

Accuracy and best optics high on the agenda

Efficiency combined with ultra-precise machining



"We get on very well with Röders' own control system"
Production Manager *Nikolaj Sterzer* (Photo: Private)

What has proven itself in tool and mould making is also suitable for everyday use in general metal cutting. Especially when, in addition to good cutting performance, high precision and excellent optical quality of the parts are required. Which milling centre should be chosen for such tasks? A field report from a medium-sized company that has to fulfil constantly changing production tasks associated with high quality demands.



Sophisticated component made of anodised aluminium for a high-quality bicycle (Photo: Klaus Vollrath)



"Our speciality is primarily complex and demanding turned and milled parts with tight tolerance specifications that are required in small quantities"
Heiko Legner
(Photo: Klaus Vollrath)

„We started in 1998 as pure service providers for design tasks,” recalls Dipl.-Ing. Heiko Legner, Managing Director of Circle GmbH in Weilmünster (Germany). As self-employed designers, Heiko and Andreas Legner initially provided support for development departments, primarily in the automotive industry. Over time, customers increasingly requested the rapid production of samples, which were initially manufactured by cooperation partners, e.g. using stereolithography (STL) or laser sintering (Selective Laser Sintering, SLS). In 2007, a milling machine was put into operation

for the first time for the production of sample parts as well as small series made of metal. Mostly aluminium is machined, but also steel, stainless steel and titanium to a certain extent. This special service has been expanded constantly since then. In the meantime, the company has three milling centres and four lathes, including a turning-milling centre. In addition, injection moulding machines as well as equipment for surface finishing such as



View of the interior: The weight-compensated Z-axis features a length-compensated spindle and alignable coolant spray nozzles. The rotary swivel table is equipped with a zero-point clamping system (Photo: Klaus Vollrath)

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vibratory finishing systems or machines for blasting with glass beads or nutshell granulate are also in use. The customer base is broad and includes not only the automotive industry but also manufacturers in areas such as medical technology, aerospace, mechanical engineering and the optical industry.

FULL SERVICE FROM A SINGLE SOURCE

„Our speciality comprises complex and demanding turned and milled parts with tight tolerances that are required in quite small quantities,“ adds H. Legner. Optical quality often plays an important role here, for example in the interiors of first-class aircraft or luxury cars, but also in medical technology products or visible components for high-end measuring systems. Here, one can offer the customer the essential advantage of fast overall realisation from a single source. This begins with advance consultation, design and construction and includes all subsequent stages up to the ready-to-install solution. All the prerequisites for this, such as modern CAD/CAM software, production systems and assembly facilities, are at hand.

In addition to quality, adherence to deadlines is also a priority, for example for products that are needed on time for approval dates or trade fairs. All services that cannot be provided in-house, such as surface coatings, heat treatments or the procurement of bought-in parts, are carried out by a network of proven suppliers with many years of experience. The quality assurance system is certified according to ISO 9001:2015. In addition, customer-



In this aluminium housing for a hand-held control unit, aesthetic demands for the surface after vibratory finishing, glass bead blasting and anodising are paramount (Photo: Circle)



Very thin-walled and therefore sensitive to damage during post-processing: sensor housing made of aluminium (Photo: Circle)

Aluminium housing for aircraft reading lights: The tumbled, glass-bead blasted 5-axis milled part should not show any machining marks after anodising (Photo: Circle)



“An essential aspect of our development projects is working in partnership with the customer’s design engineer”
Heiko Legner

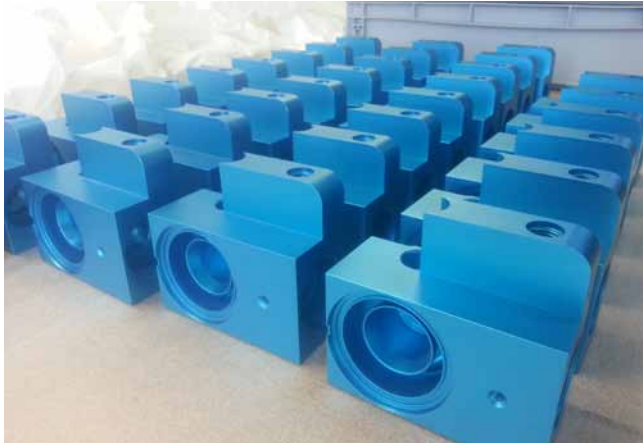
specific QA instructions or test systems as well as initial sample test reports in accordance with VDA factory standards are also applied on request.

