



**MACHINE
SIMULATION**

CIMCO Machine Simulation Manual

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Introduction to CIMCO Machine Simulation

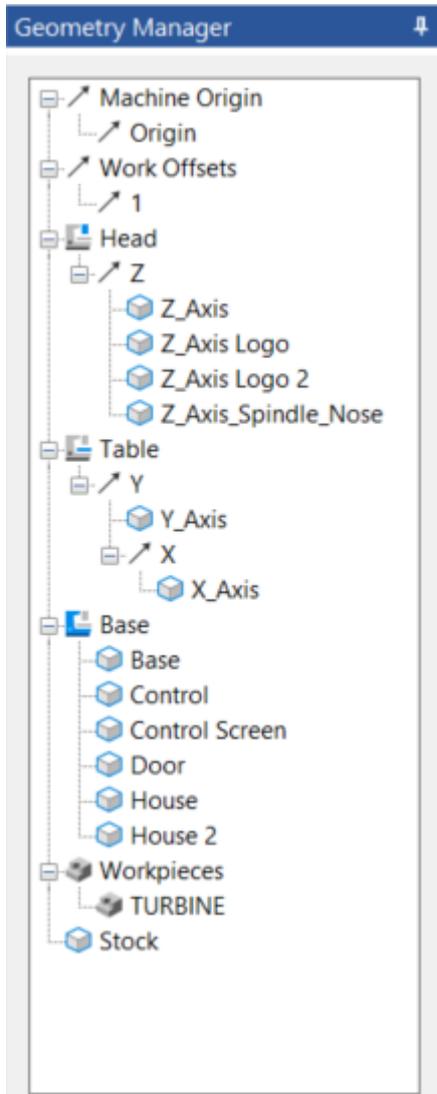
CIMCO Machine Simulation is an add on to CIMCO Edit. CIMCO Machine Simulation is used for simulating the manufacturing process of a workpiece within a machine environment. The simulation allows you to observe the toolpath and highlights all collisions or out of limit moves found within the CNC program. CIMCO Machine Simulation can be accessed by clicking on the icon  in the Backplot tab.

In CIMCO Machine Simulation, the CNC program is displayed in the left pane of the window. The simulation is shown in the centre and the Geometry Manager, Navigation and Simulation Report can be found in the right pane.

[Video link: Introduction to CIMCO Machine Simulation \(https://youtu.be/RvTXRH2SZoE\)](https://youtu.be/RvTXRH2SZoE)

Geometry Manager

The Geometry Manager can be used for defining a machine, specifying work offsets, determining the machine origin, adding stock, and importing workpiece and fixtures. The Geometry Manager contains the elements described below.





Shows head of machine and all additional axis that are applied.
Right-clicking this icon allows for machine parts to be added and setting visibility.



Shows the table of the machine and all additional axis that are applied.
Right-clicking this icon allows for machine parts to be added and setting visibility.



Shows the base of the machine and all additional axis that are applied.
Right-clicking this icon allows for machine parts to be added and setting visibility.



Shows that a workpiece has been added to the simulation. The workpiece can be added by right-clicking on any of the axis lines located within the Geometry Manager.



Identifies the axis that will have a linear movement during the machine simulation.

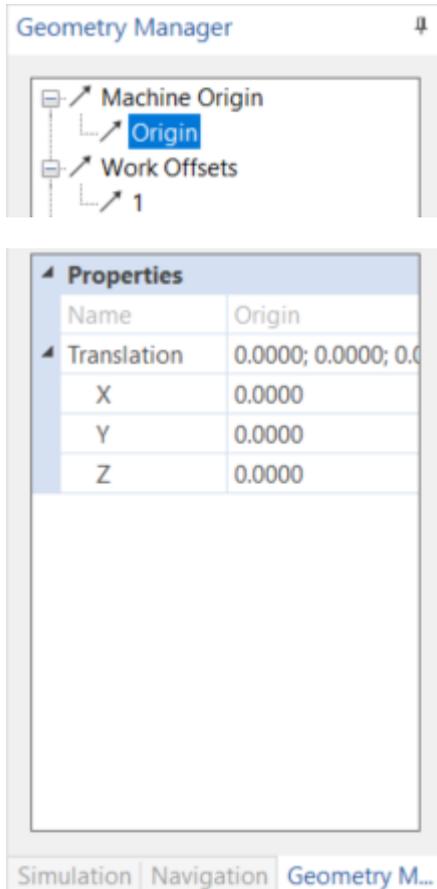


Identifies the axis that will have a rotary movement during the machine simulation.

1. Machine Origin

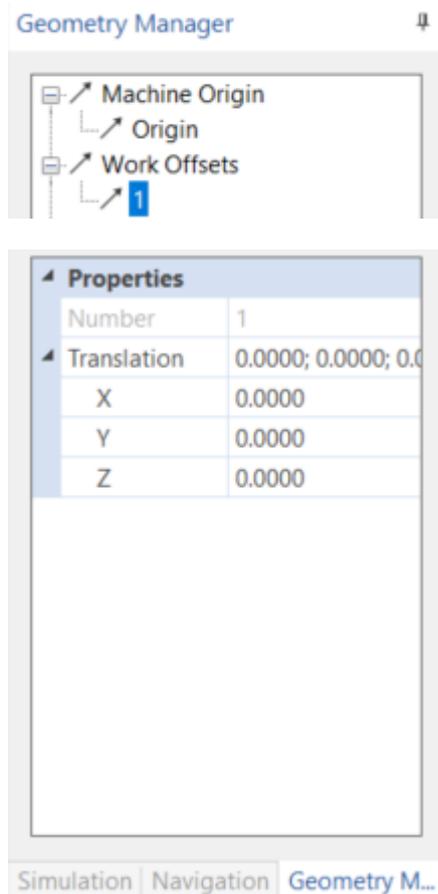
The Machine Origin is a fixed point that can be set within the 'Machine Origin' parameters. The work offsets, stock and fixture/workpiece can be positioned according to the Machine Origin.

Specify the machine origin by clicking on 'Origin'. A properties section will appear below and the option to specify the machine origin will be possible through 'Translation'. Values can be input corresponding to the X, Y and Z coordinates.

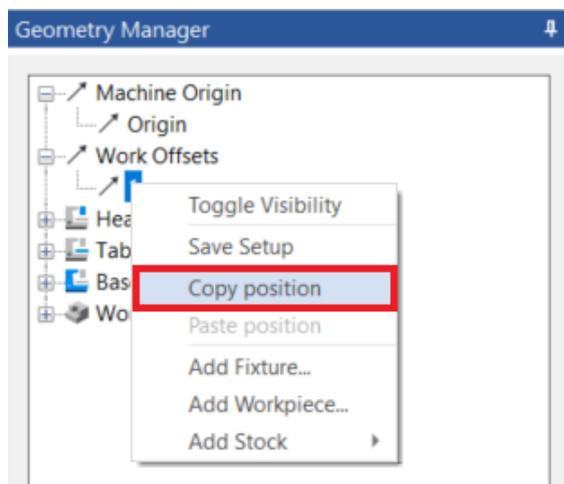


2. Work Offsets

Specify the work offset clicking on the work offset number that has been generated by the NC program. A properties section will appear below and the option to determine the work offset will be possible through 'Translation'. Values can be input corresponding to the X, Y and Z coordinates.



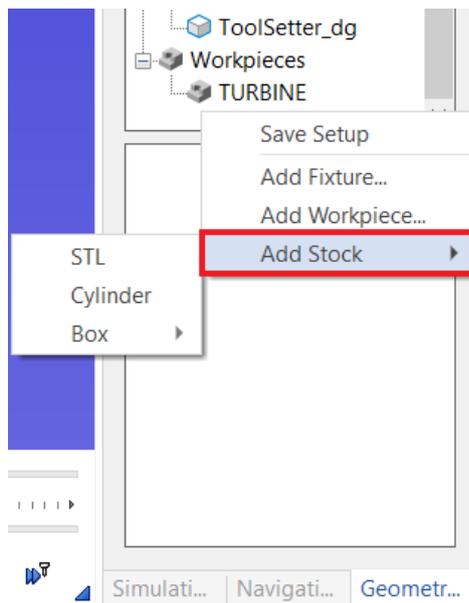
Copy and Paste a position between work offsets/workpiece and fixture/stock.



Stock

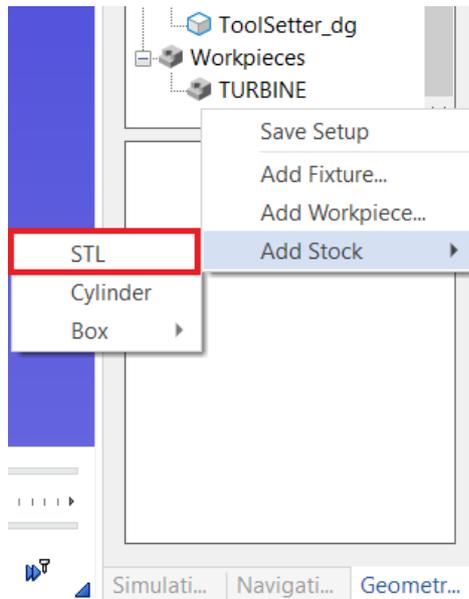
Stock can be added through the Geometry Manager. Stock removal simulates the removal of material based on the NC code. There are multiple options to create the stock, including the ability to import an external STL, manually define the stock (Cylinder/Box) and also enable automatic scanning that reads a specified value directly from the NC code and adds a stock based on those values.

[Video link: Stock Removal tutorial \(https://youtu.be/DlCt1I31jMk\)](https://youtu.be/DlCt1I31jMk)

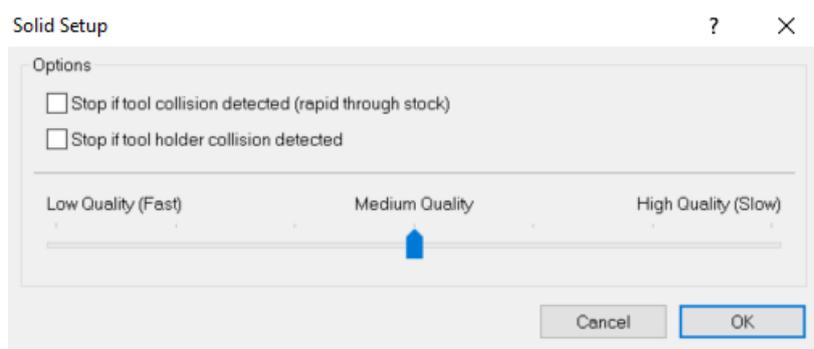


3. Importing an External STL

To import an external STL, right-click in the Geometry Manager and select 'Add stock' > 'STL'. Select the STL file from its saved location and select 'Open'.



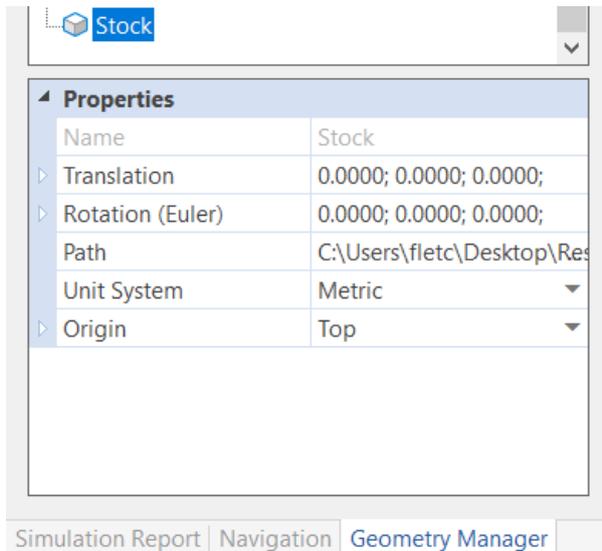
A 'Solid Setup' dialog will appear. Collision checking and render quality can be set here. This dialog will show when using either one of the options to add a stock.



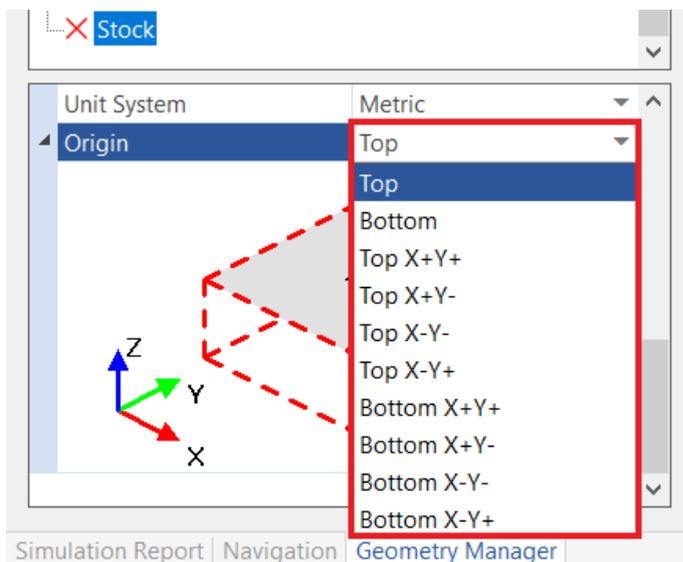
- Select the checkbox '**Stop if tool collision detected (rapid through stock)**' to enable the simulation to stop if it detects a rapid move through the stock.
- Select the checkbox '**Stop if tool holder collision detected**' to enable the simulation to stop if it detects a collision between the tool holder and stock.
- Move the cursor to '**Low Quality (Fast)**' for a fast rendering but of low quality.
- Move the cursor to '**Medium Quality**' for a standard rendering of standard quality.
- Move the cursor to '**High Quality (Slow)**' for a slow rendering but of high quality.

Select **'Stock'** in the Geometry Manager to see its **'Properties'**.

'Properties' is located below the Geometry Manager. In the Properties section specify the position of the stock by editing the values within 'Translation' and 'Rotation'.



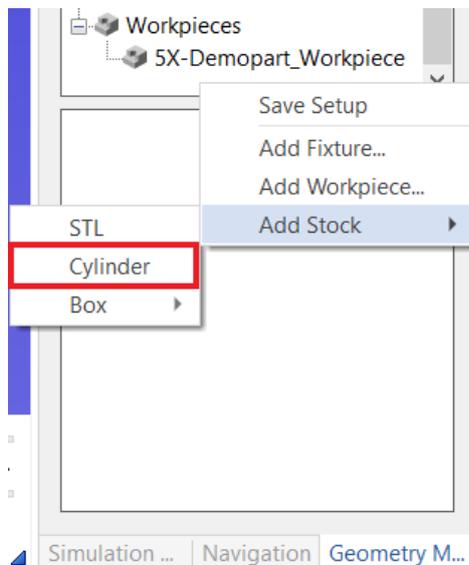
Determine the origin of the stock by clicking on the dropdown menu beside the **'Origin'** section.



The stock setup can be saved by right-clicking in the Geometry Manager and select **'Save Setup'**.

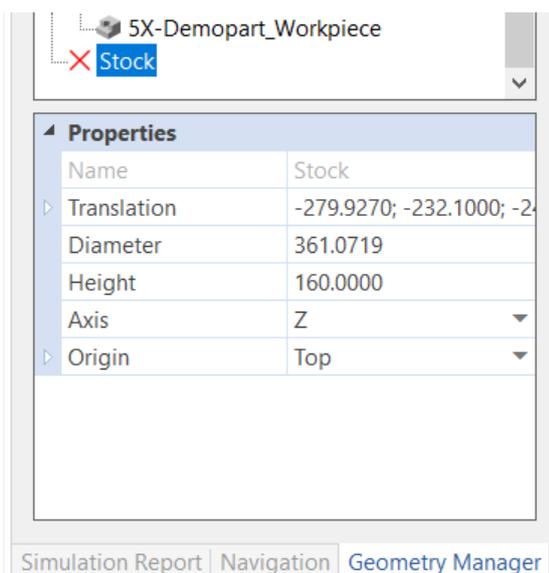
4. Manually Defining the Stock – Cylinder

To manually define a cylinder stock, right-click in the Geometry Manager and select 'Add stock' > 'Cylinder'.

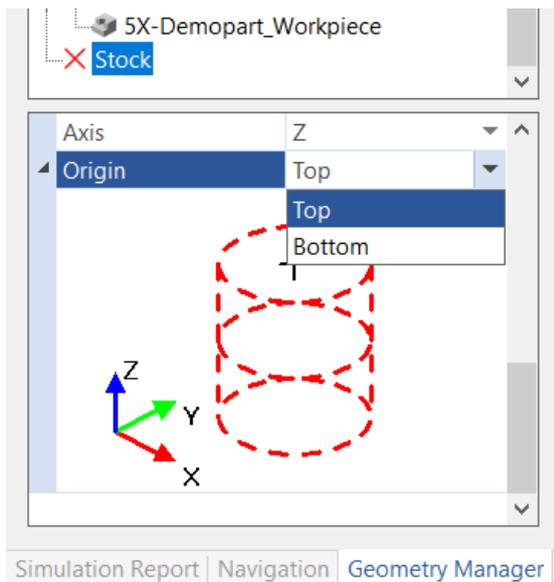


Select 'Stock' in the Geometry section to open its properties.

'Properties' is located below the Geometry Manager. In the properties section, edit the stock dimensions and the position of the stock by editing the values within 'Translation'. Determine the stocks 'Diameter', 'Height' and 'Axis'.

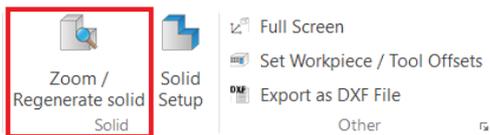


Determine the origin of the stock by clicking on the dropdown menu beside the 'Origin' section.



When changes are made to the stock's dimensions or position, a wireframe stock will appear in the backplot window providing a preview of the newly defined stock.

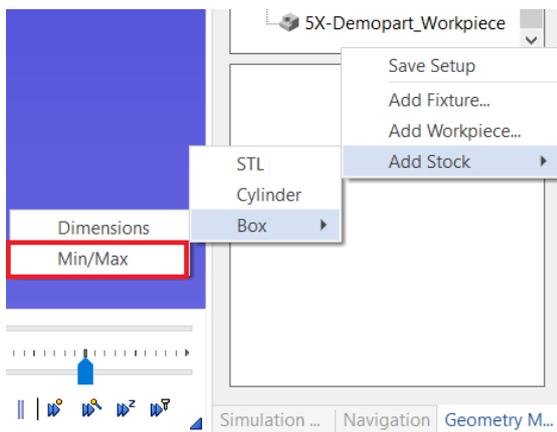
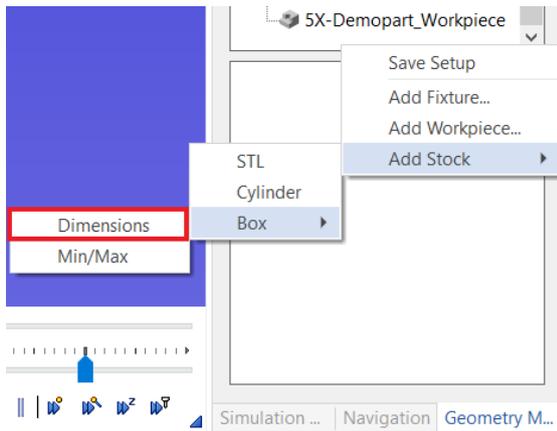
When the stock is setup correctly, locate and select the 'Zoom/Regenerate' solid tab. The fully defined stock will now appear in the backplot window.



Once the stock is fully defined and the setup is correct, you can save the setup. Right-click in the Geometry Manager and select 'Save Setup'.

5. Manually Defining the Stock – Box

To manually define a stock box, right-click in the Geometry Manager and select 'Add stock' > 'Box'. Determine whether the stock will be defined using 'Dimensions' or by its 'Min/Max' values.

