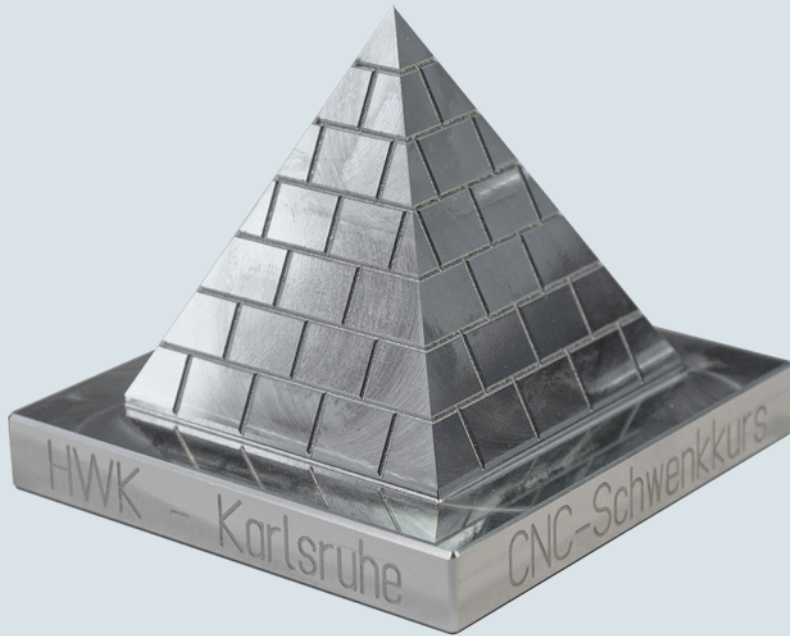# Manufacturing the Karlsruhe pyramid

Pyramid, manufactured by the Karlsruhe Chamber of Trades and Crafts (HWK)

For almost two hundred years a small pyramid has adorned the market place in Karlsruhe and is the last resting place for city founder Margrave Karl Wilhelm. This landmark was the model for an example workpiece in the swiveling course held at the Chamber of Trades and Crafts in Karlsruhe. The workpiece was designed by a team including trainer Karlheinz Hildenbrand, presenter Carsten Maier and coach Hans-Peter Moser.

The pyramid consists of an aluminum block manufactured on a 3+2 milling machine using swivel cycle CYCLE800.

All the information, tool data, drawings and ShopMill machining plans required for a reproduction are contained in the following.

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Answers for industry.

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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 pyramid.

2. Preliminary remark

The following description is intended for persons acquainted with CNC machines and who have experience with or knowledge of SINUMERIK CNCs with ShopMill. 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 ShopMill 6.4. Normally, the program can be easily adapted to other SINUMERIK user interfaces, such as SINUMERIK Operate. SINUMERIK Operate also allows a complete simulation with swiveled planes.

The part has already been manufactured on a DMG DMU50 with SINUMERIK 840D / ShopMill 6.4. The swivel data block must be adapted to the associated machine.

You can download all the CAD drawings, programs and machining descriptions for the workpieces free of charge in the registered Internet area "My SINUMERIK" at **www.siemens.com/cnc4you**. The following files and formats are available there:
Jobshop files / Drawing as PDF

3. Workpiece blanks

- AlCuMgPb; 1 piece square stock 80x80x67

4. Milling machine and machining plans

- Milling machine DMG DMU50 equipped with SINUMERIK 840D / ShopMill 6.4

- **ShopMill machining plan lower side**
  Milling and engraving lower side
  LOWERSIDE.MPF

- **ShopMill machining plan upper side**
  Milling and engraving stone pattern upper side
  UPPERSIDE.MPF

- **Samples ShopMill machining plans SinuTrain for SINUMERIK Operate V4.5**
  LOWERSIDE_OPERATE.MPF
  UPPERSIDE_OPERATE.MPF
  (For these machining plans the swivel data block was set to TC1 only with CYCLE800. This is the swivel data block used in SinuTrain.)

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5. Used Tools

Milling Tools

Overview of the used tools..

