

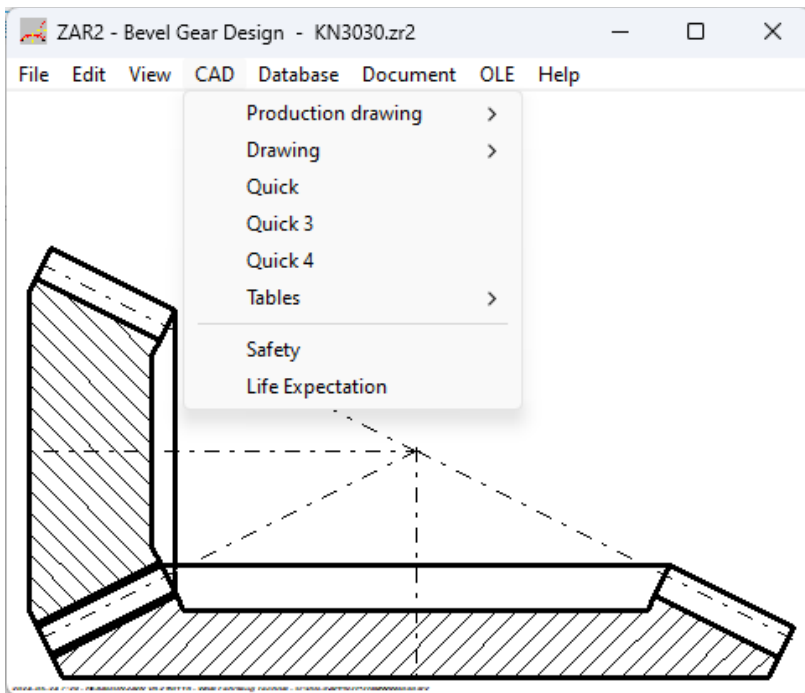
ZAR2



Spiral Bevel Gears Cyclo-Palloid to Klingelnberg

for Windows

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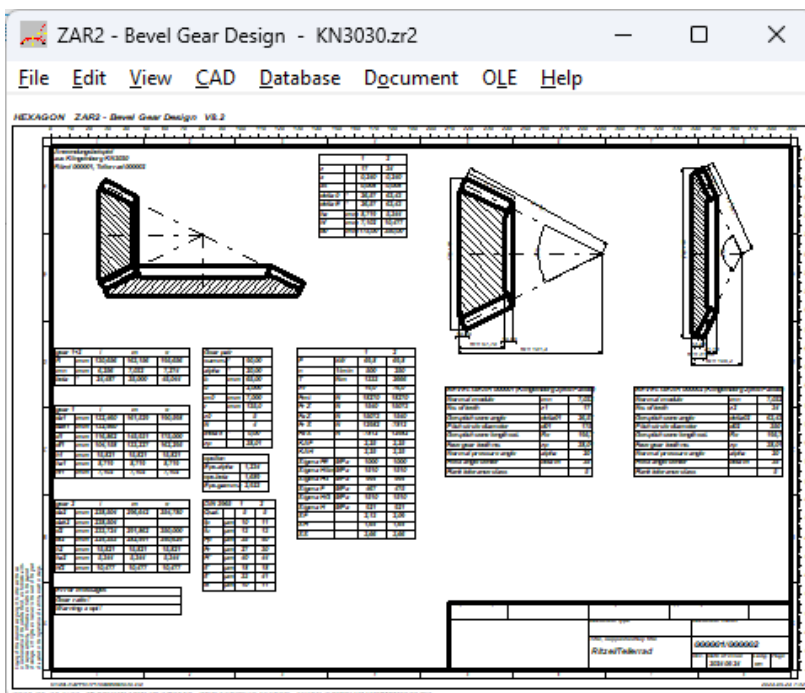
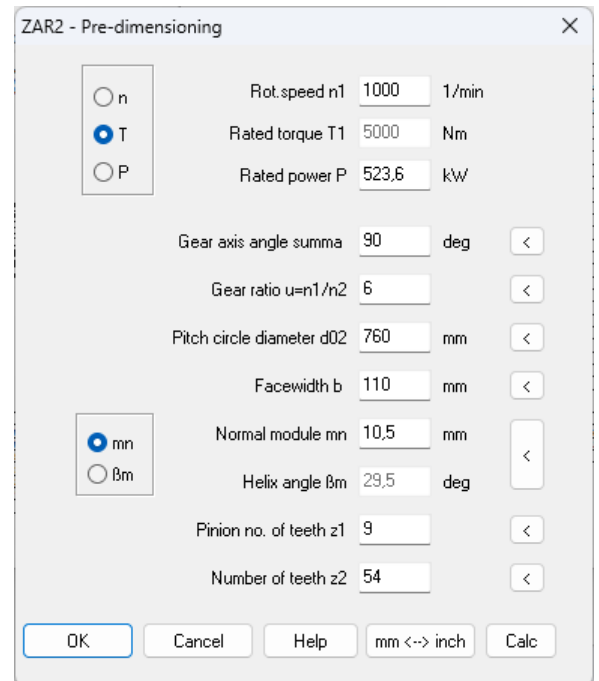


