SIEMENS

Footprint

siemens.com/cnc4you

Footprint workpiece

The CNC4you project “Footprint” was originally created by Robert Schütze and featured on the long-defunct website “Sinupedia,” but it is still frequently requested by CNC4you users. The CNC4you team has therefore created these manufacturing instructions retroactively.

One reason why the Footprint workpiece is so popular may be that it is currently the only tool and mold making workpiece available on CNC4you that can be machined on a standard 3-axis milling machine.

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

www.siemens.com/cnc4you

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1 Safety note

Operating machinery involves a wide range of risks. It is therefore crucial to comply with all legal and standard safety regulations applicable to factory environments when manufacturing CNC4you workpieces such as the "Footprint" part.

2 Preliminary comment

The following description addresses technicians familiar with CNC machines who have experience or know-how about SINUMERIK CNC controls. All the technology data listed here corresponds to the machines, tools, materials, machining plans and drawings used to craft this workpiece. However, when it comes to replicating the workpiece, 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 workpiece.

The program for the milled part was created and tested at a CNC milling machine. The machine was equipped with a SINUMERIK 828D with the ShopMill user interface. SINUMERIK Operate V4.95 was installed on the machine.

The workpiece is fabricated in a single clamping operation. Rear side machining is optional and only needed to adapt the height of the base to individual taste. Rear side machining is not described in this manufacturing description.

Generally, the program can be simply adapted to other SINUMERIK versions, for example, to other SINUMERIK Operate software releases. A simulation and any necessary modifications – for example, the zero points – must always be performed.

All programs and machining descriptions for the workpiece can be downloaded at no charge from **www.siemens.com/cnc4you**. You can find the following files and formats for this workpiece here:

- NC programs for the workpiece
- This manufacturing description in German and English

3 Workpiece, blanks/bill of materials

You require an aluminum cuboid with dimensions 150 mm x 100 mm x 50 mm.

4 Machines and machining plans

CNC milling machine:

- Type: n.n
- CNC: SINUMERIK 828D with ShopMill V 4.95

ShopMill machining plans:

Since the main program uses the EXTCALL function in conjunction with the "USB:/foot/" path, the the directory "/foot/" from the downloaded ZIP file, including all NC programs (.mpf and .ini files), must be copied to the root directory of a USB drive.

Except for the main program, the NC programs primarily consist of point clouds defined by X, Y, and Z coordinates, which are used as target positions in G1 commands.

- 01_START_FOOT_USB.MPF (Main program, calls all the other sub programs)
- 1.mpf (Roughing the contour, larger steps)
- 2.mpf (Roughing the contour, finer steps)
- 3.mpf (preparing the area surrounding the footprint)
- 4.mpf (Semi-finishing of the balls of foot and heel)
- 5.mpf (Semi-finishing the toes)
- 6.mpf (Finishing of the balls of foot and heel)
- 7.mpf (Finishing the toes)
- 8.mpf (Semifinishing the area surrounding the footprint, preparing some of the text zones)
- 9.mpf (Engraving of various texts as freeform to the sole of the foot, optional)
- 10.mpf (dito)
- 11.mpf (dito)
- 12.mpf (dito)
- 13.mpf (dito)
- 14.mpf (dito)
- 15.mpf (dito)
- 16_pocket_sinupedia.mpf (Finishing the area surrounding the footprint)
- 16A_sinupedia_pocket.mpf (Engraving SINUPEDIA logo and
- 16B_pocket_sinu.mpf various text as a freeform, optional)
- 16C_pocket_dassi.mpf (dito)
- 16D_structure.mpf (dito)
- 17_sinupedia (dito)
- 18_sinupedia (dito)
- 19_sinupedia (dito)

Note:

To modify read-only entries (e.g., to comment out subprograms that are to be skipped), you must activate the appropriate user rights using the key switch (usually position 3) and begin editing the relevant line in the NC program using the "Shift+Insert" key combination.

