

# Manufacturing a gearshift knob



*Gearshift knob*

The gearshift knob is a useful customization item for automobiles. The upper has two opposing grips. On the front grip area, the gear positions are shown, while on the rear grip area there is space to engrave a name, for example.

All components of the gearshift knob are made from readily available semi-finished parts. All the necessary post-manufacturing information, drawings, tool data and ShopMill/ShopTurn work plans are summarized below.

## Contents

### TOC

#### 1. Safety Instructions

Use of machines can be dangerous. Mandatory and general company safety regulations must be adhered to when manufacturing the gearshift knob.

#### 2. Preliminary Note

The following description is intended for CNC milling professionals who have experience with and understand how to use the SINUMERIK CNC control with ShopMill/ShopTurn. All the technical data listed below relates to the machines, tool, materials, work plans and drawings used by the company W. Andreas Pfeiffer of Zirndorf in manufacturing the prototype. For post-manufacturing, the diverse range of circumstances in other workshops means that these data should only be used as a guide. However, troublefree post-manufacturing should be possible in most cases.

ShopMill and ShopTurn can machine all component parts in a series of simple operations. The component part drawings illustrate which design elements are used in the manufacture of the workpieces with SINUMERIK ShopMill/ShopTurn.

To be on the safe side, we recommend simulating the work plans before starting. This will recognize and prevent any collisions caused by incorrect tool lengths. The work step "Carry out simulation run" before startup is, however, not strictly necessary.

The gearshift knob is made of round aluminum stock. In the first clamping operation the underside is made. At the same time the cutout to fit the piece onto the gearshift lever is drilled and an M20 external thread is cut. Three M3 threaded holes for fastening the knob onto the lever are made. The gearshift knob is cut off.

In the second clamping operation the gearshift knob upper is made. To clamp the workpiece the clamping length must be increased so that the piece can be held in a collet. Failing this a lathe chuck will be required. A clamping extension will have to be produced and screwed onto the M20 thread of the knob.

To mill and engrave the grip areas, the workpiece is placed in a special clamping jaw. This holds the knob at a 30° angle to the Z axis. The work plan for its manufacture is also contained here. Milling and engraving occurs in two clamping operations. In the first clamping operation the small grip area is milled and the name engraved. The knob is then turned through 180° in the clamping jaw and reclamped. In this second clamping operation the large grip area is milled and the gear positions engraved. The gearshift knob is constructed according to the finished part drawing.

The hole drilled into the gearshift knob is for a 15 mm gearshift lever. Modify the size of the hole accordingly for other lever diameters. The knob is fastened to the gearshift lever with M3 screws.

All CAD drawings and manufacturing descriptions of the workpieces can be downloaded free of charge from the "My SINUMERIK" registered internet zone at [www.siemens.de/cnc4you](http://www.siemens.de/cnc4you). This zone contains the following files and formats: Finished part drawings / 3D representations / IPT files / IGS files / IDW files / IAM files / JobShop files / simulation run-through



### 3. List of Drawings

- Clamping jaws finished part drawing SCHALTKNAUF-SPANNBACKEN, Sheet 1
- Gearshift knob component part drawing SCHALTKNAUF-EINZELTEIL, Sheet 1
- Clamping extension, long, component part drawing SCHALTKNAUF-KAPPE-LANG, Sheet 1
- Clamping extension, short, component part drawing SCHALTKNAUF-KAPPE-KURZ, Sheet 1

### 4. Workpiece Blanks

- 2 blanks for clamping jaws, material AlMg4.5Mn, material no.: 3.3547, 45mm x 45mm x 130mm
- 1 round stock for gearshift lever, material AlCuMgPb, material no.:3.1645, diameter 80 mm, length approx. 200 mm
- 1 round stock for cap, material AlCuMgPb, material no.:3.1645, diameter 30 mm, length approx. 200 mm

