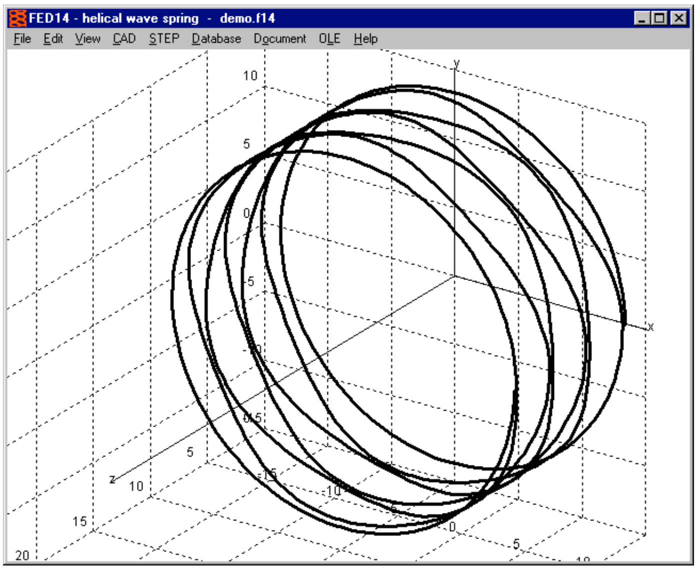
HEXAGON Newsletter 166 Nov. / Dec. 2017

by Fritz Ruoss

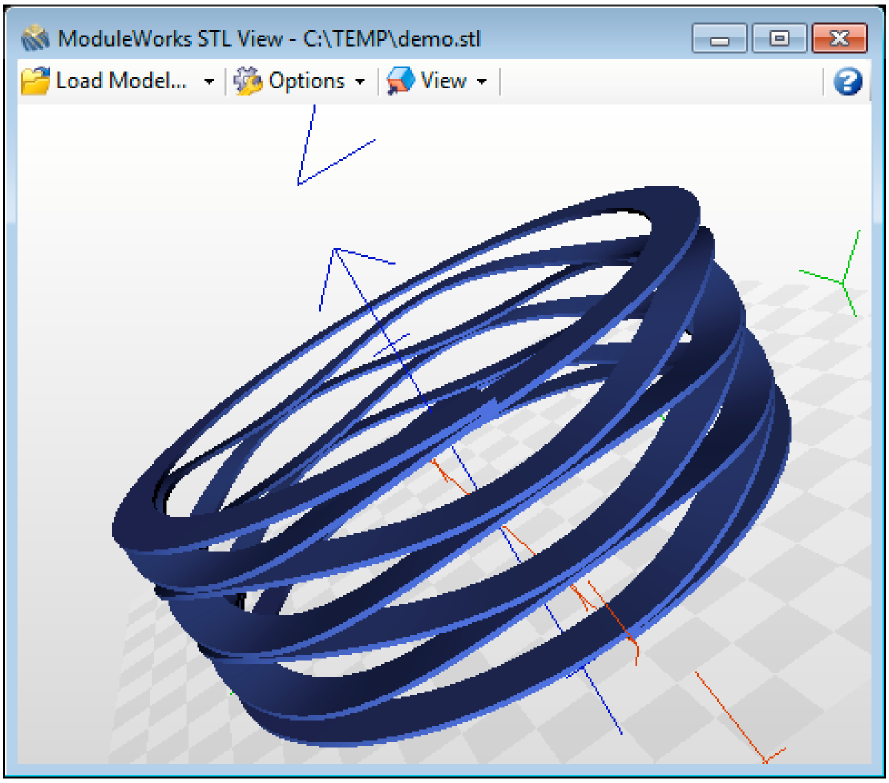
FED14: 3D Centerline of Helical Wave Spring



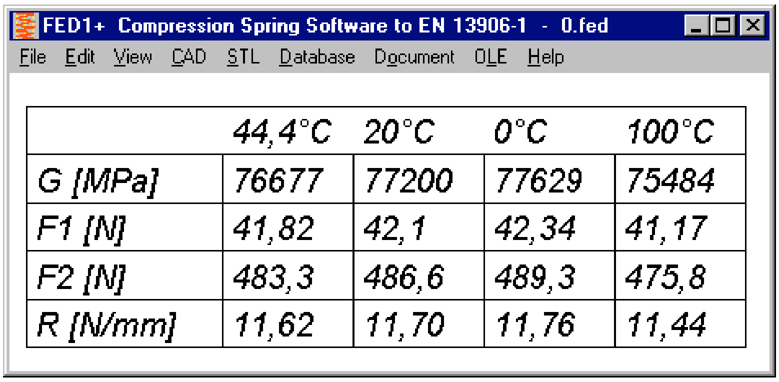
3D centerline of helical wave spring can now be generated as 3D drawing to be exported into CAD as DXF, IGES, STEP or TXT file.

FED14: STL Export

A 3D model of the helical wave spring can be generated as STL file.



FED1+: Temperature Table



	44,4°C	20°C	0°C	100°C
G [MPa]	76677	77200	77629	75484
F1 [N]	41,82	42,1	42,34	41,17
F2 [N]	483,3	486,6	489,3	475,8
R [N/mm]	11,62	11,70	11,76	11,44

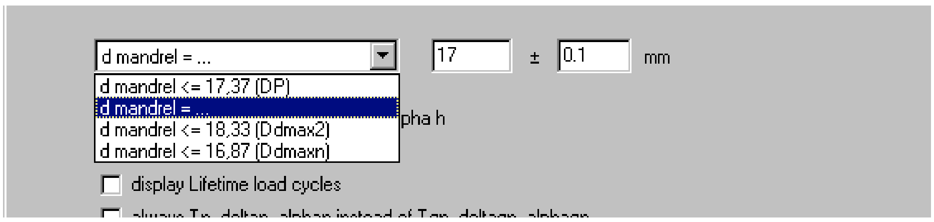
A table with spring properties for four different temperatures can be shown now at View -> Temperature -> Table:

- operating temperature
- 20°C
- temperature "from" (Edit -> Production drawing)
- temperature "to" (Edit -> Production drawing)

Table includes temperature-dependent data shear module G, spring loads F1, F2, as well as F1,48h and F2,48h after relaxation, and spring rate R.
Quick4 view includes the temperature table, if operating temperature is different than 20°C.
Quick3 view, from now on shows spring load F2,48h only if springs "not set" or "free" was selected at "Edit -> Production Drawing". If the compression spring was pre-set, remaining relaxation is much lower than calculated, and therefore no longer listed in Quick3 and Quick4 view.