5 Tools used

Tool/short name	Description
SF_D16	End-milling cutter, Ø 16 mm
SF_D6	End-milling cutter, Ø 6 mm
KF_D8	Ball mill cutter, Ø 8 mm
KF_D6	Ball mill cutter, Ø 6 mm
KF_D1	Ball mill cutter, Ø 1 mm
TF_D4	Pocket Milling Cutter, Ø 4 mm
Chamfer	Chamfer 45 degrees, Ø 6 mm

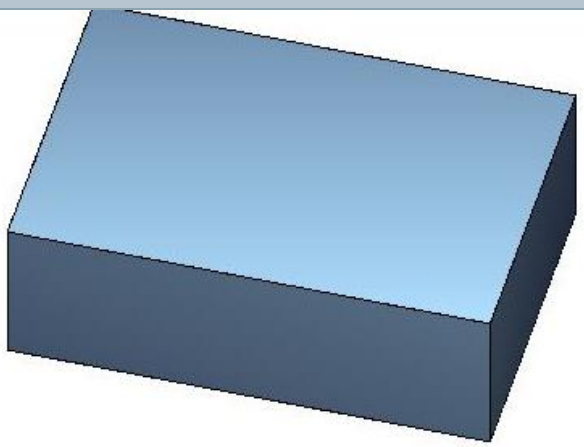
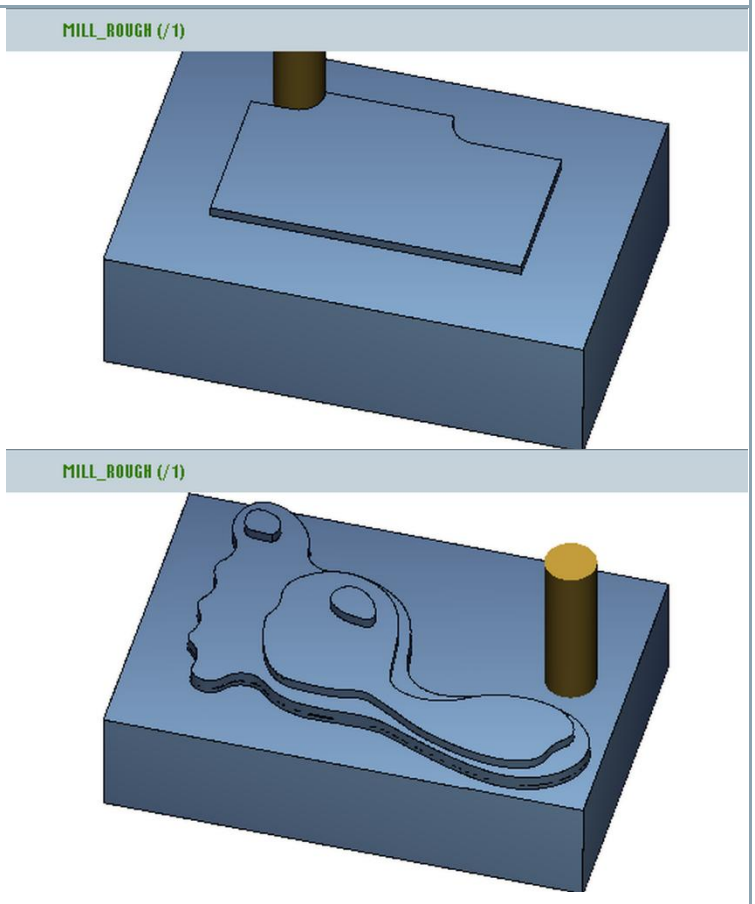
6 Fabricating the "Footprint" workpiece

