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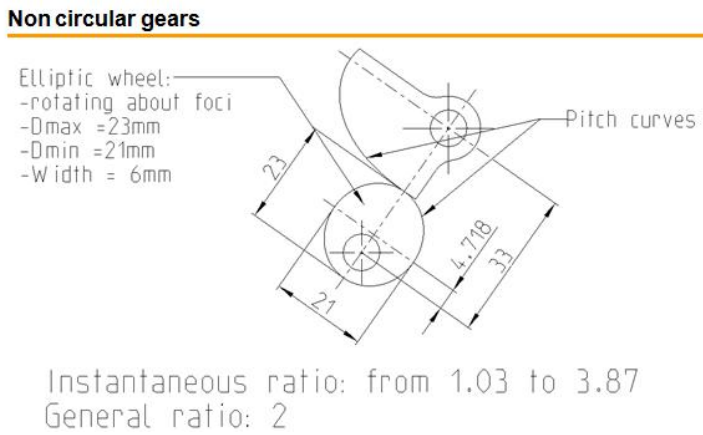
KISSsoft Instruction 064

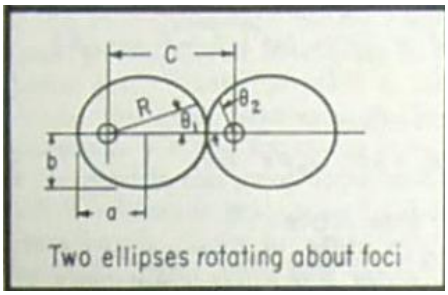
Non-circular Gear for a Customer

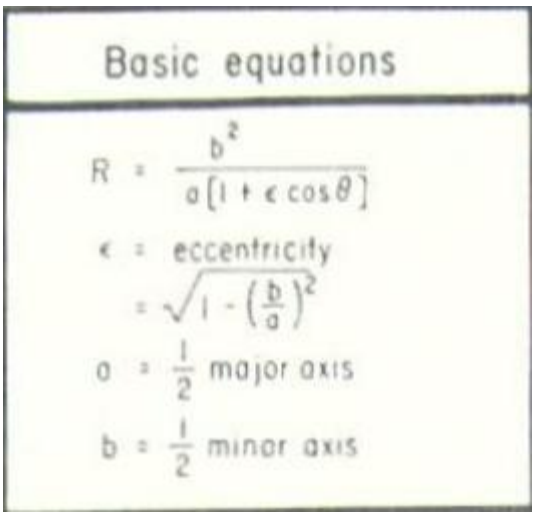
(An example)

Required Job to do

"I have done a presentation with the information regarding my gears.
The pinion is the elliptic wheel. The module of gears I will like to be 0.9."







Polar coordinates for the pitch curve of wheels			
Angle 1 (driver)	R1 (driver)	R2 (driven)	Angle 2 (driven)
0	16.218	16.782	0.000
10	16.049	16.951	9.602
20	15.565	17.435	18.824
30	14.835	18.165	27.384
40	13.948	19.052	35.130
50	12.990	20.010	42.032
60	12.033	20.967	48.139
70	11.125	21.875	53.543
80	10.298	22.702	58.345
90	9.564	23.436	62.646
100	8.928	24.072	66.535
110	8.387	24.613	70.088
120	7.936	25.064	73.370
130	7.568	25.432	76.438
140	7.277	25.723	79.337
150	7.057	25.943	82.108
160	6.903	26.097	84.788
170	6.812	26.188	87.409
180	6.782	26.218	90.000

Solution – Part 1 : Excel-Sheet

The Excel sheet calculates the operating pitch line. Given is operating pitch line of gear1 (ellipse), and the center distance. The operating pitch line of gear 2 is calculated, using COSINUS-Equation of triangles to get the rotation angle phi2.

The ellipse is defined by the Half-Axis (a and b) and the Eccentricity (ex). Eccentricity is Negative in this example, because at phi1=0°; r1 gets a+ex.

