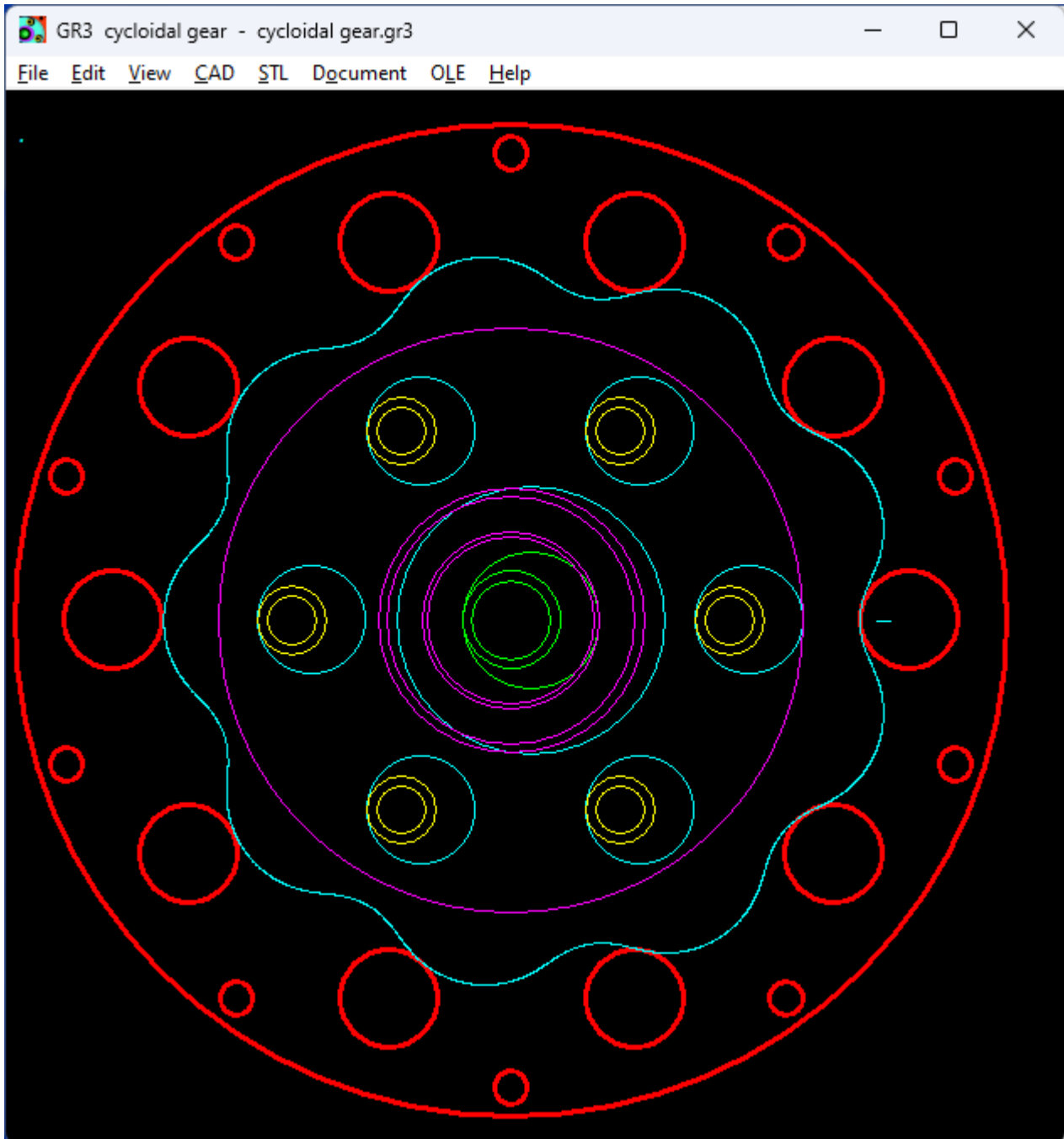


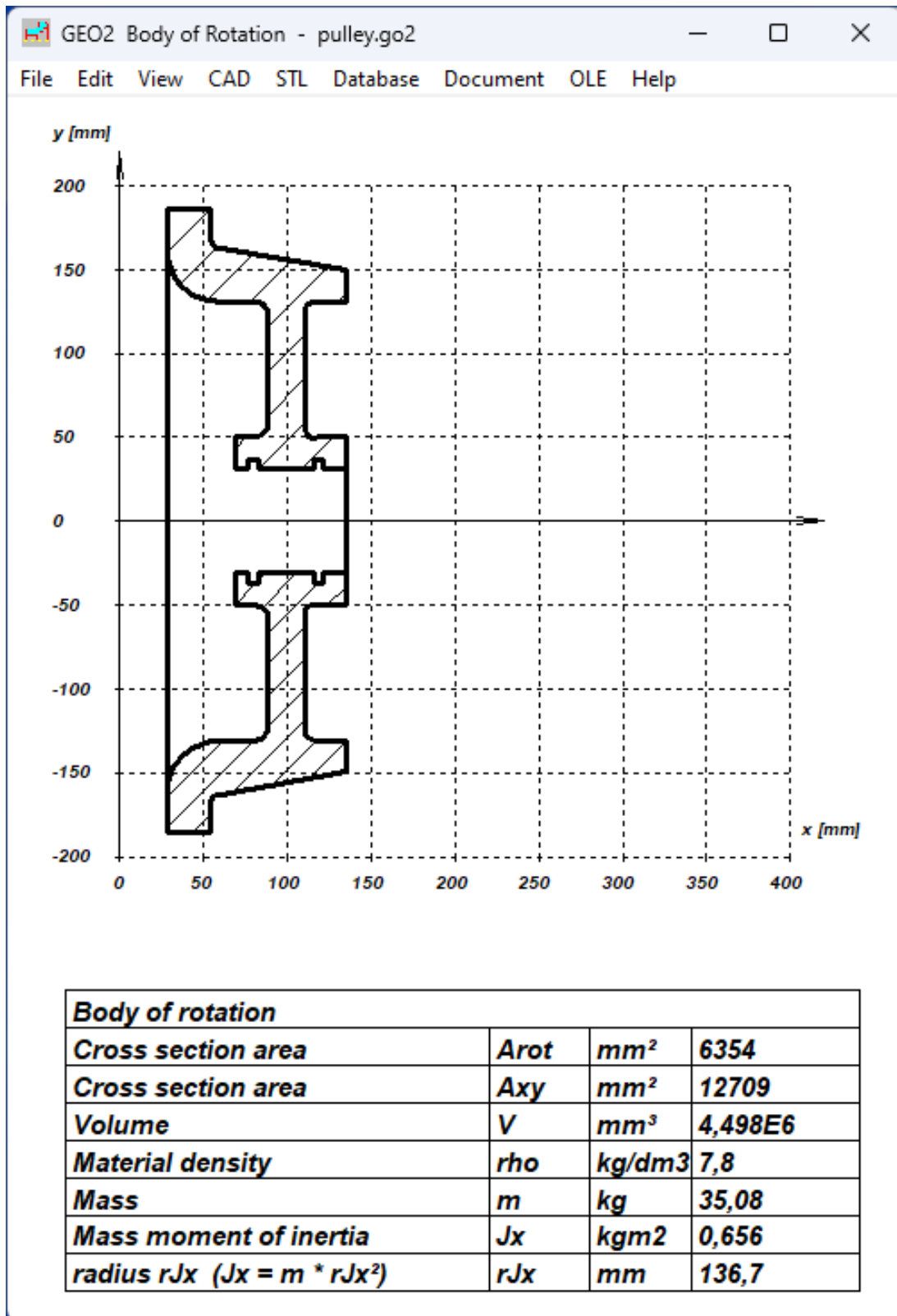
by Fritz Ruoss

GR3 – Cycloidal Drive

With GR2 we already have software for designing eccentric gears. Similar software GR3 for cycloidal drives will soon be available. This cycloidal drive is also an eccentric gear. The only difference to GR2 is that the gear pair with involute teeth is replaced by a cycloid gear pair. The “cycloid ring gear” consists here of cylindrical bolts on a bolt circle. The cycloid disc rolls eccentrically on the bolts. The number of teeth on the cycloid disc is 1 less than the number of bolts. The eccentric gears, in turn, can be viewed like a planetary gear: with a ring gear or bolt ring, planetary gear or cycloid disk, and the eccentric shaft as the sun gear.