FED3+: Diameter of Mandrel and Bore

According to DIN 2194, test mandrel diameter DP is calculated. Maximum diameter of mandrel and minimum diameter of bore had been calculated according to this formula, too. Now, max mandrel and min bore diameter are calculated without 5% buffer, but with wire diameter tolerance.
Ddmax2 = Di2 – AD – Ad (mandrel until alpha2) and Ddmaxn = Din – AD – Ad (mandrel until alpha n)
DHmin = De + AD + Ad (bore)
As alternative, you can enter mandrel diameter with tolerance at Edit->Production Drawing". List of available pre-settings was enlarged: select between Dd<=DP, Dd<=Ddmax2, Dd<=Ddmaxn, or with ".." input mandrel diameter and tolerance.

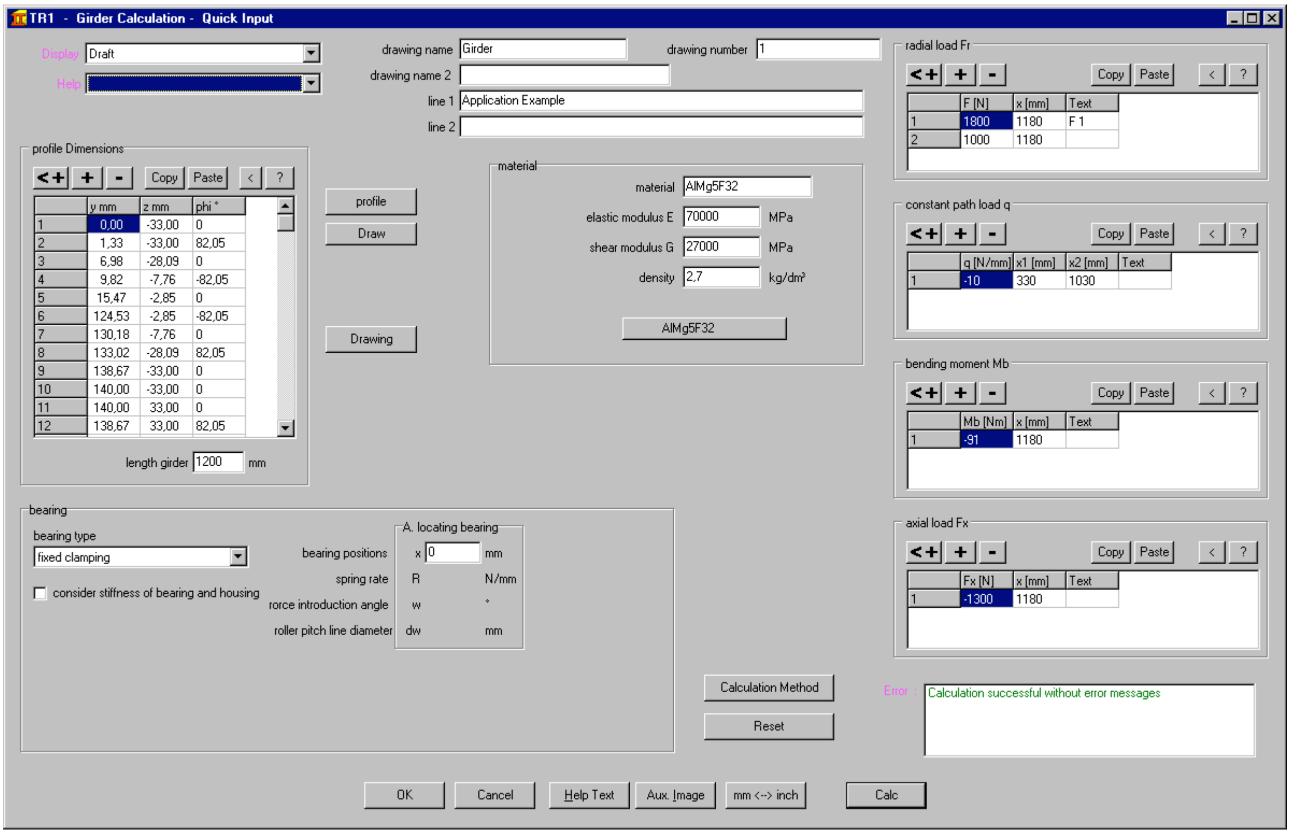


FED4: Spring rate of packed disk springs

In FED4 you can calculate disk springs as well as disk spring packages. For number of spring packages i > 1, spring loads were calculated correct, but spring rate remained unchanged, this was corrected now (i = number of spring packs, n = disk springs per pack):
Spring load of spring pack compared with single spring: F = Fi * n
Spring rate: R = Ri * n / i
Spring Work: W = Wi * n * i
Thanks to Mr. Erhardt of Hilti for the hint.

