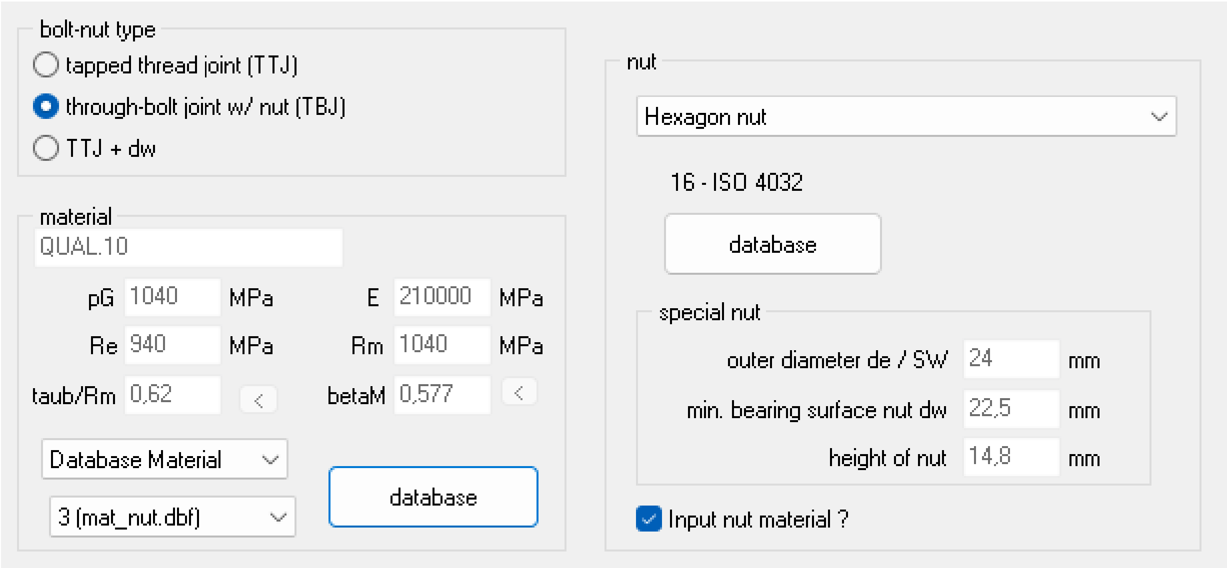
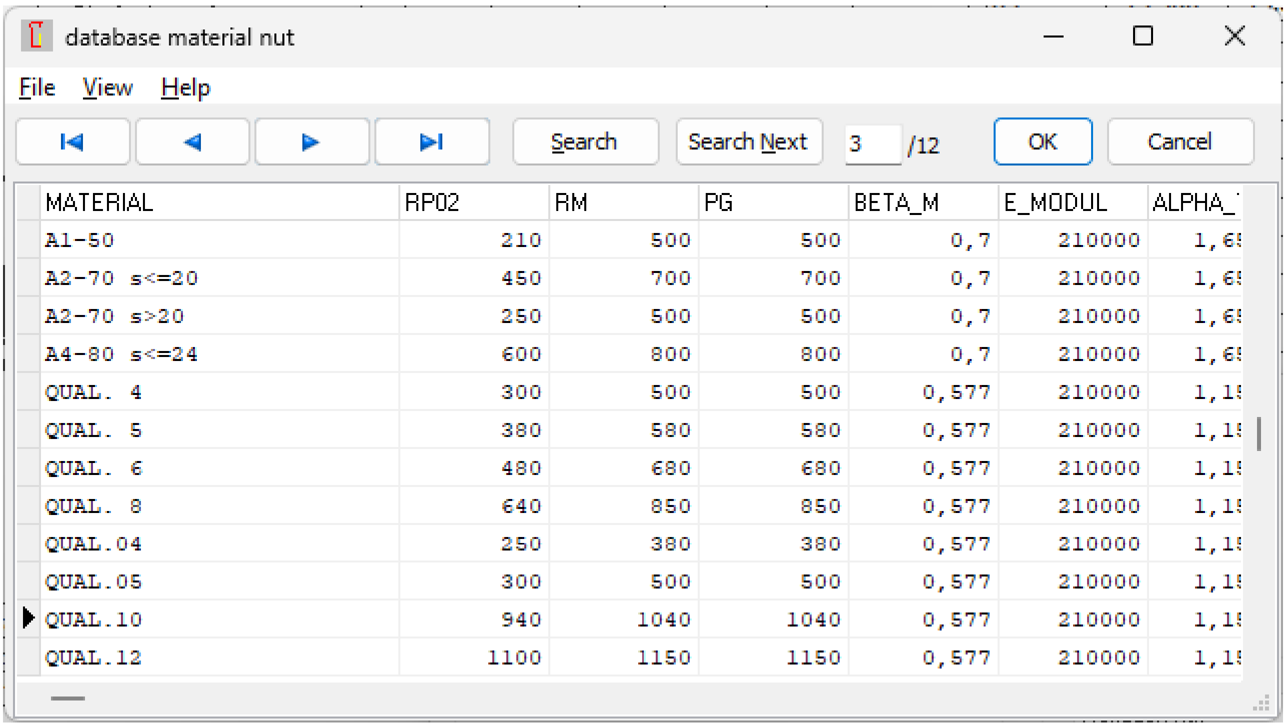
by Fritz Ruoss