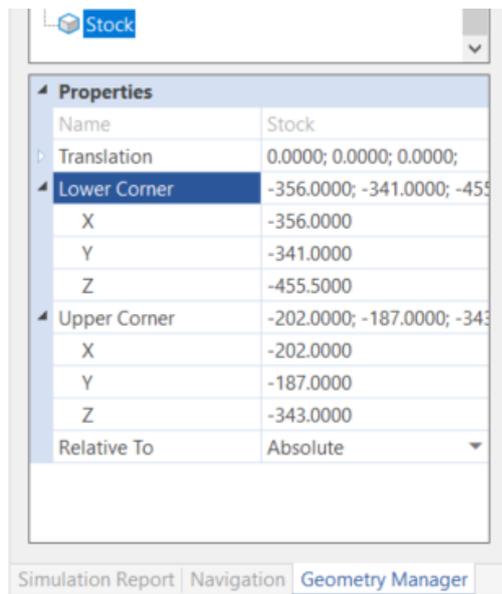


Select **'Stock'** in the Geometry section to open its properties.

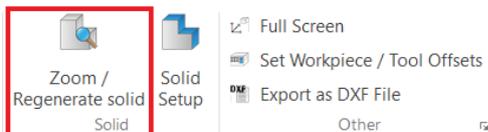
'Properties' is located below the Geometry Manager. In the properties section, edit the stock dimensions and the position of the stock by editing the values within 'Translation'.

If the stock is determined by its **Min/Max** values, specify where the stock values are relative to by selecting the drop-down menu beside **'Relative To'**. There are two options, **'Absolute'** or **'Toolpath'**.

To edit the stock dimensions the user can edit the values within the **'Lower Corner'** and **'Upper Corner'**.



When the stock is setup correctly, locate and select the **'Zoom/Regenerate'** solid tab.



6. Automatically Scanning a Stock

Input the 'Box - Min/Max' stock scanning command into the NC file using the following format.

```
( STOCK MIN X0 Y0 Z0 )  
( STOCK MAX X0 Y0 Z0 )
```

```
25 ( WCS ID0 X-279.0 Y-264.0 Z-343.6 )  
26 ( WORKPIECE ID1 "5X-Demopart_Workpiece  
27 ( FIXTURE ID1 "5X-Demopart_Fixture.stl"  
28 ( STOCK MIN X-356 Y-341 Z-455.5 )  
29 ( STOCK MAX X-202 Y-187 Z-343.0 )  
30  
31 N42 G21  
32 N44 G00 G17 G40 G49 G80 G90  
33 N46 M12 (CLAMP C-AXIS)
```

Input the 'Box - Dimensions' stock scanning command into the NC file using the following format.

```
( STOCK RECTANGLE X-279.927 Y-232.1 Z-243.6 W=220 L=286 H=160 ORIGIN="TOP" )
```

```
26 ( WCS ID0 X-279.0 Y-264.0 Z-343.6 )  
27 ( WORKPIECE ID1 "5X-Demopart_Workpiece.stl" X-279.0 Y-264.0 Z-343.6 A0 B0 C0 RGB=0,0,  
28 ( FIXTURE ID1 "5X-Demopart_Fixture.stl" X-279.0 Y-264.0 Z-343.6 A0 B0 C0 RGB=80,80,80 )  
29 ( STOCK RECTANGLE X-279.927 Y-232.1 Z-243.6 W=220 L=286 H=160 ORIGIN="TOP" )  
30  
31 N42 G21  
32 N44 G00 G17 G40 G49 G80 G90
```

Input the 'Cylinder' stock scanning command into the NC file using the following format.

```
( STOCK CYLINDER X-279.927 Y-232.1 Z-243.6 D=360 H=160 ORIGIN="TOP" AXIS="Z" )
```

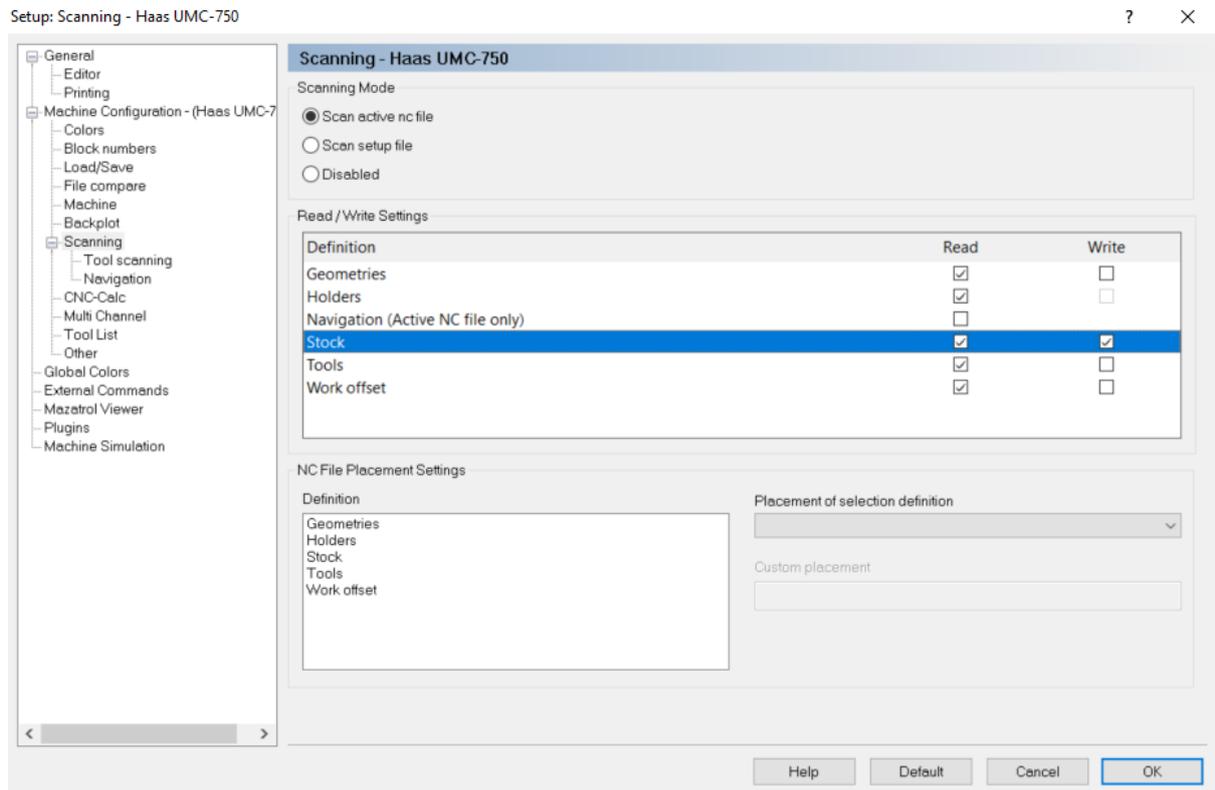
```
26 ( WCS ID0 X-279.0 Y-264.0 Z-343.6 )  
27 ( WORKPIECE ID1 "5X-Demopart_Workpiece.stl" X-279.0 Y-264.0 Z-343.6 A0 B0 C0 RGB=0,0,240 )  
28 ( FIXTURE ID1 "5X-Demopart_Fixture.stl" X-279.0 Y-264.0 Z-343.6 A0 B0 C0 RGB=80,80,80 )  
29 ( STOCK CYLINDER X-279.927 Y-232.1 Z-243.6 D=360 H=160 ORIGIN="TOP" AXIS="Z" )  
30  
31 N42 G21  
32 N44 G00 G17 G40 G49 G80 G90
```

Input the 'STL' stock scanning command into the NC file using the following format.

```
(STOCK STL X-279.0 Y-264.0 Z-343.6 PATH="C:\Users\fletc\Desktop\Haas UMC-750\5X-  
Demopart_Stock.stl" ORIGIN="TOP" )
```

```
26 ( WCS ID0 X-279.0 Y-264.0 Z-343.6 )  
27 ( WORKPIECE ID1 "5X-Demopart_Workpiece.stl" X-279.0 Y-264.0 Z-343.6 A0 B0 C0 RGB=0,0,240 )  
28 ( FIXTURE ID1 "5X-Demopart_Fixture.stl" X-279.0 Y-264.0 Z-343.6 A0 B0 C0 RGB=80,80,80 )  
29 (STOCK STL X-279.0 Y-264.0 Z-343.6 PATH="C:\Users\fletc\Desktop\Haas UMC-750\5X-Demopart_Stock.stl" ORIGIN="TOP" )  
30  
31 N42 G21  
32 N44 G00 G17 G40 G49 G80 G90
```

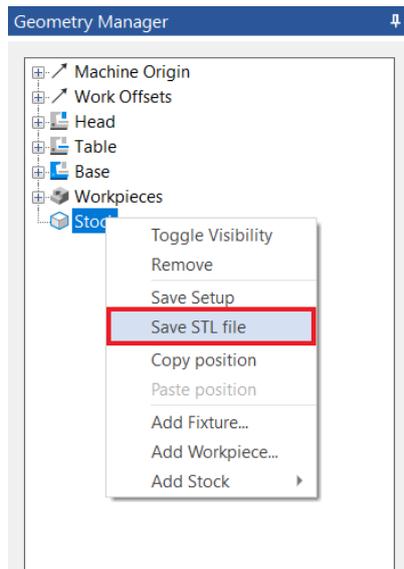
Locate and select the **'Global Setup'** tab and select **'Scanning'**. In scanning mode choose **'Scan active nc file'**. In Read/Write settings, tick the box beside **'Read'** to automatically read its description from the nc or setup file. Tick the box beside **'Write'** to automatically write the description into the nc or setup file if any changes are made.



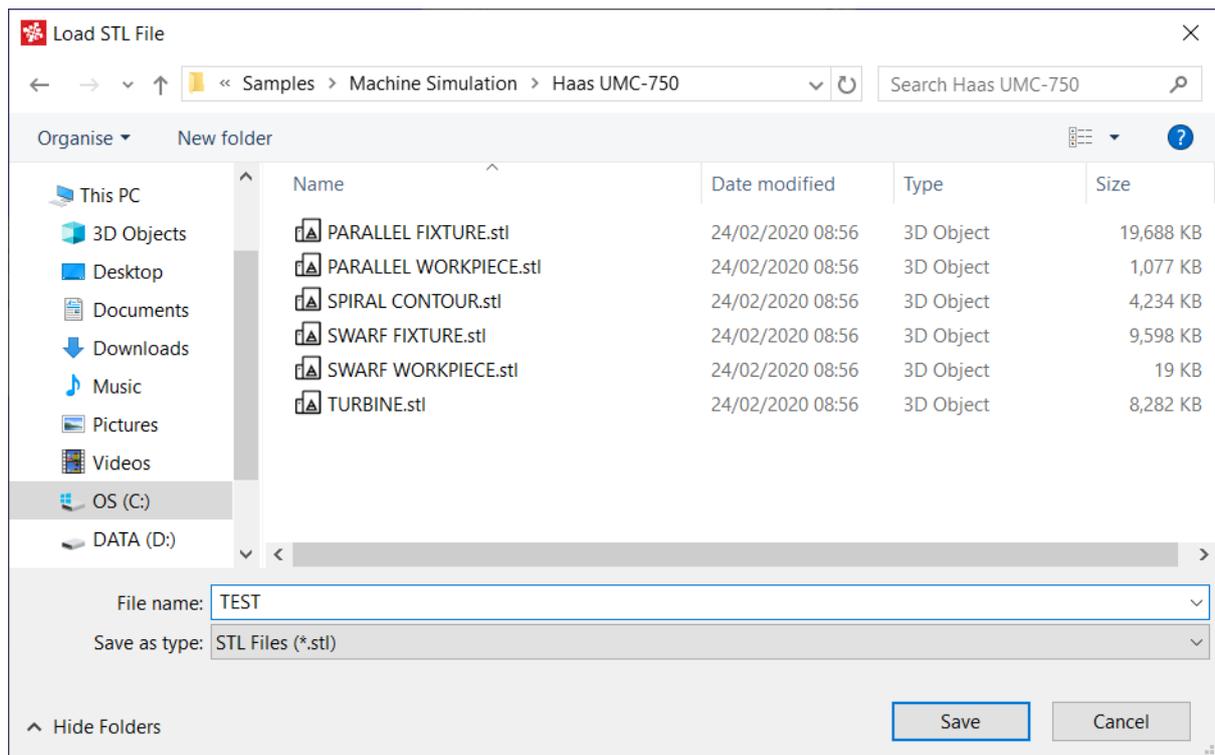
The stock will be scanned directly into the backplot window.

7. Exporting Stock STL

Export a Stock as STL by right-clicking the stock in the Geometry Manager and selecting **'Save STL file'**.



A window will open allowing the destination directory to be chosen. Input the STL name, select the directory and click **'Save'**. *Note: The position in the program that the stock is exported will correspond with the condition of the STL file.*



Simulation Report

The Simulation Report provides information about collisions and limits. The Simulation Report allows you to view all Collisions and outer Limit movements detected within the CNC program.

By clicking on any of the detected collisions or limits, the corresponding line within the CNC program will highlight. When the line causing the collision or outer limit is corrected, the Simulation Report will automatically update, removing the collision or outer limit.

To view the Simulation Report, click on the Simulation Report tab located to the left of the Geometry Manager tab.

The screenshot shows a software interface with a blue header bar labeled "Simulation". Below the header is a "Simulation Report" section. It contains two expandable sections: "Collisions" and "Limits".

Collisions

Collision	Lines: 103 - 158
Collision	Lines: 311 - 389
Collision	Lines: 548 - 621
Collision	Lines: 786 - 856
Collision	Lines: 1022 - 1086
Collision	Lines: 1254 - 1313
Collision	Lines: 1474 - 1526
Collision	Lines: 1696 - 1740
Collision	Lines: 1916 - 1955
Collision	Lines: 2180 - 2235
Collision	Lines: 2388 - 2466
Collision	Lines: 2625 - 2698

Limits

Limit	Lines: 31 - 40
-------	----------------

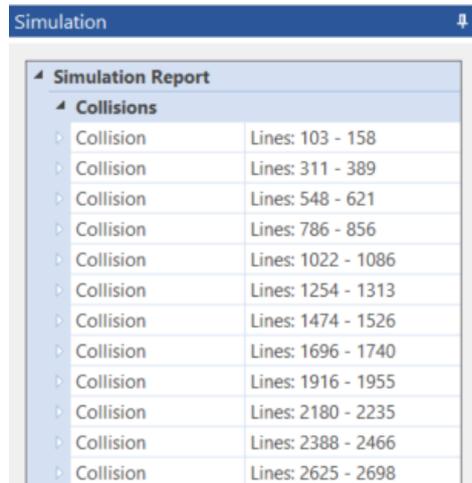
Collision Settings

Ignore Cutter on Feed	False
Collision Tolerance	0.1

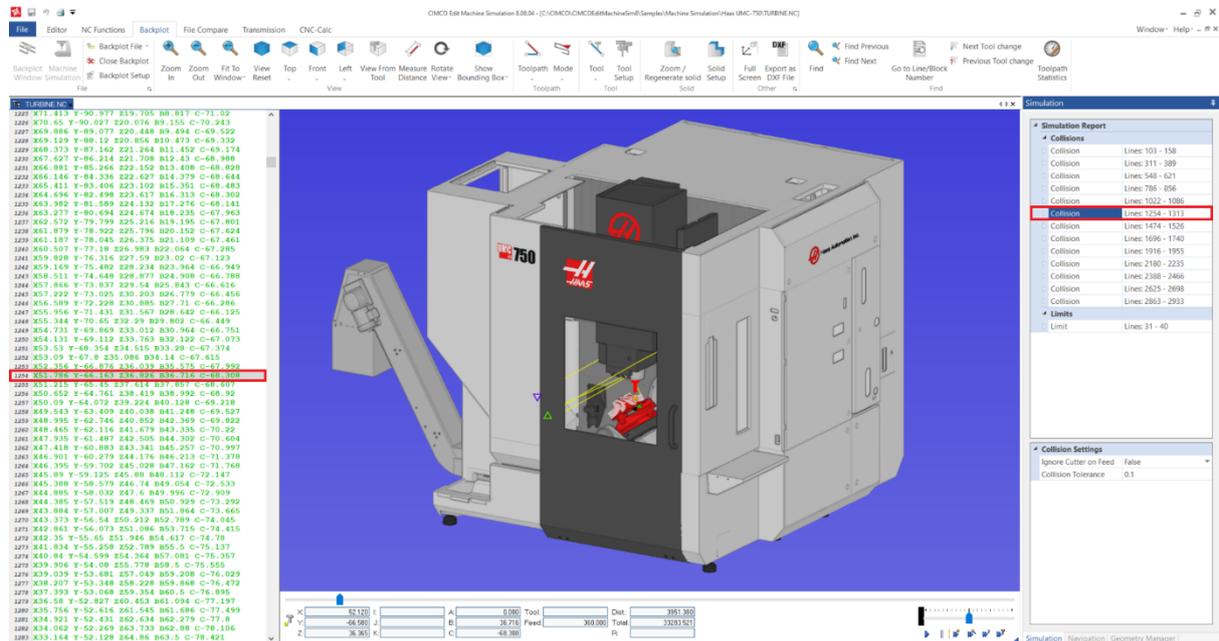
At the bottom of the interface, there are three tabs: "Simulation" (which is active), "Navigation", and "Geometry Manager".

8. Collisions

Click on the icon  to reveal a list of all the Collisions that have been detected.



Click on any Collision to highlight the corresponding line in the CNC program. The highlighted line can then be adjusted, and the Simulation Report will automatically update, removing the collision from the Simulation Report.



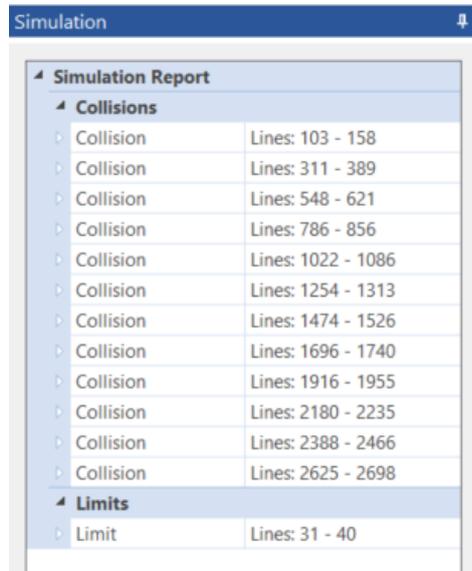
Click on the icon  to reveal additional information about the selected Collision including Distance start and end, Time start and end, point start and end and Line start and end.

