Hembrug Mikroturn® 100 Horizontal Series

Finish Hard Turning

up to part ø 450 mm

- narrow tolerances
- more flexibility
- higher productivity
- cost saving

The hard turning company

HEMBRUG
MACHINE TOOLS

Hembrug finish hard turning

Finish hard turning refers to the process of single point cutting of hardened pieces within the 2 micron range having hardness between 55 and 68 HRC. It's a simple, reliable and innovative process and is increasingly gaining ground at the cost of grinding technology. In particular for applications where the manufacturer needs to reduce change over times.

With the Hembrug finish hard turning technology the more costly and time consuming cyclindrical grinding operations can be easily replaced, without losing part quality.

Finish hard turning offers siginificant **advantages** over cylindrical grinding

Cost **saving**

Multiple operations can be done in one set-up which eliminates the need for a multi-step grinding process that historically would involve two or three seperate operations. One turning machine performs all the operations.

Environmental **friendly**

Hard turning is a dry and environmental green process due to the absence of grinding fluids and grinding sludge.

Narrow **tolerances**

Finish hard turning allows machining of parts in one set up resulting in narrow tolerances especially for concentricity, squareness and roundness.

More **flexibility**

With a single point standard CBN tool and clamping set-up a wide variety of parts with different contours and sizes can be machined. This provides more flexibility in production enviroments and reduces change over time.

Higher **productivity**

Finish hard turning ensures more material removal per machining cycle than grinding. This makes hard turning up to 3 to 4 times faster over cylindrical grinding.

Turning within **sub micron tolerances**

Hembrug Mikroturn® 100 series are installed to finish turn a wide variety of parts that fit within the maximum turning diameter of ø 450 mm. Manufacturers of automotive parts, bearings, ball screw nuts and others need to process their hardened steel parts in the sub-micron range.

Tolerances of < 2 micron and surface finish Ra 0.1 micron are no exception anymore. Constant innovation by Hembrug allows our customers to improve part quality and process reliability. By using Hembrug Mikroturn® ultra precison turning machines today's and future requirements are met.

Hydraulic parts

Rollers for bearings

Ball Screw nuts

Achievable tolerances in hardened steel parts up to 68 HRC

- Surface finish tolerances (Ra) : 0.1 - 0.4 µm
- Shape accuracies : 0.1 - 2 µm
- Dimensional accuracies : 2 µm

Finish Hard turning versus grinding

Case 1

Part : Cylindrical roller
Size : 52 x 80 mm
Material : 100Cr6
Hardness : 60 HRC
Stock : 0.3 mm

Production steps

Cyclindrical grinding
Machining of raw material
Hardening to max. 60 HRC
Rough grind right face
Rough grind crown
Rough grind left face
Finish grind right face
Finish grind crown
Finish grind left face
Super finish crown

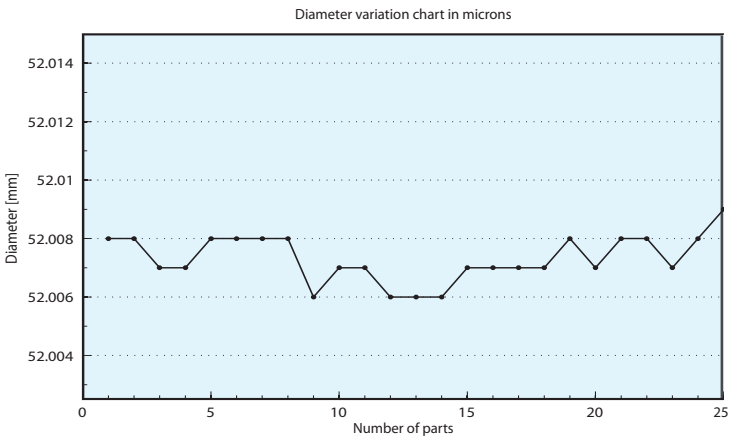
Finish hard turning
Machining of raw material
Hardening to max. 60 HRC
Finish hard turning complete part between centers in one set-up
Super finish crown

Total cycle-time: 45 Sec.

