

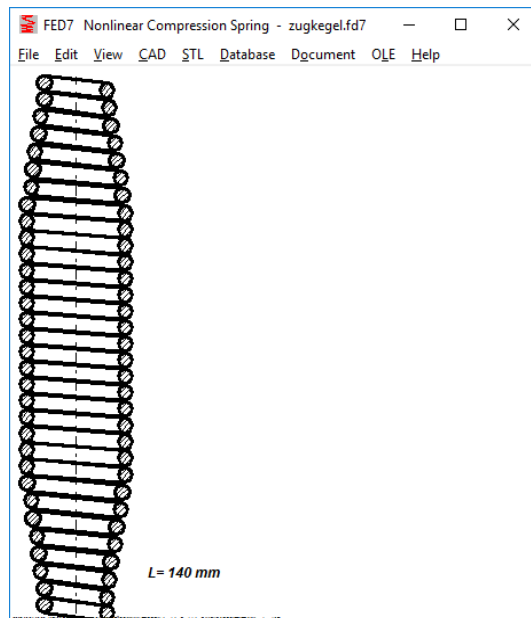
by Fritz Ruoss

**FED1+, FED2+: Cost calculation**

Cost calculation was improved, especially for wire diameter < 1mm. Material cost and cost for grinding are loaded from database FKWS and FKSCHL dependent from material and wire diameter. An additional database file FKPARA.DBF now includes parameters for cost calculation of heat treatment, shot blasting, machine cost, cost for 100% measure and sorting, and extra cost coefficient for buckling springs at setting length.

MASCHINE_M	ANLASS_L	ANLASS_KG	STRAHL_L	C_KNICKEN	MESSUNG
0,1	0,2	0,5	11,43	2	1

Machine cost is calculated with 0,10 Euro per meter of wire length for example (MASCHINE\_M). 0,10 EUR/m = machine cost 150 EUR/60min divided by feeder speed 25 m/min. Heat treatment cost calculated with 0,20 EUR for a volume of 1 liter (ANLASS\_L) or 0,50 EU per kg (ANLASS\_KG). Volume for space requirement of a spring is calculated as cuboid ( $V = De^2 * L0$ ). Cost of shot blasting i.e. 80 EUR for a volume of 7 liter makes 11,43 EUR/l (STRAHL\_L). If spring has to be pre-set, cost is loaded from FKSETZ.DBF (load-dependent). If springs are buckling at setting length, an extra cost coefficient C\_KNICKEN is applied. If springs have to be measured and sorted because of extra small tolerances, extra cost for 100% measuring and sorting (1,00 EUR of MESSUNG) and scrap are calculated.