Simulation

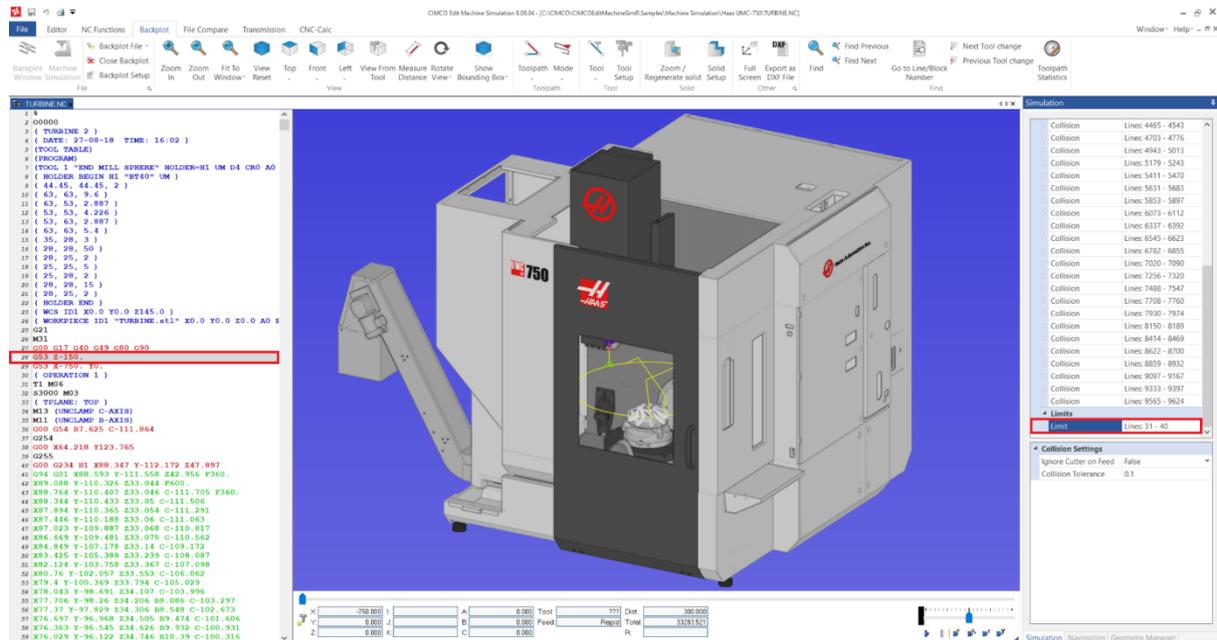
Simulation Report	
Collisions	
Collision	Lines: 103 - 158
Collision	Lines: 311 - 389
Collision	Lines: 548 - 621
Collision	Lines: 786 - 856
Collision	Lines: 1022 - 1086
Distance Start	3580.590401
Distance End	3664.488081
Time Start	230.723629
Time End	245.250308
Point Start	-221.741719; -336.9544
Point End	-275.612140; -320.1450
Line Start	1022
Line End	1086
Collision	Lines: 1254 - 1313
Collision	Lines: 1474 - 1526
Collision	Lines: 1696 - 1740
Collision	Lines: 1916 - 1955
Collision	Lines: 2180 - 2235
Collision	Lines: 2388 - 2466
Collision	Lines: 2625 - 2698
Collision	Lines: 2863 - 2933
Collision	Lines: 3099 - 3163
Collision	Lines: 3331 - 3390

9. Limits

Click on the icon  to reveal a list of all the Limits that have been detected.



Click on any Limit to highlight the corresponding line in the CNC program. The highlighted line can then be adjusted, and the Simulation Report will automatically update, removing the limit from the Simulation Report.



Click on the icon  to reveal additional information about the selected Limit including Distance start and end, Time start and end, point start and end and Line start and end.

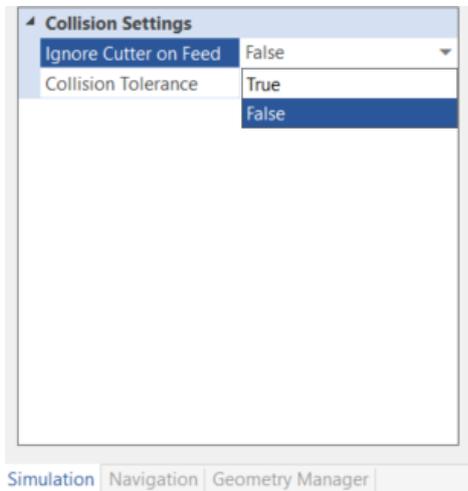
Simulation	
▶ Collision	Lines: 13490 - 13554
▶ Collision	Lines: 13722 - 13781
▶ Collision	Lines: 13942 - 13994
▶ Collision	Lines: 14164 - 14208
▶ Collision	Lines: 14384 - 14423
▶ Collision	Lines: 14648 - 14703
▶ Collision	Lines: 14856 - 14934
▶ Collision	Lines: 15093 - 15166
▶ Collision	Lines: 15331 - 15401
▶ Collision	Lines: 15567 - 15631
▶ Collision	Lines: 15799 - 15858
▶ Collision	Lines: 16019 - 16071
▶ Collision	Lines: 16241 - 16285
▶ Collision	Lines: 16461 - 16500
▲ Limits	
▲ Limit	Lines: 31 - 40
Distance Start	300.000000
Distance End	1993.655046
Time Start	0.360000
Time End	2.179328
▶ Point Start	-750.000000; 0.000000;
▶ Point End	-202.001682; -404.4529
Line Start	31
Line End	40
Limit	165.99

10. Collision Settings

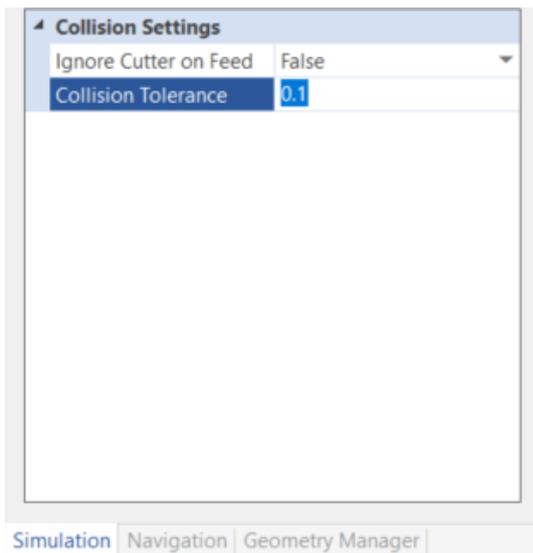
Determine whether collision checking occurs for **'Cutter on Feed'** by specifying the option of either **'True'** or **'False'**.

True = Collision of cutter on feed will be ignored.

False = Collision of cutter on feed will be checked.



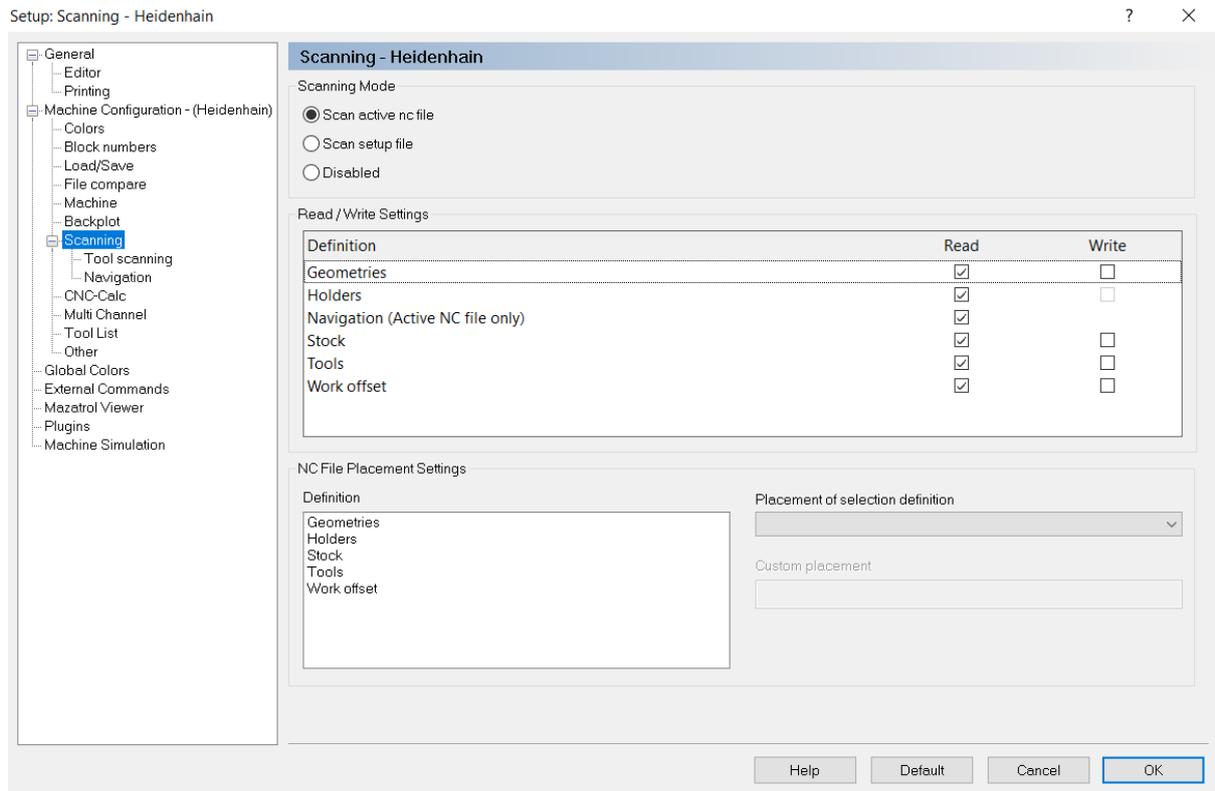
Set the collision tolerance by determining the value in the box beside **'Collision Tolerance'**.



Navigation

Navigation is an extension of the scanning feature. Navigation provides an overview of the contents in within NC files. It allows users to simply locate opposing positions within both the NC file and Navigation pane using keywords.

Locate the Editor tab and select '**Global Setup**', a setup window will open. In this window, select '**Scanning**'.



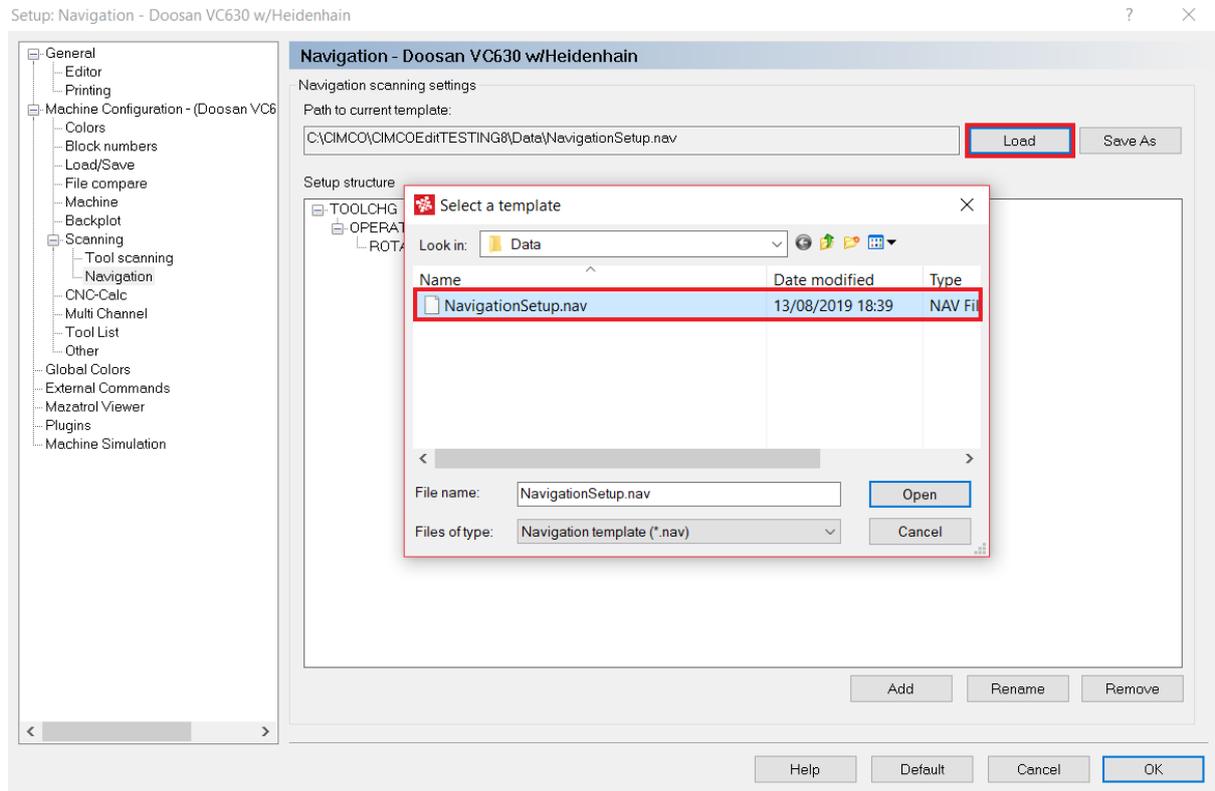
Check the box beside **Navigation (Active NC file only)** to automatically **read** corresponding keywords from the NC file.

11. Path to Current Template

In the Global Setup locate and select '**Navigation**', a setup window will open. '**Navigation**' will allow the path of a current template to be chosen.

Select **Load** to load a current template.

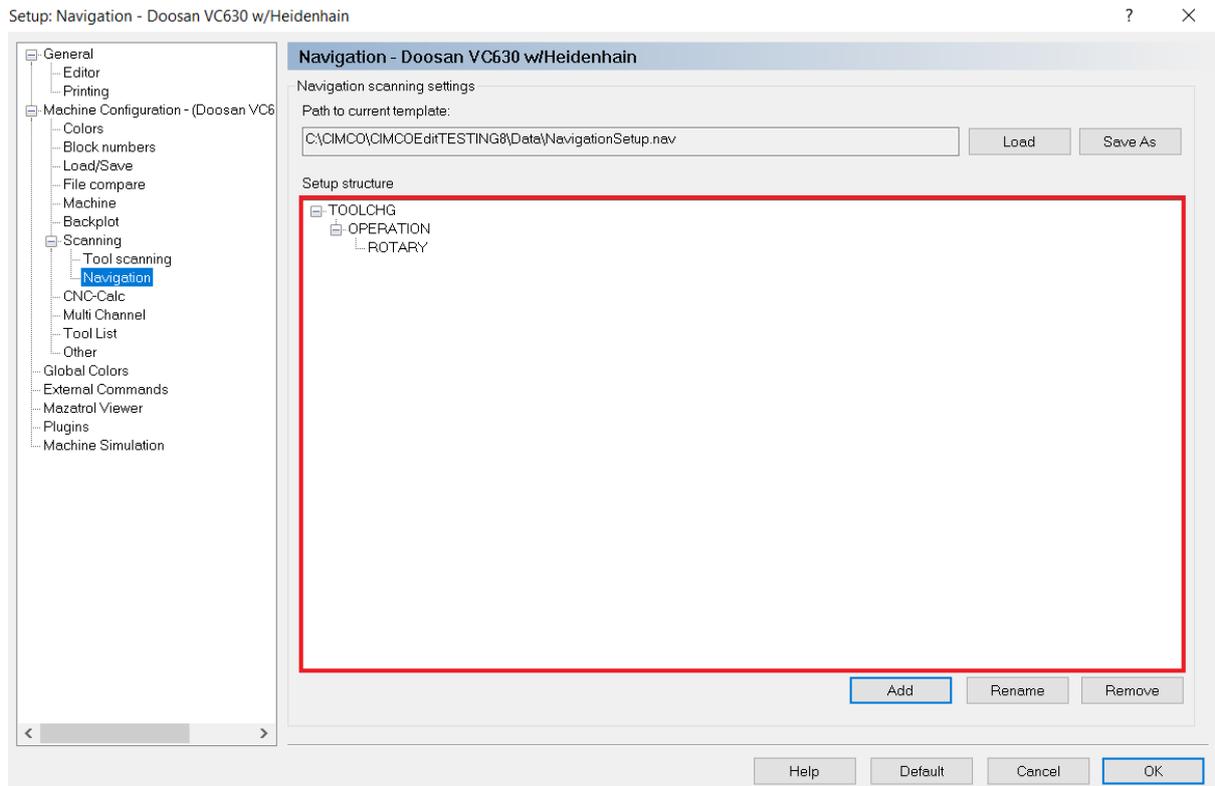
Select **Save As** to save the setup structure.



12. Setup Structure

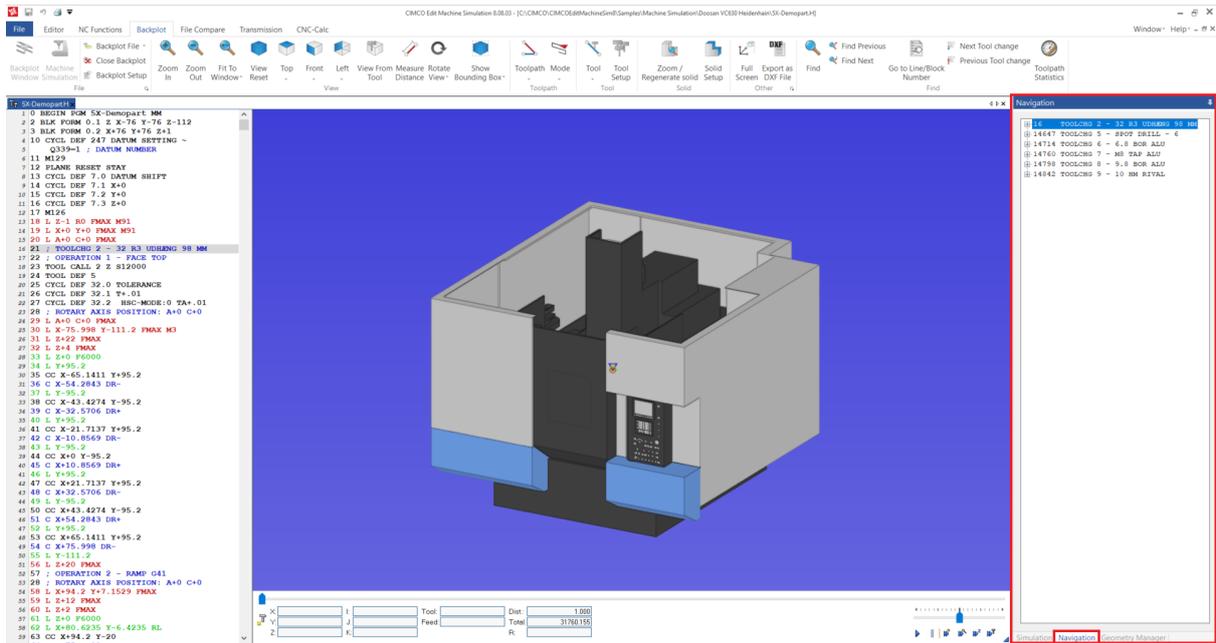
In the **'Navigation'** setup window, locate the **'Setup structure'** section. The Setup structure section allows users to specify the keywords that will be scanned for within the active NC file.

- Select **Add** to add an item to the setup structure.
- Select **Rename** to rename an added item. The keyword will be scanned for within the active NC file.
- Select **Remove** to remove an added item.

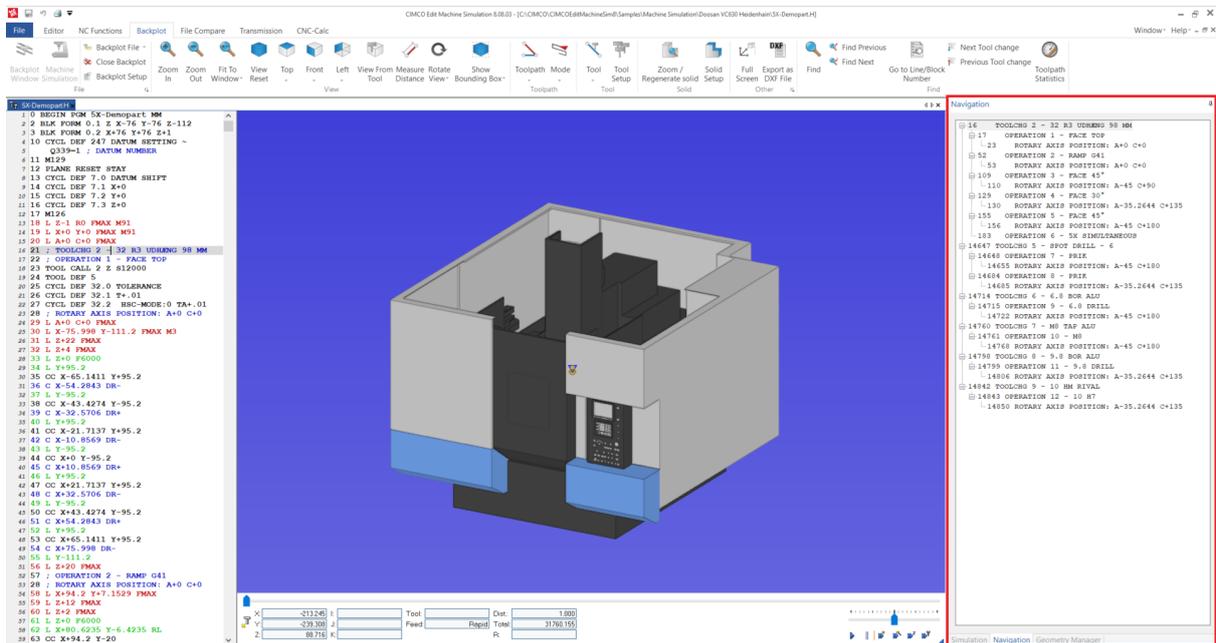


Once a template has been loaded or created select **'OK'**. Locate the Editor tab, choose a programme and open Machine Simulation. Locate the **'Navigation'** dock. The Navigation dock lists the information relating to the keywords specified in the active NC file.

