# **HEXAGON** Info 188

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by Fritz Ruoss

## FED1 +, FED2 +: Ouick Input including international production drawing

The production drawing in English, German, French, Italian, Spanish, Portuguese, Swedish, Dutch can now also be displayed in the background window of the Quick Input with "Display".

FED1+ Compression Spring Software to EN 13906-1 - Quick Ir (Di = 28)Display 44: Production drawing NL c 16: JIS-Goodman ٨ Aux, Image 17: Buckling diagram 18: Relaxation Rx % = f(tau, T, d) 19: Relaxation Rx % = f(tau/tauz, T, d) Prelin 20: Relaxation Rx % = f(tau, T) 21: Relaxation Rx % = f(T, tau) Imag 1 Spire term, accostate O Dime 22: Relaxation Rx % rel = f(t) õ e molate Reca 23: Relaxation Rx F2 = f(t) Num, spire attive n = 8.50 24: spring energy nt = 10.50 Num, spire totali 25: Drawing View Prelim.C 26: Drawing Profile Senso di avvolgimento destrorso ? 27: Drawing 3D sinistrorso 28: temperature diagram G-T Sbavatura spire terminali no O interna O 29: temperature diagram F1-T 30: temperature diagram F2-T esterna 🔾 31: stress tau-s Corsa di lavoro sh = 40 mm32: stress coefficient k Frequenza ciclo di stress f = 0,5 Hz 33: stress tau-d (lin.) 34: stress tau-d (log.) Campo temperatura di lavoro 0 ... 100 °C 35: stress Rm Quick Filo trafilata 36: Production drawing DE+EN Superficie filo laminata 37: Production drawing DE molate 38: Production drawing EN Molla pallinata 39: Production drawing FR Protez.superficiale 40: Production drawing IT 41: Production drawing SV Materiale: EN 10270-1-SH 42: Production drawing ES spring steel wire pat, drawn (ISO 8458-2-SH) 43: Production drawing PT tau perm = 1001 MPa Sollecit.Taglio permessa Production drawing NL G = 82000 MPa Modulo calc. base sollecit. 45: Resonance curve

# Material database fedwst.dbf French

For hot-rolled spring steel, the term "chaux" has been corrected to "chaud".



## **FED6: Quick Input**

In the new quick input, all input windows for the recalculation of a non-linear cylindrical compression spring have been combined in one large input window.

FED6 - Nonlinear cyl. compression spring - Quick Input		×
Display 03: Quick 3 V Aux. [mage V	Drawing name Molla a passo variab Drawing number 38746.56-Z1	
Coils	Line 1 Ejempio	
L0 ~ <+ + - ? d 2 m	nm Line 2	
L0 [mm] n Multiplikator	material	
$1 2 1$ Dm $\sim 22$ m	nm 19: ISO 6931-1-4568 X7CrNiAl17-7 4568-177-00-I	~
2 20 3	nm < surface drawn	$\sim$
4 30 2 L2 40 m		
Lx 50 m		mm
Delete Insert		mm
Calculation method	tolerance L0 EN 15800 Quality Class 2 V L0 = 91 +/- 3,246 / -3,246	mm
sping ?	tolerance F1 EN 15800 Quality Class 2 V F1 = 33,36 +/- 5,142 / -5,142	N
,	tolerance F2 EN 15800 Quality Class 2 V F2 = 97,23 +/- 6,100 / -6,1	N
	tolerance e1 EN 15800 Quality Class 2 V e1 = 4,55 mm	
end coils lined-up and ground 🗸 🗸	tolerance e2 EN 15800 Quality Class 2 v e2 = 0,72 mm	
Lc = ( nt + 0 ) * d max	production compensation by L0,n and d for 2 spring lengths ~	-
production cold coiled (up to d = 17 mm) <	type of stress dynamic 🗸 🗸	
No. of inactive end coils ✓ spring shot-blasted	required load cycles 0 Calc Nreq>1E7?	
end coils 1 (upper)		
end coils 2 (lower)	stress cycle frequency 1/s 0 1/s (f = 0/min)	
	operating temperature T 80 °C <	
coiling direction free V	seat coefficient nue 1 🗸	
Error : Warning: approx.Goodman	▲ external mass m 0 kg <	
Warning: taun>tauz ! Warning: taun>tauz		
Warning: buckling	✓ OK Cancel Help mm <> inch Calc	

Dimensioning of a spring by definition of the progressive spring characteristic curve is not covered by the Quick Input. For this case, use the menu items "Spring characteristic F-s", "Spring characteristic F-L" or "Spring characteristic F-R, L" in the Edit menu. Under "Help \ Expert Mode" you can switch off the expert mode, then only the absolutely necessary menu items are displayed.

