

numroto®
Total solution for tool grinding

New features in NUMROTO 4.2.0 and 4.2.1

(as some which were added to version 4.1.2b and following)

■ End mills

- Drills / Step drills
- Form cutters
- 3D-Simulation
- NR Draw
- Probing
- NCI
- Other changes
- Additional small improvements



Up to 6 reliefs

(complex end mills, since version 4.1.2)

- It is now possible to program up to 6 reliefs.

New grinding operation

Group

Grinding

Cylindrical grinding

In-process-measurement (measurement with cc

Inspection measurement

Probing

Wheel

ISO

Fixed equipment

Machine parts

External calculations

Operation

	possible types
Body clearance	50
Cut off (flat)	50
Flute	50
Flute-X	50
Independent cam	50
Independent flute	50
Independent manual flute	50
Independent profile with lead	50
Manual flute	50
Manual grinding path	99
Manual profile grinding path	50
Manual step face cam	50
Manual tip relief 1	50
Manual tip relief 2	50
Plunge infeed - deep cut V2	49
Relief 1	50
Relief 2	50
Relief 3	50
Relief 4	50
Relief 5	50
Relief 6	50
Roam profile	50
Supplementary flute	50
Tip clearance	50
Tip gash out X flat	50
Tip gash out	50
Tip Notch	50
Tip relief 1	50
Tip relief 2	50

Position

☒ before

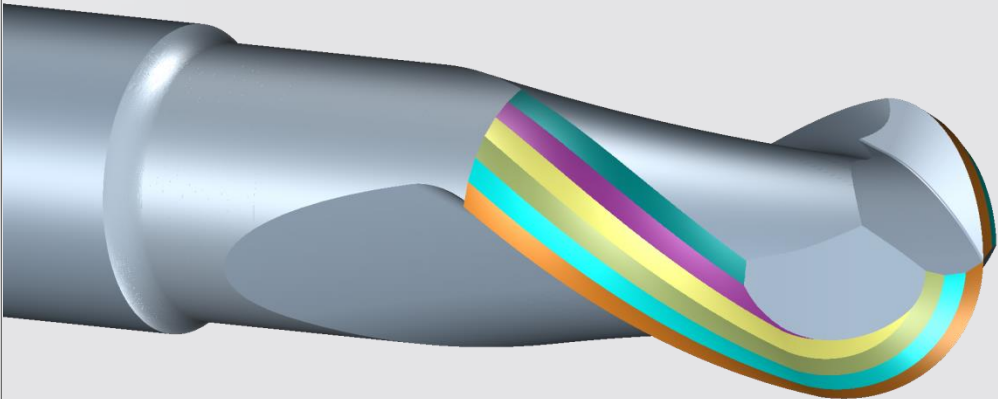
☐ after

Operation insert

OK

Cancel

?



Flute-X, Land width correction

(since version 4.2.0b)

- A new parameter for the land width correction has been added to the flute-X operation.
- The edge between the flute and the last relief can, due to grinding pressure or mechanical inaccuracies not be parallel to the cutting edge. With the help of the land with correction this can be compensated.

Cylinder/Flute-X

Flute

Core

Flute washout

Wheel

Feedrates

Reduction

Cycles/Infeed

Increments

General

Change positions

Grinding position

Cooling Valves

Division/Helix

ISO disengagement program

ISO program

Rake angle: Front 8.00000 Rear 8.00000

Measuring depth: 0.20000 mm

Rotation angle: 0.00000

Transv. displacement: 0.00000 mm

Land width correction: 0.00000 mm

Length modification: 9.00000 mm 0.00000 mm

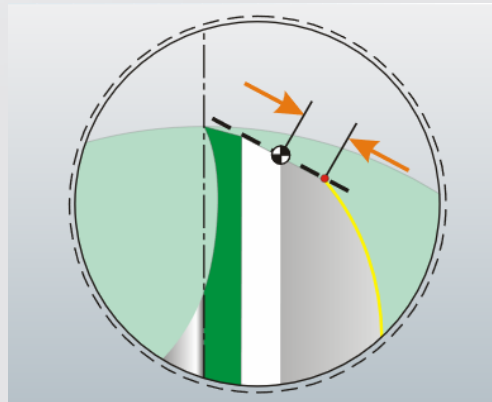
Flute land width reference: According to land width of reliefs

Reference relief: 3 Cylinder Relief 2

Calculation points for flute fitting: 25% of points

Consider complete wheel shape: Yes

OK Cancel



Body clearance / Flute land width reference

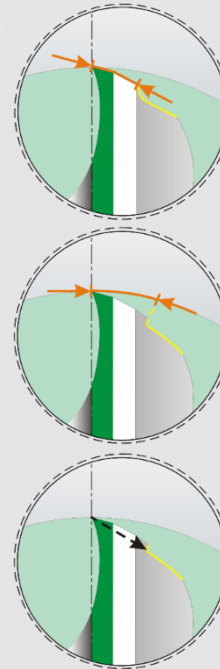
(since version 4.2.0b)

- At the operation 'Body clearance' it is now possible to define, which reference will be used to position the body clearance.

Cylinder/Body clearance

Geometry	Calculation method:	New (version 1.5 and later) ▾	
Wheel			
Feedrates			
Reduction			
Cycles/Infeed			
General			
Change positions			
Grinding position			
Cooling Valves			
Division/Helix			
ISO disengagement program			
ISO program			

	Cylinder start	Cylinder end
Clearance depth:	0.24000 mm	0.24000 mm
Clearance angle:	8.00000 °	8.00000 °
Displacement angle:	0.00000 °	0.00000 °
Modif. of land width:	0.00000 mm	0.00000 mm
Grinding point offset:	0.00000 mm	0.00000 mm
Length modification:	4.80000 mm	0.00000 mm
Flute land width reference:	According to land width of reliefs ▾	
Reference relief:	According to land width of reliefs <input checked="" type="checkbox"/> A	
	Manual flute land width	
	Manual land with/relief angle	



Flute land width reference: According to land width of reliefs ▾

Reference relief: 4 Cylinder/Relief 2 ▾ ☒ A

Flute land width reference: Manual flute land width ▾

Flute land width: 3.00000 mm ☒ 3.00000 mm

Flute land width reference: Manual land with/relief angle ▾

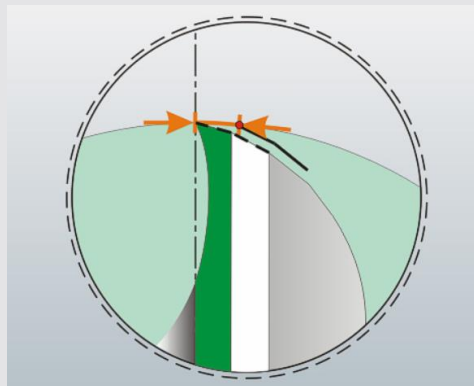
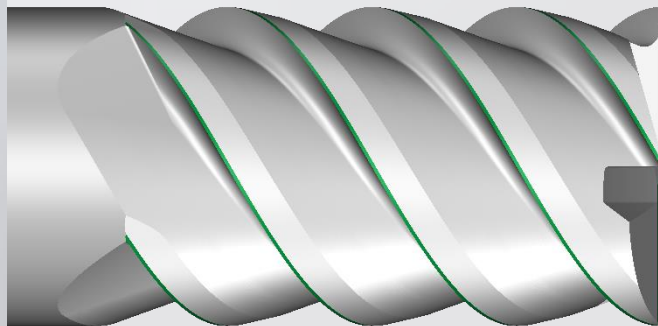
Manual land with: 3.00000 mm ☒ 3.00000 mm

Manual relief angle: 20.00000 ° ☒ 20.00000 °

Width of circular land

(since version 4.1.2f)

- At relief 1 and at the radial relief it is now possible to define a circular land (on the cylindrical part of the tool). The reliefs will afterwards be rotated according to the width of the circular land.
- The circular land is usually quite small. Due to grinding pressure or mechanical limits it might be that the circular land is not 100% parallel after grinding. Such an error can be compensated by programming the width different at the front and back. If the error is not linear, it is also possible to use a data table. Using a data table also allows to modify the width of the circular land at the transition area at the tip (ball/corner radius) to the cylindrical part.



Cylinder/Relief 1

Geometry	Cylinder start	Cylinder end
Wheel	8.00000	8.00000
Feedrates		
Reduction		
Cycles/Infeed		
Increments		
General		
Change positions		
Grinding position		
Cooling Valves		
Division/Helix		
ISO disengagement program		
ISO program		

Relief angle: 8.00000

Land width: 1.00000

Width of circular land: 0.05000

Cutting angle: 2.00000

Displacement angle: 0.00000

Length modification: 1.40000 ☒ A 0.00000 mm

Eng./diseng. slant

☐ Slant ☐ Slant

Length: 1.20000 mm 1.20000 mm

Angle: 45.00000 ° 45.00000 °

Grinding position: Tangential

Radius modification (data table)

(since version 4.1.2f)

- The radius modification (diameter correction) for reliefs can now also be programmed as a data table. This allows to add a variable diameter modification. The radius modification from relief 2 can now be linked to the radius modification from relief 1.

