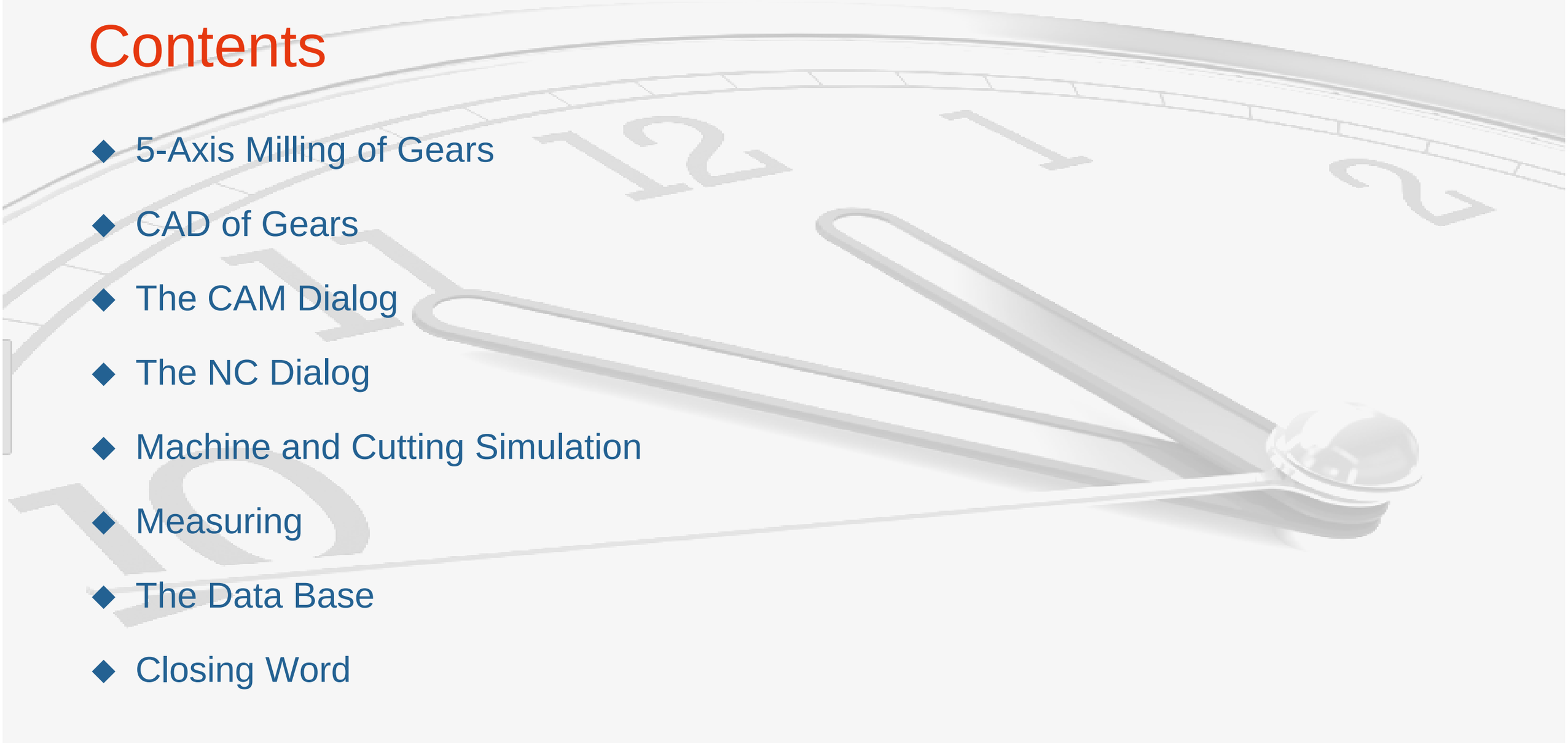
EUKLID GearCAM

The software solution for easy and accurate 5-axis-milling of gear wheels

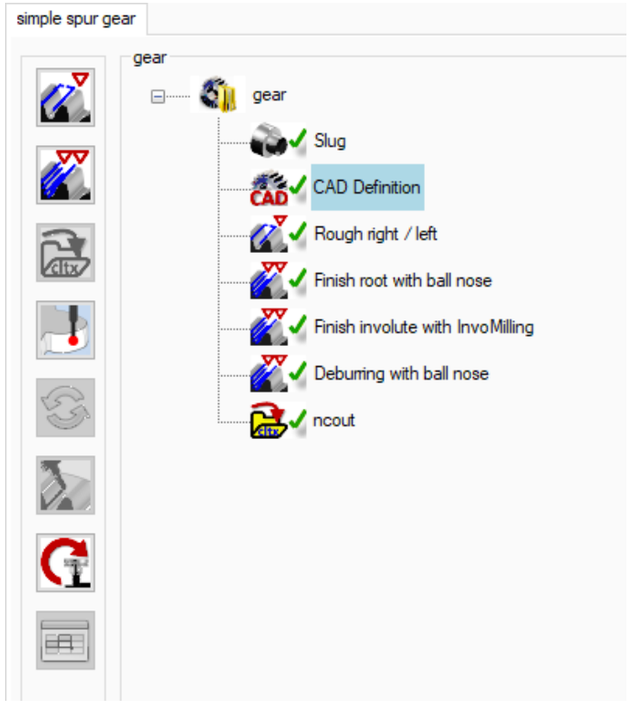
Contents

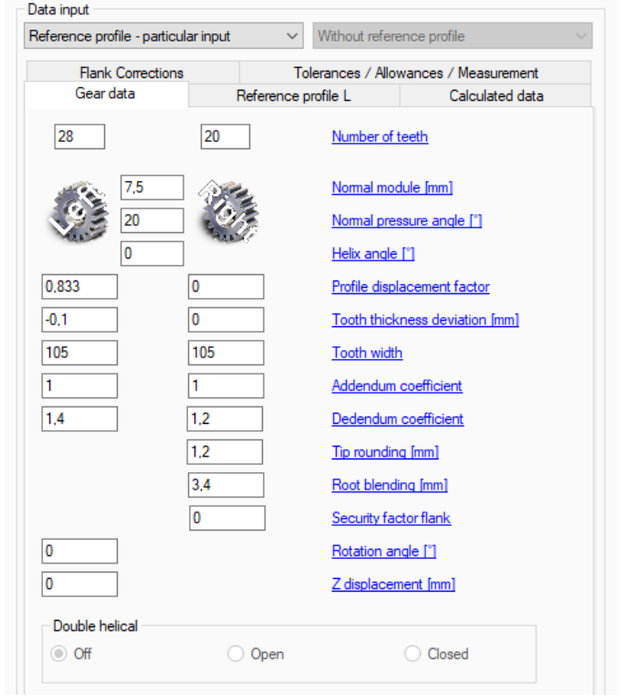


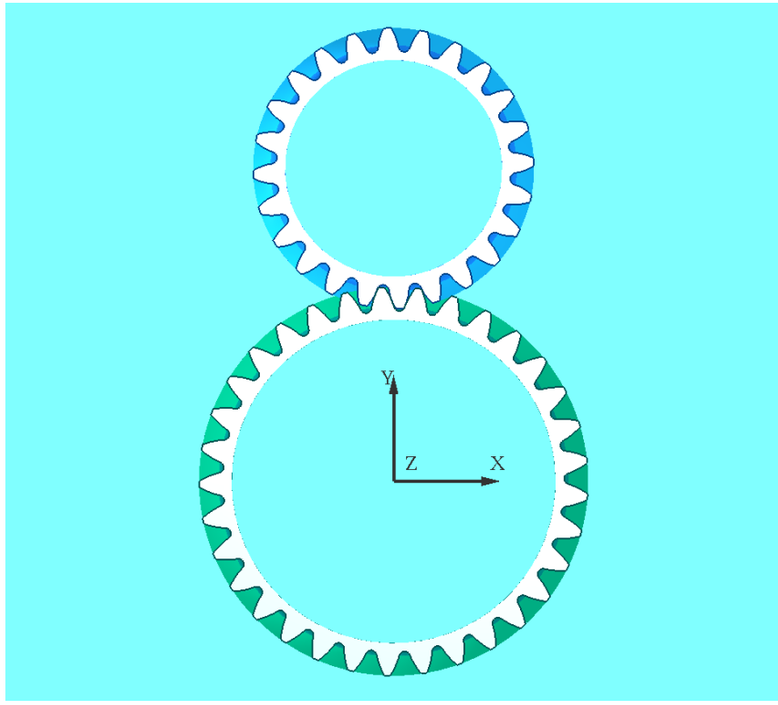
- 5-Axis Milling of Gears
- CAD of Gears
- The CAM Dialog
- The NC Dialog
- Machine and Cutting Simulation
- Measuring
- The Data Base
- Closing Word

The User Interface

- Be user friendly
- Follow a clear logical structure
- Be void of unnecessary repetitions
- Store the user actions in a suitable form
- Give feedback to avoid errors in the input
