

SIEMENS



Fir tree

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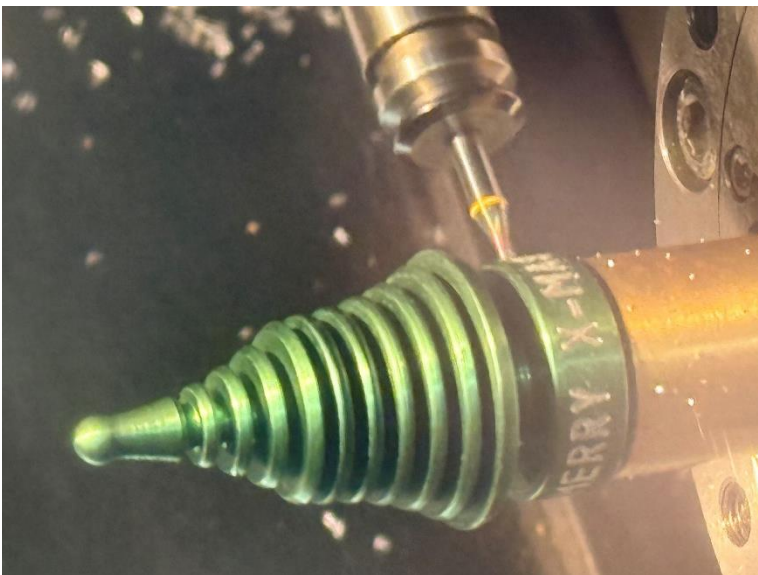
2024 Christmas workpiece "Fir tree"



The CNC4you 2024 Christmas workpiece is a milled contour of a conifer. The base of the tree has an M6 thread machined in it to attach the workpiece to a fixture during the optional engraving process.

All of the information required to machine the part is subsequently listed – such as tool data, machining plans and NC programs.

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1 For engraving, the workpiece is screwed onto a fixture clamped in the spindle. It has an M6 thread in the base for this purpose.

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1 Safety note

Handling machines involves dealing with a wide range of risks – making it crucial that the legal and usual operational safety regulations are carefully complied with when fabricating the 2024 Christmas workpiece.

2 Preliminary comment

The following description addresses technicians that are familiar with CNC machines, and who have experience or know-how about SINUMERIK CNC controls. All the technology data listed here correspond to the machines, tools, materials, machining plans and drawings used to craft this workpiece. When it comes to replicating the tree however, this only serves as an example because of the wide diversity of resources available in other workshops. Having said that, in most cases it should be possible to simply replicate this classy conifer.

The program for the milled part was generated and tested on a CNC turning machine with driven tools, Y axis and counterspindle. The machine was equipped with a SINUMERIK 828D with the ShopTurn user interface. SINUMERIK Operate V4.95 was installed on the machine.

The workpiece is milled using a counterspindle: One clamping operation for machining on the front side and one for the rear side.

Generally, the program can be simply adapted to other SINUMERIK versions, for example, to other SINUMERIK Operate software releases. A simulation run and any modifications required, for example zero points and the clamping depth in the counterspindle clamping jaws, should always be carried out.

All CAD drawings, programs and machining descriptions for the workpieces can be downloaded at no charge from www.siemens.de/cnc4you. You can find the following files and formats for this tree here:

- NC programs (ShopTurn) for the workpiece
- DXF files for the workpiece contour

3 Workpiece, blanks/bill of materials

- For the workpiece:
32 mm diameter round aluminum bar, approximately 100 mm long (unclamped length, approximately 86 mm)
- Optional for the engraving fixture:
- Suitable 24 mm diameter round bar, approximately 100 mm long (aluminum/brass/steel)

4 Machines and machining plans

CNC turning machine:

- Type: DOOSAN 2600SY
- CNC: SINUMERIK 828D with ShopTurn V 4.95

ShopTurn machining plans:

- Fabricating the tree:
 - TREE_V3_1CL_MSCS_OPT_D32.MPF
- Fabricating the clamping fixture for engraving:
 - TREE_CL_MS1_2.MPF
- Optionally engraving the tree
 - TREE_V3_CL_MS1_2_GRAVUR.MPF

Simulation with SinuTrain without a license

The NC programs for this workpiece use the counterspindle cycle, which is not included in SinuTrain DEMO machines. This means that the programs in this particular form can only be simulated with a licensed SinuTrain version.

