

GR2



Eccentric Gear Design

Software for Windows

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GR2 Exzentergetriebe - demo.gr2

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Load		1	2	Dimens. Main		Load capacity	
P	kW	0.145	0.13	IS C	30	Fr gear	N 906.4
T	Nm	0.926	25	ISH	31	Fr gear	N 906.4
n	1/min	1500	50	exz	mm 0.919	Fr gear	N 1282
tau	MPa	5	14	dcase	mm 70	Fr bolt	N 617.3
Sig.b	MPa	18	27	dcase	mm 65.2	p.max z	MPa 19
Sig.v	MPa	19	36	L tot	mm 121.2	Sig.b.z	MPa 393
						p.Hertz	MPa 776

Dimens.		1	2
dshaft	mm	12	25
Lshaft	mm	18	38
Fr shaft	N	0	0
dgear	mm	55.16	57

Bearings		1	2	3	4	5
Name		1E101	1E100	608	6005	6005
Loc.		in/case	ecc./gear	in/out	out/case	out/case
Fr	N	467	964	497	2948	1417
C	N	5070	4620	3450	11200	11200
CO	N	2360	1960	1370	6550	6550
Cu	N	100	83	57	275	275
SB		5.349	2.833	2.759	2.222	4.623
S		10.85	4.793	6.947	3.799	7.906
L10	TE6	1276	110	335.3	54.82	494

Software for eccentric gears

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

Gears

The core of the gear is a ring gear on which a planetary gear rolls. The number of teeth on the ring gear and planetary gear typically differs by only 1 to 3 teeth in order to achieve a high gear ratio ($i = zP / (zH - zP)$ with a fixed ring gear). The gearing can be an involute gearing, and a friction gear would also be theoretically possible.

Drive and output

The planetary gear is driven by an eccentric shaft. The output shaft takes over the counter-rotation of the planetary gear around the center by means of rollers that engage in holes in the planetary gear (larger by the eccentricity). If the output shaft is blocked and the output is via the ring gear, the transmission ratio is slightly higher ($i = zH / (zH - zP)$) and the direction of rotation is the same.

GR2 Exzentergetriebe - rs500i63.gr2

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Load		1	2	Dimens. Main		Load capacity	
P	kW	2.943	2.796	IS C	62.64	Fr gear	N 8612
T	Nm	14.96	890	ISH	63.64	Fr gear	N 8612
n	1/min	1879	30	exz	mm 1.65	Fr gear	N 12179
tau	MPa	2	5	dcase	mm 252	Fr bolt	N 6846
Sig.b	MPa	8	5	dcase	mm 126	p.max z	MPa 24
Sig.v	MPa	9	10	L tot	mm 270	Sig.b.z	MPa 160
						p.Hertz	MPa 1019

Dimens.		1	2
dshaft	mm	40	100
Lshaft	mm	64	80
Fr shaft	N	0	5000
dgear	mm	206.7	210

