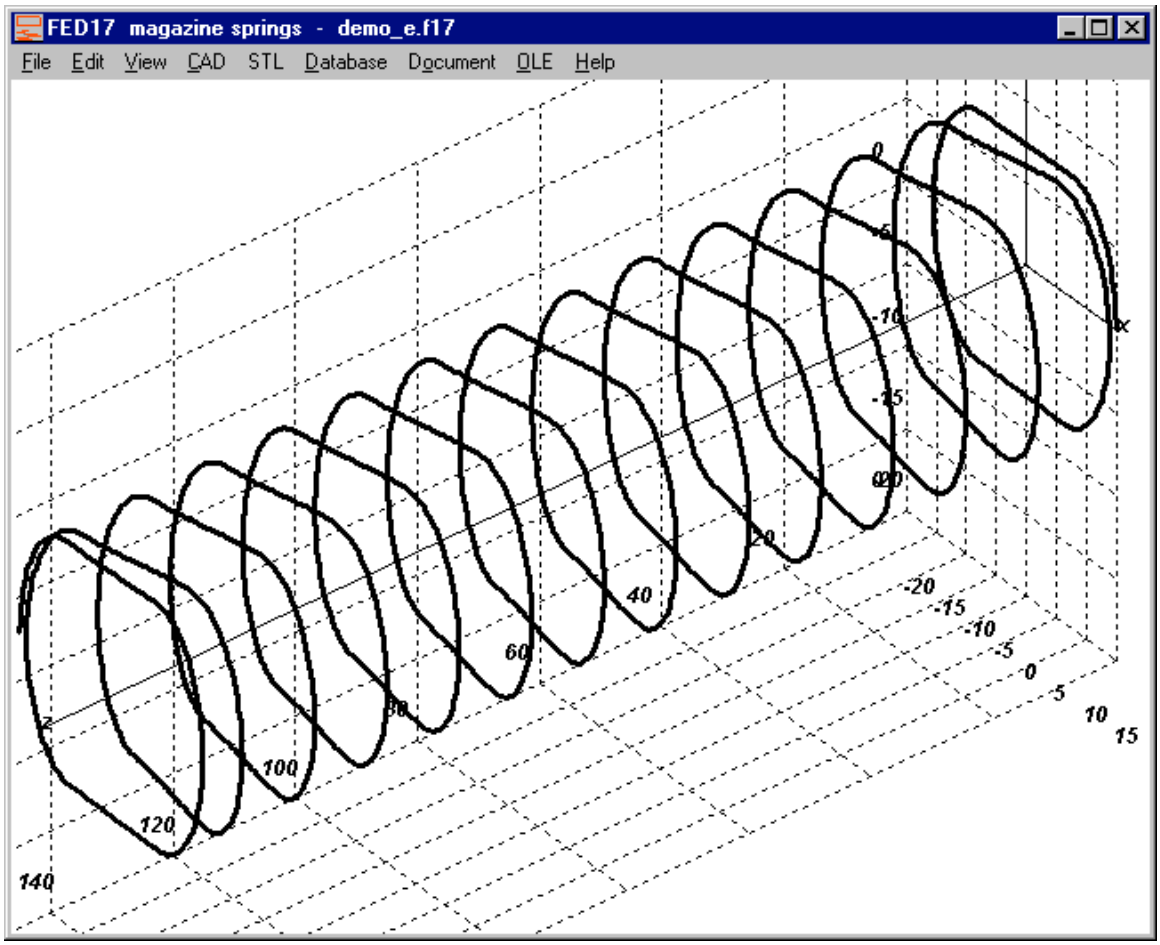
HEXAGON Newsletter 161 Jan./Feb. 2017

by Fritz Ruoss

FED17 - New Software for Magazine Springs

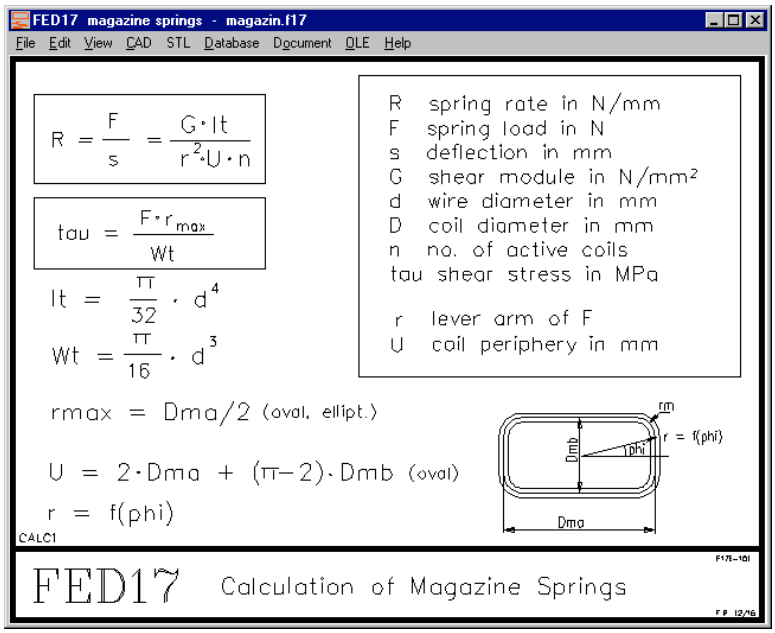


Helical compression springs with rectangular or oval or elliptic coil shape can be calculated by means of new FED17 software. These formulas are applied for calculation of magazine springs:
phi = Mt*L/(G*It) = F*r*U*n/(G*It)=s/r
R=F/s=G*It/(r²*U*n)
It=pi/32*d^4 for round wire
U = pi*Dm for round coil shape
U = 2 Dma + 2 Dmb for rectangular coil shape
U = 2 Dma + (pi-2)Dmb for oval coil shape
R = Dm/2 for round coil shape
R =f(phi) for other coil shape