For CNC training with license-free DEMO machines in SinuTrain or Run MyVirtual Machine, you can download program versions in the CNC4you online portal that do not use a counter spindle. More on this in the section "Program versions for CNC training with DEMO machines".

5 Tools

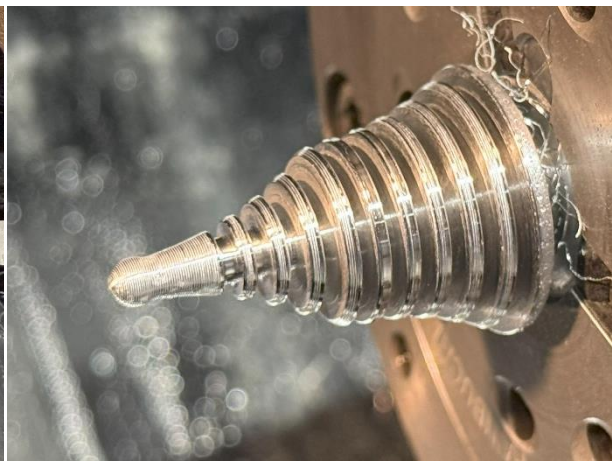
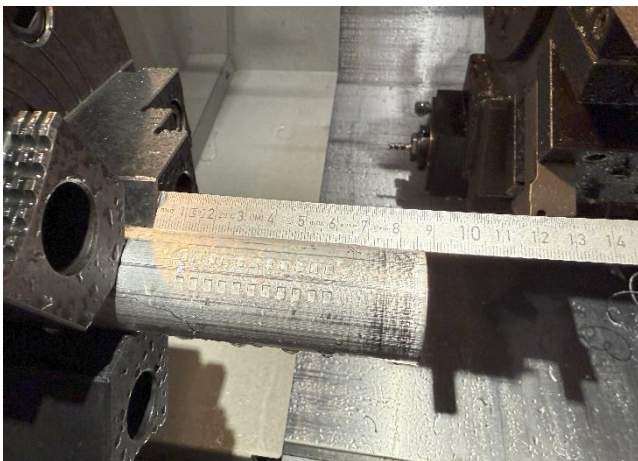
Tool/short name	Description
ROUGHING_T80 A	Roughing tool, main spindle
TAP_M6	M6 tap, main spindle
FINISHING_T35 A	Finishing tool, main spindle
ROUGHING_T80 I	Roughing tool, counterspindle
PLUNGE_CUTTER_3 A	3 mm plunge cutter, main spindle
PLUNGE_CUTTER_1.5 I	1.5 mm plunge cutter, counterspindle *)
FINISHING_T35 I	Finishing tool, counterspindle
ZENTRIERER_D12_HS_HSS	Centering mandrel/centering drill 90° tip, 12 mm, main spindle, is also used for chamfering
CUTTER_8_HS	8 mm end mill, main spindle
DRILL_5_HS	5 mm twist drill, main spindle
BALLMILL_D2	Ball mill, 2 mm diameter, driven tool (Y axis), possibly with extension/adapter
THREAD_P1.5_GS	Thread cutting plate, 1.5 pitch (for DIN M6 threads) *)

*) The tools marked in this way are required in variants for the main spindle if the alternative program versions for SinuTrain-DEMO machines are to be processed on real machines without a counter spindle.