Cylinder/Relief 1

Geometry

Wheel

Feedrates

Reduction

Cycles/Infeed

Increments

General

Change positions

Grinding position

Cooling Valves

Division/Helix

ISO disengagement program

ISO program

Name:

Modifications

Start angle correction: °

Length modification: mm

Radius modification: mm

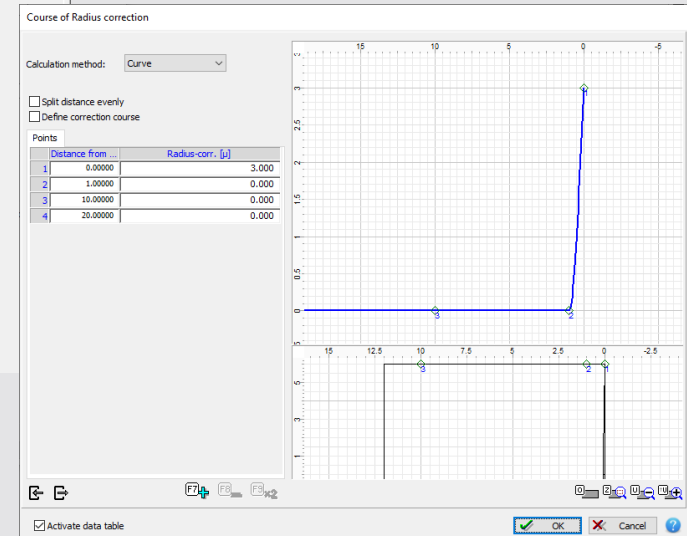
Grinding time correction: s

Lock this operation for

☐ Machining ☐ Simulate 2D ☐ Collision check

☐ Simulate 3D ☐ Wheel removal rate check

☐ Always use this operation for collision detection of the subsequent operations, also if it is disabled for grinding.



Gash-out radius independent from wheel corner radius

(since 4.2.0b)

- At the tip gash-out (for end-mills, drills or form cutters) the wheel corner radius can now be compensated so that the gash-out radius is no longer changed when a wheel with a different corner radius is used.

- Example: Gash-out X flat:

Widening

☐ Walk travel

☒ Radius

Gash out radius: mm

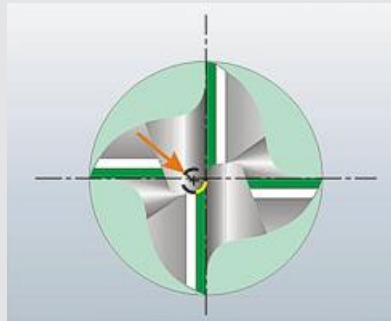
Start angle of gash out radius: °

End angle of gash out radius: °

Direction: ▾

☒ Adjust gash out widening radius to wheel corner radius

☐ Opening



Default values - General

Basic data

Clamping

Pass over

Increments

CNC

3D

ISO programs

Technology

Park positions

Cooling Valves

Templates

Machine specific data

Recalculate values for diameter variations from: %

Reliefs

Machining: ☐ 4-axis ☒ 5-axis

Sequence: ▾

Tip

Dish angle: °

Displacement angle: °

☒ Gash outs - adjust gash out widening radius to wheel corner radius

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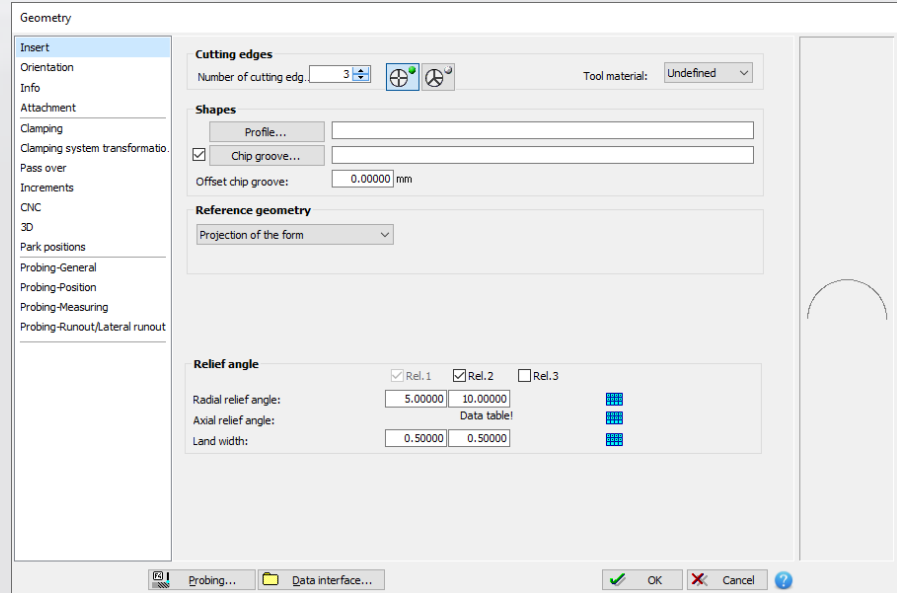
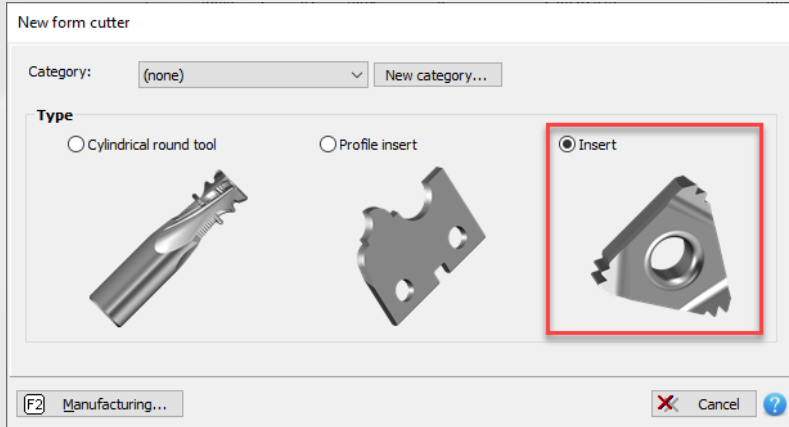
- End mills
- Drills / Step drills
- **Form cutters**
- 3D-Simulation
- NR Draw
- Probing
- NCI
- Other changes
- Additional small improvements



New module for inserts

(new option, since version 4.1.2)

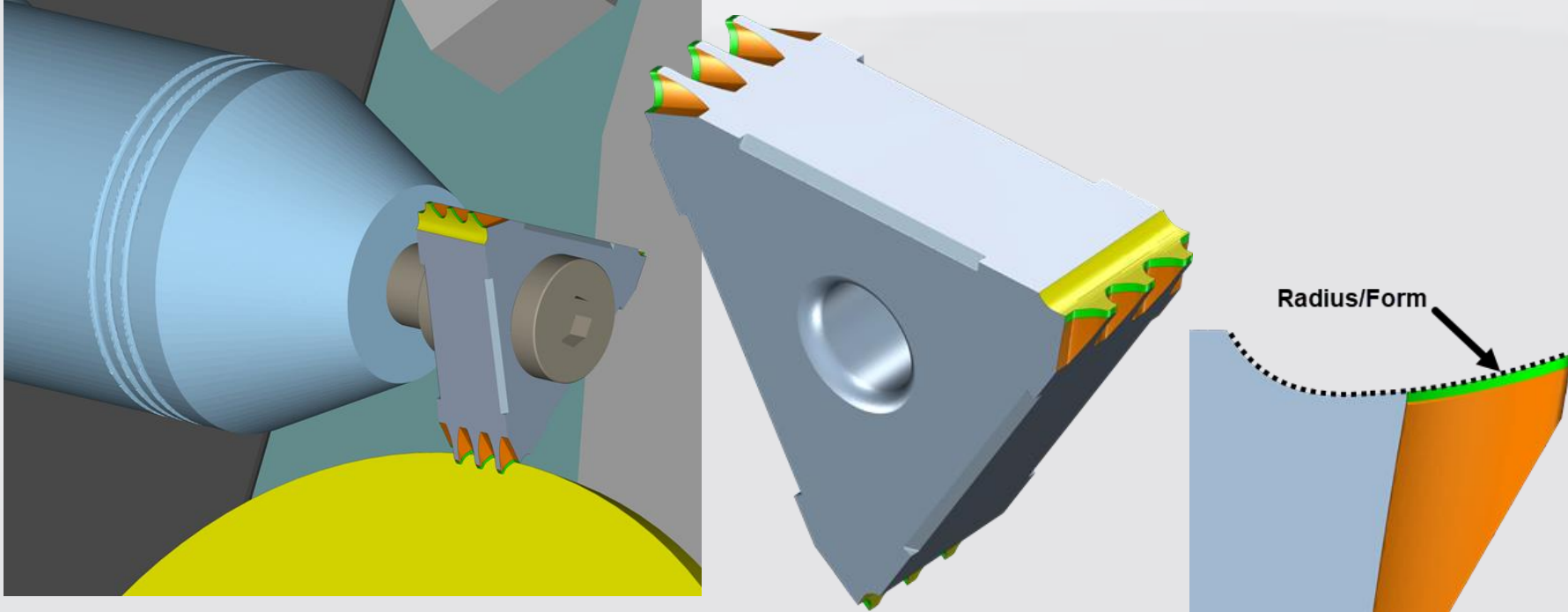
- With customized and simple dialogs for insert grinding.



