HEXAGON Info 152

by Fritz Ruoss

WXXE involute spline - ANSB92-1-FilletRoot.winx

WNXE is a flexible tool for calculation of any involute spline. Internal and external involute splines can be designed in short time, with output of true-scale profile drawing, or designing the counterpart internal/external spline. Input options are various: module or pitch, tooth heights or tooth height coefficients or major and minor diameter, in millimeters or inches, profile shift coefficient, addendum modification or tooth thickness or gap width or dimensions over/between pins or span measurement. And the counterpart spline optionally can be calculated from flank clearance and backlash. WNXE is available now, price is 375 Euro for individual license.

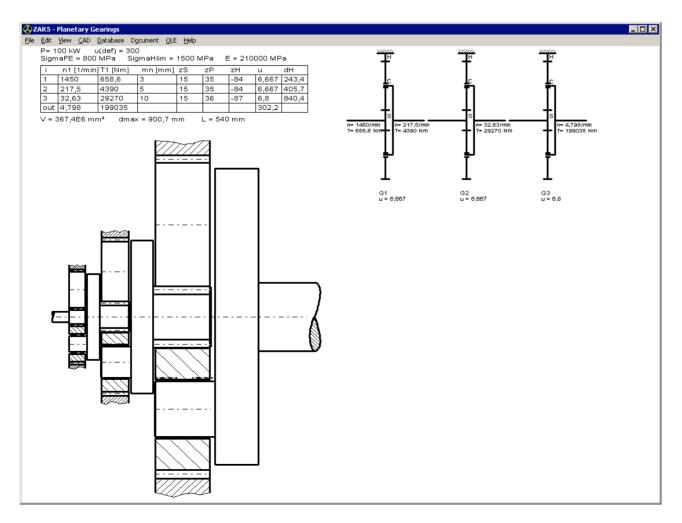
× WNXE involute spline			_ □ ×
Pressure angle alpha 📴	* <u>30 37.5 45</u> O mn	Normal module mn 3,17	5 mm
Number of teeth z 25	@ Pn	Normal Pitch Pn 8,00	1/in
d = 79,375 mm			
	C 1 (external spline) + c	1+2	○ 2 (internal spline) + c
Tooth depth coefficient C he/mn major diameter	ha1/mn 0,49754 0.45 da1 82,32 mm	ce/mn 0.5338 0.1 ce 1.695 mm	hf2/mn 0.97841 0.55 df2 85.71 mm
Tooth depth coefficient C hi/mn minor diameter C di	hf1/mn 0.96386 0.55 df1 73,04 mm	ci/mn 0.4976 0.1 ci 1.58 mm	ha2/mn 0.51922 0.45 da2 76.2 mm
Root fillet radius rhof/mn	rf1/mn 0,35 <		rf2/mn 0,35
Gen.addend.modif.coeff. C Normal tooth thickn. C Dimensions over pins C Span measurement C	sn1 4,863 mm <	cp/mn 0.0611 < cp 0.1942 mm 5.096 mm < ? 5 • < ?	xe2 0.01922 <
OK Cancel	Help Aux. Image	r ⊂/mn	mm <> in Calc

WNXE - New Software for Involute Splined Joints

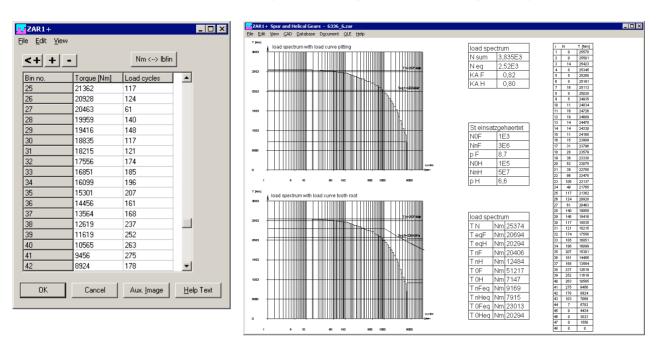
ZAR5 – Pre-Dimension for Multistage Planet Gears

San Section 2017 Contension Contensi Contension Contension Contension Contension Contens	
Pressure angle alpha	20 * < Material Material data base
Helix angle ß	15 * < Fatiguestr. tooth root stress Sigma FE 800 MPa <
Gear ratio i	300 Fatiguestr.Hertziancont.press Sigma Hlim 1500 MPa <
number stages	3 ➡ K Modulus of elasticity E 210000 MPa <
Rated power P	100 kW < Poisson ratio µ 0,3 <
Rot.speed n1	1450 /min
Width factor b/mn	15 < in 1 / in (0,8 1,25) 1 <
Safety fact. Root fatigue fracture SF	2 < SF = f(z1)
Safety fact, against pitting SH	1 < SH = f(z1)
OK	Cancel <u>H</u> elp Text mm <> inch

Pre-Dimension of multistage planet gears to achieve a large transmission ratio, is a new option in ZAR5. With only few input data you can estimate size of the sequential planet gear stages. Hence input of material data is equal for every gear and every stage. And every stage is a planetary gear with input sun, output carrier which drives next sun gear, and blocked ring gear. By means of a factor you can define dividing of transmission ratios: If "in-1/in"=1, equal transmission ratio for each stage. For "in-1/in"=1.25, transmission ratio of the next stage is 25% higher than former stage.