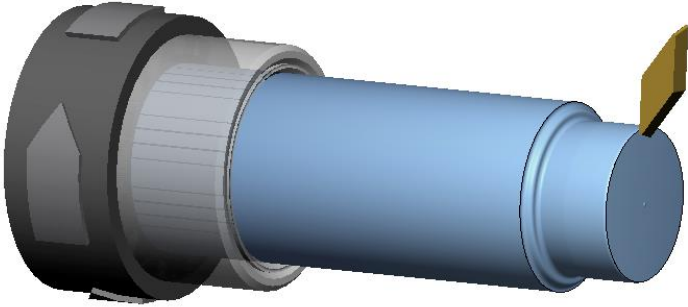
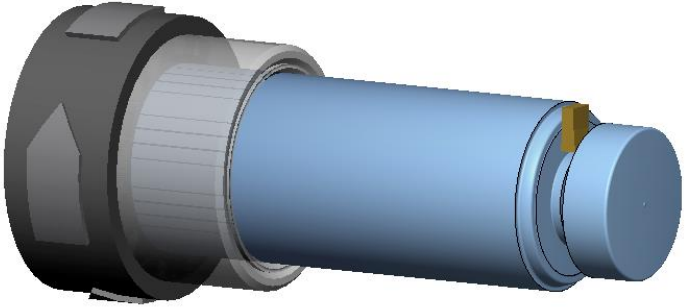
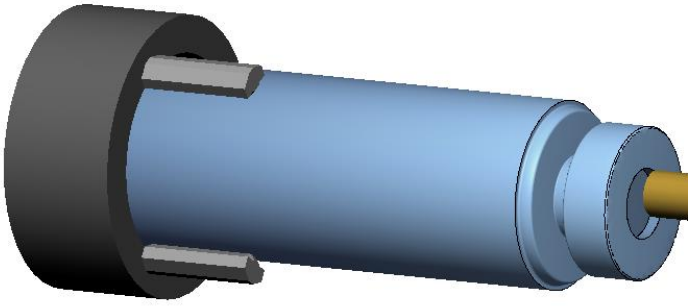
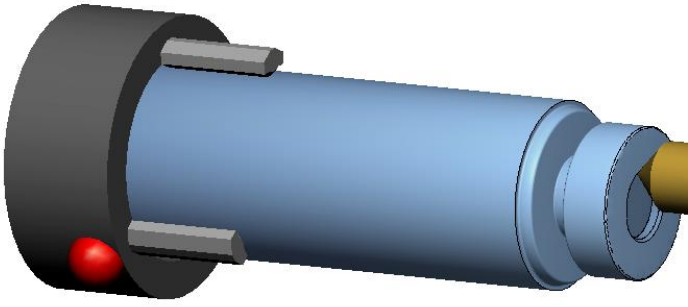
6 Fabricating the "fir tree" workpiece

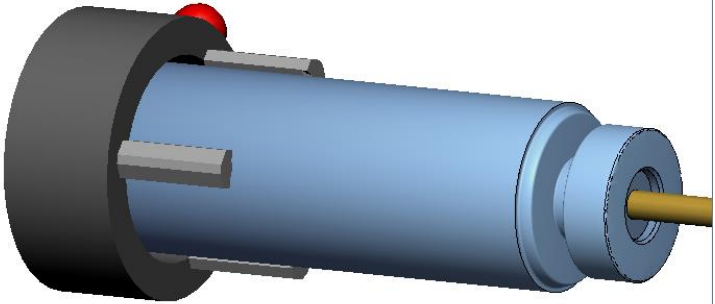
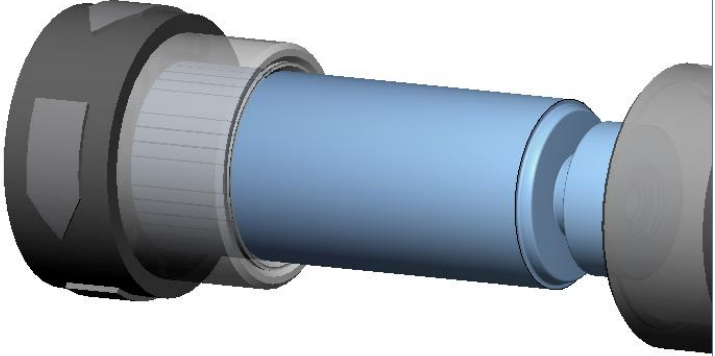
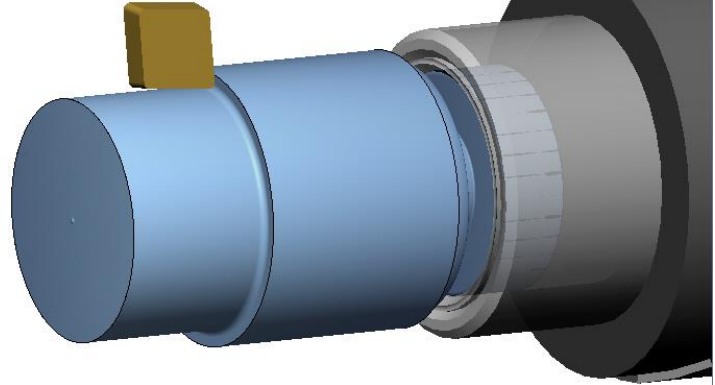
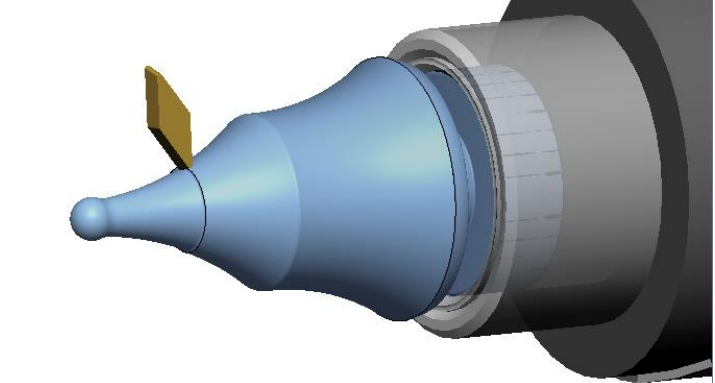
6.1 Machining steps at the turning machine