New module for inserts

(new option, since version 4.1.2)

- Distortion-free relief grinding even with a round chip surface.



Form reliefs: Radial relief


(since version 4.1.1)


- Automatic calculation of angle for the swivel axis thus on cylindrical parts of a profile a radial relief will be generated.
- Can be used for form reliefs 1 to 3.


Form A/Form relief 1


Geometry
Range
Oscillate
Division/Disengagement
Wheel
Feedrates
Cycles/Infeed
Increments
General
Reference
Change positions
Grinding position
Cooling Valves
Division/Helix
ISO disengagement program
ISO program


Positioning and grinding proc.

 Grinding with ☐ definition of rotation angle

 Grinding with ☒ definition of swivel angle

 Grinding with ☐ cutting angle relative to form

 Grinding with ☐ definition of rotation and swivel angle

 Grinding in helix direction ☐

Grinding procedure: Face grinding

Setting angle of swivel axis: 0.00000 °

Displacement angle: 0.00000 °

Grinding point offset: 0.00000 mm

☒ Radial relief

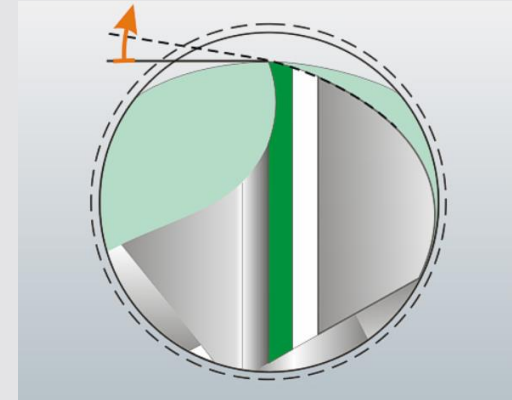
☐ Profile-dependent displacement angle

Relief angle definition: Relief angle A

Helix selection: Helix A

Radiusing: Wheel corner radius

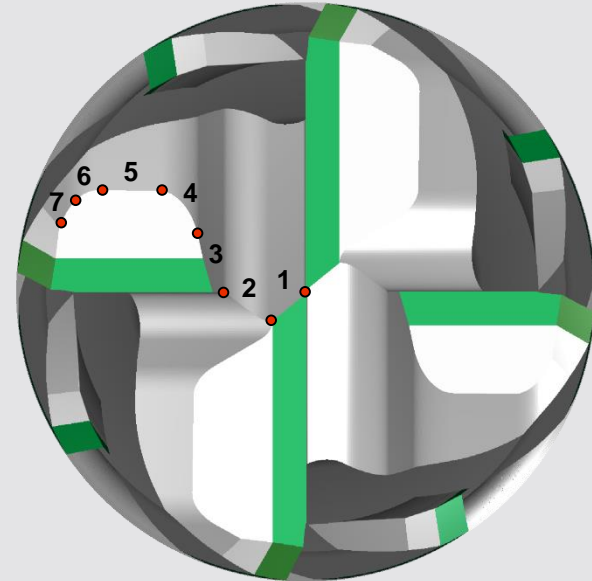
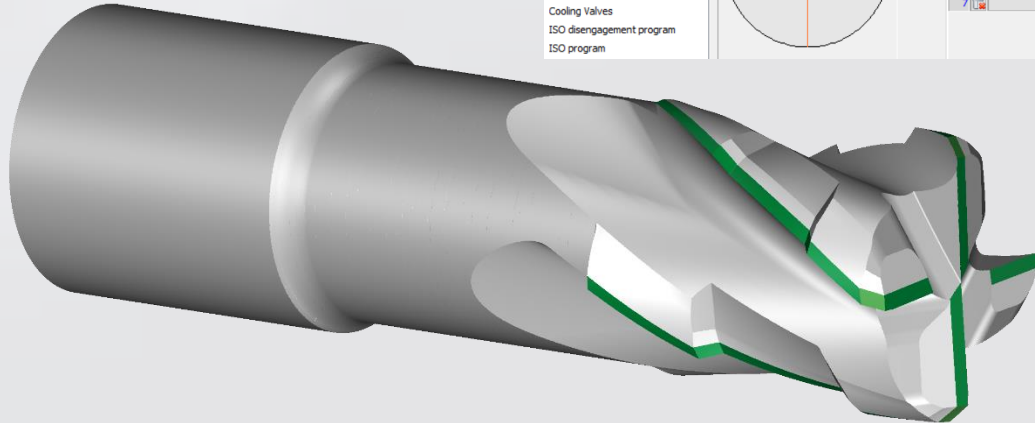
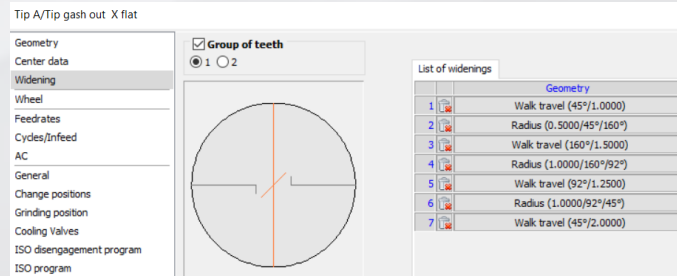
Value for radiusing: 0.27500 mm



Gash-out X flat

(since version 4.2.0a)

- The operation 'Gash-out X flat' for a flat tip can now also be used in form cutters. For individual widening of the tip chip space.



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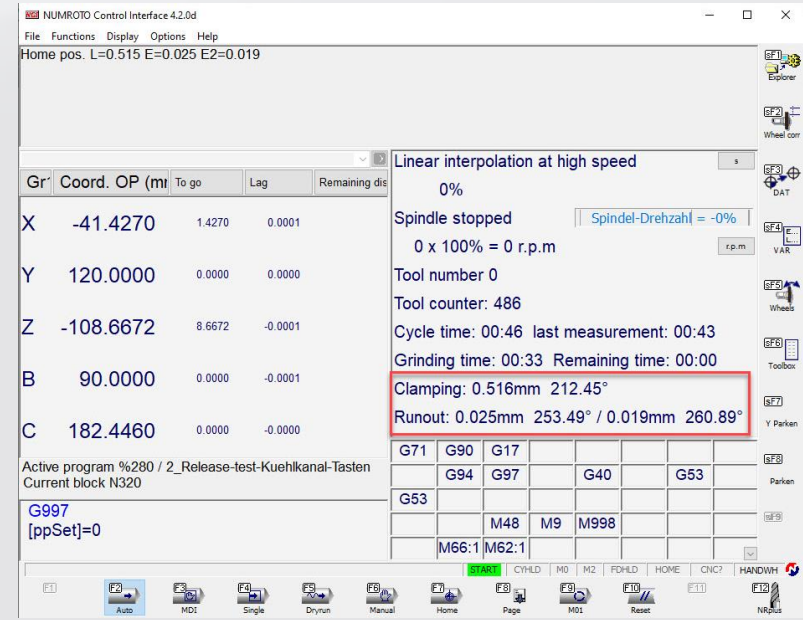
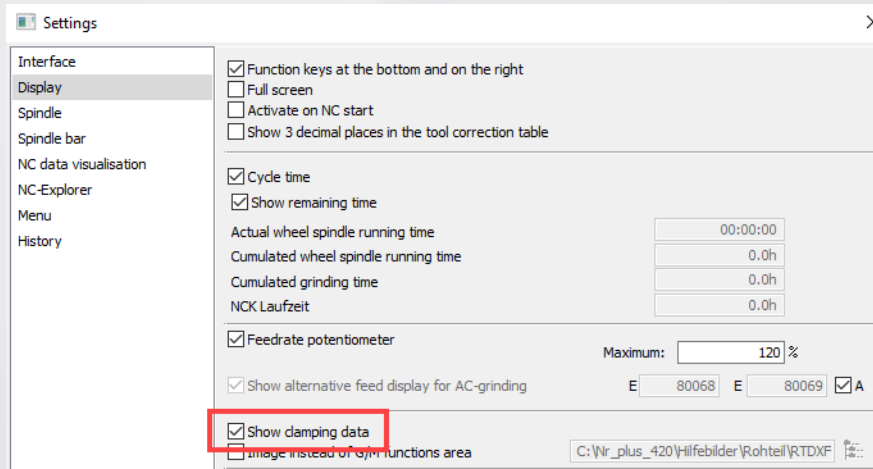
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NCI: Tool position and run-out probing results

