

Spicy turned parts - salt and pepper



Salt and Pepper Shakers

A completely different twist on hexagonal bolt and slotted screw – with spicy and salty contents. Boring salt and pepper shakers on the table are a thing of the past. You can give every meal the optimum appeal with the CNC condiment screws that you have machined yourself.

These turned parts were programmed in SINUMERIK Operate with ShopTurn and G code, and machined from a bar of material using a CNC lathe. The contour editor and the turning, drilling and milling cycles of SINUMERIK Operate were used for programming.

This document describes the machining operations along with the tools necessary.

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1. Safety Note

Working with machines is always associated with numerous hazards. It is therefore imperative that the legal and company safety regulations are also observed during the production of the Salt and Pepper Shakers.

2. Preliminary remark

The following description is intended for persons acquainted with CNC machines and who have experience with or knowledge of SINUMERIK CNCs. All the technical data listed here corresponds to the machines, tools, materials, machining plans and drawings used to produce the prototype. Because of the widely varying conditions in other workshops, this data is only of exemplary character for a reproduction. Nevertheless, a problem-free reproduction should be possible in most cases.

The program has been programmed and tested on SINUMERIK Operate V4.5 SP2 with ShopTurn. Normally, the program can be easily adapted to other SINUMERIK user interfaces, such as SINUMERIK Operate other software version. A simulation should be performed in any case.

You can download all the CAD drawings, programs and machining descriptions for the workpieces free of at www.siemens.com/cnc4you.

The following files and formats are available there:

NC-programs ShopMill/ShopTurn, Drawings PDF, 3D-data



3. Workpiece blanks

- Material V2A, material-no.: 1.4301
Round stock Ø50 mm. length (min) 300 mm

4. Turning machine and machining plan

- CNC-Turning machine DOOSAN PUMA 2600SY
SINUMERIK 828D with SINUMERIK Operate V4.5
- Turning Salt and Pepper Shakers ShopTurn machining plan and tools
SHAKERS_COUNTER.MPF
SHAKERS_COUNTER_TMZ.INI



5. Used Tools

Tools turning machine

Tool name in the machining plan	Designation
SCHRUPP	Turning tool for the exterior with roughing insert
SCHLICHT	Turning tool for the exterior with finishing insert
FRAESER_D12	End mill cutter Ø 12 mm
BOH_20	Solid boring tool with inserts, Ø20 mm
GEW_IN_P1	Tool holder outside with threaded plate, pitch P1
BOHRER_1_5	Spiral drill Ø 1,5 mm
GEW_P1	Tool holder outside with threaded plate, pitch P1
GEW_P2	Tool holder outside with threaded plate, pitch P2
FRAESER_4	End mill cutter Ø 4 mm, finishing
FASFR_6	Chamfer Ø 6mm 90°
WRITESTAR	Marking tool Ø 4mm, engraving
CUTTER	Grooving tool with 4mm tip width

Designation, SAP-number tools from Walter Tools

Description	Designation Walter Tools	SAP-Nr.
Roughing outside	PCLNR2525M12	5634280
	CNMG120408-NRS WSM20	5603988
Finishing outside	PVJBR2525M16	5008738
	VBMT160408-PS5 WSM20	5619946
End mill Ø 12	H4034217-12	5905789
Solid boring tool with inserts	B4213.F25.20.Z1.060R-2	5518622
	P4840C-2R-E67 WXP40	6154405
	P4840P-2R-E67 WSP45	5832029
Thread inside M24x1	S16M-NTS-IR16-20	5011601
	NTS-IR-16 1.00ISO WXM20	5012802



Thread outside	NTS-SER2525-16	5011567
M24x1	NTS-ER-16 1.00ISO WXM20	5012694
M30x2	NTS-ER-16 2.00ISO WXM20	5012718
End mill Ø 4	H4034217-4	5905784
Chamfer Ø 6	H3058318-6	5082347
Drill Ø 1,5	A1164TIN-1.5	5057629
	A1149XPL-1.5	5236358
Cutter	G2012.2525R-3T33SX-P	6406614
	SX-3E300N02-SF5 WSM43S	6422500
	SX-3E300N02-CE4 WSM43S	6427093
	FS1494	6472308

NOTICE

All of the turning tools are "overhead tools". Overhead tools are used because when machining the upper side of the cap, the cap is screwed onto the housing, and this should not be released/screwed-on when machining (right-hand thread). A counter-clockwise direction is used and machining is realized behind the turning center.

A tool file for the tools used at the lathe is included when downloading. You only have to open and import STREUER_ZAEHLER_TMZ.INI e.g. in SinuTrain for SINUMERIK Operate.



