

NUMgrind

Innovations within the last year / 2022



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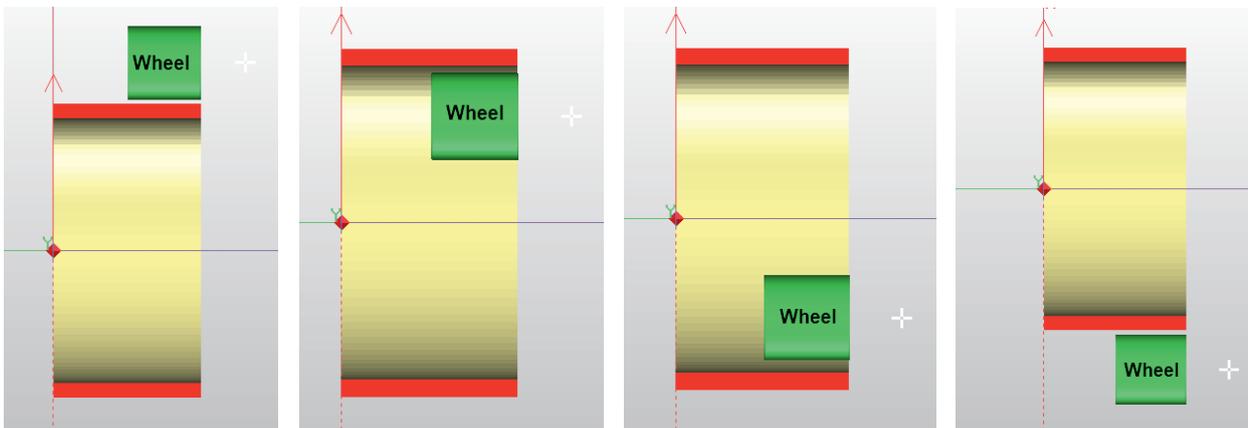
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Create possibility to choose the side for ID and OD grinding

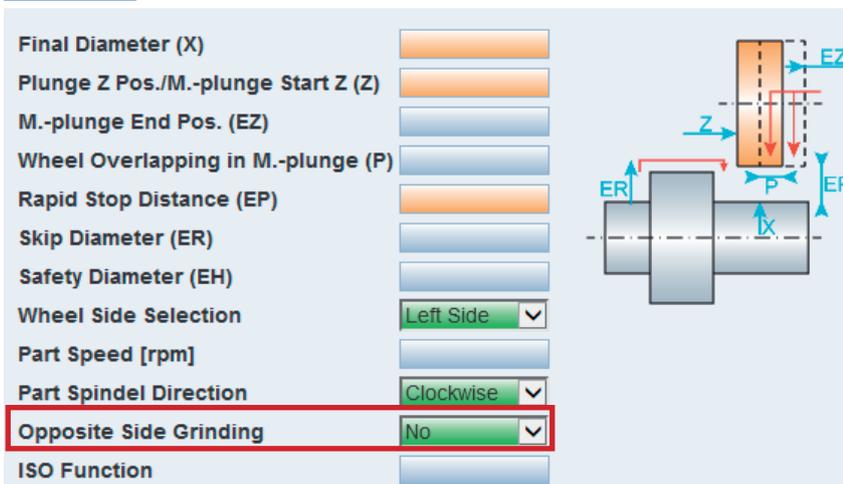
It is now possible to perform the part setup at 4 different positions and to tell each GC grinding cycle separately at which position it should be ground.



Positive OD = Side 1 (existing) Positive ID = Side 2 (new) Negative ID = Side 3 (existing) Negative OD = Side 4 (new)

The setting can be made very easily during the data input of the grinding cycle directly in the NUMgrind HMI. The grinding cycles take over the information and automatically calculate the correct paths.

Plunge



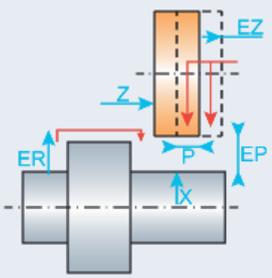
The OEM can store the default value for this in a NUMgrind HMI configuration file so that this does not have to be set each time. In addition, the configuration file can also be used to set whether this selection is displayed to the user in the HMI or not.

Change Workpiece Spindle Speed and Direction for OD & ID Cycles

It is now possible to set the spindle speed and rotation direction again in each cylindrical grinding cycle.