SR1/SR1+: Material database nut material



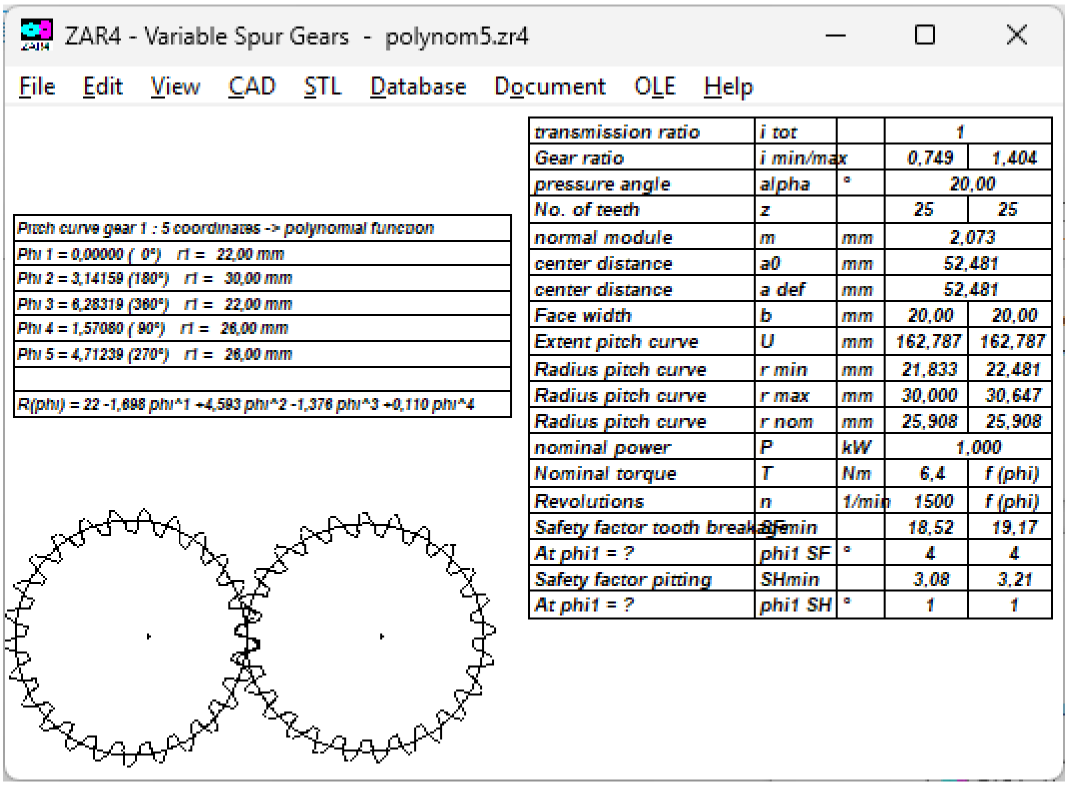
The material for the nut thread can be selected from the databases pressung.dbf, mat_p_1.dbf and mat_p_2.dbf. A fourth database has now been added, mat_nut.dbf.