₹.	ED6 -	Nonline	ear cyl.	comp	ression sprin	g - 11.fd6	
File	Edit	View	CAD	STL	Document	Help	
Moll		<u>Q</u> uick					
		Load de	eflectio	n curv	e of spring F	- s	
		L <u>o</u> ad de	eflectio	n curv	e of spring F	- L	
		Lo <u>a</u> d de	eflectio	n curv	e of spring F	,R - L	
		<u>C</u> alcula	tion M	ethod			
		+	7		ب		
	<u></u>						<b>s</b> ==
	¢ –	_	-		e - C -		





FSA and FPA are now drawn in the load-extension diagram in operating state (min / max / req). This is the distribution of the external force FA (FAo) on the bolt (S) and the plates (P). This also results in the residual clamping force FKR. This is now no longer drawn as a point, but like a dimension.

Incidentally, a symbolic representation of a sine curve is only drawn in when FAu = 0. Because FAu is not taken into account in the stress diagrams. Exception: FAo and FAu are both less than 0 (pressure load), then FSA and FPA become negative. Otherwise, FAu is only used to calculate the stress amplitude sigmaA. In the assembled state, FAu = 0 and FAo = 0.

Load-extension diagram "Operating condition min" is the representation with the smallest assembly load, but with the largest axial load FA (FAo). This gives the (smallest) residual clamping force FKR.

Under "View \ Diagrams" all load-extension diagrams except for "Operating condition min." were shown. That has now been added. The "MA-FM diagram" is omitted instead.

#### WN2, WN2+: Quick Input

In the quick input, all previous input windows are combined into one large input window. The previous single entry windows are still available. If that is too confusing for you, you can switch off the "Expert Mode", then the menu is reduced to the most important items. Under "Edit" there is then only "Quick Input".

WN2+ Dimensions				×
Display 03: Quick 3	~		Inner part (shaft)	Outer part (hub)
Auxiliary images IST_APPL: Application Example	~	Drawing name	Zahnwelle	Zahnnabe
Dimensions		Drawing number	000001	000002
Database	?	Drawing name 2		
Nominal Diameter dB 120 mm		Line 1	Anwendungsbeispiel	
Pressure angle alpha 30 *	Basic rack	Line 2	zur Demoversion	
Normal module mn 3 mm	Material Inn	er part (shaft)	Material Out	er part (hub)
Number of teeth z 38	<	Material data base		Material data base
Facewidth shaft b1 80 mm	<	material no.		material no.
Facewidth hub b2 80 mm	< <	Material name 30CrMo	V9	Material name GG-30
effective facewidth b0 80 mm	< Y	ïeld point (Rm w/brittle mat.) Re 105	50 MPa 1	'ield point (Rm w/brittle mat.) Re 230 MPa
Dedendum hfp/mn=haP0/mn 0,55 🗸	<	support factor fS 1.2	2	support factor fS 2
borehole diameter shaft dB1 0 mm		Hardness factor fH 1		Hardness factor fH 1
Outer diameter hub dB2 0 mm	< ?	plim = Re * fs * fH = 1	260 MPa	plim = Re * fs * fH = 460 MPa
Quality		Load		
Edit Ase1, Asi1, Ase2, Asi2		Rated power 💿 F	o kw	
shaft hub		Rot.speed On	n 0 /min	
Tolerance series 8 V Tolerance series	s 9 ~	Rated torque	FN 20000 Nm	Teq = TN × KA
tolerance zone s v tolerance zone	e M ∨ □AS	maximum Torque Tr	max 100000 Nm <	
Ase1 0,098 mm it min = -0,14 mm	-Ase2 0.042 mm	application factor		Teq = TN × KA
Asi1 0,035 mm jt max = 0,013 mm	-Asi2 -0,048 mm	load distrib.factor K lamb	bda 1,06 <	
No. of teeth measured External Inte	ernal Spline	load alternating factor f	W 1 < NW 0	fW ? S eq = plim * fw / peq S max = plim * fL / pmax
No. of teeth measured k 7 -5			shaft hub	
Ball and pin diameters DM 6 5.2		load peak frequency factor		NL 0 fL ?
? tooth gap 1 ? to	ooth gap 2 ?	p eq,max = 1 eq,max / (rw plim = Re * fs * fH	v * z) * cos alphaw / (L * hw) * kp	hiß * klambda k phiß ?
☑ Table shaft : Table with over pin dimension instead o	of span width		C Warnia	g: cffmin < cFmin (2: 0,030 < 0,045)
			Error : Warnin	g. on mar ( or mar (c. 0,000 ( 0,040)
OK Cancel Help A	Aux. Image mm <> ine	ch Calc		