Plunge

Final Diameter (X)	<input type="text"/>
Plunge Z Pos./M.-plunge Start Z (Z)	<input type="text"/>
M.-plunge End Pos. (EZ)	<input type="text"/>
Wheel Overlapping in M.-plunge (P)	<input type="text"/>
Rapid Stop Distance (EP)	<input type="text"/>
Skip Diameter (ER)	<input type="text"/>
Safety Diameter (EH)	<input type="text"/>
Wheel Side Selection	Left Side <input type="button" value="v"/>
Part Speed [rpm]	<input type="text"/>
Part Spindel Direction	Clockwise <input type="button" value="v"/>
Opposite Side Grinding	No <input type="button" value="v"/>
ISO Function	<input type="text"/>



Via the NUMgrind HMI configuration file both input masks can be hidden for the user and a default value for "Part Spindle Direction" can be defined. This simplifies the usage even more.

This has several advantages:

1. if you have to machine very different diameters on one workpiece, you can set the appropriate workpiece speed for each diameter separately and keep the grinding wheel speed constant.
2. if, for example, you are grinding on the opposite side, it is a vertical grinding machine or the grinding technology requires this, you can change the direction of rotation of the workpiece with one click.

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Images for Vertical Grinding Machine

All parameter images and visualizations have been adapted so that NUMgrind can be used even more effectively and easily for vertical grinding machines.

Plunge

Final Diameter (X)	<input type="text"/>
Plunge Z Pos./M.-plunge Start Z (Z)	<input type="text"/>
M.-plunge End Pos. (EZ)	<input type="text"/>
Wheel Overlapping in M.-plunge (P)	<input type="text"/>
Rapid Stop Distance (EP)	<input type="text"/>
Skip Diameter (ER)	<input type="text"/>
Safety Diameter (EH)	<input type="text"/>
Wheel Side Selection	Left Side <input type="button" value="v"/>
Part Speed [rpm]	<input type="text"/>
Part Spindel Direction	Clockwise <input type="button" value="v"/>
Opposite Side Grinding	No <input type="button" value="v"/>
ISO Function	<input type="text"/>

By changing one setting in the NUMgrind HMI configuration file, all parameter images and grinding wheel visualizations are automatically rotated to make the interface even easier to use.

General Data | Geometrical Data | Dressing Data | Shaping Data

Relief Length Left	<input type="text" value="10"/>	Wheel Width	<input type="text" value="30"/>
Radius(+) / Chamfer(-) Left	<input type="text" value="5"/>	Smallest Wheel Width	<input type="text" value="10"/>
Shoulder Height Left	<input type="text" value="0"/>	Diameter unused Wheel	<input type="text" value="50"/>
Relief Angle Left	<input type="text" value="10"/>	Diameter used Wheel	<input type="text" value="20"/>
Relief Length Right	<input type="text" value="10"/>	Maximum Wheel RPM	<input type="text" value="15000"/>
Radius(+) / Chamfer(-) Right	<input type="text" value="-5"/>		
Shoulder Height Right	<input type="text" value="0"/>		
Relief Angle Right	<input type="text" value="10"/>		

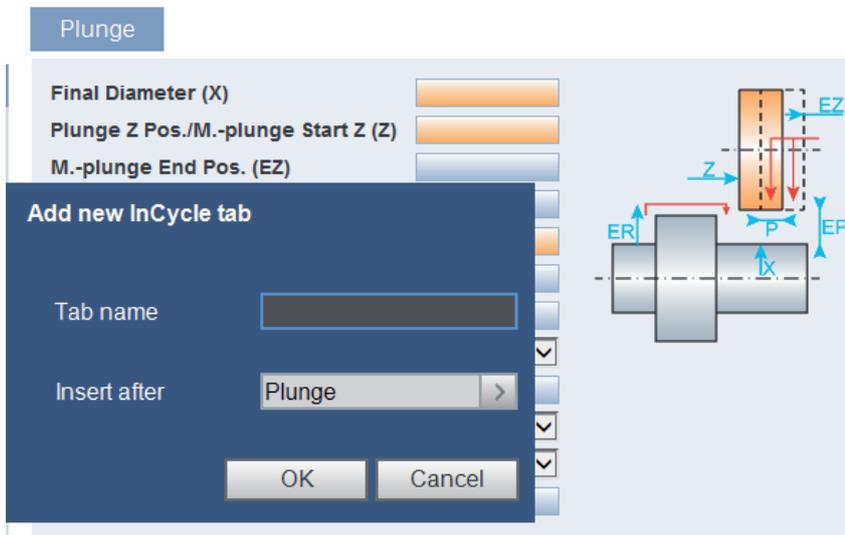
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OEM can set the number of InCycles

It is now possible to specify by the OEM how many In-Cycles (grinding steps such as roughing, finishing, fine finishing and so on) should be automatically created if a grind process is added to the program tree.