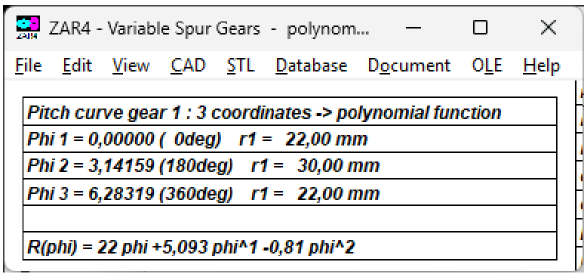
MATERIAL	RP02	RM	PG	BETA_M	E_MODUL	ALPHA_
A1-50	210	500	500	0,7	210000	1,6
A2-70 s<=20	450	700	700	0,7	210000	1,6
A2-70 s>20	250	500	500	0,7	210000	1,6
A4-80 s<=24	600	800	800	0,7	210000	1,6
QUAL. 4	300	500	500	0,577	210000	1,1
QUAL. 5	380	580	580	0,577	210000	1,1
QUAL. 6	480	680	680	0,577	210000	1,1
QUAL. 8	640	850	850	0,577	210000	1,1
QUAL.04	250	380	380	0,577	210000	1,1
QUAL.05	300	500	500	0,577	210000	1,1
QUAL.10	940	1040	1040	0,577	210000	1,1
QUAL.12	1100	1150	1150	0,577	210000	1,1

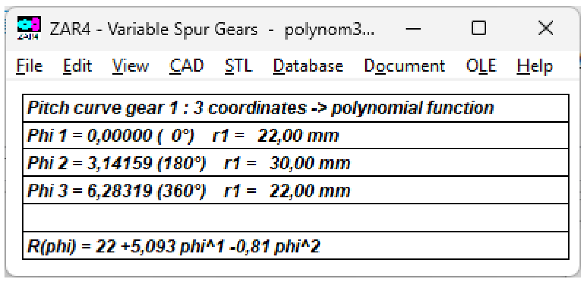
"Mat_nut.dbf" currently contains 12 records with material data for commercially available nuts if you want to calculate the thread strip safety for these. Grades 4 to 12 were taken from "pressung.dbf". Stainless steeel data A1, A2 and A4 were taken from "mat_bolt.dbf". The data for A2-70 differs for screws for d<=20 and d>20. Assumption for nuts: Outside diameter of screw d corresponds to wrench size s of the nut. Please get in touch with me if you have more precise data on nut materials or if you would like to have added further materials to the nut database.

ZAR4: Calculate polynomial function from points of the pitch curve

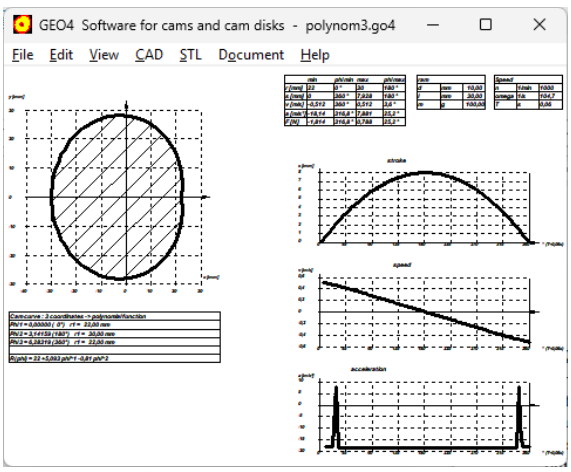


In ZAR4, you can enter three to a maximum of fifty positions of the partial curve under "Pitch curve → Spline, polynomial function", and ZAR4 calculates the polynomial function for the radius positions of the non-circular gear from this. Important: Enter the same position for phi=0° and 360°, otherwise there will be a jump. Unfortunately, the unit of the first term of the polynomial function was not displayed correctly in the Quick3 view; instead of phi, it should of course be phi^0, and phi^0 is 1. The formula has been corrected.



