



MicroStar

High Precision Microfinishing
Surface Treatment

MicroStar 200 series



MicroStar evo



MicroStar 300 series





MICROSTAR – THE INNOVATION IN SURFACE FINISHING

MICROFINISH – THE PRINCIPLE

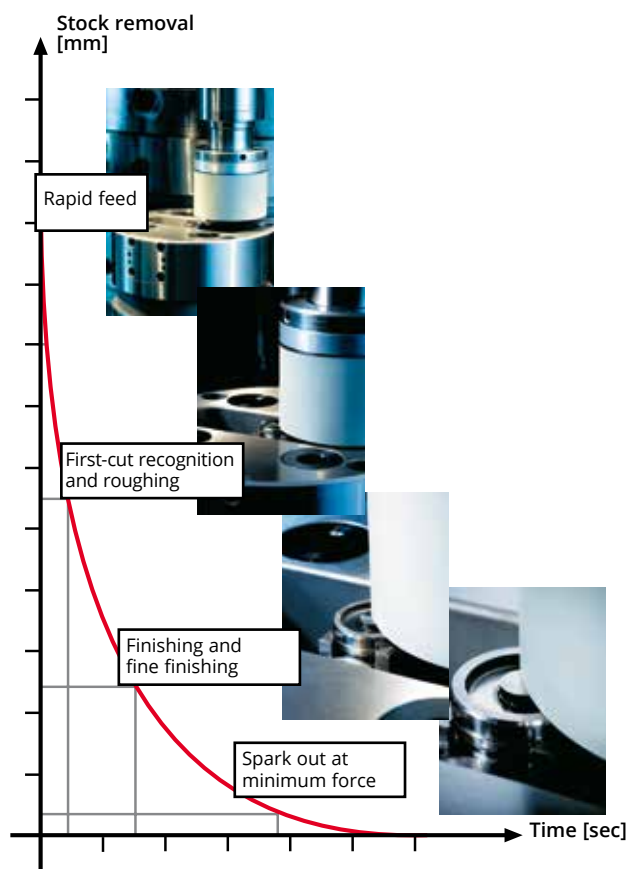
Where there is a demand for extreme precision you will find that microfinishing/superfinishing will achieve the highest form and surface qualities. This method eliminates amorphous surfaces and increases the internal compressive tension. Furthermore, it generates a metallurgically pure surface structure, minimizes friction and increases the load capacity and performance.

According to DIN 8589 the Microfinish/Superfinish process is defined as machining with geometrically undefined cutting edges. When machining cylindrical workpieces – like journals on drive shafts – a Microfinish/Superfinish tool (stone tape or belt) is placed against the surface of the workpiece. The tool then oscillates with short strokes while the workpiece rotates. The stones have grit between 500 and 1,200 and don't need dressing. They can achieve roughness value of down to $R_a 0.03 \mu\text{m}$ ($R_t 0.1$ and $R_z 0.2 \mu\text{m}$). And they can improve short

and long waviness. This method is applied for roller bearings, roll barrels, piston pins and shock absorber rods.

Instead of stones you can also use Microfinish/Superfinish tapes. They are either only rotating or both rotating and oscillating, or while they are rotating the workpiece is oscillating. Tapes are used mostly for machining crankshafts, drive shafts as well as steering racks. For machining flat or spherical surfaces cup wheels or sleeves are brought in contact with the workpiece by drive systems (e.g. NC axes). Here both the workpiece and the cup wheel rotate in opposite direction with the cup wheel positioned slightly beyond the workpiece center. As opposed to grinding the Microfinish/Superfinish tools are not dressed. The rotating speed lies between 1 and 25 m/sec. Thus, the workpiece is not heated up and there is no sparking.

MICROSENS – THE FIRST DYNAMIC PROCESS CONTROL



Until recently, the Microfinish/Superfinish process was limited by the fact that the result depended highly on the correctly chosen tool for the respective material (stone or cup wheel) regarding grain, bonding agent and hardness. During machining there was no way to look into the process. Thus, it depended on the know-how of the operator to find a setting where the grain would break free concertedly, the tool would cut and not only press down onto the workpiece. Now, however, use of the patented MicroSens first-cut recognition and force control system, developed by Thielenhaus, allows for the process to be controlled and visualized.