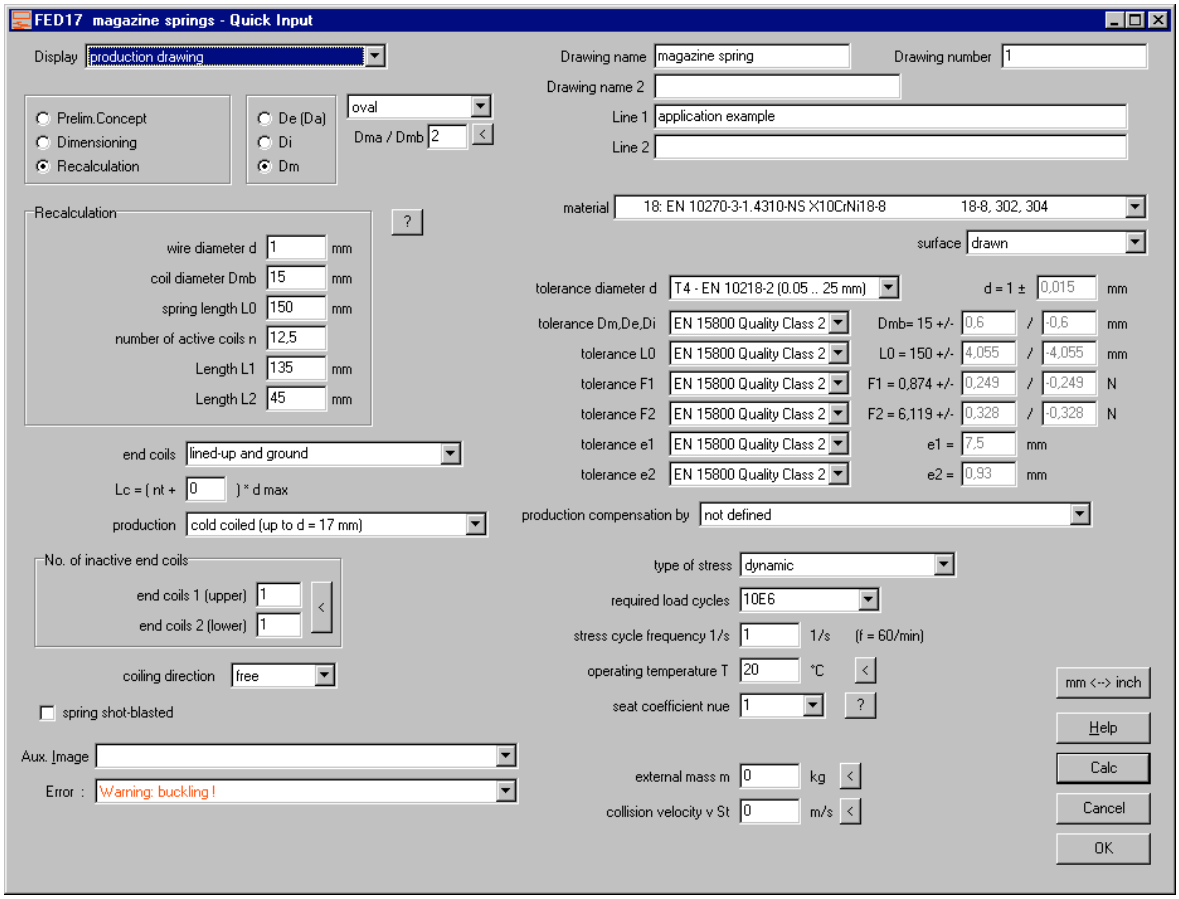
tau = Mt/Wt
Mt = F*r
taumax = F*rmax/Wt
Wt=pi/16*d³ for round wire

FED17 is almost equal with FED1+. FED17 has an additional input window for the coil shape, but no database for catalogue springs and no cost calculation. You can select between 3 coil shapes:

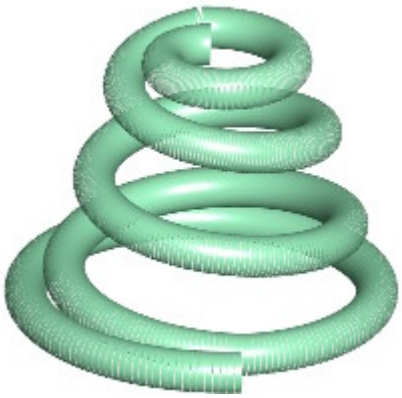
- oval
- rectangular with bending radius
- elliptic



Length of coil shape is designated as "Da" and width of coil shape as "Db". If you set Da/Db=1 and coil shape oval or elliptic, you can use FED17 to calculate cylindrical compression springs with coil diameter D=Da=Db.
Same as in FED1+, FED17 provides Quick Input as well as separate input windows.

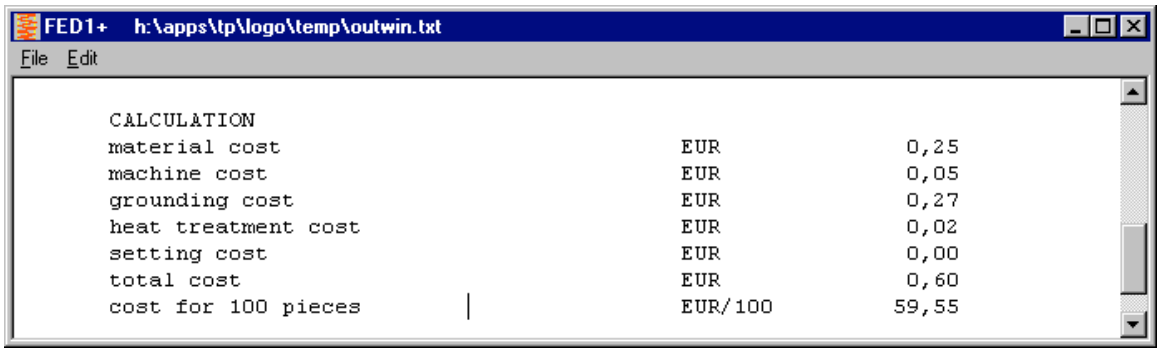


FED1+, FED5, FED6, FED7, FED17: 3D spring model as STL file
Compression springs can be generated as STL file now. Short compression springs could be printed on a 3D printer. To show the spring as 3D model, you can install a STL viewer, if not already available. To run the STL viewer automatically after generating STL file, configure "Exec CAD App" at "File->Settings->CAD". Maybe you can use your CAD software to open the STL files.



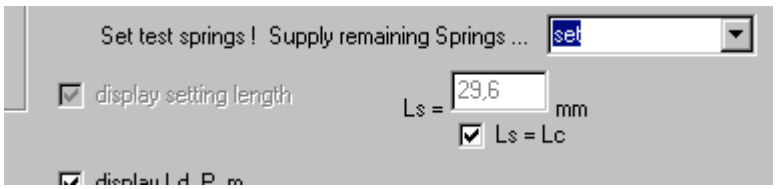
FED5 – Concentric End Coils
Concentric end coils can be used if block length should be as small as possible. But please consider that concentric end coils cannot be led precise in a mandrel nor bore. FED5 now gives a warning if you select mandrel or bore for production drawing of a conical spring with concentric end coils.

FED1+, FED2+: Cost calculation updated
At „View->Printout->Cost“ you get an approximate cost calculation of the spring. This module was programmed in 1994 and not modified since then. In 2004, base currency DM was changed into Euro with a factor of 0.511.
Currency database money.dbf was actualized now. Factor of the base currency EUR was changed from 0.511 into 1, assumed that cost of a spring since 1994 has doubled, so that a spring of 1994 for 1 DM has a price of 1 EUR today. Cost of material, grinding, setting could be modified by the user in Database menu.

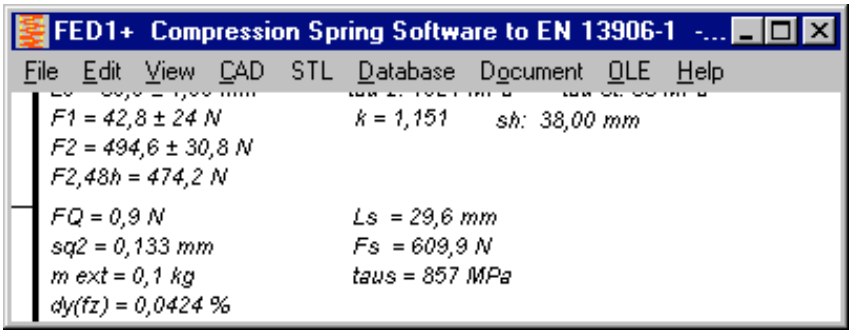


FED1+: Quick Input Improved
Database access was reduced in Quick Input Window, material data will be actualized only if you select another material. In earlier versions, material data was updated for each recalculation which slowed down calculation speed and even could cause a crash if fast double click on "Calc" button.