Calculation Base

ZAR2 calculates all dimensions of spiral bevel gears with cyclo-palloid toothing with constant tooth height according to Klingelnberg. Load-bearing capacity with safety factors for tooth breakage, pitting and seizure calculates ZAR2 according to DIN 3991.

Pre-dimensioning

In pre-dimensioning, ZAR2 makes recommendations for the size of the bevel gear, face width, module and number of teeth based on axis angle, gear ratio, pinion speed and torque.



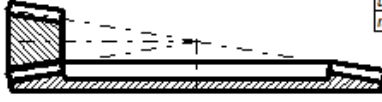
Material Data Base

Material properties can be loaded from the integrated gear material database. Database may be modified and extended by the user.

ZAR2 - Bevel Gear Design - KN3028.zr2

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Anwendungsbeispiel zur Demoversion
Quelle: Klingenberg-Werknorm KN3028
Ritzel 000000, Teillerrad 000000



Gear pair	
summa	90,00
alpha	20,00
b	110,00
u	6,000
m0	10,000

	1	2
z	9	54
x	0,540	-0,540
xs	0,050	-0,050
delta 0	8,48	80,54

	1	2	
P	KW	523,6	523,6
n	1/min	1000	166,7
T	Nm	5000	30000
ZV		9,1	328,5
FmT	N	82098	82098
Fr Z	N	28423	57741
Fa Z	N	57741	28423
Fr S	N	48580	-45077
Fa S	N	-45077	48580
Sigma FE	MPa	800	800
Sigma H1m	MPa	1500	1500
Sigma FG	MPa	805	805
Sigma F	MPa	348	403
Sigma HG	MPa	1275	1275
Sigma H	MPa	1178	1178
SF		2,31	2,00
SH		1,08	1,08
SS		1,19	1,19

	i	m	a
R	275,242	330,242	385,242
mn	9,654	10,500	10,485
beta	16,253	29,506	41,840
da1	122,399	140,483	158,567
da2	544,581	653,085	761,588
df1	90,489	108,583	128,867
df2	542,983	651,497	760,000

epsilon	
Eps.alpha	1,166
eps.beta	1,636
Eps.gamma	2,802

Calculation

The pre-dimensioning results can be used in the geometry calculation. The normal module can be calculated from the cutter module or reverse. The program supports an angle correction if this is necessary, likewise the strength matching of pinion and bevel wheel via tooth thickness variation. ZAR2 calculates the minimum addendum modification for the pinion and the addendum modification factors for same specific sliding. All dimensions and contact ratios are calculated. ZAR2 determines the permissible deviations in accordance with DIN 3965 from the tooth flank tolerance class.

Strength Calculation

The safety factors SF for tooth breakage, SH for pitting and Ss for seizure resistance are determined in the strength calculation according to DIN 3991. The individual factors can be modified.

Diagrams

Safety factors and life expectation as function of input torque can be displayed as diagram.

Tooth Forces

Axial and radial forces during push/pull operation are calculated. These values can be exported to the shaft calculation program WL1+.

Load Spectrum

ZAR2 allows you to define and calculate a load spectrum, with output of a life expectancy diagram.

CAD Interface

Drawings and diagrams can be exported to CAD via DXF or IGES interface.

User Interface

The dialogue windows of ZAR2 allow even the less experienced PC user to find his way around the program quickly. ZAR2 provides users with a relevant help text wherever they are in the program. When the demo mode is selected, ZAR2 runs through a demo program in which an example calculation is performed. If error messages appear, users can get description and remedy suggestions.

Units

ZAR2 can be switched between metric units (mm, N,MPa) and imperial units (inch, lbf, psi).