- Give the user the feeling that HE is in control







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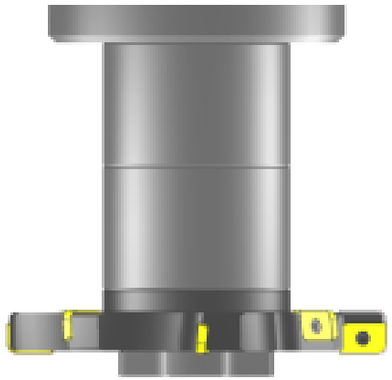
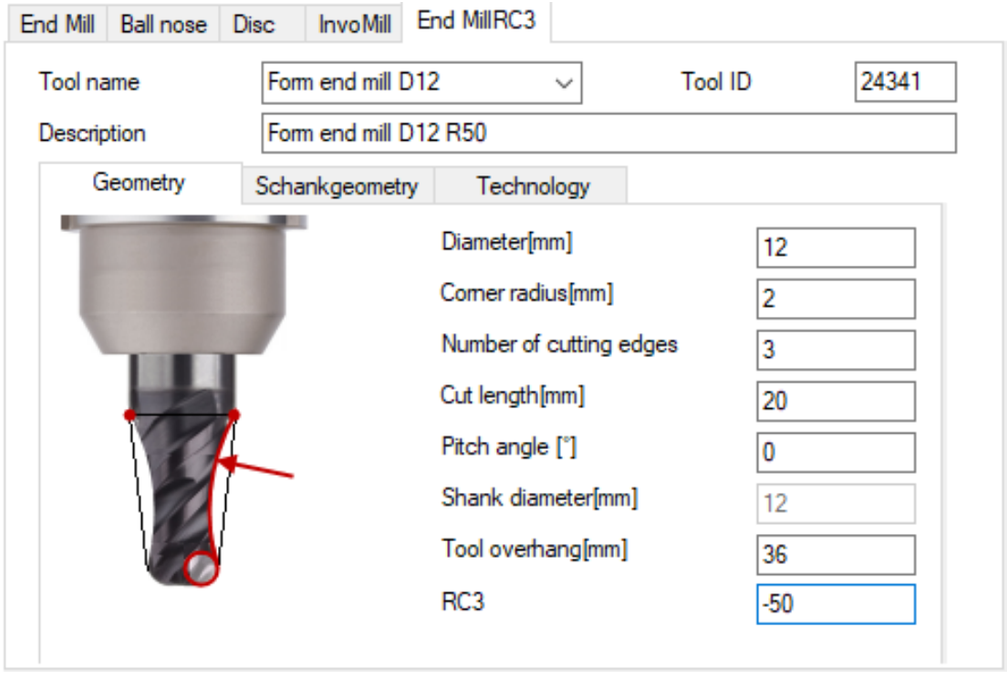
5-Axis Milling of Gears

- Many types and sizes of gears can be milled
- Inexpensive standard tools applicable for a number of modules
- Progress to more specialised tools are not excluded





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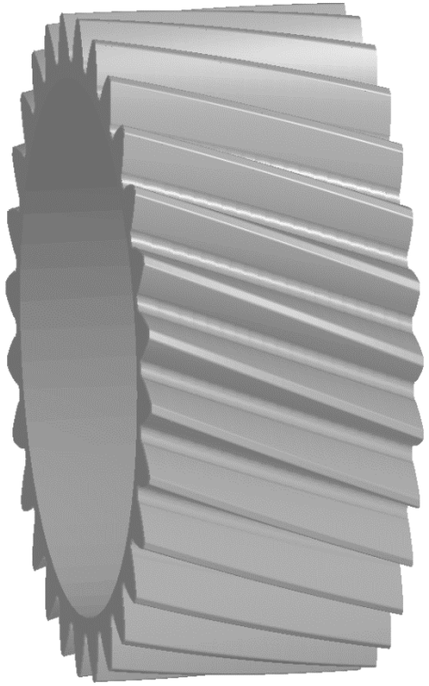
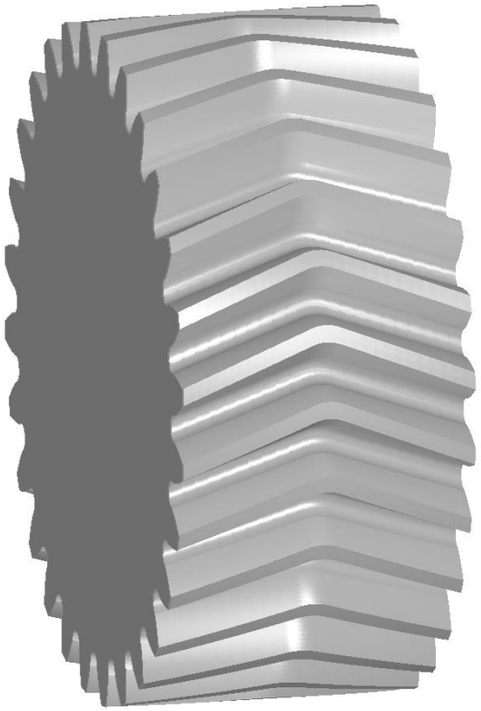
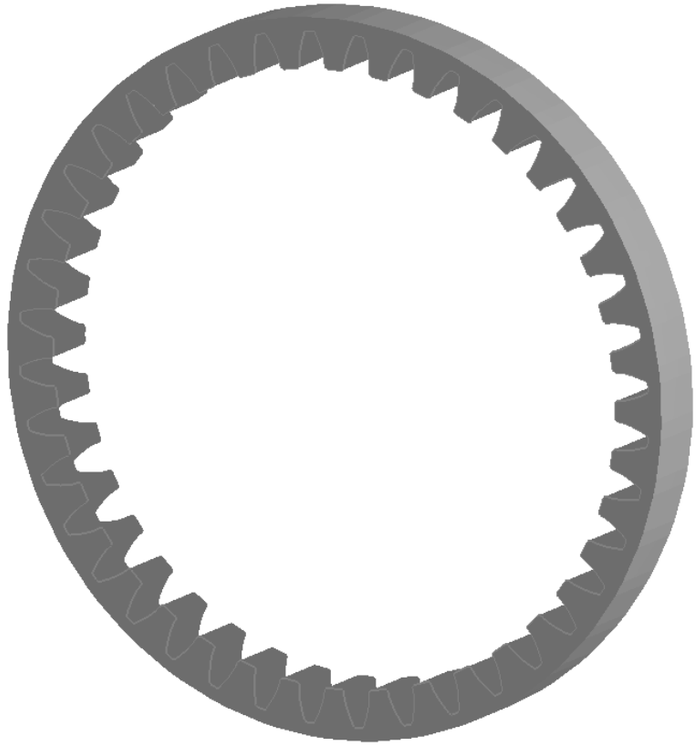
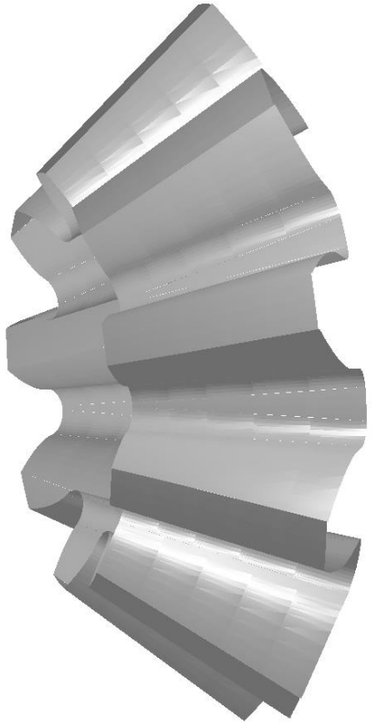
Gears form a small number of families of parts