Finish hard turning requires **only**
4 production steps instead of
9 for grinding.

Variation within **3 micron**

A series of 25 parts shows a diameter variation within 0.003 mm
Size min. 52,006 mm
Size max. 52,009 mm



Form accuracies

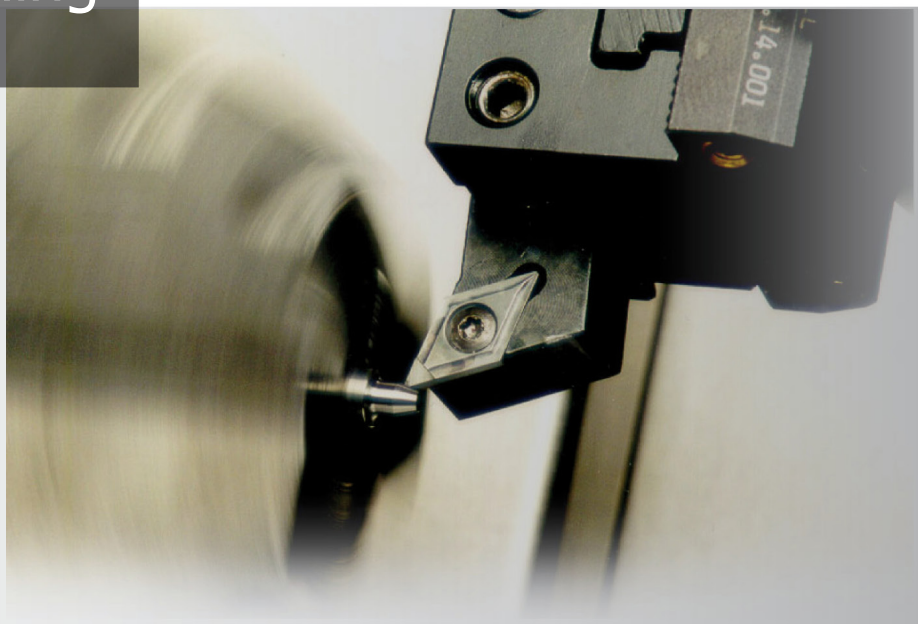
Roundness error	< 0.27 µm
Flatness face	< 0.23 µm
Run-out face	< 0.23 µm

Surface finish Ra.

Faces	< 0.2 µm
O.D/Crown	< 0.4 µm

Finish Hard turning versus grinding

Case 2



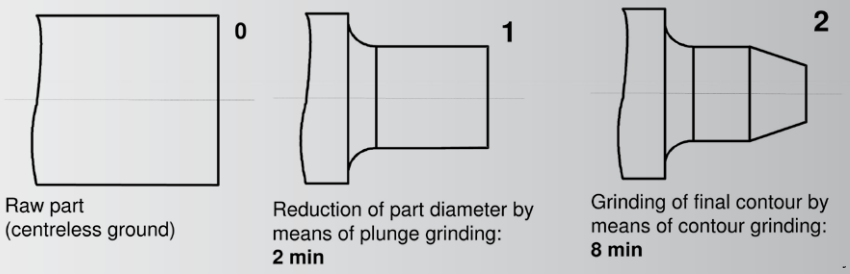
Hembrug Mikroturn® 100 series is mainly used to machine hardened steel parts up to 68 HRC. However also cutting of Tungsten Carbide up to 90 HRC has been very successful.