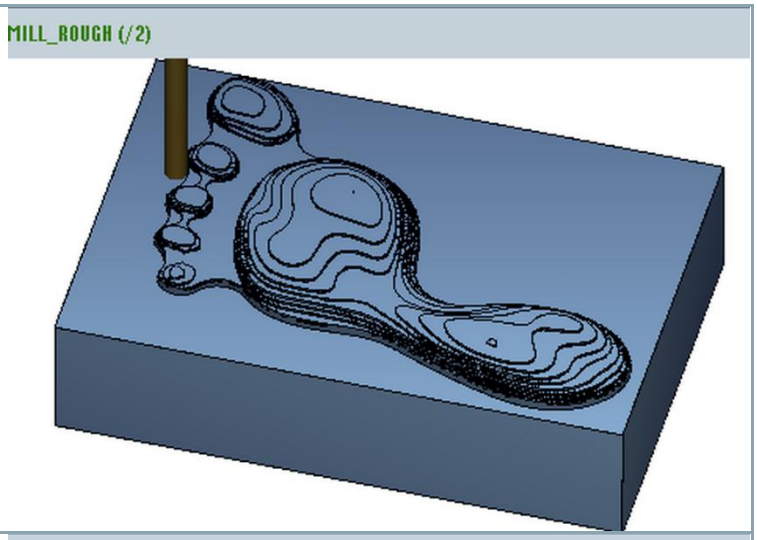
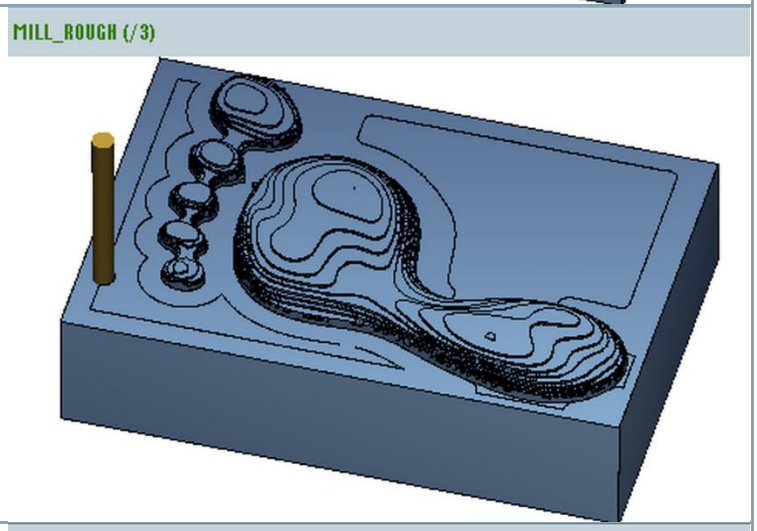
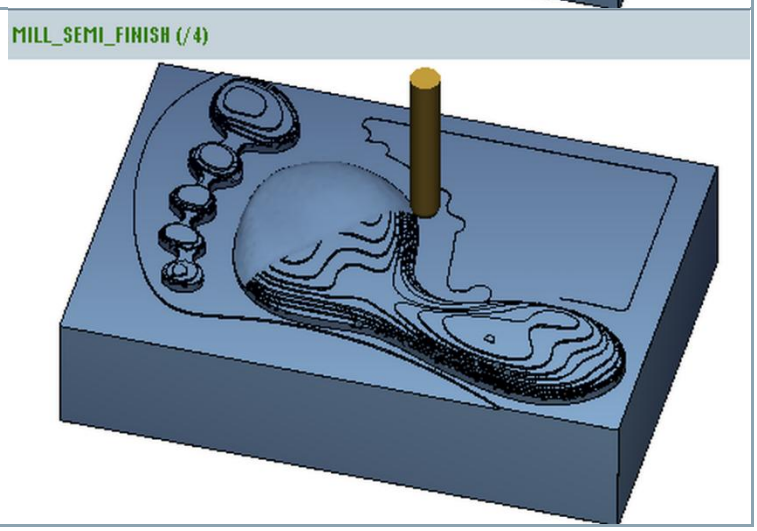
6.1 Machining steps at the milling machine

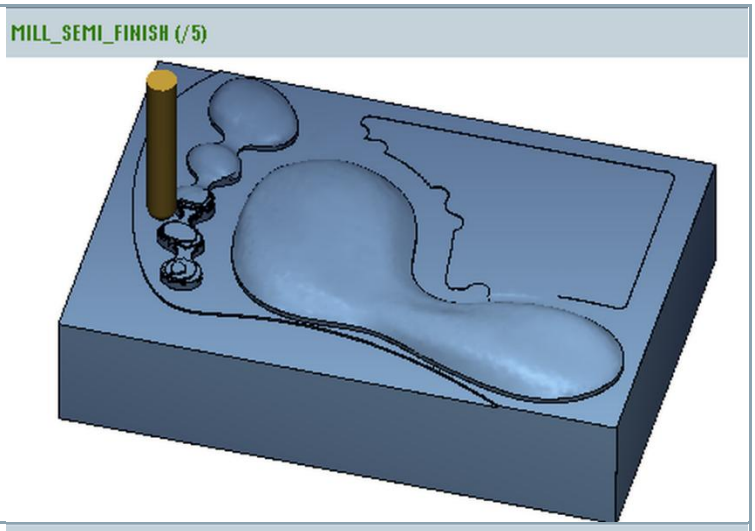
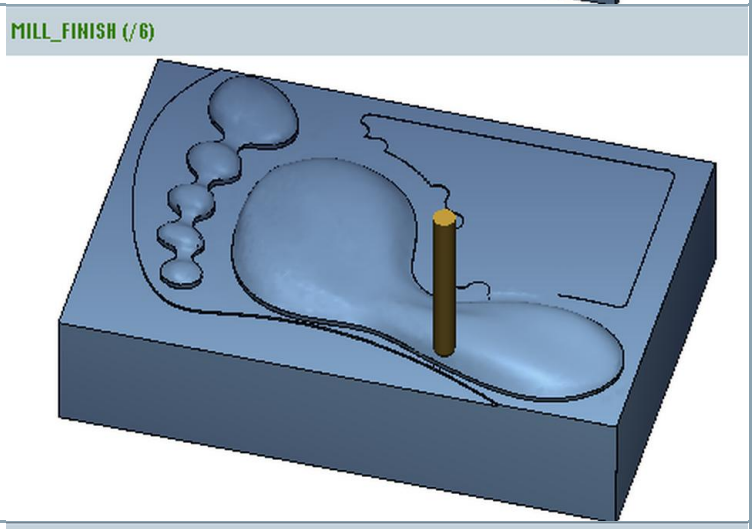
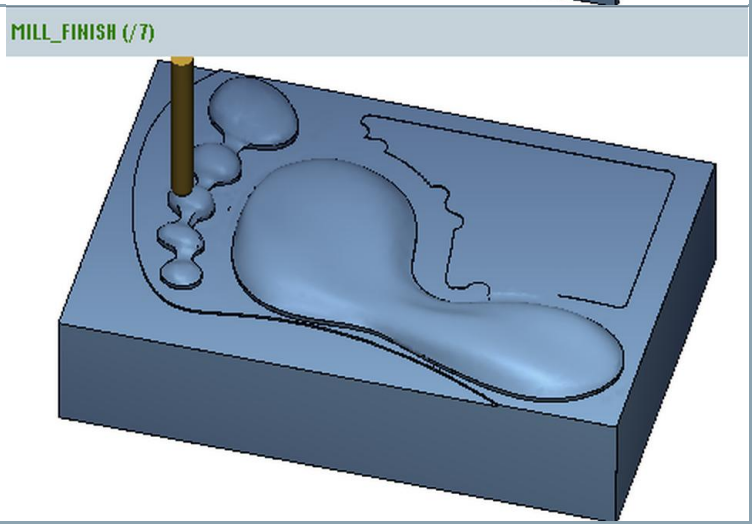
Copy the “/foot/” directory from the downloaded ZIP file – which contains all NC programs (*.mpf and *.ini files) – to the root directory of a USB drive. Connect the USB drive to the CNC system.