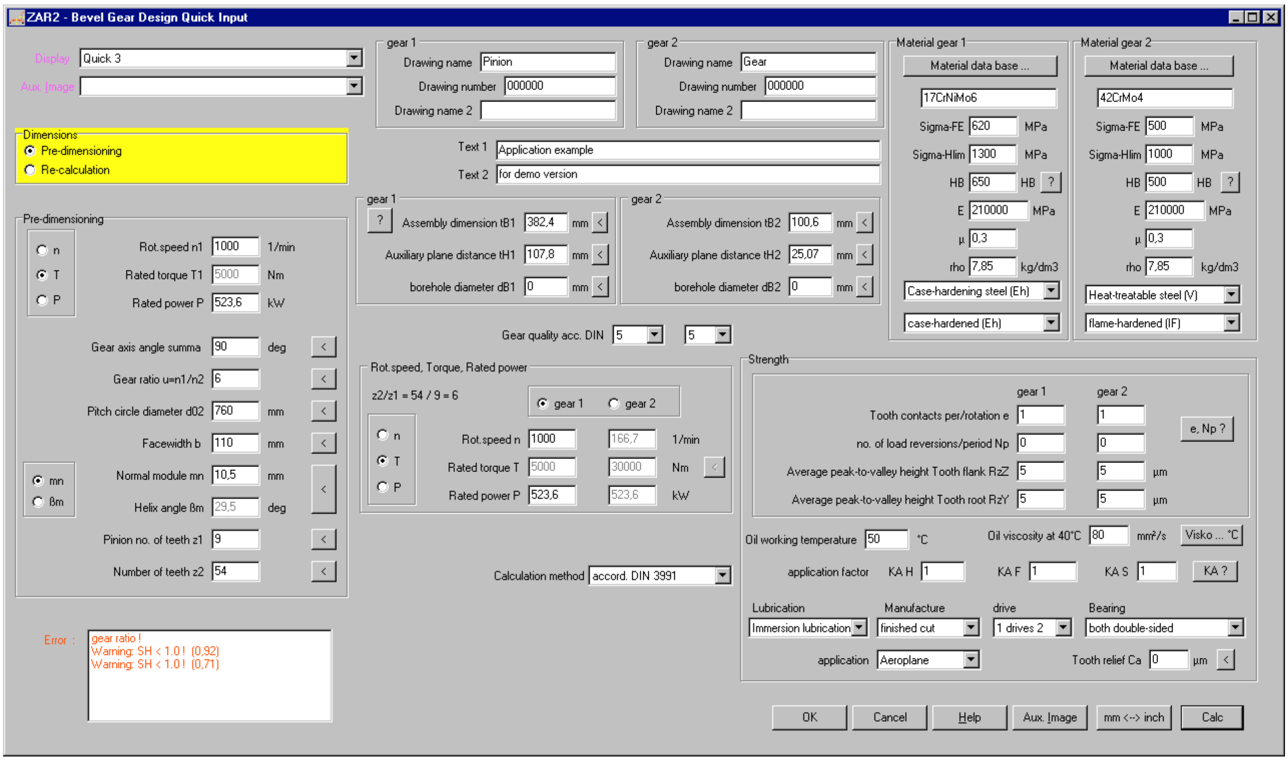
TR1: Quick Input for Girder Calculation

In a new Quick Input dialogue window you now can enter all dimensions, load, material and bearing data.



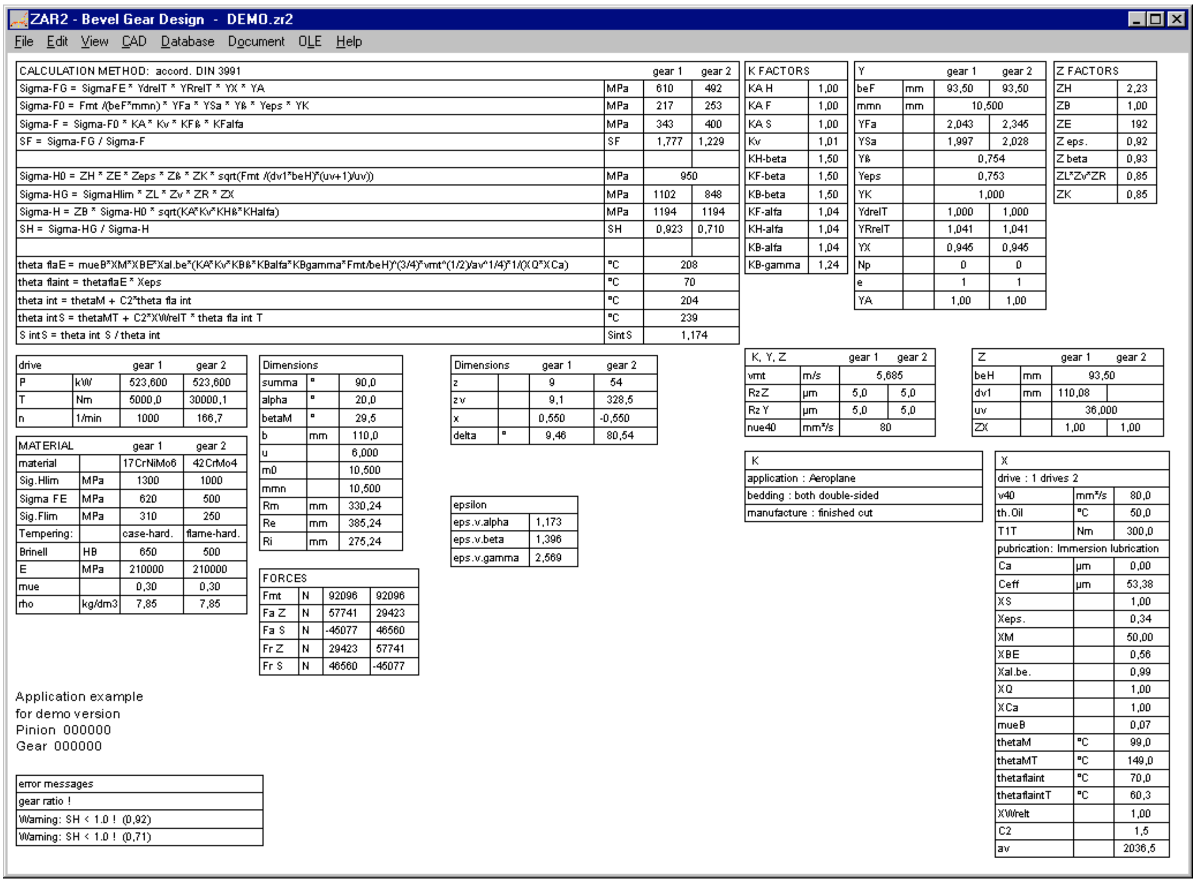
ZAR2: Quick Input for Spiral Bevel Gears (Klingelnberg Cyclopalloide)

New Quick Input allows input of all dimensions, tolerances, assembly dimensions, material, drive data, lubrication and strength calculation data in only one dialogue window now.