#### WN2: New error message (if large backlash)

If a large backlash is selected, then not only the tooth thickness but also the tip and root diameter are smaller when manufacturing using the hobbing process. If the tip diameter becomes smaller than the lower limit of the ISO tolerance h11 (H11 for internal gearing), there is now a new error message. To avoid the warning, the backlash can be distributed over the shaft and hub. Example: Tolerance pairing D7 / c7 instead of H7 / a7.

## WN2: Press fit and generated tip diameter

With tolerance field "j .. v" or "J .. M" the tip circle generated by the tool is larger than the nominal value "da nom". Therefore the tip circle is now reduced by changing the tip height to the tolerance center of "da nom h11 / H11". This increases the head clearance and form oversize cF.

## WN2: Toothing table with tip diameter w/o tip reduction

With tolerance field "j .. v" or "J .. M" the tip diameter calculated from xemin and xemax is larger than the nominal diameter "da nom". Therefore, "da" is cut to the tolerance center "da nom h11 / H11" by means of a tip reduction. In this case, "da" and "k \* m" are displayed in the toothing table instead of "da (xemin)" and "da (xemax)".

The limit value of the form circle diameter "dff lim" is no longer displayed in the gear table, as it is dependent on the counterpart and therefore only applies to the selected shaft / hub joint.

Shaft DIN 5480 - W 120 x 3 x 38 x 8	3		Hub DIN 5480 - N 120 x 3 x 38 x 9M		
No. of teeth	z	38	No. of teeth	z	38
module	m	3	module	m	3
Pressure angle	alpha	30 °	Pressure angle	alpha	30 °
Dedendum coeff	hfp/m	0,55	Dedendum coeff	hfp/m	0,55
Profile shift coeff.	x	0,45000	Profile shift coeff.	x	-0,45000
Profile shift coeff. max.eff.	xe max	0,47829	Profile shift coeff. max.eff.	xe max	-0,43788
Profile shift coeff. min.act.	xe min	0,46010	Profile shift coeff. min.act.	xe min	-0,46386
Tip diameter h11	da1 nom	119,400	Root diameter	df nom	120,000
Tip reduction (xemax)	<u>k*m</u>	0,140	Root diameter (xemax)	df min	119,927
Tip dia.w.tip reduction	da1	119,290	Root diameter (xemin)	df max	120,083
Root form diameter (xemax)	dFf1 max	114,050	Root form diameter (xemax)	dFf2 min	119,447
Root form diameter (xemin)	dFf1 min	113,941	Root form diameter (xemin)	dFf2 max	119,603
Root diameter	df1 nom	113,400	Tip diameter H11	da2 nom	114,000
Root diameter (xemax)	df1 max	113,570	Tip reduction (xemax)	<u>k*m</u>	0,091
Root diameter (xemin)	df1 min	113,461	Tip dia.w.tip reduction	da2	114,110
Tooth thickn. max. eff. (xemax)	s v max	6,369	Tooth gap max. actual (xemin)	e max	6,319
Tooth thickn. max. act. Ref.	s max	6,346	Tooth gap min. act. Ref.	e min	6,263
Tooth thickn. min. actual (xemin)	s min	6,306	Tooth gap min. eff. (xemax)	e v min	6,229
Pin/ball diameter	DM	6,000	Pin/ball diameter	DM	5,250
Measurement over pins	M1max	126,209	Measurement between pins	M2max	109,193
Measurement over pins	M1min Ref.	126,148	Measurement between pins	M2min Ref.	109,097

#### WN2: DIN 5480

In the last info letter it was stated that DIN 5480 does not specify how form diameters are calculated. That was poorly researched, because it is actually described very precisely in DIN 5480 Part 16. Of DIN 5480 there is Part 1, Part 2, Part 15 and Part 16. Part 1 is the most important. Part 2 is not needed, the table values can be calculated in WN2. Part 15 concerns plug gauges and ring gauges. Part 16 concerns the production of the toothing with hob and broaching tool. Parts 3 to 14 no longer exist. In the past, these were different measurement tables that were recombined in Part 2.