This should save the machine operator some work and enable smoother operation.

After the automatic addition of the In-Cycle, the focus jumps directly back to the input mask of the Pre-Cycle.

Shoulder Height

In the geometry of standard and angular grinding wheels, a new geometry parameter "Shoulder Height" has been added, which makes it even easier to specify the grinding wheel in a few clicks.



The shoulder height is added directly after the corner radius / chamfer. The total relief length does not change, only the section with the relief angle becomes shorter.

Above you can see well the difference from the left to the right side of the grinding wheel.

The relief length, the relief angle, as well as the corner chamfer, are identical on both sides.

The only difference is the shoulder height, which is 10 on the left side and 0 on the right.



Display of the reason for the error on this page

Now, in case of a CAM error, the corresponding input field is directly mentioned by name in the error text, so that the error search is completed more quickly.

In the example below, there is a problem with the "Rapid Stop Distance (EP)" input field.

HOME	CNC?	SYSWr	EXPErr	COLDET	FDHLD	! FXCAM There are errors on this page !: Rapid Stop Distance (EP) /
AUTO	FREE	DRIP	INTER	NPOS	MACKNW	
	M01	/	mm	VALID	PLC	
START	STOP	M02	COMM	CNC 0	CH 1	

Prog FXCam

Increase the usability of the sf3 page

For the grinding wheel type as well as the dresser type no cryptic numbers have to be entered anymore, but the type can be selected directly via a drop-down menu.

HOME	CNC?	SYSWr	EXPErr	COLDET	FDHLD		
AUTO	FREE	DRIP	INTER	NPOS	MACKNW		
	M01	/	mm	VALID	PLC		
START	STOP	M02	COMM	CNC 0	CH 1		

Set Up

Setup Number 1

Left		Right	
Face Wear	0.0000	Face Wear	0.0000
Side Wear	0.0000	Side Wear	0.0000
Radius Compensation	0.0000	Radius Compensation	0.0000
Cutter Orientation	1	Cutter Orientation	3
@X Part Compensation	0.0000	@Z Part Compensation	0.0000
Counter Left Side Dressing	0	Counter Right Side Dressing	0
Counter Face Dressing	0		

Wheel Data		Fixed Dresser Data	
DAT1 X for Dresser	280.0817	Diamond 1 Radius	0.0200
DAT1 Z for Dresser	-342.9710	Diamond 2 Radius	0.0200
DAT1 X for Part	20.0000	Distance D1 to D2 along X	-4.9367
DAT1 Z for Part	-175.0000	Distance D1 to D2 along Z	-161.1167
Wheel Type	External grinding whe	Intermediate Pos. X	0.0000
Dresser Type	Fixed two-diamond dr	Intermediate Pos. Z	0.0000
Max Wheel Speed	10000	X Correction Diamond 1	0.0000
Shared Setup Number	Shared with Setup 2	Z Correction Diamond 1	0.0000
		X Correction Diamond 2	0.0000
		Z Correction Diamond 2	0.0000

Z Pos. Probe Setup done Right side shaped Left side shaped Dresser Setup D1 done Dresser Setup D2 done Part Setup done

Function Next Prev Wheels Mode

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Shared Wheel

There is now the possibility to use the same grinding wheel for external and internal machining. A new function "Shared Wheel" is used to share the data between two setups.

For example, if Setup 1 is for OD grinding wheel and Setup 4 is for ID grinding wheel, the Dresser Setup and Part Setup only need to be run once.

The dressing data (wear) is automatically updated for both setups.

