

GR2

Eccentric Gear Design



www.hexagon.de

Software for Windows

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GR2 Exzentergetriebe - demof.gr2

Datei Bearbeiten Ansicht CAD STL Dokument OLE Hilfe

Load		Dimens. Main		Load capacity	
	1	2			
P	kW	0,145	0,13	l	30
T	Nm	0,926	25	jd	31
n	rpm	1500	50	exz	mm
tau	MPa	5	14	dcase	mm
Sig.b	MPa	20	28	bcase	mm
Sig.v	MPa	21	26	L.tor	mm
Dimens.		1	2		
dshaft	mm	12	25	Fr.gear	N
Lshaft	mm	15	30	Fr.gear	N
Fr shaft	N	30	1000	Fr.gear	N
dgear	mm	55,16	57	Fr bolt	N
				p.max.z	MPa
				p.Hertz	MPa

Bearings		1	2	3	4	5
Name		1E101	1E100	608	7205	7205
Loc.		in/case	ecc.gear	in/out	out/case	out/case
Fr	N	575	964	554	4557	4025
C	N	5070	4620	3450	15600	15600
Co	N	2360	1960	1370	10200	10200
Cu	N	100	83	57	430	430
So	N	4,105	2,033	2,472	2,239	2,534
S	N	8,818	4,793	6,225	3,424	3,875
L10	1EG	685,6	110	241,3	40,13	58,2

Software for eccentric gears

Eccentric gears are characterized by a large gear ratio (20 .. 100) with low backlash and relatively small dimensions.

Gear unit

Core of the eccentric gearbox is a ring gear with a rolling planet wheel inside. The numbers of teeth of ring gear and planetary gear typically differ only by 1 to 3 teeth in order to achieve a high transmission ratio ($i = zP / (zH - zP)$ with ring gear fixed). The teeth may be involute or cycloidal, and even a friction gear would theoretically be possible.

Drive and output

The planetary gear is driven by an eccentric shaft. The output shaft takes over the opposite rotation of the planetary gear around the center by means of rollers that dive into larger holes in the planetary gear. With blocked output shaft and output via the ring gear, the gear ratio is still slightly larger ($i = zH / (zH - zP)$) and the direction of rotation is same as input shaft.

GR2 Exzentergetriebe - rs500i63.gr2

Datei Bearbeiten Ansicht CAD STL Dokument OLE Hilfe

RS500i63 Rotospin
Spinax
Rotospin RS 500-A
63

Load		Dimens. Main		Load capacity	
	1	2			
P	kW	2,943	2,796	l	62,64
T	Nm	14,96	890	jd	63,64
n	rpm	1879	30	exz	mm
tau	MPa	2	5	dcase	mm
Sig.b	MPa	8	5	bcase	mm
Sig.v	MPa	9	10	L.tor	mm
Dimens.		1	2		
dshaft	mm	40	100	Fr.gear	N
Lshaft	mm	64	80	Fr.gear	N
Fr shaft	N	0	5000	Fr bolt	N
dgear	mm	206,7	210	p.max.z	MPa
				p.Hertz	MPa