1. Approach the machine reference point.
2. Read-in the machining plan: TREE_V3_1CL_MSCS_OPT_D32.MPF
3. Read-in the tool list TREE_V3_TMZ.INI
4. Measure the tools, enter in the tool list.
5. Insert the tools in the magazine.
6. Clamp the workpiece (unclamped length, 86 mm)
7. Set the workpiece zero using a measuring probe or by probing using an appropriate device
8. Check the work offsets programmed in the part program and if required, the specific machine configuration.
9. Perform the simulation run: Check whether the clamping jaws of the counterspindle at the real machine have sufficient clearance when machining or whether there is a risk of collision!
10. Start machining, execute the machining plan.
11. Remove the workpiece.

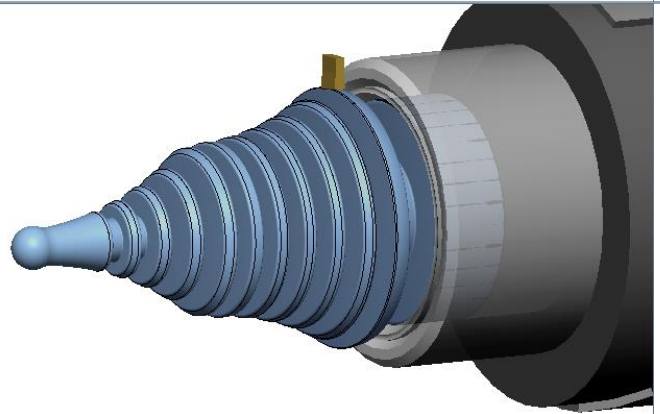
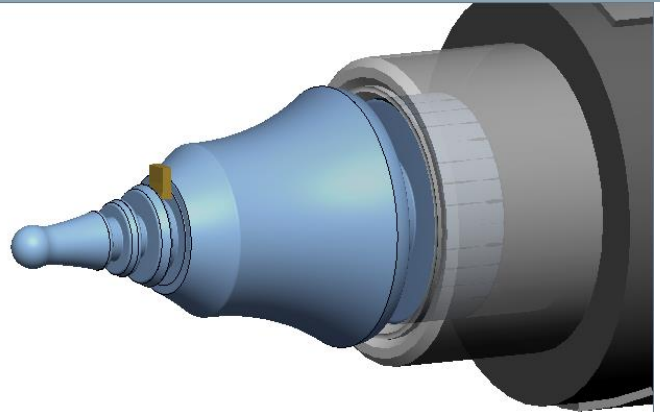


