

Calculation Example

Compression Spring According to DIN EN 13906-1, 2002

Spring geometry

Wire diameter (d):
 Wire quality (W_Q):
 Upper deviation of the spring wire (U_Q):
 Max. wire diameter (d_{max}):
 Coil diameter (D_{co}):
 Outer diameter (D_o):
 Inner diameter (D_i):
 Length of the unloaded spring (L₀):
 Number of coils (n):
 Number of unsprung coils:
 Total number of coils (n_t):
 Spring index (w):
 Thickness ratio (lambda):
 Pitch of coils (S_w):
 Spring ends:
 Support of spring ends:

Material

Material:

Results:

Static utilisation of the permissible stress: 62.704%
 Dynamic utilisation of the permissible stress: 87.438%

Spring deviation sh: 2.044mm
 Utilisation of permissible spring deflection sn: 84.854%

Load-deflection diagram. Click to enlarge.
 Goodman diagram. Click to enlarge.

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0.1 Calculation Example: Compression Spring According to DIN EN 13906-1, Edition 2002

0.1.1 Start the Calculation Module

To start the calculation module for compression springs, please click the menu item 'Spring calculation' on the left side and then select 'Compression spring'.

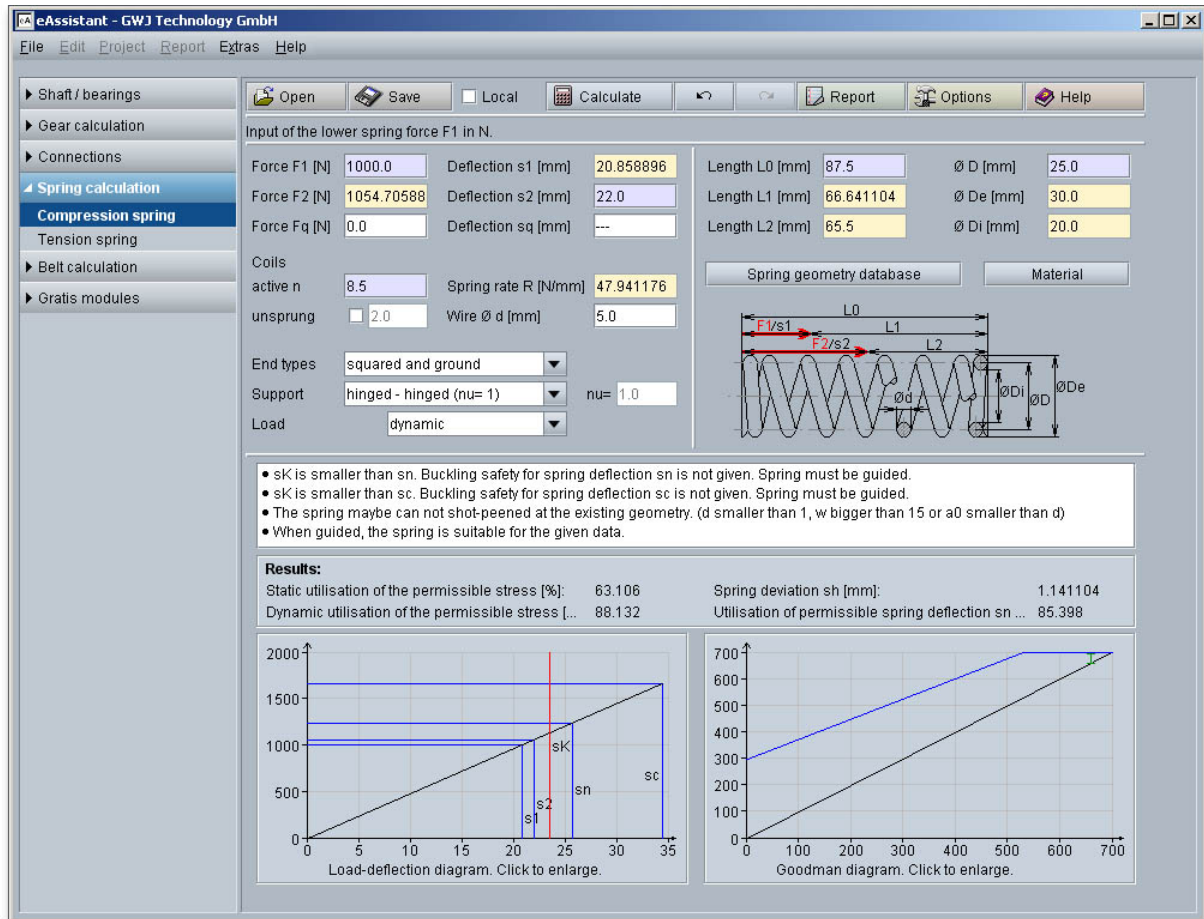


