



EXTREME PRECISION FOR OPTIMAL PERFORMANCE



**THIELENHAUS**

**MICROFINISH**





## About us

**Ernst Thielenhaus** machine factory was founded in 1909 and today belongs to Thielenhaus Technologies GmbH as the division Thielenhaus Microfinish. The company has developed over the course of several decades into the most important global player within surface precision machining.

**Microfinish** has been the technological benchmark in surface precision machining for decades, given that it has experienced significant advances in terms of efficiency, functional reliability, noise minimisation and miniaturisation.

**The high-tech process** is used in all areas where the highest degrees of precision and durability, the lowest levels of friction and operational noise, long service lives and material efficiency are required.





**THELENTHAUS**  
**TECHNOLOGIES**



# What is Microfinish?

- + The terms 'finish', 'Superfinish' and 'Microfinish' refer to a **high-precision process for improving workpiece surfaces and geometry.**
- + Rotation of the workpiece, combined with oscillation of the finishing tool, produces optimal workpiece surfaces and geometry.

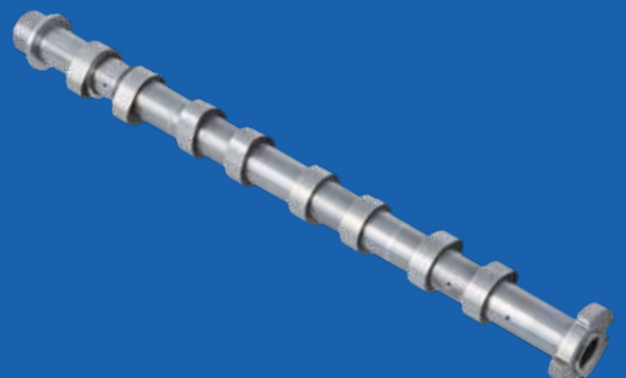


## Microfinish: Benefits at a glance

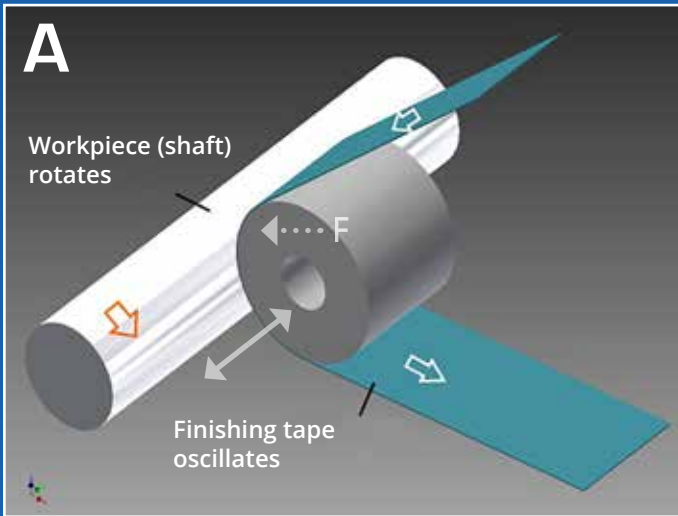
- + Noise reduction
- + Reduced energy consumption
- + Extended service life
- + Less wear
- + Higher load-bearing capacity
- + Reduced friction

## Enhanced surface qualities:

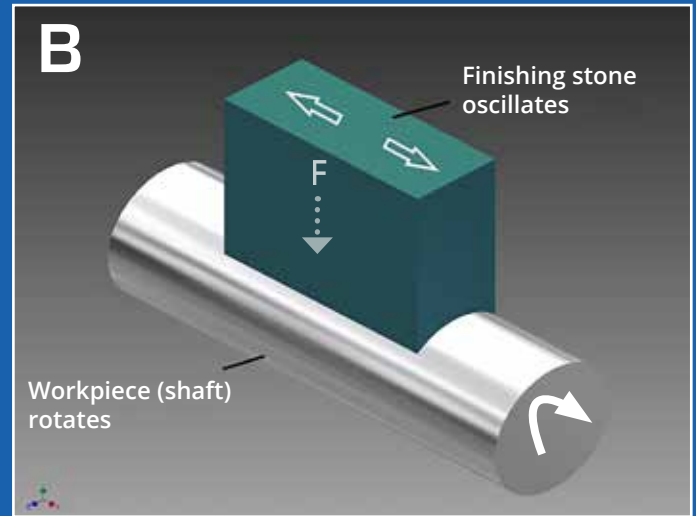
- + Roundness
- + Straightness
- + Roughness
- + Cylindricity
- + Waviness
- + Parallelism