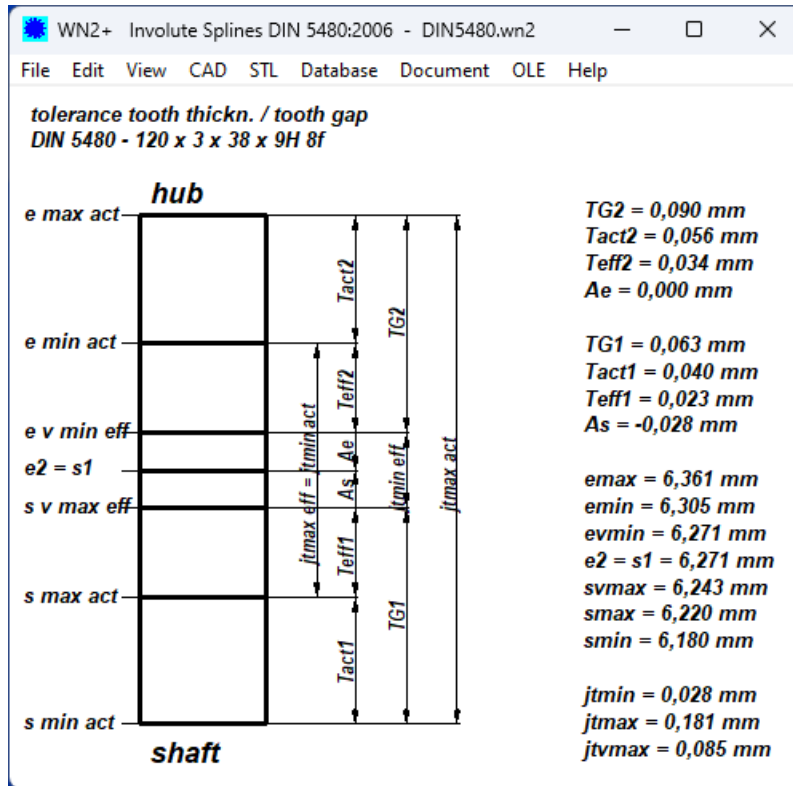
GEO2: Equivalent radius for mass moment of inertia

For point masses, the mass moment of inertia is calculated with “ $J = m * r^2$ ” with m = mass and r = circular orbit radius. In GEO2, an equivalent radius “ r_{Jx} ” is now calculated, with which the mass moment of inertia is “ $J_x = m * r_{Jx}^2$ ” ($r_{Jx} = \text{SQRT}(J_x/m)$). This is useful when assessing the design if the mass moment of inertia should be as large or as small as possible.



WN2/WN2+: “Actual” and “Effective” added for tolerances and backlash

The “actual” tolerances refer to a single tooth; the “effective” tolerances are used to calculate the torsional backlash between the toothed shaft and the toothed hub. In DIN 5480 there are “emin” and “evmin” for “reference mark min.actual” and “tolerance limit min.effective”. “act” and “eff” have been added to the tolerance graphic where there is space.