The screenshot displays the 'Setup Number 1' configuration screen in the NUMgrind CNC control. The interface includes a top status bar with various system indicators (HOME, CNC?, SYSWR, EXPERR, COLDET, FDHLD, AUTO, FREE, DRIP, INTER, NPOS, IMACKHW, M01, mm, VALID, PLC, START, STOP, M02, COMM, CNC 0, CH 1) and the NUM flexium**b9** logo. The main area is divided into several sections:

- Left/Right Parameters:** A table showing wear and compensation values for both sides.
- Wheel Data:** Parameters for the grinding wheel, including DAT1 X/Z for Dresser and Part, Wheel Type (External grinding whe), Dresser Type (Fixed two-diamond di), and Max Wheel Speed (15000).
- Fixed Dresser Data:** Parameters for the dresser, including Diamond 1/2 Radius, Distance D1 to D2 along X/Z, and Intermediate Pos. X/Z.
- Shared Setup Number:** A dropdown menu currently set to 'Shared with Setup 2', which is highlighted with a red box.
- Correction Values:** X and Z correction values for both diamonds.
- Setup Status:** Indicators for Z Pos. Probe Setup done, Right side shaped, Left side shaped, Dresser Setup D1 done, Dresser Setup D2 done, and Part Setup done.
- Function Keys:** F2 (Function), F4 (Next), F5 (Prev), F7 (Wheels), and F12 (Mode).

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Skip program elements

It is now possible to "comment out" entire program blocks in the program tree, which are then skipped and not executed during execution after a program download into the CNC.

Program
✓ Start of Program (OD_30_350)
✓ Plunge
✓ Dressing
✓ Shoulder Travers
✓ Plunge
✓ End of Program

In this example, the two program items "Dressing" and "Shoulder Traverse" have been skipped / commented out.

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Program re-entry

It is now possible to select a re-entry point in a program from which the grinding program is to be continued.

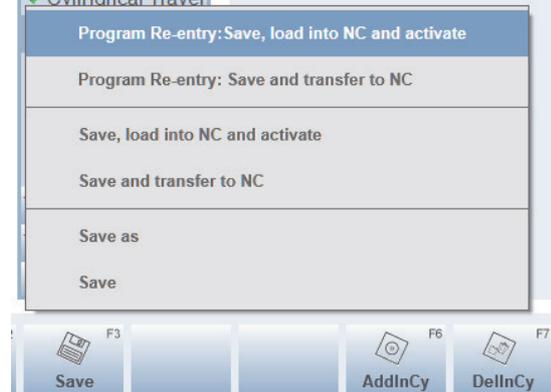
This makes it possible to stop machining in the event of problems and to start again directly at the last program step without any major problems.

Step 1



Select the grinding process at which the program is to continue again.

Step 2



Go to "Program Re-Entry: Save, load into NC and activate" via F3.

Then the CNC code is generated so that all grinding processes between "Start of Program" and "Oscillation Shoulder" are skipped.

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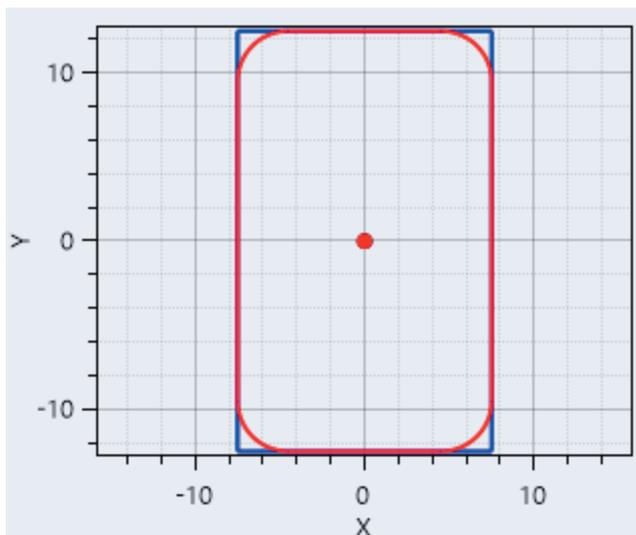
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Accuracy of NUMgrind during non-circular grinding

In one test, several workpieces were ground to shape accuracy with a deviation of less than 0.04 mm.

This involved a rectangular shape with rounded corners, which was ground non-circular over a length of 400 mm.



The workpiece was rough ground with Multiplunge and then finished with Cylindrical Traverse.

Furthermore, the Error Compensation cycle (G234) was active, which performed a correction movement along X to compensate for the deflection of the workpiece.

In addition, we have already been able to prove several times that we can achieve the required accuracy in cam grinding (example from scooter engines).