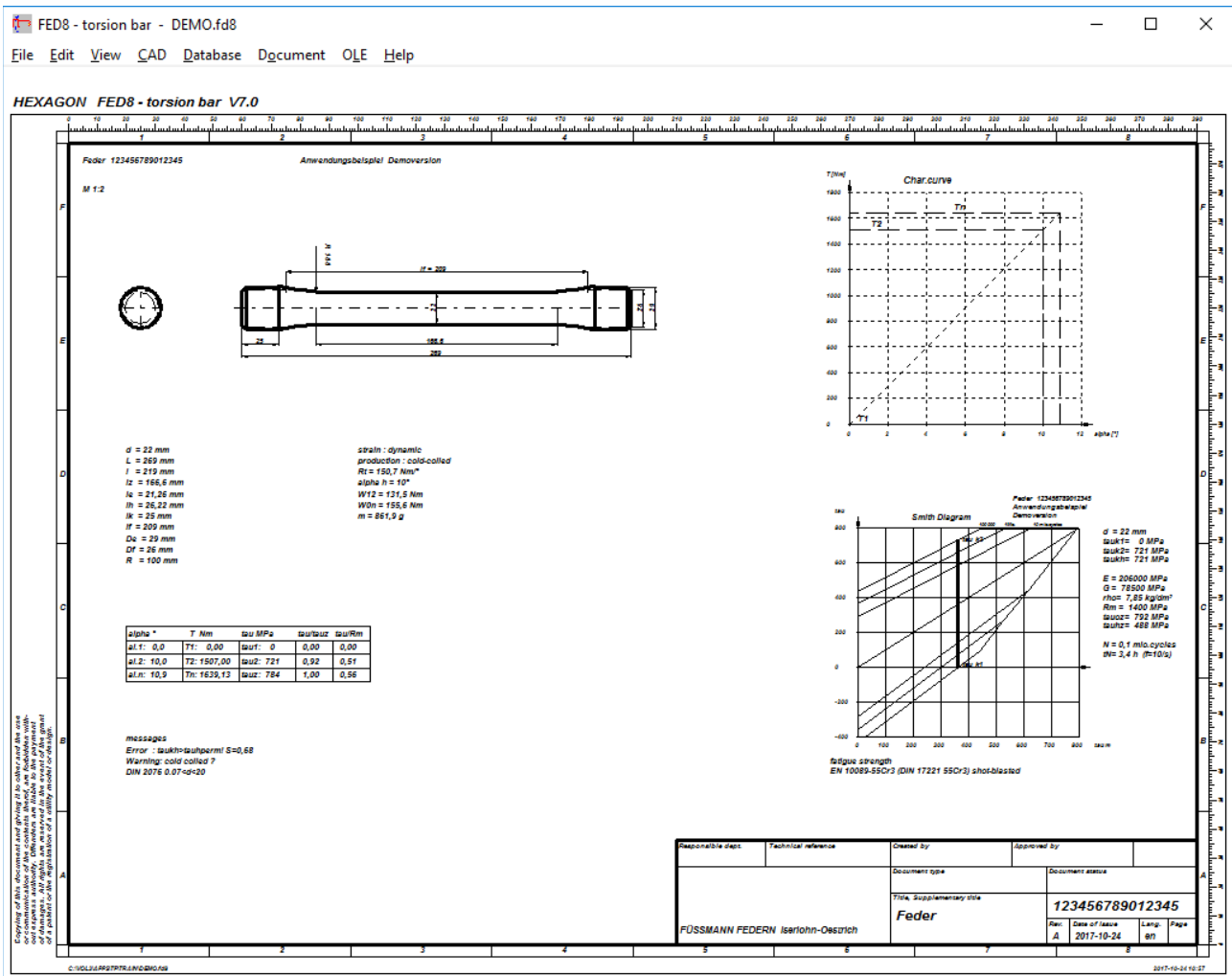


**FED7 – Insert Special Shape Spring**

In FED7 you can generate pre-defined "special shapes" (conical spring, barrel spring and hourglass spring) and you can add the generated special shape to the already defined coil sections. Cause "special shape" was inserted behind and not before the selected coil section, it could not be defined as first coil section. This was corrected now, for example you can now define a cylindrical spring as one section, then add a conical spring before and behind of the cylindrical part.

## FED8: Quick4 View

New Quick4 View includes spring drawing, tables with dimensions, loads, stresses and diagrams altogether in an ISO 7200 drawing frame.

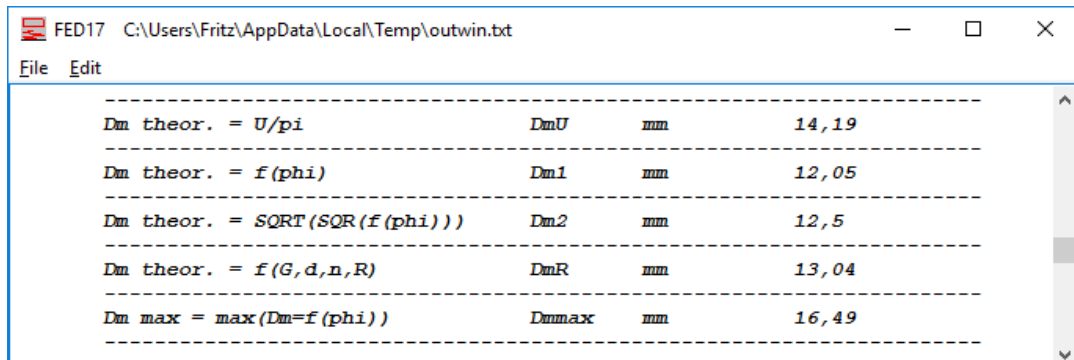


## FED17 – Calculate reference diameter

Virtual diameter of a cylindrical spring with equivalent spring rate to the calculated magazine spring has been added to the printout:

$$DmR = ((G*d^4)/(8*n*R))^{1/3}$$

This diameter is required if you use FED7 to calculate a progressive magazine spring. Please consider that only spring load and spring rate is correct in this case. Stresses are higher and must be calculated by means of FED17.