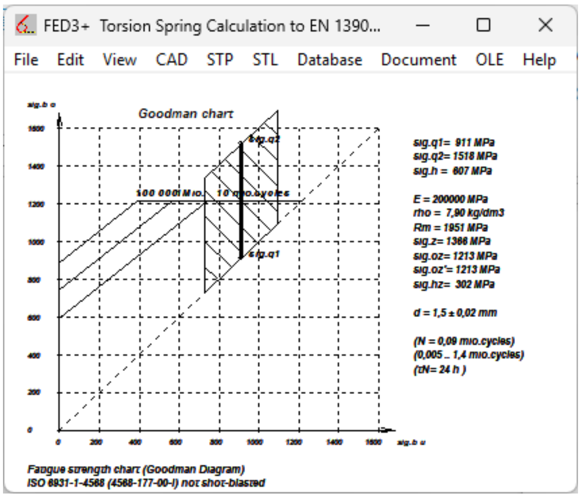


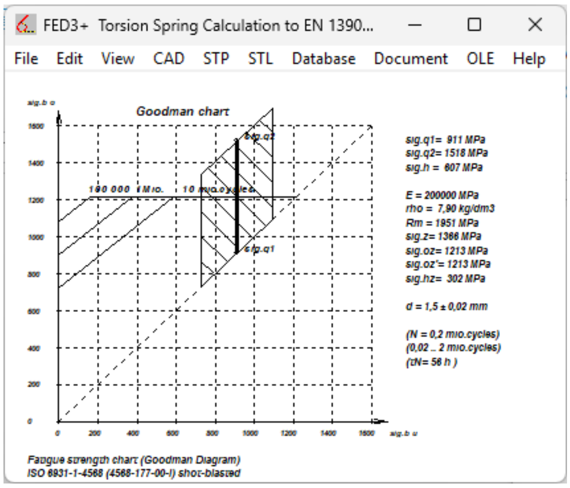
The same function also exists in GEO4. There, a cam is generated from the polynomial function instead of a non-circular gear. The representation of the formula is correct there.



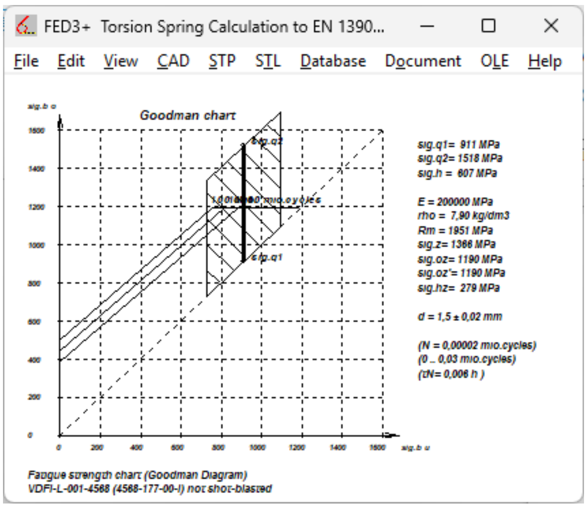
Tips and tricks for spring calculation: Adjusting Goodman diagrams
If the spring is not fatigue-resistant or the service life is too short, there are several ways to change the Goodman diagram (without changing the material database):
1. Shot blasting increases the permissible lifting stress
2. Calculation method “tauoz=tauz” or “sigmaoz=sigmaz” may increase the max.permissible stress
3. (torsion spring only): Factor Sigma/Rm =0.7 can be changed.