Figure 1: Calculation module

0.1.2 Input Values

A cold coiled compression spring 4 x 32 x 120 is made of patented cold drawn spring steel wire

Wire diameter $d = 4$ mm

Diameter $D = 32$ mm

Coils $n = 8.5$

Length of the unloaded spring $L_0 = 120$ mm

is alternately loaded with

Spring force $F_1 = 300$ N

Spring force $F_2 = 500$ N

We are looking for the spring rate R , the corrected shear stress τ_{k2} for the spring force $F_2 = 500$ N and spring deviation s_h .

0.1.3 The Calculation

Enter Spring Forces

Please start to enter the spring forces F_1 and F_2 . During entering the spring forces, the corresponding spring deflections are automatically determined and will be highlighted in a different color.

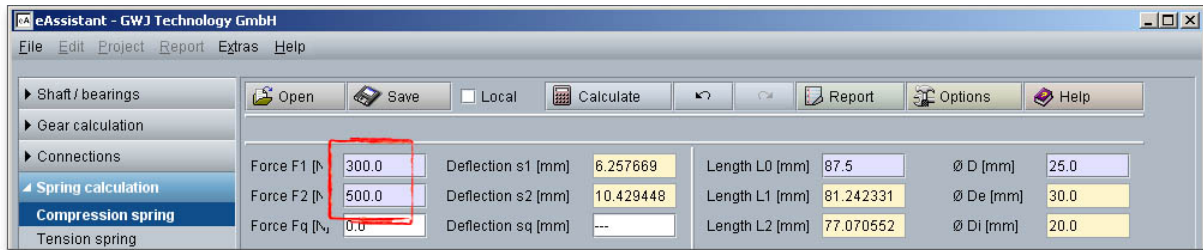


Figure 2: Input of spring forces

Enter Coils and Wire Diameter

Enter the number of coils n as well as the wire diameter d . The settings for the spring ends, the support of spring as well the load will not be changed.

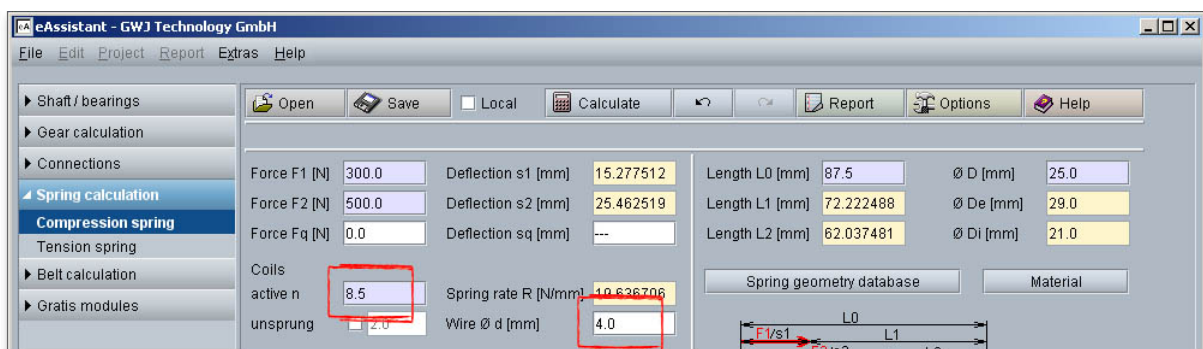


Figure 3: Input of coils n and wire diameter d

Enter Spring Length and Spring Diameter

Enter the spring length L_0 and the spring diameter D .

