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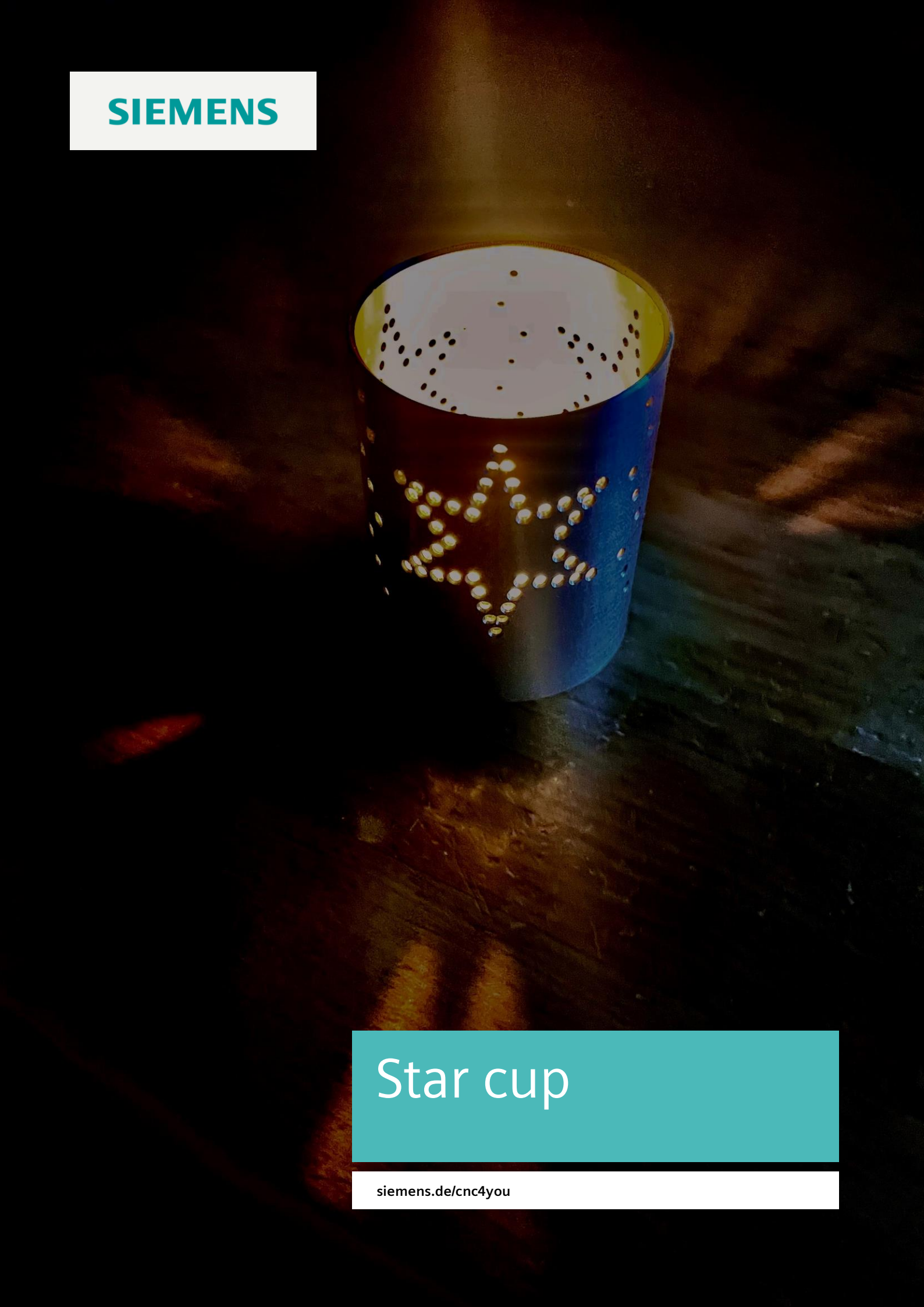

Star cup

siemens.de/cnc4you

Tealight candle holder “Star cup 2022”

The CNC4you Christmas workpiece for 2022 is again a tealight candle holder – but this time, it is a thin-walled, turned part with high didactic value: The peripheral surface transformation and drilling pattern imported from a DXF file can be easily understood in the part programs. But the icing on the "Christmas" cake is that our “Star cup 2022” is attractive and exudes precisely the right light to get you into a festive spirit.