Product : Carbide punch

Size : 73.5 x ø 7 mm
Material : WC-13%Co
Grain size : 0.8 - 1.3 µm

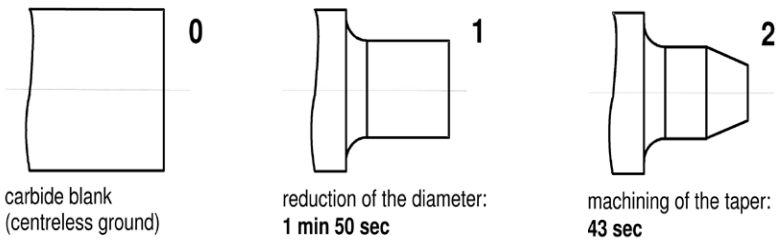
Production steps

Cyclindrical grinding



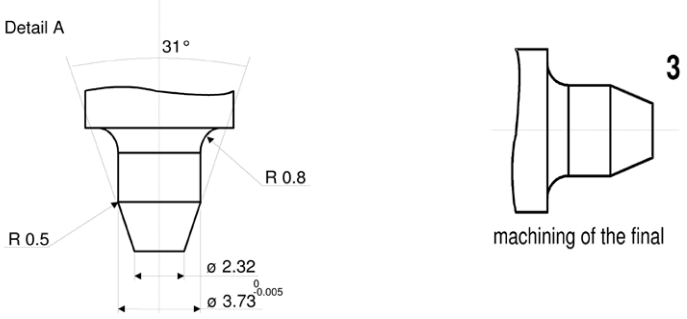
Total cycle-time: 10 **minutes**

Hard turning



Results for a batch size of 12 punches:

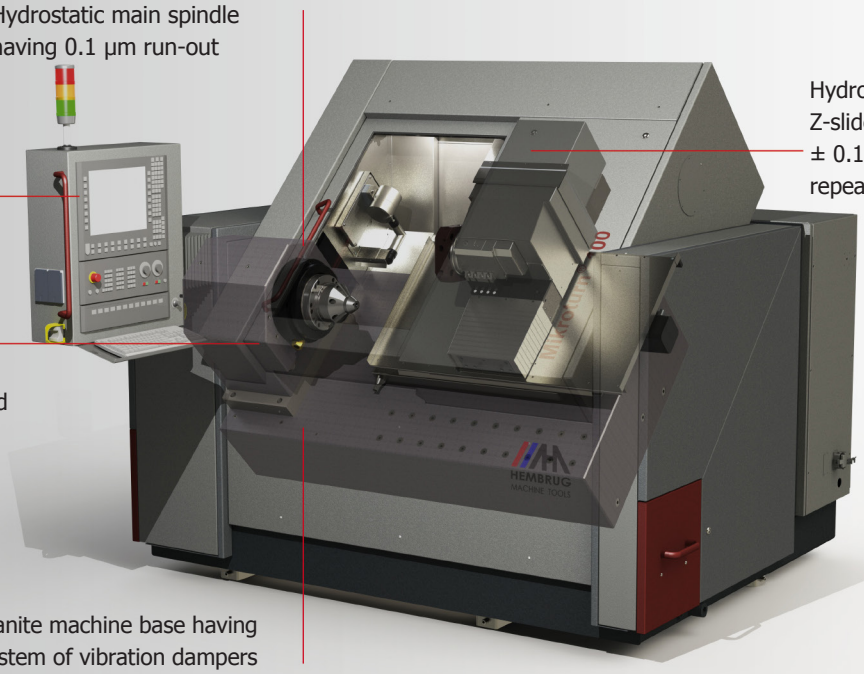
- surface roughness:
  - 0.10 µm R_a
  - 0.58 µm R_z
- accuracy (ø $3{,}73^{-0.005}$ mm):
  - better than ±1 µm



Total cycle-time: < **2,5 minutes**
= 4 times faster

Test performed on Hembrug Mikroturn® UP turning machine at the Fraunhofer Institute of Production Technology.