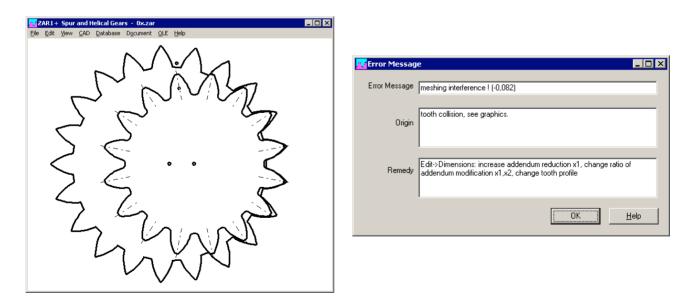
ZAR1+, ZAR2, ZAR5, ZAR6: Load Spectrum: Input Table with copy and paste



Load spectrum can be entered step by step, as used, or new as table with possibility of copy and paste or import/export with other programs via Windows clipboard. In the table menu, you can configure if x coordinate in diagram (load cycles) should be linear or logarithmic scale. And at "View->Error" you can check load spectrum input for errors.

ZAR1+ Meshing Interference

If meshing interference in tooth contacts, you get an error message. This error message was enhanced by the overlap in mm as help parameter when optimizing the gear.



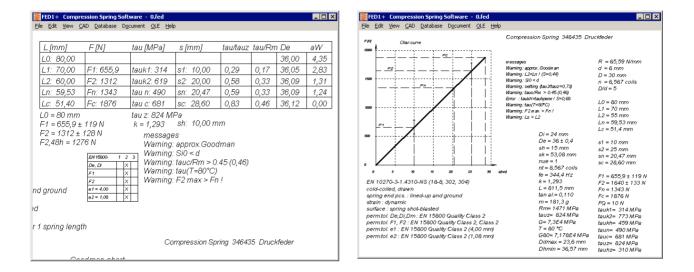
ZAR1+ Warning: z0 cutter !

For calculation of ring gears, number of teeth z0 and profile shift x0 of the pinion cutter is needed for calculation of tooth form coefficients YF and YS according to ISO 6336. Because the input button "pinion cutter" at Edit -> Cutting Tool" can easily be lost of sight, you get now a warning "z0 cutter !" if cutter pinion number of teeth is wrong or not defined.

FED1+ Coil distance aW and Tolerances e1,e2 in Quick1,3,4

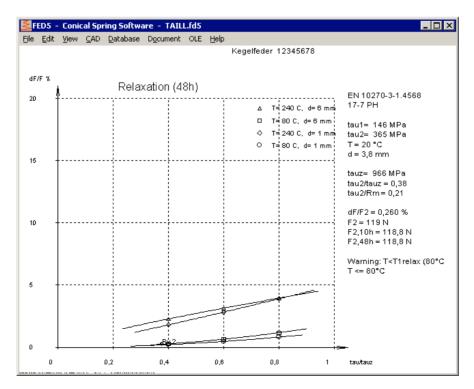
Coil distance aW (0,1,2,n,c) has been added to the table with deflections, forces, and stresses in Quick3 and Quick4 View.

Tolerances for parallelism and angle e1 and e2 have been added in Quick1 View (in brackets). In tables with tolerance grades in Quick3 and Quick4, tolerances e1 and e2 are also printed now. However, tolerance grades and tolerances e1 and e2 are no longer displayed if end coils are lined-up, but not ground. And for hot-coiled springs and self-defined tolerances, a table with tolerances and tolerance grades is drawn now.



FED1+, 2+, 5, 6, 7: Relaxation as function of tau/tauz

Relaxation curves with the coefficient tau/tauz (instead of tau) has been added into all compression spring programs now. Tauz is the permissible shear stress as function of wire diameter. I compared the curves of all materials to check if relaxation as function of wire diameter is similar than permissible shear stress as function of wire diameter. In this case the curves for different wire diameter would be equal. Unfortunately, most material curves differ. Only the curves for VDC and TDC according to EN 10270-2 and 1.4568 according to EN 10270-3 are nearly identical for wire diameters d=1 mm and d=6mm.