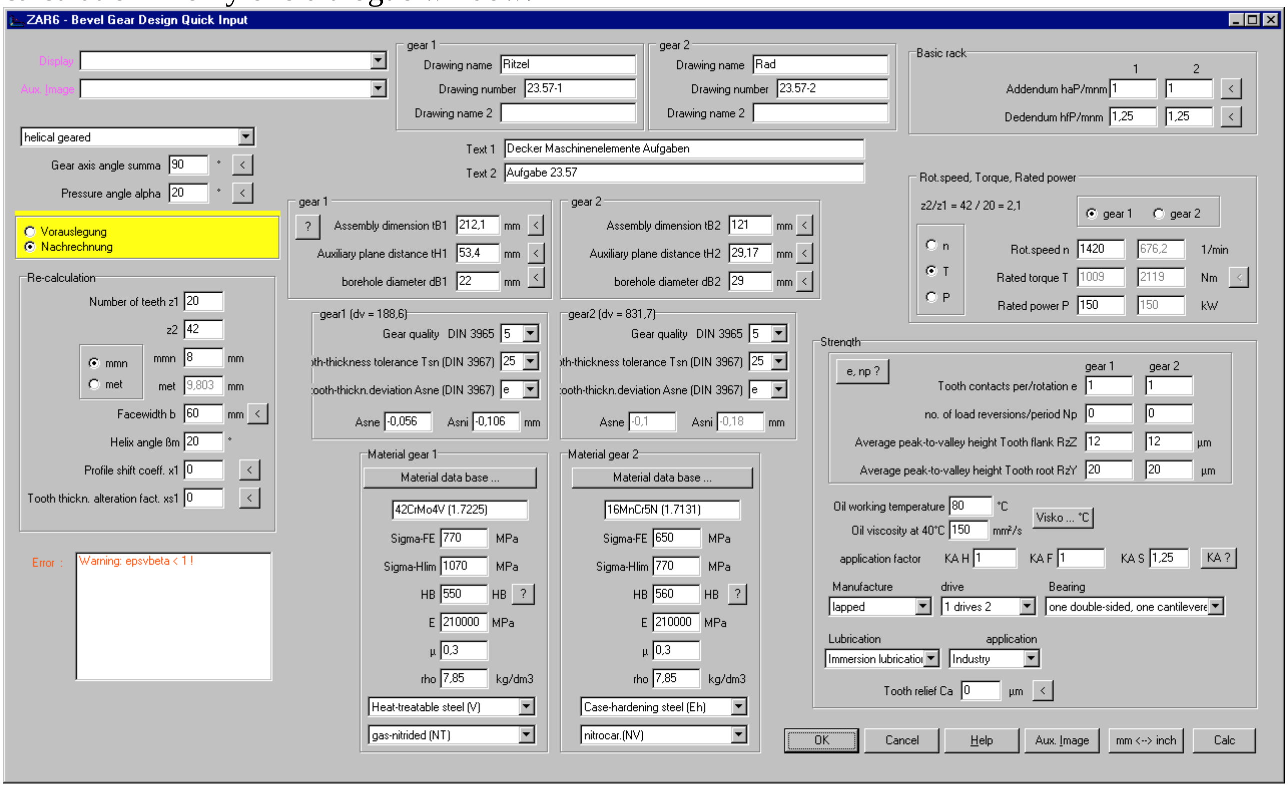
ZAR2, ZAR6: View Strength Calculation with Formulae and Factors

Similar as in ZAR1+, in ZAR2 and ZAR6 a new screen was created with essential formulas, factors and results of strength calculation according to DIN 3991.

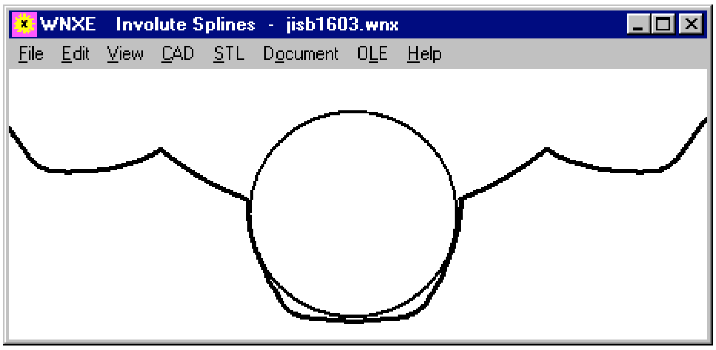


ZAR6: Quick Input for Bevel Gear Design

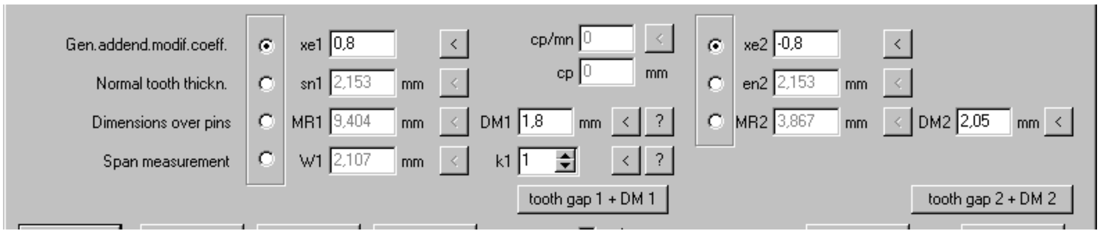
Enter all dimensions, tolerances, assembly data, material, drive data and data for strength calculation in only one dialogue window.



ZAR1+, ZAR5, ZAR7, ZAR8: Measuring circle drawn according to xe settings
Measuring circle in tooth gap drawing was drawn in tolerance center until now, as this is the default setting. If you modified tooth drawing by means of profile shift coefficient xe, position of measure circle remained unchanged. But now, dimensions over balls/pins are calculated for the actual setting and measuring circle is drawn equivalent to this setting.

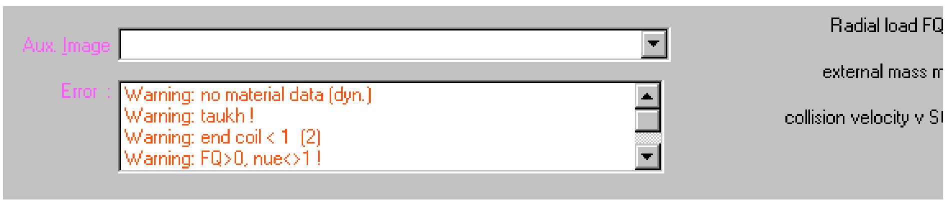


ZAR1+, ZARXP, ZAR1W,WN2+,WN4,WN5,WN10,WNXE: Button „Tooth gap + DM“
A new button "tooth gap + DM" in the input window draws tooth gap with measuring circle in the background window. So you can easily test different ball and pin diameters. The suggested value according to DIN 3960 is not always suitable for gears with small tooth height (involute splines), calculated diameter must be checked. By means of the drawing you can evaluate if a flattened pin or ball must be used.