System Requirements

ZAR2 is available as 32-bit app or as 64-bit app for Windows 11, Windows 10, Windows 7.

Scope of Delivery

Software with user manual (pdf), non-expiring license for unlimited time use with update rights.

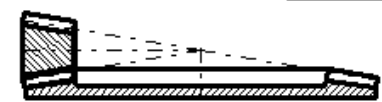
Guarantee

HEXAGON gives a 24 month guarantee on full functionality of the software. We provide help and support by email without extra charge. Registered users are regularly kept informed of updates and new editions.

ZAR2 - Bevel Gear Design - 6336_6.zr2

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Application example for demo version
Pinion 000000, Gear 000000



ZMN 3985		1	2
Querk		5	5
br	µm	17	13
fr	µm	14	16
Fp	µm	35	49
Fv	µm	38	37
Fv'	µm	43	54
n'	µm	21	23
n''	µm	36	34
n'''	µm	12	14

gear 1+2		i	m	a
fr	mm	275,242	330,242	385,242
mn	mm	9,654	10,500	10,485
beta		16,253	29,506	41,840

epsilon	
Eps.alpha	1,163
eps.beta	1,636
Eps.gamma	2,738

	1	2	
P	KW	523,6	523,6
n	1/min	1000	166,7
T	Nm	5000	30000
ZV		9,1	328,5
FmT	N	82098	82098
Fr Z	N	28423	57741
Fa Z	N	57741	28423
Fr S	N	48580	-45077
Fa S	N	-45077	48580
KAF		1,00	1,00
KAF'		1,00	1,00
Sigma FE	MPa	800	800
Sigma H1m	MPa	1500	1500
Sigma FG	MPa	805	805
Sigma F	MPa	348	404
Sigma HG	MPa	1275	1275
Sigma H	MPa	1180	1180
SF		2,32	1,99
SH		1,08	1,08
SS		1,19	1,19

	i	m	a
da1	122,898	140,690	158,774
da2	544,547	653,090	761,554
df1	90,499	108,583	128,867
df2	538,779	645,282	753,788
df3	23,625	23,625	23,625
ha1	16,273	16,273	16,273
ha2	7,350	7,350	7,350

Load spectrum	
N eqH	3,84E3
N eqH'	3,84E3
KA F	3,94
KA H	3,81

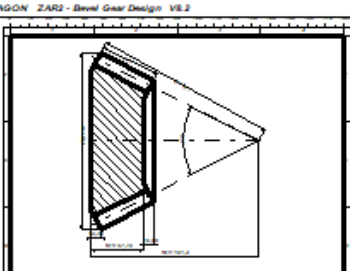
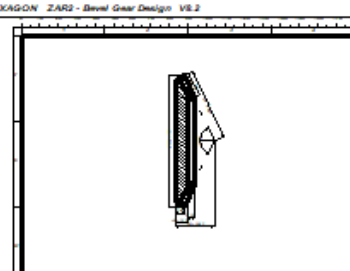
Gear pair	
summa	90,00
alpha	20,00
b	110,00
u	6,000
m0	10,000
r	210,0
z0	5
n	4
delta A	8,00
ep	54,74

Error messages	
Warning: SH please! (Load, Coll.)	
Warning: KA <=> Load, Coll.	
Gear ratio !	

ZAR2 - Bevel Gear Design - KN3030.zr2

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HEXAGON ZAR2 - Bevel Gear Design V8.2

BEVEL GEAR 000001 (Klingenberg Zyklo-Planet)		
Normalmodule	mm	7,350
No. of teeth	z1	17
Gear pitch cone angle	delta0/2	26,37
Pitch circle diameter	da1	173
Gear pitch cone length ext.	ra	195,7
Face gear tooth no.	z2	26,01
Normal module angle	beta	29
Wobb angle center	delta m	25
Flank tolerance class		5
Part number complete gear		000002
No. of teeth complete gear		34

BEVEL GEAR 000002 (Klingenberg Zyklo-Planet)		
Normal module	mm	7,350
No. of teeth	z2	34
Gear pitch cone angle	delta0/2	52,63
Pitch circle diameter	da2	350
Gear pitch cone length ext.	ra	195,7
Face gear tooth no.	z1	26,01
Normal module angle	beta	29
Wobb angle center	delta m	25
Flank tolerance class		5
Part number complete gear		000001
No. of teeth complete gear		17