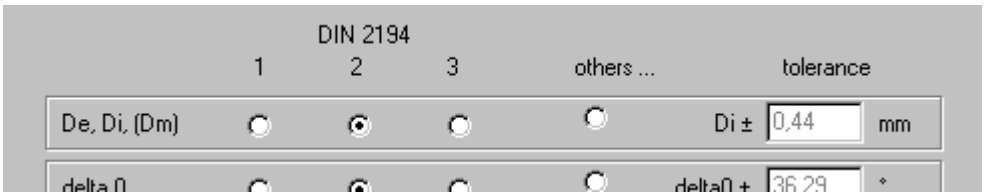
FED1+, FED5, FED6, FED7: Setting length at „Ls=Lc“ rounded
If you set setting length „Ls=Lc“, Ls will be rounded to next 1/10 mm.



FED1+, FED5, FED6, FED7: Setting length Ls printed
Setting length as entered at "Edit->Production Drawing" has been added to printout and Quick4 view , together with shear stress taus and load Fs at setting length.

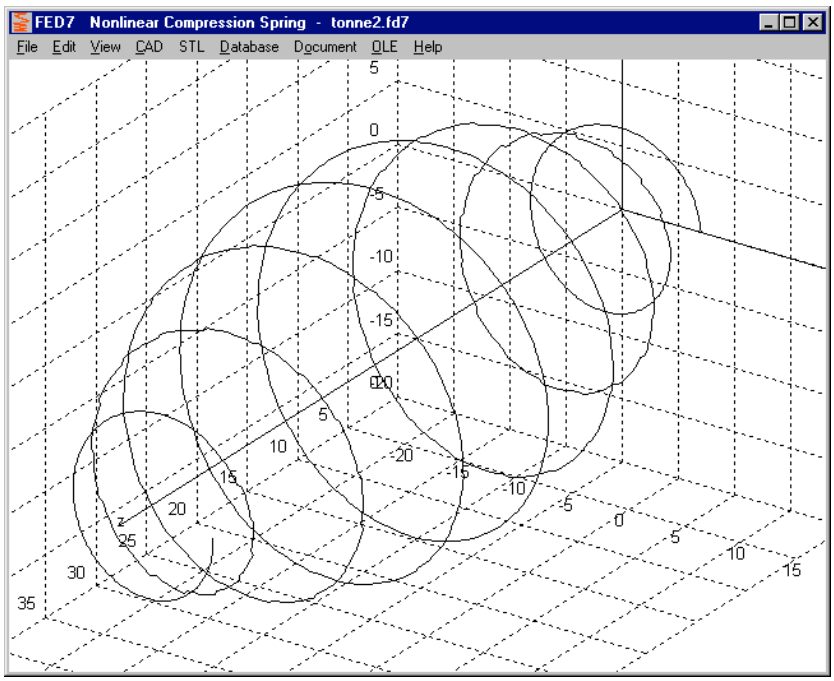


FED3+ Tolerance of Coil Diameter
Tolerance of coil diameter to quality grade 1,2,3 is now calculated based on the center coil diameter Dm, independent if De, Di or Dm was selected.



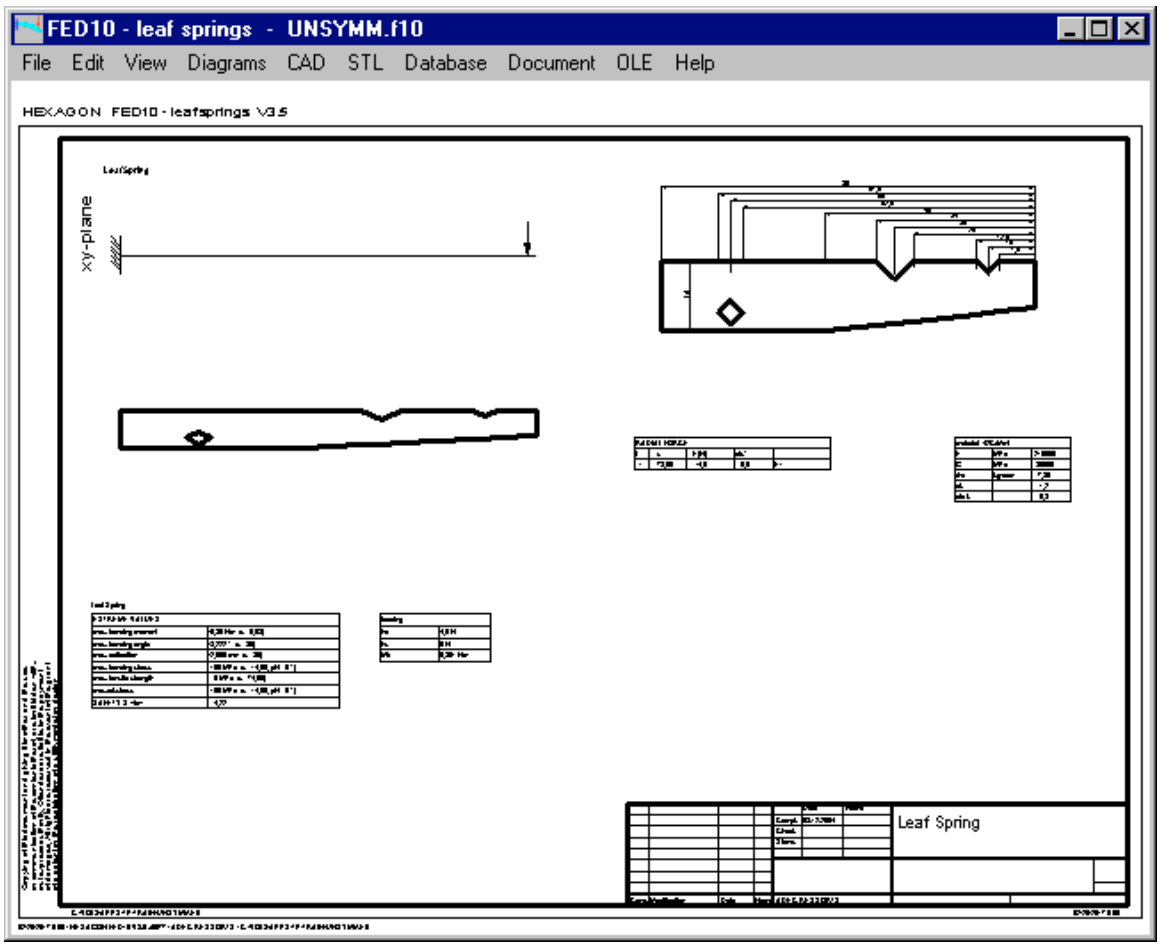
FED7 - 3D Centerline

3D centerline has been added in FED7 as drawing on screen, or to be exported as 3D DXF or IGES file to be used with CAD. Because FED7 calculates a compression spring of any form as series of cylindrical spring sections, center line may be less or more disintegrated if coil diameter changes.

