

eAssistant

the engineering assistant

A calculation example Compression spring according to DIN EN 13906-1, edition 2002

Release January 2009

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1 Example: Compression spring according to DIN EN 13906-1, edition 2002

1.1 Start the calculation module

Please login with your user name and your password. Select the module 'Compression spring' through the tree structure of the Project Manager by double-clicking on the module or clicking on the button 'New calculation'.

The calculation module is opened in a new window.

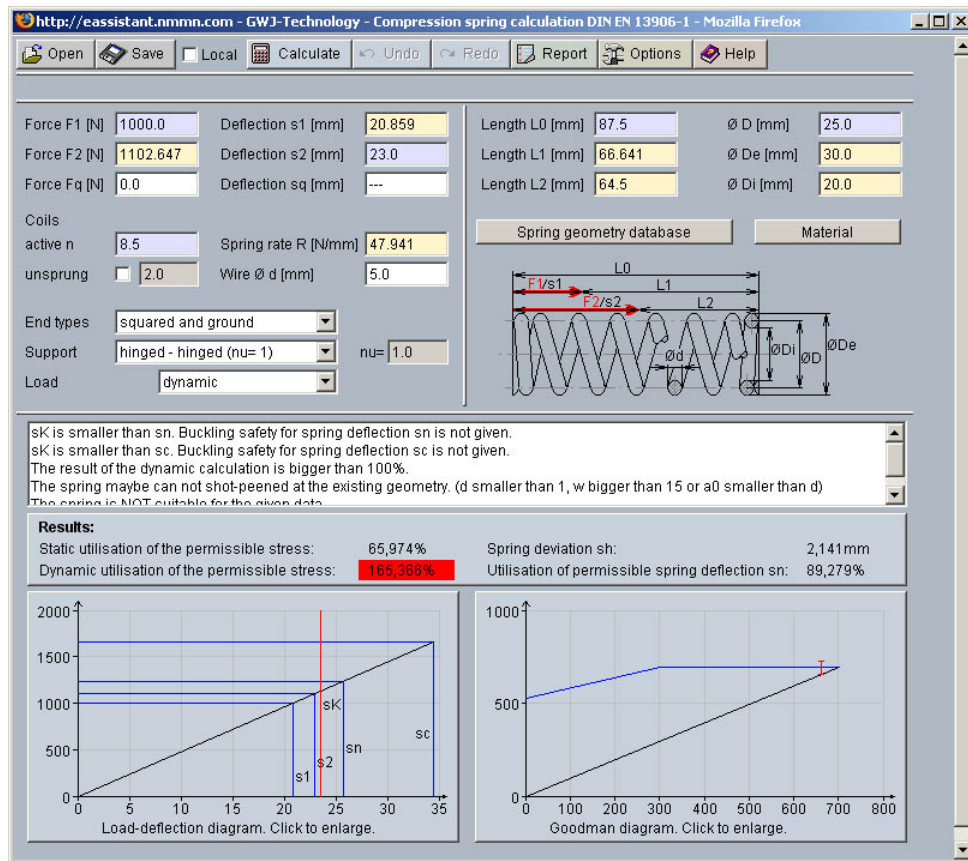


Figure 1: The calculation module

1.2 The input values

A cold-formed compression spring 4 x 32 x 120 made of patented cold drawn 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 at spring force τ_{k2} for $F_2 = 500$ N and spring deviation s_h .

1.3 The calculation

The entry of spring forces

Please start to enter the spring forces F_1 and F_2 .

| | | | |
|--------------|-------|--------------------|--------|
| Force F1 [N] | 300.0 | Deflection s1 [mm] | 6.258 |
| Force F2 [N] | 500.0 | Deflection s2 [mm] | 10.429 |
| Force Fq [N] | 0.0 | Deflection sq [mm] | --- |

Figure 2: The entry of spring forces

During the entry of the spring forces, the corresponding spring deflections are determined and color-coded.