A wear-free Piezo system integrated in the tool slide controls first-cut recognition and machining force within one gram during roughing, finishing and spark out. The force range is controlled during machining by a constant levelling out of the target and the actual value within the machine control and can be viewed on the screen. This increases tool life by ten fold as compared to the presently applied systems. Furthermore, very instable workpieces like thin layered sensors can be machined at a stable quality within the tightest tolerances. This innovative technology is used especially for machining metal sealing surfaces for injection systems where pressures of up to 3,000 bar occur.



MICROSTAR 200 SERIES

The MicroStar 200 series is presently the most modern surfacefinish machine on the market. Depending on the demand it can be converted into a surfacefinishing center. Equipped with all eight stations two workpieces can be machined simultaneously with a cycle time of three seconds per workpiece.

- Modular design with four, six and eight workpiece spindles (which can also be retrofitted)
- Up to six machining stations plus loading and unloading as well as an automatic flip over station – can also be used for consolidated machining, e.g. with additional brush deburring, honing, grinding
- High process stability through MicroSens first-cut recognition and flexible force controlled machining strategy
- Shortest cycle times (all operations are effected simultaneously)

- Vertical machining
- Loading and unloading during main machining cycle
- Excellent accessibility
- Easy to use

WORKING AREA

Workpiece height: max. 230 mm

Workpiece diameter: max. 200 mm

Injection parts



Machining area



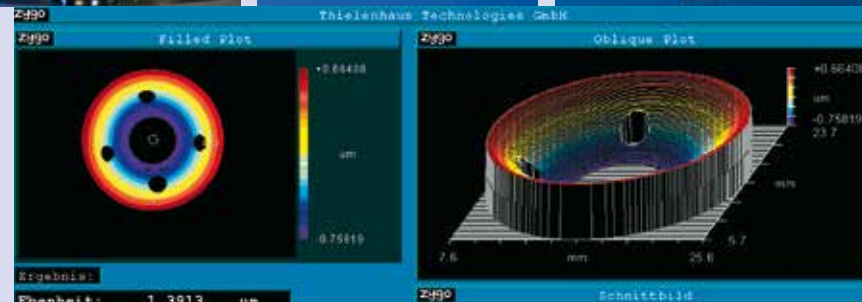
Pressure sensors



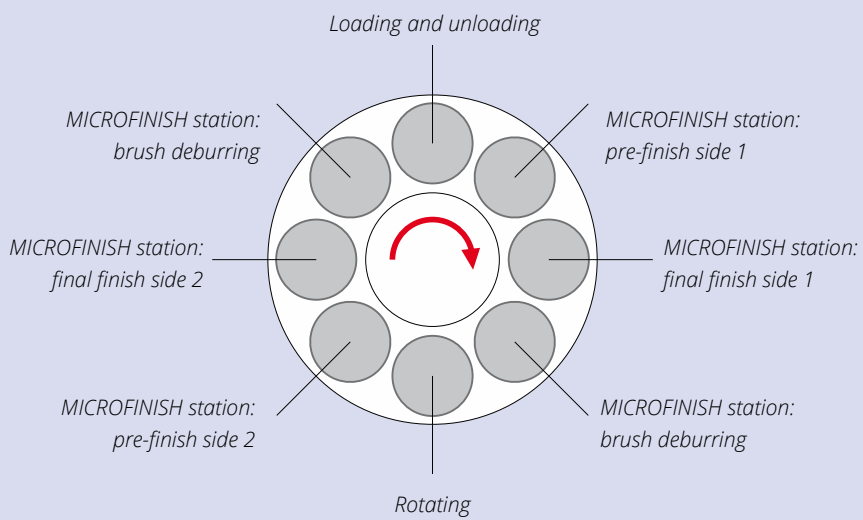
Nozzle holder



Injection elements



Flatness measurement via reflected light interferometer



Example of a machine equipped for workpieces to be machined on both sides according to the two step method with the additional operation brush deburring. The number of units can be reduced flexibly for different applications.



Hand loading with light curtain and automatic switch off



MicroStar with automation and integrated pin insertion unit for injection parts

The round design allows for optimal accessibility to each station. The latest generation of the process control MicroSens can recognize workpiece position without a gauge, it can register deviations and shortcomings in tool quality, and it can adjust the machining force and the process automatically, thus making work easier for the operator.