### 5. Machines and Work Programs

- Gildemeister CTX 510 lathe with Sinumerik 810D / ShopTurn 6.4
- Gildemeister CTX 410 lathe with Sinumerik 810D / ShopTurn 6.4
- Deckel-Maho DMC 64V milling machine with Sinumerik 810D / ShopMill V5.3
- Work plan SIE\_CLAMP\_LONG for turning the clamping extension, long
- Work plan SIE\_CLAMP\_SHORT for turning the clamping extension, short
- Work plan SIE\_KNOB\_BOTTOM for turning the underside of the gearshift knob
- Work plan SIE\_KNOB\_TOP for turning the gearshift knob upper
- Work plan SIE\_KNOB\_MILL1 for milling and engraving the small grip area
- Work plan SIE\_KNOB\_MILL2 for milling and engraving the large grip area

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## 6. Tools for Turning the Clamping Extension

Name	Tool name in work plan
NC spot drill	CENTER_R
Turning tool (out) Roughing	ROUGHING_EX-CN
Drill 15	DRILL_15
Turning tool (out) Finishing	FINISHING_EX_VC
Turning tool (in) roughing/finishing	ROUGHING_IN_VC
Threading tool (in) P1 ISO	THREAD_IN_ISO
Cutoff tool	PLUNGE_CUT_3

## 7. Tools for Turning the Cap

Name	Tool name in work plan
Drill 14.5	DRILL_14.5
Turning tool	ROUGHING_EX-CC
Turning tool	FINISHING_EX-VC
Internal turning tool	FINISHING_IN-VC
Threading tool (in) P1 ISO	THREAD_IN_ISO
Cutoff tool	PLUNGE_CUT 3

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## 8. Tools for Turning the Underside of the Gearshift Knob

Name	Tool name in work plan
Drill 14.5	DRILL_14.5
Turning tool	ROUGHING_EX-CN
Turning tool	FINISHING_EX-DC
Threading tool (in) P1 ISO	THREAD_EX_ISO
Internal turning tool	FINISHING_IN-CC
Tap M3 radial	TAP_M3_RAD
Drill 2.5	DRILL_2.5_RAD
Turning tool (cut off)	PLUNGE_CUT_OFF_5

## 9. Tools for Turning the Gearshift Knob Upper

Name	Tool name in work plan
NC spot drill	CENTER_R
Turning tool	ROUGHING_EX-CC
Turning tool	FINISHING_EX-DC

## 10. Tools for Milling and Engraving the Small Grip Area

Name	Tool name in work plan
Milling tool 16	MILLING_16
Milling tool engraving	ENGRAVING_CUTTER

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## 11. Tools for Milling and Engraving the Large Grip Area

Name	Tool name in work plan
Milling tool	MILLING_16
Milling tool engraving	ENGRAVING_CUTTER

## 12. Manufacturing the Clamping Jaws

### Lathe operations:

- A.1 Move to the machine's reference position
- A.2 Create work plan according to finished part drawing SCHALTKNAUF-SPANNBACKEN
- A.3 Add gaged tools to tool list
- A.4 Put tools into tool magazine
- A.5 Clamp clamping jaw blanks in lathe
- A.6 Scratch on workpiece zero point
- A.7 Carry out simulation run
- A.8 Start manufacturing, work through work plan

## 13. Turning the Clamping Extension, Long

### Lathe operations:

- B.1 Move to the machine's reference position
- B.2 Read in the work plan SIE\_CLAMP\_LONG.MPF
- B.3 Add gaged tools to tool list
- B.4 Put tools into tool magazine
- B.5 Clamp blanks in lathe
- B.6 Scratch on workpiece zero point
- B.7 Carry out simulation run
- B.8 Start manufacturing, work through work plan

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## 14. Turning the Clamping Extension, Short

### Lathe operations:

- C.1 Move to the machine's reference position
- C.2 Read in the work plan SIE\_CLAMP\_SHORT.MPF
- C.3 Add gaged tools to tool list
- C.4 Put tools into tool magazine
- C.5 Clamp blanks in lathe
- C.6 Scratch on workpiece zero point
- C.7 Carry out simulation run
- C.8 Start manufacturing, work through work plan

## 15. Turning the Underside of the Gearshift Knob

### Lathe operations:

- D.1 Move to the machine's reference position
- D.2 Read in the work plan SIE\_KNOB\_BOTTOM.MPF
- D.3 Add gaged tools to tool list
- D.4 Put tools into tool magazine
- D.5 Put clamping jaw and pre-milled side piece in lathe and clamp.
- D.6 Scratch on workpiece zero point
- D.7 Carry out simulation run
- D.8 Start manufacturing, work through work plan