Database Spring Materials - ISO 8458 and EN 10270

Material values according to ISO 8458-2 and EN 10270-1 are equal, and material types are equal: SL, SM, DM, SH, DH. (S for static, D for dynamic, L for low, M for middle, H für high). In the spring material database, ISO 8452-2 names has been added in NAME3 of EN 10270-1 materials. Old names (DIN 17223-1) were moved or deleted.

19: EN 10270-3-1.4568 X7CrNiAl17-7 17-7 PH	-	Database
1: EN 10270-1-SL spring steel wire pat. drawn ISO 8458-2-SL 2: EN 10270-1-SM spring steel wire pat. drawn ISO 8458-2-SM	-	
2: EN 10270-1-SM spring steel wire pat. drawn ISO 8458-2-SM 3: EN 10270-1-SH spring steel wire pat. drawn ISO 8458-2-SH	- 1	erd
4: EN 10270-1-3H spring steel wire pat, drawn ISO 8438-2-3H 4: EN 10270-1-DH spring steel wire pat, drawn ISO 8458-2-DH		720 mm)
5: EN 10270-1-DH spling steel wile pat. drawn 150 6456-2-DH 5: EN 10270-2-FDC oilhardened spring steel DIN 17223-2 FD		· 20 mm
6: EN 10270-2-VDC oilhardened spiring steel EN 10270-2 TDC		diameter
7: EN 10270-2-VDC oilhardened valve spring steel DIN 17223-2 FDC		
8: EN 10270-2-FDSiCr oilhardened spring steel DIN 17223-2 FD-SiCr		mm
9: EN 10270-2-VDCrV oilhardened valve spring steel EN 10270-2 TDCrV		DIN 2076/7
10: EN 10270-2-VDSiCr oilhardened valve spring steel EN 10270-2 TDSiCr		mm) EN 10270-
11: EN 10089-38Si7 hot-rolled spring steel wire DIN 17221 38Si7	_	EN 10270
12: EN 10089-54SiCr6 hot-rolled spring steel wire DIN 17221 54SiCr6		ue Strength
13: EN 10089-61SiCr7 hot-rolled spring steel wire DIN 17221 60SiCr7		
14: EN 10089-55Cr3 hot-rolled spring steel wire DIN 17221 55Cr3		%
15: EN 10089-51CrV4 hot-rolled spring steel wire DIN 17221 50CrV4		<
16: EN 10089-52CrMoV4 hot-rolled spring steel wire DIN 17221 51CrMoV4		%
17: EN 10089-60SiCrV7 hot-rolled spring steel wire		
18: EN 10270-3-1.4310-NS X10CrNi18-8 18-8, 302, 304		
19: EN 10270-3-1.4568 X7CrNiAl17-7 17-7 PH		
20: EN 10270-3-1.4401 X5CrNiMo17-12-2 AISI 316		
21: EN 12166-CuSn6-R900_CW452K-R900DIN 17682 2.1020.39		
22: EN 12166-CuZn36-R700 CW507L-R700 DIN 17682 2.0335.39		
23: EN 12166-CuBe2-R1300 CW101C-R1300 DIN 17682 2.1247.97		
24: EN 12166 CuCo2Be CW104C R730 DIN 17682 2.1285.97		
25: EN 10270-1-DM spring steel wire pat. drawn ISO 8458-2-DM		
26: EN 10270-3-1.4310-S2 X10CrNi18-8 Sandvik 11R51		
27: EN 10270-3-1.4310-S1 X10CrNi18-8 Sandvik 12B10		
28: EN 10270-3-1.4568-S1 X7CrNiAl17-7 Sandvik 9RU10 29: EN 10270-3-1.4401-S1 X5CrNiMo17-12-2 Sandvik 5R62	-	Help

FED3+ V17.5

In FED3+ V17.5 and V17.5.1 at "Edit->Material", input data (shot-blasting, coiling direction) were not used in every case. Click first "Calc" button and then "OK" to accept the data. Or you can request a free update from release V 17.5 to V17.5.2.

FED1+, FED5, FED6: Mandrel and Bore diameter with 2 digits

If the diameter of mandrel or bore is less than 16 mm, it is printed in mm with 2 (instead of 1) decimals now in the production drawing.

SR1 – Material Data

When opening an old SR1 file, program detects if material data Rm, Re, pG or E module differ with the actual material database and show an error message. This indicates that material data in the database has been modified. Compare calculation with printout of old calculation to see the difference. To remove warnings, just resave the file.

SR1+ Bolted J	oint Design to V	DI 2230 🛛 🔀
🥐 mat_i	nut: E 205000 -> 7	75000, Continue?
[<u>]</u> a	Nein	Abbrechen

SR1 – Compare Material Data and Database Data

Since release 20.2, a warning "old value > new value" appeared if material database data differed between stored values and new database values when opening an old SR1 file. Because of updating many old material names with new material names, since Version 20.6 idle messages like " St 50 <> E295" are not reported any more. Warnings are reported only if material data have been changed in the database and this may influence calculation results.