(since version 4.2.0b)

- Now the following probing results can be displayed:
 - Difference to the probed clamping length
 - Results from the run-out probing



New features in NUMROTO 4.2.0 and 4.2.1

(as some which were added to version 4.1.2b and following)

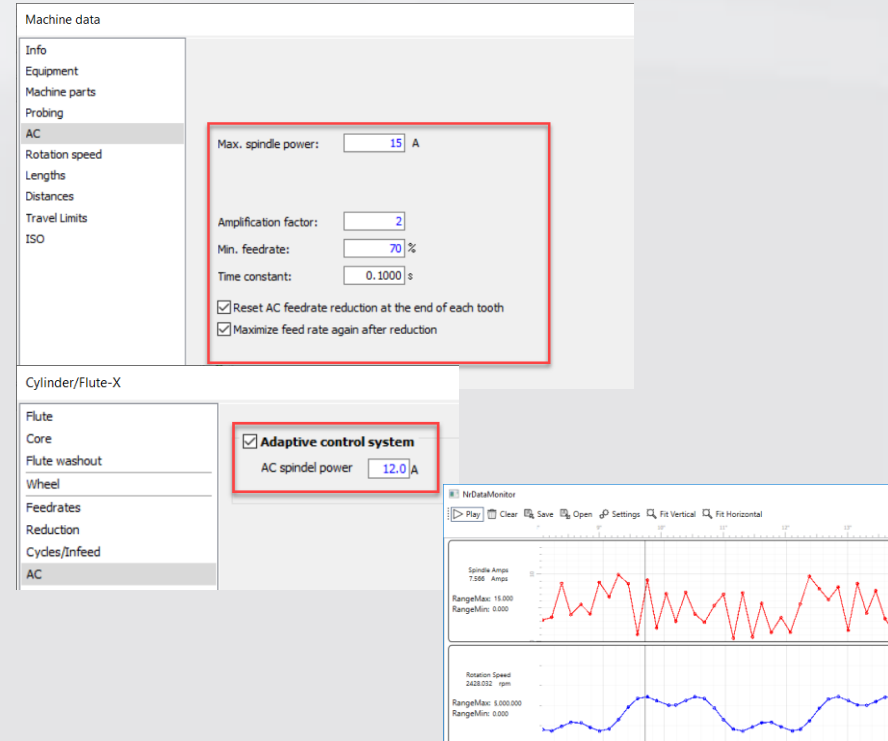
- End mills
- Drills / Step drills
- Form cutters
- 3D-Simulation
- NR Draw
- Probing
- NCI
- Other changes
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AC-grinding (Adaptive control)

(new option, since 4.1.2)

- Automatic adjustment of feed rate when reaching a certain load on the grinding spindle.
- Avoid overloading the grinding wheel
- Optimization of grinding time and grinding quality.
- Primarily for machines whose grinding spindle is equipped with a NUM drive and for which the necessary adjustments have been made.
- Further information can be obtained from the machine manufacturers.



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Diameter definition at intersection taper / tip

(since version 4.2.0b)

- For conical milling cutters with ball or corner radius, the diameter can now be defined at the theoretical intersection point between the taper and the tip.

Geometry

Cylinder geometry

Teeth

Blank

Info

Attachment

Clamping

Pass over

Increments

CNC

3D

Park positions

Probing-General

Probing-Position

Probing-Measuring

Probing-Runout/Lateral runout

Cutting edge length: 30.0000 mm

Front

Diameter at the intersection c 5.1123 mm

Ball nose radius 3.0000 mm

Cylinder diameter 10.0000 *

Diameter at the intersection of taper/tip 6.2297 *

Core taper angle: 6.2297 *

Rear

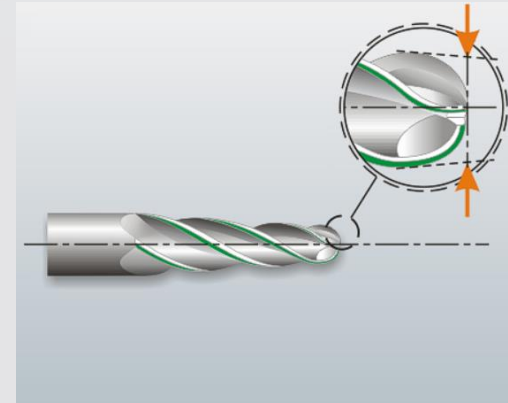
Ø: 15.6919 mm

9.0000 mm

Tip

Cylinder

☐ Radius modification





Helix angle defined in elevation projection

(since version 4.2.0b)

- For conical milling cutters, it was previously assumed that the helix angle is defined perpendicular to the taper surface.
- The helix angle can now also be defined in the elevation and programmed via the corresponding input field. Internally a conversion to the previous helix angle definition is then performed.

Geometry

Cutting edges

Number of teeth:  

Center cutting teeth:

Cutting direction:

Reliefs

☒ Normal
☐ Radial

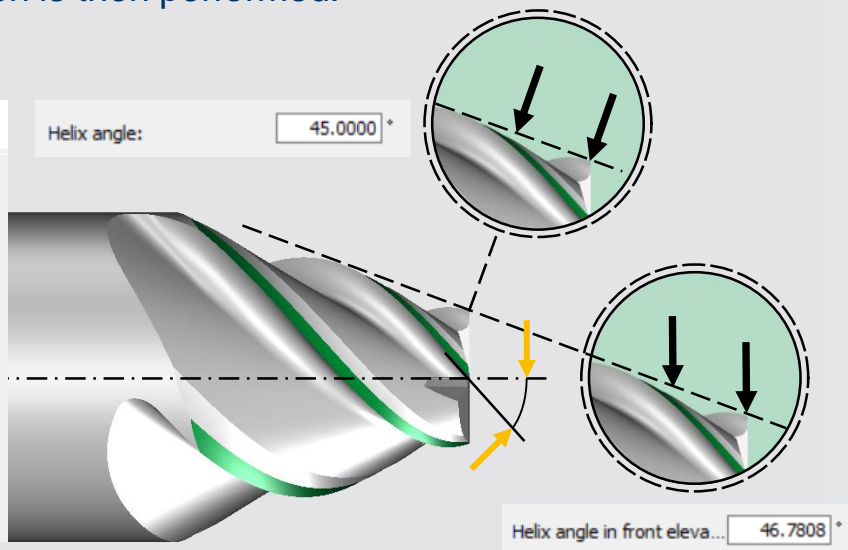
Helix

Type:

Helix hand:

Helix angle:

Helix angle in front eleva...:



Flute-X, opening angle (flute space)

(since version 4.2.0a)

- Now the flute opening angle can be used to define the width of the flute space. This width is then constant, even if the pitch is unequal.

Cylinder/Flute-X

Flute					
Core					
Flute washout					
Wheel					
Feedrates					
Reduction					
Cycles/Infeed					
AC					
Increments					
General					
Change positions					
Grinding position					
Cooling Valves					
Division/Helix					
ISO disengagement program					
ISO program					

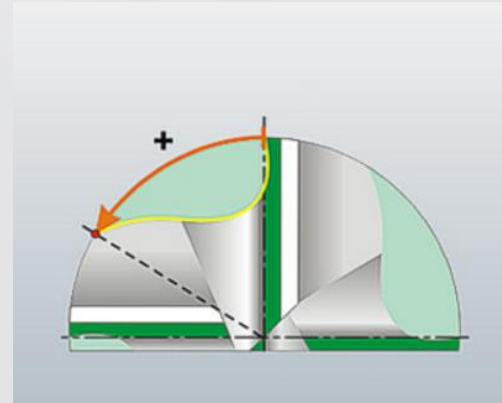
	Front		Rear		
Rake angle:	8.0000		8.0000	*	
Measuring depth:	0.2000		0.2000	mm	<input checked="" type="checkbox"/> A
Rotation angle:	0.0000		0.0000	*	
Transv. displacement:	0.0000		0.0000	mm	
Opening angle:	60.0000		60.0000	*	
Length modification:	3.6481	mm	0.0000	mm	<input checked="" type="checkbox"/> A

Flute land width reference: Opening angle

Calculation points for flute fitting: 25% of points ☒ A

Consider complete wheel shape: Yes

☒ OK ☒ Cancel ?



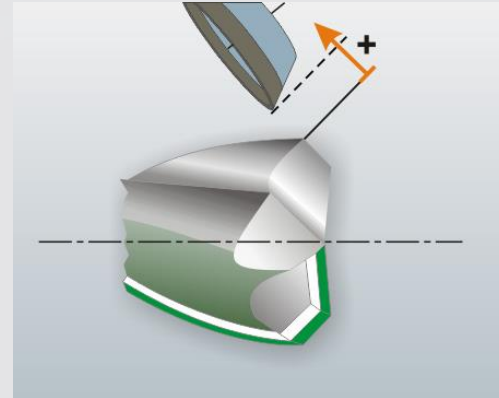
Chamfer extension

(since version 4.2.0b)

- For milling cutters with a chamfer, an extension can now also be defined 'Outside'. The grinding wheel follows the programmed helix along this path.