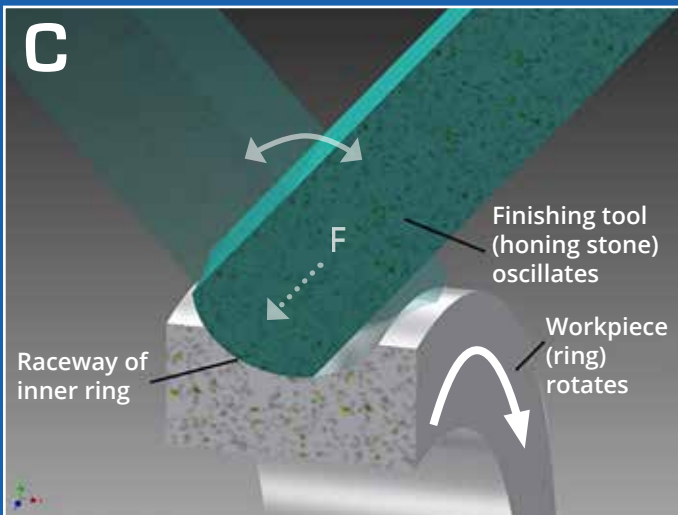
# How Microfinish works (examples)



Tape finishing of shafts



Throughfeed stone finishing of shafts

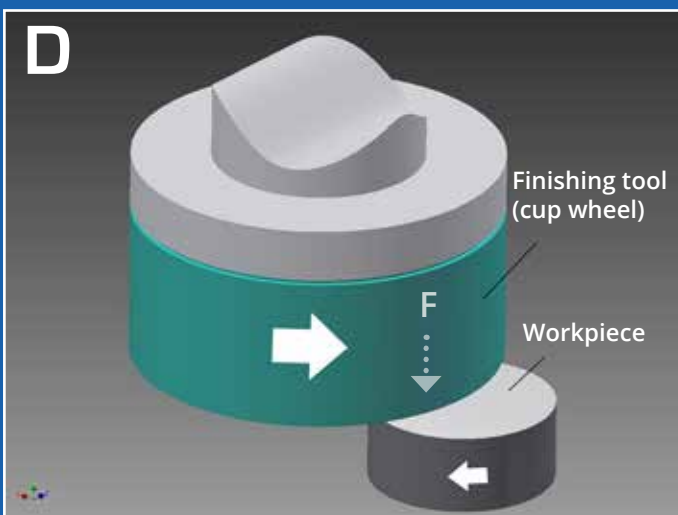


Finishing of ball and roller bearing raceways

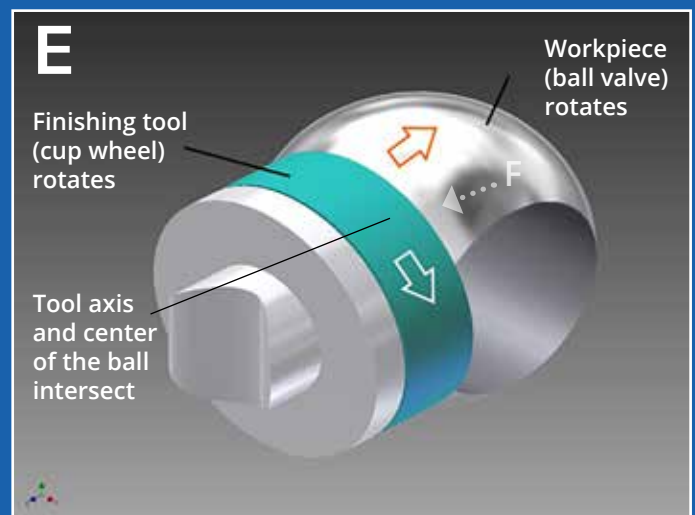
When machining cylindrical workpieces – like journals on driveshafts – a Microfinish/Superfinish tool (stone or tape) is placed against the surface of the workpiece. The tool then oscillates while the workpiece rotates (fig. A/B/C).