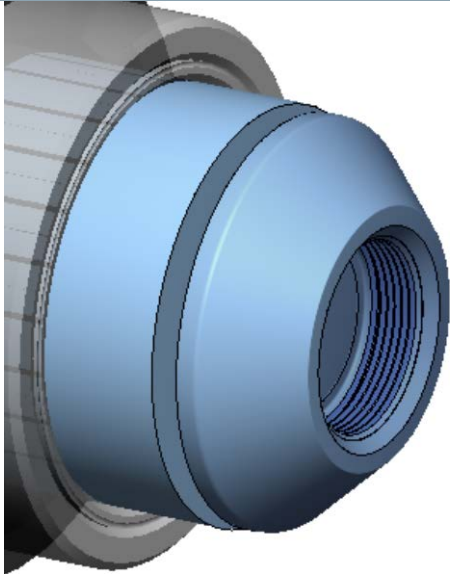
6. Turning the parts

All of the individual parts and components are turned in one clamping operation directly from the bar of material and with one NC program. After each turned part, program execution is stopped, and only continued after an NC start. The workpiece is manually repositioned and clamped during this time. A counter runs while the program is being executed. This means that if the program is interrupted, machining can resume at the last step.

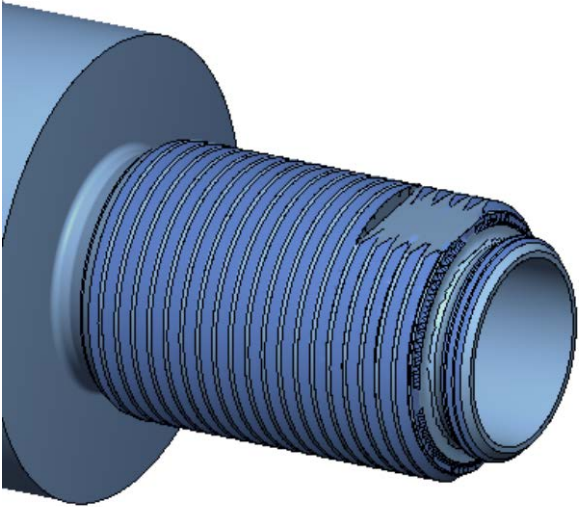
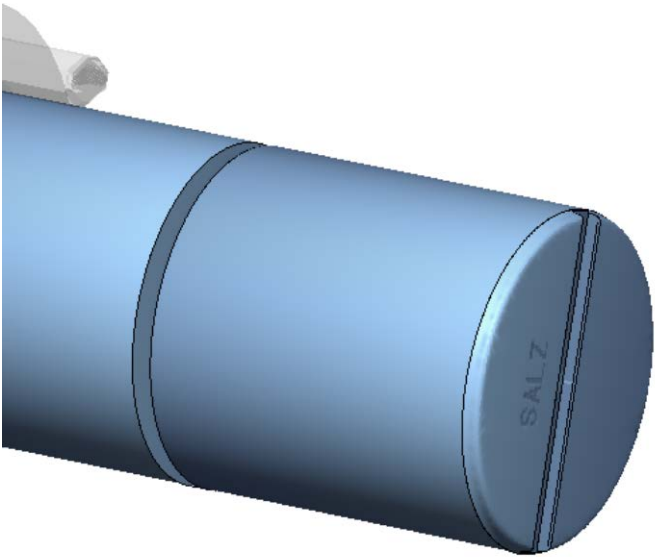
Each machining step has its own zero point. The work offset G54 is overwritten in the program using the transformation command (CTRANS). This must be adapted as required. Scratching once is not sufficient; all of the zero points must be checked and/or adapted.

The roughing tool is used as end stop after each cutting-off operation. The tool is positioned in front of the spindle and the bar of material is withdrawn to the end stop.