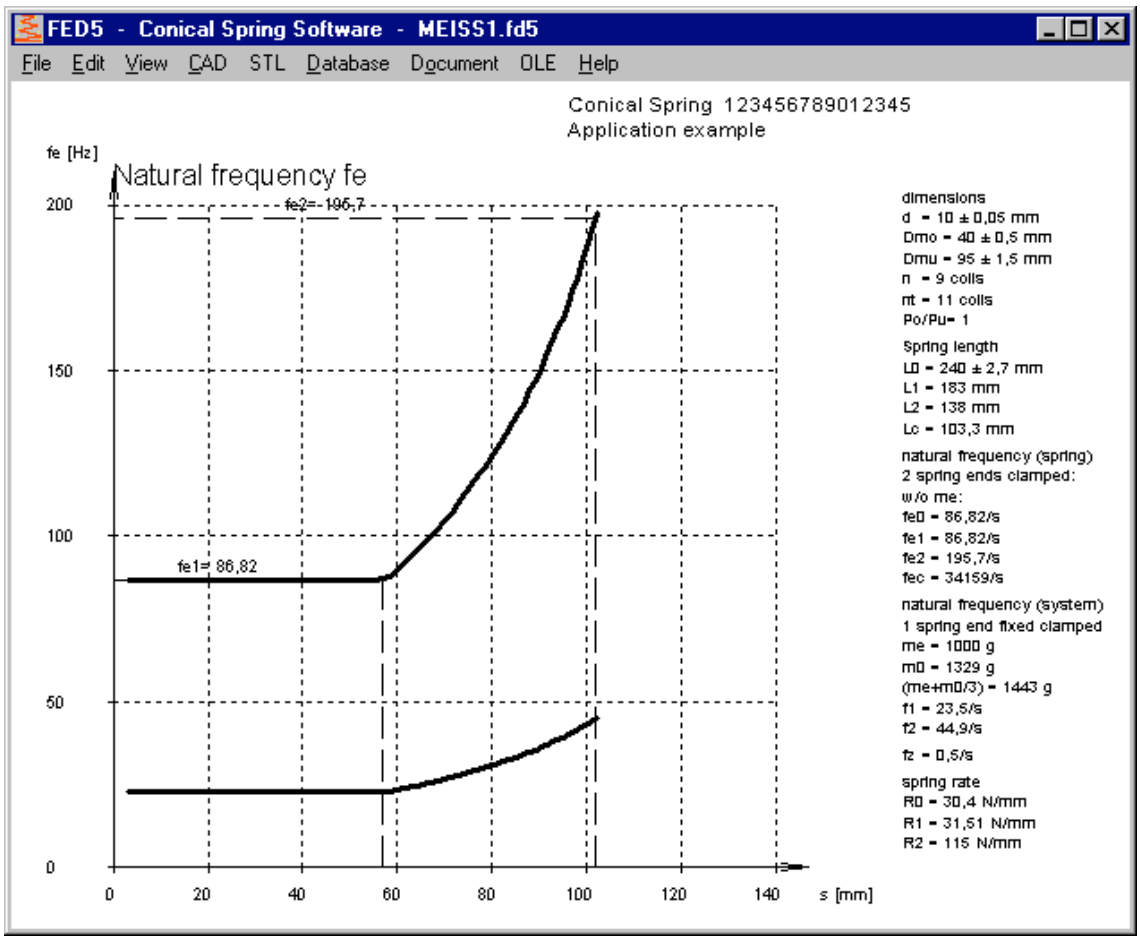


FED10 – Quick4 View

New Quick4 view includes drawing, bedding draft with loads, tables with loads and calculation results altogether on one screen in an ISO7200 drawing header.



FED5, FED6: Natural frequency of spring-mass system with external mass
Same as in FED1+, you can input an external mass at FED5 and FED6 now to calculate natural frequency of the spring-mass-system. If spring length L2 is in the nonlinear zone of the load curve, the spring-mass system has no constant resonance frequency, because spring rate changes with spring deflection. This is an advantage of nonlinear springs. FED5 and FED6 calculate then the natural frequency of the spring-mass-system at L1 and L2.
If you compare the natural frequency of the spring-mass-system with that of the naked spring, you may be astonished that natural frequency of the spring-mass-system is much lower than that of the naked spring even if external mass is nearly 0. The reason is that natural frequency of the naked spring is calculated as natural frequency of the active coils with both spring ends fixed, and without the mass of the end coils. For progressive springs, the difference is even higher, because number of active coils becomes smaller with spring deflection, and mass of inactive coils is not considered.
For calculation of spring-mass-system, however, only one spring end is fixed and the other spring end moves the external mass. Natural frequency is f=SQRT(R/m)/(2PI), oscillating mass m calculated as sum of external mass and 1/3 of spring mass.



FED5 – Spring ends and block length if no end coils defined
If no end coils defined (n end=0), form of the spring ends (raw or ground) was not considered until now and the block length was calculated until wire center (similar as for ground spring ends). Form of the spring ends (raw, ground) is now considered, raw active coils increase block length. Except if the coils bog-down until coil diameter.

XFED1: Special FED1 Freeware License for Sale

Spring manufacturers asked for a freeware version of the spring software as giveaway for their customers. So we decided to offer a special freeware version of FED1.

Menus of XFED1 Freeware are reduced, (File, Edit, View, Help) this eases the use for beginners.

Quick Input Window with pre-dimension, dimensioning and recalculation of cylindrical compression springs, altogether in one window. Output options are Quick1, Quick3, load-deflection-diagram, spring drawing and production drawing.

Freeware version is property of the buyer, HEXAGON does not offer nor distribute freeware versions. The license holder is free to offer the freeware version for unlimited download, or distribute to certain customers and suppliers only.

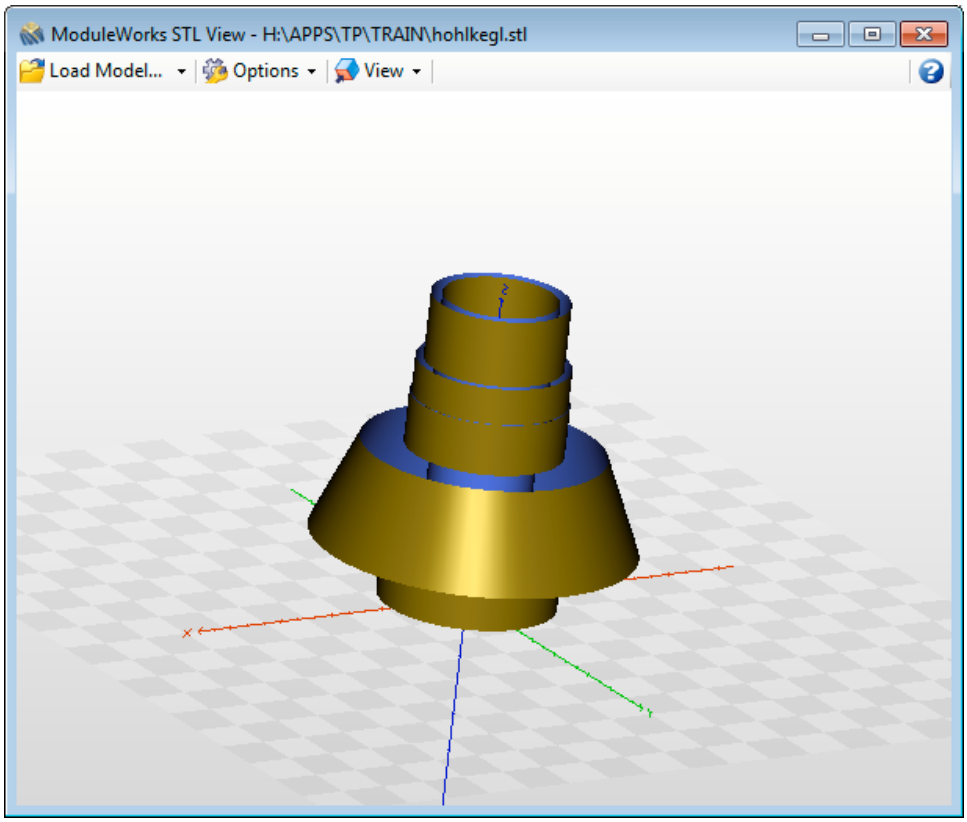
XFED1 Freeware is a special version of FED1. XFED1 runs without key code and may be copied and distributed by the license holder without any limit. The license holder determines, if and how his name and advertisement is included in software and printout.