Stone finishing is applied for roller bearings, roll barrels, piston pins and shock absorber rods. Tape is used mostly for machining crankshafts, drive shafts as well as steering racks.

For machining flat or spherical surfaces cup wheels are brought in contact with the workpiece by precision spindles.



Finishing of flat surfaces



Finishing of spherical components



Particularly in the automotive sector, superior precision and repeatability are preconditions for higher performance, reliability, durability and savings on energy and raw materials. Employing a Microfinish/Superfinish process, enables the engineer to define part surfaces and geometries to improve the function of any component.

## Components produced:

- + Crankshafts
- + Camshafts
- + Connecting rods
- + Inlet and outlet valves
- + Synchronous wheels
- + Planetary gears
- + Shock absorber rods
- + Brake discs
- + Rotor shafts
- + Seal seats
- + Balance shafts
- + Cams and tappets
- + Piston pins
- + Universal joints
- + Steering racks
- + Shim rings
- + Injectors
- + Adapter plates
- + Gear wheels and shafts including bearing seats

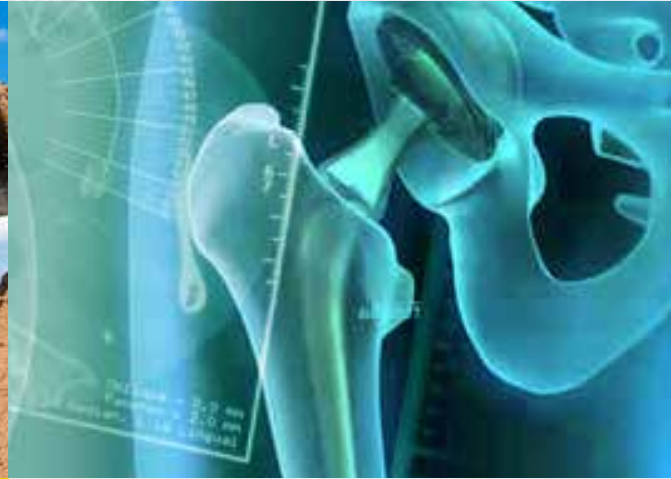


Microfinish/Superfinish processing significantly improves the roundness and roughness of roller bearing surfaces, enabling top quality.

## Components produced:

- + Ball bearings
- + Roller bearings
- + Tapered roller bearings
- + Cylindrical roller bearings
- + Self-aligning bearings, etc., and their rolling elements





Valves with finished valve balls made from steel and other materials, such as ceramics, meet the most stringent requirements for safety and the environment.

Our customers offer market-leading implants for the hip, knee, ankle, and shoulder.

ed:

### Components produced:

- + Valve balls
- + Seal seats
- + Pump pistons
- + Pump gears
- + Pump rotors
- + Port heads
- + Pump covers
- + Spherical bearings

### Components produced:

- + Endoprosthesis spherical
- + Endoprosthesis spherical caps
- + Flexible discs



## CenterStar

### Flexible processing of all shaft types

- + Modular machine design – for maximum flexibility and accessibility with minimum space requirements
- + Reduced costs per unit due to high processing capacity with short cycle times
- + Able to integrate all manner of processes, such as stone, tape, CAB and flat finishing as well as brush deburring

## CamStar

### Camshaft finishing

- + Multi-sided, fitted with two different tool holder units at each station for double output
- + One or two stations for increased flexibility or output
- + Faster and easier tool changes

Example workpiece: Balance shaft

**Before Microfinish    After Microfinish**

Roughness	Rk 0.7 $\mu\text{m}$	Rk 0.16 $\mu\text{m}$
Rvk	0.5 $\mu\text{m}$	0.1 $\mu\text{m}$
Rpk	0.5 $\mu\text{m}$	0.03 $\mu\text{m}$
Roundness	< 3 $\mu\text{m}$	< 1.5 $\mu\text{m}$