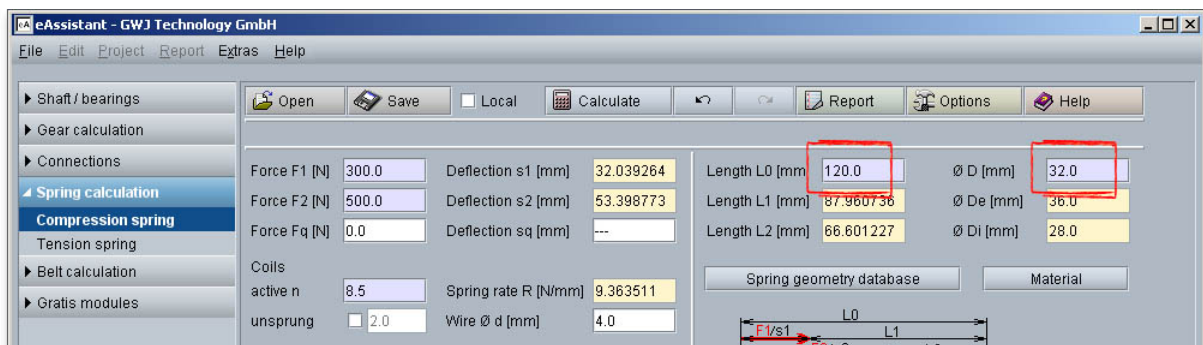


Figure 4: Input of length and diameter

Material Selection

Click the button 'Material' to open the material database and to find the required material for the compression spring.

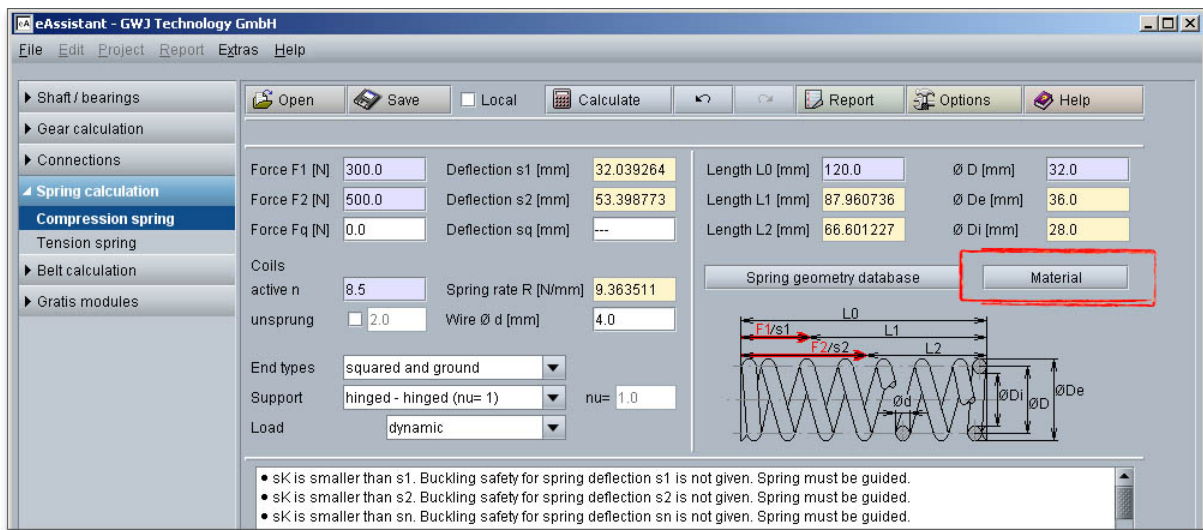


Figure 5: Button 'Material'

Select the following material from the listbox: Patented cold drawn wire DH according to EN 10270-1: 2001, shot-peened, $N = 10e^7$.