The freeware can also be used internal. If no floating license of FED1+ is available from network, you can calculate the spring with XFED1 and save. FED files of XFED1 and FED1+ are equal and can be used with FED1+.

Freeware versions can never be downloaded on www.hexagon.de. We could set download links to the download page of the license holder, if desired.

Acquisition of an unlimited freeware license XFED1 is exclusive and expensive: price is 13,500 EUR, as much as for 50 single licenses of FED1. If no one acquires a XFED1 freeware package, there will be no XFED1 freeware.

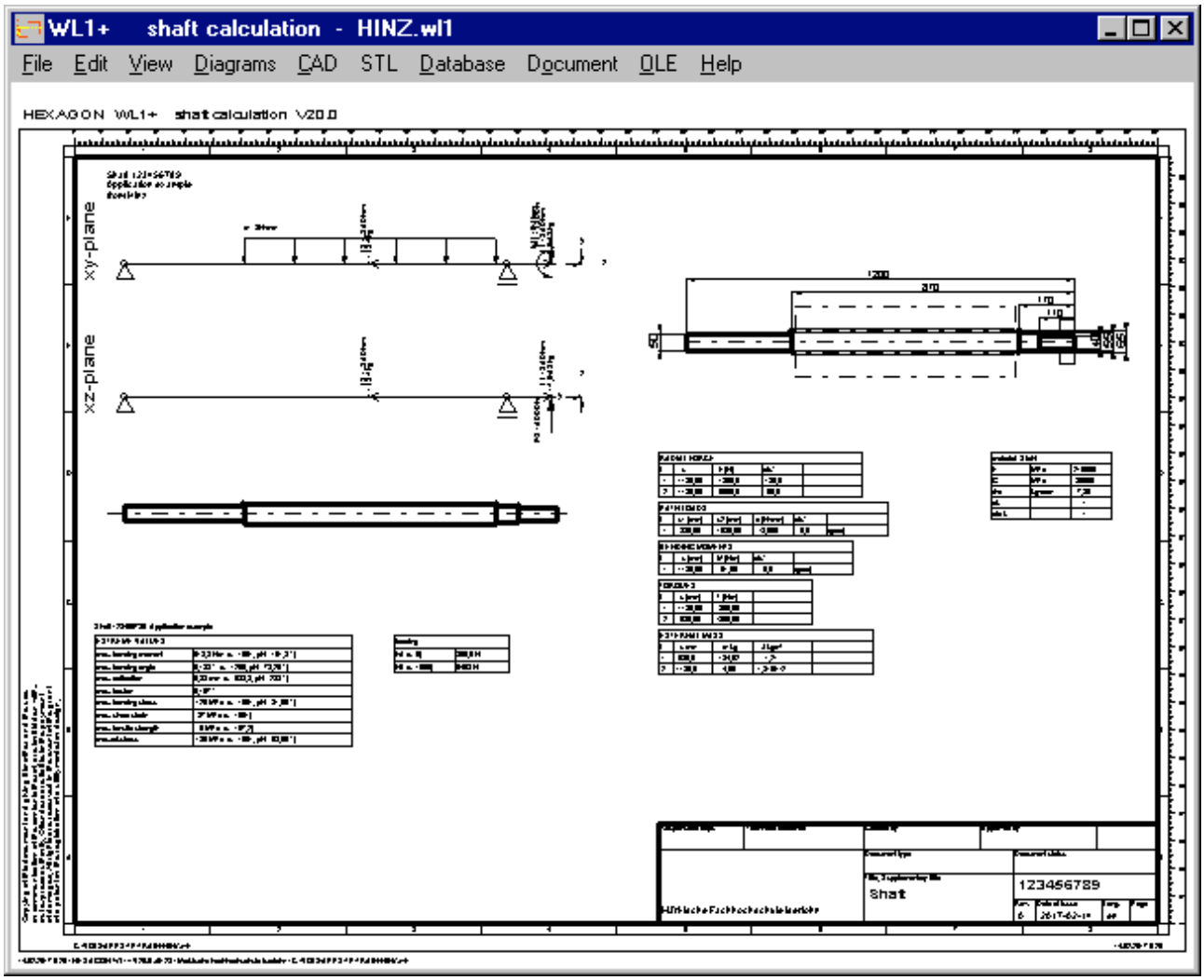
WL1+ STL-Export



WL1+ can generate a STL file of the shaft now. If it is a rather short shaft, you could print a model on 3D printer.

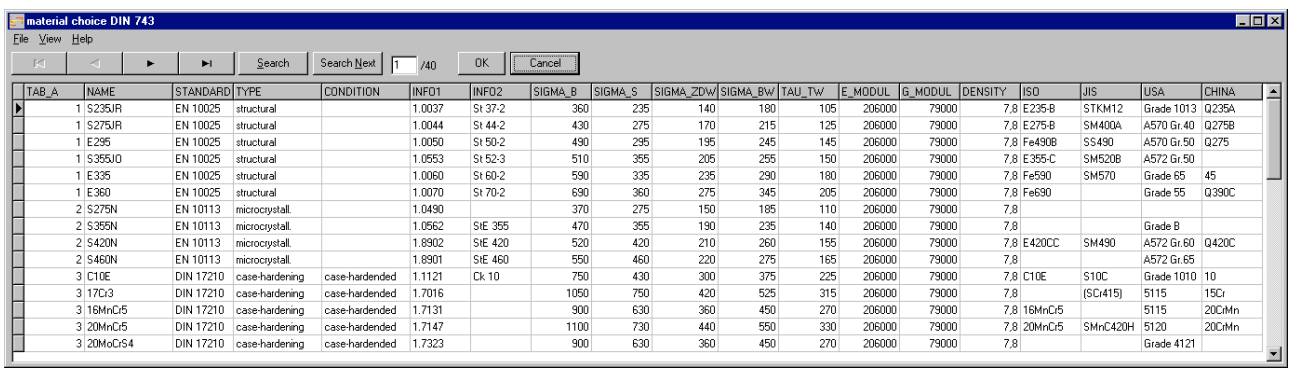
WL1+: Quick4 View

New Quick4 View shows shaft drawing, draft with bearings and loads, tables with loads and calculation results, altogether on one screen in ISO 7200 drawing frame.