## FED10: Quick Input

New Quick Input includes all dimensions, forces, bending moments, external mass, material and bedding altogether in one dialogue window. At "Display" you can select the desired diagram or result table in the background window, which is actualized with each click into "Calc" button.

FED10 - leaf springs - Quick Input

Display: Quick 3      drawing name: Leaf Spring      drawing number: 436163

Help:      drawing name 2:      line 1: Application Example

Error: - none -      line 2: for asymmetric leaf spring

leaf spring Dimensions

	x0	ye10	ye1n	ye20	ye2n	yi10	yi1n	yi20	yi2n
1	0,00	0,00	0,00	15,00	15,00	5,00	6,00	10,00	8,00
2	5,00	1,00	2,00	12,00	12,00	5,00	5,00	9,00	7,00
3	10,00	0,00	0,00	15,00	15,00	0,00	0,00	0,00	0,00
4	12,50	0,00	0,00	15,00	15,00	4,00	1,50	4,00	6,50
5	15,00	0,00	0,00	15,00	15,00	1,50	4,00	6,50	4,00
6	17,50	0,00	0,00	15,00	15,00	4,00	0,00	4,00	0,00
7	15,00	0,00	0,00	15,00	15,00	0,00	0,00	0,00	0,00

total length leaf spring: 80 mm  
thickness h: 1 mm

material: EN 10151-1.4310 C+T

bearing

bearing type: fixed clamping      bearing positions: x 12 mm

consider stiffness of bearing and housing      spring rate: R N/mm

roller pitch line diameter: dw mm      force introduction angle: w °

A. localing bearing: dw mm

Calculation Method:      Reset

radial load Fr

	F [N]	x [mm]	Text
1	-10	75	F 1

constant path load q

	q [N/mm]	x1 [mm]	x2 [mm]	Text
1	-1	45	55	q 1

bending moment Mb

	Mb [Nm]	x [mm]	Text
1	0,5	40	Mb 1

axial load Fx

	Fx [N]	x [mm]	Text
1	10	75	

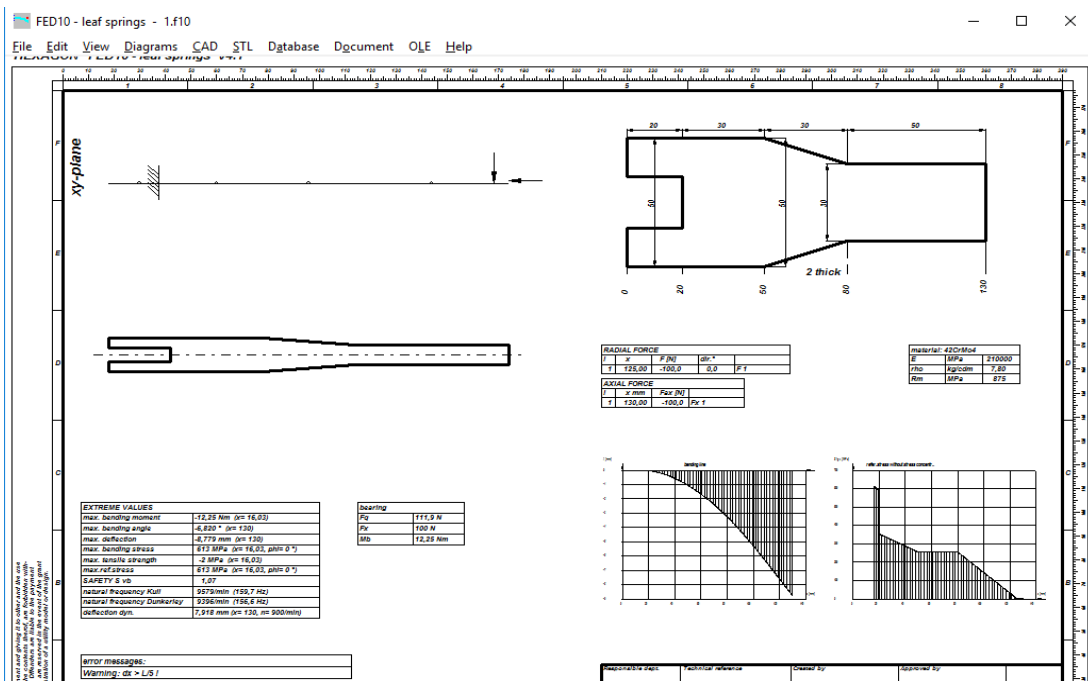
mass m

	m [kg]	x [mm]	Text
1			

OK      Cancel      Help Text      Aux. Image      mm <-> inch      Calc

## FED10: Quick4 with bending line and stress curve

Diagrams with bending line and stress curve have been added to Quick4 graphic (if space not occupied by tables with loads). Diagrams can be drawn if sum of radial loads, axial loads, path loads, and bending moments is less than 4.



## SR1/SR1+: Length of Countersunk Screw

SR1+ Bolted Joint Design to VDI 2230 - 1SENK.sr1

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ISO10642 - M12 x 60 - 10.9

i	de [mm]	di [mm]	l [mm]	A [mm]
1	12,00	0,00	16,56	113
G3	9,85	0,00	18,00	76,
G2	10,86	0,00	18,00	92,

i	de [mm]	di [mm]	l [mm]	Material
1	80,0	13,5	34,6	P 1 of

termin. bolted joint (TTJ)

Material : 1.0503 C 45

m