Expand the navigation tree to show all specified keywords that have been found within the active NC file, please right-click in the Navigation docking pane, and select **'Expand all'**.



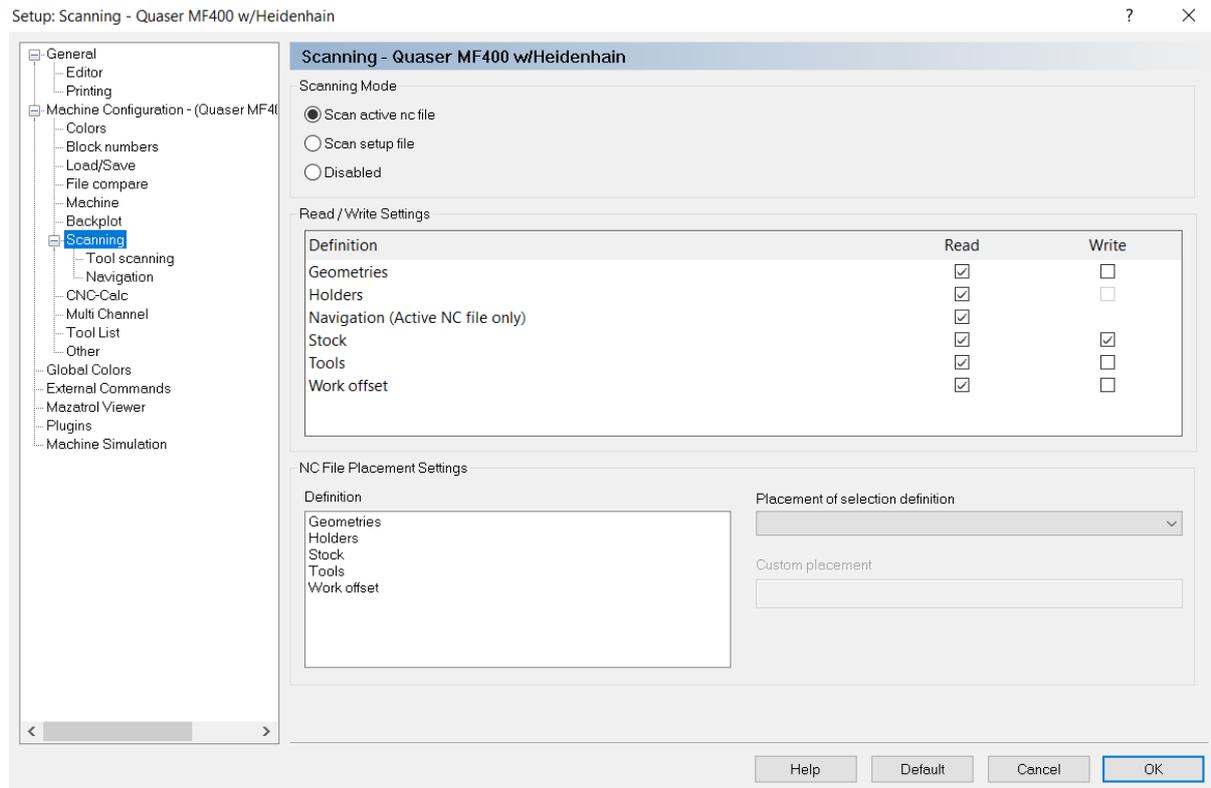
Select a keyword in the Navigation tree to automatically jump to the corresponding keyword in the active NC file. Additionally, select any line in the NC file and the nearest Keyword in the Navigation tree will be highlighted.



Scanning Commands

Scanning enables the workpiece, fixture, stock, work offset, tools and holders to be automatically loaded upon starting Backplot/Machine Simulation. Scanning is a feature that can be accessed through the Global Setup by following, 'Program Tabs -> Editor -> Global Setup -> Machine Configuration -> Scanning'.

[Video link: Scanning Commands tutorial \(https://youtu.be/1qk7WBF7dp8\)](https://youtu.be/1qk7WBF7dp8)



Three sections appear in the Scanning window, 'Scanning Mode', 'Read/Write Settings' and 'NC File Placement Settings'.

13. Scanning Mode

Scanning Mode

Scan active nc file

Scan setup file

Disabled

Scanning mode has three options,

Scan active nc file reads the scanning commands that are currently in the nc file.

Scan setup file reads an external file which contains the same scanning commands that would be located within the nc file but using default settings so that it is neutral to all controls. The setup file should be in the same location as the nc file and have the same name, but the '. setup' extension.

Name	Date modified	Type	Size
 5X-Demopart.H	14-04-2019 16:33	H File	558 KB
 5X-Demopart.setup	14-04-2019 16:35	SETUP File	2 KB
 5X-Demopart_Fixture.stl	14-04-2019 15:57	3D-objekt	507 KB
 5X-Demopart_Workpiece.stl	14-04-2019 15:57	3D-objekt	158 KB

Disabled, no scanning is done.

14. Read/Write Settings

Definition	Read	Write
Geometries	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Holders	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Stock	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Tools	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Work offset	<input checked="" type="checkbox"/>	<input type="checkbox"/>

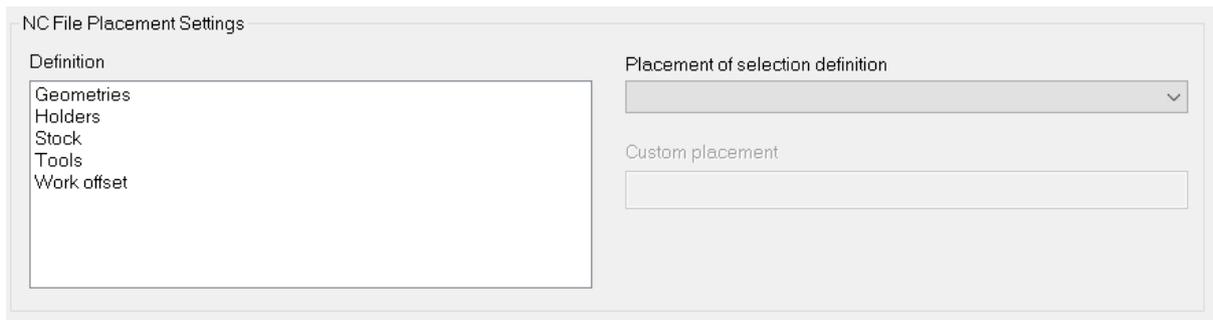
Within this section there are three columns, **Definition**, **Read** and **Write**,

Definition column contains the objects that can be scanned, Geometries, Holders, Stock, Tools, Work offset.

Under the **Read** column there are check boxes corresponding with each definition. Check the box beside the definition to automatically read its description from the nc or setup file.

Under the **Write** column there are check boxes corresponding with each definition. Check the box beside the definition to automatically write the description into the nc or setup file.

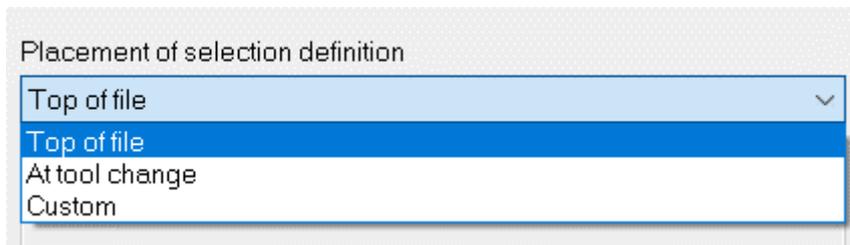
15. NC File Placement Settings



NC File Placement Settings mode has three sections,

Definition contains the objects that are scanned, by clicking on each of the definitions it allows its 'placement' to be selected.

Placement of selection definition allows the placement of the scanning commands to be chosen from default options.



Custom Placement allows the end user to choose the placement of the scanning commands.

16. Sample Scanning Commands

Sample below show scanning commands in a Setup file,

```
TOOL 1 "BORING BAR" HOLDER=H1 UM D10 FL=20.5 SL=30 BL40 AD=10 A10 CR4
TOOL 2 "END MILL SPHERE" HOLDER=H1 UM D10 FL=20.5 SL=30 BL40 AD=10 A10 CR4
HOLDER BEGIN H1 "BT50"
69.85, 69.85, 3
100, 100, 12.5
100, 85, 4.33
85, 85, 6.34
85, 100, 4.33
100, 100, 7.3
HOLDER END
WORKPIECE ID1 "workpiece_1.stl" X0 Y0 Z0 A0 B0 C0
WORKPIECE ID2 "workpiece_2.stl" X0 Y0 Z0 A0 B0 C0
FIXTURE ID1 "fixture_1.stl" X0 Y0 Z0 A0 B0 C0
FIXTURE ID2 "fixture_2.stl" X0 Y0 Z0 A0 B0 C0
WCS ID0 X100 Y100 Z0
WCS ID1 X300 Y200 Z0
WCS ID2 X300 Y300 Z0
```

Fixture/Workpiece

Load .stl model as fixture or workpiece,

```
<TYPE> ID<ID> "<FILENAME>" X<NUMBER> Y<NUMBER> Z<NUMBER> A<NUMBER> B<NUMBER> C<NUMBER>
```

```
<TYPE>      : Either of the two strings: WORKPIECE
              FIXTURE
<ID>       : Integer
<FILENAME> : String with an ".stl" extension
<NUMBER>   : Integer, Float
              : X,Y,Z Coordinate
              : A,B,C Euler transformation
```

```
WORKPIECE ID1 "workpiece_1.stl" X0 Y0 Z0 A0 B0 C0
WORKPIECE ID2 "workpiece_2.stl" X0 Y0 Z0 A0 B0 C0
FIXTURE ID1 "fixture_1.stl" X0 Y0 Z0 A0 B0 C0
FIXTURE ID2 "fixture_2.stl" X0 Y0 Z0 A0 B0 C0
FIXTURE ID3 "fixture_2.stl" X0 Y0 Z0 A0 B0 C0
```

Tool

Load tool,

```
TOOL <TOOL NUMBER> "<TYPE>" <UNIT> <DIMENSIONS>
```

Or

```
TOOL <TOOL NUMBER> "<TYPE>" HOLDER=<HOLDER ID> <UNIT> <DIMENSIONS>
```

```
<TOOL NUMBER> : Integer with tool number, at the moment supports characters `a-z` as well.  
<TYPE>        : String with tool type  
<HOLDER ID>  : Optional, Alphanumeric string [a-zA-Z0-9_-]  
<UNIT>       : Optional parameter with two possible values:  
              UM for Metric  
              UI for Imperial  
<DIMENSIONS> : List of tool dimensions, described below.
```

```
D = Diameter      : Integer, fraction or decimal  
CR = Corner Radius : Integer, fraction or decimal  
A = Taper Angle   : Integer, fraction or decimal  
FL = Flute Length : Integer, fraction or decimal  
SL = Shoulder Length : Integer, fraction or decimal  
BL = Body Length  : Integer, fraction or decimal  
AD = Arbor Diameter : Integer, fraction or decimal
```

```
TOOL T1 "BORING BAR" HOLDER=H1 UM D10 FL=20.5 SL=30 BL40 AD=10 A10 CR4
```

Holder

Load holder,

```
HOLDER BEGIN <ID> "<NAME>" <UNIT?>
<NUMBER>, <NUMBER>, <NUMBER> # Holder Segment: (Upper diameter, Lower diameter, Length of the segment)
<NUMBER>, <NUMBER>, <NUMBER> # One holder segment per line
...
<NUMBER>, <NUMBER>, <NUMBER>
HOLDER END
```

```
<ID>      : alphanumeric string [a-zA-Z0-9_-]
<NAME>    : alphanumeric string [a-zA-Z0-9_-], must be encapsulated with double quotation marks
<UNIT>    : Optional parameter with two possible values:
            UM for Metric
            UI for Imperial
<NUMBER>  : Integer, Float, Fraction
```

```
HOLDER BEGIN H2 "B2C4-0011"
42.9514,1.524,45.9994
45.9994,6.0706,45.9994
45.9994,2.00406,39.0652
37.9984,4.0132,37.9984
39.06012,2.00406,45.9994
45.9994,3.1242,45.9994
45.9994,1.27,43.4594
22.225,3.175,15.875
15.875,31.75,15.875
15.875,1.4478,12.7
12.7,5.334,12.7
14.986,0.508,16.002
16.002,11.43,16.002
16.002,0.508,14.986
HOLDER END
```

WCS

Load work offset,

```
WCS ID<INDEX> X<NUMBER> Y<NUMBER> Z<NUMBER>
```

```
<INDEX>  : Integer referring to the work offset index. (Currently we support 7 different work offsets (0-6))
<NUMBER> : Integer, Float
          : X,Y,Z Coordinate
```

```
WCS ID0 X100 Y100 Z0
WCS ID1 X300 Y200 Z0
WCS ID2 X300 Y300 Z0
```

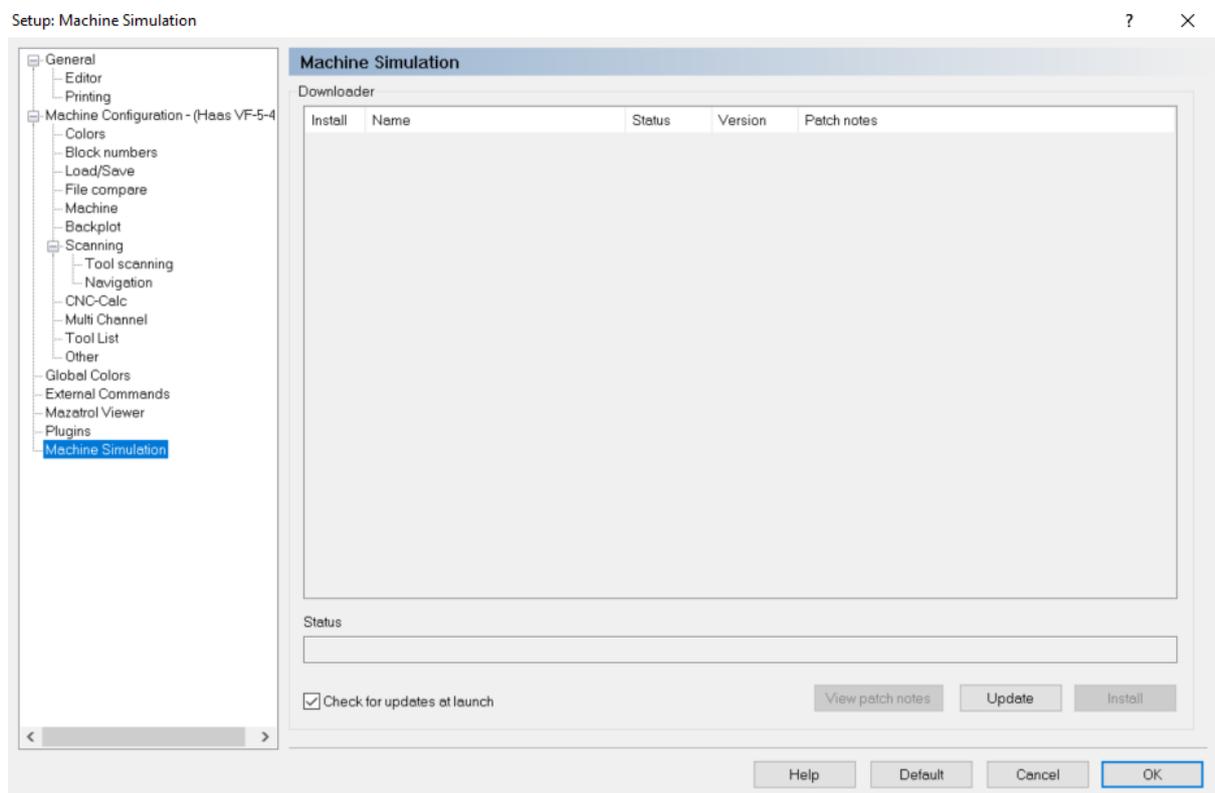
Downloading Machines

Download machines from a user interface using the CIMCO machine server. CIMCO have agreements with various machine tool vendors to use their 3D machine models. CIMCO apply the specifications set by the machine tool vendors to the machine setup, including, travel limits, feedrates, machine zero position, centre of rotations, and tool change positions.

If a specific machine is not available in the machine server, machines can be configured to use within Machine Simulation by using the 'Machine Configuration Editor'. Please refer to the Machine Configuration Editor section.

[Video link: Downloading Machines tutorial \(https://youtu.be/KLVKleI7J3o\)](https://youtu.be/KLVKleI7J3o)

Locate the Editor tab and select '**Global Setup**', a setup window will open. In this window, select '**Machine Simulation**'.



To view all available machines, click on '**Update**'. All available machines will now appear in the Downloader window. To install specific machines, click the check boxes beside the corresponding machine.

Install	Name	Status	Version	Patch notes
<input type="checkbox"/>	Haas VF-2 TR160	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF-3YT	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF-7/40	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF-7/50	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF-8/40	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF-8/50	New	2.00	2.00: * Uploaded to server
<input checked="" type="checkbox"/>	Haas VF-9/40	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF-9/50	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Haas VF1	Update	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Haas VF2-HRT210	New	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Haas VF6/40TR	Update	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Haas VM-2	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Hwacheon M2 w/Fanuc	New	2.20	2.20: * Updated machine origin
<input checked="" type="checkbox"/>	Okuma MU-4000V_32mg	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Okuma MU-5000V_48mg	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Okuma MU-6300V_48mg	New	2.00	2.00: * Uploaded to server
<input type="checkbox"/>	Okuma MU-8000V_48mg	New	2.00	2.00: * Uploaded to server
<input checked="" type="checkbox"/>	Quaser MF400 w/Heidenhain	Update	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Quaser MF500 w/Heidenhain	Update	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Quaser MV134 w/Heidenhain	New	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Quaser UX500 w/Heidenhain	New	2.20	2.20: * Updated machine origin
<input type="checkbox"/>	Quaser UX600 w/Heidenhain	Update	2.20	2.20: * Updated machine origin

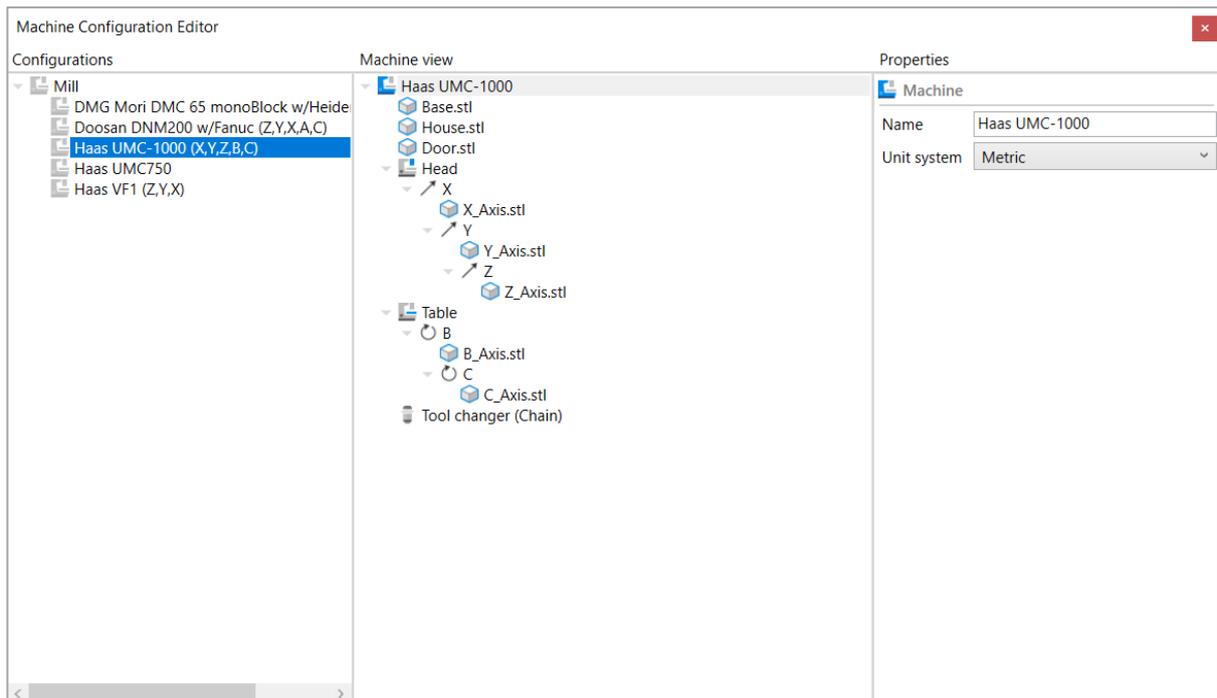
Check for updates at launch

Once the specific machines have been ticked, please select 'Install'. This will automatically install all the chosen machines and they will become available from the 'Machine Configuration' drop down menu.