6.2 Executing the ShopTurn machining plan TREE_V3_MSCS_OPT_D32.MPF

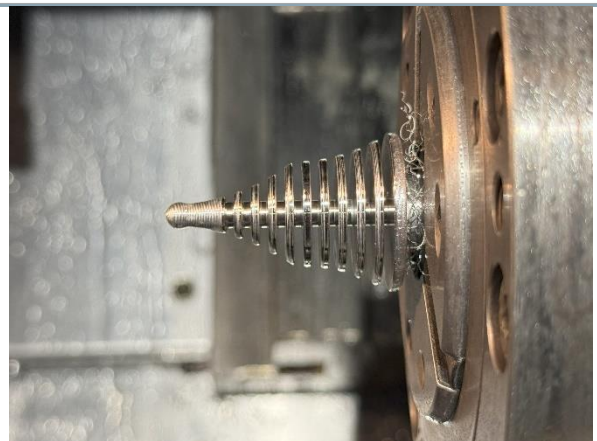
Machining step	Image
<p>After clamping the blank in the main spindle, machining starts by face turning the base of the tree. This part of the blank is turned to the target diameter (roughing and finishing).</p>	
<p>The contour of the tree base is machined using the plunge cutter</p>	
<p>The circular pocket in the tree base is prepared</p>	
<p>The circular pocket is chamfered using the centering tool</p>	

<p>Drilling, chamfering and thread cutting for the M6 thread as option to mount the workpiece</p>	
<p>The workpiece is loaded into the counterspindle and cut to the target length</p>	
<p>The contour is roughed on the counterspindle (longitudinal turning with several machining runs)</p>	
<p>The contour is finished on the counterspindle</p>	

Plunge turning of the "levels of branches"



Completed "Fir tree 2024" Christmas workpiece



7 Optional engraving of the workpiece

Coloring the workpiece

Engraving the workpiece is especially impactful if the workpiece has been colored before engraving, for example by anodizing or painting it.

Fixture into which the workpiece is screwed

To protect the workpiece surface, it is not clamped but screwed onto a cylindrical holder with M6 thread using the thread machined in the base of the tree. This cylindrical holder is fabricated before the engraving process.

Machining and engraving on the counterspindle

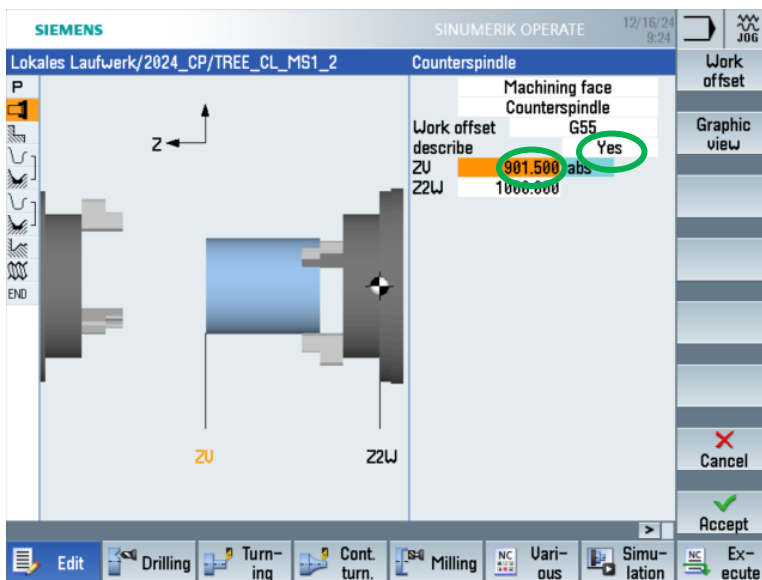
These NC programs are used to machine the clamping fixture and to engrave on the counterspindle. To do this, the workpieces are directly clamped in the counterspindle, which means they are not transferred from the main spindle to the counterspindle. As a result, some calculations that would otherwise be automatically performed by the SINUMERIK CNC are not available and must instead be carried out manually.