Mikroturn® **100** series



Hembrug **hydrostatic** slides and main spindle

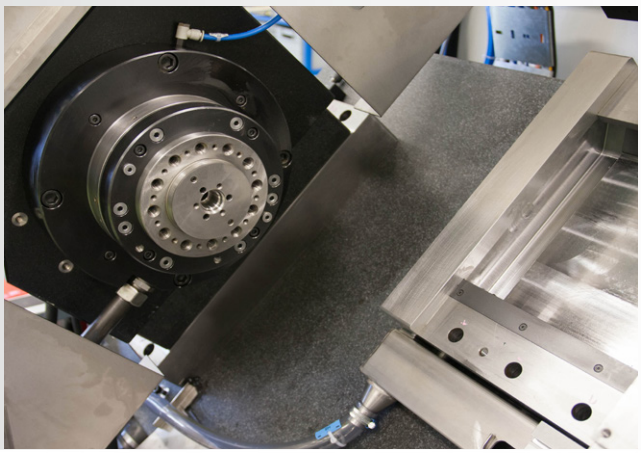
High accuracy requirements on precision parts can only be achieved with suitable machine concepts. Required is a superb static and dynamic stiffness, a sub micrometer run-out of the main spindle as well as a high thermal stability.
The hydrostatic system in the Hembrug Mikroturn® series is superior to any conventional bearing system and offers significant advantages.

- A new continuous oil film over the entire length of the guideways and bearing elements provides excellent damping properties and a high static and dynamic stiffness.
- The absence of metal contact and thus wear ensures a long and reliable machine life and low operational costs.
- The temperature controlled oil flow guarantees thermal stability.
- Due to the absence of the stick-slip effect smallest incremental steps of 0.01 microns are possible.

Natural **granite** machine base

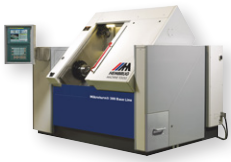
During the cutting of hardened steel parts high process forces are generated. These have to be absorbed by the machine tool system. That is why natural granite has been selected as base material. Natural granite offers much higher stiffness than polymer concrete or other base materials. It is corrosion and stress free and has a low thermal expansion coefficient resulting in superior thermal stability.

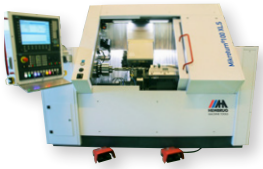
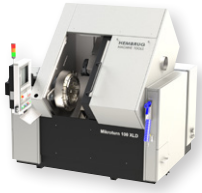
- Excellent damping properties
- High thermal stability
- High static and dynamic stiffness
- Free of stress
- Corrosion free



Specifications

	Mikroturn® Base Line	Mikroturn® 100	Mikroturn® 100 XLS	Mikroturn® 100 XLD
Max. turning diameter	ø 380 mm	ø 380 mm	ø 350 mm	ø 610 mm
Max. part diameter between centers	200 x 350 mm	200 x 350 mm	890 x 190 mm	-
Max. part weight / between centers	50 / 100 kg	50 / 100 kg	50 / 100 kg	200 kg
Max. spindle speed	4,000 rpm	2,000 / 4,000 / 8,000 rpm	2,000 / 4,000 / 8,000 rpm	2,000 rpm
Main spindle run-out	0.15 µm	0.1 µm	0.15 µm	0.2 µm
Z-axis travel	350 mm	350 / 450 mm	890 mm	350 mm
X-axis travel	240 mm	240 mm	190 mm	340 mm
Rapid travers rate	12 m/min	12 m/min	12 m/min	12 m/min
Max. feed rate	0-12 m/min	0-12 m/min	0-12 m/min	0-12 m/min
Positioning accuracy	1 µm	1 µm	1 µm	1 µm
Slide repeatability (±)	0.1 µm	0.1 µm	0.1 µm	± 0.1 µm
CNC control	Fanuc Oi	Siemens 840DSL	Siemens 840DSL	Siemens 840DSL
CNC resolution	0.1 µm	0.01 µm	0.01 µm	0.01 µm