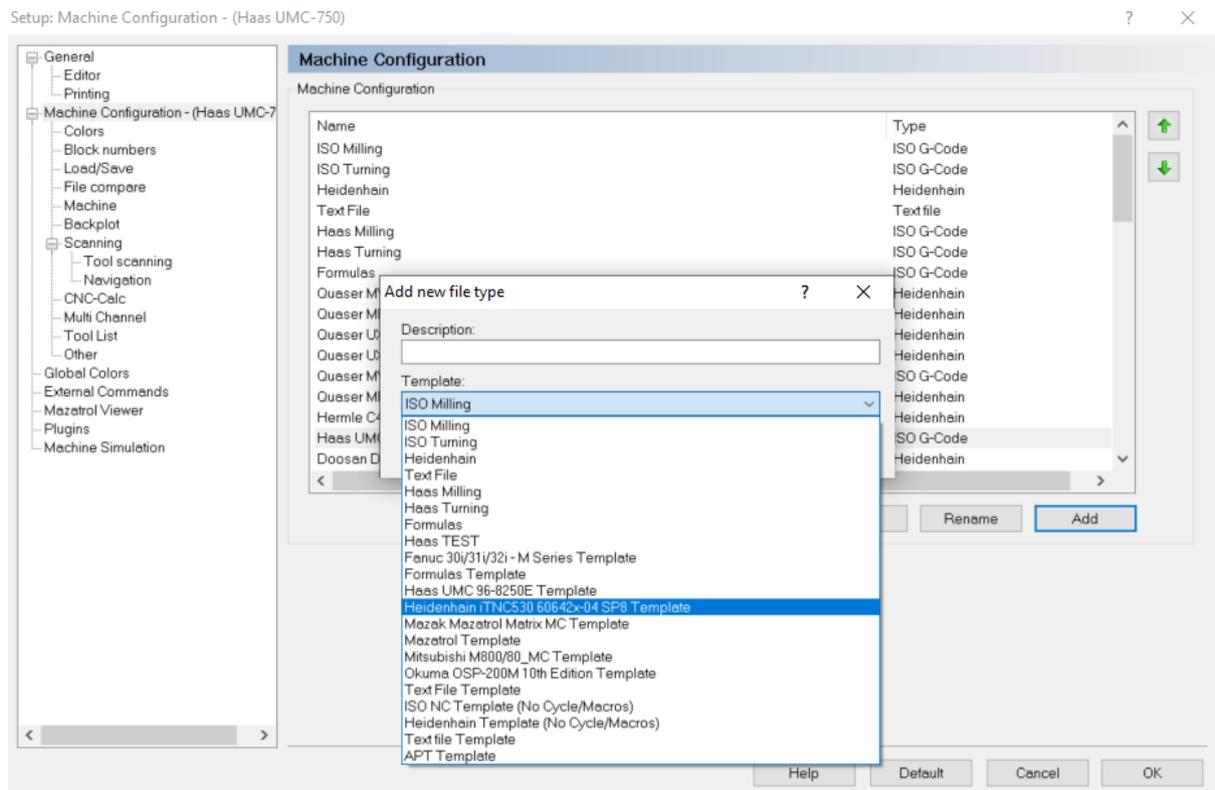
Machine Configuration Editor

The Machine Configuration Editor allows for machines to be configured. Add geometry to an individual machine component and determine the axis components of the machines, travel limits, feedrates and tool change position. Once a machine configuration has been created, it will become available for selection and can then be used within Backplot and Machine Simulation. The Machine Configuration Editor is split into three sections, **Configurations**, **Machine View**, and **Properties**.

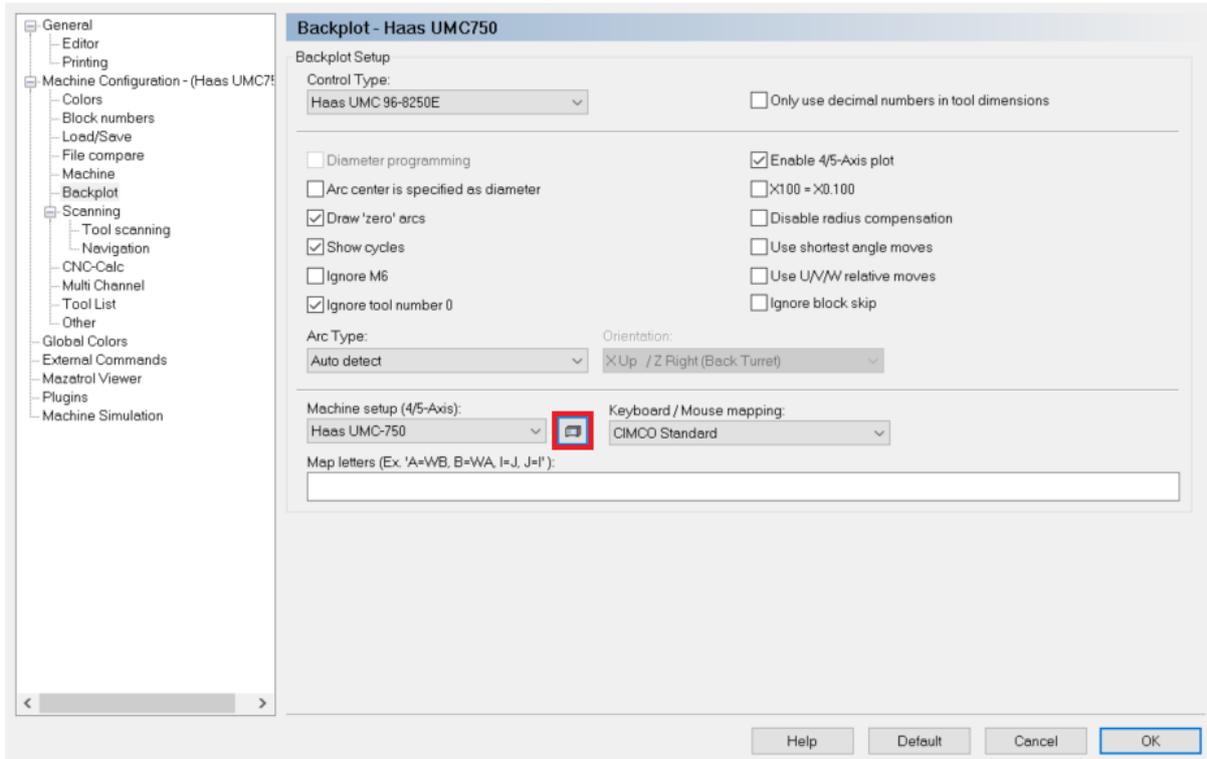
[Video link: Machine Configuration Editor tutorial \(https://youtu.be/CQrGsOr7JxQ\)](https://youtu.be/CQrGsOr7JxQ)



Locate the 'Global Setup' tab and select 'Machine Configuration'. Click 'Add' and in the 'Description' box input the machine name. Under 'Template', choose the control type for the machine using the drop-down menu.



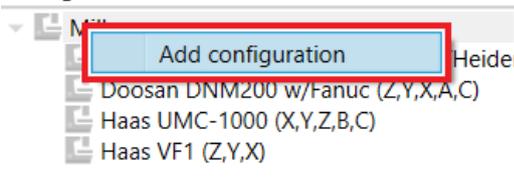
Select the machine in the 'Machine Configuration' section and then locate 'Backplot' in the Global Setup. Click the 'Edit Machine Configuration' icon to open the Machine Configuration Editor.



Add a machine configuration by right-clicking **'Mill'** and selecting **'Add configuration'**. The machine configuration will appear in the 'Configurations' section as **'New'**.

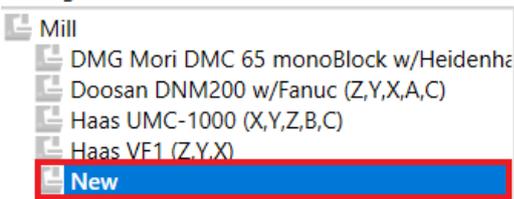
Machine Configuration Editor

Configurations



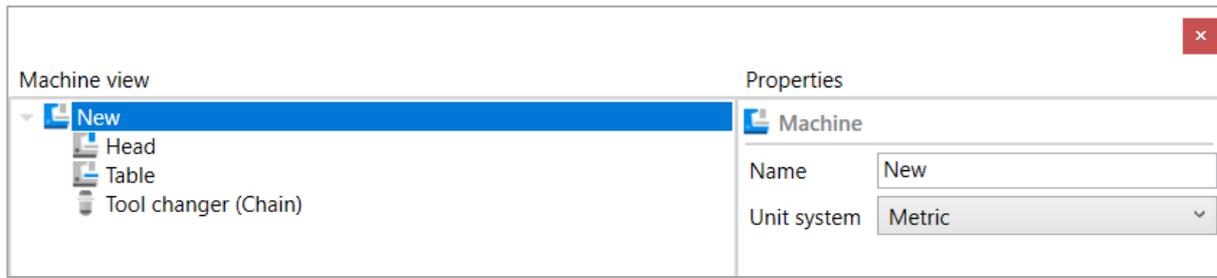
Machine Configuration Editor

Configurations

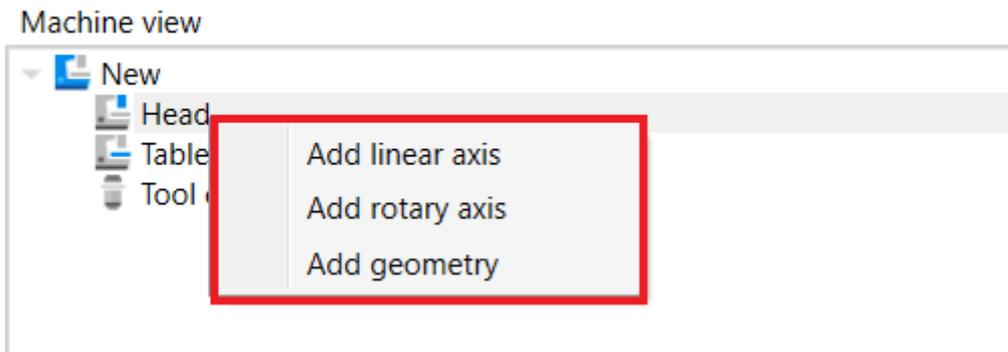


Click on the **'New'** machine configuration. This will open the machine configuration tree in the Machine View section of the Machine Configuration Editor. This section allows the machine to be defined.

Select the machine component **'New'** to edit the machine name and unit system.



Note: The Unit system is used for limits, center of rotation and feedrate.



Right-click '**Head**' to add a linear axis, a rotary axis or geometry to the head section of the machine.

17. Add a Linear Axis

Add a linear axis to the 'Head' by right-clicking 'Head' and selecting 'Add linear axis'. This will add a linear axis and open the configurable parameters in the 'Properties' section, the axis can now be defined by inputting the specific values.

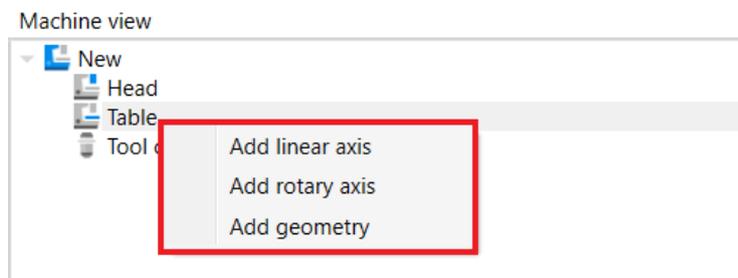
Address = Select the drop-down menu and select the specific axis, X, Y or Z.

Limit +/- = Input the max/min values of the axis.

Feedrate = Input the feedrate of the axis.

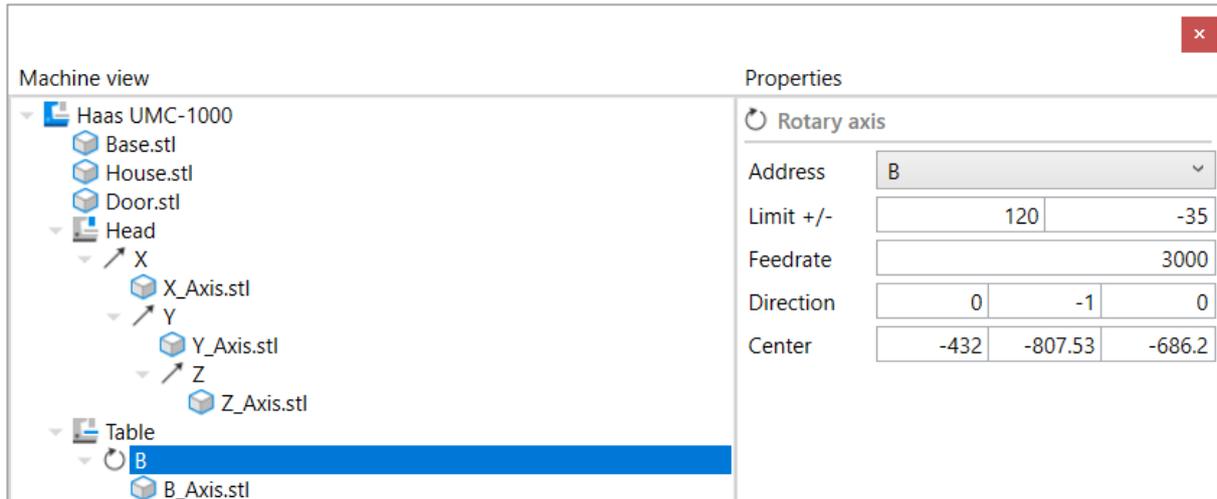


Right-click 'Table' to add a linear axis, a rotary axis or geometry to the table section of the machine.



18. Add a Rotary Axis

Add a rotary axis to the 'Table' by right-clicking 'Table' and selecting 'Add rotary axis'. This will add a rotary axis and open the configurable parameters in the 'Properties' section, the axis can now be defined by inputting the specific values.



Address = Select the drop-down menu and select the specific axis, X, Y or Z.

Limit +/- = Input the max/min values of the axis.

Feedrate = Input the federate of the axis.

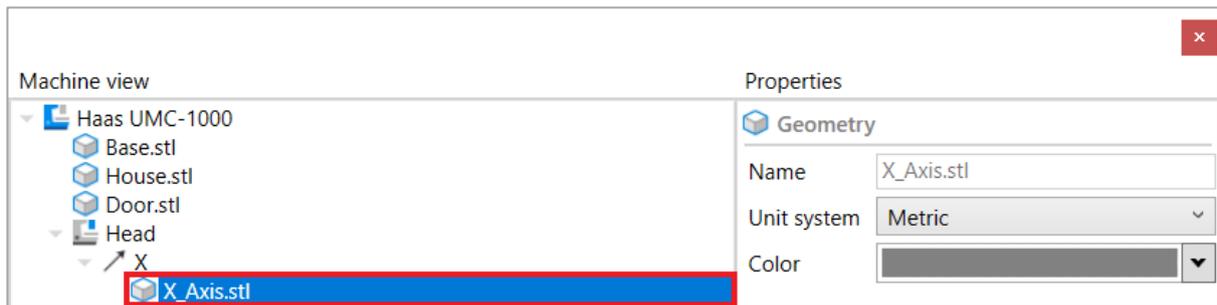
Direction = Input the value for the vector direction in the parameter box corresponding with its axis of rotation.

Center = Input the value of the center of rotation in the parameter box corresponding with its axis, X, Y and Z

Note: To add a second axis to a machine component, right-click the component and select either 'Add linear axis', 'Add rotary axis'.

19. Add Geometry

Add geometry to an axis by right-clicking an axis and select '**Add geometry**', select the location of the STL model and choose '**Open**'.



Name = The name is determined by the name of the STL file.

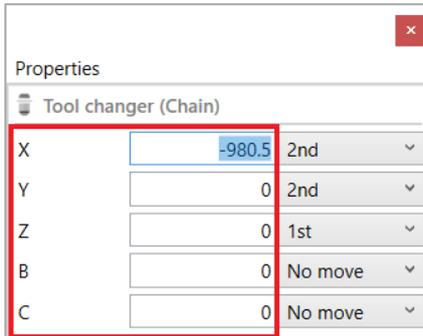
Unit system = Input unit measurement, metric or imperial.

Colour = Select the colour of STL model.

***Note:** The '**Unit system**' that is applied in the machine configuration will control what scale is used in Machine Simulation. Metric models will be scaled up if an imperial machine configuration is chosen in Machine Simulation and vice versa.*

20. Tool Change Position

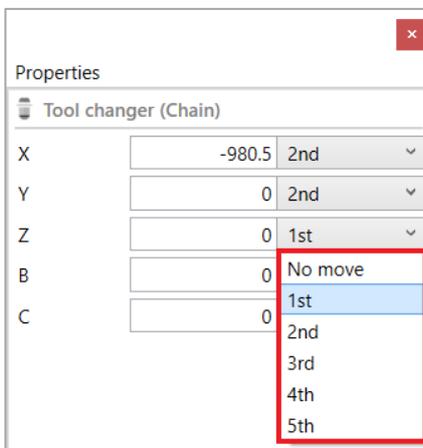
To configure the tool change position, select '**Tool Changer (Chain)**' in the Machine View section. The configurable parameters in the 'Properties' section will appear, the tool change position can now be defined by inputting the specific values. Input the position in relation to each axis during the tool change. Click in the box beside the axis to determine a value.



The screenshot shows a 'Properties' dialog box for 'Tool changer (Chain)'. It contains a table with five rows for axes X, Y, Z, B, and C. Each row has a text input field for a numerical value and a dropdown menu for the move order. The X-axis row is highlighted with a red box, showing a value of -980.5 and a '2nd' dropdown. The Y-axis row shows 0 and '2nd'. The Z-axis row shows 0 and '1st'. The B-axis row shows 0 and 'No move'. The C-axis row shows 0 and 'No move'.

Axis	Value	Order
X	-980.5	2nd
Y	0	2nd
Z	0	1st
B	0	No move
C	0	No move

In the drop-down selection, choose the order in which the axis move during the tool change.



The screenshot shows the same 'Properties' dialog box, but the dropdown menu for the Z-axis is open. The menu options are 'No move', '1st', '2nd', '3rd', '4th', and '5th'. The '1st' option is highlighted with a blue background and is enclosed in a red box.

Axis	Value	Order
X	-980.5	2nd
Y	0	2nd
Z	0	1st
B	0	No move
C	0	No move

No Move = Axis will not move during tool change.