ZARXP, WNXE: Minimum and Maximum values of Dimensions over Pins or Balls
Input of dimension over pins/balls for iterative calculation of profile shift coefficient xe was improved in ZARXP and WNXE. Allowed input zone for internal gears and splines was enlarged, and if overriding allowed zone you get error messages MR>MRmax, MR<MRmin, MK>MKmax, MK<MKmin. Please consider negative signs if you calculate internal gears (-2 is smaller than –1).

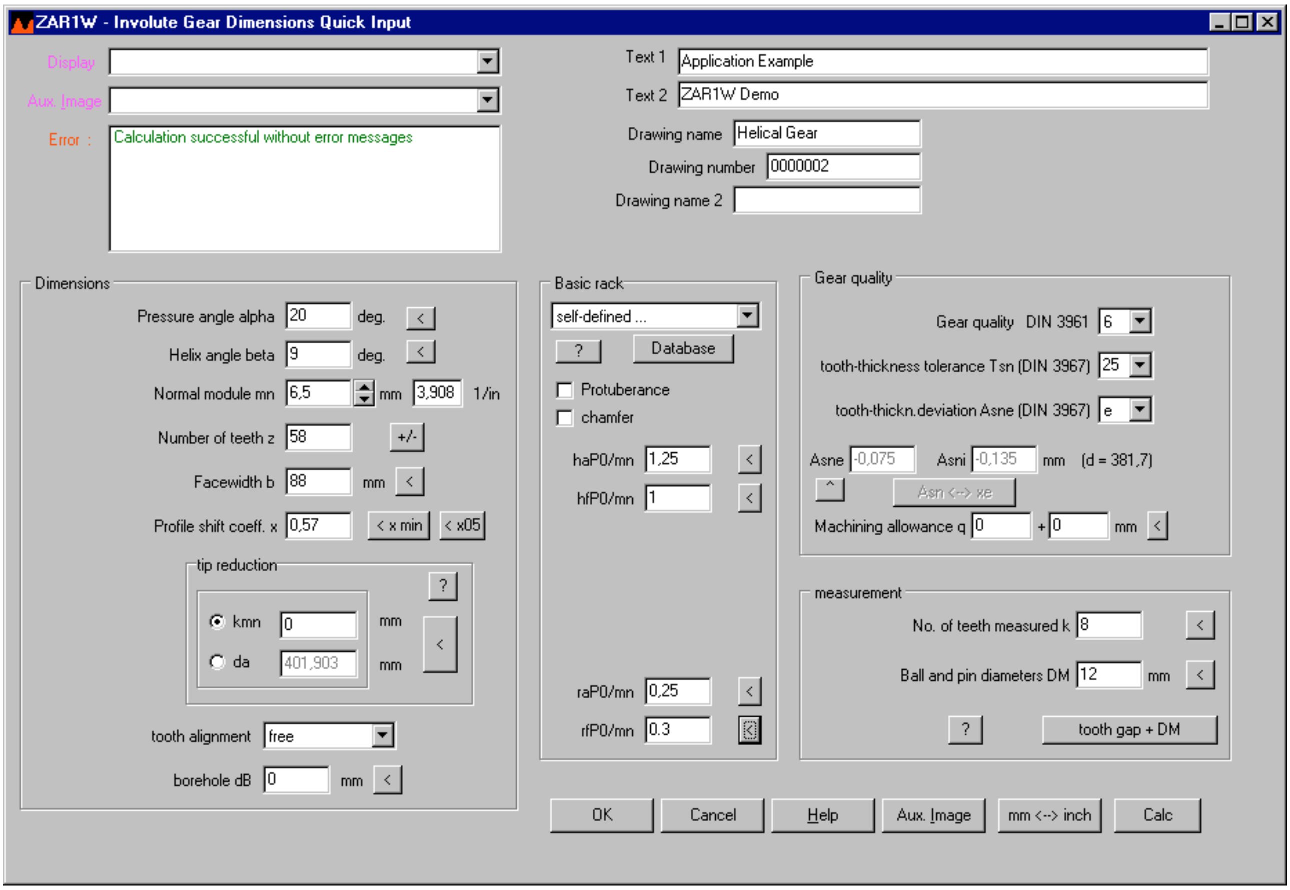
FED1+, SR1+, WL1+, FED10: Error Box in Quick Input Window
New box with error messages at Quick Input: Click into error message to get description and remedy displayed as hint.



ZAR1+, ZAR1W, ZARXP: Profile drawn continuous
By inserting teeth as block into the drawing, gear wheels not always were drawn in one curve. This cannot be seen in the drawing, but if you convert the profile drawing into CNC code this can be used without optimization now. By means of our DXFMAN software, tooth profile can be converted into one polyline, to be used in GEO1+ for example to calculate area, mass and area moments of inertia.

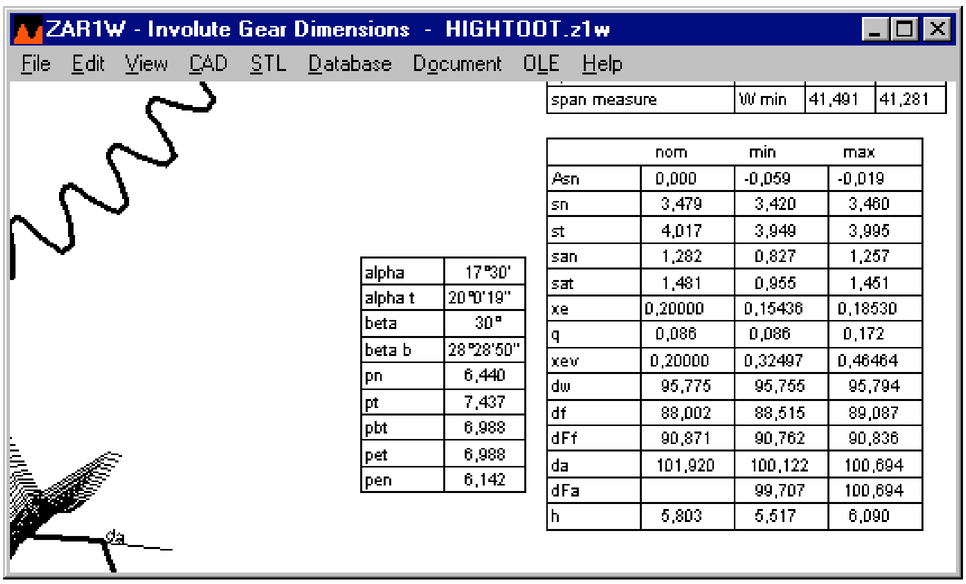
ZAR1W: Quick Input

ZAR1W calculates dimensions and tolerances of one gear wheel. Other as in ZAR1+, in ZAR1W you calculate one gear wheel, no gear pair. No center distance, no strength calculation. ZAR1W is well suited for gear manufacturers, few input data are enough to get all dimensions and a profile drawing. New in ZAR1W is Quick Input with all input data in one dialogue window. With „Calc“ button or „Enter“ key, gear wheel is recalculated and result graphic is actualized in the background window.