SR1 – Consider Bolt Length Tolerance

Bolt length tolerance for hexagon head bolts according to ISO 4014 and ISO 4017 is "IT 15" for allowance class A and "IT 17" for allowance class B. Bolts larger than M30 and longer than 160 mm get class B tolerances. For hexagon socket head bolts to ISO 4762 is no selection, tolerances are equal with allowance class A. And the same for hex flange bolts to EN 1662 and EN 1665. Length tolerances and elongation of the bolt and deflection of the clamping plates are considered now when checking available thread depth. A new error message "LK+tG < Lmax" shows that in worst tolerance case bolt collides with end of thread in TTJ joint. If you get additionally the old message "thread depth !", this is even the case with nominal dimensions without tolerances.

🕻 SR1+ bolt	
shank bolt	bolt head
thread	hex flange bolt
thread M12	IFI 536 - 12 mm
Allowance class Allowance class 6h	diameter of the bolt head dk 18 mm
EI = 0,000 Td = 0,265 Td2 = 0,148 mm	min bearing surface bolt head dw 17,23 mm
d nom =12,000 d min =11,735 d max =12,000 mm d2nom=10,863 d2min=10,715 d2max=10,863 mm	thread length IG 36 mm
d3nom=9,853 d3min=9,637 d3max=9,853 mm	material
bolt length up to head I 60 mm ∢ Allowance class A ★ √ I = 60 ± 0,6mm B ?	material 10.9 endurance strength RTBHT T
OK Cancel Help Text Aux	x [magemm <-> inchCalc

Should bolt length tolerance also be considered for thread strip safety calculation? Or is it already considered in the addition mzu?

The user can decide himself if he wants to consider bolt length tolerance for calculation of engaged thread length "mtr" or not at "Edit->Calculation Method".

SR1+ calculation base	
C VDI 2230 : 1986 VDI 2230 : 2014 C VDI 2230 : 2014 C deformation sleeve (VDI 2 C deformation cone (VDI 2	· ·
T thread length engaged to Dose	MA pre
🥅 calc.min.thread length engag.for FSmax (=FMzul+FSA)	FA pre
Tolerances for friction coefficients ?	F pre
tolerances d2, d3 for FM, MA ? max (d2=d2max, d3=d3max) Multi-bolted joint (FA,FQ,FKR = f (MV) ? No Flange	•
calculation FA (Mb) flange © Dose, VDI2230-2 (34) © VDI2230-2 (43): FAmax = 4"Mb / (ns"dt)	
tightening angle incl. torsion bolt ?	
TTJ: thread engagement mgeo and mtr reduced by bolt length tolerance	
Units metric/imperial metric (mm, N, MPa, Nmm, *C) 📃 💌	
OK Cancel Help Text	Calc

SR1 – E Module of Nut for Calculation of deltaM

According to VDI 2230-1:2014, elastic resilience deltaM of the nut thread is calculated with the E module of the nut thread if TTJ (tapped blind hole joint), but with the E module of the bolt if TBJ (through bolted joint with nut). But why??

SR1 calculates according to VDI 2230, however in earlier versions the E module of the nut material had been replaced by standard E module of 205000 Mpa when switching between TTJ and TBJ joints.

GEO1+, GEO2: Coordinate Input Table

Coordinates and angles of the cross-section or rotation area can be entered in a new table now. With copy and paste you can move cells or import/export data from/to MS Excel or other programs. Cells are marked by cursor keys together with shift key.

<+ +			m <> inch	Calc
i	Y [mm]	Z [mm]	phi (*)	
1	2,5	1	0	
2	6	2	0	
3	9,5	2	0	
4	8	4	0	
5 6 7	9,5	10	0	
6	3	14	0	
	1	9	0	
8	1,5	7	0	
9	3	8	0	
10	4	11,5	0	
11	7	10	0	
12	6	6	0	
13	3	8	0	
14	1,5	7	0	
15	3,5	3	0	
16	2,5	1	0	

<+ +		m	m <> inch	Calc
i	Y [mm]	Z [mm]	phi (*)	-
1	134,8	31	0	
2	134,8	50	0	
3	117,5	50	-108,9	
4	110,5	55	0	
5	110,5	125,8	-71,05	
6	117,5	130,8	0	
7	134,8	130,8	0	
8	134,8	149,8	0	
9	60	162,8	-81,53	
10	53,75	170	0	
11	53,75	186	0	
12	28	186	0	
13	28	163,8	91,79	
14	60	130,8	0	
15	82	130,8	-82,39	
16	88,25	123,5	0	
17	87,75	55	-62,45	
18	79,5	50	0	-

WL1+: Copy and Paste via Clipboard

Input of dimensions, radial and axial forces, path loads, bending moments and torque gets copy and paste functions to move or import/export data via Windows clipboard.

