

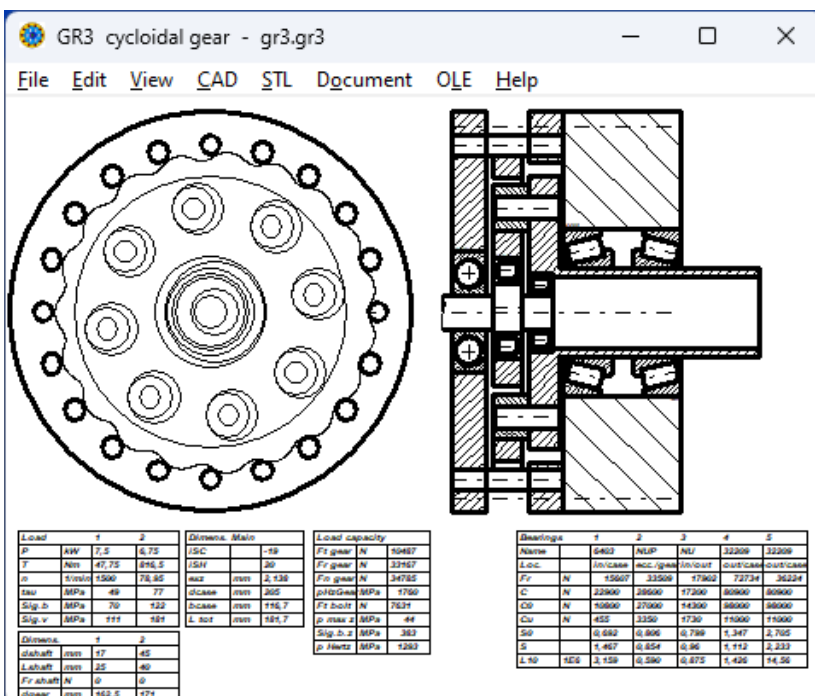
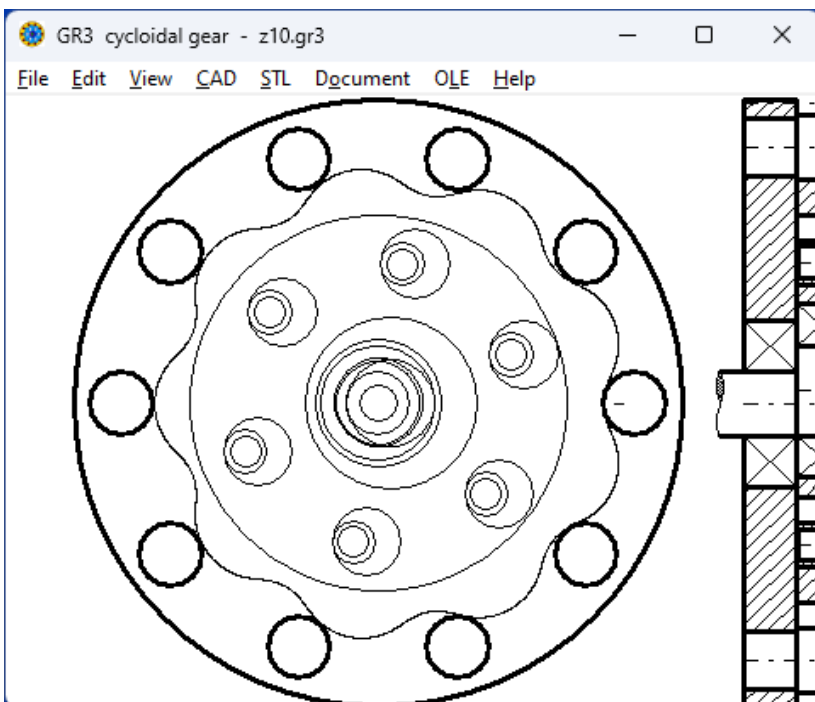
# GR3



## Cycloid Gear Design

Software for Windows

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### Software for cycloid gears

Cycloid gears are eccentric gears, whereby in the cycloid gear a cam disk rolls on a ring of cylindrical bolts. Eccentric gears are characterized by a large gear ratio (10 .. 100) with little torsional backlash and relatively small dimensions.