In your DIN 5480-1: 2006 you can change the formula for df1 in table 5 from Adf1 = -(0.2m + 1.73 \* (-As + TG))in Adf1 = -((1.3-2 \* hfp) \* m + 1.73 \* (-As + TG))

Then the formula no longer only applies for hfP = 0.55 \* m, but also for 0.6 \* m and 0.65 \* m. This means that the specifications from DIN 5480-1 Chapter 7 are implemented.

# WN4: Quick Input

The individual input windows were integrated in the new Quick Input.

WN4 Quick Input	×
Display         04: Quick 4            Auxiliary images         GEOMETRY: Dimensions of Involute Spline to ANSI B92.1	Inner part (shaft) Outer part (hub) Drawing name Shaft Hub Drawing number 000001 000002
Pressure angle alpha     30     *       Spline Pitch     Spline Pitch P     8 / 16     1/in       O     Diametral Pitch P     8     1/in     (m= 0,1250 in)	Drawing name 2
Fit type       Fillet Root Side Fit         Number of teeth N       25 t         d = 3,1250       in         Facewidth shaft bi       0,9000         in       <	Spline       Flexible Spline       Shaft Torque, T       10001       Ibfin         Material       Carburized, Rc58       Maximum allowable shear stress, Sas       50000       psi         Revolutions       100.000       Maximum allowable compressive stress, Sac       15000       psi         Torque cycles       100,000       Wear life factor, Lw       1.0         Torque cycles       Uni directional       Fatigue life factor, Lf       0.5         Power Source       Light       Spline overload factor, Ko       1.2         Misalignment       0.002 in./in.       Misalignment factor, Km       1.0
ANSI B92.1b - 1996 Centerline runout (diametral) of external part CDe 0.0005 in Centerline runout (diametral) of internal part COi 0.001 in 6 (f = 1.40)  d (es = 0,00434'')  Error : Warning: b < d/2	External       Internal Spline         No. of teeth measured k       5         Ball and pin diameters DM       0.24000 v         0.2160 v       in         tooth gap1 + DM 1       tooth gap2 + DM 2         OK       Cancel         Help       Aux. Image       mm <> inch

**WN5: Quick Input** The individual input windows were integrated in the new Quick Input.

WN5 Quick Input	X
Display       03: Quick 3         Auxiliary images       MEASURE2: Dimension over pins         Calculation method       ISD 4156         Pressure angle alpha       30         30       *         Module m       1         Number of teeth N       25         Facewidth shaft bE       12.5         Facewidth hub bl       12.5         Outer diameter hub 0D       30.46         borehole diameter shaft Din       0         mm       <	Inner patt (shaft)       Outer patt (hub)         Drawing name       Shaft         Drawing number       000001         Downing name 2       000002         Drawing name 2       1         Line 1       ISO 4156 A.6         Line 2       Application Example         Spline       Lw (and Sac) self-defined         Material       Sac self-defined         Revolutions       Lw self defined         Maximum allowable shear stress, Sas       0         MPa       Maximum allowable compressive stress, Sas         Torque cycles       Lf self-defined         Power Source       Ko self-defined         Load intermittent       Ko self-defined         Misalignment       Km self-defined         Misalignment face width       Misalignment factor, Km
Centerline runout (diametral) of external part COe       0       mm         Centerline runout (diametral) of internal part COi       0       mm         Error :       Calculation successful without error messages	External     Internal Spline       No. of teeth measured k     5       Ball and pin diameters DM     1.8       tooth gap1 + DM 1     tooth gap2 + DM 2         OK     Cancel         Help     Aux. Image       mm <-> inch     Calc

WN4,WN5: Production Drawing: Bore, outside diameter and length dimensioned.