- Spur gears
- Double helical gears with/without groove
- Helical gears
- Internal gears
- Beveloid gears
- Crown gears
- Bevel gears
- Worm gears



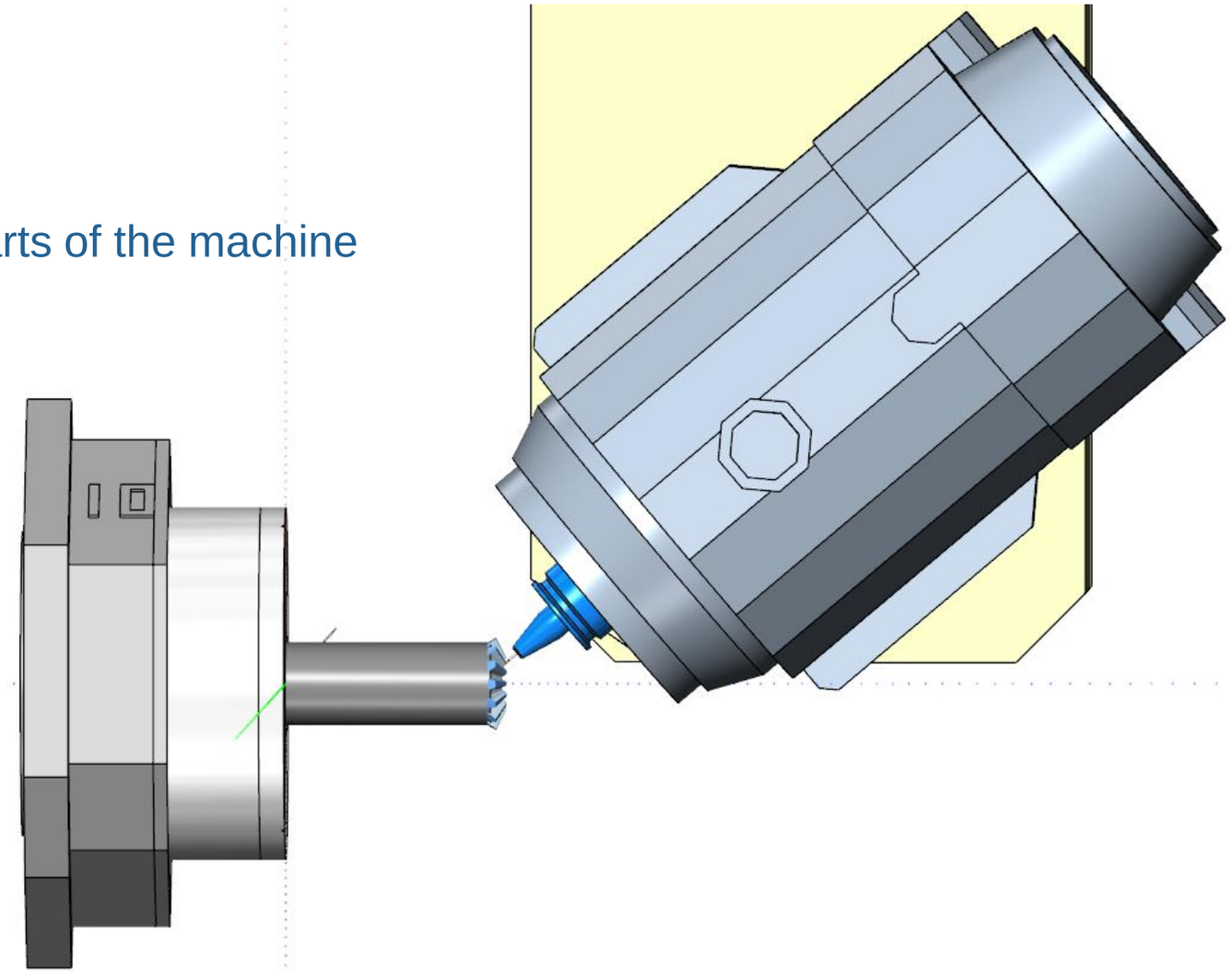






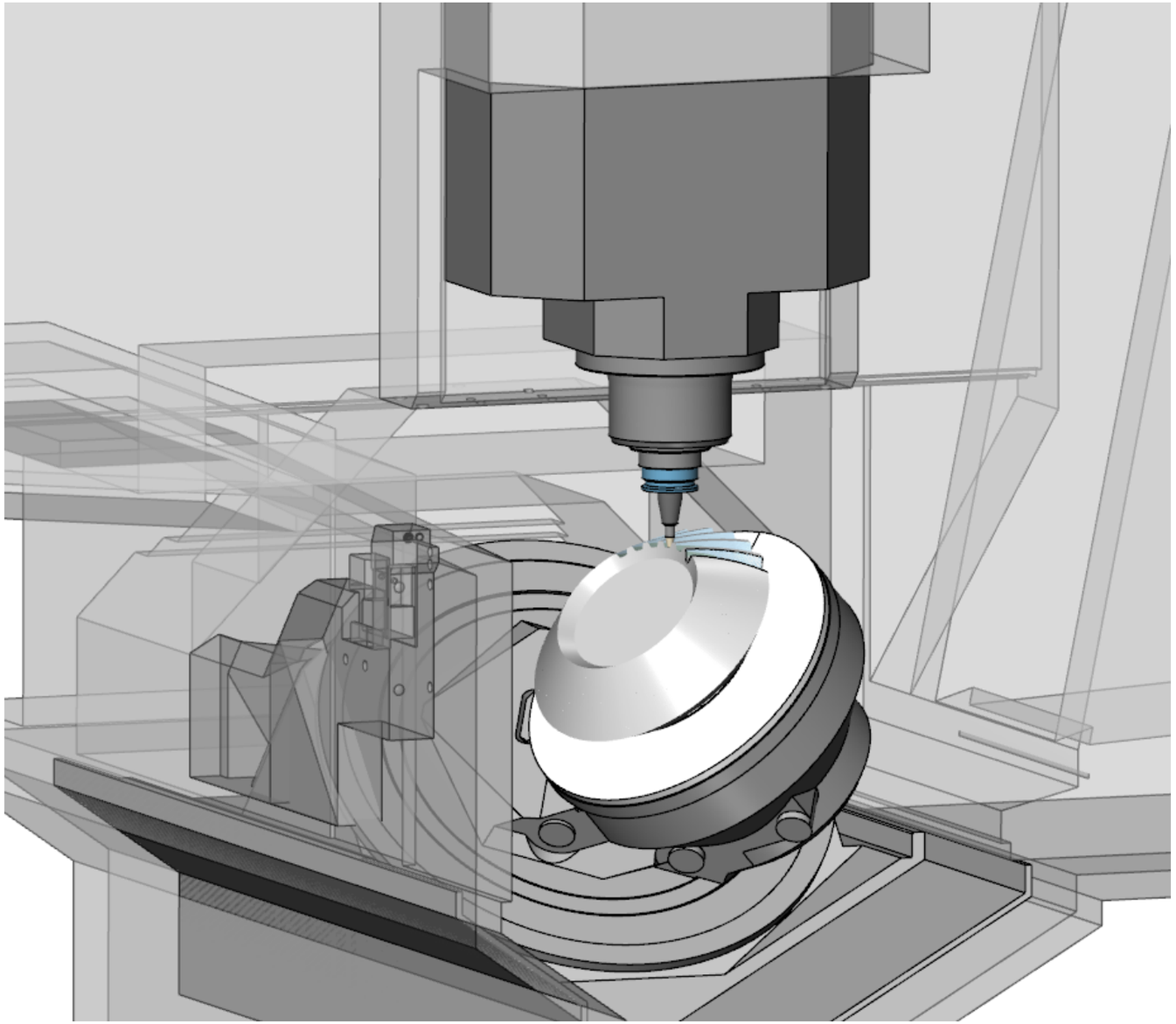
Sources of inaccuracies

- Each axis has six degrees of freedom
  - Five should be accurate and one measured
- Temperature changes or heat generated of parts of the machine
- Cutting forces
- Tool wear
- Dynamic forces may cause deformations
- Clamping
- Precision of the trajectory data