ZAR1W: Additional Table in Quick4 View

Two tables with additional dimensions (nominal/min/max) have been added to Quick4 View.

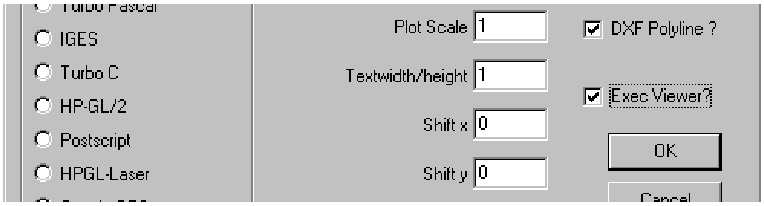


span measure	W min	41,491	41,281

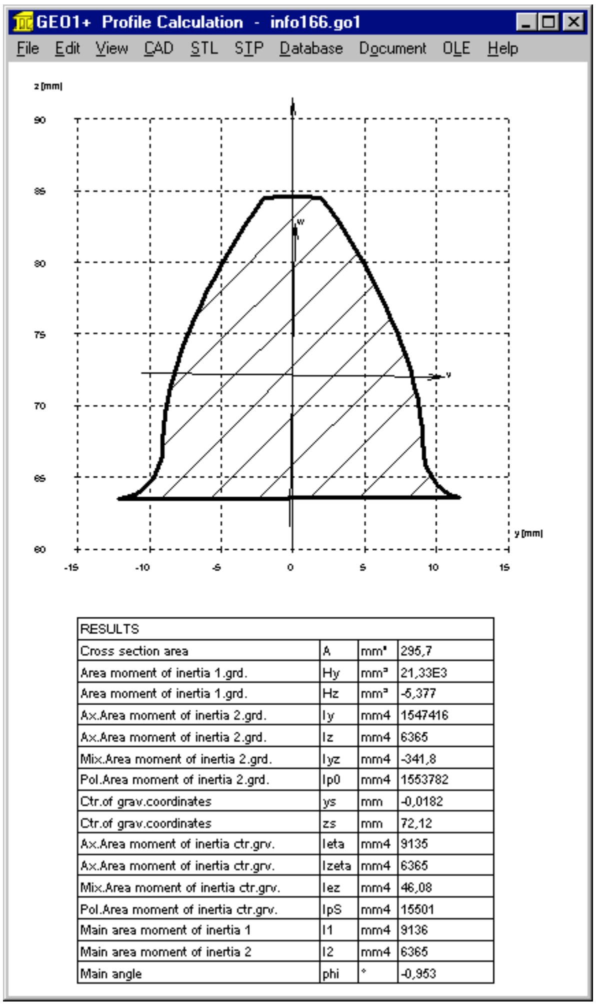
alpha	17°30'
alpha t	20°0'19"
beta	30°
beta b	28°28'50"
pn	6,440
pt	7,437
pbt	6,988
pet	6,988
pen	6,142

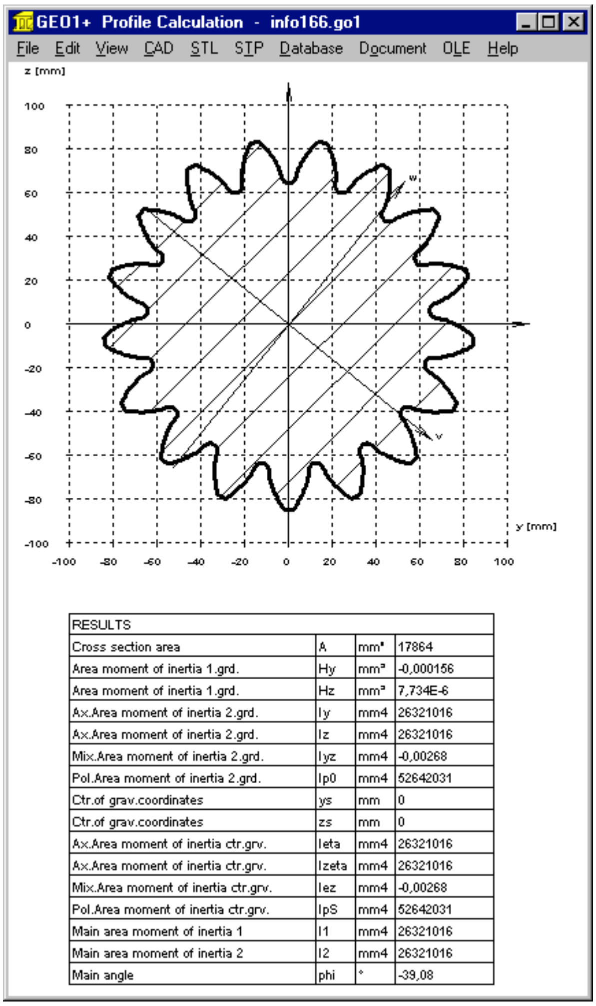
	nom	min	max
Asn	0,000	-0,059	-0,019
sn	3,479	3,420	3,460
st	4,017	3,949	3,995
san	1,282	0,827	1,257
sat	1,481	0,955	1,451
xe	0,20000	0,15436	0,18530
q	0,086	0,086	0,172
xev	0,20000	0,32497	0,46464
dw	95,775	95,755	95,794
df	88,002	88,515	89,087
dFf	90,871	90,762	90,836
da	101,920	100,122	100,694
dFa		99,707	100,694
h	5,803	5,517	6,090

HPGL-Manager, DXF-Manager: DXF Polyline



For conversion of a profile drawing into DXF you can set a new Option “DXF Polyline?” to create a dxf drawing which consists of only one drawing element, one polyline. Of course, this makes sense only if the drawing is a continuous profile, a gear profile drawing of ZAR1+ for example, where a teeth is defined as block and inserted z times. By conversion from DXF into DXF, blocks are removed and tooth profile drawn as one polyline. Example applications: convert into CNC track, or load into CAD and extrude as 3D body, or import with GEO1+ for calculation of area and area moments of inertia. If you import a gear wheel DXF file of ZAR1+ into GEO1+, one teeth will be loaded and calculated. If you convert the file by means of DXFMAN and "DXF Polyline?" option, you can import the complete gear wheel profile into GEO1+.