Calculation of bolted joints with countersunk screws cannot be found in VDI 2230. Deformation cone of clamping plates under countersunk screws is not researched until now. SR1 calculates countersunk screws like cylindrical head bolts. However, drawing and calculation were slightly different until now. For calculation, countersunk head was assumed to be sunk in the first clamping plate, but to be drawn so, height of the first clamping plate must be shortened by the countersunk head height. You got a warning "countersunk screw" with the suggestion to use a cylindrical head screw instead. This warning was moderated in the new version by a hint to reduce the first clamping plate by the height of the countersunk head, and that screw length of countersunk screws is measured with head and not until head. Calculation and generated drawing in SR1 are conform now, calculated thread length in nut plate and on drawing are identical. Bolt thread sections of countersunk screw are calculated without head height now. If you select a countersunk screw, input text for bolt length changes from "shaft length" into "screw length".

If you update to a new version, please check earlier calculations with countersunk screws. Maybe you have to reduce the first clamping plate by the countersunk head height.

### SR1+: Quick Input: Table with clamping plates

Row moving was enabled in the clamping plate table by click and hold left mouse key then pull to the desired row. If you forgot a washer, you can enter it at the end and then move it on first row. Selection of material database and material now by double click (instead of buttons Material and <). New "Copy" and "Paste" buttons allow exporting and importing of clamping plates by spread sheet.

clamped plates

<+ + - Washer Material Copy Paste < ?

	De	Di	L	Washer	Material	Name Plate
1	40,00	29,00	1,50	0	1.0503 C 45	
2	80,00	29,00	7,00	0	1.0050 St 50	
3	80,00	28,00	7,50	0	1.0050 St 50	

### SR1+: Quick Input MA +/- tol

MANom +/- tolerance can be entered instead of MAmx and MAmin.

### SR1+: Top View and Bottom View

Washers and clamping plates are drawn at "top view" and "bottom view", if not larger than 1.5\*d.

## WL1+: Quick Input

In Quick Input you can enter all input data (shaft dimensions, material, bedding, radial load, axial load, bending moment, path load, torque, .) in only one dialogue window now. Other new features are Copy and Paste buttons and a function to draw the shaft contour. At "Display" you can select one of 45 diagrams, drawings and result tables which will be updated after each click into the "Calc" button.