The star cup can either be anodized or polished.

Starlight – just off the machine ...

... and anodized

All the information required for the machining is subsequently listed – such as tool data, machining plans and NC programs.

www.siemens.de/cnc4you

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1 Safety note

Handling machines involves dealing with a wide range of risks. This means that it is crucial that the legal and the usual operational safety regulations are carefully complied with when fabricating the Christmas workpiece 2022.

The star cup may only be used on a fireproof base must not be placed under flammable, heat-sensitive or combustible objects. The necessary caution must be observed when dealing with open fires and heat sources in general.

2 Preliminary comment

The following description addresses technicians who are familiar with CNC machines, and who have experience or knowledge about SINUMERIK CNC control systems. All of the technology data listed here correspond to the machines, tools, materials,
machining plans and drawings used to craft this workpiece. However, when it comes to replication, 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 festive workpiece.

The program for the turned part was generated and tested on a CNC turning machine with C / Y axes and counterspindle. The machine was equipped with a SINUMERIK 828D with the ShopTurn user interface. SINUMERIK Operate V4.95 was installed on the machine. A Y axis is not required for turning.

Generally, the program can be simply adapted to other SINUMERIK versions, for example, to other SINUMERIK Operate software releases. A simulation and necessary changes, for example the zero points and the clamping depth in the counterspindle clamping jaws, should always be performed.

All CAD drawings, programs and machining descriptions for the workpieces can be downloaded at no charge from **www.siemens.de/cnc4you**

Here you can find the following files and formats for this workpiece:

- NC programs (ShopTurn)
- DXF file with the drilling pattern for the star (G19 plane of the peripheral surface transformation)

2.1 Reprogramming the workpiece

Transferring the drilling pattern from the DXF file

The DXF file included with the part programs can be used if the “Star cup 2022” tealight candle holder is to be reprogrammed for didactic purposes. It includes the drilling pattern for the star motif, which can be directly used with the peripheral surface plane G19.

The drilling pattern is transferred via DXF import for drilling/centering commands; the star contour is machined with sets of up to 8 drilling positions using a "positions" command. "Peripheral surface C, outer" with a cylinder diameter of 43 mm is used as machining plane.

3 Workpiece, blanks/bill of materials

- Round aluminum bar Ø 50 mm

  Approximately 60 mm of material is required to fabricate the Star cup The sample workpiece was machined with an unclamped length of 101 mm. When estimating the material, the area required to clamp the workpiece must also be taken into consideration.

4 Machines and machining plans

CNC turning machine:

- Type: DOOSAN 2600SY
- CNC: SINUMERIK 828D with ShopTurn V 4.95
- ShopTurn machining plan: STAR_CUP_2022.MPF

5 Tools used

Notice: When inserting tools in the tool revolver, ensure that a) there is adequate clearance for the driven tools and b) there is sufficient clearance between adjacent tools and the clamping jaws of the spindle and counterspindle!