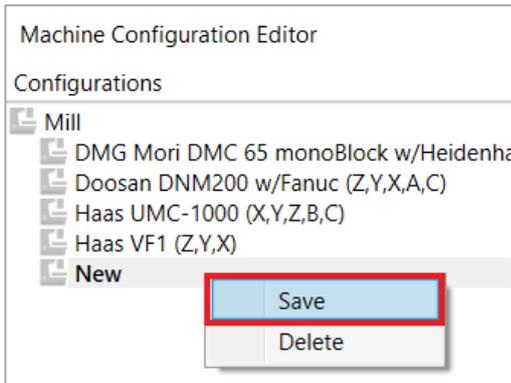
1st, 2nd, 3rd, 4th, 5th = Determines the order the axis move during the tool change.

1st = axis will move first during the tool change, etc.

Note: The tool change position can only be specified once all axis have been configured.

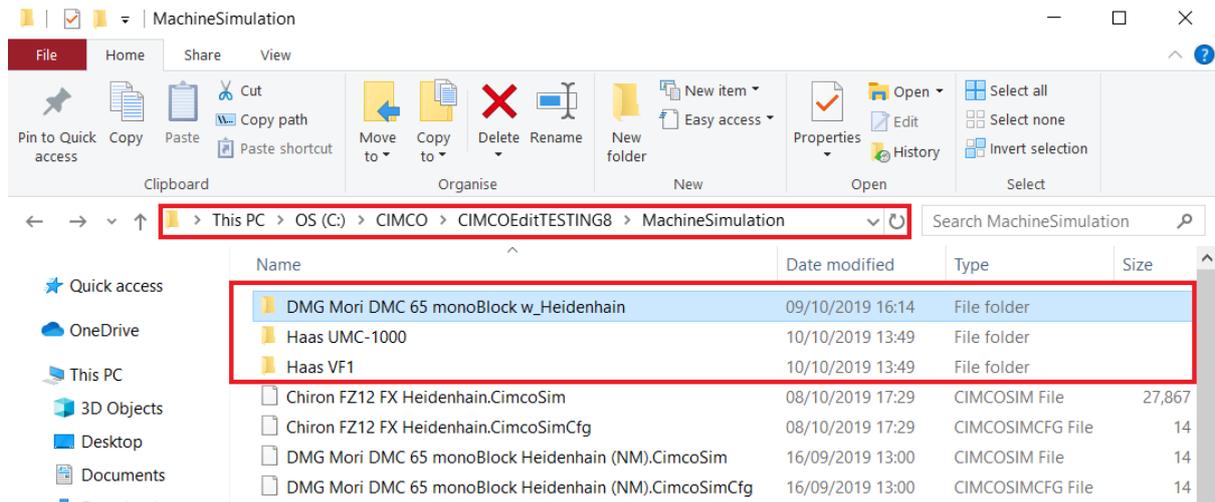
21. Saving a Machine Configuration

Machine configurations can be saved by right-clicking and selecting 'Save'. All saved machine configurations appear in the 'Configurations' section of the Machine Configuration Editor.



Note: A machine will not have the option to 'Save' if the configuration has errors. A prompt will appear with a red cross beside the machine component that contains the error.

Note: All saved machine configurations are saved in a sub folder which can be found in the directory, **C-Drive > CIMCO > CIMCOEditMachineSim8 > Machine Simulation**. Users can use saved configurations on multiple PC's by copying and pasting the machine configuration sub folders into the directory listed above on the individual PC.

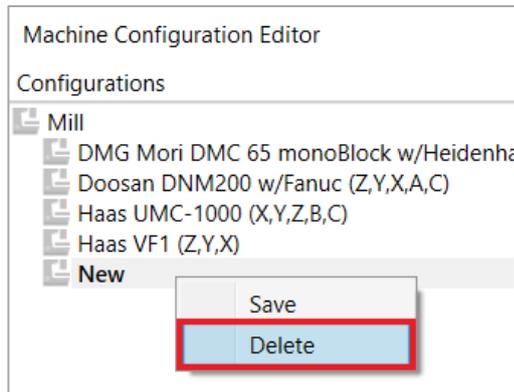


If machine models **are included** in the configuration, then sub folders will be created when saving the configuration. The fully defined machines will automatically be available when running Machine Simulation.

If a machine configuration **does not include** machine models, then only the .mcfg file needs to be copied and pasted. The machine models can then be added to the configuration within CIMCO Machine Simulation using the Geometry manager.

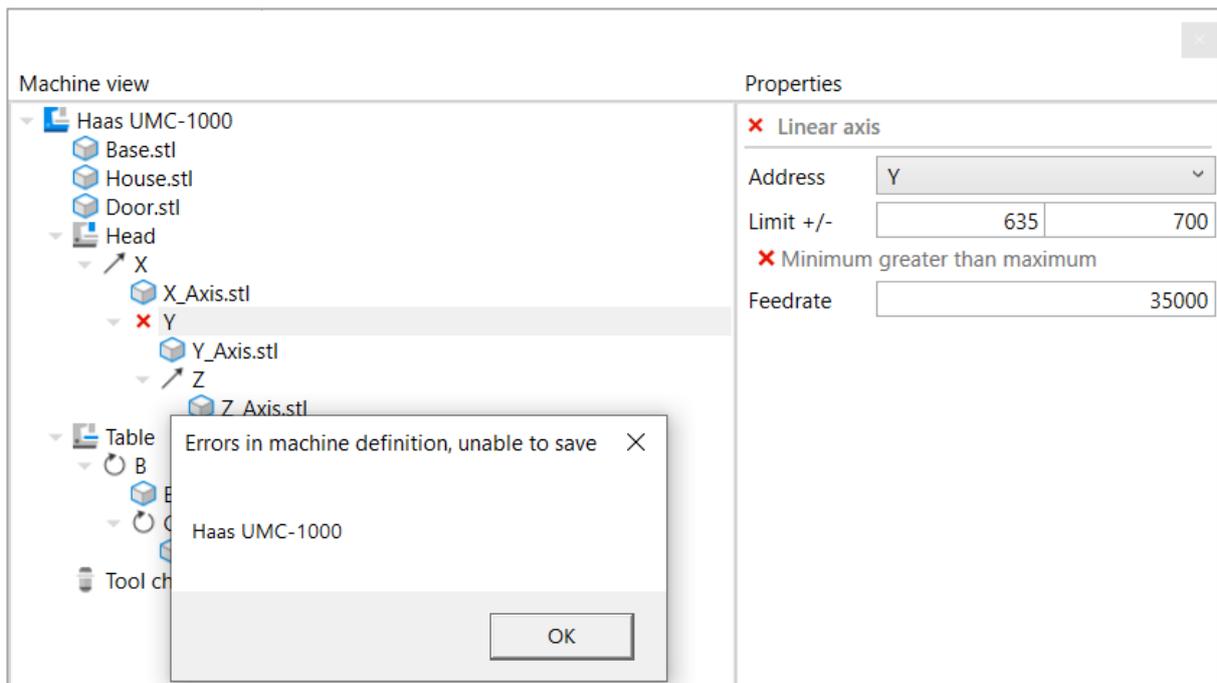
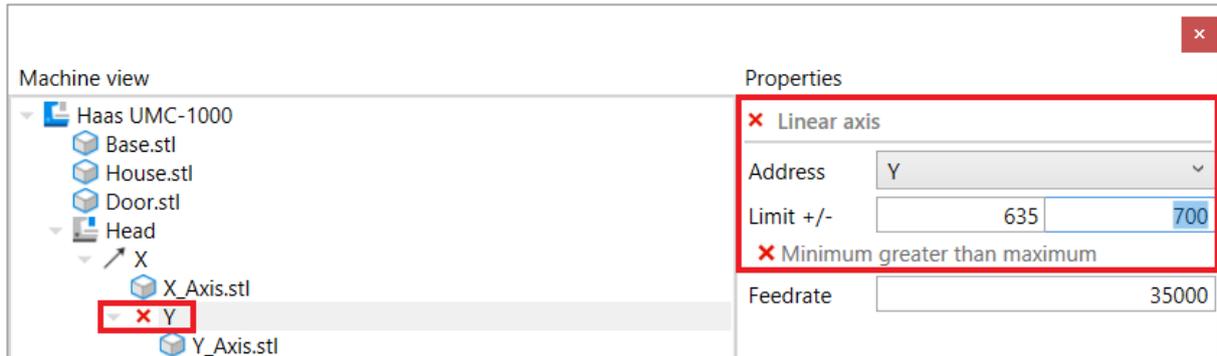
22. Deleting a Machine Configuration

Delete a machine configuration by right-clicking and selecting **'Delete'**.



23. Machine Configuration Error Notifications

If an **incorrect parameter** has been entered, an error will show with a prompt. A **red cross** will also appear beside the machine component that contains the error. A machine configuration will not be able to be saved until the errors have been resolved.

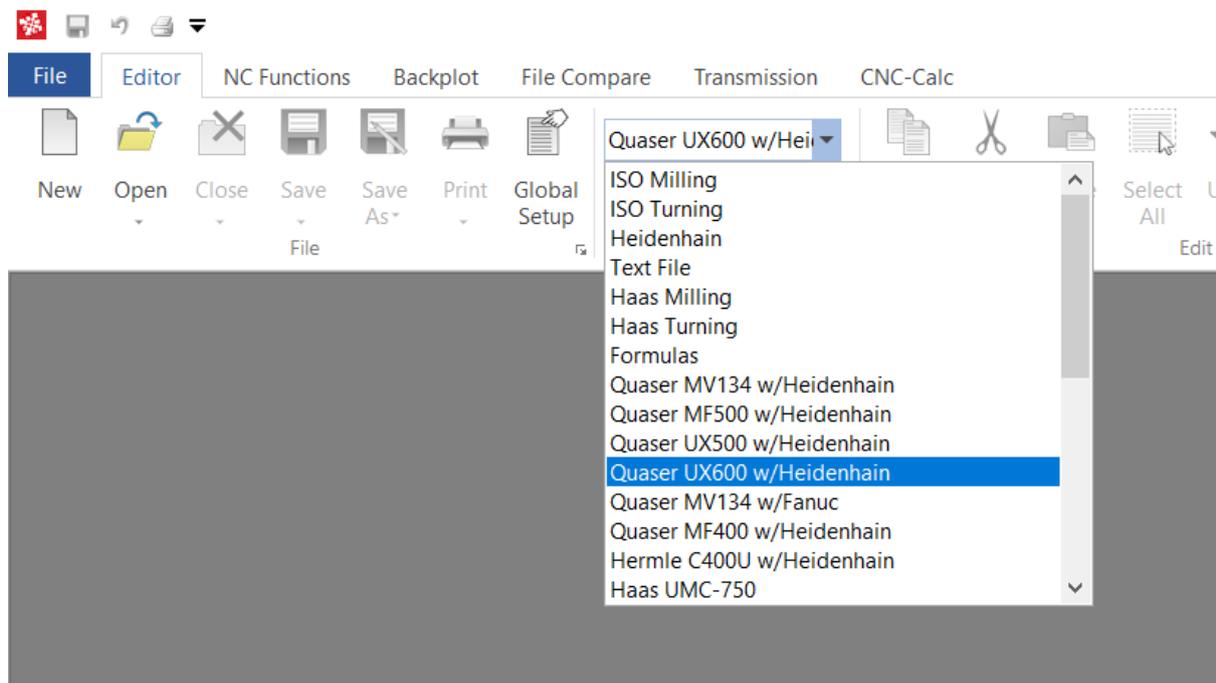


Specifying Default Machine Configurations for NC Programs

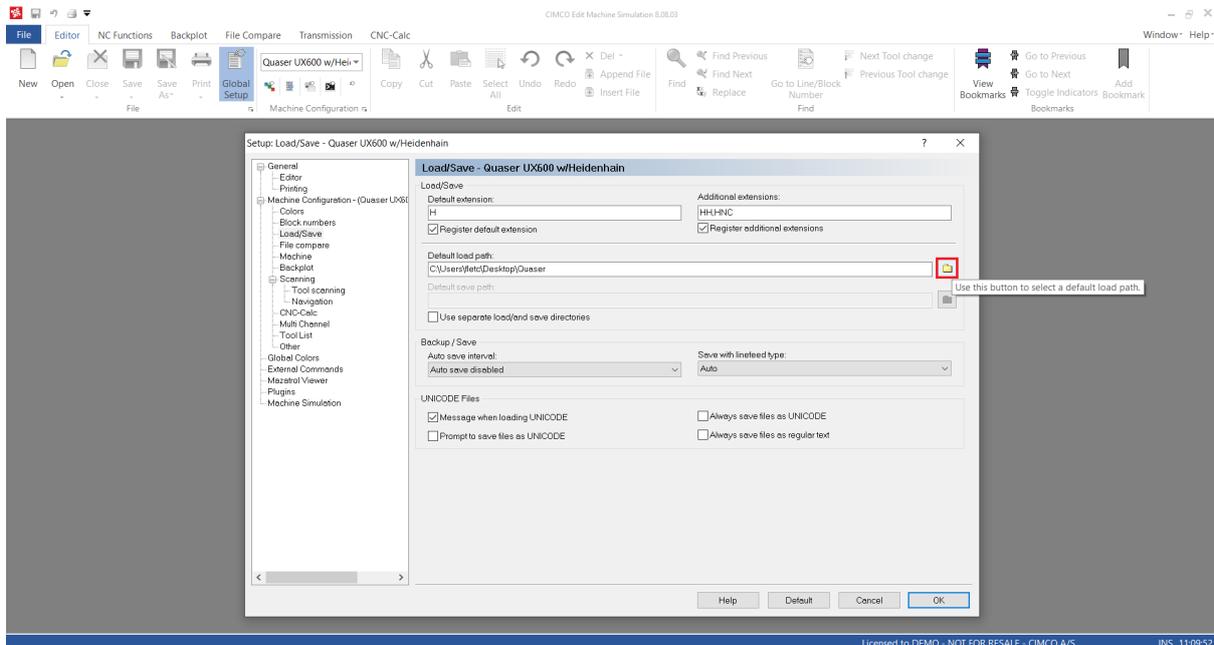
Specifying a default loading path for configurations allows a machine configuration to be automatically selected upon opening specific NC programs.

[Watch Specifying Default Machine Configurations for NC Programs \(https://youtu.be/g1WXij991VI\)](https://youtu.be/g1WXij991VI)

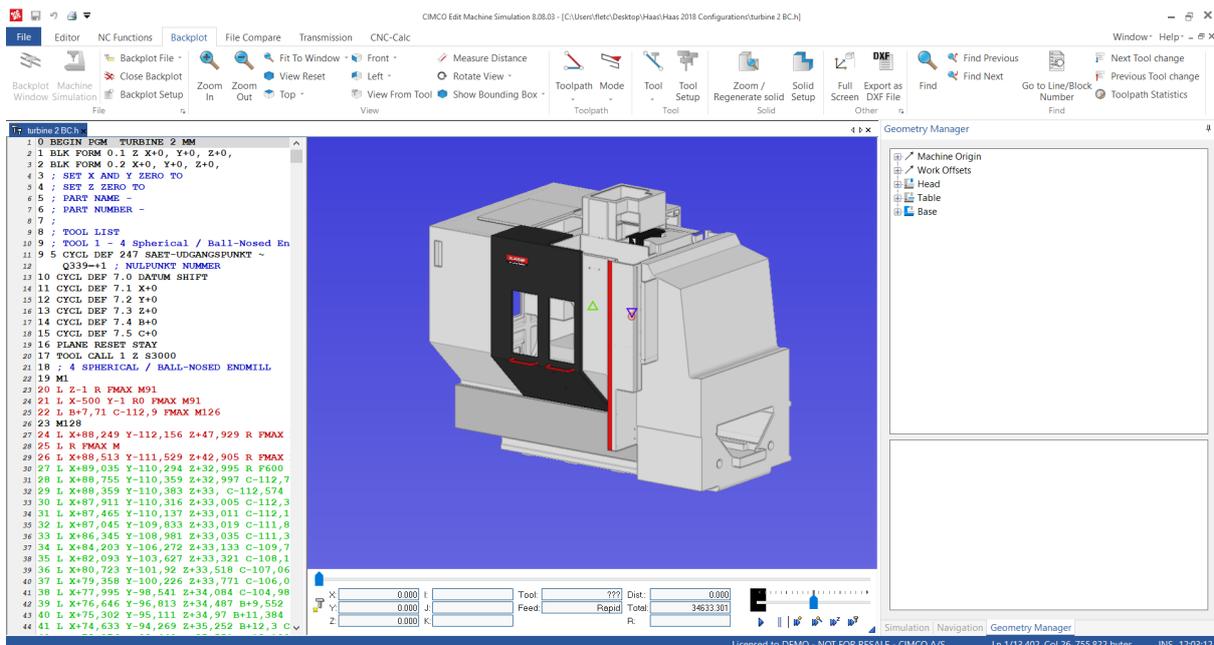
Select the machine from the machine configuration drop down menu to be used as the specific default configuration for NC programs.



In Global Setup, navigate to 'Load/Save' settings and specify a 'Default load path' by clicking on the folder icon located to the right of the 'Default load path' section. Programs from this path opened in the editor with one of the specified extensions will automatically select this configuration, unless other configurations using same extensions are using same default folder.

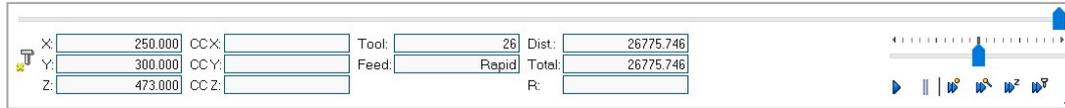


The default machine configuration will now be automatically selected. It is now possible to simply open the NC program, locate the Backplot tab and select Machine Simulation.



Simulation Interface

The Simulation interface is used for controlling the simulation and contains the functions described below.



Start/Stop simulation

Click to start/stop the simulation.



Pause simulation

Click to pause the simulation.



Jump to next move

Click to jump to the next linear or rotary move.



Jump to next cutting pass

Click to jump to the next linear or rotary move.



Jump to next Z-level

Click to jump to the Z-level in the CNC program.



Jump to next tool

Click to jump to the next tool change.



Show/hide information bar

Click to either show or hide the interface, this will expand the backplot window when hidden.



Speed and direction slider

Drag this slider from its midpoint to the right to forward from slow to fast. Drag from midpoint to the left to reverse the simulation from slow to fast.



Simulation progress slider (0-100%)

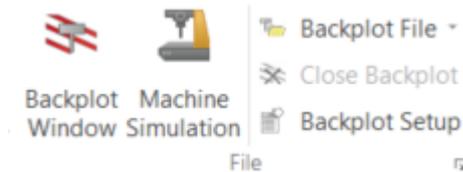
Drag this slider to set a new starting point for the simulation.

Backplot Tab



24. File

The file menu contains the below described functions for file simulation and general backplot settings.



Backplot Window / *Ctrl+Shift+P*

Shows backplot of current window. The window splits in two, allowing the lines of the program file and their toolpath simulation to be shown simultaneously. The icon  is active only when a program file is already open. Clicking this icon disables the *Machine Simulation* icon.

Machine Simulation

Select this option to show a machine simulation of the current NC program. The window splits in two, allowing the lines of the program file and the machine/toolpath simulation to be shown simultaneously. The icon  is active only when a program file is already open, and the correct machine is selected. Clicking this icon disables the *Backplot Window* and *Solid Animation* icon.

Backplot File

Enables to backplot file directly from disk, without opening the file. When clicking this icon, a window opens allowing a file to be selected to plot. A click on the down arrow next to the icon will display a list of recently simulated programs. In both cases, a complete plot of the selected program without showing the CNC program is displayed.

Close Backplot / *Ctrl+Shift+Q*

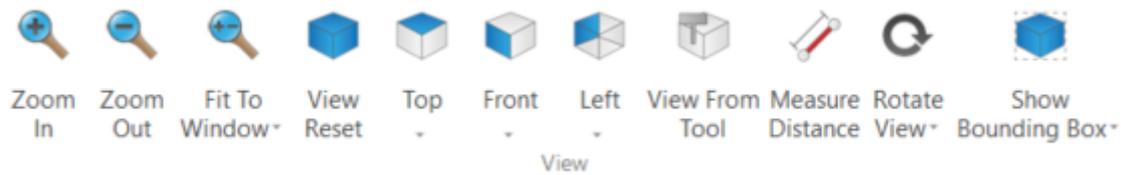
Closes the backplot window. Available when machine simulation is active.