# WN8: Root fillet for non-standard sizes added in the database

DIN 5481 for serrations covers the sizes 7x8 to 55x60. There are also 60x65 to 120x125 in the WN8 database. For these non-standardized sizes, fillet radii have been added in the database (RI\_MAX and RE\_MAX).

🛑 DIN 548	1						_		×
<u>File V</u> iew	<u>H</u> elp								
м	•		Searc	h Search	Next 2	/27 OK	Cancel		
NAME	DII	DEE	D	Z	GAMMA_E	RI_MAX	RE_MAX	INF01	
55x60	55	60	57,5	42	60	0,6	0,5	DIN 5481	
60x65	60	65	61,5	41	55	0,4	0,8		
65x70	65	70	67,5	45	55	0,6	0,6		_
70x75	70	75	72	48	55	0,5	0,7		
75x80	75	80	76,5	51	55	0,4	0,8		
80x85	80	85	82,5	55	55	0,6	0,6		
85x90	85	90	87	58	55	0,5	0,7		
90x95	90	95	91,5	61	55	0,4	0,8		
95x100	95	100	97,5	65	55	0,6	0,6		
100x105	100	105	102	68	55	0,5	0,7		
105x110	105	110	106,5	71	55	0,4	0,8		
110x115	110	115	112,5	75	55	0,6	0,6		
115x120	115	120	117	78	55	0,5	0,7		
120x125	120	125	121,5	81	55	0,4	0,8		
<									>

# WN8: Input tolerance tooth thickness and tooth gap for tooth profile drawing

Similar to involute splined shaft-hub joints, you can now also enter a value in WN8 in the CAD and STL menu, which determines the flank clearance and backlash. With WN8 this is the tooth thickness on the splined shaft and the gap width on the toothed hub. Min / Max is the upper and lower dimension, which is calculated from the ISO tolerances A11 / a11 from Dii and Dee. For the production by eroding or 3D printing, the flank clearance can be changed within the tolerance limits. The default value is the tolerance center.

shaft				×
	Sv = p/2 =2	,356		< max
		tooth thickness S	2,3344	<
				< min
	OK	Cancel	Help	
	0	00,1001	p	



If a high surface pressure is to be expected due to a small overlap, the additional reduction of the clamping surface due to a chamfer should also be taken into account. To do this, a clamping plate is divided into two clamping plates. The chamfer is considered to be a cylindrical countersink. The inner diameter of the additional clamping plate is the chamfer diameter, the height of the clamping plate is the height of the chamfer.

Applied to example 1 from VDI 2230, a chamfer of  $1x45^{\circ}$  would be clearly too big, an error message "p perm clamping plate 1! (S = 0.87) "is the consequence.

# SR1 Tip: Countersink due to thread run-out



The thread length is always smaller than the shaft length. There is no "thread to head" with short screws, with rolled and cut threads you need between 2 and 5 thread turns. If you screw thin sheet metal directly, the screw run-out runs onto the thread (error message "IG3 Bolt <0!"). Then you either need a washer, or the nut thread has a cylindrical or conical countersink (or the screw has an undercut, but this is not recommended for reasons of strength). This countersink is modeled in SR1 by defining an additional clamping plate with the height of the countersink and shortening the nut by the same height (see above).

## Tip: Settings when changing the font size in Windows 10

In Windows 10 you can change the display under "Settings \ System \ Display \ Scaling" in steps of 100%, 125%, 150%, 200%. However, this also reduces the graphics resolution. Alternatively, you can change the size in HEXAGON software without changing the Windows system settings. To do this, increase the size of the dialog window and dialog element size under "File\Settings\Graphics". Also check whether the large Quick Input window still fits into your screen when the window size is changed. Otherwise "sizeable?" tick for scroll bar in all input windows.

Directories	Graphics	CAD	Colour	Printer	Printout	Settings	external	Drawing				
Color O colo	graphics-					3840 x	2160				%	<
⊛ mo	nochrom				b	ackground	d colour			Dialog eleme	nt size %	
×	ow Size 3824 2048	<		Zoom		om increm Mouse W pan fa			<	Input	~	
	Input		~							× ° -15	у° 90	z ° 210

## Corona, the fourth

As expected, those returning from vacation bring the fourth corona wave with them. Most of the Balkan countries, just like in 2020. At the top Kosovo, Turkey, Croatia according to RKI from 12.8.2021. In Germany, people who have not been vaccinated are being pressured to finally get vaccinated. Perhaps a little hasty: the vaccine will soon run out again because the vaccinated will come back and ask for their third vaccination. Because the syringe from Biontech and Co. no longer provides protection after 6 months.