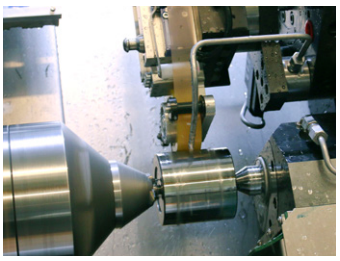
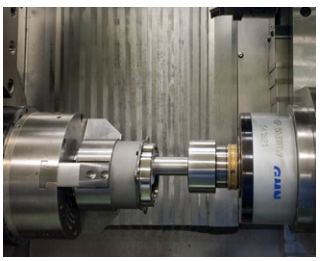
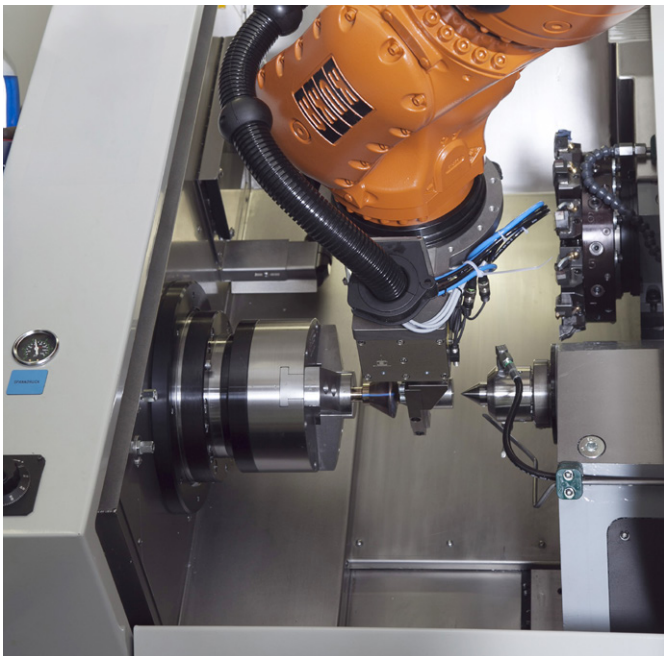
Options

Air or magnetic operated clamping units	**Additional options for Mikroturn® 100:**
Precision tailstock	8 or 12 pos. tool turret with driven or non driven tooling
8 position tool turret	Automated part handling systems
Linear tooling	Post process measuring systems
Tool presetting probe	Spray mist installation
Part probing system	Extended Z-axis stroke to 450 mm instead of 350 mm
Automatic machine door opening	Fanuc 32i CNC control
Chip conveyor	Grinding spindle
Fanuc 0i CNC control	Tape finish unit
	Max. turning ø 450 instead of 380 mm

Turn key solutions

Tape finish, Grinding spindle, Automation

Hembrug offers customer specific turn key systems in the area of automation and combined machining. All solutions are based on proven technology and ensure a further increase in productivity with less process steps and cost reduction.

The leading edge
finish hard turning today

Hembrug representation
all over the **world**

Hembrug have a long tradition in design and manufacturing of machine tools. Today we already have more than 45 years experience in engineering, manufacturing and marketing of ultra precision hydrostatic turning machines. The strength of our organisation is being able to fulfill manufacturer's needs to meet current market demands for higher part quality and productivity.

Finish hard turning is increasingly competitive over cylindrical grinding technology and meanwhile our scope of ultra precision machines finds a ready sale far beyond Europe. Our head office is located in Haarlem, the Netherlands. Sales and Service are provided by an extensive network of high quality agents and distributors world wide. We have our own sales office in the USA.

Engineering focus on today's and future demands

The world around us is changing rapidly. In order to meet today's and future customer demands, the Hembrug engineers are permanently facing new challenges. New demands on productivity, safety, cost saving, precision and environment are met by development of modern machine tools. From dual spindle design to hybrid machine concepts that combine turning and grinding or polishing operations: no effort big enough to serve our customers' needs. Hembrug Machine Tools: always a few steps ahead of the competition.

Made
in The Netherlands

Hembrug Mikroturn® machines are built to order at the Hembrug facility in The Netherlands. All hydrostatic key components are produced in house.

Hembrug **Sales** and **Service close to the customer**

In offering a full service package Hembrug aims to support the customer from transport, commissioning, process development, operator-, programmer- and maintenance training to long term supply of spare parts and after sales service. Also inquire after our possibilities for retrofit on older machines.

Represented by:

ISO9001 CERTIFIED

The **hard turning** company

Hembrug Machine Tools
H. Figeeweg 1a+b
2031 BJ Haarlem
P.O. Box 6014
2001 HA Haarlem
The Netherlands

T +31 (0)23 512 49 00
E sales@hembrug.com
I www.hembrug.com

HEMBRUG
MACHINE TOOLS

sept 2018