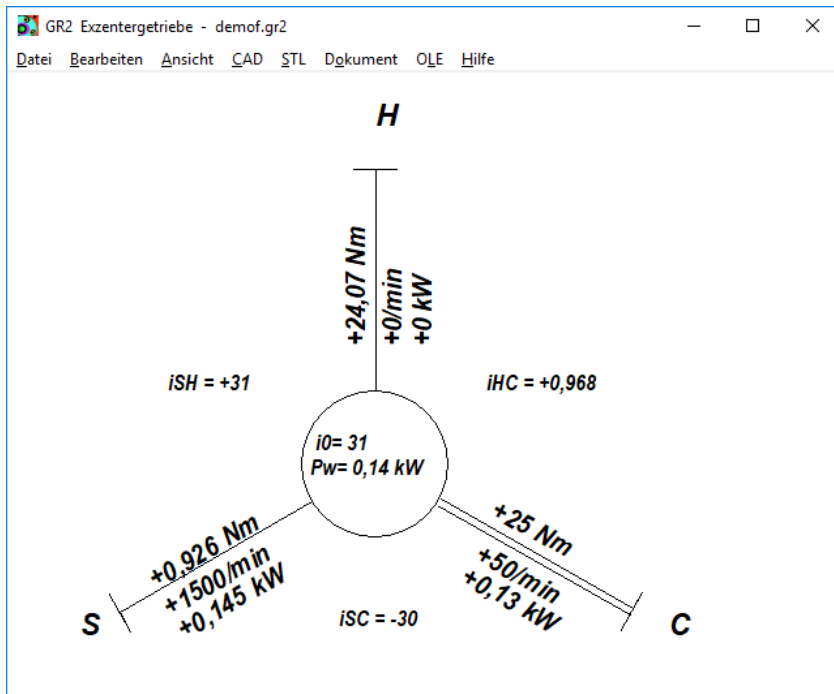
Bearings		1	2	3	4	5
Name		6008	6007	6006	33020	33020
Loc.		in/case	ecc.gear	in/out	out/case	out/case
Fr	N	4833	9999	5165	41511	30230
C	N	16500	15000	13300	224000	224000
Co	N	11600	11600	8300	350000	350000
Cu	N	490	440	355	41500	41500
So	N	2,4	1,16	1,607	9,395	12,9
S	N	3,476	1,9	2,575	5,396	7,410
L10	1EG	42,00	6,862	17,07	275,6	793,2

Roller bearings

Both, drive shaft and output shaft require two roller bearings. One roller bearing of the drive shaft is bedded in the output shaft. The fifth roller bearing is needed between eccentric shaft and planetary gear. The GR2 software is supplied with databases of groove ball bearings, angular contact ball bearings, cylindrical roller bearings, tapered roller bearings, needle roller bearings and others.

Preliminary Design

In the preliminary design, gear ratio and performance data are used to propose diameters of drive shaft, output shaft and toothing. This results in the dimensions of Wälzlager and gears, eccentric shaft and output shaft, bearing caps and on the output side.



Dimensions

In the input window "Dimensions" you can optimize and modify the preliminary design data. Appropriately, one begins with selection of the bearings from database. After the 5 rolling bearings are fixed, most dimensions are fixed. If desired, GR2 calculates default values for the remaining data fields.