Tool name in the machining plan	Designation	
FRAESER 40	Angular face milling head D40	
FRAESER 16	End mill D16	
FRAESER_45_Grd	Multi mill D4 x 90 deg	

6. Milling the pyramid

ShopMill allows the pyramid to be completely milled in just two clamping operations. The underside is milled first. The foot of the pyramid is made with the cycles mill spigot and chamfering. Still individual engravings can be milled by means of the engraving cycle. The pyramid body and the wall structure are milled with the help of the swivel cycle in the second clamping.

The sawn blank is securely clamped. The swivel data block has been adapted to the associated machine.

Machining steps on the milling machine for the lower side

1. Home the machine.
2. Load the LOWERSIDE.MPF machining plane.
3. Enter the measured tools in the tool list.
4. Insert the tools in the magazine.
5. Set the workpiece zero-point by scratching or contacting.
6. Perform simulation.
7. Start production, execute machining plan.

8. Perform face milling using angular face milling head D40.

9. Perform spigot milling 78x78 using end mill D16.

10. Chamfer spigot using multi mill D4 x 90 deg.

11. Engrave text along circumference of spigot using a multi mill in the swiveled system.

Machining steps on the milling machine for the upper side

1. Home the machine.

2. Load the UPPERSIDE.MPF machining plane.

3. Enter the measured tools in the tool list.

4. Insert the tools in the magazine.

5. Set the workpiece zero-point by scratching or contacting.

6. Perform a simulation.

7. Start production, execute machining plan.

8. Perform face milling at a total height of 65mm using angular face milling head D40.

9. Isolate for spigot milling 55x55mm due to chucking situation of angular face milling head D40.

10. Perform spigot milling 55x55mm using angular face milling head D40.

11. Mill side surfaces in the swiveled system using machining limit.

12. Engrave wall structure in the swiveled system using multi mill D4 x 90 deg.

13. Chamfer spigot 78x78 from the top using multi-mill D4 x 90 deg.
    Note:
    Ensure sufficient length of 60 mm for unclamping the tool.

7. Information at the Internet

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

HANDWERKSKAMMER KARLSRUHE
Friedrichsplatz 4-5
76133 Karlsruhe
Internet: www.hwk-karlsruhe.de

Details of the tool machine to be used

DMG MORI SEIKI AKTIENGESELLSCHAFT,
Gildemeisterstraße 60,
33689 Bielefeld,
Internet: www.dmgmoriseiki.com/de

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Manuals and information from the Siemens AG

Manuals and detailed information about our products can be found at www.siemens.de/sinumerik ->
Index or search: DOConWEB   ->   SINUMERIK

- "Simple Turning with ShopTurn" Training Documents
  -> Info/Training -> "Simple Turning with ShopTurn" Training Documents

- ShopTurn Product Brief
  -> 840D/840Di/810D Users -> ShopTurn Product Brief 840D/810D

- ShopTurn Operation/Programming
  840D/840Di/810D Users -> ShopTurn Operation and Programming

- "Simple milling with ShopMill" training document
  -> Info/Training -> "Simple milling with ShopMill" training document

- ShopMill product brief
  -> 840D/840Di/810D users -> ShopMill 840D/810D product brief

- ShopMill operating/programming
  -> 840D/840Di/810D users -> ShopMill operating and programming

Tips when searching in DOConWEB

DOConWEB enables individual pages to be called up quickly from documents
without having to load the entire file.

- You can restrict the search by clicking "A-Z"
  (-> a search is now only performed below this point in the index)