Calculating the work offset when clamping directly in the counterspindle

The following must be taken into consideration when calculating the work offset:

- The machining position of the counterspindle with reference to the main spindle
- The unclamped length
- When engraving, also the reference point of the engraving with respect to the lower edge of the tree base

The sum of these values must be entered in the counterspindle cycle as Z value (ZV) of the work offset and checked in the simulation run. The Z value can be entered if parameter "describe" is set to "Yes".

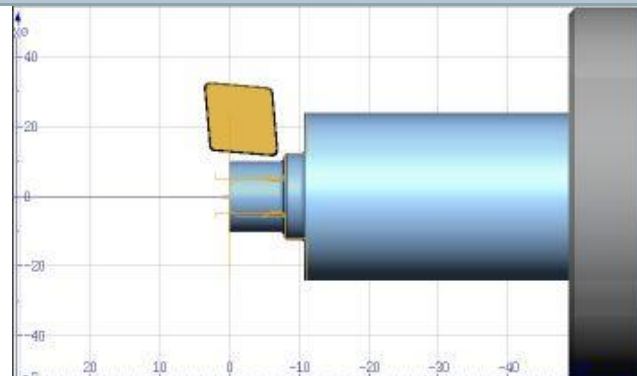
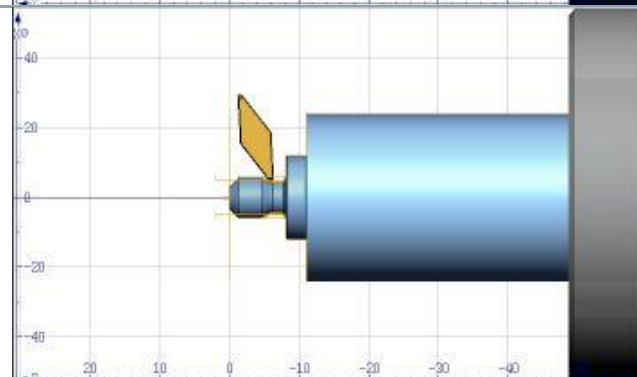


Note:

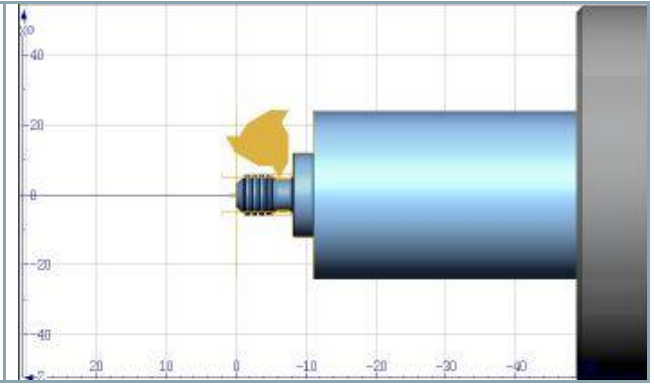
You can find more information on this topic in the SINUMERIK User Manual "Turning" in Section "Machining with movable counterspindle".

7.1 Machining steps at the turning machine – machining the clamping fixture

1. Approach the machine reference point.
2. Read-in the machining plan: TREE_CL_MS1_2.MPF
3. If you have not already done so: Read-in the tool list TREE_V3_TMZ.INI
4. If you have not already done so: Measure the tools, enter in the tool list.
5. If you have not already done so: Insert the tools in the magazine.
6. Clamp the workpiece directly in the counterspindle (unclamped length, 51 mm)
7. Set the workpiece zero using a measuring probe or by probing using an appropriate device
8. Check the work offsets programmed in the part program and if required adapt to the machine configuration (also see Section "Calculating the work offset when clamping directly in the counterspindle").
9. Perform the simulation run: Check whether the clamping jaws of the counterspindle at the real machine have sufficient clearance when machining or whether there is a risk of collision!
10. Start machining, execute the machining plan.
11. Check the workpiece