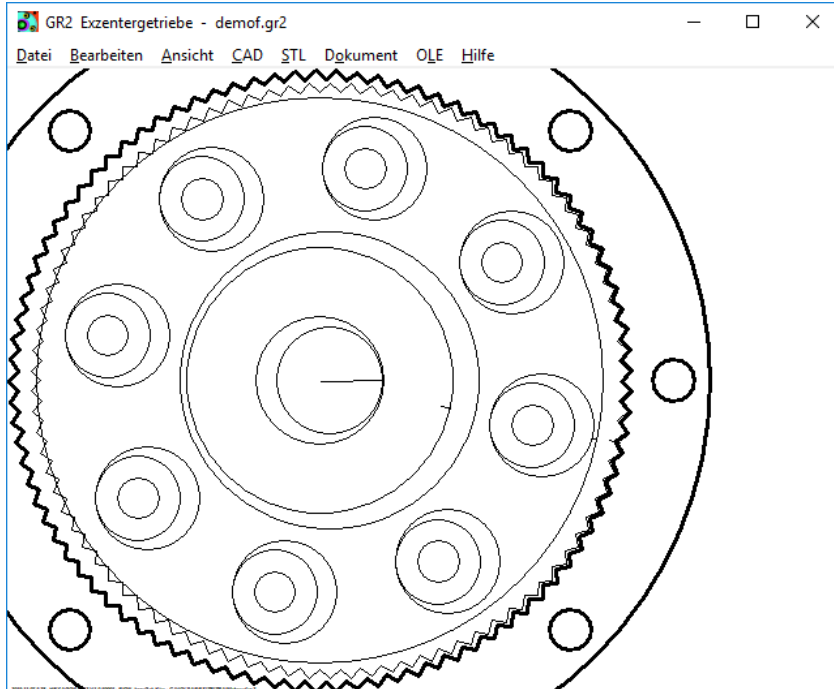
Calculation

GR2 calculates safety factors and life expectation of the roller bearings. The most important loads and stresses of the gear components are also calculated. However, the gear pair is not calculated. For the exact calculation of the individual components there are interfaces to HEXAGON software for gear calculation and shaft calculation.

Data transfer to calculation programs

GR2 generates a ZAR file with ring wheel and planet wheel gear data that can be opened and calculated directly with HEXAGON ZAR1+.

From the drive shaft, output shaft, and drive pins on the output shaft, GR2 generates WL1 files with shaft geometry and loads that can be opened and calculated directly with HEXAGON WL1+ software for shaft calculation.



Wolf chart for planetary gearbox

An eccentric gear can be calculated and displayed like a planetary gear. Sun gear S is the eccentricity of the drive shaft, Carrier C is the output shaft. Hollow wheel H is the ring gear.

Animation

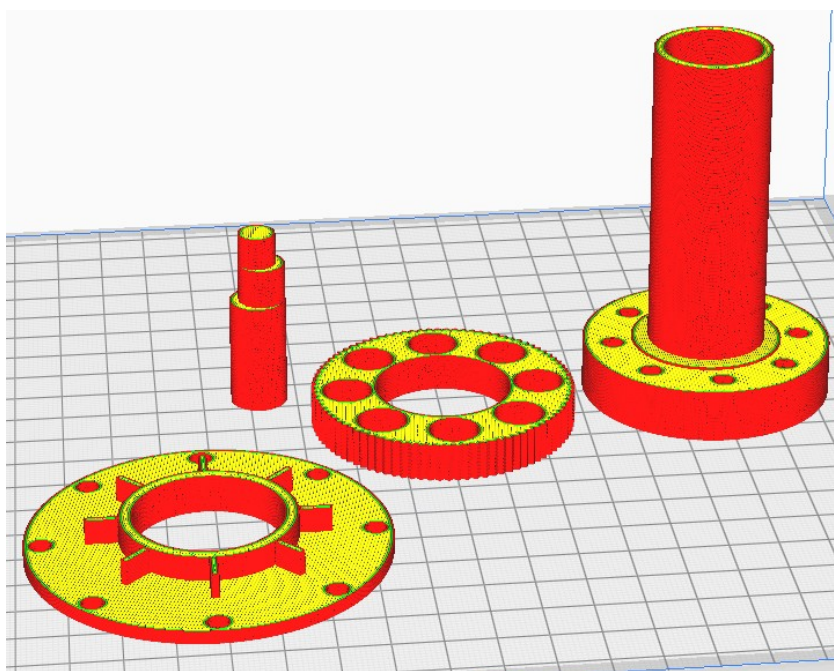
In an animation you can run the calculated eccentric gear with rotation of the planetary gear, drive shaft and output shaft on the screen.

Model gearbox made of 3D printer

GR2 generates STL files for 3D printing of drive shaft, output shaft, bearing caps, spacer, rollers. Planetary and ring gear STL files are available from ZAR1+. Only need rolling bearings, screws and pins to build a functional model of the calculated eccentric gear.

CAD Interface

Drawings and diagrams can be exported as DXF or IGES files in CAD.



Delivery

Calculation program with user manual (pdf), license agreement for unlimited right of use with update authorization.

System Requirements

GR2 is available as a 32-bit and 64-bit application for Windows 10, 8, 7.

Warranty

HEXAGON provides a warranty of 24 months on the software. Free deployment support (via e-mail).