- Or click the zoom
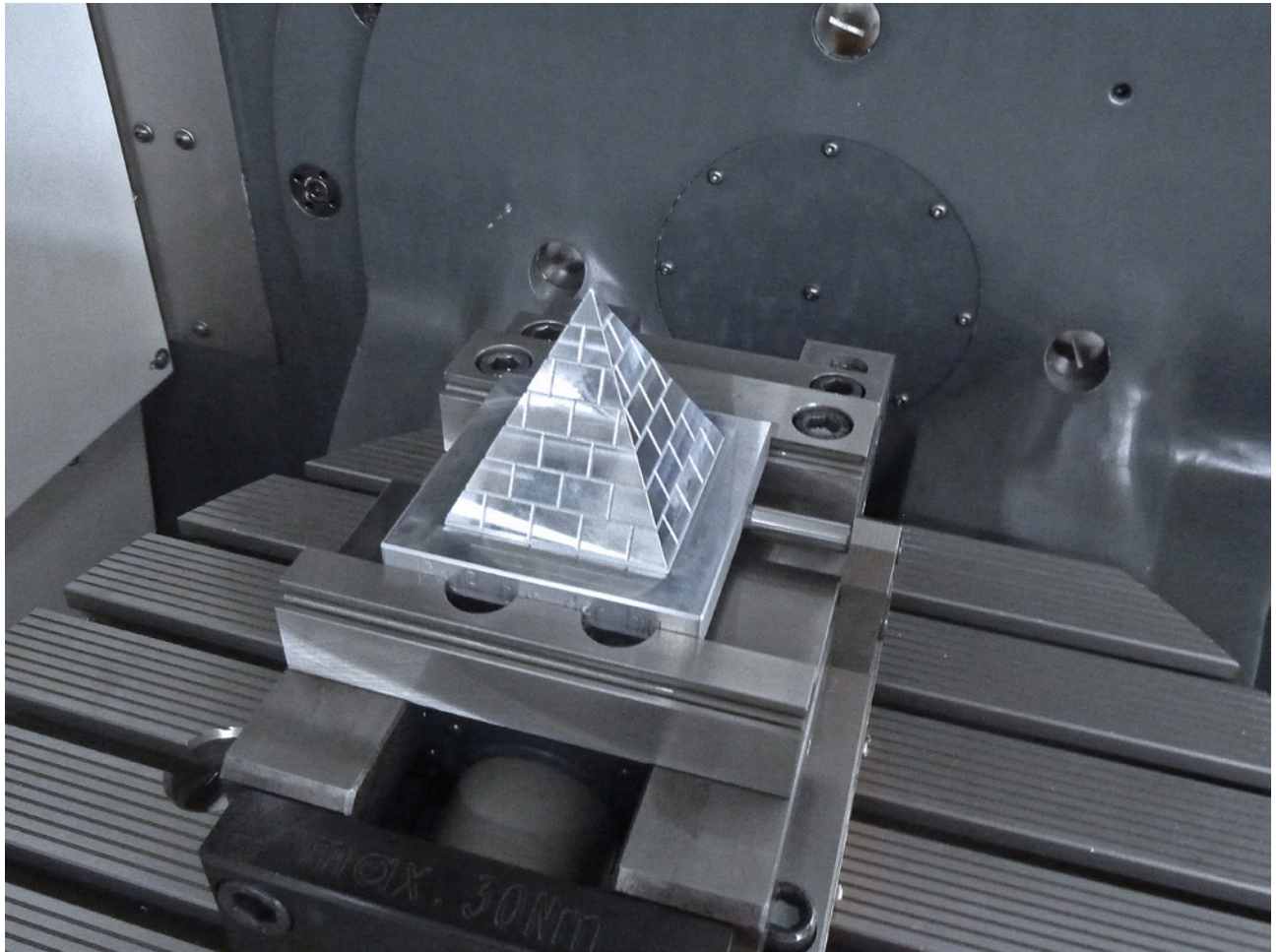 (-> a full text search is now performed below this point
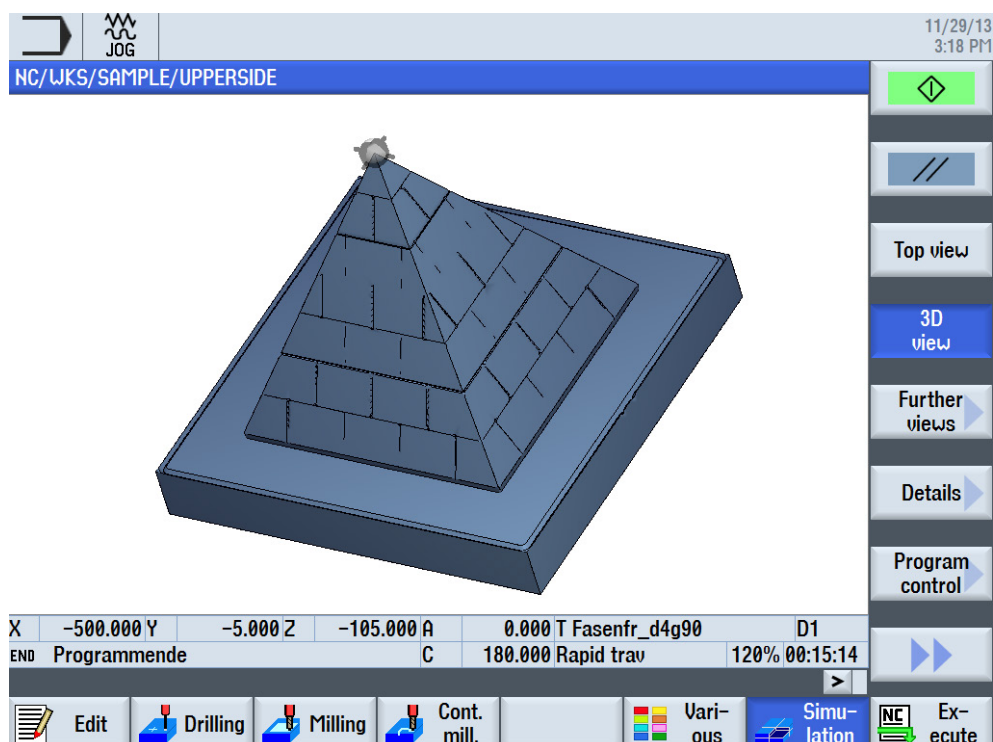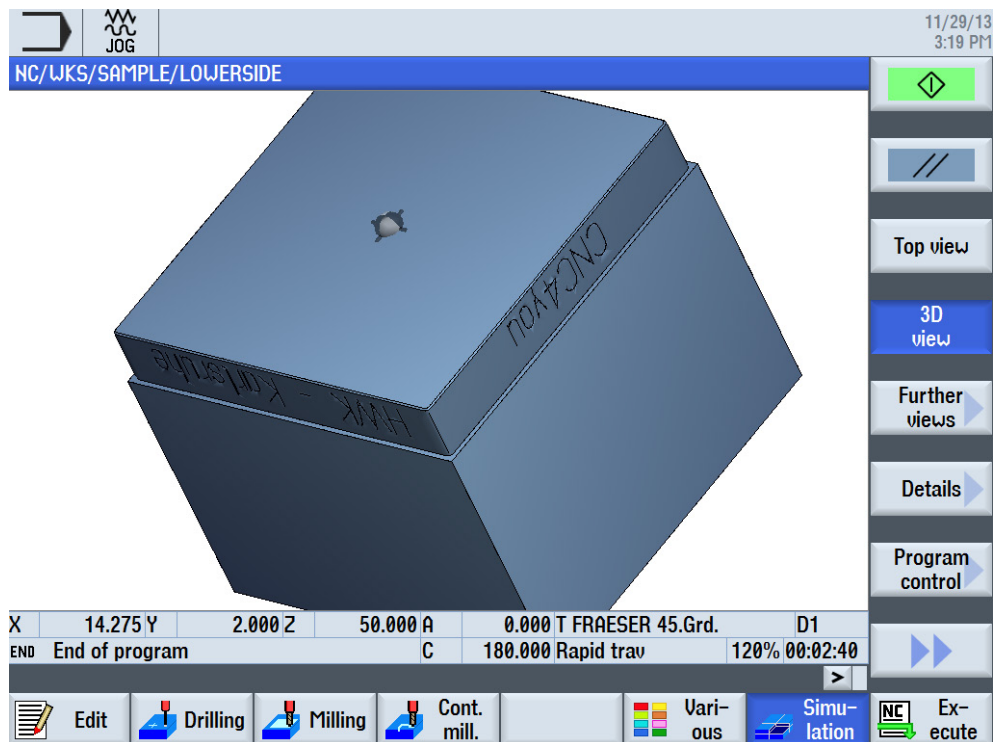
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8. Figures

Pyramid

Pyramid, clamping

Simulation in SinuTrain for SINUMERIK Operate V4.5

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Tools and swiveling CYCLE800 in SinuTrain for SINUMERIK Operate V4.5

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