

ARTIFEX
Elastisches Schleifen und Polieren
Elastic bonded Abrasives

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Improve the Surface Quality of Your Workpieces



Ultrafine surface finishing with target Ra roughness values
of less than 0.04 μm

APPLICATION REPORT

Ultrafine surface finishing with target Ra roughness values of less than 0.04 µm

In industries such as aerospace, automotive, mechanical engineering, medical technology, and electronics, demands on surface quality are continuously rising and, in consideration of economics and sustainability, are becoming decisive factors in the value creation process.

ARTIFEX GmbH & Co. KG helps its customers produce the highest surface qualities with innovative precision tools.

Required: Ra Roughness Values of 0.04 µm to 0.05 µm

Dr.-Ing. Timo Bathe, CEO of InduGrind GmbH, was faced with a special challenge: A customer order required Ra values of 0.04 µm to 0.05 µm with a high process reliability. During the discussions between Dr.-Ing. Timo Bathe and his colleagues about possible solutions for polishing 200 shafts made of 18CrNiMo7 (partially case-hardened) with a roughness requirement of Ra 0.04 µm to 0.05 µm, it quickly became clear that conventional machining using a vitrified bond grinding wheel would not be expedient. The use of support grinders for microfinishing was also not considered further due to the high process times and process workflows associated with them. In order to successfully fulfill the customer's order, Dr.-Ing. Timo Bathe turned to Artifex Dr. Lohmann GmbH & Co. KG in Kaltenkirchen

Among other things, the material to be machined, the roughness requirement, and the machining of the workpieces with one clamping operation were defined as requirements for the machining. Following the expert and insightful consultation, in which all relevant process and part information was provided, the polishing tool EK 800 MFP with dimensions $\varnothing 400 \times 30 \times \varnothing 127.00$ mm was recommended and employed. Products from the ARTIFEX EK- MFP series are rigid foam polyurethane polishing wheels that are produced with different geometries and grits

They are mainly used on CNC grinding machines with and without oscillation for alloyed and high-alloy steels. The main advantages include complete machining with one clamping operation, no changes in workpiece geometry, and the elimination of the roughness peaks with removal in the micrometer range.



Picture: D. Ramlow (left) T. Bathe (right)

Work picture: InduGrind GmbH, Bochum, Machine: Kellenberger KelVaria 225/1500

« Unlike in the conventional machining process, the first step is pregrinding to the upper tolerance limit. The only thing that changes here is that the roughness peaks are removed. The part geometry is not changed. In addition, there are no changes in dimensional accuracy. »

Daniel Ramlow, Key Account Manager, ARTIFEX

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Process Parameters

In the machining of the shafts on a Kellenberger KelVaria 225/1500, the parts were preground on a vitrified bond grinding wheel. In this case, due to the design as a double-center machine, the ultrafine surface finishing could be carried out immediately afterwards



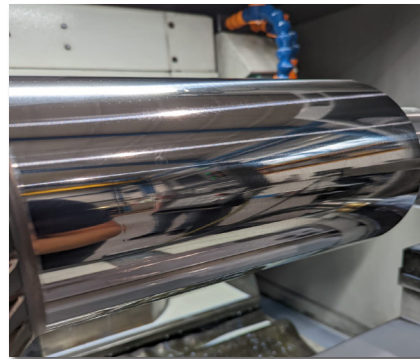
with no reclamping required. This led to a drastic reduction in process times and thus enabled faster machining of the workpiece, unlike with conventional grinding tools. When it came to selection of process parameters, the expert team from Artifex Dr. Lohmann GmbH & Co. KG was relied on. Even if the users at InduGrind GmbH were initially sceptical about the 0.25 mm depth of cut, they could be convinced that no negative influence was to be expected and that the process would be able to be carried out with a high stability.