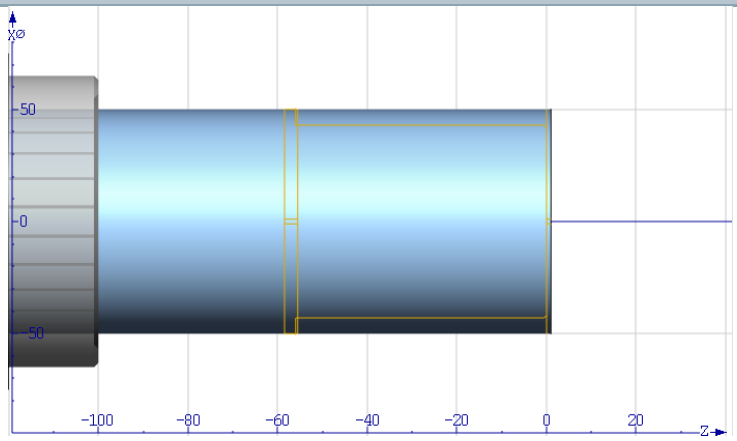
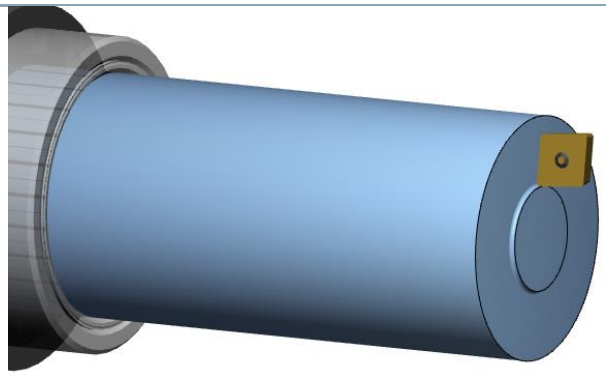
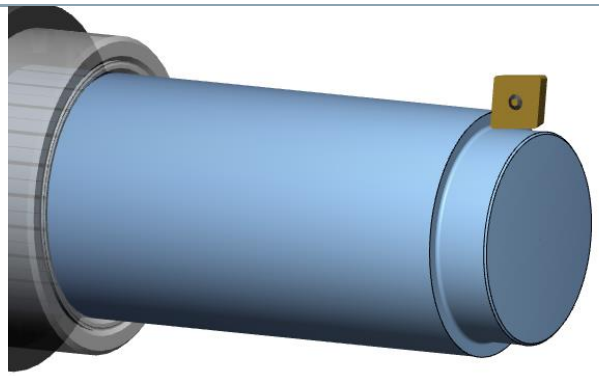
Tool/short name	Description
SCHRUPP_HS	Outer roughing turning tool with a roughing plate, roughing tool, main spindle
SCHL35_HS	Outer turning tool with a finishing plate, finishing tool, main spindle
BOHRER_D10_HS	10 mm drill bit, main spindle, driven tool, machining on the face side
FRAESER_D12_HS	12 mm milling tool, driven tool, main spindle (here, for inside machining from the face side)
ZENTRIERER_D12_HS	Centering tool, 12 mm diameter, 90 degree cutting edge angle, driven tool, main spindle, peripheral surface machining
ENDMILL_D10_5SN	End mill, 10 mm diameter, main spindle, machining on the face side
ZENTRIER_D8	Centering tool, 8 mm diameter, 90 degree cutting edge angle, driven tool, main spindle, peripheral surface machining
DRILL_D1.5	Drill bit, 1.5 mm, driven tool, main spindle, peripheral surface machining
STECHER_3MM_HS	3 mm parting tool, main spindle
SCHRUPP_GS	Outer turning tool with a roughing plate, counterspindle
SCHLICHT_GS	Outer turning tool with a finishing plate, counterspindle
ZENTRIERER_D12_GS	Centering tool, 12 mm diameter, 90 degree cutting edge angle, counterspindle, machining on the face side