The oil mist suction unit is situated directly at each machining station and the oil mist generated during machining is conducted through the central column preventing it from covering the machining units and ducts. The machine features a pressure relieve flap and an interface to fire suppression equipment. The machine control can be either Bosch Rexroth MTX or Siemens 840 D.

The FEM machine stand is designed as a column and together with the round table made from grey cast iron it forms a massive construction (approx. 5.5 t). All machine elements can be reached at arms length (250 mm). The design does not contain any hydraulic, belt, or trailing cable systems in order to reduce wear and source of errors. The machine has a small foot print with a diameter of only 1.4 m. The automation into and out of the machine is effected without any unnecessary potential handling errors. At the same time manual loading and unloading can also be effected.



Handling cell with pre-measuring gauge (bore depth) as well as workpiece position recognition via camera for connection to the MicroStar



MicroStar with automation cell; bulk container into staple grid with pre- and in-process gauge as well as with SPC unit



MICROSTAR EVO 1200

The MicroStar evo(lution) 1200 sets new productivity standards in high precision machining, featuring up to 12 stations on which different operations can take place simultaneously. The machine is based on the successful indexing-table concept of the MicroStar 200 series, adding an additional four stations on which microfinishing, honing, deburring, loading/unloading or other operations can be carried out.

- Maximum productivity enabled by parallel machining operations on 8-11 stations and simultaneous loading/unloading on 1-4 four stations
- Parallel machining of multiple component types: the machine can be divided into multiple segments, each of which can be configured to carry out different operations for different component types.
- MicroSens force-controlled tool feed and EasyTilt tool adjustment ensure maximum process stability and operational safety
- All operations can be carried out in a single clamping, thereby eliminating chucking errors and maximizing workpiece quality
- Modular design allows flexible addition or exchange of machining units to accommodate new workpiece types

WORKPIECE RANGE

Height: max. 230 mm

Diameter: max. 200 mm

Injection parts



Machining area

Carrier pinion

Rotary table with 12 stations



MICROSTAR 300 SERIES

The machines of this series are designed for both small and large workpieces with a complex contour and are meant for machining small or medium batches. Depending on the equipment, a flatness of less than 0.001 mm and a roughness of Rz 0.5 μm can be achieved with a stock removal of up to 0.35 mm.

- Adjustments for different processes and equipment
- Vertical machining
- Machining in several steps as an additional option
- Machining with conventional tools, CBN and diamonds
- NC axis with MicroSens first-cut recognition and force controlled feed
- In-process gauge
- Ready for automation

The MicroStar 300 is very flexible: the machining range can be extended by up to three vertically arranged stations. It can also be adapted to different workpiece weights. It uses either finish sleeves, cup wheels or segment heads. The machine control can be supplied either by Bosch Rexroth or Siemens. With the integrated electrical cabinet the MicroStar 300 features a compact design and thus a small footprint.

WORKING AREA

Workpiece weight: max. 80 kg

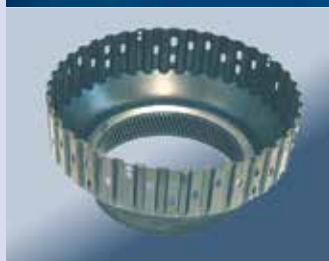
Workpiece diameter: max. 550 mm

Workpiece height: max. 470 mm

Working area



Automatic camshaft adjustment device

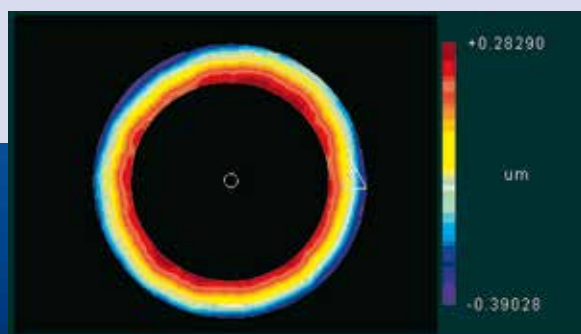
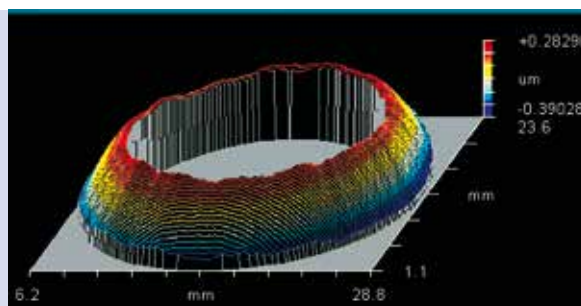


Gearbox



Plunger Diesel injection

Flatness measurement via reflected light interferometer



Result:

Flatness: 0.6514 μm

PROCESS COMBINATIONS

The importance of workpieces being machined to extreme precision at short cycle times is increasing more and more. This cannot be achieved if the workpiece is clamped several times within one or several machines. The consolidation of several

processes within one machine and the workpiece clamped in one chuck increases the quality profoundly.