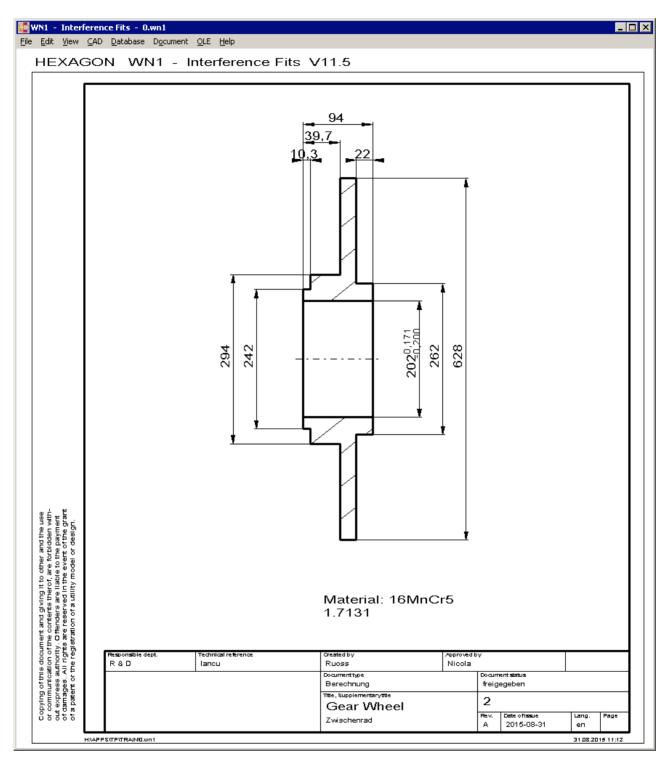
+					
<u>.</u>	-				
x	1 [mm] de0 [m	m] den (mm)	di0 (mm)	din [mm]	r [mm]
2	1 20	20	0	0	0,5
3		25	0	0	0,5
5		30	0	0	0,5
	15 25	25	0	0	0,5
	35 20	20	0	0	0,5
1	50 18	18	0	0	0,5
		_			
		Shaft Length 🛛	50 m	n	
	1				
	-				
ĸ	Cancel	Aux. Im	age		mm <> inch

FED6, FED7, FED10, ZAR4, GEO4: Tables with copy and paste

Tables for input of coil sections or load-deflection diagrams in FED6 and FED7, input of spring geometry in FED10, and input tables for pitch curve or cam geometry in ZAR4 and GEO4 got a menu with copy and paste and import/export functions.

WN1 – Production Drawing

New in WN1 is hub drawing with dimensions as production drawing. Drawing header is configurable, and drawing data, names and modifications can be entered in WN1.



FED1+ Dimensioning or Recalculation after Modification of Temperature

If you change operating temperature at "Edit->Application", you have to select "Dimensioning or Recalculation?". If dimensioning, number of coils will be modified. Else spring loads are recalculated.

All Programs: Drawing Header Configurable, Default Setting ISO 7200

<u>C</u> AD <u>D</u> atabase D	ocument OLE Help			oining opringo opt	(>)	
Calc. B	asis of Shear Modulus	s G = 71783 MPa	Supply term		× 0	
Responsibl	e dept. Technical refe	erence Docun	nent type		Document status	
Responsible R & D	e dept. Technical refe Mill@r		nenttype culation		Document status released	
		Calc Tille, s		Spring		

The drawing header of all production drawings and table drawings is configurable now (at "File->Settings->Drawing). Default Setting is "ISO 7200 Fig.2".

In spring drawings, cell 13 or cell 12 (additional indications) was removed. But text, if any, is printed, without cell and 6 mm higher than before.

ISO 7200 header and DIN 6771 header differ. Self-defined changes in drawing and calculation are not documented in ISO 7220 header, only the index letter. And only the issue date is listed.

However, ISO 7200 header includes additional fields "Responsible dept.", "Document type", "Document status". At "Document->Drawing data" you can input these texts, if an ISO 7200 drawing header was defined at "File->Settings->Drawing". Other data are used commonly for DIN and ISO drawing header:

Technical reference: stand.