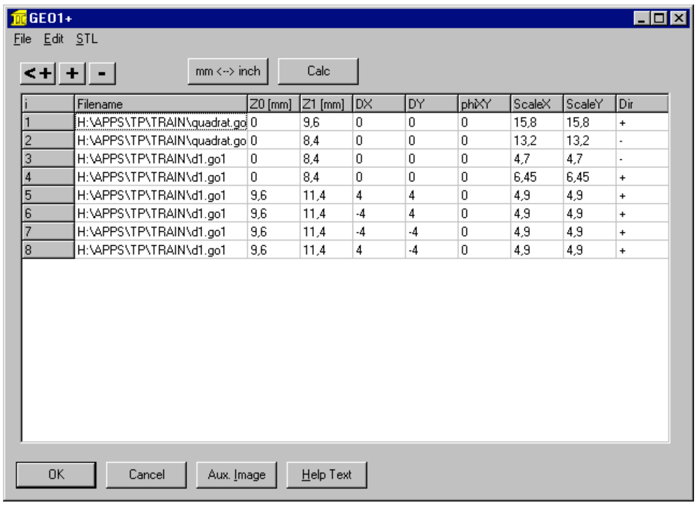




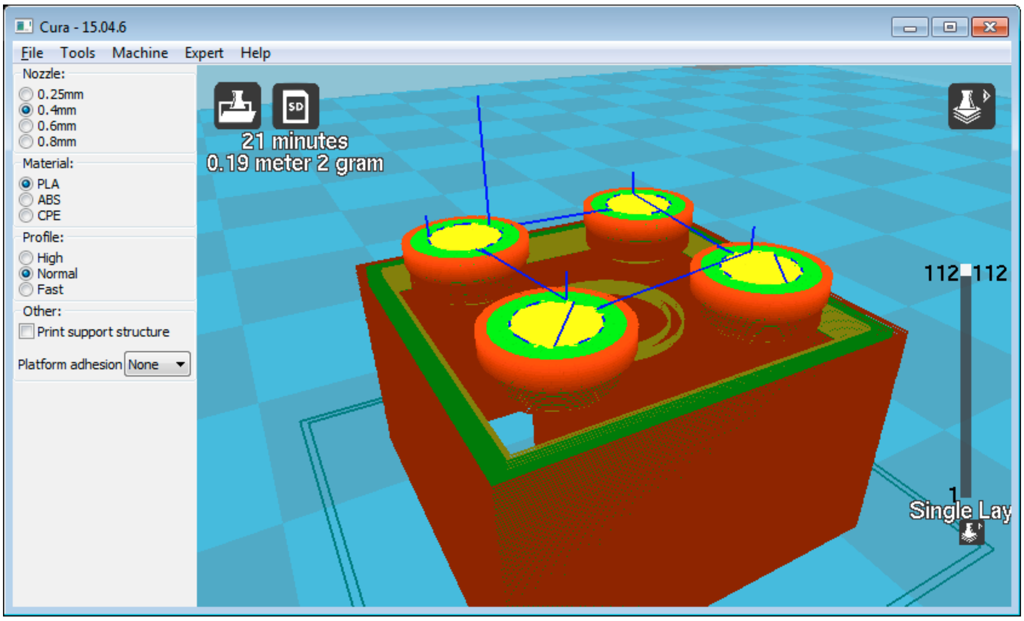
GEO1+: Mirror and Copy

By button „Transform.“, profile coordinates can be moved, turned, mirrored and direction inverted. A new option „Mirror and Copy“ has been added.. This eases input of symmetric profiles. Design a half of the profile, 2^{nd} half "mirror and copy".

GEO1+: Create 3D STL files from 2D GEO1 Profiles



At “Edit -> 3D Layer” you can select up to 100 GEO1 files and assemble to a 3D body by input of profile height and position. Next you can create a STL file for 3D printing. For a gear wheel with inner internal spline, for example, 2 files are required: gear profile of ZAR1+ or ZAR1W or ZARXP, and inner involute spline profile of WN4 or WNXE.
For each GEO1 element, you can define position, scale and direction. This is very practical, so you can work with only few base profiles. For example, a circle with diameter of 1mm can be used for each cylinder and bore, because diameter is entered as scale. With direction “+” as cylinder and inverse direction “-“ as cylindrical bore.
Example: Lego block made from only 2 base elements: circle (6x) and square (2x).

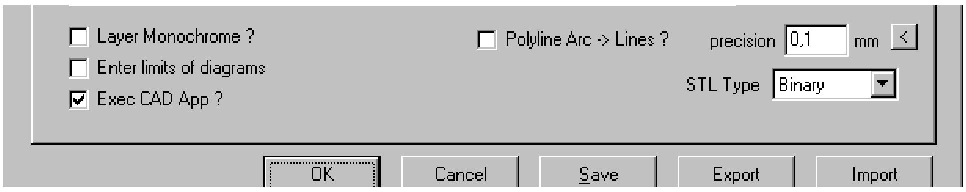


SR1: Yield Point at higher temperature

If you enter a working temperature other than reference temperature, SR1 calculates tensile strength Rm, yield point Rp0.2 and permissible pressure pG for working temperature from database at "Database\Material\Bolt,Plates\Rp0.2=f(T)". If the selected material cannot be found in the database, SR1+ uses this formula for approximated calculation of the yield point:
Rp(T) = Rp*(1.018-T/1120)
Tensile strength and permissible pressure at temperature are calculated with the same coefficient:
Rm(T)=Rm20*Rp(T)/Rp20
pG(T)=pG20*Rp(T)/Rp20.