Example workpiece: Cams

**Before Microfinish    After Microfinish**

#### Lobes

Roughness	Ra $\leq$ 0.45 $\mu\text{m}$	Rk < 0.6 $\mu\text{m}$
	–	Rvk < 0.6 $\mu\text{m}$
	–	Rpk < 0.35 $\mu\text{m}$
	–	Wt < 1 $\mu\text{m}$

#### Journals

Roughness	Ra $\leq$ 0.9 $\mu\text{m}$	Ra < 0.2 $\mu\text{m}$
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## CrankStar

### Crankshaft finishing

- +** Flexible machine solution in a compact design for small to large lot sizes
- +** Cost-effective and reliable processing of crankshaft mains, pins, seal diameter and thrust faces
- +** Optional: Loading/unloading during processing with external automation systems, independently of production time

## Sphero

### Precision-grinding and finishing of spherical surfaces

- +** Microfinish unit with MicroSens process control, and tool wear compensation
- +** Automatic tool changer with precision tool holder
- +** Compact, ergonomic design

Example workpiece: Crankshaft

**Before Microfinish    After Microfinish**

#### Pins & mains

Roughness	Rz ≤ 4 µm Rk ≤ 2.1 Rpk ≤ 0.29	Rz ≤ 1 µm Rk ≤ 0.18 Rpk ≤ 0.05
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#### Thrust bearing

Roughness	Rz ≤ 4 µm	Rz ≤ 1 µm
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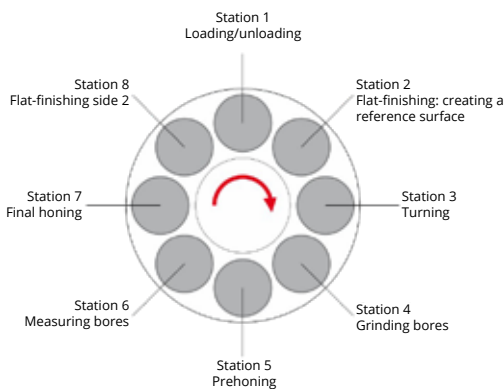
Improvement of the roundness up to 50% (depending on the waviness in circumferential direction)

Example workpiece: Ball & spherical cup

**Before Microfinish    After Microfinish**

Roughness	–	0.02 µm Rz
Roundness	–	1 – 2 µm

**One-of-a-kind:**  
Combined processing  
finishing/grinding/honing



# MicroStar FGH

Combined processing (finishing, grinding, honing)

- +** Lower overall investment due to integration of one or more processes with corresponding automation
- +** Lower space requirements due to process combinations at a diameter of only 1.5 m
- +** Extremely high workpiece quality in machine accuracy – free of defects caused by repeated clamp and unclamping

Example workpiece: Gear wheel

**Before Microfinish    After Microfinish**

Surface	turned	$Rz \leq 1.5 \mu\text{m}$
Flatness	-	$2 \mu\text{m}$
Radial and axial run-out	-	$\leq 10 \mu\text{m}$
Cylindricity	-	$< 3 \mu\text{m}$
Roundness	-	$< 3 \mu\text{m}$





## MicroStar EVO

### Flat surface finishing

- +** Center column, rotary indexing table with up to 12 workpiece spindles
- +** Loading and unloading independent of production time due to concurrent processing on all stations
- +** Higher output due to extremely short cycle times

## MicroStar 300

### Flat surface finishing

- +** Designed for both small and large workpieces with a complex contour
- +** Up to 3 vertical arranged workpiece spindles
- +** Small machine footprint

Example workpiece: Injection nozzle

**Before Microfinish**    **After Microfinish**

Roughness	turned	$Rz \leq 0.5 \mu\text{m}$
Flatness	-	$1 \mu\text{m}$ concave
Needle stroke tolerance	$\pm 0.2 \text{ mm}$	$\pm 0.005 \text{ mm}$
Edge rounding	-	$\leq 0.05 \text{ mm}$