Created by:	compl.		
Approved by:	check.		
Changes:	modification	index	+1

Info drawing D	IN 6771				[In	fo draw	ing IS	0 7200	D			
												_
	Date	Name								(Date)	Name	
Compl.	07.10.1997	Ruoss	< 31.08.2015			Created	d by		0)7.10.1997	Ruoss	
Check		Smith	< 31.08.2015			Approv	ed by				Smith	
Stand.		Miller	< 31.08.2015			Techni	cal refe	rence			Miller	
Арр			< 31.08.2015			_			_			
	·					Respor	ooible d	ant		R&D		
Replacem	nent for					Docum				Calculation		
Replac	ed by					Docum				eleased		
	. ,											
x y	h phi	Text				×	у	h	phi	Text		
1 0 0	0 0				1	0	0	0	0			
2					2	_			_			
3					4	-						
4					5							
5					6							
7					7							
8					8							
					A4	•	ĩ					
A4 💌			1	1	Jere 1		1		Г	OK	Cancel	Help
		OK	Cancel <u>H</u> elp						L	510		

POLYLINE usable for logo drawing

Polylines are now allowed to be used in logo drawings and the modified dxf file for inserting your company logo in the drawing header. Use our free tool DXF2LOGO.EXE to convert your DXF drawing into the required \$LOGO_1.DX\$ file, then copy into temporary directory and set R/O file attribute.

One Logo drawing for all drawing headers

Dependent on the configured drawing header, your logo drawing will be scaled and positioned to fit.

FED1+ Compres	sion Spring Software - D <u>D</u> atabase D <u>o</u> cument					
Responsible dept R & D	Technical reference Miller	Documentige Calculation		Documentstatus released		
J	Createdby Ruoss	The, supprementary the Compression Spring	34	6435		
d/u/r/o/v/i/s	Approved by Smith	Druckfeder	Rev. Date of Issue A 2015-09-01		Lang. en	Page
STPT TRAIN De Sed					0100.2	0154,41

In ISO 7200 Fig.1, the "legal owner" field is only 30x16mm, but in ISO 7200 Fig.2 it is more than double size (70x26mm). If you do not create your own \$LOGO_1.DX\$ drawing, your company name from the license text is printed in the "legal owner" cell.

M	FED1+ Compression Spring Software - Oe.fed											_ 🗆
Eile	File Edit View CAD Database Document OLE Help											
	_											
	Responsit R&D	ore aepz.		Technical reten Miller	ence	Created by Ruoss		Approve Smith	aoy			
						Epcumenttype			Боси	ment status	1	
	1				Calculation	Calculation released						
				^	JĪC	Title, Supplementary title	Trate, Supplementary title Compression Spring 346435			3/6/35		
	u,	'U	Π.	/U/\	V/1/3	Compressio						-
d/u/r/o/v/l/s				Druckfeder			A A	Date of Issue 2015-09-01	Lang. en	Page		
1.4PP	รากาสลเพ	De Seci									0100.20	15 4,43

Drawing header with or without copyright note

At "File->Settings->Drawing" you can configure if a copyright note should be printed on the left border or not.

FED1+ Configuration	_ 🗆 ×
Directories Graphics CAD Colour Printer Printout Settings external Drawing	I
Production drawing ✓ HEXAGON FED1+ Compression Spring Software V27.2 ? ✓ file name H:\APPS\TP\TRAIN\0e.fed ? ✓ \$1.08.2015 18:23 ? ✓ \$logo_1.dx\$? ✓ Production drawing with header ? ✓ Copyright notice ?	Index C a.b.c C 1.2.3 • A.B.C C
Drawing with header ISO 7200 Fig.1 Drawing approved App Size coeff. Dimension	ing 1 <
OK Cancel Save E	xport Import

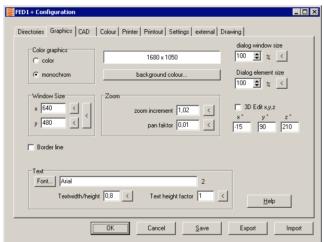
Print A4 Production drawing without Border to Printer

To print production drawing without border on printer, it must be lightly enlarged and moved. Settings can be saved in the printout database: Scale x/y: 2,0/1,06. Origin x/y: -6 / -12.

Frintout	
Printer	Win2PDF an PDFFILE:
Database	Apply Database
Scale x 2,000 Scale y 1,060	Origin x -6 Origin y -12
Printout © Portrait © Landscape	shading Monochrome C Color / grey-scale
🔲 fit limits	🔲 Border line
ОК	Cancel <u>H</u> elp

Configure Windows Size

After Installation or "<" button, window size is set maximum. On wide screen display, drawings may appear stretched and circles appear as ellipses. Two new "<" buttons set the relation of horizontal to vertical pixels 4:3 to avoid this effect.



Update History online

At "Help -> History" you can show description of updates until your present release. To get update information about later updates from the web, a new menu item "Help -> History (www)" is available now with an internet link to the updated update history of your program. Login data are required for access to this page, see info email.