Tip/Chamfer 1	
Geometry	
Wheel	
Feedrates	
Cycles/Infeed	
General	
Change positions	
Grinding position	
Cooling Valves	
Division/Helix	
ISO disengagement program	
ISO program	

	External	Internal
Relief angle:	12.0000	12.0000 °
Land width:	0.8000	0.8000 mm <input checked="" type="checkbox"/> A
Cutting angle:	5.0000	5.0000 °
Displacement angle:	0.0000	0.0000 °
Length modification:	1.0000 mm	1.0000 mm



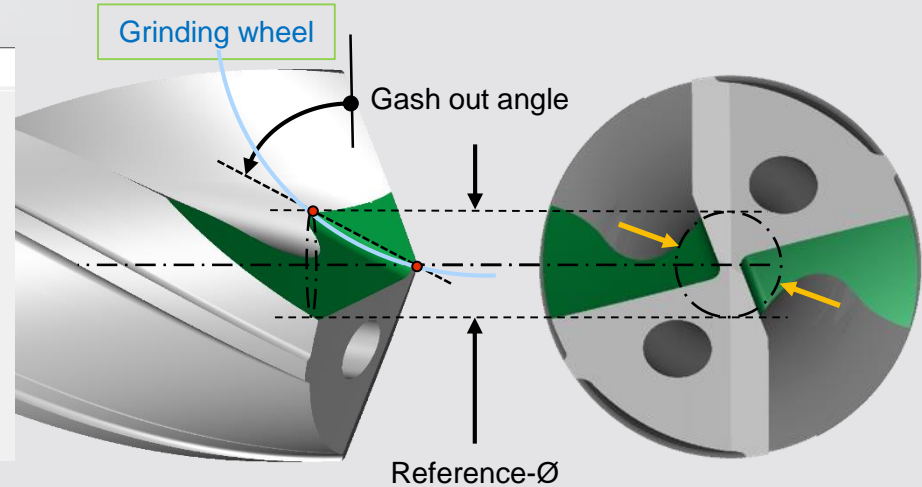
Gashout angle calculation

(since version 4.2.0a)

- The gashout angle of the drill was previously measured tangentially at the center of the point.
- Now it can be measured between two points: Point 1 at the point and point 2 at a selectable reference diameter. This makes the gashout angle less dependent on the grinding wheel diameter.

Point/Gash out

Geometry	Gash out type
Disengagement	<input checked="" type="radio"/> Manual input
Wheel	<input type="radio"/> Predefined form
Spindle	
Feedrates	Gash out angle: 60.0000 °
Cycles/Infeed	Gashout angle calculation: Between center and programmable diameter
AC	Reference diameter: 2.0000 mm <input type="checkbox"/> A
General	Rot.angle meas. from cutt. ed.: 10.0000 °
Change positions	Engagement length: 3.6000 mm
Grinding position	Rake angle: 0.0000 °
Cooling Valves	Axial displacement: -0.8000 mm
Division/Helix	Transversal displacement: 0.3000 mm
ISO disengagement program	Modification of length position: 0.0000 mm <input checked="" type="checkbox"/> A
ISO program	



Shaper cutter

(since version 4.2.0)

- If several cycles are defined, the cyclic infeed can now be performed in such a way that all teeth are first ground with the first infeed. The next infeed is then performed, which in turn grinds all teeth and so on.
- In addition, a skipping tooth function can be performed after each complete revolution.

Point/Shaper cutter

Geometry

Wheel

Feedrates

Cycles/Infeed

General

Change positions

Grinding position

Cooling Valves

ISO disengagement program

ISO program

Cycles

☒ Cyclic 2 Cycles

	A	V-Factor	Feedrate	N.passes	Stock	per pass
1	<input checked="" type="checkbox"/>	1.000	80.0	5	1.00000	0.20000
2	<input checked="" type="checkbox"/>	1.000	80.0	1	0.01000	0.01000

Infeed

Process infeed for all teeth before proceeding to the next infeed

☒ Infeed outside

Skipping tooth after each pass: 1

Form reliefs: Cam grinding with alternating infeed

(since version 4.1.2)

- Newly the infeed for cam grinding can be made at the cutting edge and at the back. This reduces the grinding time while maintaining the same surface quality.

Form A/Form relief 1

Geometry
Range
Oscillate
Division/Disengagement
Wheel
Feedrates
Cycles/Infeed
Increments
General
Reference
Change positions
Grinding position
Cooling Valves
Division/Helix
ISO disengagement program
ISO program

Disengagement

Type of disengagement: No special diseng. ▼

Cycles

Type of cycles: Cam relief with const. infeed ▼

Min. distance between opening positions: 0.20000 mm

Machining length: 70.00000 *

Infeed definition: Infeed in [mm] ▼

Axiale infeed per division: 0.00000 mm

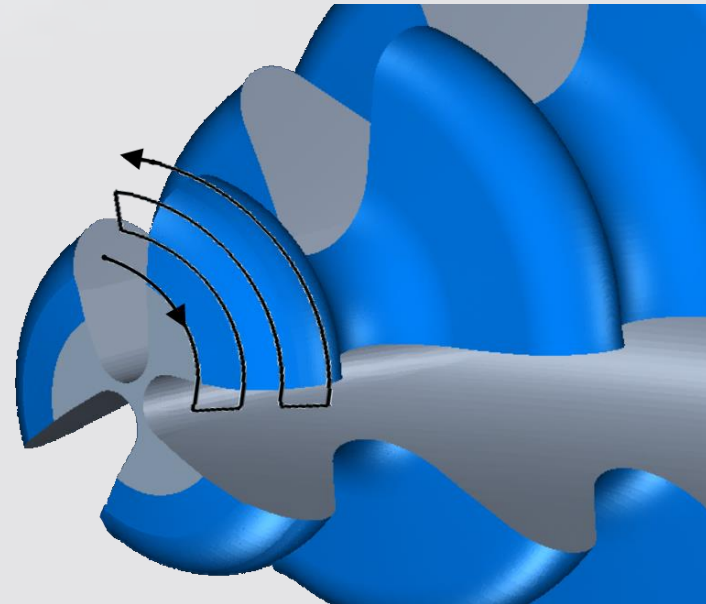
Radiale infeed per division: 1.00000 mm

Engagement angle: 10.00000 °

☒ Alternating cam grinding

F3 F10

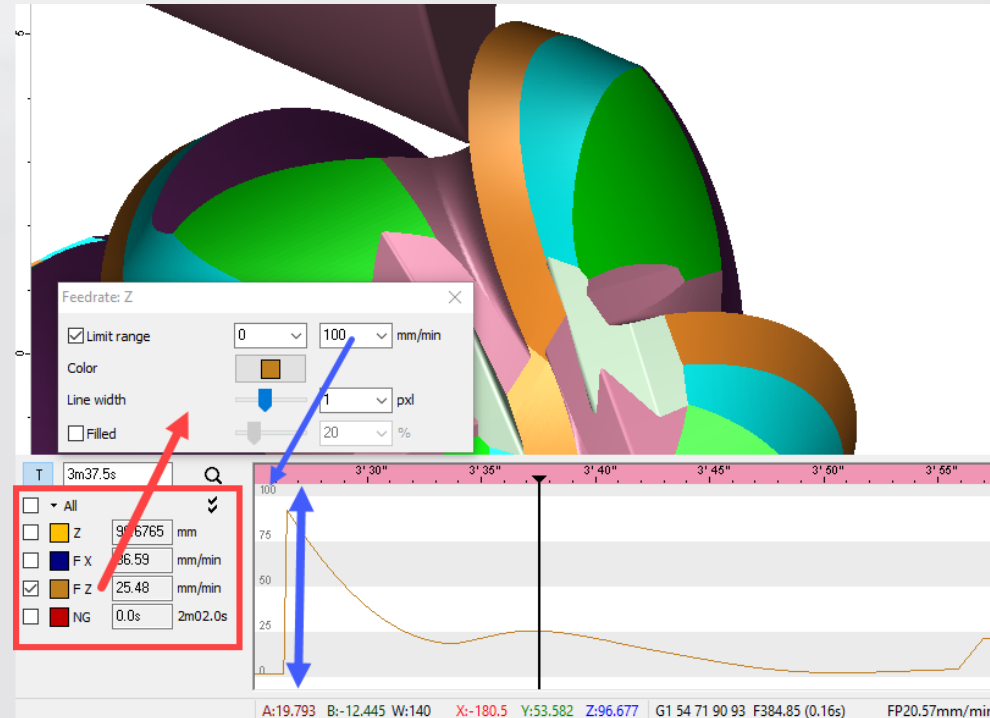
OK Cancel ?