The Milling Process

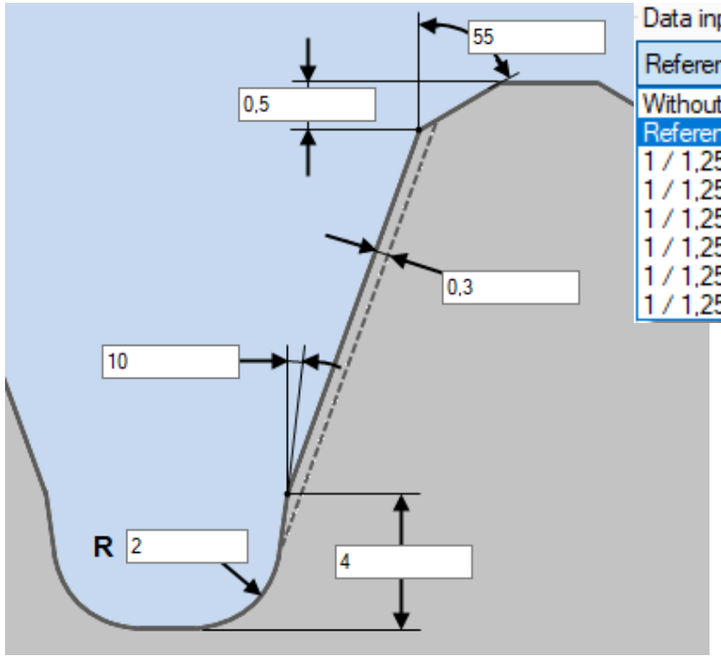
- The right machine
- The right tools
- The best strategy
- The best parameters
- Minimization of costs for the required quality

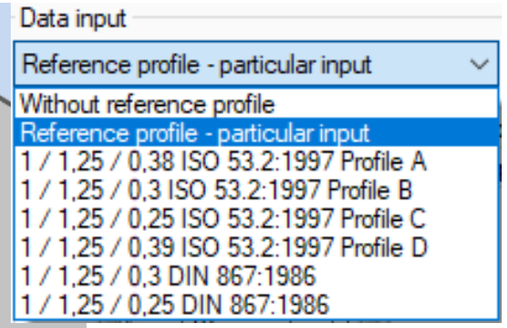


CAD of Gears

For spur and helical gears

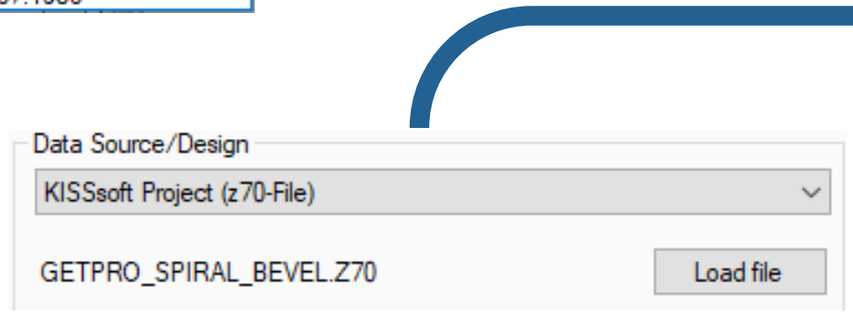
- Parametric (ISO) input
- Input as reference profiles

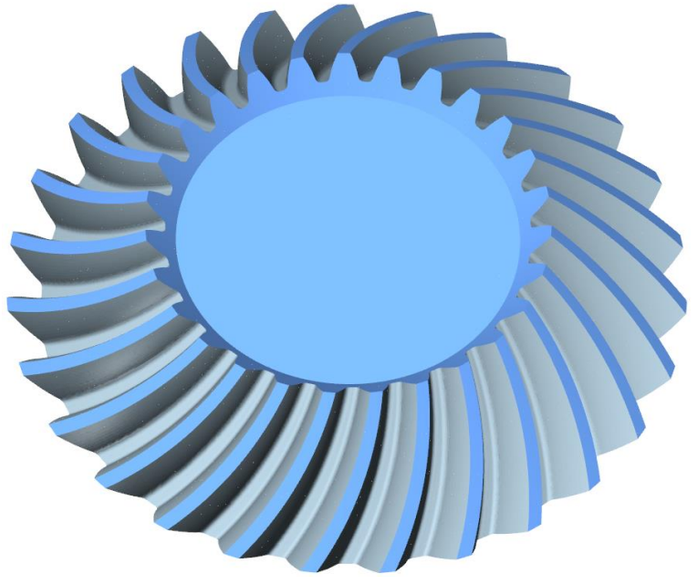




For bevel gears

- Parametric (ISO) input
- Spiral bevel gears via KISSsoft files
- Virtual machines based on the plane gear