PRODUCT DEVELOPMENT IN PARTNERSHIP

„An essential aspect of our development projects is working in partnership with the customer’s design engineers,“ explains H. Legner. Here, the Circle experts contribute their knowledge of the possibilities and limits of the production processes used for realisation. A drawing created by a junior designer with the help of a CAD system is by no means a guarantee for problem-free production. For production on a CNC-controlled machine, additional input is needed regarding clamping positions, machining strategies, tool selection and which tools can be used to reliably achieve certain surface qualities. Here, cooperation with the Circle experts helps to avoid suboptimal results, which often cause technical as well as economic disadvantages. The customers appreciate the advantages of this overall package including advice, speed of realisation and quality of the delivered product.

FOCUS ON SURFACE QUALITY

„Many of the products we manufacture have to meet exceptionally high demands in terms of surface quality,“ says H. Legner. This concerns not only flat areas as well as free-form surfaces,



These anodised aluminium visible parts for ventilators have to meet particularly high standards of dimensional accuracy (Photo: Circle)

produced strictly according to Circle's specifications: the NC programme and the tools were specified exactly, and Circle itself provided the material from its own stocks. For the second workpiece, the machine manufacturer could then try to be faster or achieve a better result with his own software and tools.

STRESS TEST PASSED

„After Röders had achieved by far the best result in terms of surface quality in these tests, we also carried out an endurance test at the manufacturer's premises," says Nikolaj Sterzer, production manager at Circle. He travelled to Soltau himself and tried to bring the machine to its knees with an extremely hard roughing task using a 16 mm milling cutter. The machine also passed this test well. In the meantime, Röders has even adopted this task as a benchmark. In addition, it was also possible to clarify during this test run which of the spindle options available at Röders was best suited to the company's own requirements profile. During the visit, the already positive impression of the qualification and consulting competence of the Röders employees was further strengthened. He also had very good experience

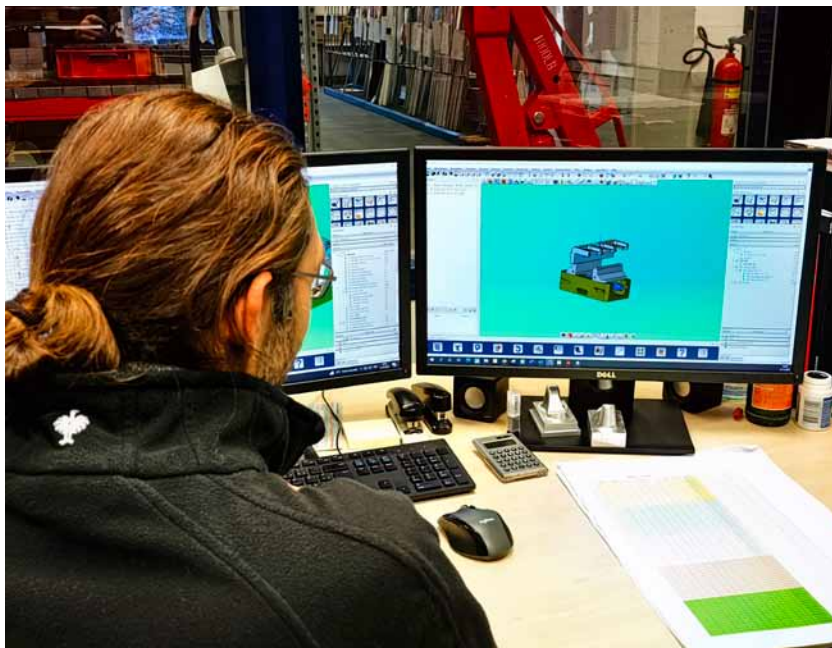
throughout with the installation and the first one-week training as well as the subsequent telephone support. As a confirmed Heidenhain® user, he found that he had no problems with the new system and that it offers many interesting options. For example, the dripping of coolant through thin tools, which may interfere with measurement, can be prevented using specific commands. He gave the support from Soltau a straight A+. The selected Röders system – an RXP 601 DSH – has been in operation since April 2022.