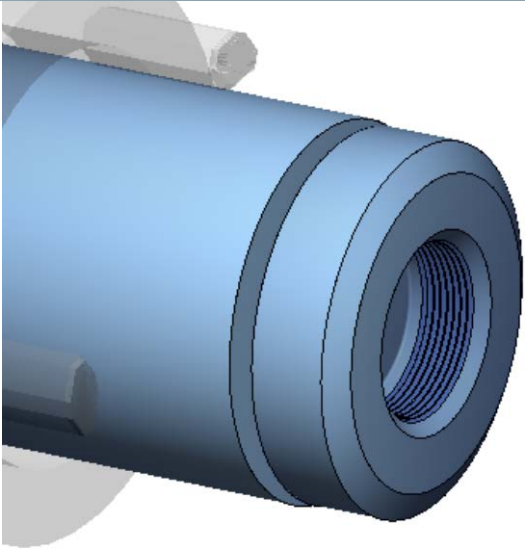
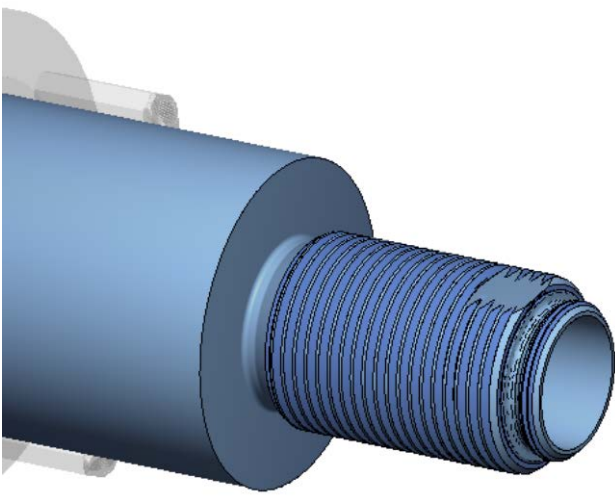
Structure of of the machining plan

Step	Description	Simulation figure
STEP1	Lower side of the cap (side 1) salt shaker. The part is cut-off at the end of STEP 1.	

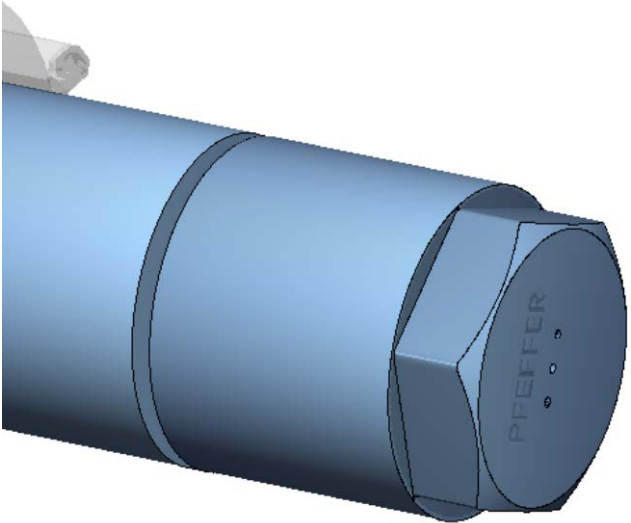


<p>STEP2</p>	<p>Position the workpiece against the end stop. Turn the main body for the salt shaker. At the end of STEP 2, the cap of the salt shaker must be screwed onto the main body. The upper side of the cap (side 2) is then machined.</p>	
<p>STEP3</p>	<p>Position the workpiece against the end stop. The upper side of the salt shaker is machined. At the end of STEP 3, the workpiece main body and screwed cap are cut-off. These must then be unscrewed from one another in a vice or using another suitable tool. The main body of the shaker has milled spanner flats to facilitate this.</p>	



<p>STEP4</p>	<p>Position the workpiece against the end stop. The lower side of the pepper shaker is machined. The part is cut-off at the end of STEP 4.</p>	
<p>STEP5</p>	<p>Position the workpiece against the end stop. Turn the main body for the pepper shaker. At the end of STEP 5, the cap of the pepper shaker must be screwed onto the main body. The upper side of the cap (side 2) is then machined.</p>	



<p>STEP6</p>	<p>Position the workpiece against the end stop.</p> <p>The upper side of the pepper shaker is machined. At the end of STEP 6, the workpiece main body and screwed cap are cut-off. These must then be unscrewed from one another in a vice or using another suitable tool. The main body of the shaker has milled spanner flats to facilitate this.</p>	
<p>At the end, for the two main bodies, the lugs remaining after cutting off must be removed using a file or by grinding them off.</p>		



Turning the parts

All parts are manufactured on a lathe in one clamping setting. The blank is securely clamped.

Machining steps on the milling machine

1. Home the machine.
2. Load the machining planes (SHAKERS_COUNTER.MPF).
3. Enter the measured tools in the tool list.
4. Insert the tools in the magazine.
5. Set the workpiece zero by scratching (check or adapt the other zero points in the program).
6. Perform the simulation.
7. Start production, execute the machining plan, automatic stop when exiting STEP 1. After each STEP, withdraw the bar to the end stop and position accordingly.
8. Execute the machine plan again with NC start STEP 2 – machining the main body for the salt shaker.
9. After stopping, screw the cap onto the main body. With NC start, continue with STEP 3 – machining the upper side of the cap.
10. After stopping STEP 3, with NC start continue to STEP 4 – turning the main body.
11. Execute the machine plan again with NC start STEP 5 – machining the main body for the pepper shaker.
12. After stopping, screw the cap onto the main body. With NC start continue with STEP 6 – machining the upper side of the cap.