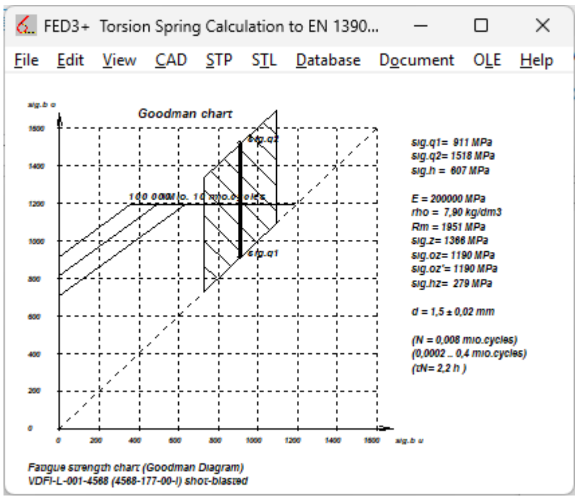
Example: A customer has received a Goodman diagram for a torsion spring from his material supplier for 1.4568 in which the upper horizontal line is higher than calculated with FED3+ and asks how this can be. The Goodman diagrams in the FED programs are in accordance with EN 13906. However, there are ways to change them.





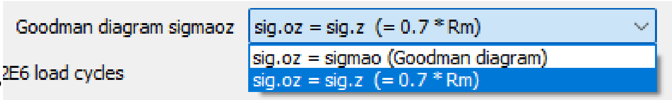
Shot peening is of no use here. Shot peening improves the permissible lifting stress, but not the permissible maximum stress. For some time now, there have been new material data from the German spring manufacturers association, which should eventually replace the old Goodman diagrams from EN 13906-1. But the permissible stresses for 1.4568 are actually even lower here (pictures below).

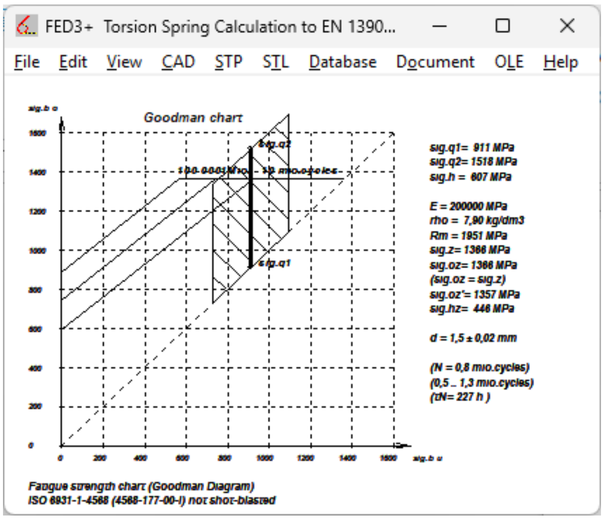


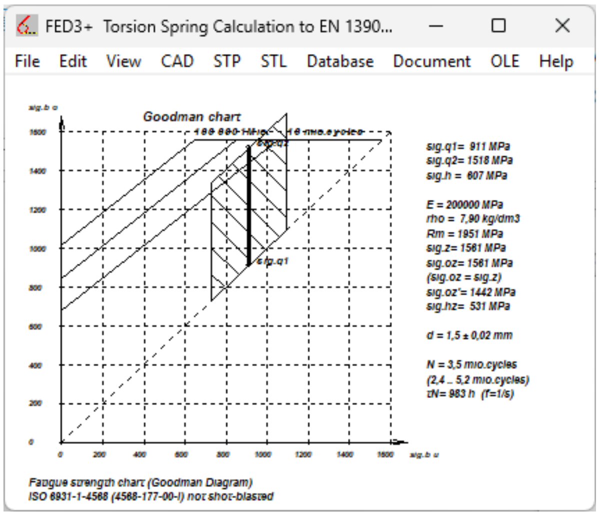


However, the FED software now offers the option of setting the horizontal line with the upper stress as the permissible shear stress (FED1..7) or bending stress (FED3).
The upper horizontal line applies to lifting stress 0, means purely static load. Accordingly, this limit line should actually be identical to the permissible shear stress tauz or bending stress Sigmaz. However, in the Goodman diagrams from EN 13906-1, the horizontal line from the Goodman diagrams is usually lower than the permissible shear stress to EN/ISO.

