

Optimized machining for microsurgical instruments – Customized milling cutter with HiPIMS coating for maximum performance

In microsurgery in particular, the quality of the microsurgical instruments plays a major role in the success of an operation. This places the highest demands on their manufacture in terms of precision, durability and workmanship. MICROMA Martin Alber GmbH & Co. KG from Irndorf, Germany, has been a specialist in the production of microsurgical instruments for many years. With a milling tool from NACHREINER GmbH in Balingen-Weilstetten, Germany, tailored to the application, the medical technology experts were able to significantly reduce the machining time – and almost double the tool life. A key detail in the adaptation of the milling cutter was the high-performance HiPIMS coating.

Surgical spring scissors, needle holders and forceps in the smallest dimensions are the specialty of MICROMA. In order to meet the extreme demands placed on such high-precision microsurgical instruments, the highest quality standards are mandatory. The guarantee of success at MICROMA is the combination of specially designed special machines, high-quality materials and high-performance precision tools. “Precision and quality are indispensable in medical technology and are uncompromisingly adhered to in our production. But of course we always focus on efficiency and productivity as well. That’s why we regularly put our processes to the test in order to tap into optimization potential. For example, we were looking for an efficient milling tool to reduce our machining times. We found what we were looking for at NACHREINER,” says Jan Alber, Production Manager at MICROMA.

In-house coating expertise for even more differentiated solutions

NACHREINER’s expertise lies in precision tools for demanding machining tasks involving metal, non-ferrous metals, plastic and composite materials. The company produces as much as possible in-house with optimized manufacturing, quality and service processes. Temperature-controlled production, modern technology for edge preparation and optimization of micro-geometry as well as innovative grinding, measuring and automation technology are fixed factors in its tool production. For some years now, an in-house coating line from CemeCon based around the CC800® HiPIMS coating system has also been a central component of production. Martin Seifriz, Managing Director at NACHREINER GmbH: “Our aim is to develop the best cutting tools for our customers now and in the future so that they can achieve outstanding product quality. Thanks to our high level of vertical integration, including premium coating expertise, we can deliver outstanding solutions. The CC800® HiPIMS is the key to differentiating ourselves even better from the competition with high-quality coating solutions.”

With the HiPIMS technology CemeCon has once again significantly increased the quality and performance of coatings compared to other processes. The technology is flexible and suitable for coating many different tool variants. Whether small batches or batch sizes with high quantities: It can be optimally adapted to different

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requirements, for example from micro-tools to tools for heavy-duty machining – and within a very short time. The HiPIMS coatings have excellent properties across this entire range: they are smooth, adhesive, hard and tough at the same time, have a fine crystalline, dense morphology, adapted residual stresses and high thermal stability. The uniform layer thickness distribution also contributes to optimum wear protection of the cutting tools. The perfect combination for precision tools in premium quality.

Application with special challenges

The manufacture of microsurgical instruments places high demands on the cutting tools: they are made of stainless steel (1.4034 or 1.4022). These high-quality steels are characterized by their high resistance to corrosion and acids. They are also very tough and have low thermal conductivity. Excellent properties for use in medical technology, but a challenging combination for machining. This is because high temperatures are generated at the cutting edge during drilling, milling or turning, which can damage the tool. In addition, the machining itself is very demanding: the milling tool must achieve a high material removal rate on a long and thin component while also achieving good surface qualities.

Precise adjustment for excellent performance

In a first step MICROMA switched to the solid carbide HPC Superstar milling cutter from the NACHREINER standard range, which was then adapted to the special application in a second step. “The combination of a 3 and 6-edged tool in our Superstar milling cutter enables both efficient roughing and smooth finishing with outstanding surface quality. This is because the unequal pitch prevents vibrations and oscillations, among other things, and is therefore responsible for the very smooth running and reduced friction,” explains Martin Seifriz.

Even with the standard version, MICROMA was able to triple the feed rate and increase the cutting speed by more than 30 percent. “That was already a great success! We reduced our machining time and achieved first-class machining results with increased productivity,” says Jan Alber happily. But that was just the beginning; optimizing the tool further improved the results. To this end, the experts worked closely together to adapt the milling cutter precisely to the MICROMA application and almost doubled the tool life. In addition to the targeted adaptation of the micro-geometry, the coordinated TiAlSiN coating also provided an additional performance boost.

The standard milling cutter from NACHREINER has an AlTiN coating. However, the TiAlSiN coating offers significant advantages when machining stainless steel: Thanks to its high temperature stability up to 1,100°C, it optimally protects the tool from heat during the machining process and the heat is dissipated through the chip. “The extreme smoothness resulting from the HiPIMS process further reduces the heat. TiAlSiN also has a low affinity to stainless steels. This reliably prevents built-up edges and ensures process reliability,” says Marc Semder, Sales Manager at CemeCon, explaining the benefits of the customized coating solution.