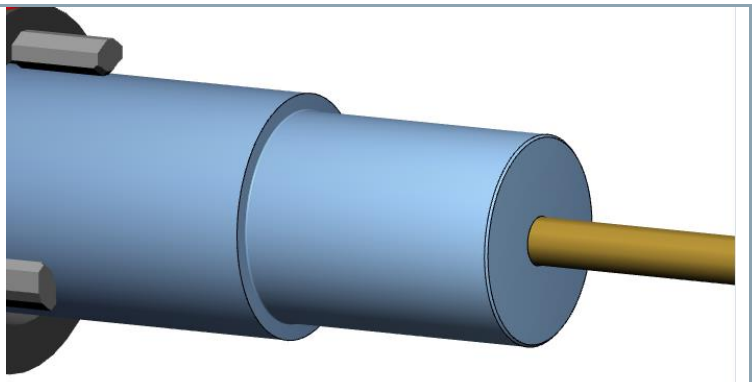
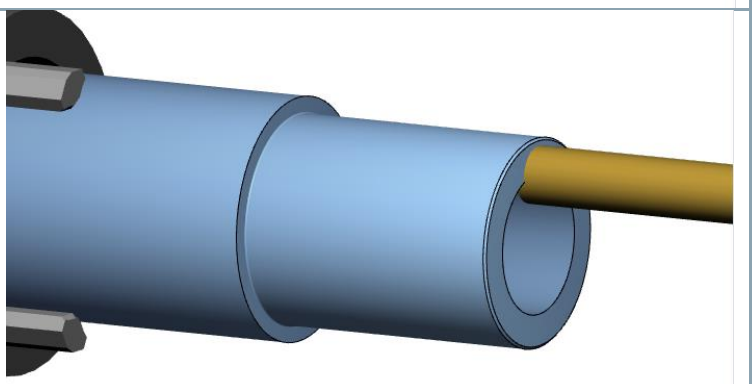
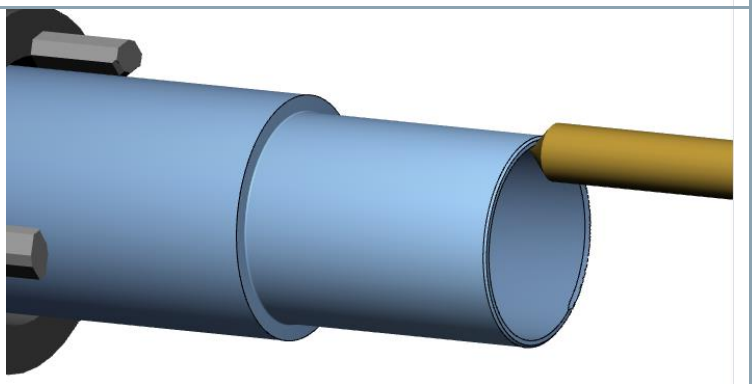
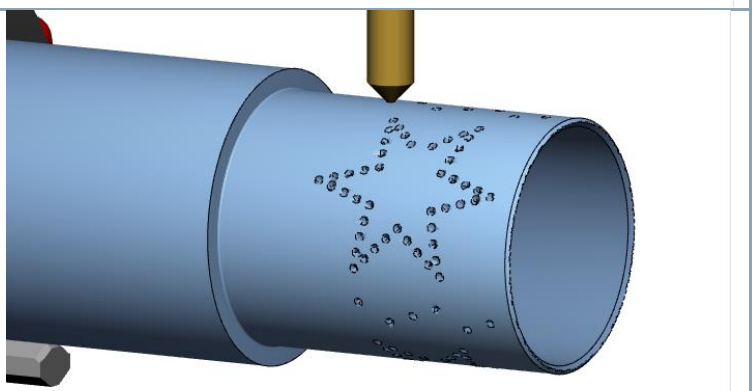
6 Machining the “Star cup”