### Cycloid disk and bolt ring

The core of the gear is the cycloid disk (planetary gear), which rolls on cylindrical bolts on a bolt circle (ring gear). The number of teeth on the cycloid disk is 1 less than the number of bolts that form the ring gear. The gear ratio is equal to the number of teeth on the cycloid disk (if ring gear fixed).

### Drive and output

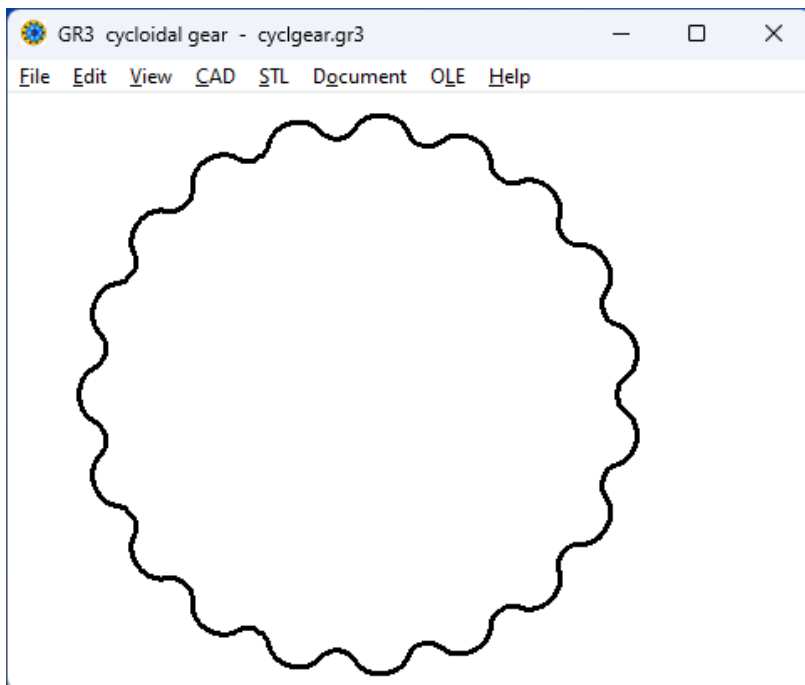
The cycloid disk is driven by an eccentric shaft. The output shaft takes over the counter-rotation of the planetary gear around the center by means of rollers that plunge into holes in the planetary gear. If the output shaft is blocked and the output is via the ring gear, the transmission ratio is slightly higher ( $zH = \text{number of bolts}$ ) and the direction of rotation is the same.

### Rolling bearings

The drive shaft and output shaft are each supported by two bearings, with one side of the driving shaft being supported in the driven shaft. The fifth rolling bearing is used to support the planetary gear on the eccentric shaft. The GR3 software is supplied with databases of deep groove ball bearings, angular contact ball bearings, cylindrical roller bearings, tapered roller bearings, needle bearings, self-aligning ball bearings and spherical roller bearings.