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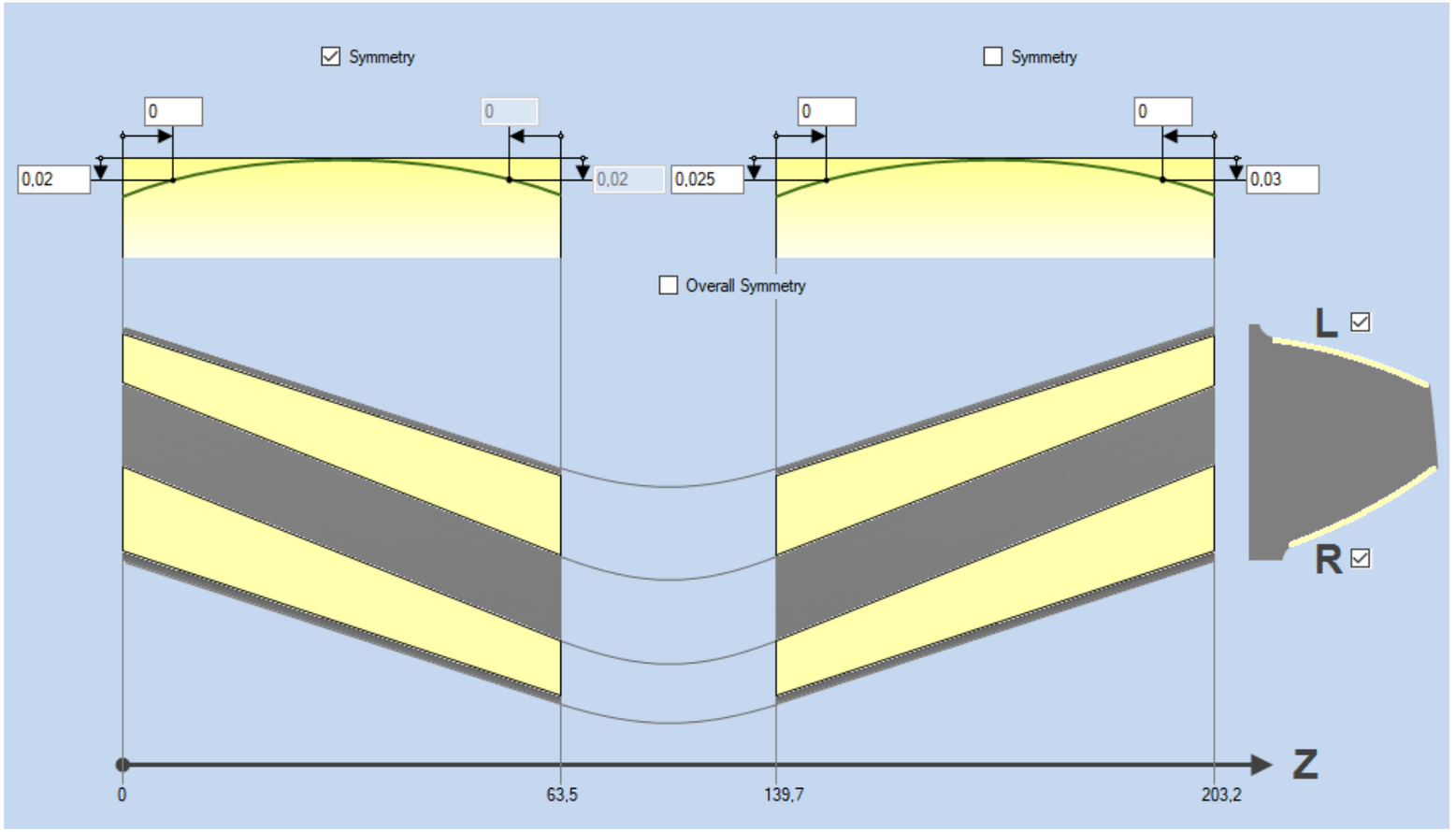
Crowning and Reliefs