In FED you can configure tauz instead of tauo or sigmaz instead of sigmao for the horizontal line under Edit\Calculation Settings. In this example, sigmaoz increases from 1213 MPa to 1366 MPa. Now the fatigue strength looks much better.

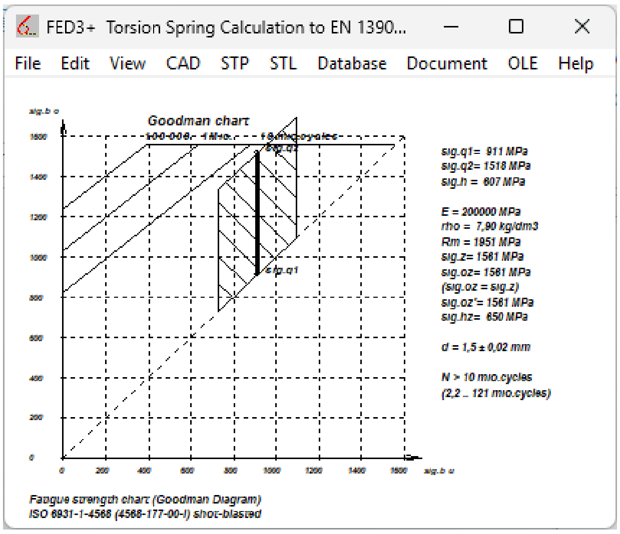


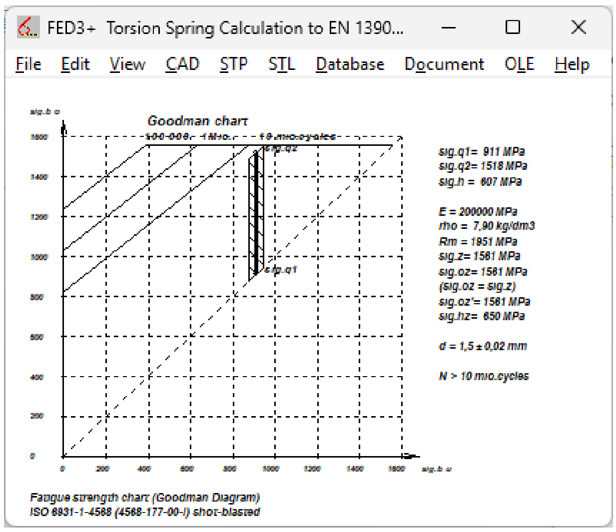




In FED3+ you can also change the conversion factor for max. bending stress spring = 70% tensile strength.

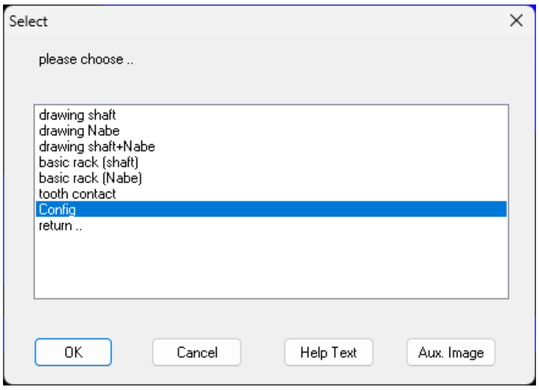
According to EN 13906-3, the bending stress of torsion springs is calculated with sigmab = 0.7 Rm. But in general mechanical engineering, sigmab = 1.0 Rm is used. Then the permissible bending stress sigmaz is much higher. But be careful: the calculation is then no longer according to EN 13906-3. If you increase Sigmab/Rm from 0.7 to 0.8, sigmaq2 is below sigmao. Now only the lifting stress is a little too high (picture top right). No problem, thanks to shot blasting almost all values are in the green range (picture bottom left).