Successful partnership

The collaboration between MICROMA and NACHREINER shows how crucial an intensive exchange between user and tool manufacturer is. Through the use of HiPIMS technology from CemeCon and the targeted optimization of the tool geometry MICROMA was able to shorten the machining time while at the same time significantly increasing tool life. A result that inspires everyone!



With a milling cutter with HiPIMS coating from NACHREINER tailored to the application, MICROMA was able to significantly reduce the machining time for the microsurgical instruments while doubling the tool life.
(Photo: NACHREINER)



Jan Alber (left), Production Manager at MICROMA, and Martin Seifriz (right), Managing Director at NACHREINER, in front of the HiPIMS coating system in the NACHREINER production facility.
(Photo: NACHREINER)



Customized milling cutter with TiAlSiN coating (Photo: NACHREINER)



Microsurgical instruments from MICROMA (Photo MICROMA)



With NACHREINER tools, MICROMA was able to increase the cutting speed by more than 30 percent and triple the feed rate. (Diagram: CemeCon)



Thanks to the precise adjustment of the milling cutters to the application, the tool life was almost doubled.
(Diagram: CemeCon)

Numb. of char: 6.691 (characters, including spaces)

Id.-No: 137_8341

Metadata:

Meta-title

Optimized cutting for microsurgical instruments: HiPIMS coating for maximum efficiency

Meta-Description

MICROMA relies on coordinated milling cutters from NACHREINER with HiPIMS coating from CemeCon. The tools reduce machining times, have double the tool life and ensure maximum precision in the production of microsurgical instruments.

Tags / Keywords

MICROMA, NACHREINER, CemeCon, machining, HiPIMS coating, milling, microsurgical instruments, medical technology, milling tool, tuned milling cutter, precision tools, tool life, reduce machining time, increased feed rate, increased cutting speed, TiAlSiN coating, stainless steel, tool optimization, coating system, CC800® HiPIMS

About NACHREINER GmbH

NACHREINER GmbH from Balingen-Weilstetten is a renowned and highly respected tool manufacturer in the global industry. NACHREINER has been a reliable solution partner for machining technology since 1981 and consistently follows the guiding principle “Precision means leaving nothing to chance”. The company produces high-quality milling, drilling and reaming tools for machining a wide variety of materials at its sites in Balingen and the Black Forest with a high level of vertical integration. In addition to the standard range, the experts also offer users from a wide variety of industries intensive technical advice on customer-specific solutions; in addition, they manufacture individual special tools for special applications. An efficient regrinding service and innovative coatings round off the product range perfectly.

About MICROMA Martin Alber GmbH & Co. KG

MICROMA Martin Alber GmbH & Co. KG from Irndorf has stood for the development and production of high-precision microsurgical instruments, such as micro-spring scissors, micro-needle holders and micro-tweezers, since it was founded in 1989. The owner-managed company combines maximum flexibility for small and large series with the highest quality standards. As an MDR-certified company, MICROMA is active in the OEM and own brand labeling sector. This makes the medical technology expert a powerful and valued partner.

The instruments for microsurgery are produced on specially developed machines that have been specifically designed for these demanding requirements. The combination of high-quality materials and expert manufacturing ensures that the products not only have an exceptionally long service life, but also a high level of availability. MICROMA also offers a fast and reliable repair service for microsurgical instruments.

About CemeCon AG

CemeCon is the world market leader in diamond coating and technology leader in PVD coating of precision tools for machining. The coating materials required for premium coatings are produced within the coating systems developed by CemeCon.

Customers make use of the company's expertise in both coating services and plant engineering. Renowned tool manufacturers worldwide use the technology and expert knowledge of CemeCon for their own competitive advantage and to open up new business areas.

CemeCon has brought the future technology HiPIMS to market maturity. It combines the advantages of all common PVD coating processes – and that with high economic efficiency. With HiPIMS, maximum performance and a significantly longer tool life are possible even when machining materials that are extremely difficult to machine. Maximum productivity in the machining of innovative materials – such as fibre-reinforced plastics, ceramics or graphite – is guaranteed by the patented multilayer technology in diamond coating developed by CemeCon.

Founded in 1986 by Dr. Toni Leyendecker, CemeCon AG has expanded continuously over three decades. At its headquarters in Würselen, the company operates the world's largest coating center. All important international markets are served from there and from the centers in the USA, China and Japan as well as by our sales partners in the Czech Republic, Denmark, Taiwan, Korea, India and Russia.

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