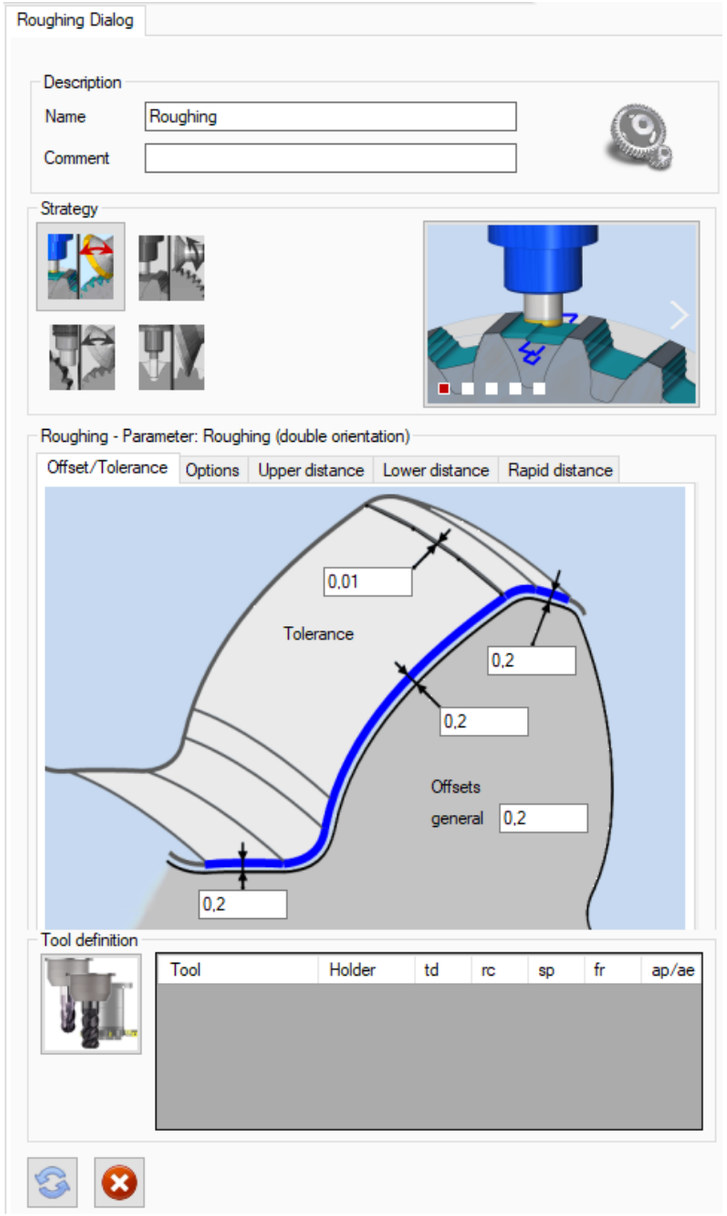


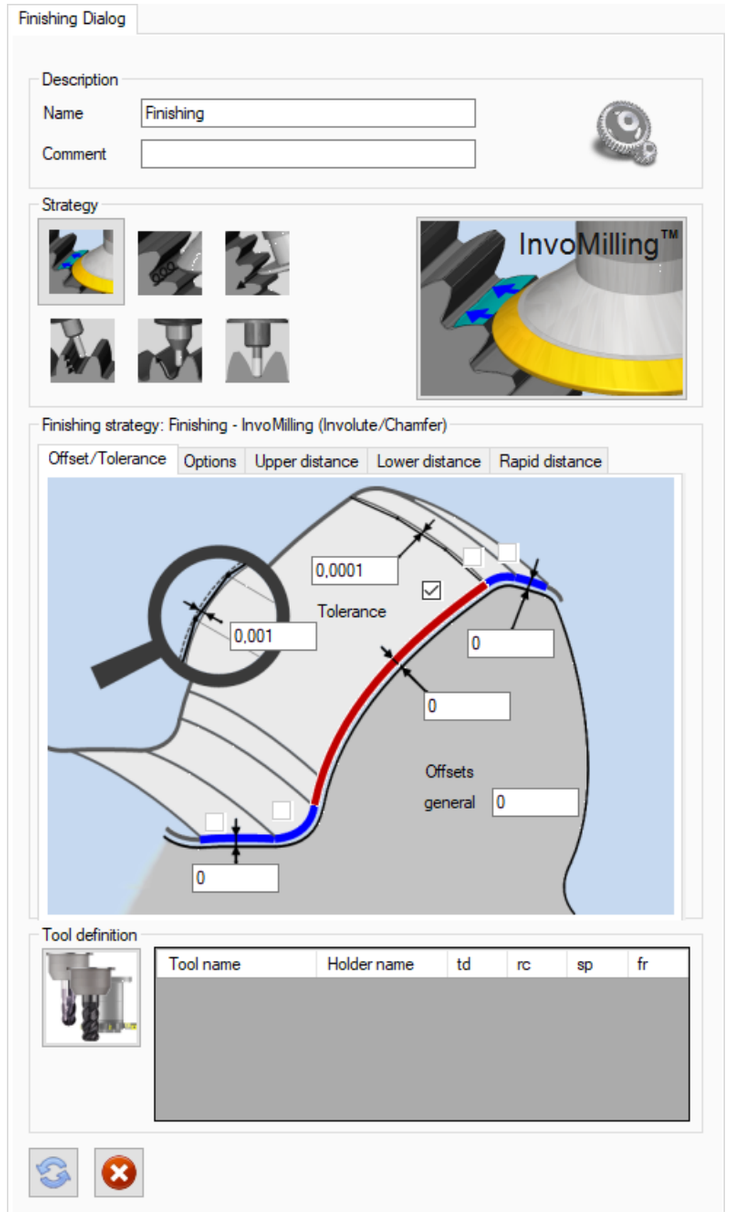
Type	Name	Left	Right
	Width crowning	✓	✗
	Angle correction	✗	✓
	Tip relief	✓	✓
	End relief	✓	✓
	Root relief	✗	✓

Width crowning | Height crowning | Tip relief | Foot relief

The CAM Dialog

- Offsets and tolerances
- Milling strategy
- Tool selection
  - Finger tools
  - Disk tools (InvoMilling tools)