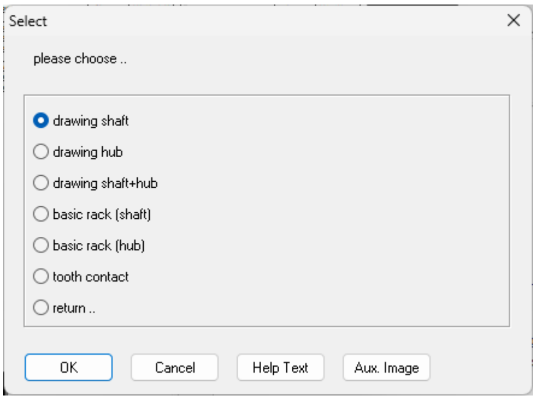


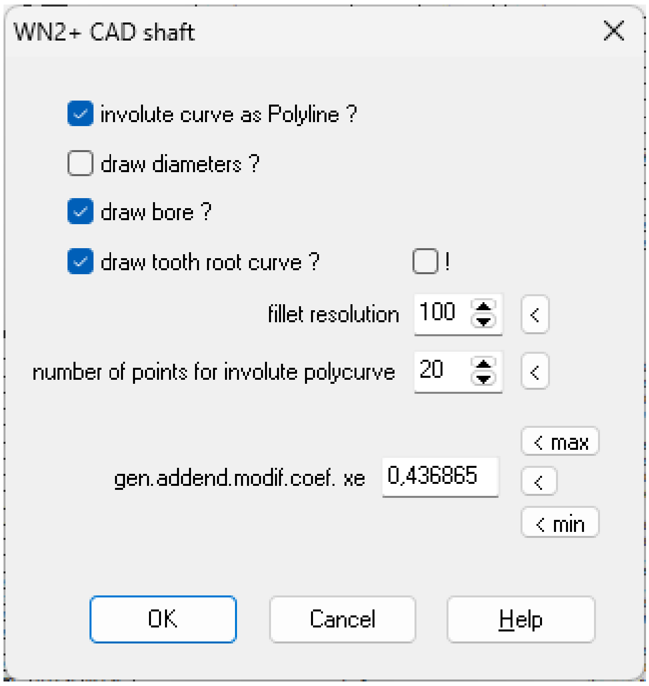


The permissible maximum stress is only exceeded at the upper tolerance limit. The solution is to reduce the tolerances for torque T1 and T2 (right picture).
This is how you can use tricks to change the fatigue strength and service life of a spring. The result is not in accordance with EN 13906, which is also displayed as a warning in FED3+. The spring should be verified using fatigue strength tests before use.

WN2,4,5,10: CAD configuration under „CAD\Tooth form“
Previously, you had to set the number of points for involute and root fillet under “CAD\Tooth form\ Config”, now you can do this directly under “CAD\Tooth form shaft/hub”. Unfortunately, at the time, we forgot to remove the idle “Config” selection, but this has now been done.







FAQ: Save individual start data
Question: When we start a calculation via "File" > "New", there are already parameters by default that have to be overwritten each time. Can you please tell us where these "default parameters" are saved and how we can adjust them when we want to start a new calculation?
Answer: Save your default parameters with the file name "NULL". This zero file is loaded automatically at startup.

February 23, 2025: Germany has voted
The unpopular „traffic lights“ coalition was voted out. Hopefully the future Chancellor Friedrich Merz can quickly push through his plans in parliament.

February 24, 2025: 3 years of war in Ukraine
Hopefully my prediction from February 2024 in Info Letter 203 will come true that Trump and Putin will decide to end the war in Ukraine. Then European politicians should also be happy about peace and not reject it because they are not allowed to sit at the kids' table during the peace negotiations.

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DXFPLOT V 3.2	123.-
FED1+ V32.1 Helical Compression Springs incl. spring database, animation, relax., 3D,..	695.-
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