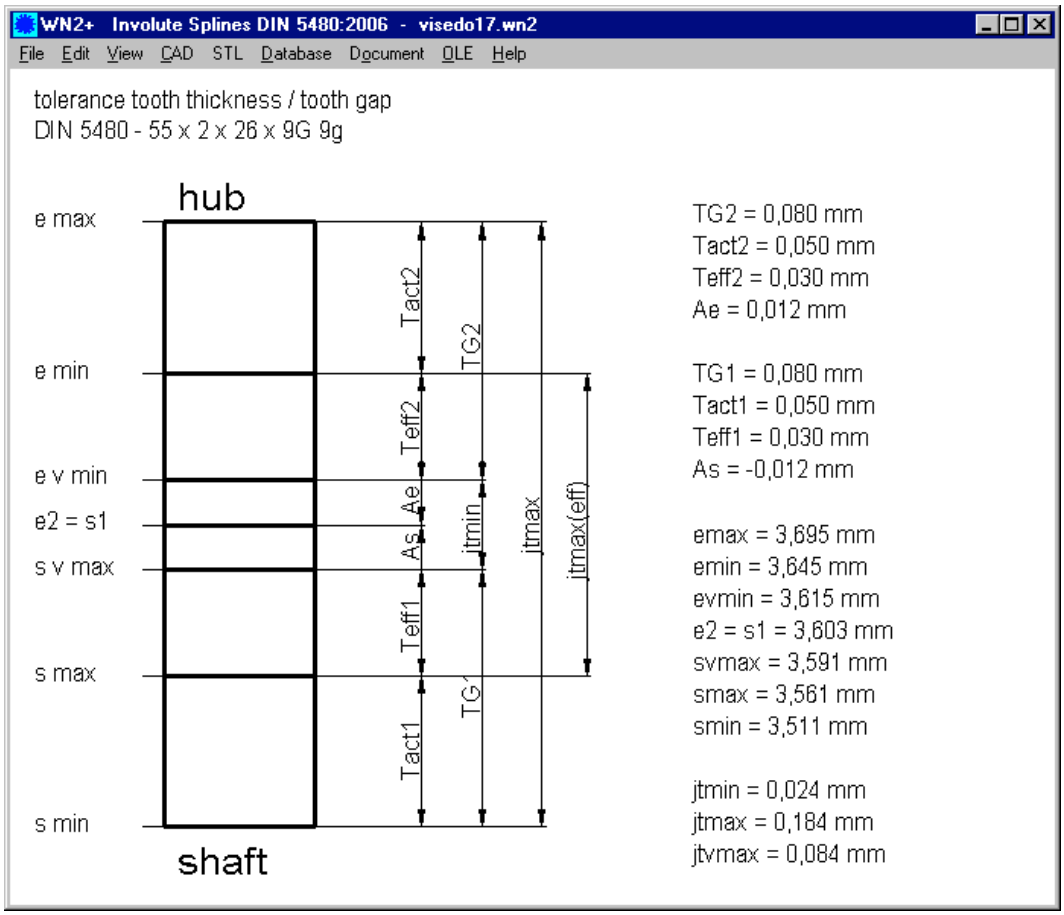
WL1+: International Material Names in DIN 743 Material Database

Material numbers and material names to ISO, JIS, US and Chinese standards have been added to DIN 743 material database. If you use materials from WST1 database in WL1+, you can search for international material names in the WST1 material comparison database.

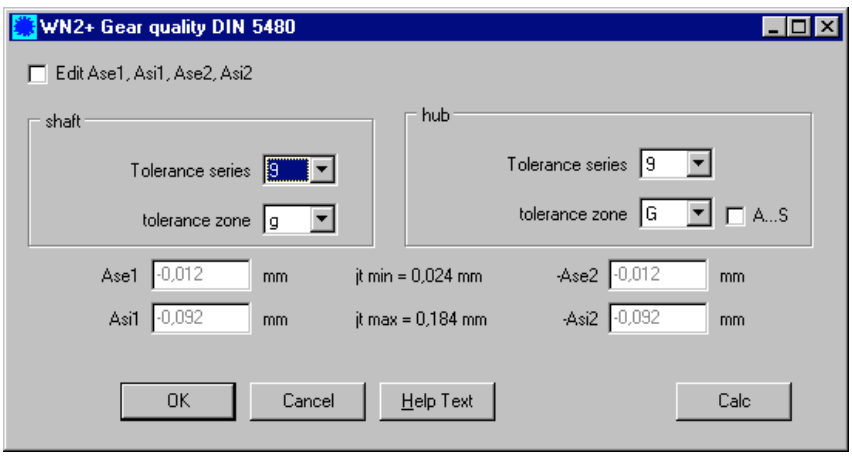


TAB_A	NAME	STANDARD	TYPE	CONDITION	INFO1	INFO2	SIGMA_B	SIGMA_S	SIGMA_ZDW	SIGMA_BW	TAU_TW	E_MODUL	G_MODUL	DENSITY	ISO	JIS	USA	CHINA
1	S235JR	EN 10025	structural		1.0037	St 37-2	360	235	140	180	105	206000	79000	7,8	E235-B	STKM12	Grade 1013	Q235A
1	S275JR	EN 10025	structural		1.0044	St 44-2	430	275	170	215	125	206000	79000	7,8	E275-B	SM400A	A570 Gr.40	Q275B
1	E295	EN 10025	structural		1.0050	St 50-2	490	295	195	245	145	206000	79000	7,8	Fe490B	SS490	A570 Gr.50	Q275
1	S355J0	EN 10025	structural		1.0553	St 52-3	510	355	205	255	150	206000	79000	7,8	E355-C	SM520B	A572 Gr.50	
1	E335	EN 10025	structural		1.0060	St 60-2	590	335	235	290	180	206000	79000	7,8	Fe590	SM570	Grade 65	45
1	E360	EN 10025	structural		1.0070	St 70-2	690	360	275	345	205	206000	79000	7,8	Fe690		Grade 55	Q390C
2	S275N	EN 10113	microcrystall.		1.0490		370	275	150	185	110	206000	79000	7,8				
2	S355N	EN 10113	microcrystall.		1.0562	StE 355	470	355	190	235	140	206000	79000	7,8			Grade B	
2	S420N	EN 10113	microcrystall.		1.8902	StE 420	520	420	210	260	155	206000	79000	7,8	E420CC	SM490	A572 Gr.60	Q420C
2	S460N	EN 10113	microcrystall.		1.8901	StE 460	550	460	220	275	165	206000	79000	7,8			A572 Gr.65	
3	C10E	DIN 17210	case-hardening	case-hardended	1.1121	Ck 10	750	430	300	375	225	206000	79000	7,8	C10E	S10C	Grade 1010	10
3	17Cr3	DIN 17210	case-hardening	case-hardended	1.7016		1050	750	420	525	315	206000	79000	7,8		(SCr415)	5115	15Cr
3	16MnCr5	DIN 17210	case-hardening	case-hardended	1.7131		900	630	360	450	270	206000	79000	7,8	16MnCr5		5115	20CrMn
3	20MnCr5	DIN 17210	case-hardening	case-hardended	1.7147		1100	730	440	550	330	206000	79000	7,8	20MnCr5	SMnC420H	5120	20CrMn
3	20MoCrS4	DIN 17210	case-hardening	case-hardended	1.7323		900	630	360	450	270	206000	79000	7,8			Grade 4121	

WN2, WN2+: Reversed sign at Ae caused error at e2min, e2max



Ring gears and internal splines were calculated with negative signs for number of teeth and diameters so that all formulas were valid for both, external and internal gears and splines. Unfortunately, nowadays American calculation method with major diameters and minor diameters instead of tooth tip diameter and tooth root diameters with always positive sign are used for involute splines. Together with the diameters, sign of tolerances have to be reversed for internal splines. WN2 uses internal the "old German method". Only tolerances emin and evmin, emax and Teff and Tact were calculated to new formulas. Unfortunately, there was forgotten to reverse the sign of tolerance "Ae". If tolerance zone of internal spline is "H", Ae is 0. But if another tolerance zone "F,G,J.K,M" was selected as tolerance zone, calculated tooth gap width emin, evmin and evmax of the internal spline was calculated wrong. The error concerns gap width to DIN 5480:2006 only. Span measurement, dimensions between pins and backlash were calculated correct always.