TOP PERFORMANCE, SUPPORT AND SERVICE

„For us, it is not necessarily the pure machine running time of part production that is decisive, but the complete process, including the finishing of highly decorative

surfaces," H. Legner summarises. When using the Röders milling machine, he has noticed time savings of up to 25%. The surface quality was already so good after the milling process that manual finishing could be significantly reduced. The differences were most noticeable in critical radius transitions and 5-axis free-form surfaces.

Another important factor was the quality of the manufacturer's service. For him, a quick response to problems is just as essential as the machine's performance during production. At the end of the day, the best machine is of no use to him if he has to wait weeks for repairs. That is why he had already asked around in advance by visiting references at companies with Röders machining centres, but also without chaperone by Röders at colleague companies in the vicinity, and had received consistently positive feedback.



The connection of the Röders system to the CAD-CAM environment from Catia, Solidworks and Hypermill worked straight away (Photo: Private)

but also transitions after a change of tool or clamping position. Therefore, when the procurement of another milling machining centre was pending in 2021, these criteria figured prominently in the list of requirements. It was not only a matter of the visual quality of the surfaces immediately after machining: it was crucial that no grooves, shoulders or machining marks should be visible even after further surface finishing such as vibratory grinding, glass bead blasting or anodising. With the machinery available at the time, it was often necessary to grind or polish for up to three days after completion of the milling process in order to ensure acceptable results for the customer.

In the search for a new system, they therefore looked at numerous manufacturers. In the first step, the number of candidates was initially narrowed down to 6-7 and finally to three, including Röders from Soltau. The first test part was to be

This positive reputation then proved to be deserved when, after some time, a sensor defect occurred. After the report, a Röders employee appeared the very next morning and got the machine running again.

In general, the complete handling of ordering, delivery and training in the initial phase was exemplary. This also applies to the always competent and quick support via the hotline, which often had been strained, especially in the initial phase. The next phase in the near future will be the automation of the plant with Röders' own system in order to be able to switch from the previous two-shift operation to 24-hour operation.
Klaus Vollrath b2dcomm.ch

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THE RÖDERS RXP 601 DSH

The Röders RXP 601 DSH HSC 5-axis milling machine has been designed to meet the highest accuracy requirements while at the same time achieving optimal cutting performance, even with materials that are difficult to machine, such as stainless steel or titanium. It has frictionless linear direct drives which, in combination with 32 kHz controllers in all axes, enable dynamic and high-precision machining. With this high correction frequency, a significant reduction in machining time can be achieved with optimum surface quality at the same time.

An essential prerequisite for this is high-precision optical scales in all axes - when it comes to precision, no compromises are made. The machine can also be used for jig grinding due to its accuracy and dynamics. In addition, the Z-axis features patented frictionless vacuum weight compensation.

To ensure maximum thermal stability, the system has a sophisticated temperature management system. The temperature of the medium flowing through all essential system components is controlled with an accuracy of ± 0.1 K. Another special feature is a dedicated control system based on PC technology, whose functionalities are precisely tailored to the specific tasks of HSC high-precision milling or coordinate grinding and other grinding operations. Since Röders has developed the control itself on the basis of industrial PCs and the Windows operating system, updates of both hardware and software are available on request at any time, so that obsolescence of the machines on the part of their control can be virtually ruled out. <<