### Preliminary design

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



### Dimensions

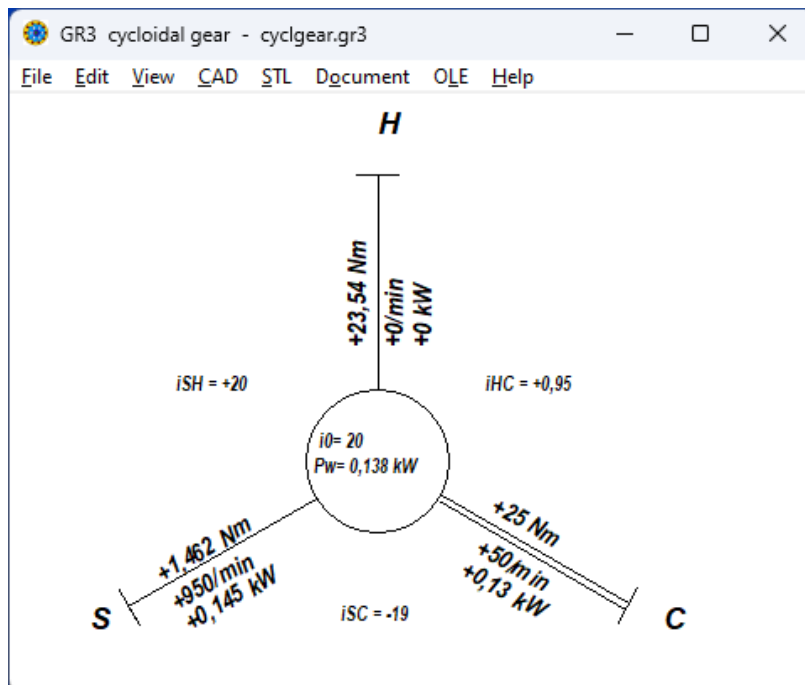
In the dimensions input window, you can optimize and adjust the data from the preliminary design. It is advisable to start by selecting the rolling bearings from the database. After the 5 rolling bearings have been determined, most of the dimensions are fixed. GR3 calculates suggested values for most data fields on request.

### Cycloid disk (cam disk)

GR3 generates the exact contour of the cycloid disk. The number of support points and flank clearance can be configured. The profile factor  $x$  from 0.1 to 0.9 can be used to vary the tooth height and eccentricity.

### Calculation

GR3 calculates the safety and service life of the rolling bearings. The most important loads and stresses of the gear components are also calculated. There are interfaces to WL1+ for the precise calculation of the individual components.



### Data transfer to calculation programs

GR3 generates w1 files with shaft geometry and loads from the drive shaft, output shaft, ring gear bolt and driver bolt, which can be opened and calculated directly with HEXAGON WL1+ for shaft calculation. And you can import gr2 data files of our GR2 software for a fast conversion into a cycloid gear.

### Wolf diagram for planetary gears

An eccentric gear can be calculated and displayed like a planetary gear. Planetary gear P is the cam disk, ring gear H is formed from the bolts rolling on it, 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 run on the screen with the rotation of the planar gear, drive shaft and output shaft.

### Model gear from 3D printer

GR3 generates STL files for 3D printing of cam disk, drive shaft, output shaft, bearing cover, bolts and rollers. All that is missing are rolling bearings, screws and pins to build a functional model of the calculated cycloidal gear.

Load		Dimens. Main		Load capacity	
P	N	ISC	iSH	F <sub>z</sub> gear	N
0.145	0.13	-19	20	974.8	
1.462	25			2539	
950	30			2759	
MPa	mm	mm	mm	MPa	mm
7	14	70	197.7	197.7	
47	37	58.2	617.2	617.2	
49	44	94.2	19	19	
			393	393	
			902	902	

Dimens.		Bearing	
cl shaft	l shaft	1	2
12	25	10401	10500
15	30	608	6002
0	0	6002	6005
54.15	57		

Bearing		1		2		3		4		5	
Name	Loc.	10/Case	10/Case	10/Case	10/Case	10/Case	10/Case	10/Case	10/Case	10/Case	10/Case
FR	N	1237	2552	1315	4305	3483					
C	N	5070	4620	3450	13200	11300					
CS	N	2350	1960	1370	5550	6550					
Cu	N	590	83	57	275	275					
S0		1.907	0.768	1.042	1.039	1.981					
S		4.088	1.87	2.624	1.776	3.217					
L/No	REG	58.80	5.933	18.07	5.906	33.29					

### 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 non-expiring right of use with update authorization.

### System requirements

GR3 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.