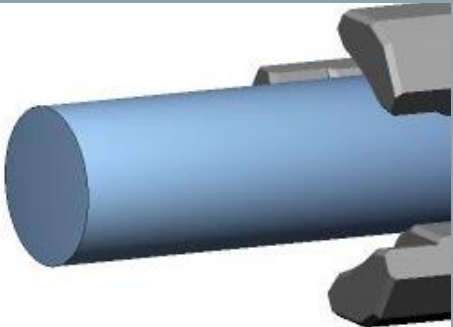
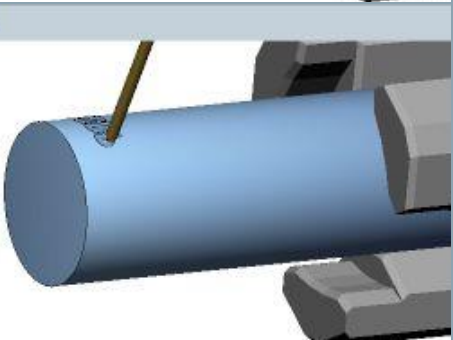
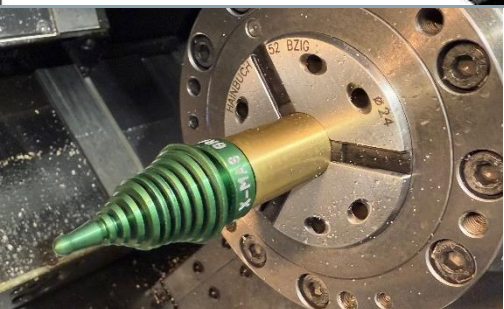
Machining step	Image
After clamping the blank in the counterspindle, machining starts by face turning and roughing the spigot.	
Finish the spigot and prepare the undercut for the thread	

Turn the thread



7.2 Machining steps at the turning machine – engraving

1. Approach the machine reference point.
2. Read-in the machining plan: TREE_V3_CL_MS1_2_GRAVUR.MPF
3. If you have not already done so: Read-in the tool list TREE_V3_TMZ.INI
4. If you have not already done so: Measure the tools, enter in the tool list.
5. If you have not already done so: Insert the tools in the magazine.
6. Clamp the clamping fixture in the counterspindle (unclamped length 50 mm), lightly oil the thread, screw the workpiece onto the clamping fixture
7. Set the workpiece zero using a measuring probe or by probing using an appropriate device
8. Check the work offsets programmed in the part program and if required, adapt to the machine configuration (also see Section "Calculating the work offset when clamping directly in the counterspindle").
9. When required, change the suggested text in the engraving cycle.
10. Perform the simulation run: Check whether the clamping jaws of the counterspindle at the real machine have sufficient clearance when machining or whether there is a risk of collision!
11. Start machining, execute the machining plan.
12. Remove the workpiece.

Machining step	Image
<p>In the simulation, the workpiece screwed to the clamping is shown simply as a cylinder.</p>	
<p>Engraving the text</p>	
<p>Finished workpiece, still screwed to the brass clamping fixture clamped in the counterspindle.</p>	

8 Program versions for CNC training with DEMO machines

In the Download section of the workpiece website, you will also find a zip file with NC program versions for training with unlicensed SinuTrain or Run My Virtual Machine installations. These program versions do not use a counter spindle. All work steps are simulated on the main spindle.

These program versions are intended exclusively for CNC training on the PC and are not tested on real machines. If you still want to produce the workpiece with these program versions on real lathes without a counter spindle, the following changes will result compared to the previous chapters of this production description:

- Some of the tools mentioned in the tool list in section 5 are required in versions for the main spindle. This concerns the thread-cutting steel for external threads and the 1.5 mm plunge cutter (see note under the table in section 5).
- The workpiece must be reclamped in the main spindle between the production of the tree base and the contour of the tree crown. In order to protect the surface of the already finished base part, soft clamping jaws should be used in the second clamping operation.
- The zero point offsets of the NC program intended for SinuTrain training must be adapted particularly carefully to the real clamping situation. This applies in particular to the third clamping of the workpiece for engraving, in which the workpiece is screwed onto the clamping device.
- The position and alignment of the engraved text should be checked on a test part before the final workpiece is engraved.

9 Information in the Internet

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Design of the parts, creation of the drawings, development of the machining plans

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