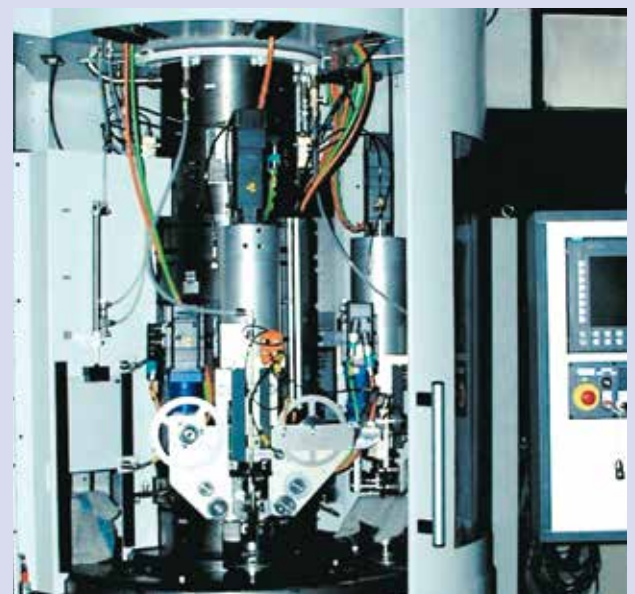
Consolidated machining of injection parts (defined edge deburring) with force controlled deburring brush



Patented consolidated machining of injection parts (sealing seat machining) with tape



Machining of needles with diamond tape



Consolidated machining of a needle and cartridge for petrol injection

ACCESSORIES

Thielenhaus can supply its machines together with the complete accessories as for example:

- half and fully automatic filter units
- oil mist/emulsion suction units
- pre-/in- and post-process gauges
- fire suppression units
- connection to master computer
- camera supported recognition systems
- DMC-code reader
- dry cleaning systems
- laser marking systems
- tools (MicroTool)
- flushing oil (Methone)

Half and fully automatic filter units



Pre-/in- and post-process gauges



Dry cleaning systems



Fire suppression units



Oil mist/emulsion suction units

SERVICES

Thielenhaus Microfinish takes the term “services” literally to mean service for the customer. Our goal is to ensure the longest machine life for our customers, best production quality and customer specific solutions for any machining. Our service points applying a concise information management are situated on three continents ensuring efficient customer care worldwide.

Thielenhaus services comprise the following:

- Experienced service engineers can be reached throughout the day at our **24 hour hotline** and help you solve your problem in no time. Our customers can reach us under the following telephone number: +49 (0)2 02 481-112. Thus they can rest assured that they will never be left alone with any kind of problem.
- Our **Online Direct Service** (ODS) features a direct connection to the respective machine control from our central service computer. Many failures can thus be cleared worldwide reducing unproductive times and costs.
- Customer Service to us means a prompt reaction should our specialists become necessary at the customer. Within Europe we can even guarantee a **24 hour service** if desired.



- We do not only offer operator training but also **intensive training** applying theory in practice. Detailed and practice relevant training materials ensure that the topics covered can be re-read at a later time again and again.
- In order to increase the lifetime of the machines we encourage our customers to have **inspections** carried out documenting the present state of the machines as well as all necessary overhauling or modification measures that might become necessary in the future.
- On request, we analyze your manufacturing processes and submit **process evaluations**, detailed measuring documentation and quality certificates.
- Increasing the quality, lowering production costs, and increasing productivity can be achieved by our extensive **service consulting** or even life cycle costing.
- On request, we also take over **services for other machine tools** within your production line.
- We also support our customers with **finding the right financing means** for our machines or services.
- Within the scope of our **operating scheme** we offer small series production of workpieces for our customers carried out on our machines by our personnel.



The Power of Precision.



THIELENHAUS TECHNOLOGIES



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