The entry of coils and wire diameter

Enter the number of coils n as well as the wire diameter d .

| | | | |
|----------|--------------------------|---------------------------|--------|
| Coils | | | |
| active n | 8.5 | Spring rate R [N/mm] | 19.637 |
| unsprung | <input type="checkbox"/> | Wire \varnothing d [mm] | 4.0 |

Figure 3: The coils d and wire diameter d

The settings for the spring ends, the support of spring as well the load are not changed.

The entry of spring length and spring diameter

Enter the spring length L_0 and the spring diameter D .

| | | | |
|----------------|--------|-----------------------|------|
| Length L0 [mm] | 120.0 | \varnothing D [mm] | 32.0 |
| Length L1 [mm] | 87.961 | \varnothing De [mm] | 36.0 |
| Length L2 [mm] | 66.601 | \varnothing Di [mm] | 28.0 |

Figure 4: The entry of length and diameter

The material selection

To find the required material for the compression spring, click on the button 'Material'.

| | |
|--------------------------|----------|
| Spring geometry database | Material |
|--------------------------|----------|

Figure 5: The button 'Material'

The material selection is opened.

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

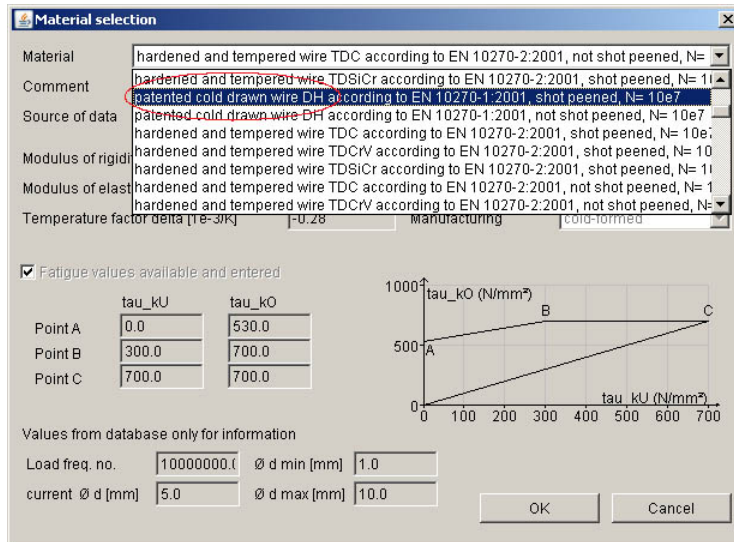


Figure 6: Select the material

1.4 The calculation results

When you enter the values, the result is determined and displayed immediately. You can find all detailed results in the result panel.

The spring rate

The spring rate R is = 9,364 N/mm and is displayed above the input field for the wire diameter.

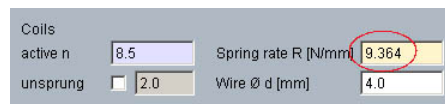


Figure 7: The result for the spring rate

The shear stress at spring force

In order to find the result for the shear stress, click on the 'Report' button. The shear stress τ_{k2} at spring force F_2 is = 636,62 N/mm².

| At load 2 | |
|---|---------------------------|
| Spring force 2(F_2): | 500.0 N |
| Spring deflection 2 at spring force F_2 (s_2): | 53.399 mm |
| Length at spring force F_2 (L_2): | 66.601 mm |
| Shear stress at spring force F_2 (τ_{k2}): | 636.62 N/mm ² |
| corrected shear stress at spring force F_2 (τ_{k2}): | 746.382 N/mm ² |
| Stored energy 2(W_2): | 13.35 Nm |

Figure 8: The result for the shear stress

The spring deviation

You will find the value for the spring deviation s_h in the result panel. The spring deviation s_h is = 21,36 mm.

| Results: | | | |
|--|---------|--|---------|
| Static utilisation of the permissible stress: | 73,581% | Spring deviation s_h : | 21,36mm |
| Dynamic utilisation of the permissible stress: | 74,36% | Utilisation of permissible spring deflection s_n : | 79,072% |