## 16. Turning the Gearshift Knob Upper

### Lathe operations:

- E.1 Move to the machine's reference position
- E.2 Read in the work plan SIE\_KNOB\_TOP.MPF
- E.3 Add gaged tools to tool list
- E.4 Put tools into tool magazine
- E.5 Clamp bolts in lathe
- E.6 Scratch on workpiece zero point
- E.7 Carry out simulation run

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## 17. Milling and Engraving the Small Grip Area

### Milling machine operations:

- F.1 Move to the machine's reference position
- F.2 Read in the work plan SIE\_KNOB\_MILL1.MPF
- F.3 Add gaged tools to tool list
- F.4 Put tools into tool magazine
- F.5 Clamp bolts into milling machine
- F.6 Set and center the workpiece zero point
- F.7 Carry out simulation run
- F.8 Start manufacturing, work through work plan

## 18. Milling and Engraving the Large Grip Area

### Milling machine operations:

- G.1 Move to the machine's reference position
- G.2 Read in the work plan SIE\_KNOB\_MILL2.MPF
- G.3 Add gaged tools to tool list
- G.4 Put tools into tool magazine
- G.5 Clamp blanks into milling machine
- G.6 Set and center the workpiece zero point
- G.7 Carry out simulation run
- G.8 Start manufacturing, work through work plan

## 19. Online Information

### Design of the parts, creation of drawings, development of machining work plans.

W. Andreas Pfeiffer Maschinen- und Apparatebau,  
Buchackerstraße 4 in D-90513 Zirndorf,  
Internet: [www.wapfeiffer.de](http://www.wapfeiffer.de)

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## Measurements and performance data for tools used

Hoffmann – Gruppe,  
Werkzeughersteller Hoffmann GmbH Qualitätswerkzeuge,  
Haberlandstraße 55, D-81241 Munich,  
Internet: [www.hoffmann-group.com](http://www.hoffmann-group.com)

## Details of the machine tools used

Gildemeister Aktiengesellschaft,  
Gildemeisterstraße 60,  
D-33689 Bielefeld,  
Internet: [www.gildemeister.com](http://www.gildemeister.com)

## Handbooks and information from Siemens AG

Handbooks and detailed information about our products can be found by visiting [www.siemens.de/sinumerik](http://www.siemens.de/sinumerik) > Index or search for DOConWEB > SINUMERIK

- Training document "Easy milling with ShopMill"  
-> Info/Training -> Training document "Easy milling with ShopMill"
- ShopMill Quick Reference  
-> 840D/840Di/810D Users -> ShopMill Quick Reference 840D/810D
- Operating and programming ShopMill  
-> 840D/840Di/810D Users -> Operating and programming ShopMill
- Training document "Easy turning with ShopTurn"  
-> Info/Training -> Training document "Easy turning with ShopTurn"
- ShopTurn Quick Reference  
-> 840D/840Di/810D Users -> ShopTurn Quick Reference 840D/810D
- Operating and programming ShopTurn  
840D/840Di/810D Users -> Operating and programming ShopTurn

## Tips for searching using DOConWEB

DOConWEB allows quick access to individual pages of documents without having to load the entire file.

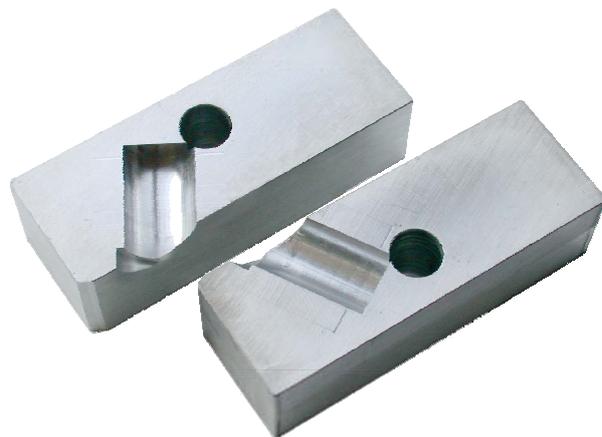
- You can restrict your search by clicking on "A-Z"  
(-> only index items starting with the relevant letter will be returned),
- or by clicking on the magnifier  
(-> a full text search is then performed).

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## 20. Illustrations



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