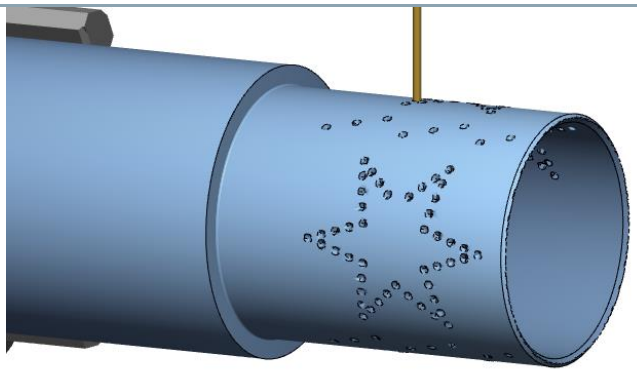
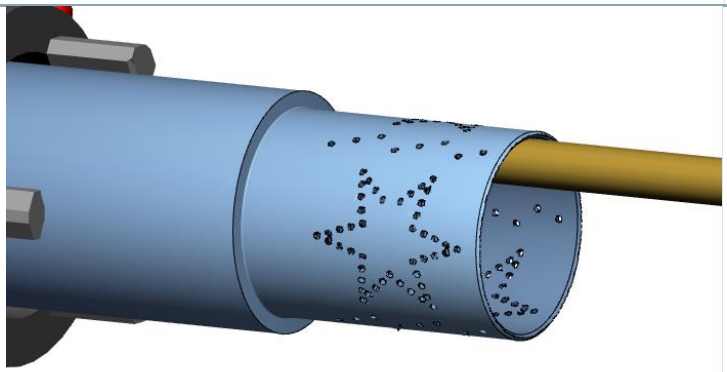
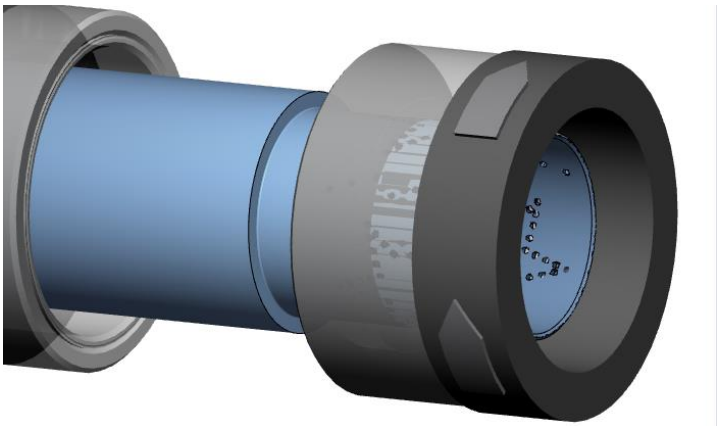
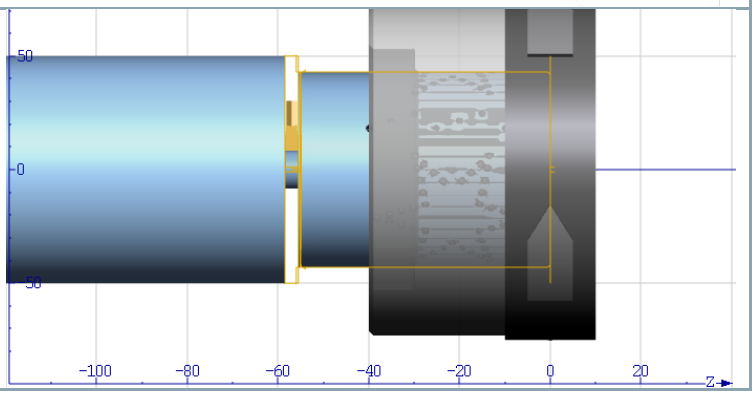
6.1 Machining steps at the turning machine

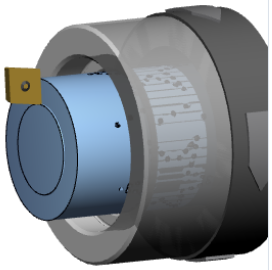
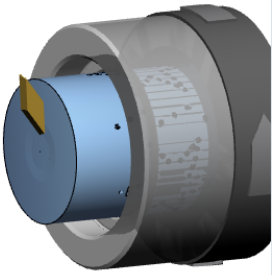
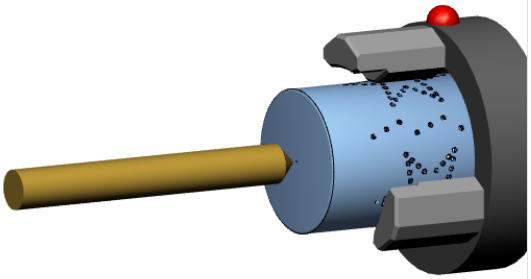
1. Approach the machine reference point.
2. Read-in the machining plan: STAR_CUP_2022.MPF.
3. Read-in the tool list STAR_CUP_2022_TMZ.INI
4. Measure the tools, enter in the tool list.
5. Insert the tools in the magazine.
6. Clamp the workpiece, observe the unclamped length of 101 mm or appropriately adapt in the part program.
7. **Notice:** Set the clamping jaws of the counterspindle to the minimum, just enough tensioning force so that when machining with the counterspindle the very thin-walled workpiece (approximately 1 mm wall thickness) is not deformed or crushed. We strongly recommend the use of collets in the counter-spindle.
8. Set the workpiece zero by scratching.
9. Check the work offsets programmed in the part program and if necessary appropriately adapt to the machine configuration – the same is true for the clamping depth in the counterspindle.
10. Perform the simulation.
11. Start fabrication, work through the machining plan.
12. Remove the workpiece