# Corona: Superspreader with vaccination certificate

**SWR report:** A total of 34 infections are currently reported around the party night in the "Topsy Turvy" on 2.7.21, according to the Karlsruhe health department. Six people are said to have tested positive, despite full vaccination protection. The virus was alleged to have been spread by an infected woman returning home from Mallorca. She was not tested because she was vaccinated. **Zdf.de** from August 11, 2021: Israel is still a long way from herd immunity. At first glance, the vaccination status of the 400 people who are in hospital with severe courses is particularly surprising and frightening (as of August 11, 1 p.m.): 140 are not vaccinated at all, 10 are single and 240 are even double vaccinated.

**RKI** weekly report of August 12th, 2021: 13.5% of the new corona infected people with severe disease were fully vaccinated (technical jargon: hospitalized symptomatic breakthroughs in vaccination).

**Conclusion:** vaccination does not protect against infection. Since the vaccination is supposed to protect against severe disease and the proportion of those who are vaccinated is still 13.5%, the proportion of those who are vaccinated in all new corona infections may be estimated to be 50%. There are no figures on this because vaccinated people are not tested.

#### Travel tip: Stasi headquarters and BND headquarters in Berlin

If you visit the former Stasi headquarters in Hohenschönhausen in Berlin, you should also visit the new BND headquarters in Berlin-Mitte, on the ground where the GDR's Olympic Stadium and Olympic Village should originally have been built. It is now overbuilt with modern office wings. At the edge is a park with a renatured stream, the Panke. Adorned with an artificial giant palm made of sheet metal and concrete. A new street was built especially for the BND parking garage, Idi-Amin-Street (or similar).

# HEXAGON PRICE LIST 2021-09-01

Base price for single licences (perpetual)	EUR
DI1 Version 2.1 O-Ring Seal Software	190
DXF-Manager Version 9.1	383
DXFPLOT V 3.2	123
FED1+ V31.3 Helical Compression Springs incl. spring database, animation, relax., 3D,	695
FED2+ V21.9 Helical Extension Springs incl. Spring database, animation, relaxiton,	675
FED3+ V21.4 Helical Torsion Springs incl. prod.drawing, animation, 3D, rectang.wire,	600
FED4 Version 8.0 Disk Springs	430
FED5 Version 17.0 Conical Compression Springs	741
FED6 Version 18.0 Nonlinear Cylindrical Compression Springs	634
FED7 Version 14.3 Nonlinear Compression Springs	660
FED8 Version 7.4 Torsion Bar	317
FED9 Version 6.4 Spiral Spring	394
FED10 Version 4.5 Leaf Spring	500
FED11 Version 3.6 Spring Lock and Bushing	210
FED12 Version 2.7 Elastomer Compression Spring	210
FED12 Version 2.7 Elasioner compression Spring FED13 Version 4.2 Wave Spring Washers	220
FED13 Version 2.6 Helical Wave Spring	395
FED14 Version 2.6 Trefical Wave Spring FED15 Version 1.6 Leaf Spring (simple)	180
FED16 Version 1.3 Constant Force Spring	225
FED17 Version 2.1 Magazine Spring	725
GEO1+ V7.5 Cross Section Calculation incl. profile database	294
GEO2 V3.3 Rotation Bodies	
GEO2 V3.3 Rotation Bodies GEO3 V4.0 Hertzian Pressure	205
GEO3 V4.0 Hertzian Pressure GEO4 V5.3 Cam Software	205 265
GEO5 V1.0 Geneva Drive Mechanism Software	205 218
GEO6 V1.0 Pinch Roll Overrunning Clutch Software GEO7 V1.0 Internal Geneva Drive Mechanism Software	232 219
GR1 V2.2 Gear construction kit software	185
GR2 V1.2 Eccentric Gear software	
	550,-
HPGL-Manager Version 9.1	383
LG1 V6.6 Roll-Contact Bearings	296
LG2 V3.1 Hydrodynamic Plain Journal Bearings SR1 V24.0 Bolted Joint Design	<u>460</u> 640
SR1 V24.0 Bolted Joint Design incl. Flange calculation	750
TOL1 V12.0 Tolerance Analysis	506
TOL2 Version 4.1 Tolerance Analysis	495
TOLPASS V4.1 Library for ISO tolerances	<u> </u>
TR1 V6.4 Girder Calculation	945
WL1+ V21.7 Shaft Calculation incl. Roll-contact Bearings	<u> </u>
WN1 V12.4 Cylindrical and Conical Press Fits	
WN2 V11.1 Involute Splines to DIN 5480	250
WN2+ V11.1 Involute Splines to DIN 5480 and non-standard involute splines	<u>380</u> 245
WN3 V 6.0 Parallel Key Joints to DIN 6885, ANSI B17.1, DIN 6892	
WN4 V 6.0 Involute Splines to ANSI B 92.1	276
WN5 V 6.0 Involute Splines to ISO 4156 and ANSI B 92.2 M	255
WN6 V 4.1 Polygon Profiles P3G to DIN 32711	180
WN7 V 4.1 Polygon Profiles P4C to DIN 32712	175
WN8 V 2.6 Serration to DIN 5481	195
WN9 V 2.4 Spline Shafts to DIN ISO 14	170
WN10 V 4.3 Involute Splines to DIN 5482	260
WN11 V 2.0 Woodruff Key Joints	240
WN12 V 1.2 Face Splines	256
WN13 V 1.0 Polygon Profiles PnG	238
WN14 V 1.0 Polygon Profiles PnC	236
WNXE V 2.3 Involute Splines – dimensions, graphic, measure	375
WNXK V 2.2 Serration Splines – dimensions, graphic, measure	230
WST1 V 10.2 Material Database	235
ZAR1+ V 26.7 Spur and Helical Gears	1115
ZAR2 V8.2 Spiral Bevel Gears to Klingelnberg	792