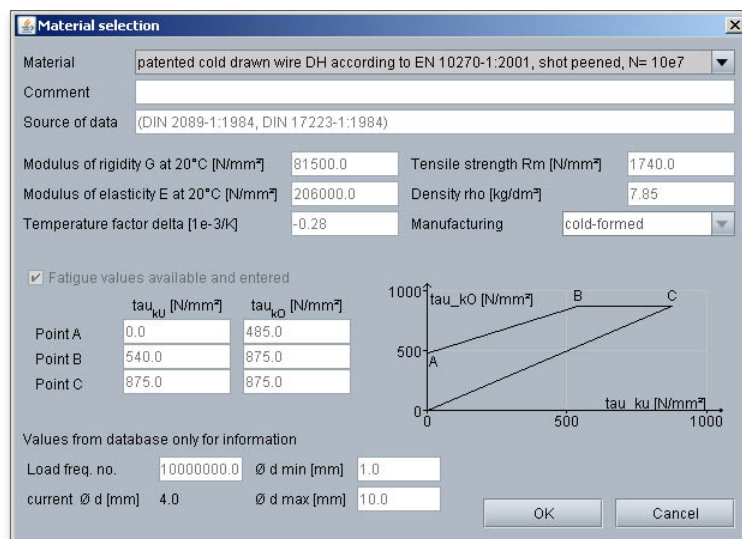


Figure 6: Select the material

0.1.4 Calculation Results

All important calculation results, such as the static and dynamic utilization of the permissible stress, the spring deviation s_h and the utilization of the permissible spring deflection s_n , will be calculated during every input and will be displayed in the result panel. A recalculation occurs after every data input. Any changes that are made to the user interface take effect immediately. Press the Enter key or move to the next input field to complete the input. Alternatively, use the Tab key to jump from field to field or click the 'Calculate' button after every input. Your entries will be also confirmed and the calculation results will displayed automatically.

Spring Rate R

The spring rate R is = 9.363511 N/mm and is displayed above the input field for the wire diameter.

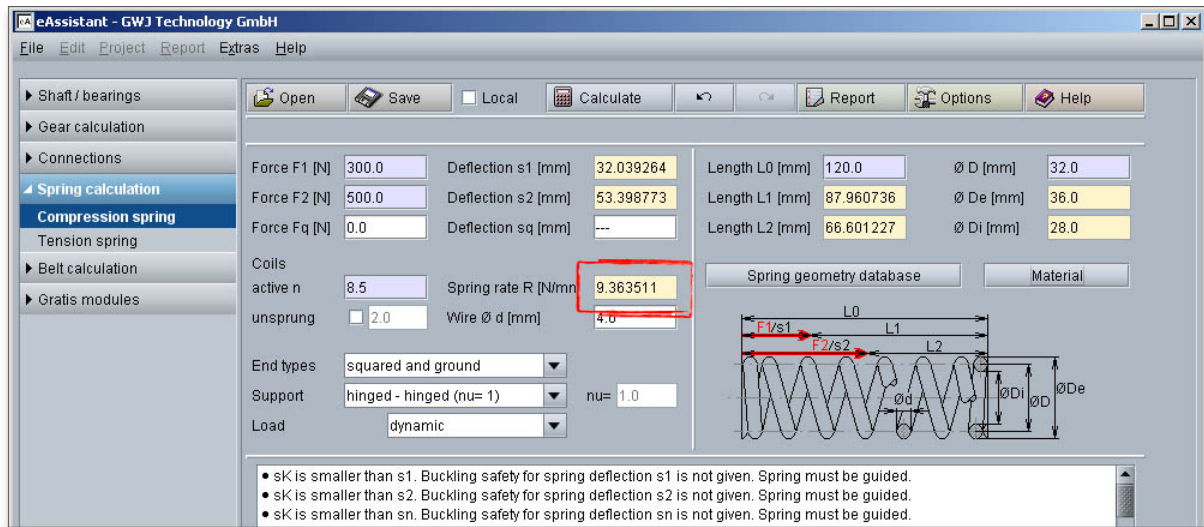


Figure 7: Result for the spring rate

Shear Stress for the Spring Force F_2

The calculation report provides the result for the shear stress. Click the button 'Report' to open the calculation report. The shear stress τ_{k2} for the spring force F_2 is = 636.62 N/mm².