NUMROTO-3D: New possibilities of graphical representation

(since version 4.1.2)

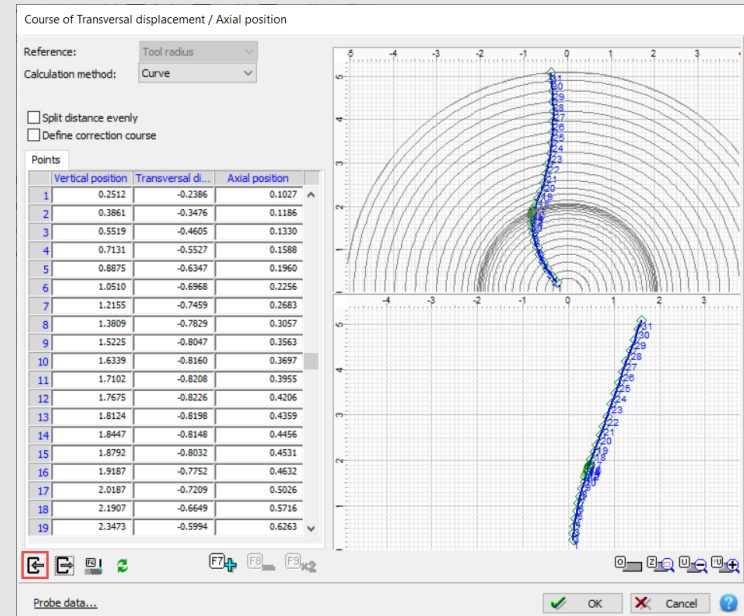
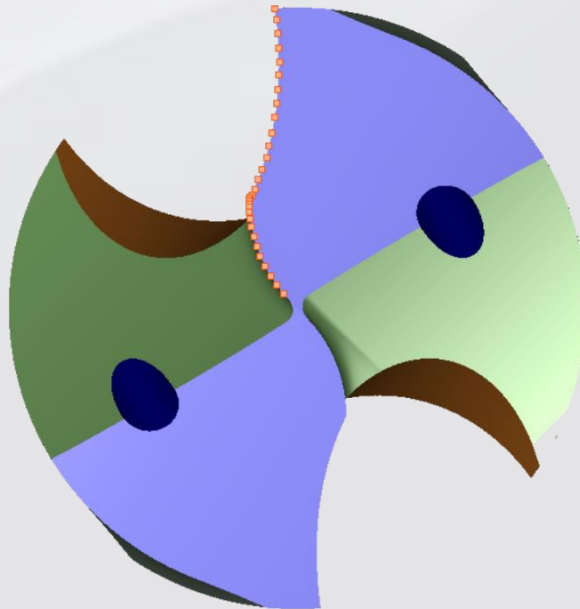
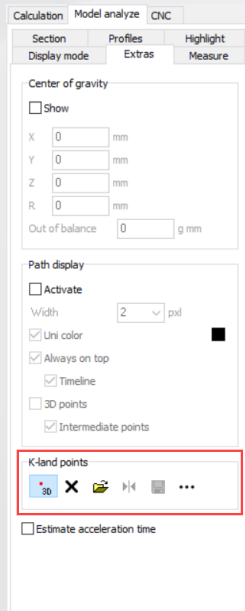
- In the graphic analysis, each active graphic curve can now be switched on/off individually.
- Each graphic curve can be freely scaled with a minimum and maximum value.
- You can also specify the line width, color and fill for each curve.



NUMROTO-3D: Teach-In of K-land shape

(3D special functions, since version 4.2.0b)

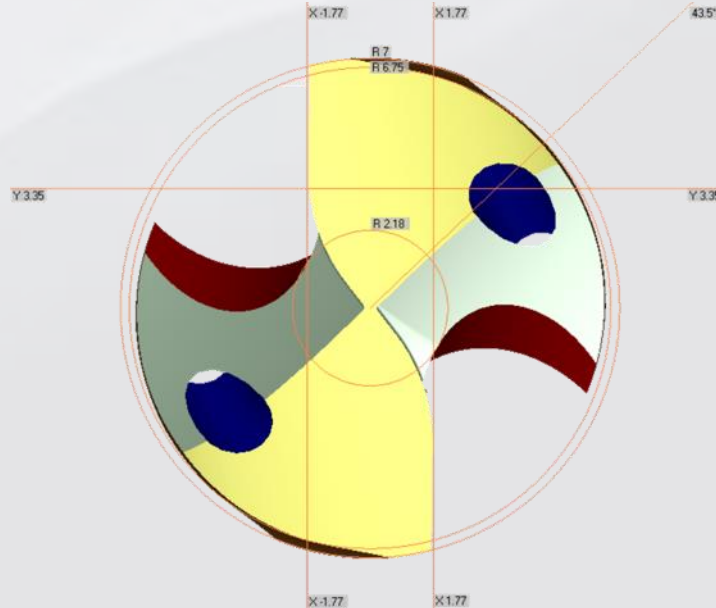
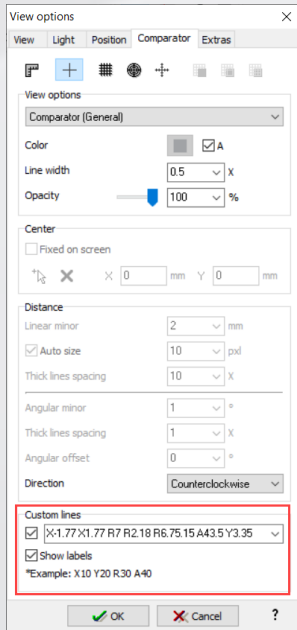
- The points along the drill's main cutting edge required for grinding a K-land can now be selected in the 3D simulation and then exported for NUMROTO.



NUMROTO-3D: User defined lines

(since version 4.2.0b)

- New user-defined guiding lines can be inserted. In addition, these lines can now be automatically provided with dimensions (label).



Wheel probing: Form wheels

(since version 4.2.0)

- Automatic adjustment of the measuring depth for probing the flange dimension and use of the width for the offset of the diameter measurement.

Default settings - probing

Probing
Wheel probing
Check values
Compensation values

	Flange dist. measuring	Offset for diameter measurement
Periphery:	0.00000 mm	0.00000 mm
Cup:	2.00000 mm	0.00000 mm
Full radius:	2.00000 mm	0.00000 mm
Disk:	2.00000 mm	0.00000 mm
Shape:	2.00000 mm	0.00000 mm
Point:	2.00000 mm	0.00000 mm

No. of measuring points axial: 3
No. of measuring points radial: 2

☐ Always disregard the biggest measured value

Shape wheels

☐ Use 'Profile height from contact point' as 'Measuring depth flange distance' if the value is greater than the default 'Measuring depth flange distance'

☐ Use width as 'Offset for diameter measurement'

What should be probed

☒ Diameter
☒ Flange distance
☐ Width
☐ Angle

☐ Measure angle at all probing points

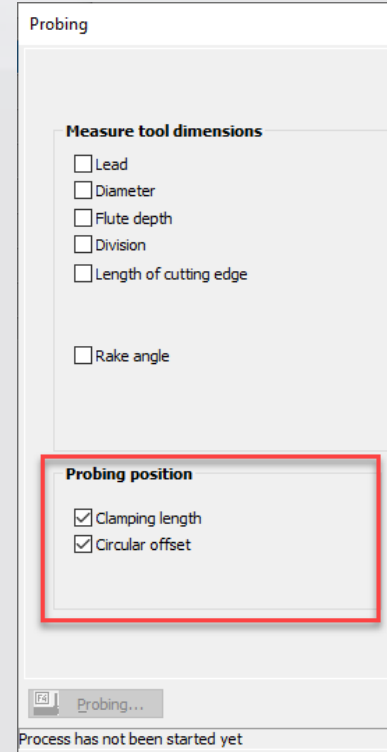
Limit value for run-out: radial: 0.20000 mm axial: 0.20000 mm

OK Cancel ?

Probing: Clamping length / Rotation

(since version 4.2.0b)

- The previous checkbox 'blank' is no longer available. Instead, it is now possible to select directly from the 'Geometry' and 'Resharpening' pages whether or not the rotation should also be determined before measurement. If the tooth position (rotation) is not probed, we assume a blank will be used and only the diameter and run-out of the tool can be measured.