Operating pitch line of gear1: phi1, r1

Operating pitch line of gear2: phi2, r2

NOTE: To get very nice teeth at the beginning and at the end of the contact (at 0° and 180°) it is recommended to extend the operating pitch line by 20 to 30°. That is why t-ellipse (ellipse angle) starts at -30° and stops at 210°. This is not a must, KISSsoft will otherwise automatically extend this line.

7	t_ellipse	r1	phi1	i	r2	phi2
8	-30	15.58799	340.318	1.117015	17.412	198.538

The starting angle for phi2 (198.538°) was set manually, so that phi2=180° when phi1=0°:

317	-0.1	16.21799	359.935	1.034777	16.782	180.0631
318	2E-13	16.218	1E-13	1.034776	16.782	180.000533
319	0.1	16.21799	0.06474	1.034777	16.782	179.937966

Input a Module (right side) or a Tooth number (left side) to get information about possible module, or tooth number when you would like to have a full tooth number over the operating range.

Proposition for Module			Proposition for Tooth number	
z =	12		mn =	0.9
mn =	0.917626207		z =	12.2350161

Check:

Your Table at 90°:

90	9.564	23.436	62.646

Values in our Excel sheet at 90.086°:

1461	114.3	9.569745	90.0863	2.448368	23.4303	117.261347

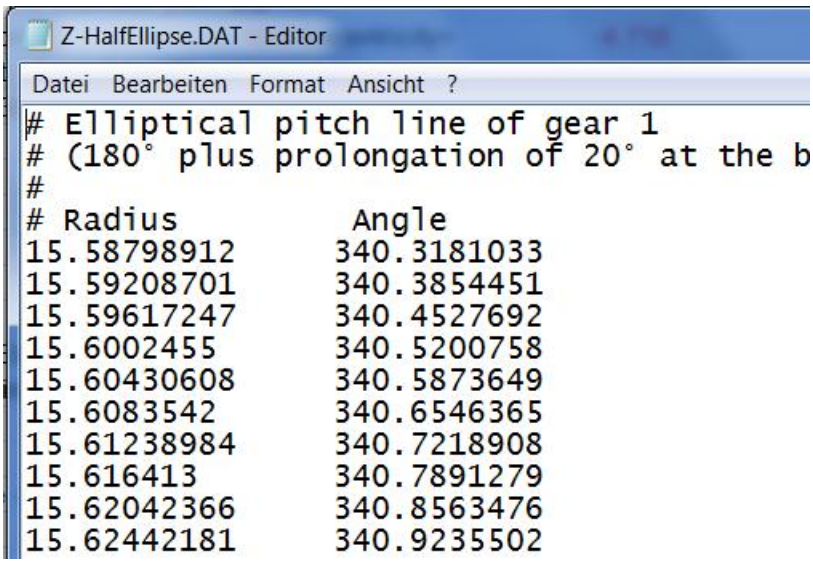
r1 ph1 r2 ph2 (phi2: 180-117.26 = 62.74)

Values are in agreement (Excel to your table), small differences may be caused by different interpolation.