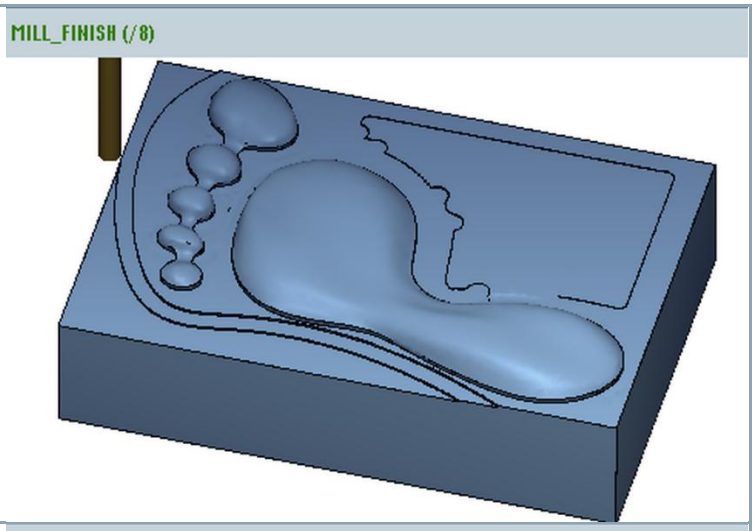
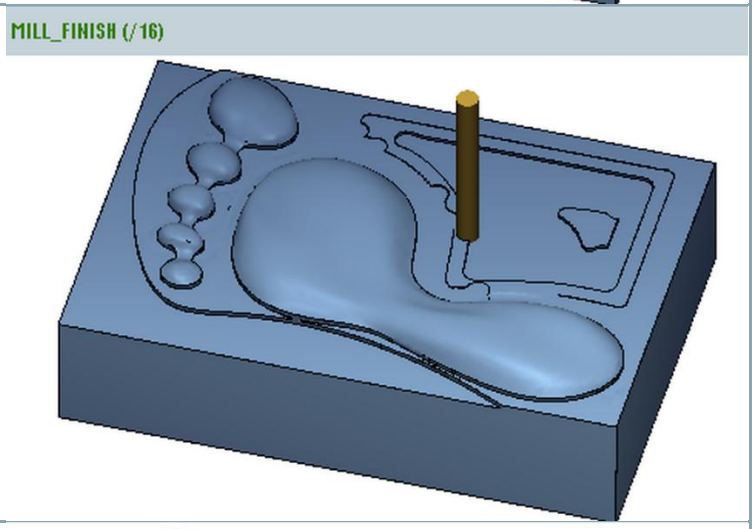
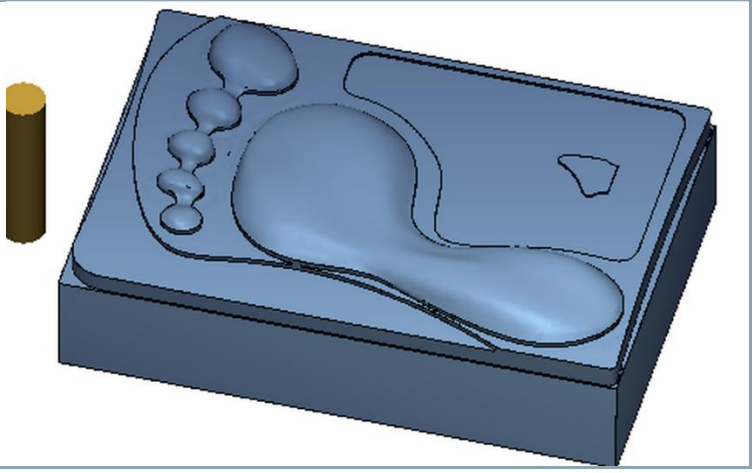
1. Approach the machine reference point.
2. Read-in the machining plan: 01_START_FOOT_USB.MPF
3. Read-in the tool list: 01_FOOT_TMZ.INI
4. Measure the tools, enter the tool list.
5. Insert the tools in the magazine.
6. Clamp the workpiece close to the lower edge.
7. Set the workpiece zero using a measuring probe or by probing using an appropriate device.
8. Check the work offsets programmed in the part program and if required, adapt to the specific machine configuration.
9. Run a simulation and check for possible collisions. Enable or disable the optional NC programs 9.mpf to 19.mpf as required by deleting or inserting comment markers, then run the simulation again. After verifying the NC program sequence in simulation, start machining, execute the machining plan.
10. Remove the workpiece.