ZAR3+ V10.4 Cylindrical Worm Gears	620
ZAR4 V6.3 Non-circular Spur Gears	1610
ZAR5 V12.3 Planetary Gears	1355
ZAR6 V4.3 Straight/Helical/Spiral Bevel Gears	585
ZAR7 V2.2 Plus Planetary Gears	1380
ZAR8 V1.8 Ravigneaux Planetary Gears	1950
ZAR9 V1.0 Cross-Helical Screw Gears	650
ZARXP V2.6 Involute Profiles - dimensions, graphic, measure	275
ZAR1W V2.6 Gear Wheel Dimensions, tolerances, measure	450
ZM1.V3.0 Chain Gear Design	326
ZM2.V1.0 Pin Rack Drive Design	320
ZM3.V1.0 Synchronous Belt Drive Design	224

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, GEO2, GEO3, ZM1, ZM3, WN6, WN7, LG2, FED12, FED13, WN8, WN9, WN11, DI1, FED15, GR1)	
HEXAGON Mechanical Engineering Base Package (ZAR1+, ZAR3+, ZAR5, ZAR6, WL1+, WN1, WST1,	4,900
SR1+, FED1,+, FED2+, FED3+)	4,000.
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 Complete Spring Package (FED1+, FED2+, FED3+, FED4, FED5, FED6, FED7, FED8, FED9,	4,985
FED10, FED11, FED12, FED13, FED14,, FED15, FED16, FED17)	-
HEXAGON Tolerance Package (TOL1, TOL1CON, TOL2, TOLPASS)	945
HEXAGON Complete Package (All Programs)	14,950

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(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, FED13, FED14, FED17.

- Swedish: FED1+, FED2+, FED3+, FED5, FED6, FED7.
- Portugues: FED1+, FED17
- Spanish: FED1+, FED2+, FED3+, FED17

#### **Updates:**

Software Update	(software Win32/64 + pdf manual)	40 EUR
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Software Update (software 64-bit Win + pdf manual) 50 EUR

Update Mechanical Engineering Package: 800 EUR, Update Complete Package: 1200 EUR **Maintenance contract** for free updates: annual fee: 150 EUR + 40 EUR per program

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#### **Conditions for delivery and payment**

Delivery by Email or download (zip file, manual as pdf files): EUR 0.

General packaging and postage costs for delivery on CD-ROM: EUR 60, (EUR 25 inside Europe) Conditions of payment: bank transfer in advance with 2% discount, or PayPal (paypal.me/hexagoninfo) net. After installation, software has to be released by key code. Key codes will be sent after receipt of payment.

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