FED1+ h:\apps\tp\logo\outwin.txt	_ 🗆 ×
Ele Edit	
FED1 / FED1+ Version 27.2	
	_
This file contains information about alterations and additions to your Software.	
You can view the actualized file at "http://www.hexagon.de/history".	
Hotline	
If you have any remaining questions about the program, please contact:	
HEXAGON Industriesoftware GmbH Hr Fritz Ruoss Stiegelstr.8	
D-73230 Kirchheim	-

COTEMPTIBLE History *	
C f D www.hexagon.de/history/fedi_s.htm	() =
🚍 Apps ★ Bookmanis 🚺 Google 🗋 New Tab 🧿 Wetter Kachheim Te	
View-Printest-Production Compensation: Prints limit values	10.36. 025
V 26.6 (07.11.14) Modification: Tolerances for load and spring length recording to EN 15000-2009. Voue-Terror Messages: Warnings: if dimensions beyond defined validity limits for selected tolerance grades according to EN15400 and DEN 2006.	
V 26.7 (12.02.15) View-Quick3,Quick4: utble with De1, De2, Den, Dec.	
V 26.8 (11.05.15) (FED)=-only) VeroReinaution: If d ~ (10 of forboyn: diff size d1. Worming ddDrefan, if were transmere over of profetiated limits. VeroReinauton-Reis-Signar, D. Nere relaxation encross with d spring for operating temperature and non- range of working temperature.	
V 26.9 (05.06.15) Eds=Production.Application.Load spectrum: New Calc barton for calculation and updated results in background graphic.	

"Document Links" instead of "Document Setup" and "Document 1..5"

The functions for linking any external documents has been integrated in one dialog box.

Software - 0e.fed - FED1+ Compression Spring Software - 0e.fed	
Program 1 c:\hexagon\fed6\wfed6.exe File 1 alternative.fd6	Exec Prog Exec File
Program 2 CAD drawing File 2 p:\cad\drawings2015\675776.dwg	Exec Prog Exec File
Program 3 FED1+ manual File 3 c:\hexagon\fed1\fed1.htm	Exec Prog Exec File
Program 4 Email to customer File 4 mailto:entwicklung@kunde.com	Exec Prog Exec File
Program 5 HEXAGON Info letter File 5 www.hexagon.de/info152/	Exec Prog Exec File
OK Cancel <u>H</u> elp Text	

At "File 1" .. "File 5" you define the documents to be linked. With "Exec File" you show or run the linked document. If document file is not linked with an application under Windows, you have to input the appropriate program and run with "Exec Prog". Else, you can use "program" input for description or remarks.

Tip: Compare Calculation Results

Use Shift-F2 keys to switch between latest 2 calculations, or Shift-F3 or Shift-F4 to compare 3 or 4 results. Result graphic can be configured at File->Settings->Settings: Result Screen. To compare more than 4 calculations, copy the files in a subfolder, then "File->Open Table"

Edit View CAD Database Docum	ent OLE Help	a state a second	
<u>N</u> ew	Ctrl+N		
Open	Ctrl+O		$d = 2 \pm 0.02 \text{ mm}$
Open ([able)	and the second s		Di = 32 mm Dm = 34 mm
Save	Ctrl+S		$D_{H} = 34 \text{ mm}$ $D_{e} = 36 \pm 0.7 \text{ mm}$
Save <u>A</u> s	and the second		n = 8.5
Print	Ctrl+P		nt = 10.5 R = 0.437 N/mm
Print Macro			Dec = 36,48 mm
Printer Setup			Ddmax = 31.28 m
Export dbf, xls	4		Dhmin = 37.20 m sk = 32.2 mm
Export Excerpt Printout dbf, xls	6		L = 1129 mm
EDI	, –		m = 28.02 g
Settings	<		W12 = 94.40 Nmr W0c = 2133 Nmr
1 H:\APPS\TP\TRAIN\4310.fed	Shift+F1		fe = 69.63 Hz
2 H:\APPS\TP\TRAIN\1464619W.fed	Shift+F2		spring end pcs.: li
3 H:\APPS\TP\TRAIN\0.fed	Shift+F3		strain: dynamic surface : spring sl
4 H:\APPS\TP\TRAIN\LOADCOLL.fed	Shift+F4		nue = 1
Exit			Manufact.compen