WN2, WN2+; WN4, WN5: Radial Backlash and Normal Backlash
Additional to torsional backlash, WN2+, WN4 and WN5 now also calculate normal backlash and radial backlash. Normal backlash requires a customer for grinding allowance, and radial backlash to compensate errors of a neighboured toothing.

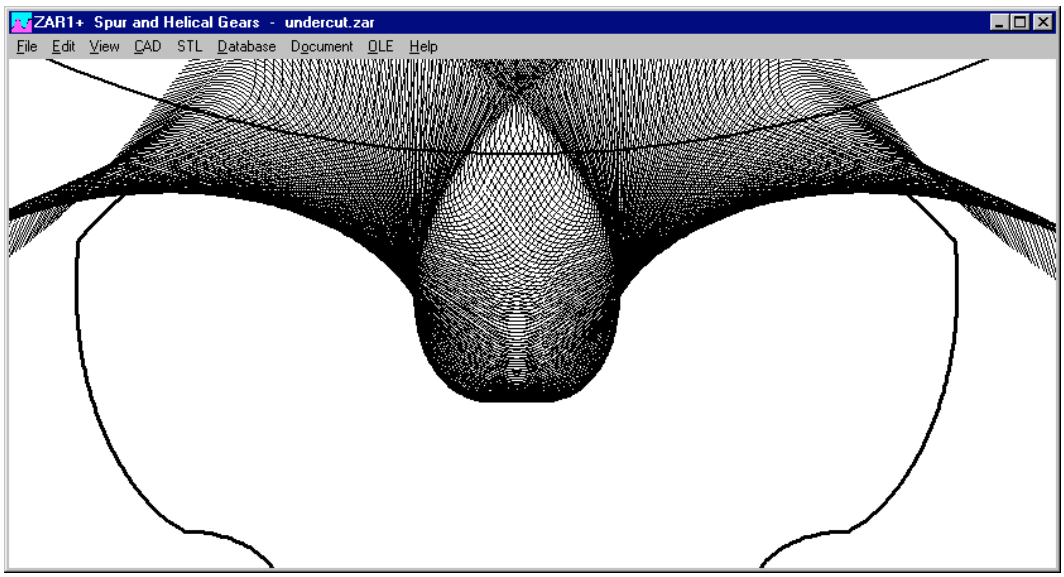
torsional backlash min	jtmin	mm	0,024
torsional backlash max.eff	jtmaxeff	mm	0,084
torsional backlash max.act.	jtmaxact	mm	0,184
normal backlash min.	jnmin	mm	0,021
normal backlash max.eff.	jnmaxeff	mm	0,073
normal backlash max.act.	jnmaxact	mm	0,159
radial backlash min.	jrmin	mm	0,021
radial backlash max.eff.	jrmaxeff	mm	0,073
radial backlash max.act.	jrmaxact	mm	0,159
torsional backlash min	jtmin	°	0,05
torsional backlash max.eff.	jtmaxeff	°	0,19
torsional backlash max.act.	jtmaxact	°	0,41

WN2, WN2+: Allowable Deviations to DIN 5480
Until now WN2+ printed allowable deviations according to DIN 3961 for involute gears and splines. This was replaced now by deviations fp, Fp, Falpha, Fß and Fr according to DIN 5480:2006.

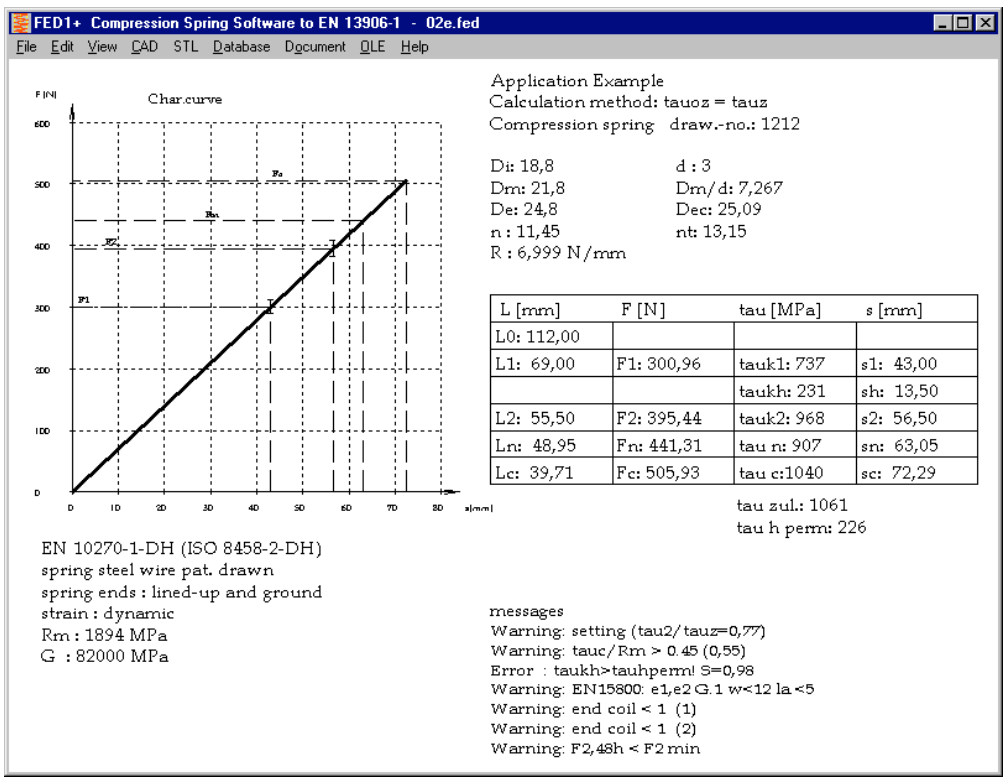
ALLOWABLE DEVIATIONS ACC. TO DIN 5480:2006

Accuracy grade			9	9
profile tolerance, total	Falpha	µm	25	25
helix tolerance, total.	Fbeta	µm	16	16
single pitch tolerance	fp	µm	21	21
cumulative pitch tol.tot.	Fp	µm	50	50
runout tolerance	Fr	µm	50	20

ZAR1+, ZAR1W, ZAR5: Configure Resolution of Involute and Tooth Root Curve
If you use undercut gears, drawing may show a gap or edge at the transition of the involute into tooth root trochoide if resolution is unsufficient. In this case, goto „CAD->Settings“ and increase "fillet resolution" and "number of points for involute polycurve" to about 100.



Tip: Configure Text Font
To give your printout an individual touch, you can configure another text font at „File->Settings->Graphic". Click button „Font“ and select font as desired. Default is „Arial“. If you scan or fax your printout, set attribute "bold".



Another text font for the standard text printout can be configured at „File->Settings->Printout“ with „Font“ button. Only fonts with constant text width can be configured there. Default is "Courier New", text height 10. Set attribute "bold", then "Save" button.