The screenshot shows the 'WL1+ shaft calculation - Quick Input' dialog box. It is divided into several sections:

- General:** Drawing name 'Shaft', drawing number '123456789', and drawing name 2.
- shaft:** A table with columns x1, de0, den, di0, din, r. Rows 1-4 show dimensions for different shaft sections. Total shaft length is 1200 mm.
- material:** Material: '???' (unknown), surface roughness Rz: 5 µm, coeff. surface strain hardening Kv: 1.
- mass m:** A table with columns m [kg], J [kgm2], x [mm], Text.
- notch zone:** A table with columns beta k, beta kb, beta kt, x1 [mm], x2 [mm], Text.
- bearing:**
  - bearing type: '5 bearing (fixed-floating bearing)'
  - consider stiffness of bearing and housing:
  - A. locating bearing: x 0 mm, R N/mm, w, dw mm
  - B. floating bearing: x 1060 mm, R N/mm, w, dw mm
  - C. floating bearing: x 250 mm, R N/mm
  - D. floating bearing: x 500 mm, R N/mm
  - E. floating bearing: x 800 mm, R N/mm
- radial force Fr:** A table with columns F [N], x [mm], w [°], Text. Rows 1-2 show values 1800 and 5000.
- path load q:** A table with columns q [N/mm], x1 [mm], x2 [mm], w [°], Text. Row 1 shows values -3, 330, 1030, 0.
- bending moment Mb:** A table with columns Mb [Nm], x [mm], w [°], Text. Row 1 shows values -91, 1180, 0.
- axial force Fx:** A table with columns Fx [N], x [mm], Text. Row 1 shows values.
- torque Mt:** A table with columns Mt [Nm], x [mm], Text. Rows 1-2 show values 350 and -350.

Buttons at the bottom include OK, Cancel, Help Text, Aux. Image, mm <-> inch, Calc, shaft, and load.

For optimal use of the new Quick Input, a large monitor with at least 1280x1024 pixel is required. Or better a higher resolution (i.e. 1920x1080) so that the graphic window with calculation results is not overlapped by the input dialogue window. For notebook, tablet or small monitors, the old input windows with separate input of shaft dimensions, material, bedding, forces, bending moment, torque etc. are still available.

## LG1: Load Spectrum

New input window for load spectrum eases input of revolutions by converting from time and speed. And maximum number of bins was increased to 255.

The screenshot shows the 'LG1 load spectrum Bin No. 2' dialog box. It contains the following input fields and controls:

- Radial load Fr2: 500 N
- revolutions N2: 10080000
- Calc  $N = n * t$
- speed n: 1000 1/min
- time t: 7 day

Buttons at the bottom include OK, Cancel, Help, Aux. Image, Nm <-> lbfm, and a scroll arrow.

## WN1: Quick Input

New Quick Input allows input of all dimensions, material, load, friction coefficients, temperatures for cylindrical or tapered interference fits or shrink fits in only one dialogue window.

The screenshot shows the 'WN1 Dimensions' dialog box configured for a cylindrical interference fit. The 'Dimensions' section has 'cyl. interference fit' selected. Key parameters include a seam diameter DF of 51 mm and an inner diameter of 30 mm. The 'material' section lists materials 42CrMo4 and 16MnCr5. Friction coefficients are set to 0.12. The 'Application' section shows a minimum pressure pmin of 73.09 MPa and a work rotation speed of 416 /min. A table of dimensions is visible on the right side of the dialog.

	DeA	L
1	30	16,5
2	168	27
3	80	16,5
4		
5		
6		
7		
8		
9		
10		

## WN1: Taper Interference Fit: Min and Max Values

Same as for cylindrical interference fits, min and max interference amount can be entered for taper interference fits, to calculate min and max stress, mounting force and dismantling force.

The screenshot shows the 'WN1 Dimensions' dialog box configured for a tapered interference fit. The 'Dimensions' section has 'cone interference fit' selected. Key parameters include a seam diameter DF of 56.5 mm, a taper ratio of 1:10, and a cone angle alpha of 5.7248 degrees. The 'material' section lists materials E295 (St 50) and C45E (Ck 45). Friction coefficients are set to 0.1. The 'Application' section shows a minimum pressure pmin of 720 MPa and a work rotation speed of 0 /min. The 'Re-calculation' section shows U max of 0.039 mm and U min of 0.020 mm.

# WN1: "Quick2" View and "Quick4" View

New Quick4 View includes drawing, diagrams and tables with calculation results in an ISO 7200 drawing header on one screen.