Figure 9: The result for the spring deviation

1.5 The documentation: The diagrams and the calculation report

The diagrams

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

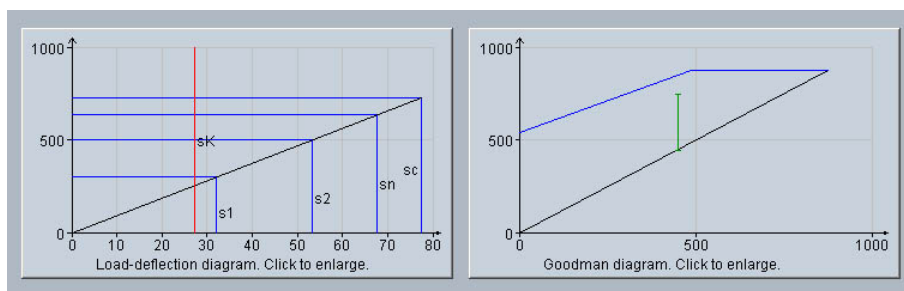


Figure 10: The diagrams

The calculation report

After the completion of your calculation, you can create a calculation report. Click on the 'Report' button. You can navigate through the report via the table of contents that provides links to the input values, results and figures. The report is available in HTML and PDF format. Calculation reports, saved in HTML format, can be opened in a web browser or in Word for Windows.

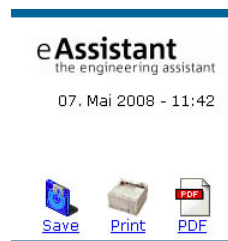


Figure 11: Save, print and PDF features

- 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.
- If 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.

1.6 How to save the calculation

When the calculation is finished, you can save it either on the eAssistant server or on your own workstation. Click on the 'Save' button.



Figure 12: The 'Save' button

If you have activated the option 'Enable file save local' in the Project Manager and the option 'Local' in the calculation module, a standard Windows dialog for saving the file on your workstation appears.

Please note: You must not forget that the calculation module has to be closed to activate the option 'Enable file save local.'

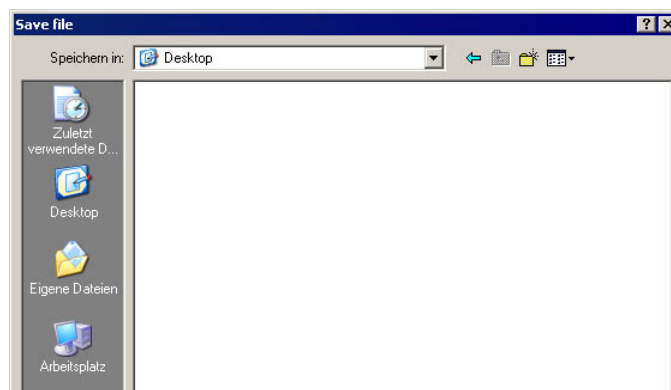


Figure 13: Windows dialog for saving the file

In case you have not activated this option, a new window is opened and you can save the calculation on the eAssistant server.

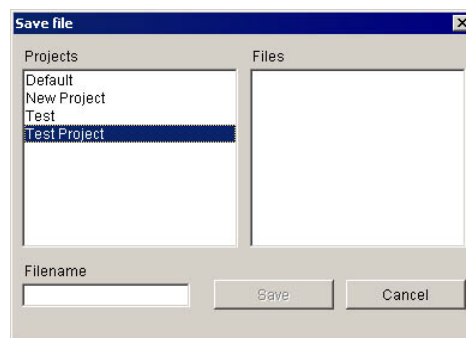


Figure 14: Save the calculation

Please enter a name into the input field 'Filename' and click on the button 'Save'. Then click on the button 'Refresh' in the Project Manager. Your saved calculation file is displayed in the window '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 via phone +49 (0) 531 129 399-0 or email eAssistant@gwj.de.