Probing

Measure tool dimensions

- ☐ Lead
- ☐ Diameter
- ☐ Flute depth
- ☐ Division
- ☐ Length of cutting edge
- ☐ Rake angle

Probing position

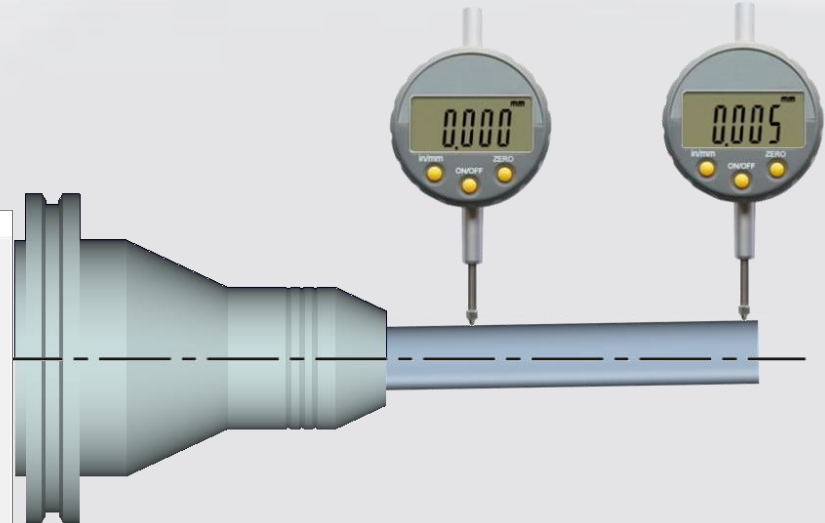
- ☒ Clamping length
- ☒ Circular offset

Probing...

Process has not been started yet

(since version 4.1.2)

-
- Geometry
- Point
 - Flute spacing
 - Diameter
 - 1
 - 2
 - Geometry
 - Blank
 - Info
 - Attachment
 - Clamping
 - Pass over
 - Increments
 - CHC
 - 3D
 - Park positions
 - Probing-General
 - Probing-Position
 - Probing-Measuring
 - Probing-Runout/Lateral run.
 - Probing-K-land
- ☒ Compensate runout error
☒ Monitor runout error
 Measurement sequence: Automatically
☒ Measuring runout at 2 different length positions
- ☒ at length position: 5.00000 mm
 Max. runout error: 0.02000 mm
 Second length position: 10.00000 mm
- Probing
- Results
- Results 2
- | | Accept value | Diameter | Before | Probed |
|---|--------------|----------|---------|-------------------|
| <input checked="" type="checkbox"/> Diameter: | | | | [mm] |
| | | | 9.95000 | 9.95000 |
- Clamping length: -93.00000 mm
 Max. concentricity error with ref. to radius: 0.00500 mm 37.21000 ° 0.00300 mm 120.89000 °
 Start angle: 270.00000 °
- Process successful
- OK Cancel



Wheel probing

(since version 4.2.0b)

- In the settings, the limit value for the maximum runout for wheel probing can now be specified. If one of the two limit values is exceeded, the wheel probing results are highlighted in color.

Default settings - probing

Probing

Wheel probing

Check values

Compensation values

Periphery: 2.00000 mm

Cup: 2.00000 mm

Full radius: 2.00000 mm

Disk: 2.00000 mm

Shape: 2.00000 mm

Point: 2.00000 mm

No. of measuring points axial: 3

No. of measuring points radial: 2

☐ Always disregard the biggest measured value

Shape wheels

☐ Use 'Profile height from contact point' as 'Measuring depth flange distance' if the value is greater than the default 'Measuring depth flange distance'

☐ Use width as 'Offset for diameter measurement'

What should be probed

☒ Diameter

☒ Flange distance

☐ Width

☐ Angle

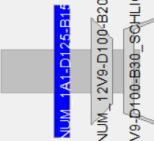
☐ Measure angle at all probing points

Limit value for run-out: radial: 0.50000 mm axial: 0.50000 mm

OK Cancel ?

Probing wheels

Package name: HM-1



		Diameter		Flange distance		Width		Angle		
		Before	Probed	Before	Probed	Before	Probed	Before	Probed	show all measuring values
1	<input checked="" type="checkbox"/> NUM_1A1-D...	123.9230	123.9530	49.9940	49.9940					Radial: 0.0300 Axial: 0.0160
2	<input type="checkbox"/> NUM_12V9-D...									
3	<input type="checkbox"/> HM_11V9-D1...									

Wheel probing: Offset for diameter measurement

(since version 4.2.0b)

- Depending on the type of grinding wheel, different offsets can now be programmed, so that not all grinding wheels touch the wheel probe at exactly the same place when measuring the diameter.

Default settings - probing

Probing
Wheel probing
Check values
Compensation values

Flange dist. measuring

Periphery:	2.00000 mm
Cup:	2.00000 mm
Full radius:	2.00000 mm
Disk:	2.00000 mm
Shape:	2.00000 mm
Point:	2.00000 mm

No. of measuring points axial: 3
No. of measuring points radial: 2

☐ Always disregard the biggest measured value

Shape wheels

☐ Use 'Profile height from contact point' as 'Measuring depth flange distance' if the value is greater than the default 'Measuring depth flange distance'

☐ Use width as 'Offset for diameter measurement'

What should be probed

☒ Diameter
☒ Flange distance
☐ Width
☐ Angle

☐ Measure angle at all probing points

Limit value for run-out: radial: 0.50000 mm axial: 0.50000 mm

Offset for diameter measurement

0.00000 mm
0.00000 mm
0.00000 mm
0.00000 mm
0.00000 mm
0.00000 mm

OK Cancel ?

Wheel probing: No. of measuring points axial / radial

(since version 4.2.0b)

- The number of measuring points for probing the flange dimension and the diameter can now be specified separately. More measuring points are recommended for the flange dimension probing as for the diameter probing.
- Thus the measuring process can be optimized in terms of time.

Probing data - Wheel probe

☐ Measure diameter before flange distance

No. of measuring points:

Axial	Radial
3	2

External Internal

Meas. depth flange dist.: 5.00000 mm 5.00000 mm

Offset for diameter measurement: 3.00000 mm 3.00000 mm

Offsets for probing results

Flange distance: 0.10000 mm 0.00100 mm

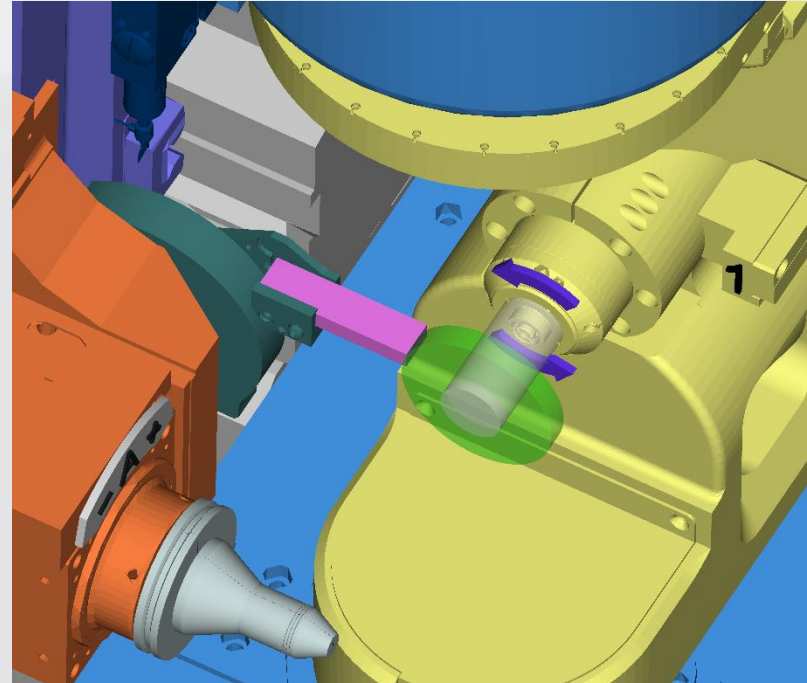
Diameter: 0.02000 mm

OK Cancel ?

Wheel dressing/sticking

(since version 4.2.0b)

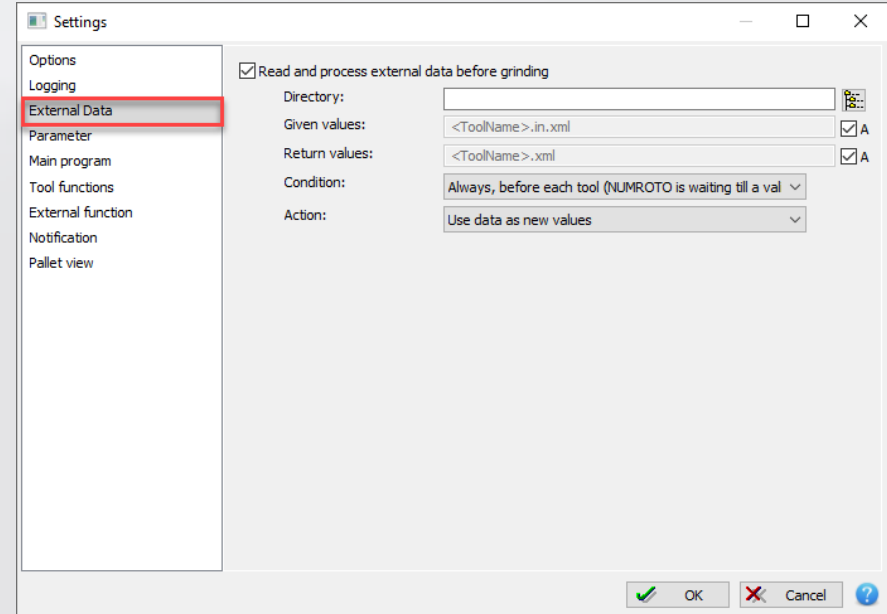
- The active collet is now used for sticking and dressing in the 3D simulation.
- Wheel sticking available on various customer machines. (more information is available from the respective machine manufacturers).
- Further options for the installation and orientation of the sticking station in the machine
- Various extensions and optimizations of the sticking cycles, e.g. for form wheels.