Settings for the Downstream Polishing Process

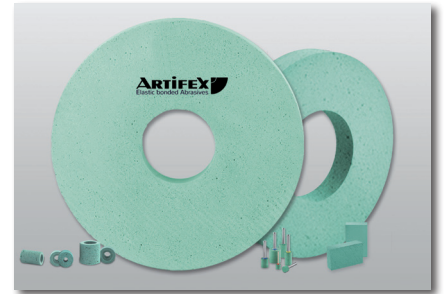
Cutting speed: $v_c = 35 \text{ m/s}$
Depth of cut: $a_e = 0.25 \text{ mm}$
Feed rate: $v_f = 250 \text{ mm/min}$
Strokes: $n = 2$
Coolant lubricant: Emulsion,
approx. 90 L/min

Results

- Arithmetic mean roughness $R_a 0.034 \mu\text{m}$
- Desired surface quality was achieved
- Process reliability and reproducibility



Within the scope of the machining processes, additional potential for the use of elastically bonded polishing wheels was evaluated.



Through the in-process quality control, it was found that a freshly conditioned wheel led to a surface topography with an increased groove depth. This aspect was validated on a test part in various steps. Within the scope of this study, the following findings, among others, were obtained: Theoretically, tribologically favorable surface topographies can also be obtained through skillful selection of the process parameters for grinding and subsequent ultrafine surface finishing. The multitude of possible applications is driving the further development and, with it, the customer-specific optimization of polishing results. The polishing application carried out here demonstrated once again the potential of elastically bonded grinding and polishing tools.

« Based on the estimated potential, it should also be possible to produce tribologically challenging surfaces using MFP polishing wheels. »

Dr.-Ing Timo Bathe, Managing Director, InduGrind GmbH

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About InduGrind GmbH from Bochum, Germany

InduGrind GmbH is a mid-sized company that arose out of the acquisition of a tool and cylindrical grinding shop in Bochum. Following the acquisition by Dr.-Ing. Timo Bathe in the summer of 2022, the already existing operations were successively modernized and new processes and workflows installed. Customers from the gear industry place their tools in the hands of InduGrind GmbH for high-quality grinding and reconditioning for reuse. Not just gear-cutting tools, but tools of all kinds are reconditioned and re-ground at InduGrind on a total of seven CNC grinding machines. Through its contact with companies in the gear industry, InduGrind GmbH also became involved in cylindrical grinding,

as customers also value the well-known quality of tool grinding in cylindrical grinding. The highly motivated and qualified InduGrind team is happy to take on any challenging manufacturing task – whether it involves the design of tools or the cylindrical grinding of various components up to a length of approx. 2 meters. InduGrind GmbH from Bochum in the heart of the Ruhr region offers a competent grinding service for tools and components.

Familiar workflows are deliberately rethought to provide optimal manufacturing workflows for different lot sizes. This includes both new approaches for the machining and manufacturing of high-quality machining tools and services for cylindrical grinding of a wide range of workpieces from various branches of industry.

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About ARTIFEX Dr. Lohmann GmbH & Co. KG from Kaltenkirchen, Germany

Founded in 1924 as a mid-sized family business in Hamburg, Germany, ARTIFEX Dr. Lohmann GmbH & Co. KG quickly made a name for itself with metal cleaning blocks for household use. Today we operate globally as a leading manufacturer of elastically bonded grinding and polishing tools. With our worldwide sales network, we advise customers around the globe on the topic of abrasive machining of glass and metal. At ARTIFEX Dr. Lohmann GmbH & Co. KG, you can expect “Made in Germany” quality and a fair price-performance ratio. We specialize in the professional abrasive machining of glass and metal and provide advice to a wide range of industries – from

the process industry to structural steel design and mechanical engineering to aerospace. We combine 100 years of tradition with the expertise of today. In close dialogue with our customers, machine manufacturers, and application engineers, we tackle the challenges of new products and surfaces, develop suitable technologies for them, and constantly expand our know-how.

We are flexible and can quickly and easily develop ideal solutions for our customers. In our laboratory, we carry out research to find the perfect materials and shapes for a wide range of applications.

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