Backplot Setup

This option the backplot to be configured. Before starting the graphical simulation, first, configure the file type for the program that has already been opened. To do this, click on **Backplot Setup** to open the configuration dialog. In the Setup dialog, select the *Control Type* (for example 'ISO Milling') and configure the desired parameters.

25. View

These functions define how the current file is shown during the simulation.



Zoom In / *Mouse Wheel*

Click on this icon to enlarge the view by "zooming in" the entire plot for a detailed view.



Zoom Out / *Mouse Wheel*

Click on this icon to reduce the view by "zooming out".



Fit To Window / *Mouse Middle Button*

Click this icon to adjust the plot view to the size of the window.



Zoom Selection

Click this icon to zoom in on the selected area.



Zoom To Highlighted

Click on this icon to zoom to the highlighted element.



View Reset

Click this icon for the default perspective view (initial size and position).



View from Top (XY/G17)

Click this icon to view the simulation from the top.



View from Bottom (XY)

Click this icon to view the simulation from the bottom.



View from Front (XZ/G18)

Click this icon to view the simulation from the front.



View from Back (XZ)

Click on this icon to view the simulation from the back.



View from Left (YZ/G19)

Click on this icon to view the simulation from the left.



View from Right (YZ)

Click this icon to view the simulation from the right.



View from Tool

Click this icon to view the simulation from the tool.



Measure Distance

Click this icon to measure the distance between 2 points.

To measure the distance between two points of the generated toolpath, click this icon to get an arrow with a ruler. Move the mouse to the first point and press the left mouse button to select it. Point 1 becomes black. Drag the mouse pointer to point 2 (or point 3, 4, 5, etc.) while holding the left mouse button down to obtain the absolute distance (in space) and the distance in the XY plane (G17) and the ZX plane (G18) between the two points.



Rotate View

Select this item to rotate the view.



Zoom View

Select this item to zoom the view.



Pan View

Select this item to pan the view.



Show Bounding Box

Click on this icon to show the toolpath bounding box.



Set Origin Location

Select this item to set the origin location.

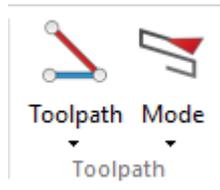


Show Plot Control

Select this item to show/hide the plot control.

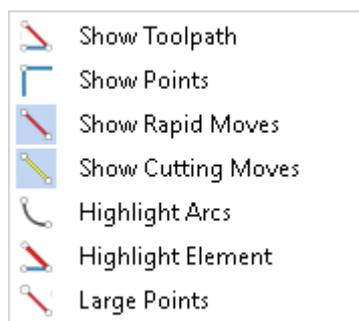
26. Toolpath

This is the representation of the current file relative to the toolpath in the simulation.



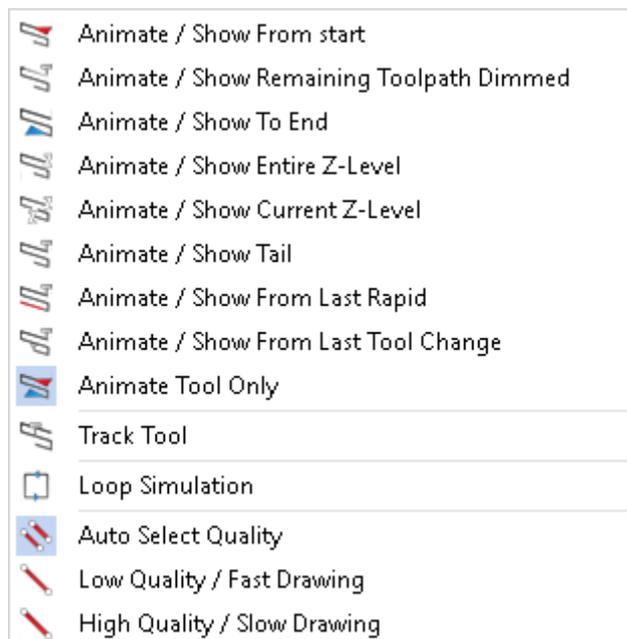
Toolpath

Show/hide the paths of the tool. Click the down arrow under this function to activate or deactivate toolpath options.



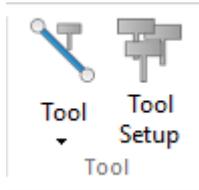
Mode

Show toolpath from start until current position. Click on the down arrow to open a drop-down menu, from which you can select options and additional functions for toolpath simulation.



27. Tool

The functions in this menu control the presentation of the tools in the simulation.



Show/Hide Tool

Select this item to show or hide the simulation tool.



Show Tool Holder

Select this item to show the toolholder.



Show Tool Transparent

Select this item to show the tool transparent.



Show Tool Colors

Select this item to show the tool colors.



Show Tool Vector

Select this item to show the tool vector.



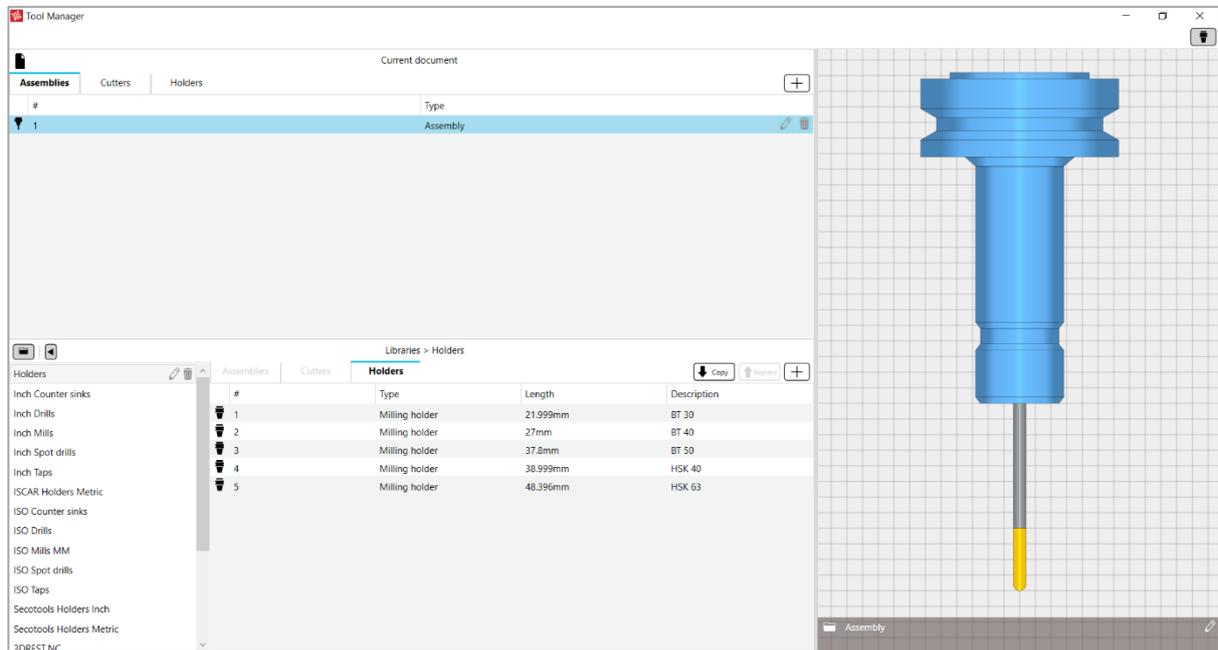
Tool Setup

Click this icon to configure tool types, colors, and tool library. Please refer to the **Tool Setup section** for further information on tool configuration.

27.1. Tool Setup

This section describes the Tool Manager from the Tool Setup tab pane. The Tool Manager is used for creating and editing new tools/holders and setting up tool libraries. To view the Tool Manager, open Machine Simulation, select the Backplot tab and click the Tool Setup icon.

Clicking the Tool Setup icon opens the following Tool Manager window,



The **upper section** of the Tool manager window refers to the **current document**.
The **lower section** of the Tool Manager refers to the **tool library**.



Copy

A tool can be copied from a library into the current tools list or vice versa.



Replace

A tool from a library can replace the currently selected tool of the current document but retain the tool number.



+

Add item to current document, create library or add item to holders.



Edit Tool/Rename Library

A tool from the current document can be edited. A library from the tool library can be renamed.



Delete Item/Delete Library

A tool from the current document can be deleted. A library from the tool library can be deleted.



Hide Libraries

The libraries contained in the tool library can be hidden which will enable a larger viewing area of the tools located within the selected library.



Hide Lower Libraries

The tool library can be hidden which will enable a larger viewing area of the current document.

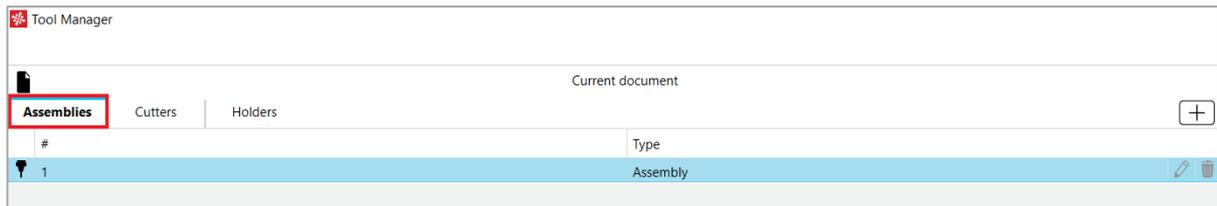


Hide Preview

The tool preview can be hidden which will enable a larger viewing area of the current document and tool library.

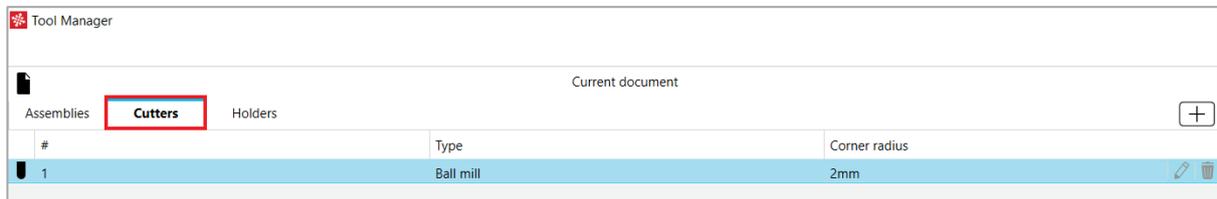
Assemblies – Current Document

A tool assembly from the current document can be selected and previewed in the tool preview section. A tool assembly can be edited, deleted, or copied to a tool library.



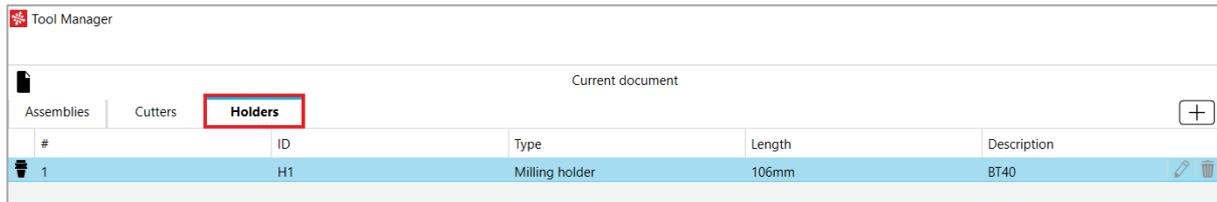
Cutters – Current Document

Cutters from the current document can be selected and previewed in the tool preview section. A cutter can be edited, deleted, or copied to a tool library.



Holders – Current Document

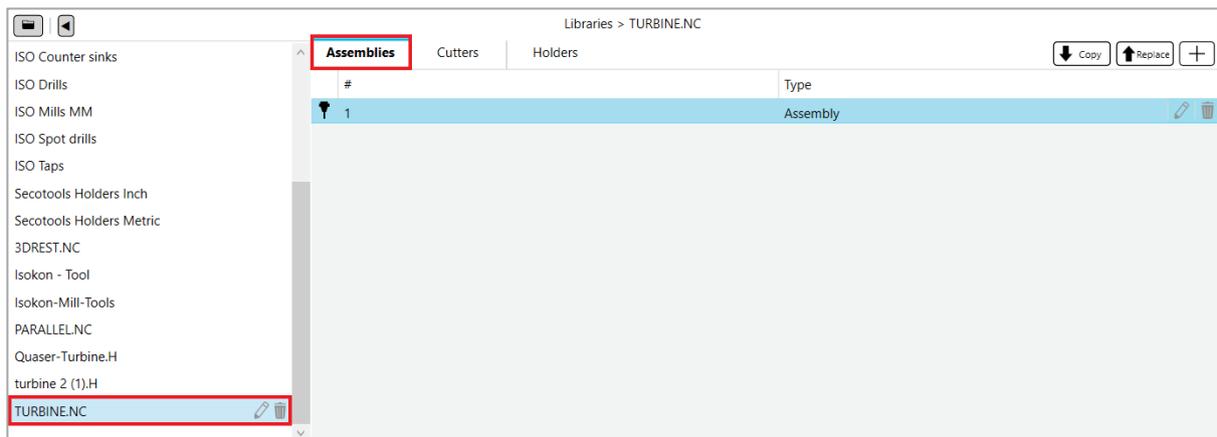
Holders from the current document can be selected and previewed in the tool preview section. A holder can be edited, deleted, or copied to a tool library.



#	ID	Type	Length	Description
1	H1	Milling holder	106mm	BT40

Assemblies – Tool Library

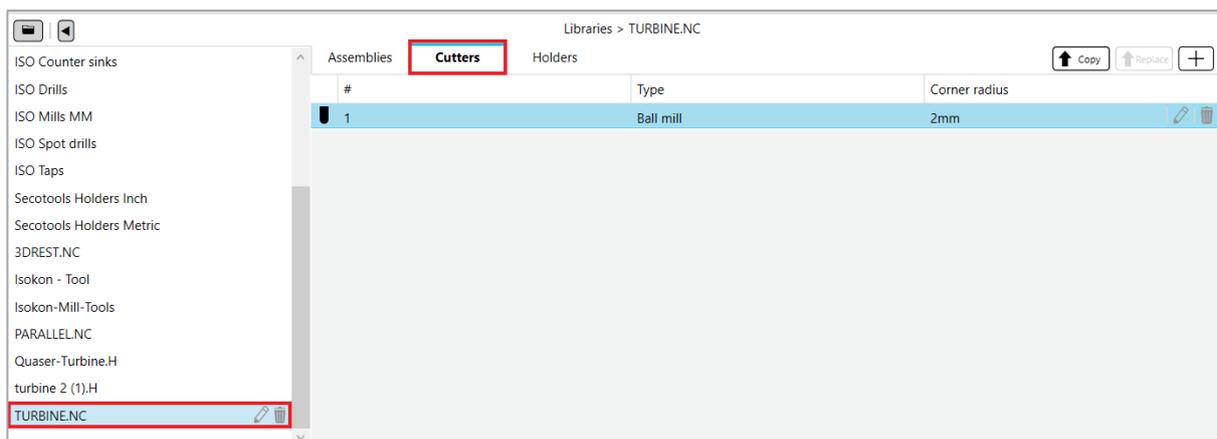
A tool assembly in the tool library can be selected and previewed in the tool preview section. Within a tool library, a tool assembly can be edited and deleted. Tool assemblies that are created in the tool library can be copied to current documents and can also replace tool assemblies within the current document.



#	Type
1	Assembly

Cutters – Tool Library

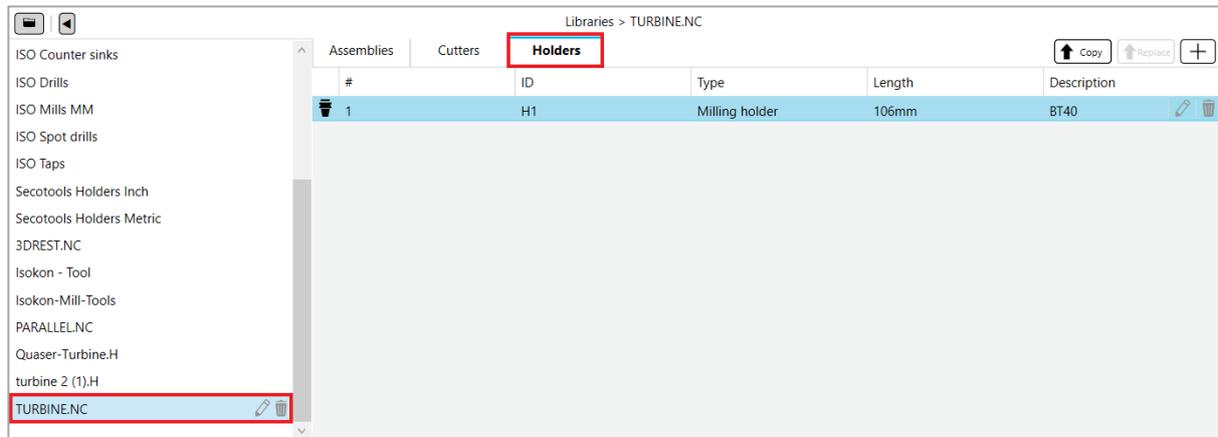
Cutters located in the tool library can be selected and previewed in the tool preview section. Cutters that are created in the tool library can be copied to current documents and can also replace currently used cutters within the current document. Cutters can be edited and deleted within a tool library.



#	Type	Corner radius
1	Ball mill	2mm

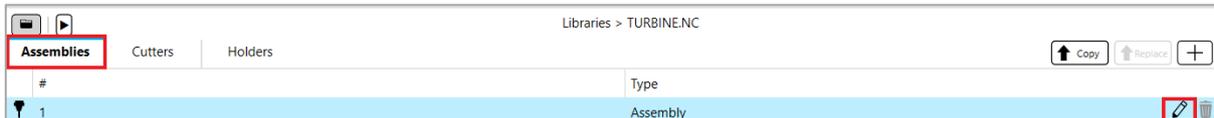
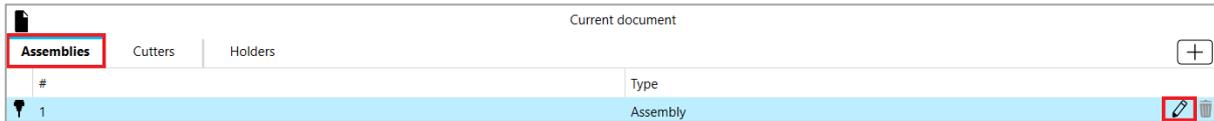
Holders – Tool Library

Holders located in the tool library can be selected and previewed in the tool preview section. Holders that are created in the tool library can be copied to current documents or replace currently used holders within the current document. Holders can be edited and deleted within a tool library.

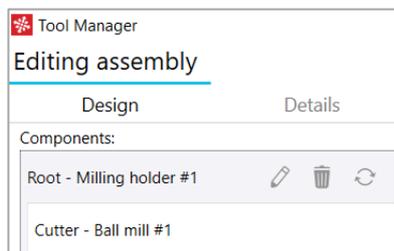


Editing Assemblies

Edit a tool assembly within a current document or tool library by selecting the tool assembly and clicking on the **'Edit'** icon. Alternatively, double click the tool assembly within the current document or tool library.