7. Information at the Internet

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

TAC Technology and Application Center
Frauenauracher Str. 80
91056 Erlangen

Details of the tool machine and tools to be used

DOOSAN turning center
Internet: <http://www.doosan.com/>

Walter Tools turning tools
Internet: <http://www.walter-tools.com>



Manuals and information from the Siemens AG

Manuals and detailed information about our products, please visit the following websites:

- DOConWEB (www.automation.siemens.com/doconweb)
- Service&Support Portal (www.support.automation.siemens.com)
- SINUMERIK Website (www.siemens.com/sinumerik)

Manufacturing Salt and Pepper Shakers

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8. Figures

Simulation base body

X	122.562	Z	240.102	Y	0.000	SP1	152.420	T	SCHRUPP	D1
G	M30					Z2	0.000		Eilgang	100% 00:02:32

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Tool list

JOG

09/03/15
10:19 AM

Tool list										MAGAZIN1			
Loc.	Type	Tool name	ST	D	Length X	Length Z	Radius						
15													
16													
17													
18													
19													
20													
		WRITESTAR	1	1	-0.008	21.938	2.000	2					
		FRAESER_4	1	1	-0.028	19.529	4.000	4					
		FRAESER_D12	1	1	-0.053	40.655	12.000	4					
		BOHRER_1_5	1	1	-0.042	15.956	1.500		118.0				
		FASFR_6	1	1	0.000	18.704	6.000		90.0				
		SCHRUPP	1	1	76.552	0.420	0.800	←	95.0	80	11.0		
		SCHLICHT	1	1	78.210	0.430	0.800	←	93.0	35	11.0		
		CUTTER	1	1	44.961	13.322	0.200		3.000		30.0		
		GEW_IN_P1	1	1	-21.964	48.861	0.100				10.0		
		GEW_P1	1	1	76.274	-6.766	0.100				10.0		
		GEW_P2	1	1	78.946	-6.812	0.100				10.0		
		BOH_20	1	1	-19.954	84.027	0.400		10.00				

Tool list

Tool wear

Magazine

Work offset

User variable

Setting data

Manufacturing Salt and Pepper Shakers



Program

09/03/15
10:18 AM

NC/WKS/SALZ_PFEFFER/STREUER_ZAEHLER 1

P Program header Cylinder G54

```

G IF R10>5 GOTOF STEP1
G IF R10==1 GOTOF STEP2
G IF R10==2 GOTOF STEP3
G IF R10==3 GOTOF STEP4
G IF R10==4 GOTOF STEP5
G IF R10==5 GOTOF STEP6
G STEP1:
G R10=0
G MSG("SALZ DECKEL SEITE 1")
G $P_UIFR[1]=CTTRANS(Z,190) ; Nullpunkt G54 beschreiben, Wert=190
SALZ 1 01:40.8
G F_HOME
G T="SCHRUPP"
G D1
G $P_UIFR[1]=CTTRANS(Z,240) ; Nullpunkt G54 beschreiben, Wert=240
G G0 X10 Z0.5
G R10=R10+1
G M30
G STEP2:
G MSG("GRUNDKOEPPER")
    
```

Edit Drilling Turning Cont. turn. Milling Vari-ous Simu-lation NC Ex-ecute

Manufacturing Salt and Pepper Shakers



CTRANS zerpoints

JOG

09/03/15
10:18 AM

NC/WKS/SALZ_PFEFFER/STREUER_ZAEHLER 11

	P	Program header	Cylinder G54
G	IF R10>5	GOTOF STEP1	
G	IF R10==1	GOTOF STEP2	
G	IF R10==2	GOTOF STEP3	
G	IF R10==3	GOTOF STEP4	
G	IF R10==4	GOTOF STEP5	
G	IF R10==5	GOTOF STEP6	
G	STEP1:		
G	R10=0		
G	MSG("SALZ DECKEL SEITE 1")		
G	\$P_UIFR[1]=CTRANS(Z, 190)	; Nullpunkt G54 beschreiben, Wert=190	
+ SALZ 1 01: 40.8			
G	F_HOME		
G	T="SCHRUPP"		
G	D1		
G	\$P_UIFR[1]=CTRANS(Z, 240)	; Nullpunkt G54 beschreiben, Wert=240	
G	G0 X10 Z0.5		
G	R10=R10+1		
G	M30		
G	STEP2:		
G	MSG("GRUNDKOEPPER")		

Edit

Drilling

Turning

Cont. turn.

Milling

Vari-ous

Simu-lation

Ex-ecute

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Pepper



Manufacturing Salt and Pepper Shakers

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Salt



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