All Programs: Zoom Screen Graphic with Mouse Wheel
As alternative to keys + and – you now can use mouse wheel to enlarge or reduce size of screen graphic.

Tip: Exec DXF, IGS, STP, STL software directly



If "Exec CAD App" is checked at "File\Settings\CAD\", the installed software to edit or view CAD files or STL files is executed to open the generated CAD file. If no application is assigned to the file extension (DXF,IGS,STP,STL), maybe you get an error message such as "cannot open file" or "no certificate". To avoid the error message, uncheck "Exec CAD App?", then save configuration.
At "File\Settings\Directories" you can configure the folder for CAD files.

Tip: Spring Calculations with different shear module
Our spring software calculates with shear module G=82000MPa for spring wire DM,DH,SM,SH. EN 10270-1 and EN 13906, however, use G= 81500 MPa. The difference of 0.6% results in an equivalent difference at load and stress. We use G=82000MPa since decades, because customers claim that these data are exact. To compare results with shear module G=81500 according to EN, you have several possibilities:

1. Edit->Material: Select "others..": input G=81500
2. Edit->Application: Enter operating temperature T = 44.4 °C to get G=81500
3. Database -> fedwst (Browse): copy record with Edit\Append, then modify G

Option 3 is not recommended: On a later update, your modified database fedwst.dbf may be overwritten, if you do not take care about.

Other materials with deviations to EN standards: spring wire according to EN 13906-2: G=79500 MPa. HEXAGON software uses G=79500 for FDC, FDCrV and FDSiCr. But shear module G for VDC is a bit higher and for VDCrV and VDSiCr a bit lower.

Tip: Save default settings in NULL file
Your individually preferred materials, tolerances, dimensions, .. can be saved in a NULL file. NULL is the file name.
Example: In SR1, material database mat_p_1.dbf for clamping plates and material 10.9 for bolts and friction coefficients 0.1 should be set by default.
Then start a new calculation, input default data and one clamping plate, then save with file name "null". If you start SR1+ next time, it opens file null.sr1 automatically, if exist.

HEXAGON PRICELIST 2018-01-01

PRODUCT	EUR
DI1 Version 1.2 O-Ring Seal Software	190,-
DXF-Manager Version 9.1	383,-
DXFPLOT V 3.2	123,-
FED1+ V29.8 Helical Compression Springs incl. spring database, animation, relax., 3D,..	695,-
FED2+ V20.5 Helical Extension Springs incl. spring database, animation, relaxation, ...	675,-
FED3+ V19.1 Helical Torsion Springs incl. prod.drawing, animation, 3D, rectang.wire, ...	480,-
FED4 Version 7.3 Disk Springs	430,-
FED5 Version 15.7 Conical Compression Springs	741,-
FED6 Version 16.3 Nonlinear Cylindrical Compression Springs	634,-
FED7 Version 13.3 Nonlinear Compression Springs	660,-
FED8 Version 7.0 Torsion Bar	317,-
FED9 Version 6.0 Spiral Spring	394,-
FED10 Version 4.1 Leaf Spring	500,-
FED11 Version 3.3 Spring Lock and Bushing	210,-
FED12 Version 2.4 Elastomere Compression Spring	220,-
FED13 Version 4.0 Wave Spring Washers	228,-
FED14 Version 2.0 Helical Wave Spring	395,-
FED15 Version 1.4 Leaf Spring (simple)	180,-
FED16 Version 1.1 Constant Force Spring	225,-
FED17 Version 1.3 Magazine Spring	725,-
GEO1+ V7.0 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,-
GEO5 V1.0 Geneva Drive Mechanism Software	218,-
GEO6 V1.0 Pinch Roll Overrunning Clutch Software	232,-
GR1 V2.0 Gear construction kit software	185,-
HPGL-Manager Version 9.1	383,-
LG1 V6.6 Roll-Contact Bearings	296,-
LG2 V2.2 Hydrodynamic Plain Journal Bearings	460,-
SR1 V22.8 Bolted Joint Design	640,-
SR1+ V22.8 Bolted Joint Design incl. Flange calculation	750,-
TOL1 V12.0 Tolerance Analysis	506,-
TOL2 Version 4.0 Tolerance Analysis	495,-
TOLPASS V4.1 Library for ISO tolerances	107,-
TR1 V5.0 Girder Calculation	757,-
WL1+ V21.0 Shaft Calculation incl. Roll-contact Bearings	945,-
WN1 Version 12.0 Cylindrical and Conical Press Fits	485,-
WN2 V10.1 Involute Splines to DIN 5480	250,-
WN2+ V10.1 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 4.7 Involute Splines to ANSI B 92.1	276,-
WN5 V 4.7 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 4.2 Involute Splines to DIN 5482	260,-
WN11 V 1.3 Woodruff Key Joints	240,-
WNXE V 2.1 Involute Splines - dimensions, graphic, measure	375,-
WNXK V 2.0 Serration Splines - dimensions, graphic, measure	230,-
WST1 V 10.2 Material Database	235,-
ZAR1+ V 26.1 Spur and Helical Gears	1115,-
ZAR2 V8.0 Spiral Bevel Gears to Klingelnberg	792,-
ZAR3+ V9.0 Cylindrical Worm Gears	620,-
ZAR4 V5.2 Non-circular Spur Gears	1610,-
ZAR5 V11.5 Planetary Gears	1355,-
ZAR6 V4.0 Straight/Helical/Spiral Bevel Gears	585,-
ZAR7 V1.4 Plus Planetary Gears	1380,-

ZAR8 V1.4 Ravigneaux Planetary Gears	1950,-
ZARXP V2.2 Involute Profiles - dimensions, graphic, measure	275,-
ZAR1W V2.0 Gear Wheel Dimensions, tolerances, measure	450,-
ZM1.V2.5 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, GEO5, GEO6)	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%

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Licenses	1	2	3	4	5	6	7..8	9..11	>11
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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, FED13, FED14, FED17.
- **Swedish**: FED1+, FED2+, FED3+, FED5, FED6, FED7.
- **Portugues**: FED1+, FED17
- **Spanish**: FED1+, FED2+, FED3+, FED17

Updates:

Update prices	EUR
Software Update (software Win32/64 + 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
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Conditions for delivery and payment

General packaging and postage costs for delivery on CD-ROM: EUR 60, (EUR 25 inside Europe)
Delivery by Email or download (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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