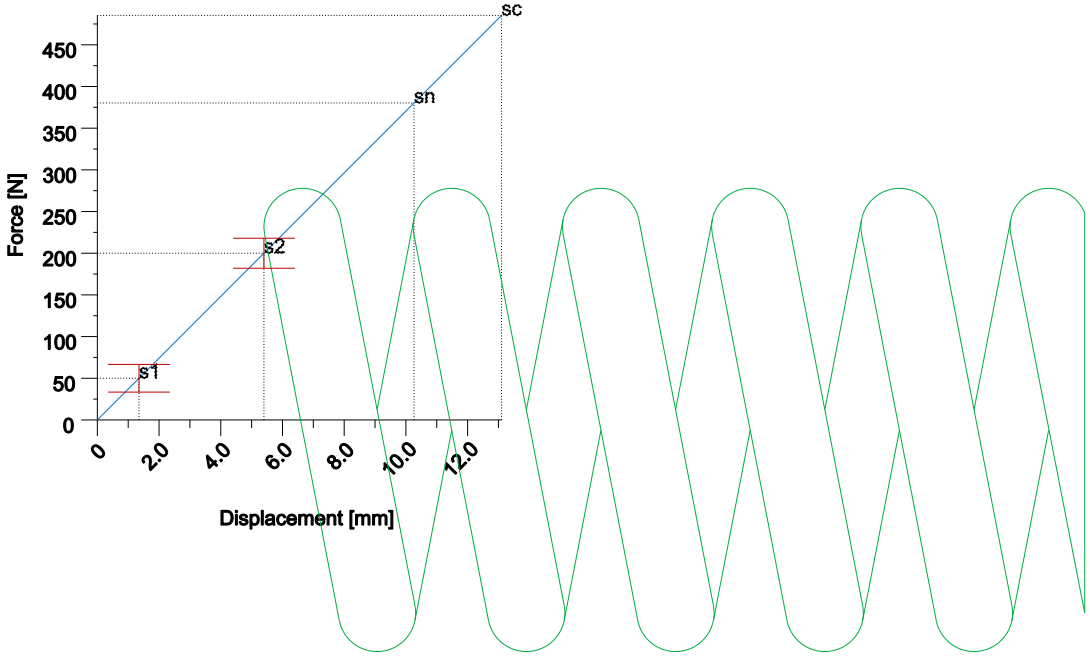


Figure: Force-Travel Diagram

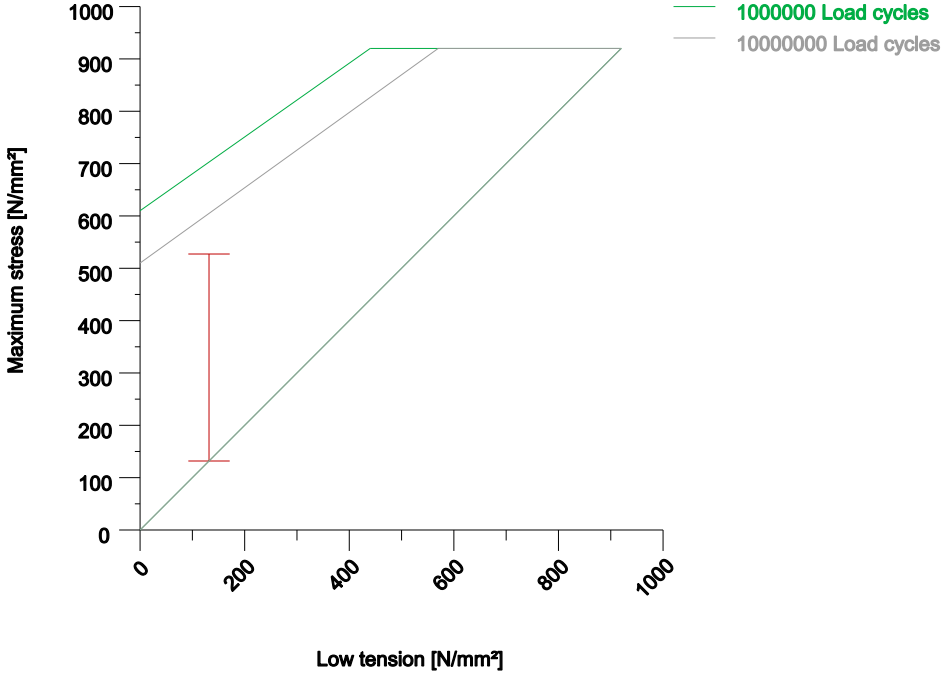


Figure: Goodman Diagram

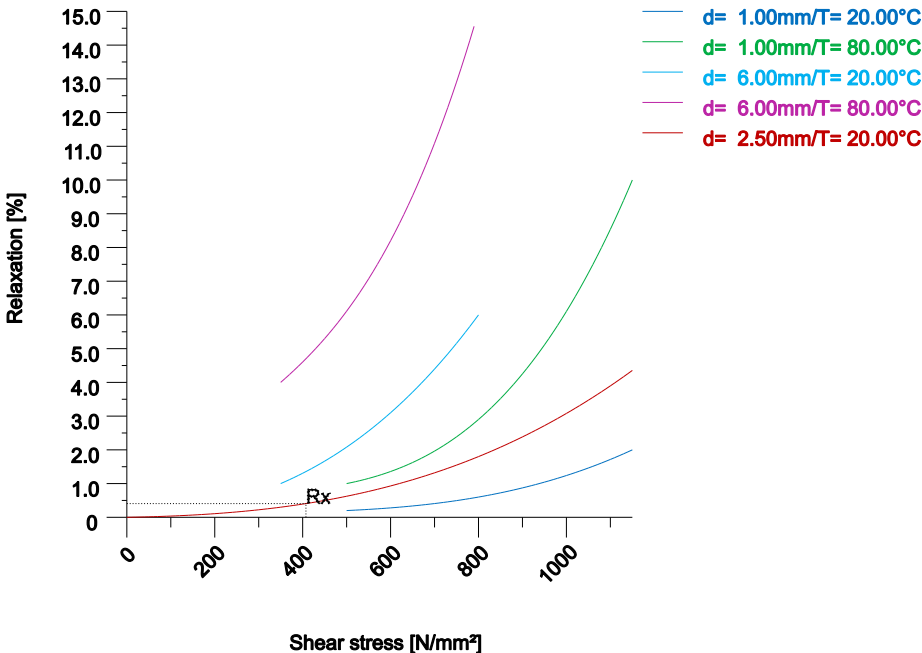


Figure: Relaxation