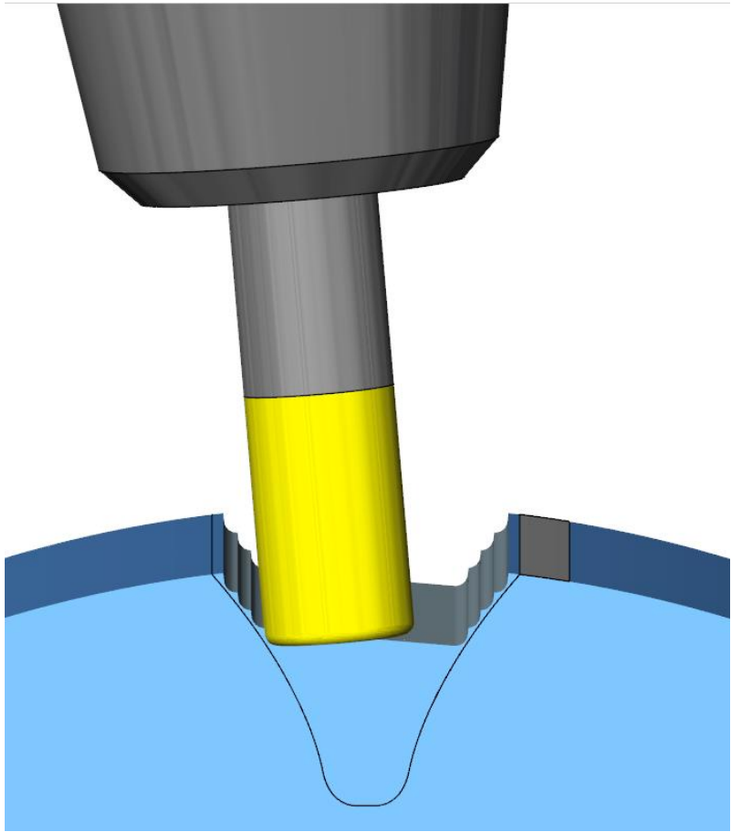




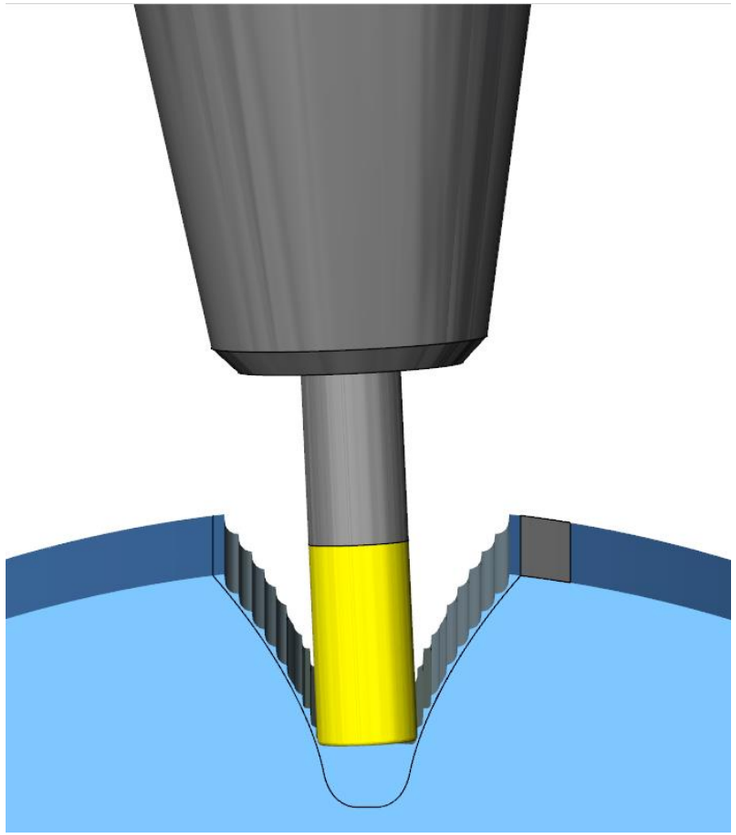
Roughing

- One working step with several tools

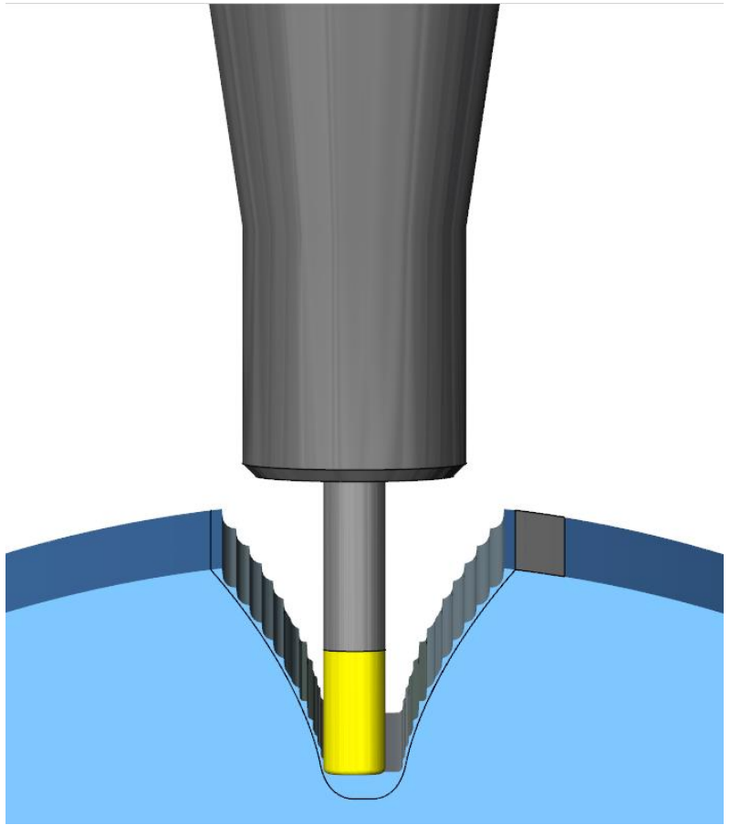
D = 12mm



D = 8mm

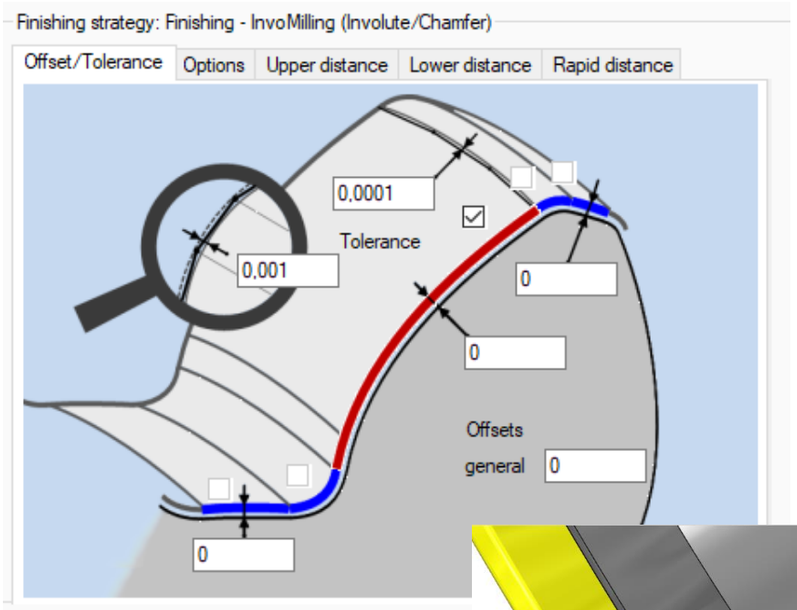


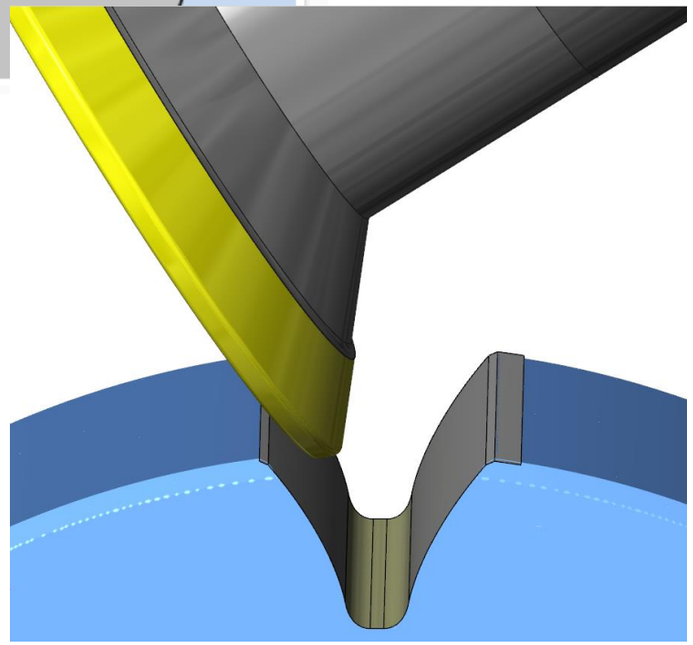
D = 5mm



Finishing

- Several working steps with one tool per step
- Definition of offsets
- Tolerance along the flank
- Tolerance in direction of the profile
- Selection of the tool
- Selection of the Strategy
- Automatic minimisation of the number of trajectories
- Efficient finishing with the InvoMilling method
  (patented by Sandvik Coromant)





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Solutions for CAD/CAM

Postprocessor Properties

- Powerful configuration language
- Output of the tool movements for machine simulation
- Rapid moves depending on the machine kinematics
- Support of repetitions of program parts and of macros
- 5-axis output with 3D-radius-compensation
- Support of additional axis and milling heads
- Interactive user dialogs
- Multicore processing

Base settings	
Rotation [°]	0
Axes options	
Start position tilting axis [°]	0
Tilting feedrate [°/min]	500
Tool settings	
Tool call	Tool magazine
Tool preselection	☐ on
Tool table	☐ on
Milling path options	
Rapid feedrate [mm/min]	20000
Rapid tolerance [mm]	0.05
3D tool radius compensation	☐ on
Rapid distance [mm]	30
Rotary axis mode	between 0-360°
M Functions	
Coolant #1	M08
Coolant #2	M07
Coolant #3	M108
Coolant #4	M107
Miscellaneous	
Logic for restart	☑ on

No.	Operation	Magazine (ID)	Tracks	Length [m]	Time [min]	Strategy	From Gap	To Gap	Sectors	Grouping	Output	rogram Calcula
Roughing (3)											☑	
1	Roughing_1	20121 (20121)	14	29.568	22.40	successive	1	22	1	Gaps	☑	0%
2	Roughing_2	20081 (20081)	6	3.312	1.67	alternating	5	10	1	Gaps	☑	0%
3	Roughing_3	20052 (20052)	10	7.120	3.00	individually	1-5,10,8,15		1	Gaps	☑	0%
Finishing (1)											☑	
4	Finishing_1	30041 (30041)	55	106.480	53.78	alternating	1	22	3	Gaps	☑	0%

NC Programming and Simulation

Slug	D:\Projekte\Test_GearCAM\1\ExtData\slug.stl	...	X
Workpiece	D:\Projekte\Test_GearCAM\1\ExtData\workpiece.stl	...	X
Fixture		...	X
Machine	C:\ProgramData\Euklid CADCAM\EUKLID GearCAM\pp_config\3.(	...	
Offset (X,Y,Z)	0	0	200 X

Create NC program files (1 per CLTX file)

☑ Remove previously created NC program files — Show Log...

☐ Also create simulation data — ☐ User dialog

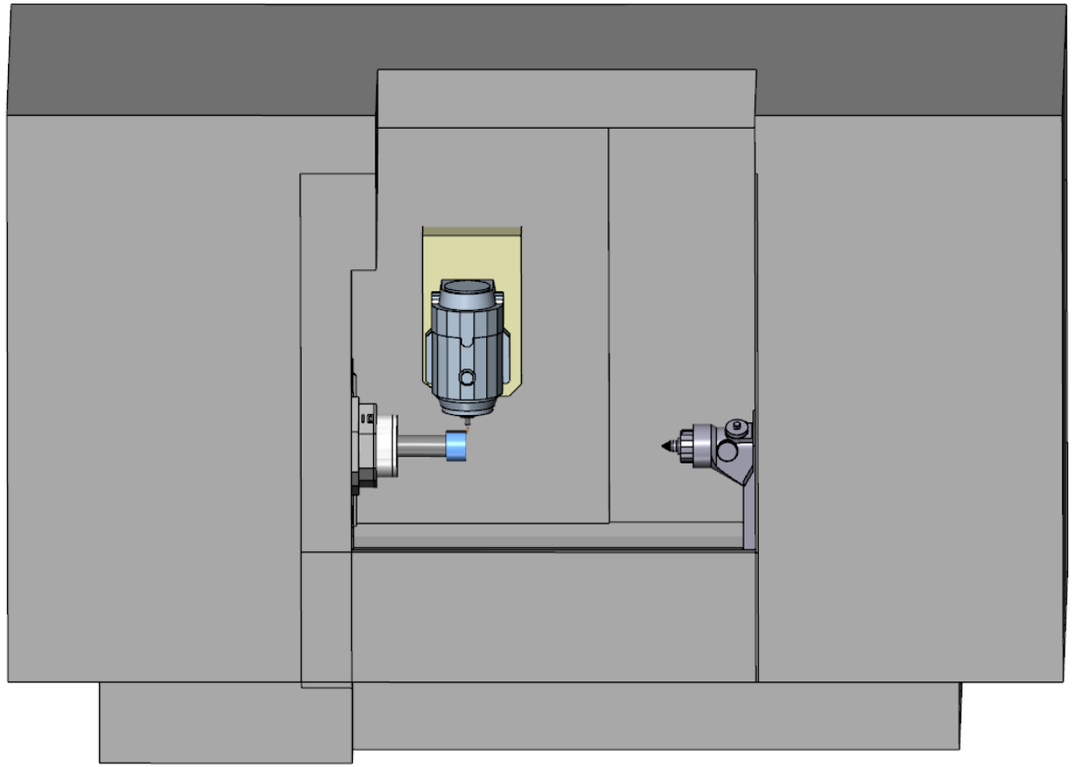
Cutting Simulation | Machine Simulation

Teeth number: 22 | Module: 8 | Time: 1h 21min | Sync: | modified

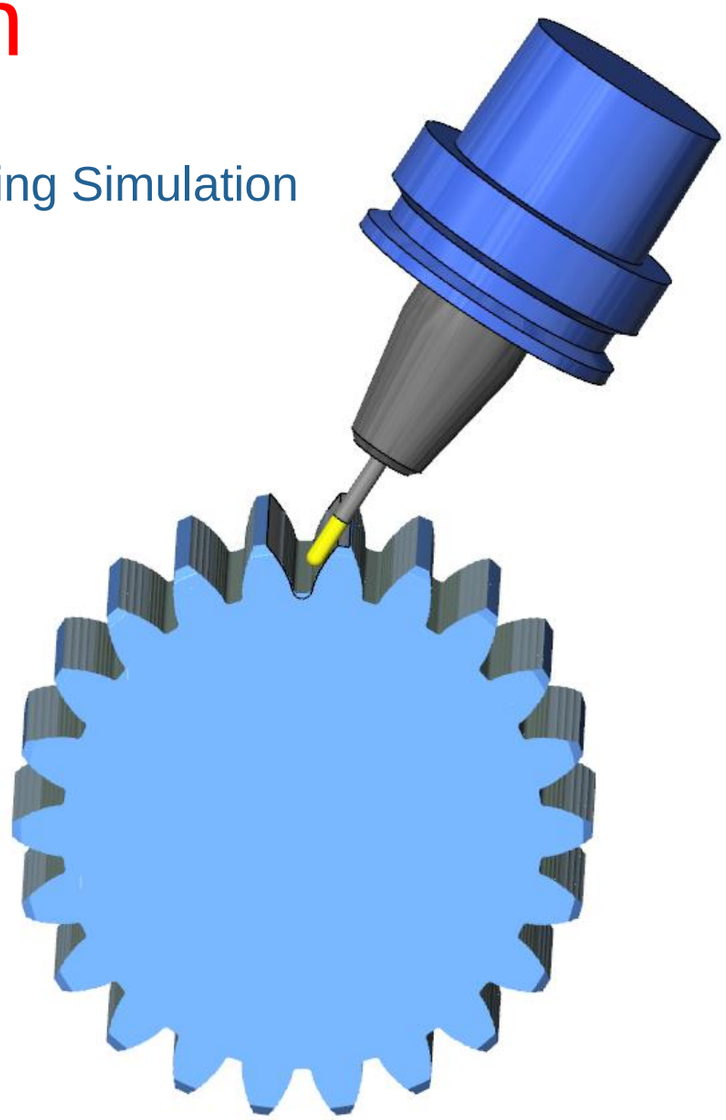
EUKLID Solutions for CAD/CAM

Machine and Cutting Simulation

- Machine Simulation



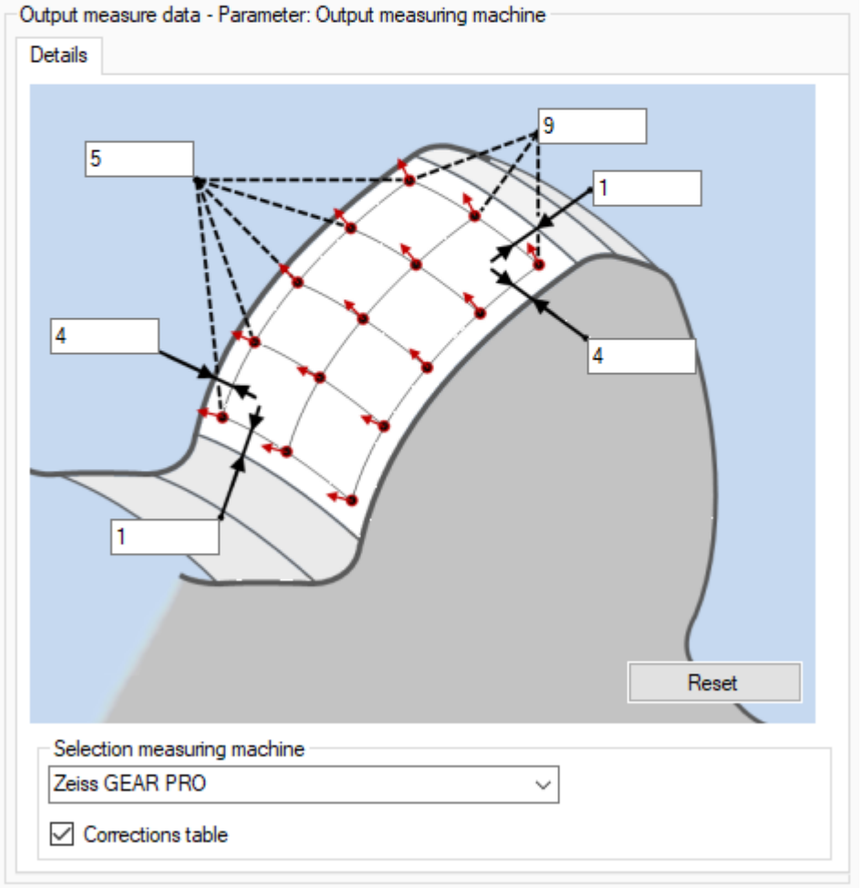
- Cutting Simulation



Measuring

EUKLID GearCAM provides four different outputs of measuring data:

- Grids of points
  - for measuring on the milling machine
  - or on specific measuring machine
- STEP interface to export surfaces of the tooth
- Table of points in machine tool format for measuring of pre-machined gears
- Measuring protocol for particular measuring machines (CMM)



EUKLID
Solutions for CAD/CAM

Main Features of EUKLID GearCAM

- The comfortable and intuitive user interface
- Surfaces accuracy with double precision
- User intervention for achieving optimum results
- The smallest number of trajectories for the tolerances given
- The 5-axis output with 3D-radius-compensation

EUKLID GearCAM

The software solution for easy and accurate 5-axis-milling of gear wheels