PRICELIST 2015-09-01

PRODUCT	EUR
DI1 Version 1.2 O-Ring Seal Software	190,-
DXF-Manager Version 8.6	383,-
DXFPLOT V 3.0	123,-
FED1 V27.2 Helical Compression Springs	491,-
FED1+ V27.2 Helical Compression Springs incl. spring database, animation, relax., 3D,	695,-
FED2 V19.0 Helical Extension Springs	501,-
FED2+ V19.0 Helical Extension Springs incl. spring database, animation, relaxation,	675,-
FED3+ V17.6 Helical Torsion Springs incl. prod.drawing, animation, 3D, rectang.wire,	480,-
FED4 Version 6.6 Disk Springs	430,-
FED5 Version 14.0 Conical Compression Springs	741,-
FED6 Version 14.5 Nonlinear Cylindrical Compression Springs	634,-
FED7 Version 11.8 Nonlinear Compression Springs	660,-
FED8 Version 6.5 Torsion Bar	317,-
FED9 Version 5.6 Spiral Spring	394,-
FED10 Version 3.2 Leaf Spring (complex)	500,-
FED11 Version 3.1 Spring Lock and Bushing	210,-
FED12 Version 2.4 Elastomere Compression Spring	210,-
FED13 Version 3.8 Wave Spring Washers	185,-
FED14 Version 1.2 Helical Wave Spring	395,-
FED15 Version 1.2 Leaf Spring (simple)	180,-
GEO1+ V5.7 Cross Section Calculation incl. profile database	294
GEO2 V2.6 Rotation Bodies	<u> </u>
GEO2 V2.6 Rotation Bodies GEO3 V3.3 Hertzian Pressure	205,-
GEO4 V3.9 Cam Software	205,-
HPGL-Manager Version 8.5	383,-
LG1 V6.3 Roll-Contact Bearings	296,-
LG1 V0.3 Koll-Contact Bearings LG2 V2.1 Hydrodynamic Plain Journal Bearings	460,-
SR1 V20.8 Bolted Joint Design	<u>400,-</u> 640,-
SR1+ V20.8 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 V3.7 Girder Calculation	757,-
WL1+ V19.7 Shaft Calculation incl. Roll-contact Bearings	945,-
WN1 Version 11.5 Cylindrical and Conical Press Fits	485,-
WN2 V 9.5 Involute Splines to DIN 5480	250,-
WN2+ V 9.5 Involute Splines to DIN 5480 and non-standard involute splines	380,-
WN3 V 5.3 Parallel Key Joints to DIN 6885, ANSI B17.1, DIN 6892	245,-
WN4 V 4.4 Involute Splines to ANSI B 92.1	276,-
WN5 V 4.4 Involute Splines to ISO 4156 and ANSI B 92.2 M	255,-
WN6 V 2.9 Polygon Profiles P3G to DIN 32711	180,-
WN7 V 2.2 Polygon Profiles P4C to DIN 32712	175,-
WN8 V 1.9 Serration to DIN 5481	195,-
WN9 V 2.0 Spline Shafts to DIN ISO 14	170,-
WN10 V 3.7 Involute Splines to DIN 5482	260,-
WN11 V 1.3 Woodruff Key Joints	240,-
WNXE V 1.1 Involute Splines - dimensions, graphic, measure	375,-
WST1 V 9.3 Material Database	235,-
ZAR1+ V 24.3 Spur and Helical Gears	1115,-
ZAR2 V7.6 Spiral Bevel Gears to Klingelnberg	792,-
ZAR3 V8.7 Worm Gears	404,-
ZAR3+ V8.7 Worm Gears incl. profile drawings, variable tooth height, OPD measure	620,-
ZAR4 V3.7 Non-circular Spur Gears	1610,-
ZAR5 V9.1 Planetary Gearings	1355,-
ZAR6 V3.6 Straight/Helical/Spiral Bevel Gears	585,-
ZARXP V2.0 Involute Profiles - dimensions, graphic, measure	275,-
ZAR1W V1.5 Gear Wheel Dimensions, tolerances, measure	450,-
ZM1.V2.3 Chain Gear Design	326,-

Packages

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+,	8,500
TOL2, TOL1CON, GEO2, GEO3, ZM1, WN6, WN7, LG2, FED12, FED13, WN8, WN9, WN11, DI1, FED15,	0,500
WNXE)	
HEXAGON Mechanical Engineering Base Package (ZAR1+, ZAR3+, ZAR5, ZAR6, WL1+, WN1, WST1,	4.900,-
SR1+, FED1,+, FED2+, FED3+)	4.500,
HEXAGON Spur Gear Bundle (ZAR1+ and ZAR5)	1,585
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	11,500
Package, Helical Spring Package, TR1, FED8, FED9, FED10, ZAR4, GEO4, WN4, WN5,	
FED11,WN10, ZAR1W, FED14)	

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	78	911	>11
Discount/Add.cost	-50%	-20%	0%	10%	15%	20%	25%	30%	35%
(Nexesting Discount means additional cost)									

(Negative Discount means additional cost)

Language Version:

- German and English : all Programs
- French: FED1, FED1+, FED2, FED2+, FED3, FED3+, FED5, FED6, FED7, FED9, WL1+.

- Italiano: FED1, FED1+, FED2, FED2+, FED3, FED3+, FED5, FED6, FED7, FED9, DXFPLOT.

- Swedish: FED1, FED1+, FED2, FED2+, FED3, FED3+, FED5, FED6, FED7, DXFPLOT.

- Portugues: FED1, FED1+

- Spanish: FED1, FED1+

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

Upgrades

For upgrades to network licenses or plus versions or software bundles, upgraded licenses are credited 75%.

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 (program packed, 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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