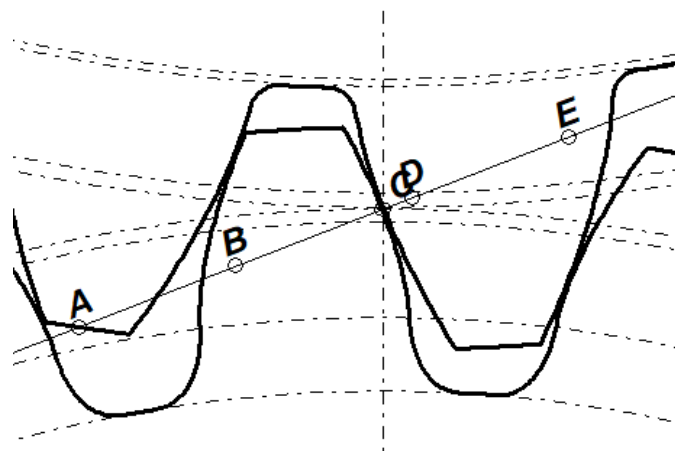


ZAR1+, ZAR5, ZAR7, ZAR8: Warning “cffmin < 0” only if in tooth mesh

The warning $cffmin < 0$ came relatively often, and sometimes unnecessarily. Cffmin is the clearance between the outside diameter da and the base circle diameter of the mating gear (a =center distance):

$$cffmin1 = a - (da1 + dffmax2) / 2$$

$$cffmin2 = a - (da2 + dffmax1) / 2$$



As shown here, the tooth head of wheel 2 protrudes deep into the root curve, but does not touch it. This particularly affects gears with a small number of teeth. In newer versions, the error message will only appear if the tooth tip can hit the root fillet shortly before tooth engagement.

ZAR5, ZAR7, ZAR8: Enter individual ZW factors

There is a change if you do not want to calculate the K,Y,Z factors from the program according to ISO 6336, but enter them individually yourself. The factor ZW must now be entered individually for each gear, no longer for each gear pair. For ZAR5 as ZW1,2,3 or ZW-S, ZW-P and ZW-H instead of the previous ZW-SP and ZW-PH.

SR1/SR1+: Quick3 with overlapped tables if DIN 25201-4 and temperature set

SA=A τ u τ auB/FQ	26,11	Rm nut	MPa	900	al.tors	deg	0,1
SL=h \cdot d \cdot Re/FQ	35,34	Rm-25	MPa	900	d _{km}	mm	29,30

DIN 25201-4				Deformation cone			
a			12	DA,Gr	mm		99,03
u _q	mm		1,868	phi	deg		21,6
u _{q,kons}	mm		2,319	W / betaL			1 / 4,92
u _{q,zul}	mm		2,799				

i	material	E [MPa]	pG	pBmax	dwo	d _{wu}	d ₁ [mm/N]	alpha T	l-25 mm	E -25	pG-25	p20	p-25	delta -25
1	QUAL.10	210000	1040	718	33,6	36,8	0,0400E-6	11,5E-6	3,998	210000	1040	719	718	0,0400E-6
2	1.7218 25CrMo4	211000	440	392	36,8	46,5	0,15E-6	11,5E-6	32,983	211000	440	392	392	0,15E-6
3	1.1192 C45C (Cq 45)	205000	500	298	46,5	46,5	0,411E-6	11,1E-6	98,351	205000	500	298	298	0,411E-6
4	1.0577 S355J2	210000	490	244	46,5	48,0	0,109E-6	11,5E-6	29,984	210000	490	244	244	0,109E-6

The tables for temperature calculation and DIN 25201-4 overlapped when a working temperature was entered. That is why the DIN 25201-4 table now only contains “a, u_{q,kons}” and “u_{q,zul}” if a working temperature has been defined.

SD=Sig _{AS} /Sig _a	2,17	Rm S	MPa	1040	al.max	deg	116,6
Sp=pG/pBmax	1,12	Rm-25	MPa	1040	al.min	deg	68,6
SG=FKRmin/FKQreq	1,48	Re nut	MPa	355	R MA	Nm/°	6,409
m σ / m σ eff min	0,84	Re-25	MPa	355	R FM	N/°	2379
τ u Rm / τ u B,M	1,22	Rm nut	MPa	510	al.tors	°	0,1
SA=A τ u τ auB/FQ	26,11	Rm-25	MPa	510	d _{km}	mm	29,30
SL=h \cdot d \cdot Re/FQ	35,34						