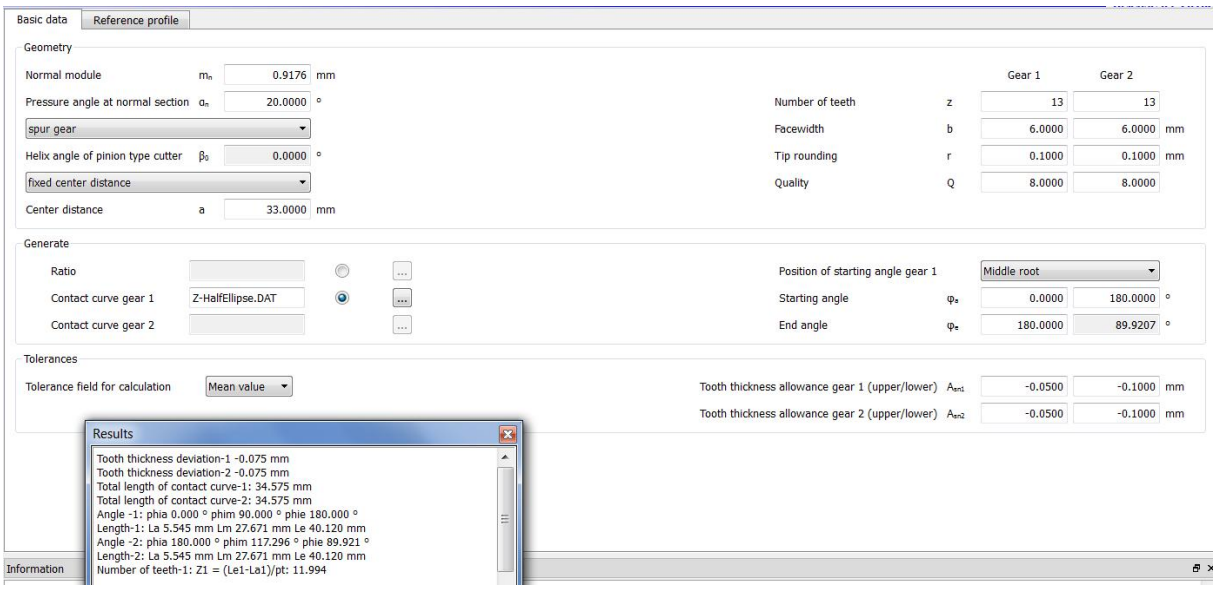
Solution – Part 2 : Calculation in KISSsoft

Take r1-phi1 out of the Excel sheet and put it into a *.dat file:

	t_ellipse	r1	phi1	i
8	-30	15.58799	340.318	1.11
9	-29.9	15.59209	340.385	1.11
10	-29.8	15.59617	340.453	1.11
11	-29.7	15.60025	340.52	1.11
12	-29.6	15.60431	340.587	1.11
13	-29.5	15.60835	340.655	1.11
14	-29.4	15.61239	340.722	1.11
15	-29.3	15.61641	340.789	1.11
16	-29.2	15.62042	340.856	1.11