WN1 - Interference Fits - 0.wn1

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HEXAGON WN1 - Interference Fits V12.0

Dimensions		Friction coeff.		shaft		hub	
IF	94,00	nue lu	0,14	Material	Ck45	16MnCr5	
Dil	0,00	nue ll	0,14		1,1191	1,7131	
DF	202,00	nue ru	0,14		1,1191		
		nue rl	0,14	E	MPa	205000	210000
				$\mu$		0,30	0,30
				Re	MPa	500	600
				alpha	1/K	1,11E-5	1,1E-5
				Tzul	°C	500	600
				rho	kg/dm3	7,85	7,85

Max.press.full.plast.		
p PA	MPa	180,2
p Pl	MPa	577,4

TB= 20°C		
	Min.	Max.
Tn [Nm]	6,365E4	8,2E4
U [mm]	0,264	0,339
SPl	4,76	3,70
SPA	2,55	1,98
SPAx	3,04	2,36
SR	0,94	1,21
Fe [N]	634766	816418
Tl [°C]	-1	-1
TA [°C]	131	165

Fit		shaft	hub
ISO	v 6	H 7	
Ao		339	46
Au		310	0
Ao 20C		339	46
Au 20C		310	0
Rz		0,8	1,6

p u < p min !  
p nu < p min !

p ut < p min !  
Sliding !  
Sliding at tB !  
Warning: n>0 -> Bed.: EA=EI,  $\mu A=\mu l$ , Dil=0

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		Titel, Supplementary title	1/2
DIETZ-MOTOREN Dettingen		Shaft/Gear Wheel	
		Rec. Date of issue	Lang. Page
		A 2017-10-24	de 8

New Quick2 View provides a quick overview about calculation results and dimensions of the joint.

WN1 - Interference Fits - 0.wn1

File Edit View CAD Database Document OLE Help

Shaft 1  
Gear Wheel 2  
3. Shrink Fit Calculation of the Gear Wheel

Dimensions		Friction coeff.		shaft		hub	
IF	94,00	nue lu	0,14	Material	Ck45	16MnCr5	
Dil	0,00	nue ll	0,14		1,1191	1,7131	
DF	202,00	nue ru	0,14		1,1191		
		nue rl	0,14	E	MPa	205000	210000
				$\mu$		0,30	0,30
				Re	MPa	500	600
				alpha	1/K	1,11E-5	1,1E-5
				Tzul	°C	500	600
				rho	kg/dm3	7,85	7,85

Max.press.full.plast.		
p PA	MPa	180,2
p Pl	MPa	577,4

TB= 20°C		
	Min.	Max.
Tn [Nm]	6,365E4	8,2E4
U [mm]	0,264	0,339
SPl	4,76	3,70
SPA	2,55	1,98
SPAx	3,04	2,36
SR	0,94	1,21
Fe [N]	634766	816418
Tl [°C]	-1	-1
TA [°C]	131	165

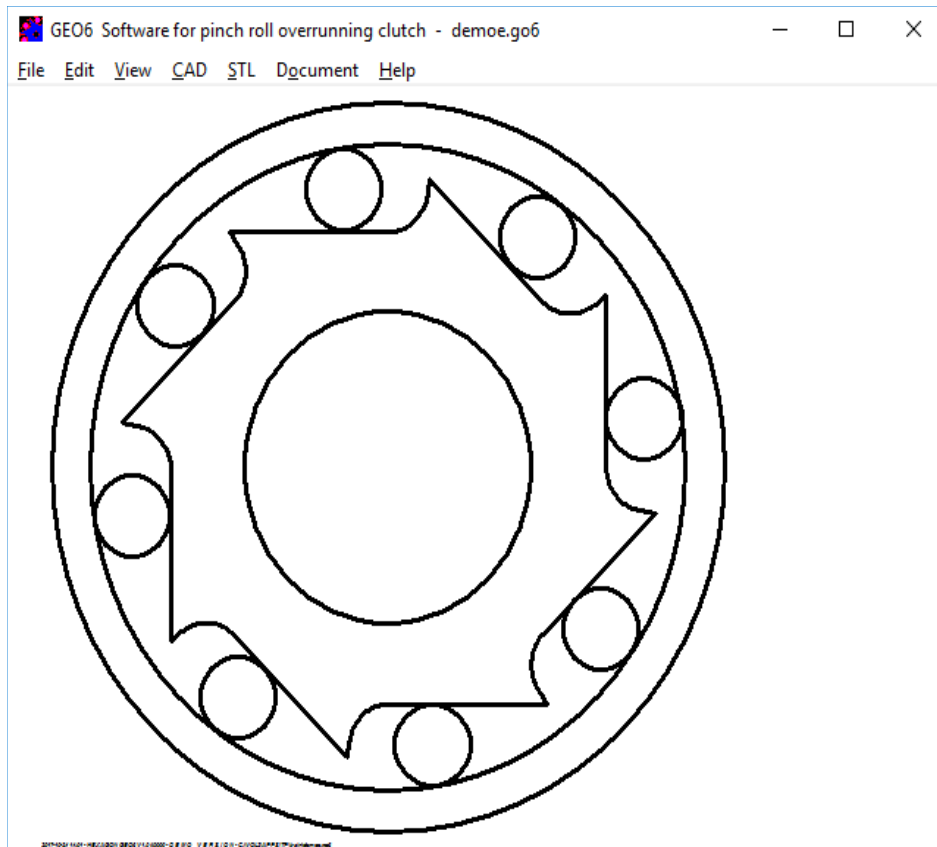
Fit		shaft	hub
ISO	v 6	H 7	
Ao		339	46
Au		310	0
Ao 20C		339	46
Au 20C		310	0
Rz		0,8	1,6

p u < p min !  
p nu < p min !

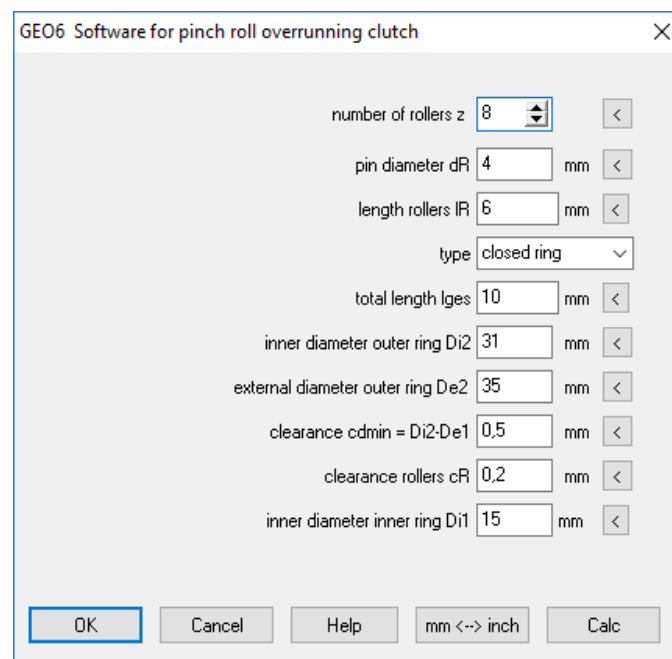
p ut < p min !  
Sliding !  
Sliding at tB !  
Warning: n>0 -> Bed.: EA=EI,  $\mu A=\mu l$ , Dil=0

## GEO6: New Software for Pinch Roll Overrunning Clutch

Our new software GEO6 calculates inner ring and outer ring of a pinch roll overrunning clutch.



Geometry of inner ring and outer ring is generated by GEO6.



You can generate inner ring and outer ring as STL file, produce by means of your 3D printer, then build a full functioning model.



## HEXAGON PRICELIST 2017-11-01

PRODUCT	EUR
DI1 Version 1.2 O-Ring Seal Software	190,-
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DXFPLOT V 3.2	123,-
FED1+ V29.7 Helical Compression Springs incl. spring database, animation, relax., 3D,..	695,-
FED2+ V20.5 Helical Extension Springs incl. spring database, animation, relaxation, ...	675,-
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FED4 Version 7.3 Disk Springs	430,-
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WN2 V10.0 Involute Splines to DIN 5480	250,-
WN2+ V10.0 Involute Splines to DIN 5480 and non-standard involute splines	380,-
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WN4 V 4.6 Involute Splines to ANSI B 92.1	276,-
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WN10 V 4.1 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,-
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PACKAGES	EUR
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#### Language Version:

- **German and English** : all Programs
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- **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,-

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

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