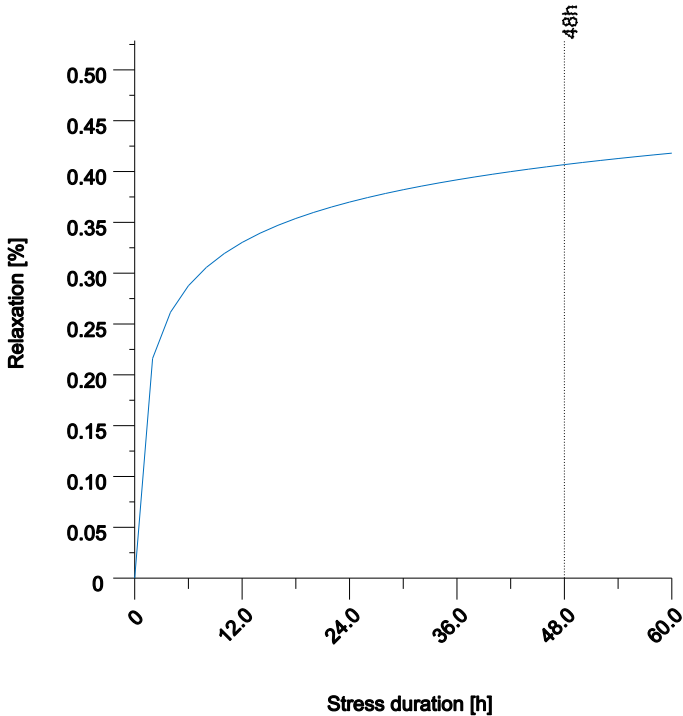


Figure: Relaxation time curve

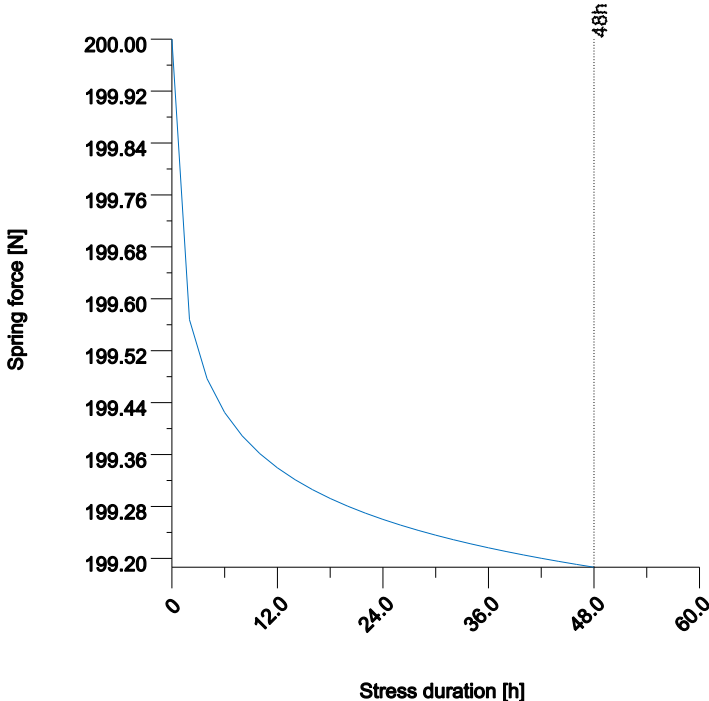


Figure: Spring force time curve

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