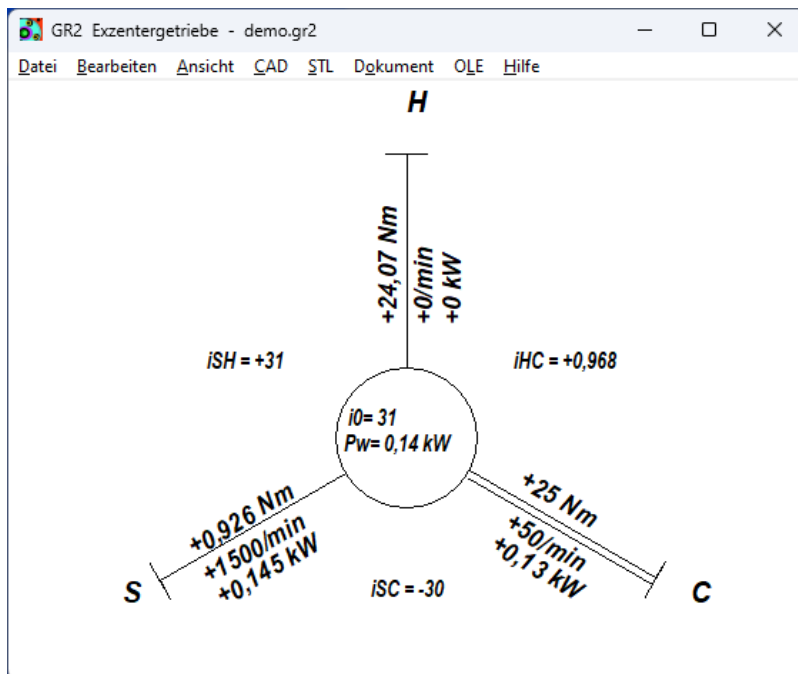
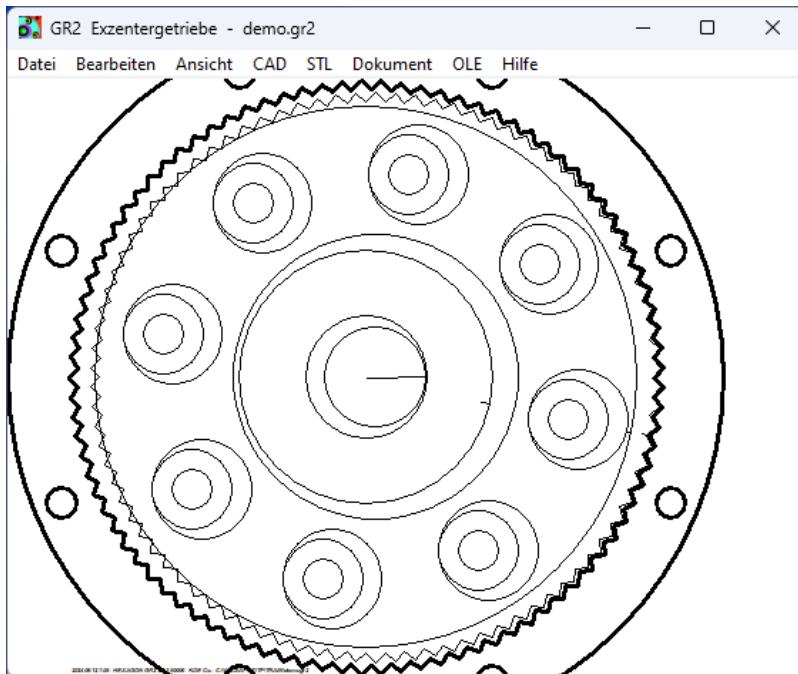
Bearings		1	2	3	4	5
Name		6008	6007	6006	6020	6020
Loc.		in/case	ecc./gear	in/out	out/case	out/case
Fr	N	4833	9999	5165	37236	25980
C	N	16800	19000	13300	60500	60500
CO	N	11600	11600	8300	54000	54000
Cu	N	490	440	355	2040	2040
SP		2.4	1.16	1.607	1.45	2.079
S		3.476	1.9	2.575	1.625	2.329
L10	TE6	42.00	6.862	17.07	4.289	12.63

Rolling bearings

The drive shaft and output shaft are each supported by two bearings, with one side of the drive shaft being supported in the driven shaft. The fifth rolling bearing is used to support the planetary gear on the eccentric shaft. The GR2 software is supplied with databases of deep groove ball bearings, angular contact ball bearings, cylindrical roller bearings, tapered roller bearings, needle bearings, etc.

Preliminary design

In the preliminary design, suggestions for the diameter of the drive shaft, output shaft and gearing are made from the transmission ratio and performance data. This results in the dimensions of the rolling bearings and gears, eccentric shaft and output shaft, bearing caps on the drive side and output side.



Dimensions

In the dimensions input window, you can optimize and adjust the data from the preliminary design. It is advisable to start by selecting the rolling bearings from the database. After the 5 rolling bearings have been determined, most of the dimensions are fixed. GR2 calculates suggested values for the remaining data fields on request.

Calculation

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

Data transfer to calculation programs

GR2 generates files with gear data and load data from the ring gear and planet gear, which can be opened and calculated directly with HEXAGON ZAR1+. GR2 generates ready-made w1 files with shaft geometry and loads from the drive shaft, output shaft, and drive pin on the output shaft, which can be opened and calculated directly with HEXAGON WL1+ for shaft calculation.

Wolf diagram for planetary gears

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.

Animation

In an animation, the calculated eccentric gear can be shown on the screen with rotation of the planing gear, drive shaft and output shaft.

Model gear from 3D printer

GR2 generates STL files for 3D printing of drive shaft, output shaft, bearing cover, spacer ring, rollers. STL files of planetary gear and ring gear can be obtained from ZAR1+. All that is missing are rolling bearings, screws and pins to build a functional model of the calculated eccentric gear.

CAD interface

Drawings and diagrams can be imported into CAD to scale as DXF or IGES files.

Scope of delivery

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

System requirements

GR2 is available as a 32-bit and 64-bit application for Windows 11, Windows 10, Windows 7.

Warranty

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.