HEXAGON PRICELIST 2017-03-01

PRODUCT	EUR
DI1 Version 1.2 O-Ring Seal Software	190,-
DXF-Manager Version 9.0	383,-
DXFPLOT V 3.2	123,-
FED1+ V29.6 Helical Compression Springs incl. spring database, animation, relax., 3D,..	695,-
FED2+ V20.2 Helical Extension Springs incl. spring database, animation, relaxation, ...	675,-
FED3+ V19.0 Helical Torsion Springs incl. prod.drawing, animation, 3D, rectang.wire, ...	480,-
FED4 Version 7.3 Disk Springs	430,-
FED5 Version 15.6 Conical Compression Springs	741,-
FED6 Version 16.2 Nonlinear Cylindrical Compression Springs	634,-
FED7 Version 13.1 Nonlinear Compression Springs	660,-
FED8 Version 6.9 Torsion Bar	317,-
FED9 Version 6.0 Spiral Spring	394,-
FED10 Version 3.5 Leaf Spring (complex)	500,-
FED11 Version 3.3 Spring Lock and Bushing	210,-
FED12 Version 2.4 Elastomere Compression Spring	220,-
FED13 Version 3.9 Wave Spring Washers	185,-
FED14 Version 1.4 Helical Wave Spring	395,-
FED15 Version 1.3 Leaf Spring (simple)	180,-
FED16 Version 1.0 Constant Force Spring	225,-
FED17 Version 1.0 Magazine Spring	725,-
GEO1+ V6.1 Cross Section Calculation incl. profile database	294.-
GEO2 V2.6 Rotation Bodies	194,-
GEO3 V3.3 Hertzian Pressure	205,-
GEO4 V4.2 Cam Software	265,-
GR1 V1.0 Gear construction kit software	185,-
HPGL-Manager Version 9.0	383,-
LG1 V6.4 Roll-Contact Bearings	296,-
LG2 V2.2 Hydrodynamic Plain Journal Bearings	460,-
SR1 V22.2 Bolted Joint Design	640,-
SR1+ V22.2 Bolted Joint Design incl. Flange calculation	750,-
TOL1 V11.8 Tolerance Analysis	506,-
TOL1CON V1.5 Conversion Program for TOL1	281,-
TOL2 Version 3.3 Tolerance Analysis	495,-
TOLPASS V4.1 Library for ISO tolerances	107,-
TR1 V4.0 Girder Calculation	757,-
WL1+ V20.0 Shaft Calculation incl. Roll-contact Bearings	945,-
WN1 Version 11.6 Cylindrical and Conical Press Fits	485,-
WN2 V 9.9 Involute Splines to DIN 5480	250,-
WN2+ V 9.9 Involute Splines to DIN 5480 and non-standard involute splines	380,-
WN3 V 5.4 Parallel Key Joints to DIN 6885, ANSI B17.1, DIN 6892	245,-
WN4 V 4.6 Involute Splines to ANSI B 92.1	276,-
WN5 V 4.6 Involute Splines to ISO 4156 and ANSI B 92.2 M	255,-
WN6 V 3.0 Polygon Profiles P3G to DIN 32711	180,-
WN7 V 3.0 Polygon Profiles P4C to DIN 32712	175,-
WN8 V 2.2 Serration to DIN 5481	195,-
WN9 V 2.2 Spline Shafts to DIN ISO 14	170,-
WN10 V 4.0 Involute Splines to DIN 5482	260,-
WN11 V 1.3 Woodruff Key Joints	240,-
WNXE V 2.0 Involute Splines - dimensions, graphic, measure	375,-
WNXK V 2.0 Serration Splines - dimensions, graphic, measure	230,-
WST1 V 10.0 Material Database	235,-
ZAR1+ V 25.4 Spur and Helical Gears	1115,-
ZAR2 V7.7 Spiral Bevel Gears to Klingelnberg	792,-
ZAR3+ V8.9 Cylindrical Worm Gears	620,-
ZAR4 V5.1 Non-circular Spur Gears	1610,-
ZAR5 V11.1 Planetary Gearings	1355,-
ZAR6 V3.7 Straight/Helical/Spiral Bevel Gears	585,-
ZAR7 V1.0 Plus Planetary Gears	1380,-
ZAR8 V1.0 Ravigneaux Planetary Gears	1950,-

ZARXP V2.1 Involute Profiles - dimensions, graphic, measure	275,-
ZAR1W V1.7 Gear Wheel Dimensions, tolerances, measure	450,-
ZM1.V2.4 Chain Gear Design	326,-

PACKAGES	**EUR**
HEXAGON Mechanical Engineering Package (TOL1, ZAR1+, ZAR2, ZAR3+, ZAR5, ZAR6, WL1+, WN1, WN2+, WN3, WST1, SR1+, FED1+, FED2+, FED3+, FED4, ZARXP, TOLPASS, LG1, DXFPLOT, GEO1+, TOL2, GEO2, GEO3, ZM1, WN6, WN7, LG2, FED12, FED13, WN8, WN9, WN11, DI1, FED15, WNXE, GR1)	8,500.-
HEXAGON Mechanical Engineering Base Package (ZAR1+, ZAR3+, ZAR5, ZAR6, WL1+, WN1, WST1, SR1+, FED1,+, FED2+, FED3+)	4.900,-
HEXAGON Spur Gear Package (ZAR1+ and ZAR5)	1,585.-
HEXAGON Planetary Gear Package (ZAR1+, ZAR5, ZAR7, ZAR8, GR1)	3,600.-
HEXAGON Involute Spline Package (WN2+, WN4, WN5, WN10, WNXE)	1,200.-
HEXAGON Graphic Package (DXF-Manager, HPGL-Manager, DXFPLOT)	741.-
HEXAGON Helical Spring Package (FED1+, FED2+, FED3+, FED5, FED6, FED7)	2,550.-
HEXAGON Tolerance Package (TOL1, TOL1CON, TOL2, TOLPASS)	945.-
HEXAGON Complete Package (All Programs of Engineering Package, Graphics Package, Tolerance Package, Helical Spring Package, Planetary Gear Package, TR1, FED8, FED9, FED10, ZAR4, GEO4, WN4, WN5, FED11,WN10, ZAR1W, FED14, WNXK, FED16, FED17)	12,900.-

Quantity Discount for Individual Licenses

Licenses	2	3	4	5	6	7	8	9	>9
Discount %	25%	27.5%	30%	32.5%	35%	37.5%	40%	42.5%	45%

Network Floating License

Licenses	1	2	3	4	5	6	7..8	9..11	>11
Discount/Add.cost	-50%	-20%	0%	10%	15%	20%	25%	30%	35%

(Negative Discount means additional cost)

Language Version:
- **German and English :** all Programs
- **French**: FED1+, FED2+, FED3+, FED4, FED5, FED6, FED7, FED9, FED10, FED13, FED14, FED15, TOL1, TOL2.
- **Italiano**: FED1+, FED2+, FED3+, FED4, FED5, FED6, FED7, FED9, FED14.
- **Swedish**: FED1+, FED2+, FED3+, FED5, FED6, FED7.
- **Portugues**: FED1+
- **Spanish**: FED1+, FED2+, FED3+

Updates:

Update prices	EUR
Software Update (software + pdf manual)	40,-
Software Update (software 64-bit Win + pdf manual)	50,-

Update Mechanical Engineering Package: 800 EUR, Update Complete Package: 1000 EUR
Maintenance contract for free updates: annual fee: 150 EUR + 40 EUR per program

Hexagon Software Network Licenses
Floating License in the time-sharing manner by integrated license manager
Individual licenses may not be installed in a network!

Conditions for delivery and payment
General packaging and postage costs are EUR 60, (EUR 25 inside Europe)
Delivery by Email (zip file, manual as pdf files): EUR 0.
Conditions of payment: bank transfer in advance with 2% discount, or by credit card (Master, Visa) net.

Key Code
After installation, software has to be released by key code. Key codes will be sent after receipt of payment.

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