DIN 25201-4				Deformation cone			
a			12	DA,Gr	mm		99,03
u _{q,kons}	mm		2,319	phi	°		21,6
u _{q,zul}	mm		2,799	W / betaL			1 / 4,92

i	material	E [MPa]	pG	pBmax	dwo	d _{wu}	d ₁ [mm/N]	alpha T	l-25 mm	E -25	pG-25	p20	p-25	delta -25
1	QUAL.10	210000	1040	718	33,6	36,8	0,0400E-6	11,5E-6	3,998	210000	1040	719	718	0,0400E-6
2	1.7218 25CrMo4	211000	440	392	36,8	46,5	0,15E-6	11,5E-6	32,983	211000	440	392	392	0,15E-6
3	1.1192 C45C (Cq 45)	205000	500	298	46,5	46,5	0,411E-6	11,1E-6	98,351	205000	500	298	298	0,411E-6
4	1.0577 S355J2	210000	490	244	46,5	48,0	0,109E-6	11,5E-6	29,984	210000	490	244	244	0,109E-6

ZAR1W: Mysterious error message Dm Ball (12 mm)

If an error message "Dm Ball (Dm)" appears (usually with mn>10mm), but the measuring circle diameter in brackets does not correspond to the entered value, go to "Edit\Measurement", then "<" button for measuring ball diameter, then enter desired value. The error message then disappears. The message no longer appears in new versions. The cause of the pseudo error message was that the calculation module internally calculates a pair of gear wheels, but only one of them (gear 2) is used.

Tip: Configure network version individually

Ideally, each user has their individual configuration file (cfg) in their own working directory (Properties\Run In). We recommend "C:\HEXAGON\" as the working directory. If the cfg file is there, it will also be used when starting the program (e.g. wfed1.exe) when clicking on a calculation file (e.g. test.fed).

Under "File\Settings\Directories" please make sure that the Temp directory is local and not a network path (e.g. C:\TEMP\) otherwise the program will run very slowly when the network is busy.

Tip: E-manual for floating licenses in several languages

If you have a floating license installed in several languages, you will find the last installed manual under "Help\E-Manual". If you want to select the manuals in German/English/French, for example, you can change or expand the htm file yourself.

If you want to start the multilingual fed1.htm in subdirectories with fed1.htm, your modified fed1.htm will look something like this:

```
<HTML>
<HEAD>
<TITLE>FED1+ E-Manual</TITLE>
</HEAD>
<BODY>
<PRE>
<A HREF="ger/pdf/fed1/fed1.htm">Handbuch FED1+ DE</A>
<A HREF="eng/pdf/fed1/fed1.htm">Manual FED1+ EN</A>
<A HREF="frz/pdf/fed1/fed1.htm">Manuel FED1+ FR</A>
</PRE>
</BODY>
</HTML>
```

Tip: Do not use dots in the file name

A period is the separator between the file name and the file extension, so the file should contain exactly one period. In newer versions of Windows, multiple dots are allowed in the file name, then the file extension comes after the last dot. However, the old rule still applies in HEXAGON software, so do not use periods in the file name! It is better to use the underline character _ instead of a period or a comma or a space in the file name.

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February 24, 2024: 2 years of war in Ukraine and no end in sight

A bold prediction: The war will not be ended by a peace treaty between Russia and Ukraine, nor by a victory of one of the warring parties. But through an agreement between Putin and Trump. Crimea and the occupied eastern Ukrainian territories will become Russian, the current front line will become the new border between Russia and free Ukraine.

HEXAGON PRICE LIST 2024-03-01

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D11 Version 2.2 O-Ring Seal Software	190.-
DXF-Manager Version 9.1	383.-
DXFPLOT V 3.2	123.-
FED1+ V31.9 Helical Compression Springs incl. spring database, animation, relax., 3D,..	695.-
FED2+ V22.5 Helical Extension Springs incl. Spring database, animation, relaxation, ...	675.-
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GR2 V1.2 Eccentric Gear software	550.-
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SR1+ V25.2 Bolted Joint Design incl. Flange calculation	750.-
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Updates:

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Update Mechanical Engineering Package: 800 EUR, Update Complete Package: 1200 EUR

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