7 Executing the ShopTurn machining plan STAR_CUP_2022.MPF

Machining step	Image
Clamping the workpiece, observe the unclamped length of 101 mm	
Turning the face surfaces (roughing)	
Roughing and finishing the cylinder to the target diameter	

Preparing to mill the tealight candle holder: Deep hole drilling on the face side (pilot hole for subsequent machining with the driven tool)	
Mill the circular pocket on the face side down to the specified wall thickness of the cup shape	
Debur and chamfer the edge of the holder	
Set the centering holes for the hole pattern on the peripheral surface. The drilling pattern of the star taken from the DXF file is predrilled three times. The "manually" programmed zigzag lines between the stars are then also predrilled.	

Drill out the holes in the wall of the Star cup prepared with the centering tool, starting with the star pattern specified by the drilling pattern, followed by the intermediate, manually programmed zigzag lines	
Debur the holes from the inside and again mill the circular pocket	
As a result of the thin wall thickness, use a minimum counterspindle clamping force!	
.. and then cut off the part	

Carefully rough/face turn the base of the holder	
Finish and contour the base so that the holder is stable	
Remove any residual material at the center of the base using the centering tool	
Completed “Star cup” tealight candle holder	

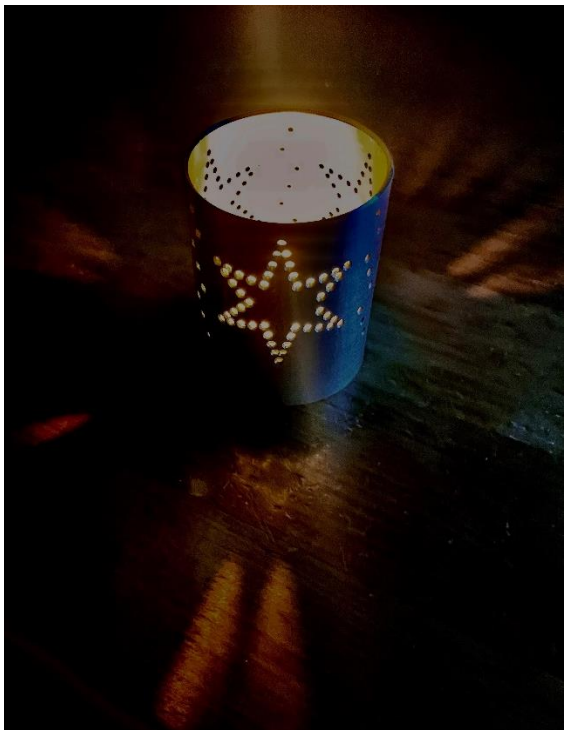
8 Finishing and enjoying

After machining, the “Star cup 2022” tealight candle holder can be polished and/or anodized.

Tealights that are in transparent plastic containers are the most suitable as the light through the lower parts of the star pattern can also be seen. Tealights in aluminum containers will cut off some of the star motif.

Safety note:

The “Star cup 2022” tealight candle holder has been designed so that even after a longer period of use it does not become too hot. In spite of this, just like any other tealight candle holder, it should only be used on a fireproof surface. Further, the necessary precautions should be taken whenever handling open fire and sources of heat.



“Star cup 2022” with a tealight candle in the recommended transparent plastic container.

9 Information in the Internet

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

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