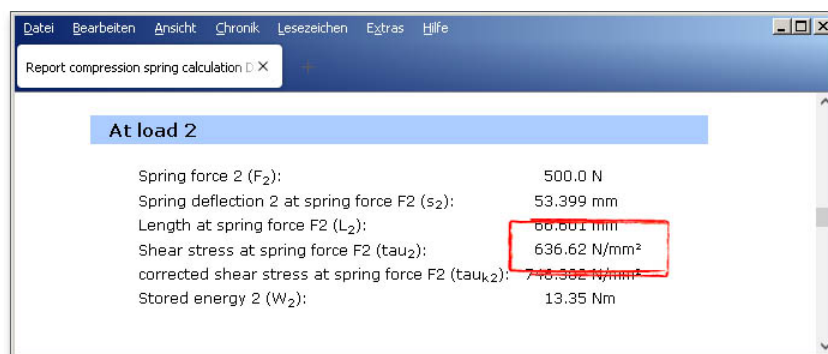


Figure 8: Result for the shear stress

Spring Deviation s_h

You will find the value for the spring deviation s_h in the result panel. The spring deviation s_h is = 21.36 mm.

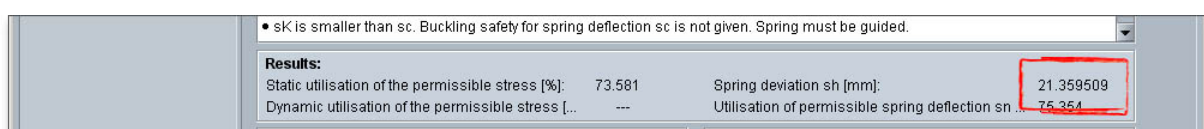


Figure 9: Result for the spring deviation

0.1.5 Documentation: Diagrams and Calculation Report

Diagrams

The results are clearly displayed in the diagrams. Click on the diagram to see the full image and details.

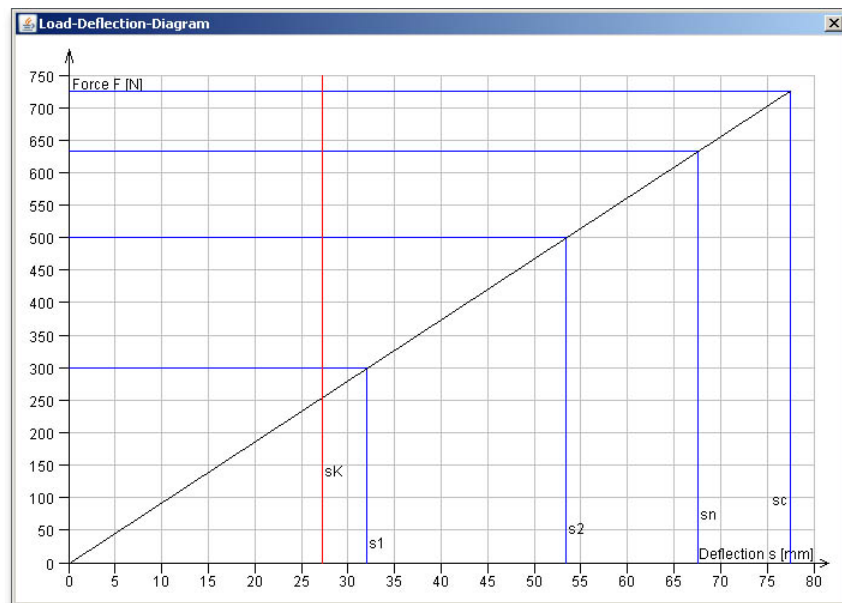


Figure 10: Diagrams

Calculation Report

After the completion of your calculation, you can create a calculation report. Click on the 'Report' button.