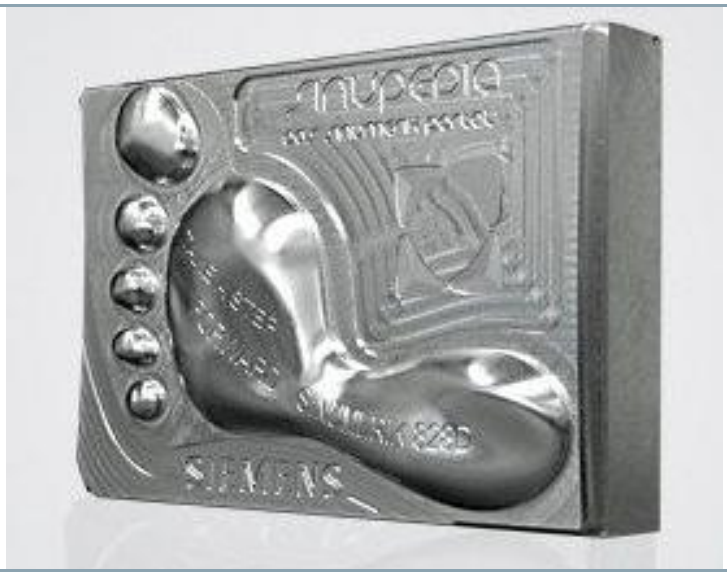
6.2 Working through the ShopMill machining plan 01_START_FOOT_USB.MPF

Machining step	Graphic
Clamp the blank, machining depth is about 20 mm.	
01_START_FOOT_USB.MPF calls 1.mpf with first roughing of the contour	

02.mpf: Roughing the contour a bit finer	
3.mpf: Preparing the area surrounding the foot-print	
4.mpf: Semi-finishing of the balls of foot and heel	

5.mpf: Semi-finishing the toes	
6.mpf: Finishing of the balls of foot and heel	
7.mpf: Finishing the toes	

8.mpf: Finishing the area surrounding the foot-print, preparing some of the text zones	
16.mpf: Milling the faceplate for optional text	
In main program: finishing and chamfering the contour of the socket.	

The optional NC programs 9.mpf to 15.mpf, 16A.mpf to 16D.mpf, and 17.mpf to 19.mpf add freeform text engraving to the sole of the footprint and the surrounding areas. These very fine structures cannot be simulated accurately and are therefore omitted here from the simulation. The finished workpiece, machined with all subprograms, shows the text and logo that are not displayed in the simulation.	

7 Information on the Internet

Published by

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Frauenauracher Str. 80
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Design of the parts, creation of the drawings, development of the machining plans

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