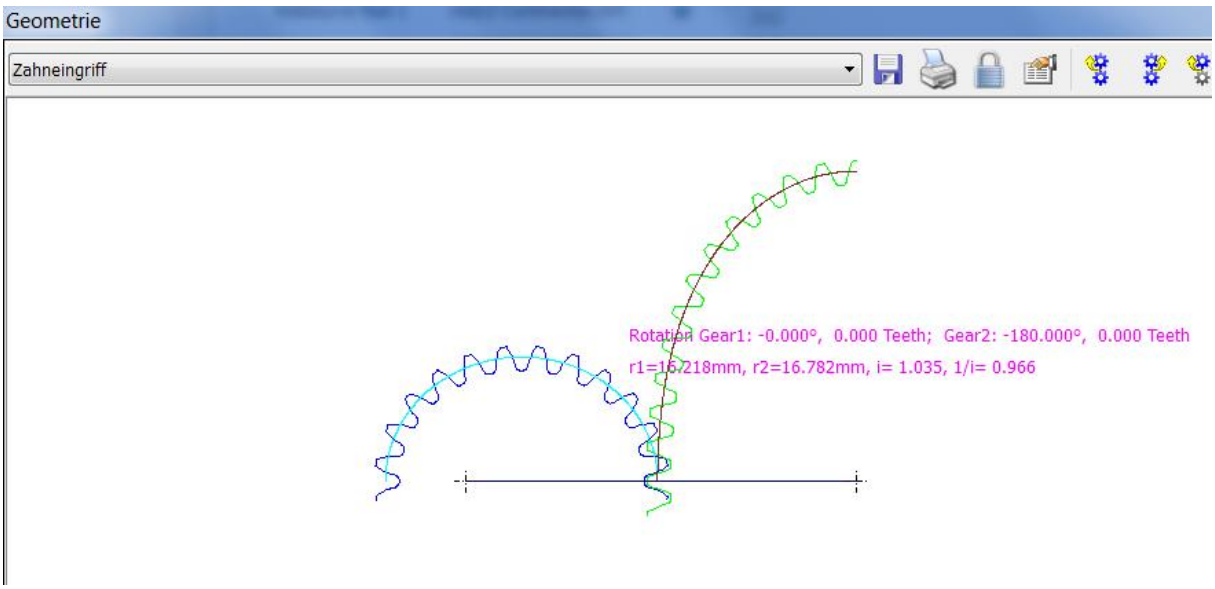


Inputs to do:

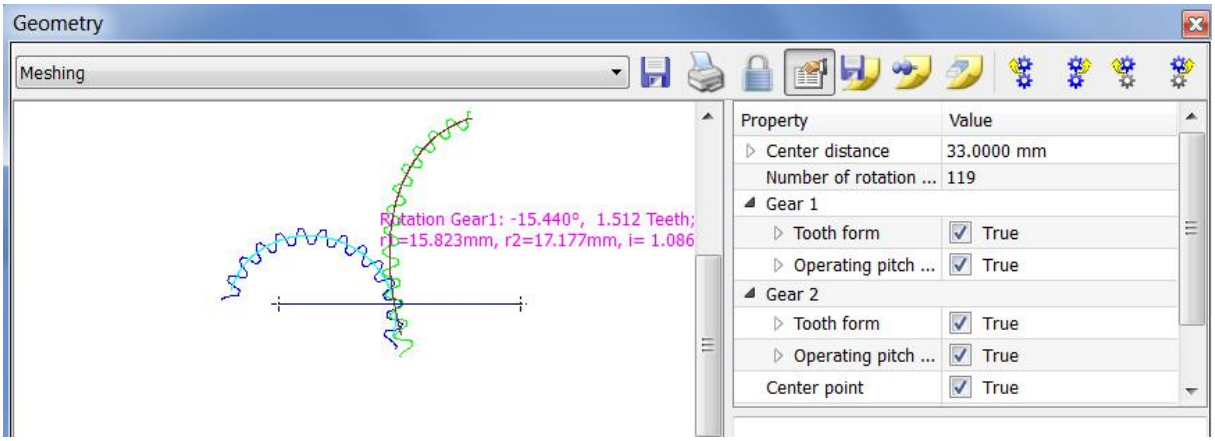


Note: Here module is set as 0.9176, so exactly 12 teeth are needed between 0 and 180°, you may set mn=0.9 and z to 14.

Result:

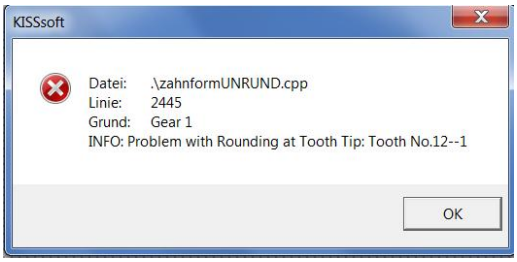


Check rotation by clicking on  :



You may increase or decrease rotation step by changing 'Number of rotation steps'.

IMPORTANT: Check carefully if collisions occur. Note also, that the higher the module is, teeth number decreases and tooth form problems may occur. In this example tooth forms are all very nice, so you could try to increase module, if you like.

Note: Warnings as this 

are not critical: You must – after exporting the tooth form – add manually the tooth tip radius at gear 1, Tooth no. 12.

Export of tooth form as DXF

Use  in Window Tooth form Gear 1 or 2: