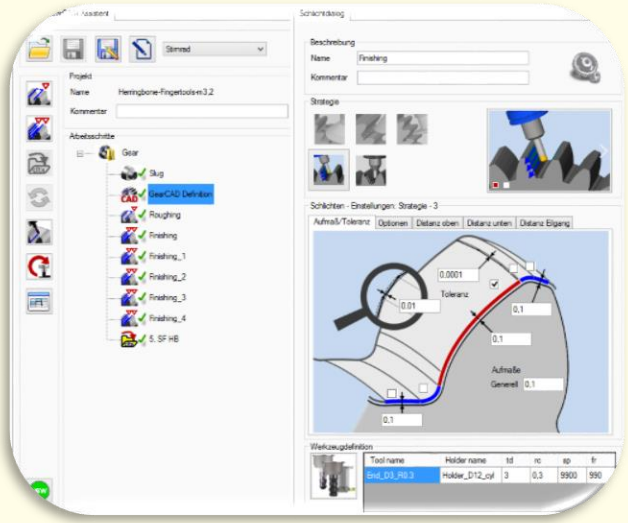

EUKLID GearCAM
Maschinensimulation
Projektverwaltung
Messdatenausgabe
Optionen
Gitteranzeige
Ansicht
Darstellungen
Testfunktion
Information
EUKLID GearCAM
Y
X
Z
EUKLID GearCAM
Challenge in the 5-axis manufacturing of gears
EUKLID GearCAM Assistent
Stirnrad
Projekt
Name
METAV 2016
Kommentar
Arbeitsschritte
Zahnrad
Slug
GearCAD Definition
Schruppen
Schlichten
Entgraten
METAV 2016
NEW

Requirements

user-friendly surface



different type of gears

use of standard tools

low machine set-up times

Fields of application

small batches

prototypes

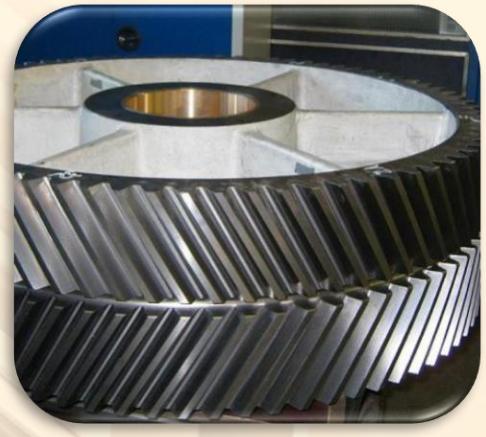
repair

teeny / very big gears

Type of gears

spur gear

helical gear



double-helical gear

Herringbone

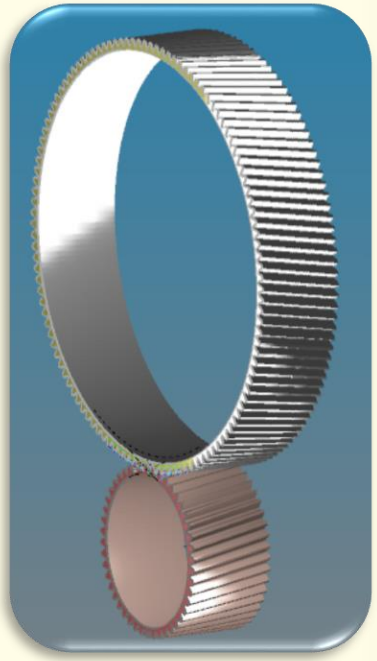
spur and helical bevel gear

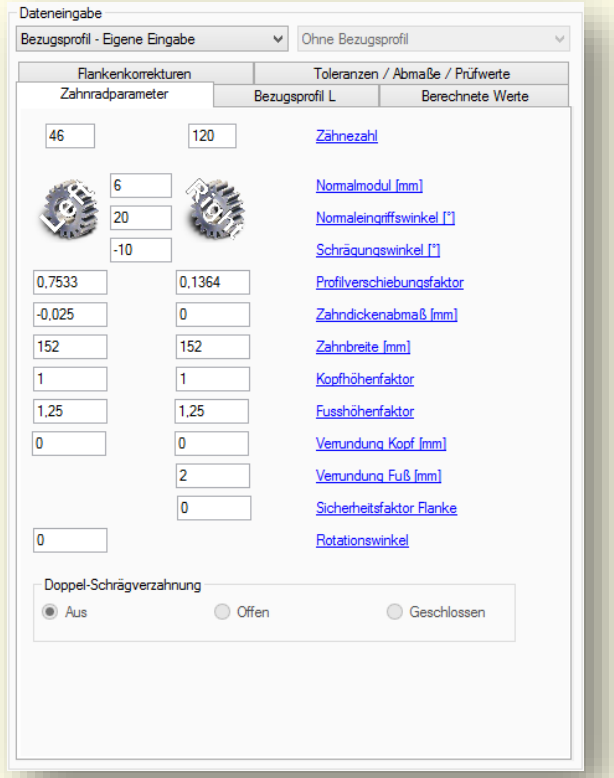
spiral bevel gear

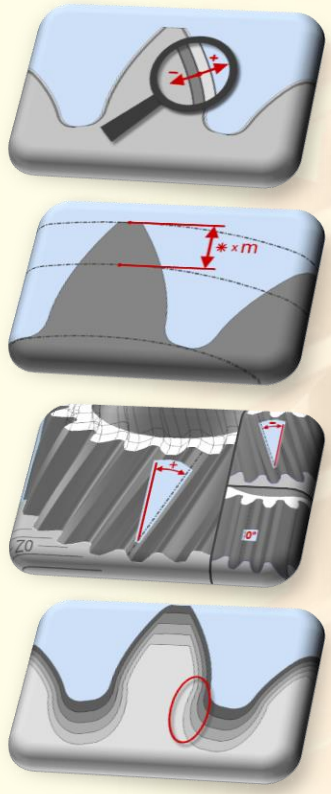
Design spur gear

EUKLID GearCAM

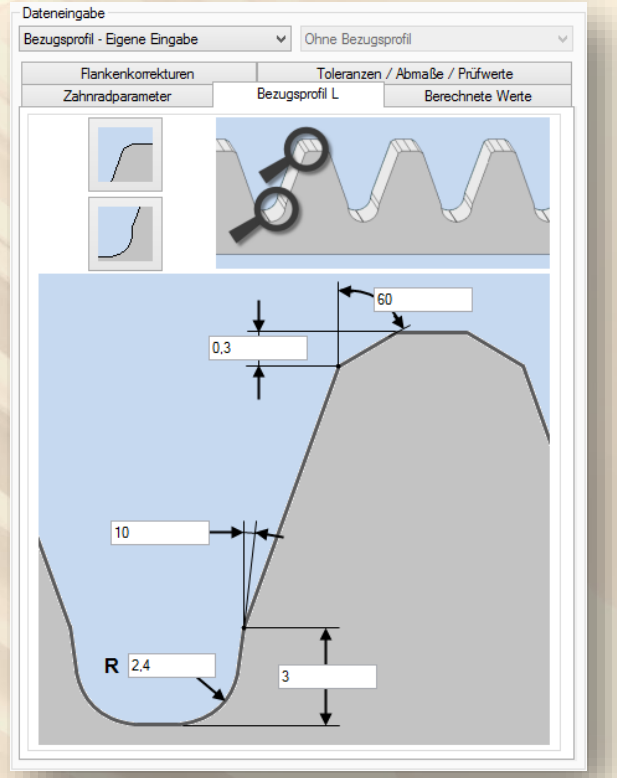
definition of the
gear parameters



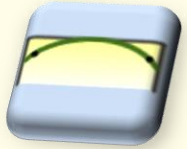
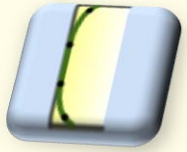
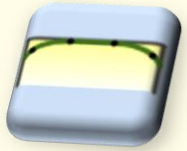
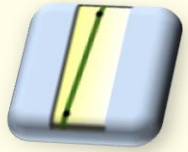
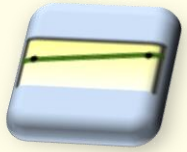


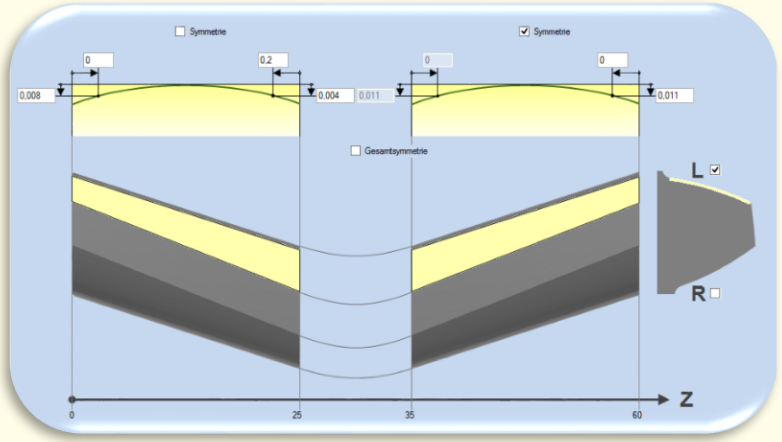


enter reference profile,
define protuberance



Flank corrections

height crowning	width crowning	tip relief	foot relief
 arc	 arc	 arc of a circle	 arc of a circle
 arc-line-arc	 arc-line-arc	 parabola	 parabola
 line	 line	 involute	 involute

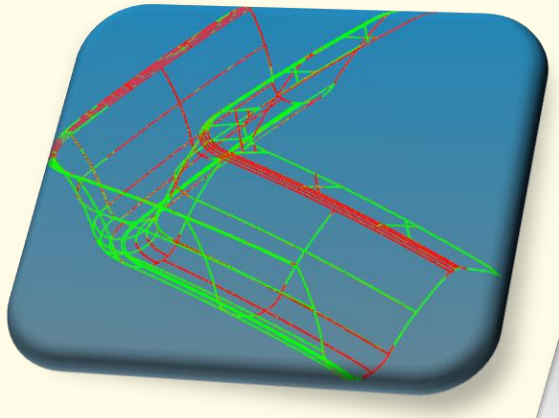


- any number of corrections
- each combination freely selectable
- corrections are added
- each surface individually correctable

Typ	Name	Links	Rechts
	Breitenballigkeit	✓	✗
	Höhenballigkeit	✓	✓
	Höhenballigkeit	✗	✓
	Kopfrücknahme	✓	✓

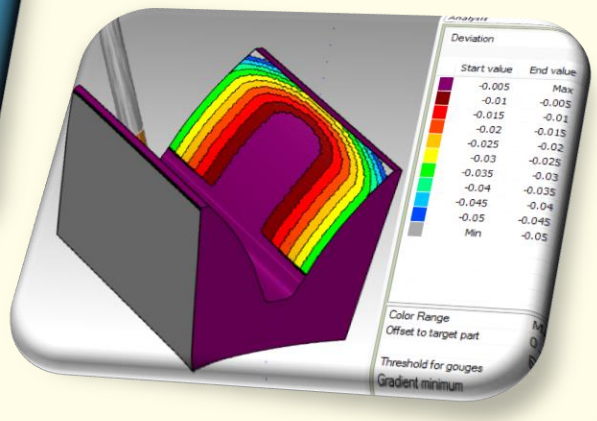
Analysis of the flank corrections

detail analysis



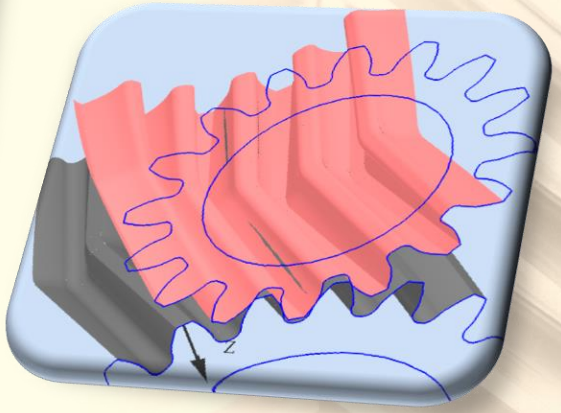
representation in the lattice model

simulation model



control of the tooth flanks

contact analysis



control of contact areas

measuring data

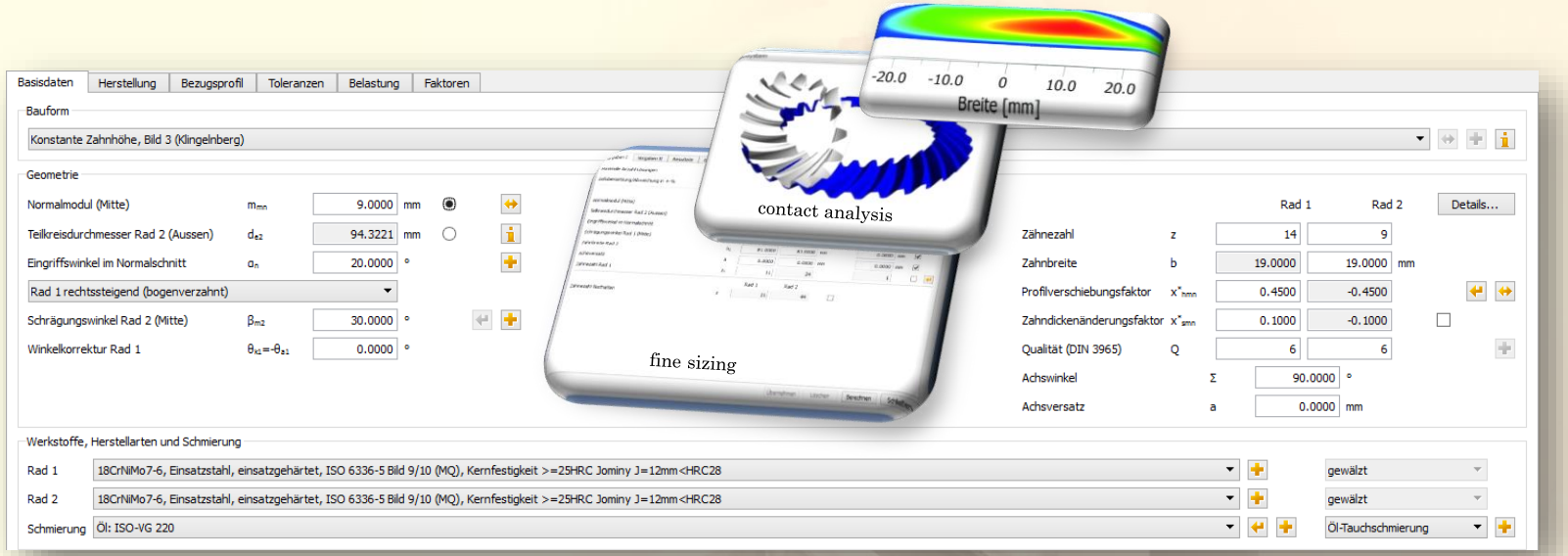
Output of a measuring grid

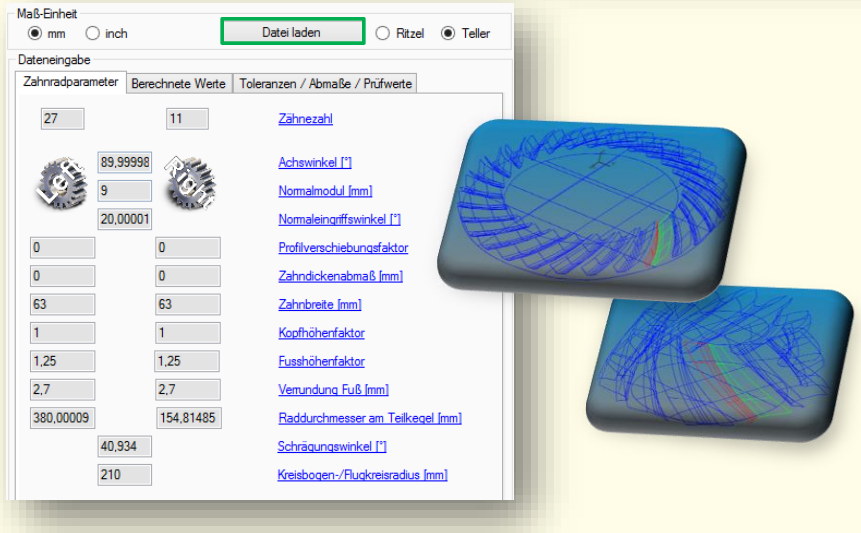
Design bevel gear

design with KISSsoft

calculation method according:

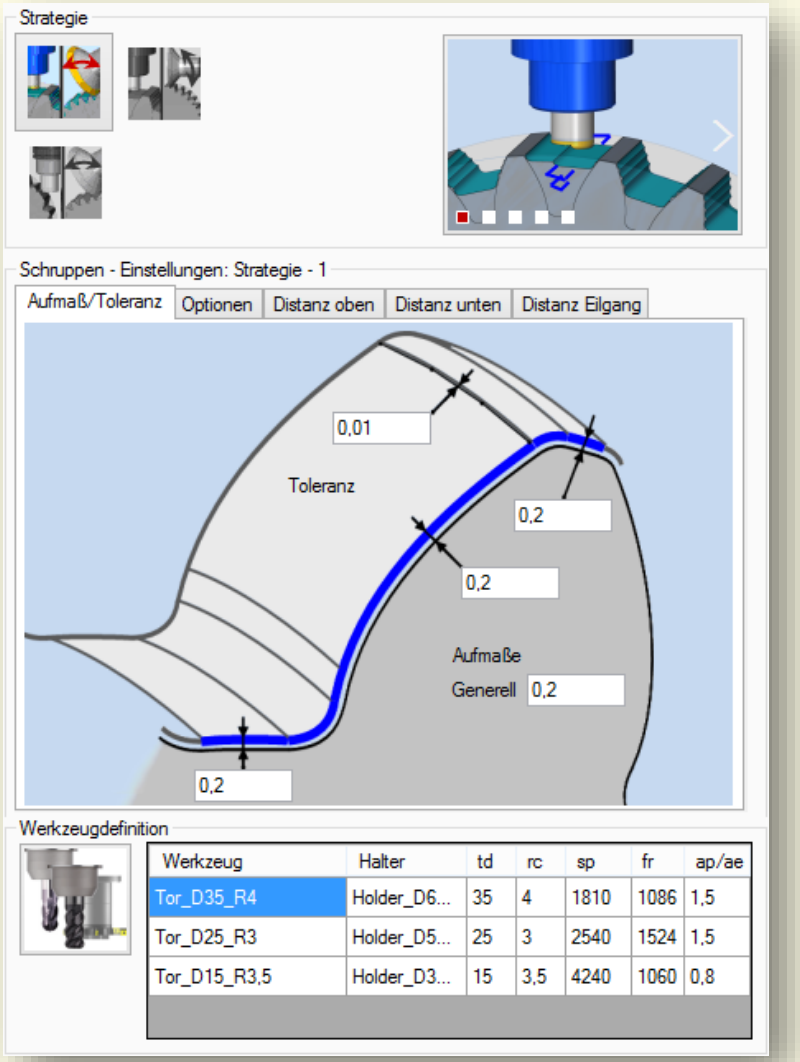
- DIN/ISO
- Klingelnberg
- Gleason
- …



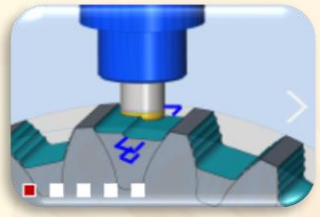


- specialized software for gear / transmission design
- EUKLID GearCAM uses a direct interface to the original KISSsoft file
- process interpretation is done completely in EUKLID GearCAM

Roughing - process

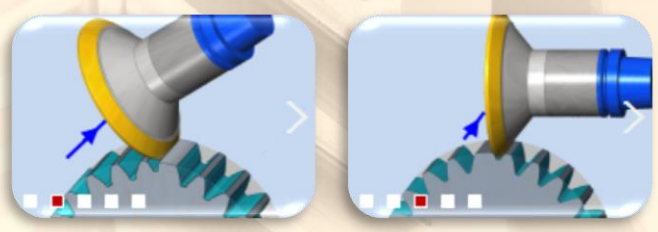


strategy 1

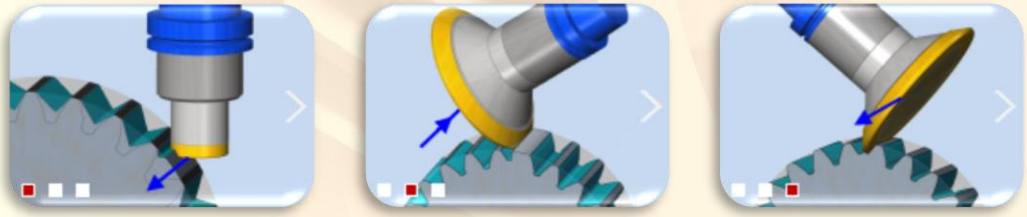


strategy 2

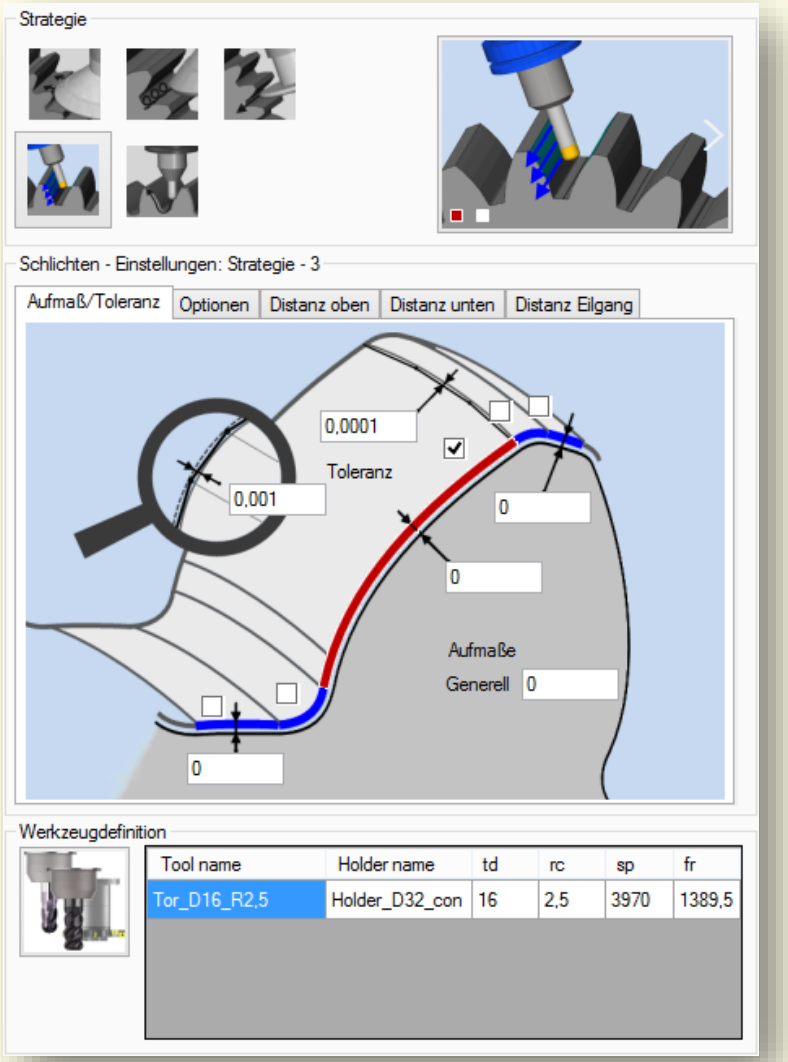
strategy 3



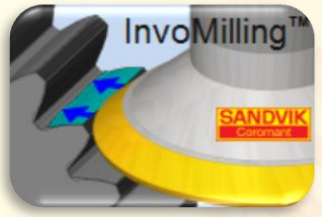
strategy 4



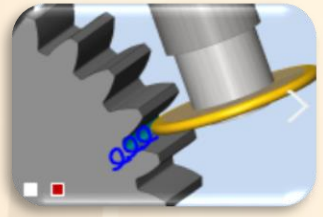
Finishing - process



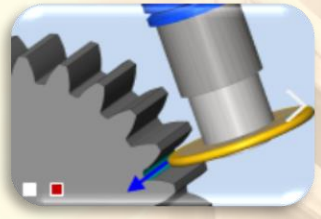
strategy 1



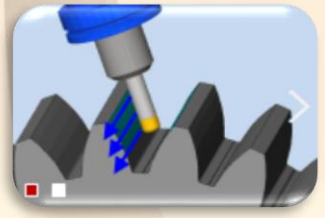
strategy 2



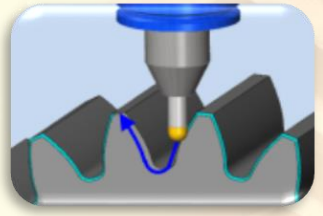
strategy 3



strategy 4



strategy 5



Processing rates finishing

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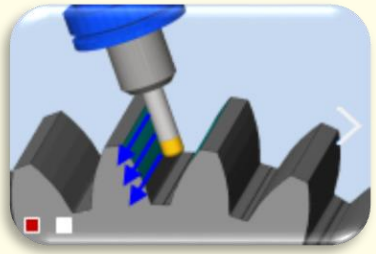
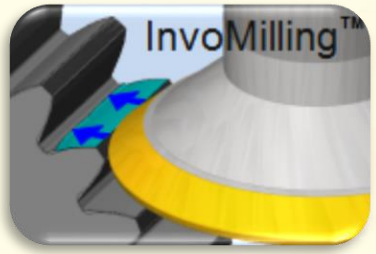
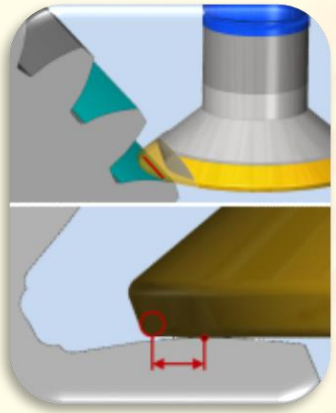
shaft turning

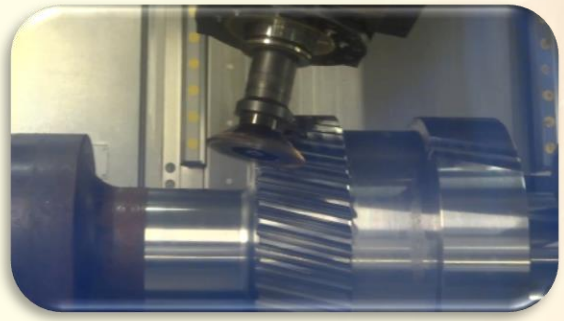


- use of cylindrical and conical end mills
- involute is generated by using the girthed area
- use of sister tools
- processing teeny / large gears
- suitable for all 4- / 5- and 6-axis machines

InvoMilling™ - method







Source : YouTube EUKLIDCADCAM

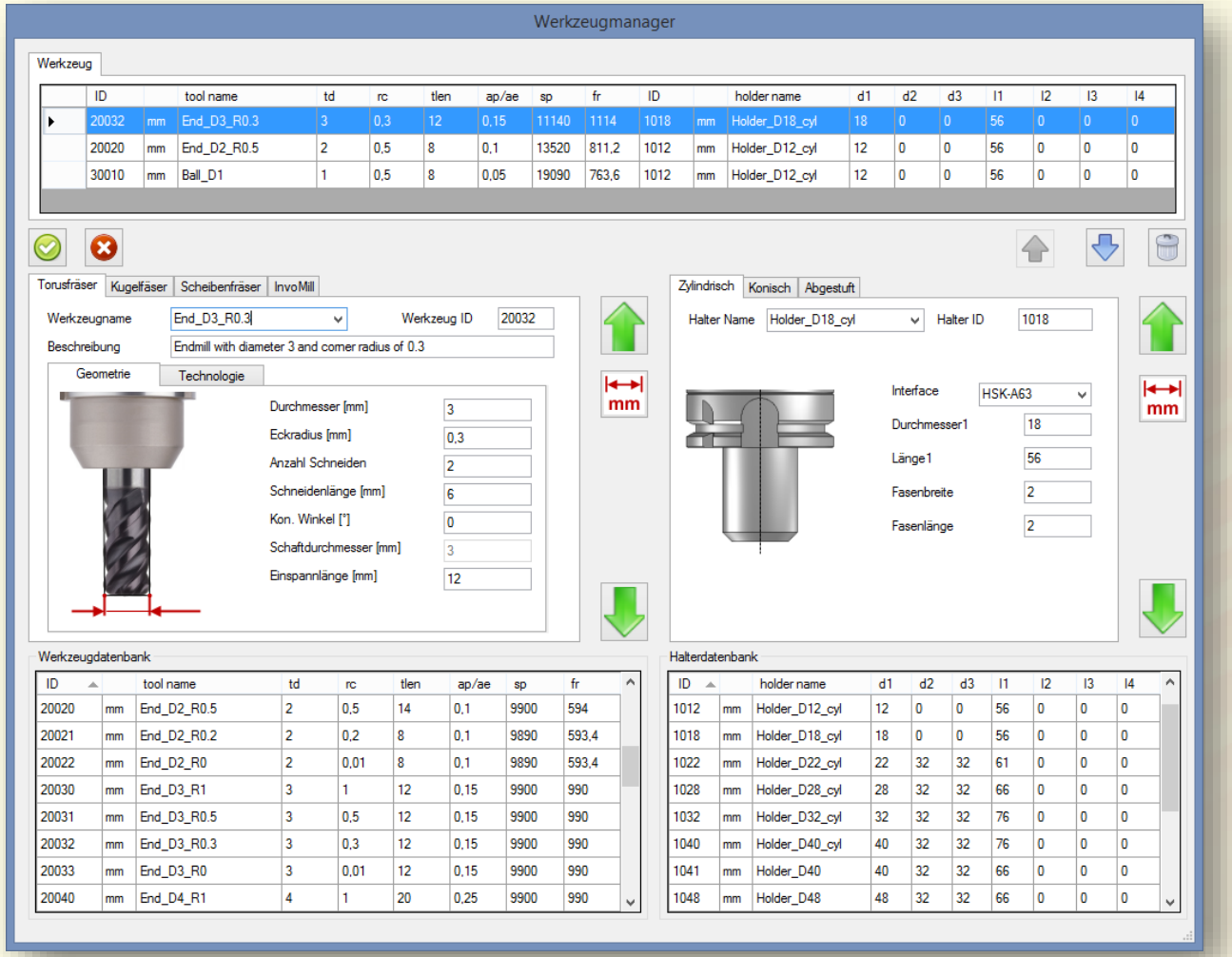
- use of disc cutters
- involute is generated by roll up
- low processing time
- high lifetime of the cutter
- processing from module 1
- not feasible on all machine concepts

<u>Speed increase of 200% and higher</u>

(depending on the number of teeth and geometry)

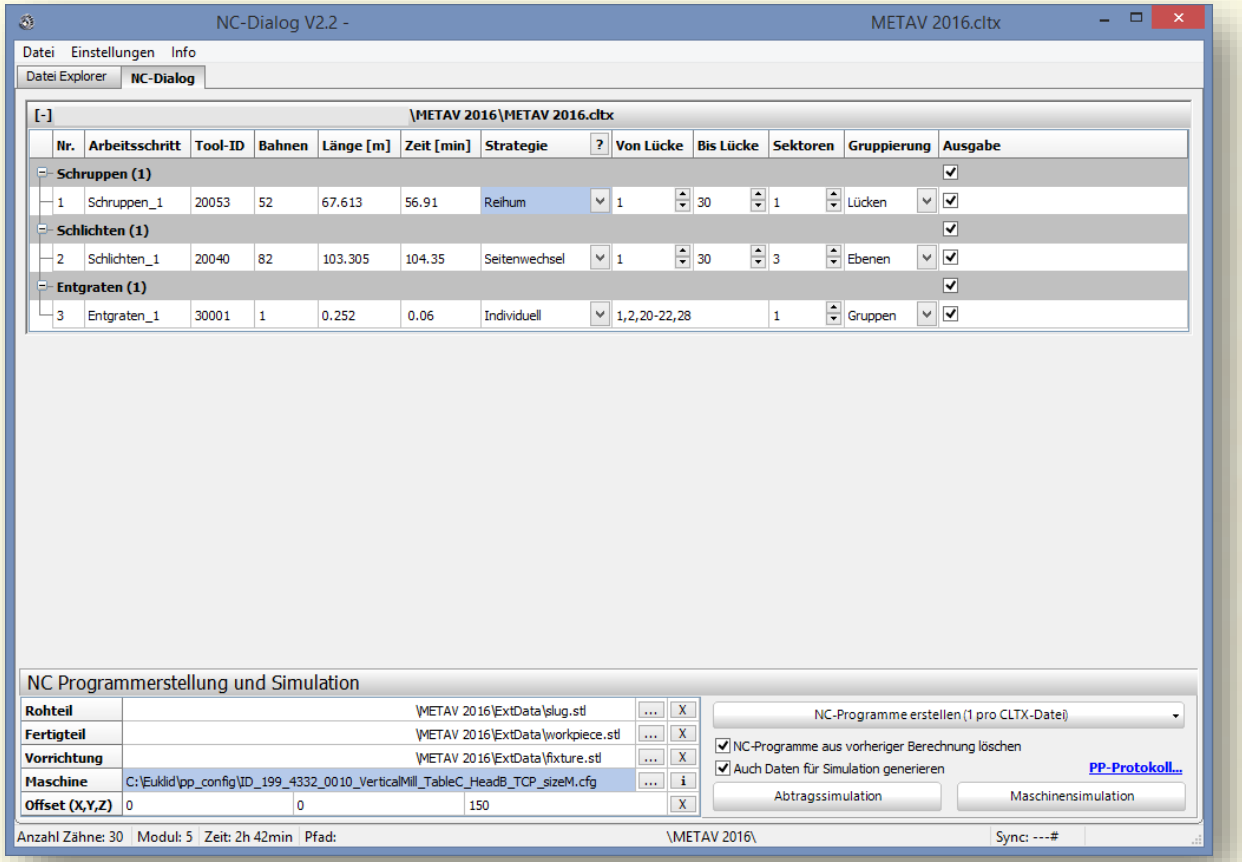
TM = Trademark of company Sandvik Coromant

Tool data bank



- selection of ball nose, end mills and disc cutters
- each tool is applied individually
- included free creatable holders
- remembers the last combination of tool + holder
- Sandvik Coromant CoroMill-disc cutter are fixed

Processing strategys



selection of strategy

successive

alternating

individually

selection of sectors

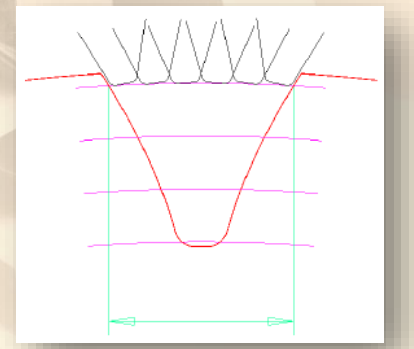
set number of processing areas

grouping

gaps

levels

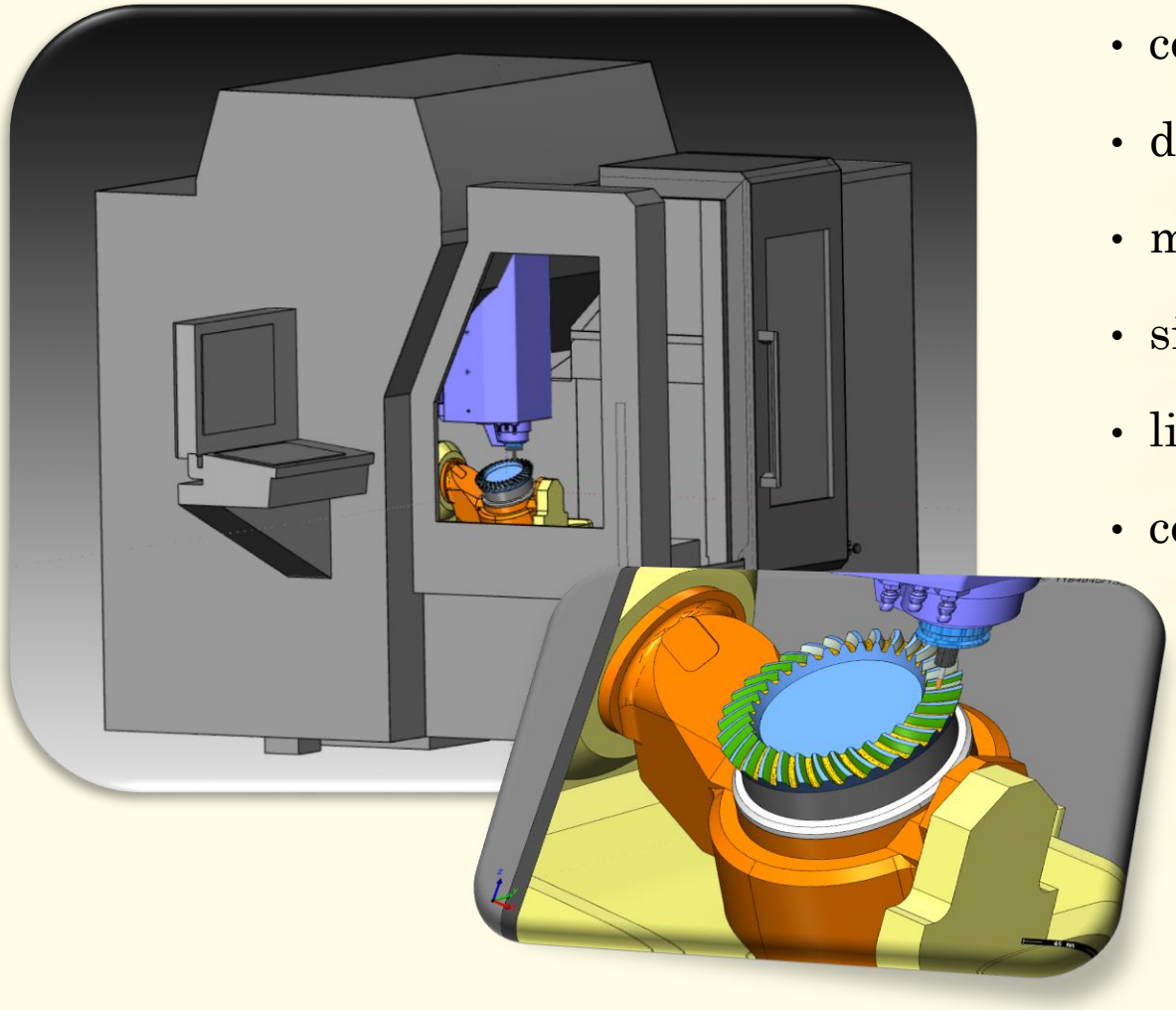
groups



Postprocessor

- offers customizable postprocessor
- for all machine types
- customized optimization
- for 3- / 4- / 5- and 6-axis-machines
- customizable custom macro by operator
- generation of NC simulation data

Machine simulation

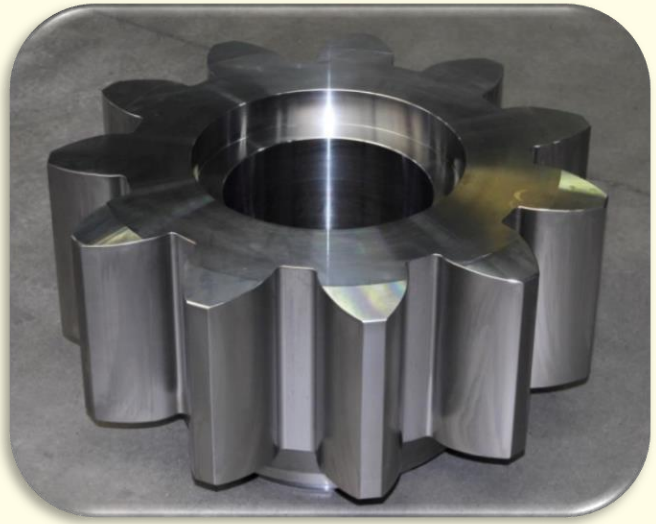


- collision detection processing
- detailed machine model or
- material removal without machine model
- simulation of the NC machine data
- limit control of all axes
- control of all interfering contours (chuck, …)

Application examples from practice

Crown wheel:
m = 16 t = 36
d = 780 mm
Case hardend
60 HRC

Repair:
Press drive - Herringbone
m = 18 t = 120
d = 2450 mm w = 400 mm
30CrNiMo8



Lantern gear:
m = 48 t = 11
d = 655 mm w = 250 mm
30CrNiMo8

Compressor waves:
double helical
m = 9
d = 120 mm

Spare Parts Production

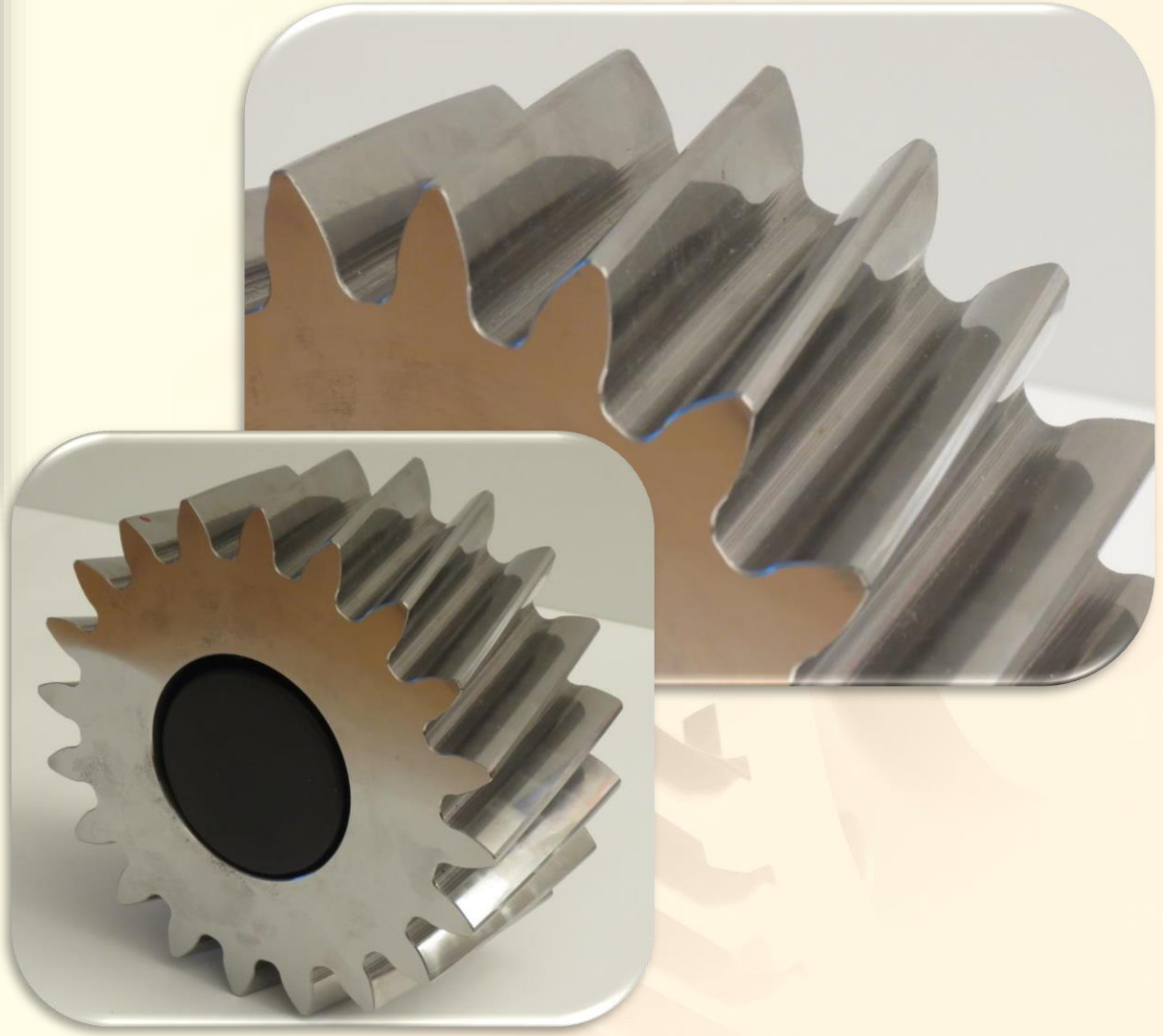
To improve performance to large gearboxes:

- Double helical gear
  Case hardened pinion shafts
  18CrNiMo7-6
- Increase the tooth width
  by 40% in the same space!

Sorry but the pictures of the large gearboxes are not public…

high productive
gear machining
InvoMilling™ - technology

InvoMilling™ with disc cutters



Spur gear:

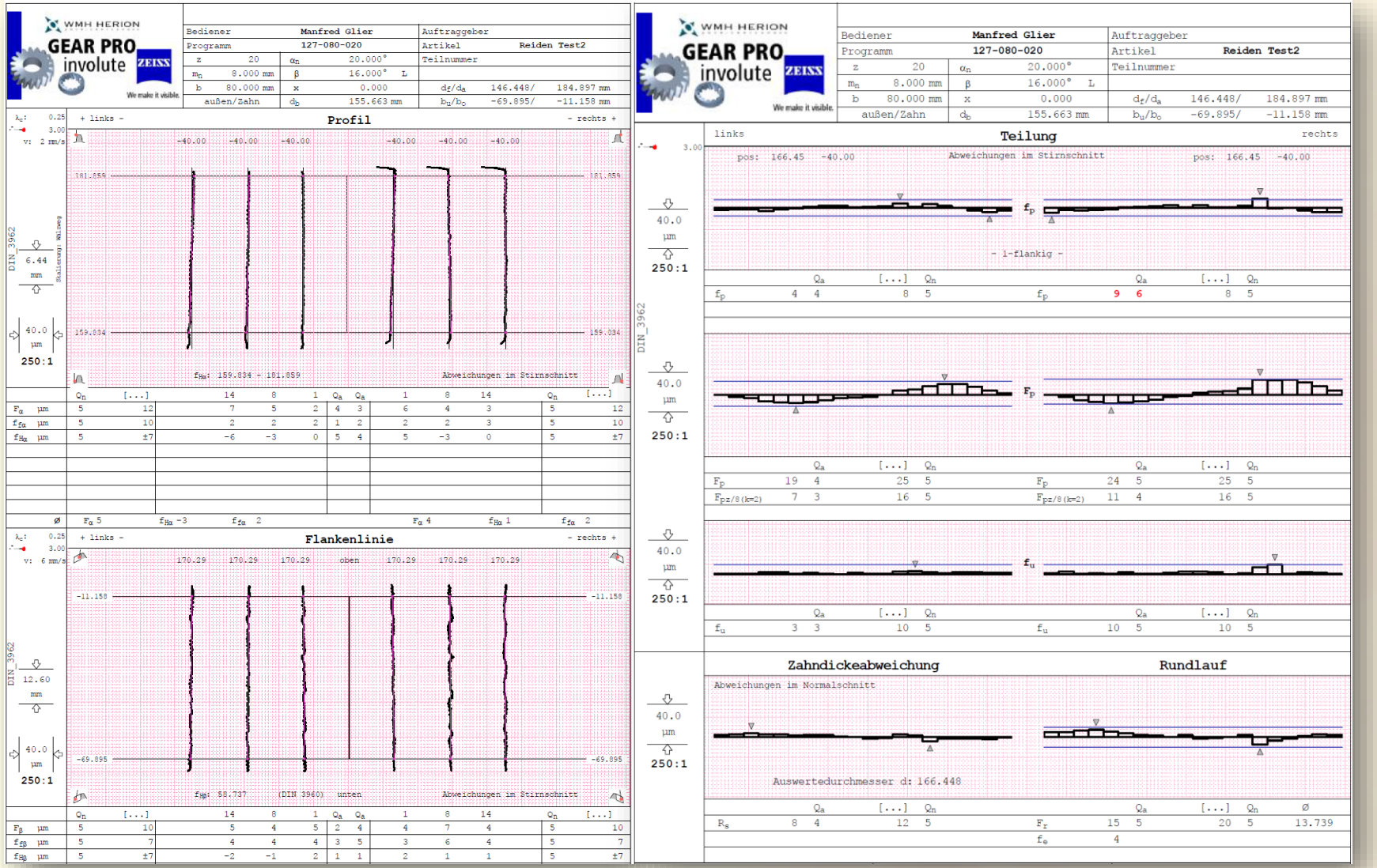
m = 8 mm	t = 20	ß = 16°
d = 185 mm	w = 80 mm	
42 CrMo4		

Example:

Spur machining with InvoMilling™ technology

Quality:

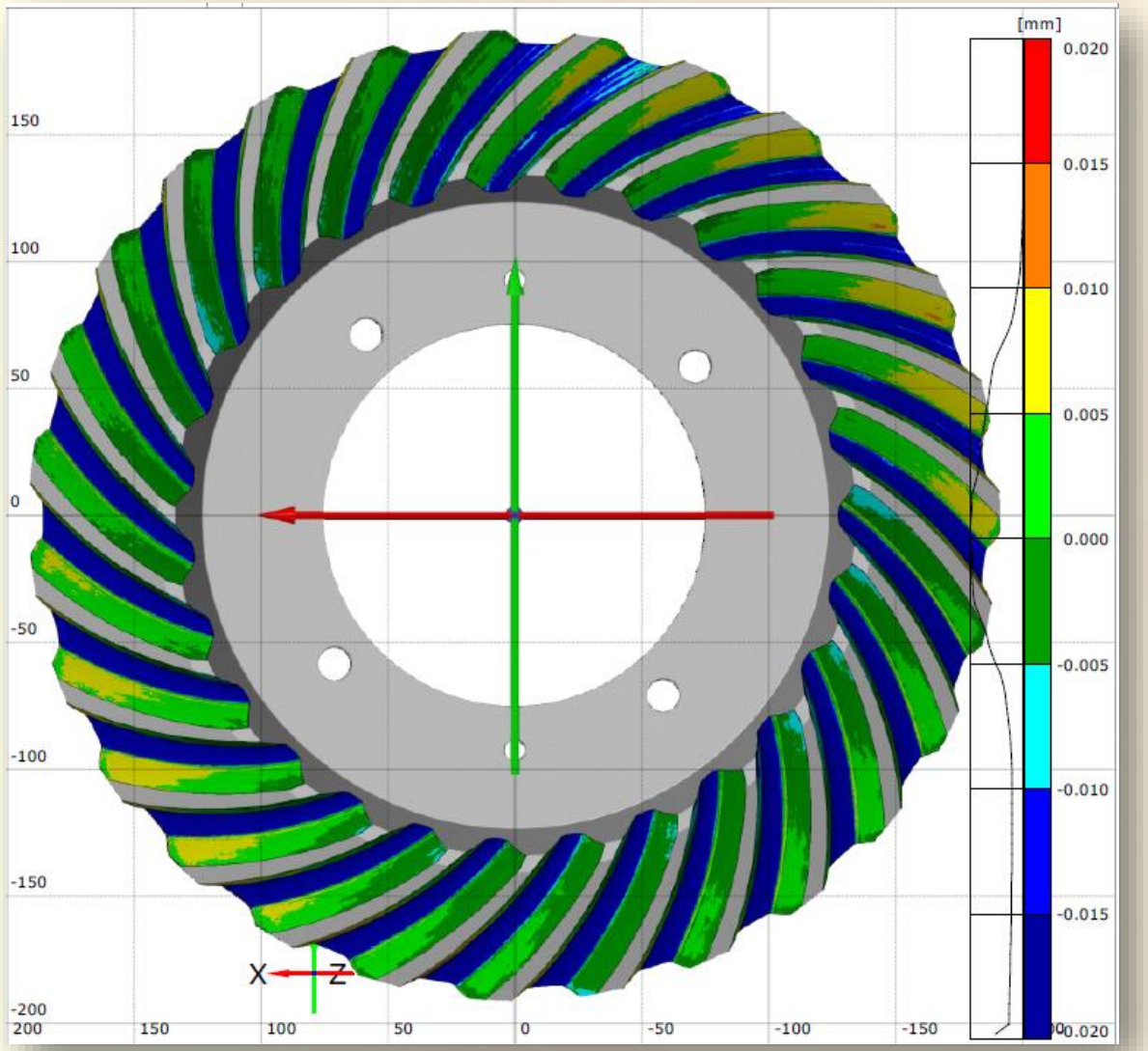
IT 6



Example bevel gear:

- 18 CrNiMo7-6, case hardend, 60 HRC
- Klingelnberg gearing
- Normal module mn = 9 mm
- teeth t = 27
- width w = 63 mm
- Tip diameter d = 387 mm

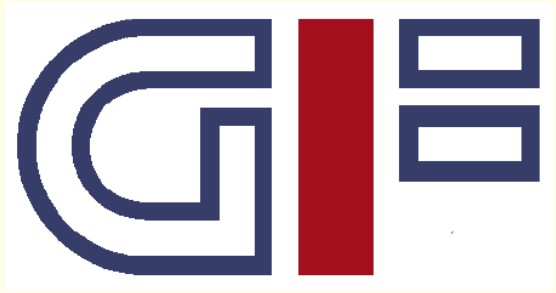
optical measurement and evaluation with GOM



Conclusion / Outlook

- growing popularity
- 5-axis milling is becoming more common
- faster expectant machining stategies and methods
- profitable batches
- grinding on the milling machine
- machining of shafts in one clamping

Thank you for your Attention!



EUKLID

Solutions for CAD/CAM