Example workpiece: Injector body

**Before Microfinish**    **After Microfinish**

Roughness	turned	$Rz \leq 0.5 \mu\text{m}$
Development of flatness	-	$0.9 \mu\text{m} \pm 0.3 \mu\text{m}$ concave
Bore depth	$\pm 0.15 \mu\text{m}$	$\pm 0.025 \mu\text{m}$
Edge rounding	turned	$\leq 0.05 \mu\text{m}$



## NanoStar

Flat surface finishing

- +** Rotary indexing table with max. 4 work-piece spindles and 2 tool spindles
- +** Low space requirements
- +** Excellent accessibility for loading, unloading and maintenance

## Infinity

Flow-through and plunge finishing

- +** Transport roller lengths of up to 1,100 mm with usable rollers diameters of up to 275 mm
- +** Lifting and lowering using pneumatic proportional valves, programmed part storage
- +** Faster tool changes and short retooling times as well as shared bearing housings for fast roller changes

Example workpiece: Planetary gear

**Before Microfinish**    **After Microfinish**

Roughness	turned	$R_z \leq 1.6 \mu\text{m}$
Flatness	-	$\leq 0.02 \text{ mm}$

Example workpiece: Shock absorber rod

**Before Microfinish**    **After Microfinish**

Roughness	$R_a 0.12 - 0.20 \mu\text{m}$	$R_a \leq 0.03 \mu\text{m}$
		$R_z \leq 0.2 \mu\text{m}$





## CUBE evo

Finishing of shaft bearings and cams with maximum flexibility

- + Self-preparation of the machine in combination with Industry 4.0
- + Lot size 1
- + Error-free and fast changeover times

## PowerCUBE

Finishing of shaft parts at highest productivity

- + Special space-saving Microfinish solution
- + Innovative and user-friendly touchscreen software
- + Up to six horizontally arranged workpiece spindles

Example workpiece: Pump wheel shaft

**Before Microfinish    After Microfinish**

Roughness bearing	Rz 2.2 – 2.8 $\mu\text{m}$	Rz 0.4 – 0.6 $\mu\text{m}$
Roughness seal seat	Ra 0.6 $\mu\text{m}$	Ra 0.2 – 0.6 $\mu\text{m}$

# Microfinish Machines



Outer diameter of roller bearing rings



BearingStar mini

05 – 19 mm



KM 90 evo

26 – 90 mm



BS 90

26 – 90 mm



BearingStar 120

60 – 120 mm





BearingStar 200

85 – 200 mm



## BearingStar

Ball and roller bearing finishing

-  Compact, high production bearing raceways  
Microfinishing machines for all product size ranges
-  Short setup times due to menu-guided setup and workpiece visualisation on the HMI



BearingStar 320

180 – 320 mm



BearingStar 650

200 – 650 mm

Example workpiece: 4-point ball bearing

	Before Microfinish	After Microfinish
Roughness	Ra 0.3 – 0.4 $\mu\text{m}$	Ra $\leq$ 0.04 $\mu\text{m}$
Roundness	< 2 $\mu\text{m}$	< 1.5 $\mu\text{m}$





## Thielenhaus MicroTool

We recommend using our MicroTools as distinguished by their consistency and near total lack of variation in quality from lot to lot.

- + Finishing stones and cup wheels
- + Contact shoe system for tape finishing units
- + Finishing tape / finishing film
- + Brushes for deburring processes

## Prototyping & Contract Manufacturing

It is becoming increasingly common that components and workpieces have to satisfy complex geometric requirements and/or greater loads. In such cases, surface precision machining is generally applied. When it comes to start-up productions, prototype machining, our contract manufacturing service Thielenhaus Microfinish – the market-leading manufacturer of high-precision machine tools – is available to you.

- + Shafts
- + Balls and sockets
- + Centerless
- + Flat & special parts

## Service

Thielenhaus Technologies takes the term 'customer service' seriously. We aim to maximise global availability of our machines. To ensure workpiece quality and availability, we offer you flexible support in training your production team, and our service team is always ready to help you with any new needs that may arise.

- + Inspections
- + Replacement parts
- + 24/7 service hotline
- + Training
- + Modifications

# The Power of Precision.



## THIELENHAUS TECHNOLOGIES



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