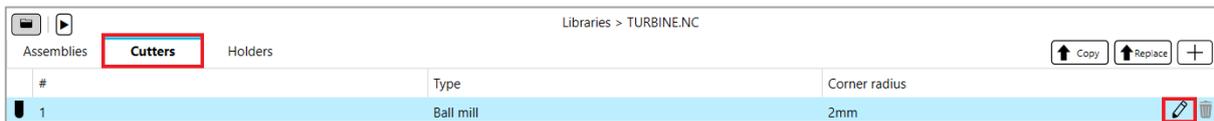
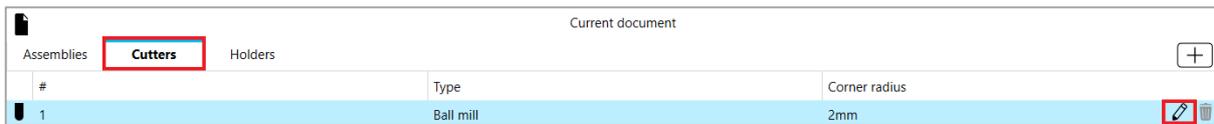


Click on the **'Edit'** icon to open the editing window. The tools design and details can be edited. The design consists of the **'Root'** and **'Cutter'**. Select the **'Edit'** icon beside the Root or Cutter to begin editing the tools components. Click the **'Delete'** icon to delete a tools holder or cutter, additionally, select the **'Replace'** icon to replace a tools component with an existing holder or cutter.

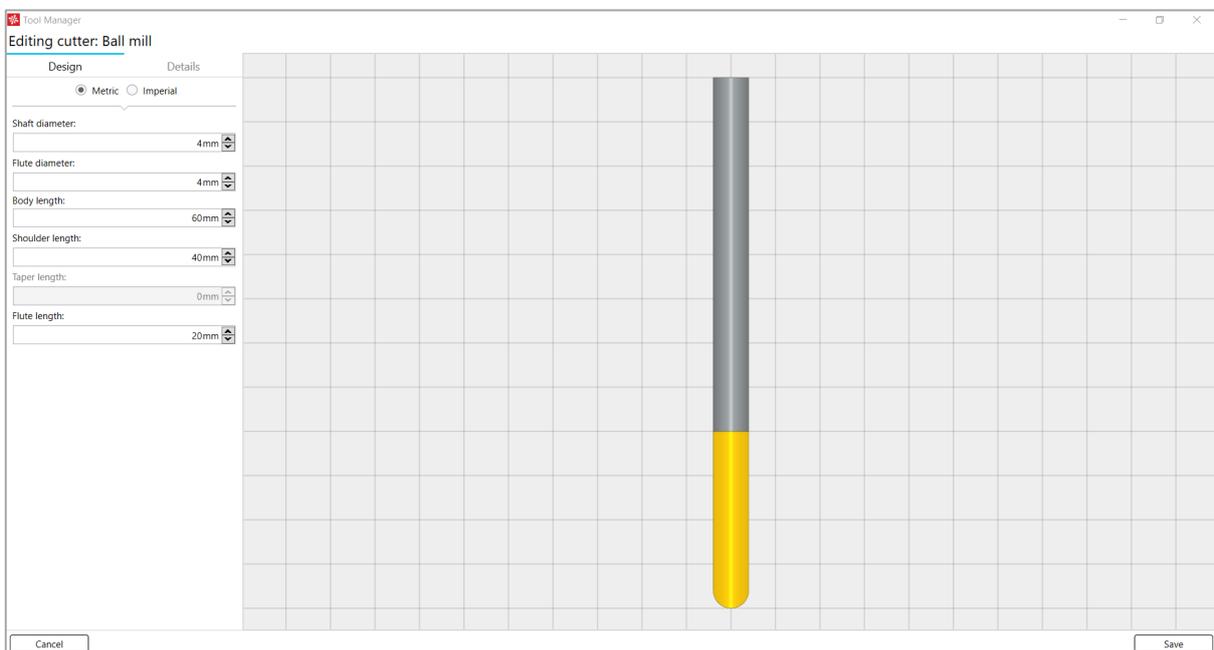


Editing Cutters

Edit a Cutter within a current document or tool library by selecting the cutter and clicking on the 'Edit' icon. Alternatively, double click the cutter within the current document or tool library.

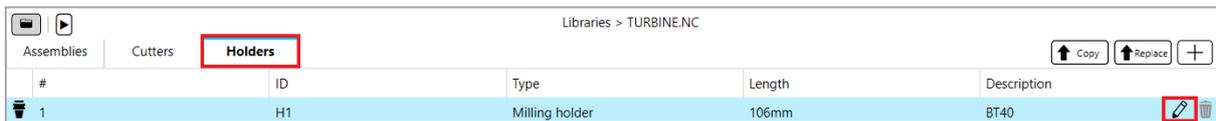
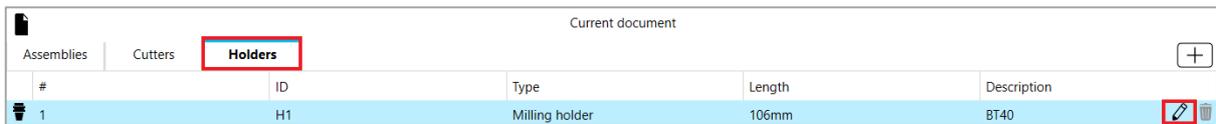


Click on the 'Edit' icon to open the editing window. The cutters design and details can be edited. The cutters design consists of the Shaft diameter, Flute diameter, Body length, Shoulder length, Taper length, and Flute length. Select 'Save' to save all changes to a cutter and 'Cancel' to discard any changes made to a cutter. A preview of the cutter is shown to the right of the editing section.

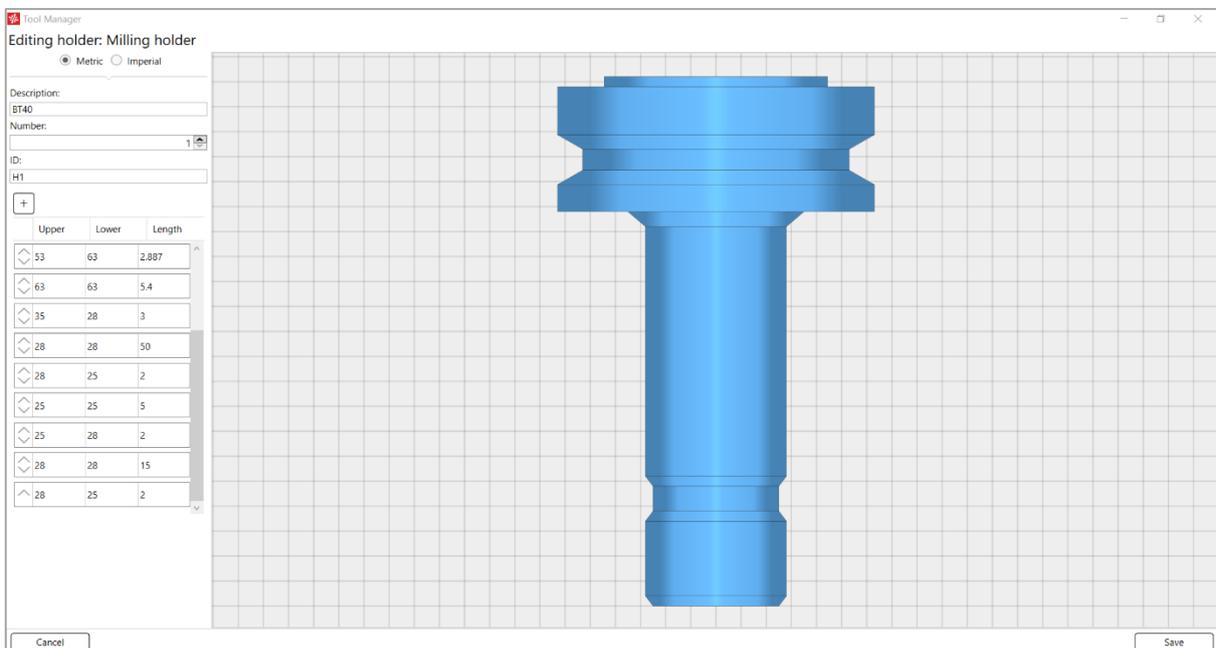


Editing Holders

Edit a Holder within a current document or tool library by selecting the holder and clicking on the 'Edit' icon. Alternatively, double click the holder within the current document or tool library.

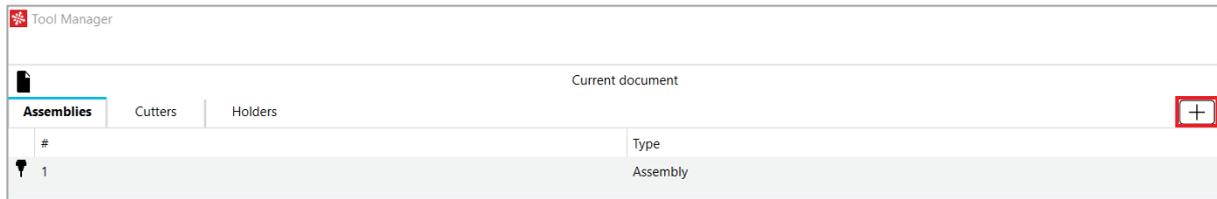


Click on the 'Edit' icon to open the editing window. The holders design and details can be edited. The holders design consists of its individual Upper, Lower and Length segments. Select 'Save' to save all changes to a holder and 'Cancel' to discard any changes made to a holder. A preview of the holder is shown to the right of the editing section.

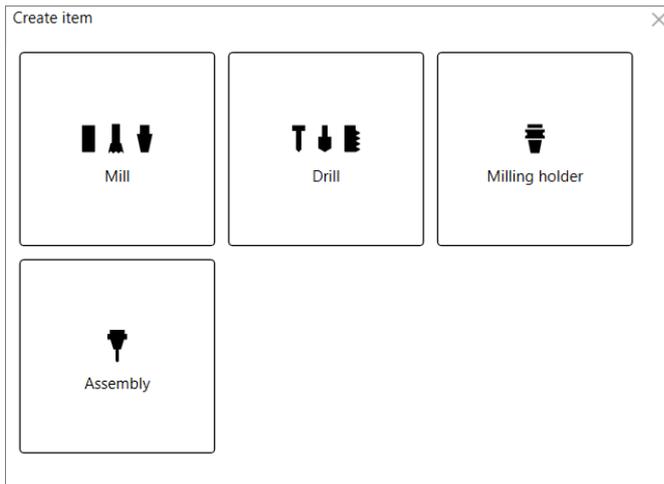


Creating a Tool

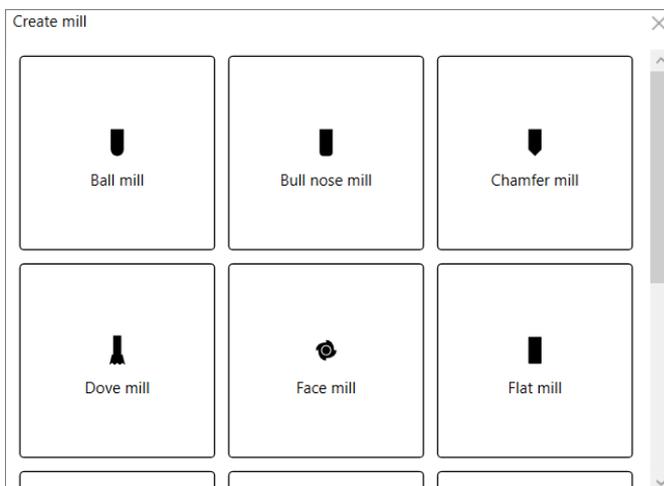
Create a tool by selecting the 'Add item to current document' icon.



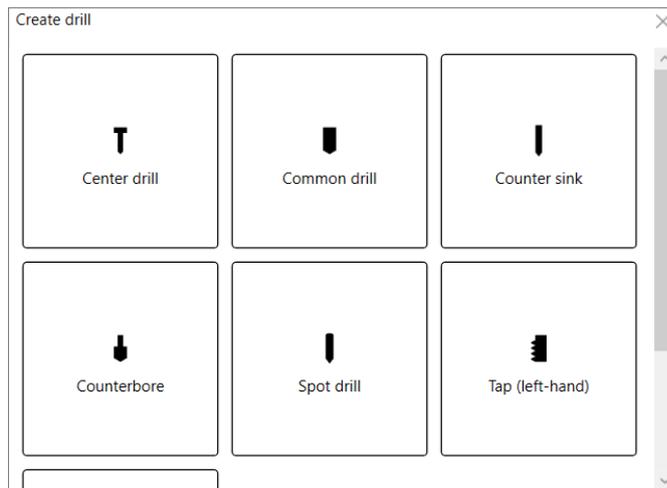
A window will open which will allow multiple options to be selected including 'Mill', 'Drill', 'Milling holder' and 'Assembly'.



Select 'Mill' and all milling cutter types will become available to choose from. Once an option has been chosen, the cutter editing window will appear.



Select **'Drill'** and all drilling cutter types will become available to choose from. Once an option has been chosen, the cutter editing window will appear.



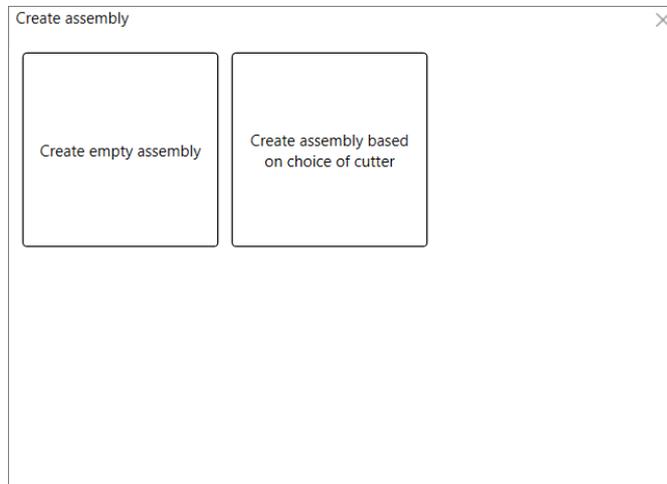
Select **'Milling holder'** and the holder editing window will appear. Select the 'Add' icon to add a segment of the holder. Determine the segment size by editing the values in the 'Upper', 'Lower' and 'length' sections.



Select **'Assembly'** and all assembly options will become available to choose from. Once an option has been chosen, the assembly editing window will appear.

Create empty assembly allows the cutter and holder to be created using the editing window. Specify tool parameters and holder segments.

Create assembly based on choice of cutter allows the cutter to be chosen from a library and then the holder can be created using the editing window.

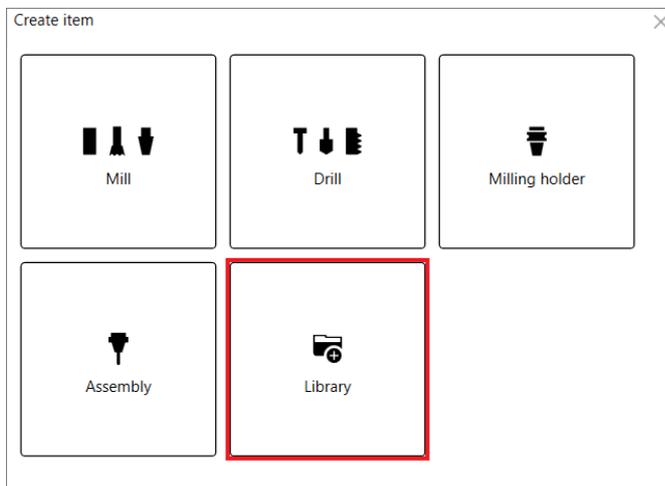


Creating a Library

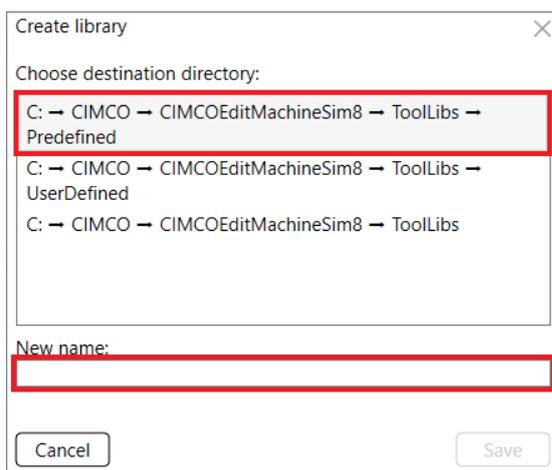
Create a library by selecting the 'Create library or add item to Holders' icon.



A window will open which will allow multiple options to be selected including 'Mill', 'Drill', 'Milling holder', 'Assembly' and 'Library'.

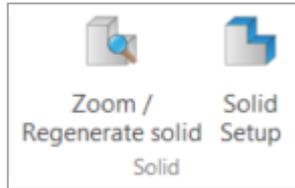


Select Library. A window will open allowing a library destination directory to be chosen. Alternatively, create a new library by specifying a 'New name'.



28. Solid

The functions in this menu control the presentation of a solid in the simulation.

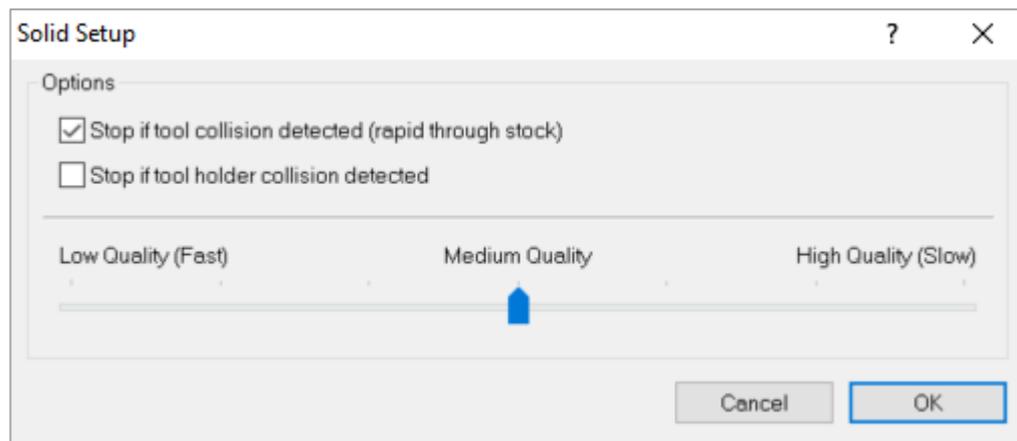


Zoom / Regenerate solid

Creates a solid from the current view. Click this icon to regenerate a solid model of the workpiece, based on the settings specified in the **Solid Setup**. You can select if the toolpath should be shown or hidden when a solid model is displayed. When this option is enabled, the program will be checked for collision during dynamic simulation. The collision check options are activated in the **Solid Setup** dialog and all collisions will highlight red and appear in the simulation report.

Solid Setup

Click on this icon to configure the options for the solid setup.



Options include specifying whether simulation will stop if a tool collision is detected or if a tool holder collision is detected. Click the check boxes beside either option depending on user preference. Choose the rendering quality of the solid model during the stock removal simulation. Select whether it will be of 'Low Quality (Fast)', 'Medium Quality' or 'High Quality (Slow)'. Low Quality is 2.0 and High Quality is 0.01.

29. Other

This function is concerned with simulation in full screen and DXF files export.



Full Screen

Shows the backplot in full screen.



Export as DXF File

Exports toolpath as a DXF file.

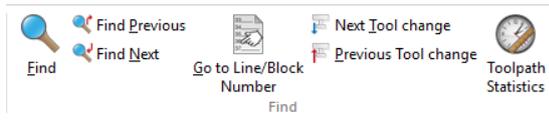


Backplot Setup

This option lets you configure the backplot settings.

30. Find

Find describes the search for data through the file.



Find / *Ctrl+F*

Finds the specified text string (or one of the defined tool operations) in the CNC-program.



Find Previous / *Shift+F3*

Finds the previous occurrence of the specified search string in the CNC program.



Find Next / *F3*

Finds the next occurrence of the specified search string in the CNC program.



Go to Line/Block Number / *Ctrl+J*

Locate line or block number in current window.



Next Tool Change

Goes to next tool change.



Previous Tool Change

Goes to previous tool change.



Toolpath Statistics

Find range of X,Y,Z, machining time, tool change time, toolpath length, etc.