NR-Control: Read external data

(Data interface option, since version 4.1.2)

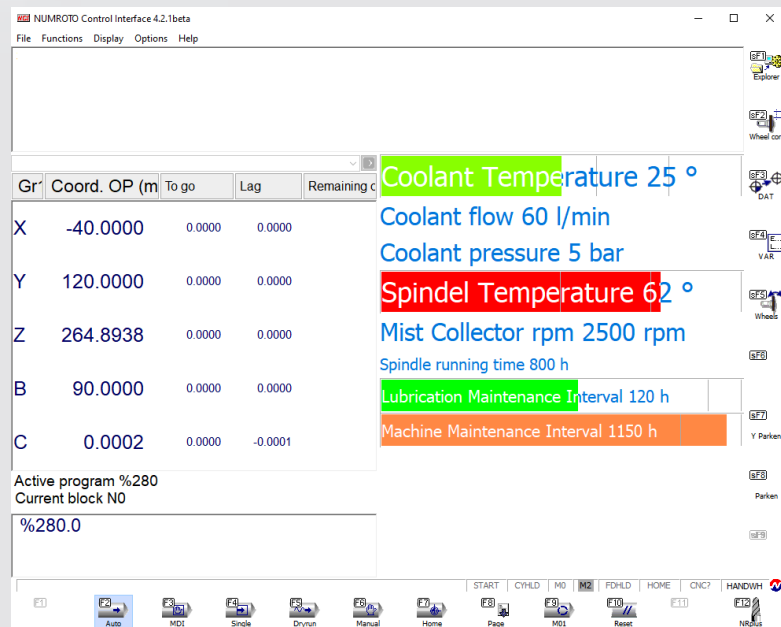
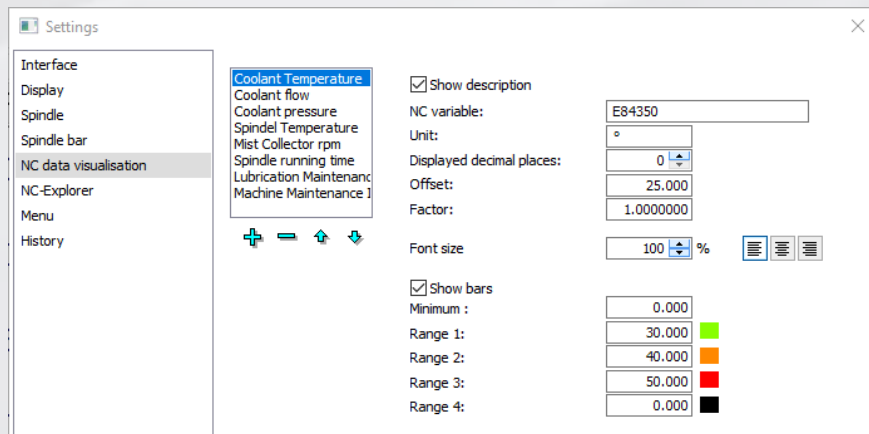
- When grinding several tools with NR-Control, external data (e.g. measured values) can now be read in automatically at some point in the process, allowing automatic compensation to be carried out.
- The use of this function requires special training.



NCI: CNC data visualization

(since version 4.1.2f)

- Individual CNC/PLC parameters can be displayed on an additional page in the NCI. For example coolant temperature, axis information, maintenance intervals etc.



Further new features (Draw)

- It is now possible to insert user-defined images into user-defined tables.
- Using data elements and drawing properties as value sources for cells of user-defined tables.
- Easier operation when creating tables (insert, move and delete column and rows).
- The position of the drawing header for new drawings can now be specified in the settings for each tool type (end-mills, drills/step drills, form cutters and burrs).
- Dimensions can be hidden individually with Ctrl + double click.
- For the tolerances you can now choose between the display mode: "Upper and lower" or "Symmetrical".
- When printing, you can now select in more detail which pages are to be printed.
- If the minimum number of decimal places is set to 0, only decimal places are displayed if there are actually decimal places.
- Extension of the toolbar for grids, rulers and crosshairs.

Further new features (Draw)

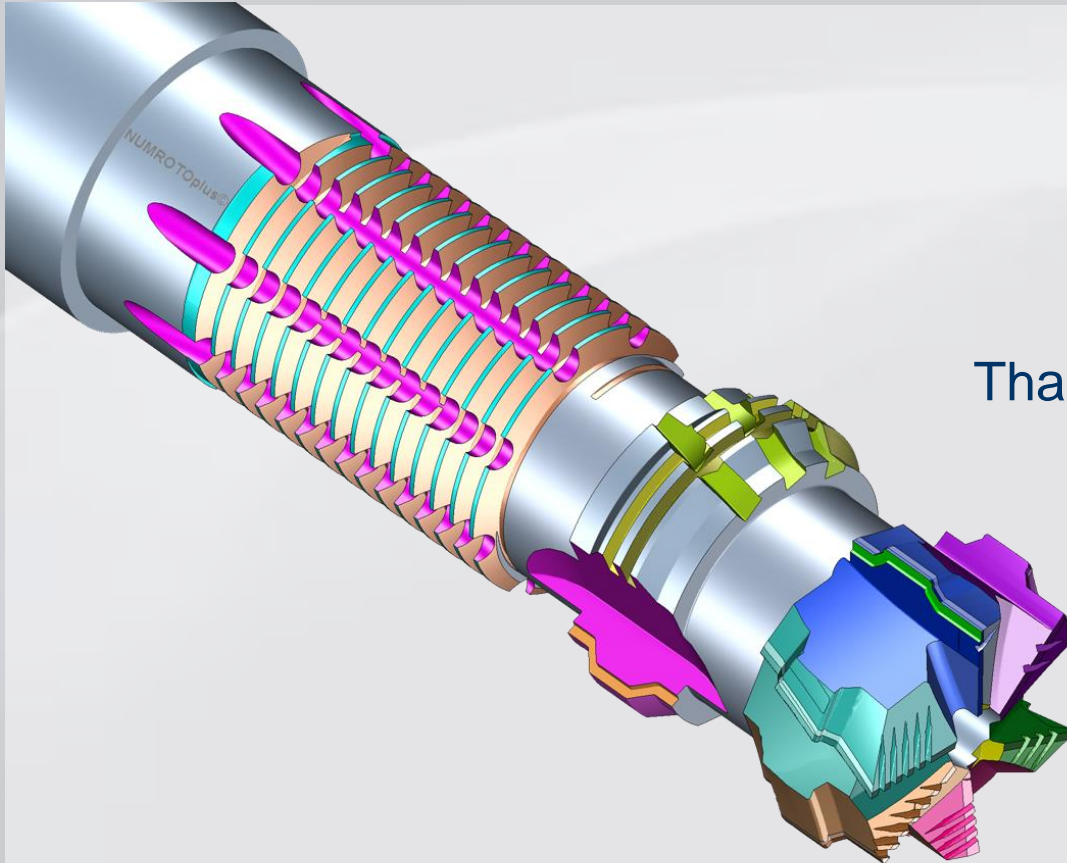
- Color pixel images of tools in SVG format.
- Removing the support lines of a measurement for better clarity.
- Improved snap function for defining dimensions.
- Individually adjustable line width, color and dashing of foreground lines.
- Separate settings for font sizes, colors, prefixes and suffixes of dimension names.
- Separate settings for lines, colors and fillings used for wheels and wheel packages.
- Overwrite the label fonts for each dimension.
- Calling the specific help per window (dialog).
- Self-drawn rectangles and circles can now also be cropped.
- Optionally, an empty page can be inserted automatically from the beginning of a new drawing.

Further new features

- Now you can specify in the settings which diameter definition is to be used depending on the tip shape. You can also select whether the core diameter or the flute depth should be queried for manufacturing and resharpener.
- Form reliefs - division: now all form reliefs can be divided. So it is now possible to repeat the first form relief several times, even if there is a second form relief.
- NUMROTO-3D: For the quick export of bitmaps and STL models, various individual settings can now be specified. From 4.2.0b.
- When probing the side distance of a drill with S-gashout, the second measurement position can now be adjusted based on the point angle.
- When using the wheel probing function, the feed rates for measuring the flange dimension and the diameter can now be specified separately. For measuring the diameter a lower feed rate is recommended to minimize the wear of the wheel probe.

Further information:

Release Notes in the NUMROTO customer area:
www.numroto.com



Thank you for your interest!