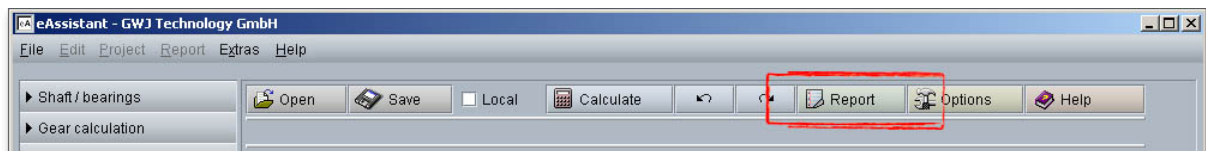


Figure 11: Button 'Report'

You can navigate through the report via the table of contents that provides links to the input values, results and figures. This calculation report contains all input data, the calculation method as well as all detailed results. The report is available in HTML and PDF format. The calculation report saved in HTML format, can be opened in a web browser or in Word for Windows. You may also print or save the calculation report:

- To save the report in the HTML format, please select 'File' ⇒ 'Save as' from your browser menu bar. Select the file type 'Webpage complete', then just click on the button 'Save'.
- If you click on the symbol 'Print', then you can print the report very easily.
- When you click on the symbol 'PDF', then the report appears in the PDF format. If you right-click on the PDF symbol, you should see the 'Save Target As' option. Click on that option and you will see the dialog box for saving the report.

0.1.6 How to Save the Calculation

When the calculation is finished, it is easy to save the calculation. You can save the calculation to your computer. Click the button 'Save'.

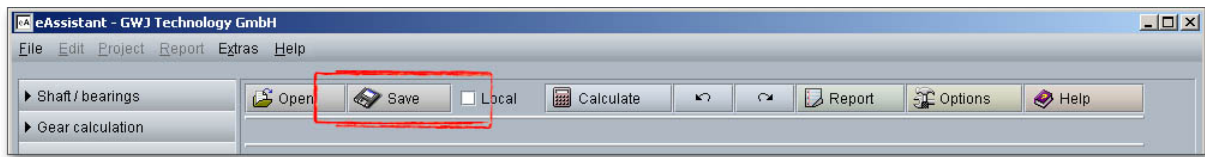


Figure 12: Button 'Save'

Please enter a name into the input field 'Filename' and click on the button 'Save'.

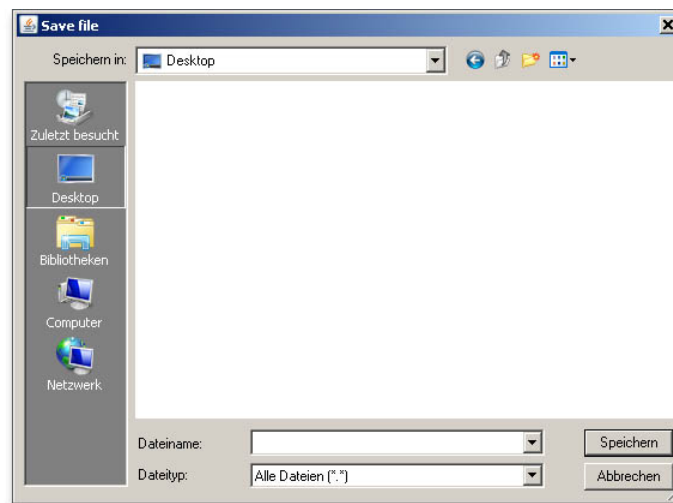


Figure 13: Windows dialog for saving the file

Our manual is improved continually. Of course we are always interested in your opinion, so we would like to know what you think. We appreciate your feedback and we are looking for ideas, suggestions or criticism. If you have anything to say or if you have any questions, please let us know by phone +49 (0) 531 129 399-0 or email info@tbksoft.eu.