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USER REPORT



From a 5-axis micro injection molding machine to a six-axis-controlled high-tech production cell

mikrotechnik HIRT (abbreviated MTH), based in Schramberg, Germany, is establishing itself increasingly as a specialist in small components, micro parts and hybrid parts. In close partnership with its customers, MTH develops highly complex products and components which it produces with advanced technology and process reliability. MTH manufactures these parts on a MicroPower 15/10 from WITTMANN BATTENFELD.

mikrotechnik HIRT, founded by Franz Hirt, is a young, innovative company located in the central Black Forest. Its specialty is the development, design and production of micro parts consisting of plastics combined with metal, as well as complete systems. In this area, MTH has been cooperating closely with WITTMANN BATTENFELD for a number of years. For Franz Hirt, owner-manager of MTH, close cooperation with his partners is a vital success factor. "Optimal results can only be achieved by an honest technological partnership based on mutual trust", says Hirt.

At MTH, a machine from WITTMANN BATTENFELD's *MicroPower* series with 150 kN clamping force has been installed, specially designed for injection molding of micro parts. This machine offers the utmost in terms of precision and cost efficiency, made possible primarily by its two-step screw-and-plunger injection unit with shot volumes ranging from 0.05 to 4 cm³. Thermally homogeneous melt is injected via this aggregate. This enables the production of top-quality parts with absolutely stable manufacturing processes and short cycle times.

Working together in close partnership, MTH and WITTMANN BATTENFELD have jointly developed the 5-axis *MicroPower* into a 6-axis production cell. With this equipment, parts with unscrewing functions, helical micro cogwheels and shafts with inclination profiles can now be manufactured with high precision.

Following mold opening, the cavity element inside the mold is driven by a toothed belt installed on the side of the mold to release the molded part for ejection. The ejector subsequently demolds the part with a servo-electric drive, and a new cycle starts as soon as the contour element has been returned to its original position.

The entire operation of the unscrewing unit is integrated completely into the machine's UNILOG B6 control system and operated from there. This makes it very easy for the user to address any conceivable unscrewing position with high precision. This function also makes it possible to drive thread cores inside the mold, for example to produce high-precision internal threads on molded parts. One example of an industrially produced part with such prefabricated internal threads is a focusing device used mainly in cameras to hold lenses in place and/or focus them, or in medical measuring devices to focus optical measurement systems.

MTH processes all types of thermoplastics. This also includes MIM injection molding. As a next step, micro thermoset processing is in planning. In its product development, MTH cooperates closely with renowned institutes and technology centers, in particular with KISW in Villingen, a partnership greatly appreciated by Franz Hirt: "To put it simply, we know and trust each other, and sometimes one look is enough to understand what the other person thinks and would like to have realized. This is the way to master even projects with a difficult start."

More than 40 years of experience in injection molding and stamping of parts as well as assembly of components in international companies have enabled Franz Hirt to develop his molds in-house and design them in 3D. His designs are developed with zero tolerance and high precision down to at least three decimal places. To achieve optimal manufacturing conditions, MTH cooperates with carefully selected suppliers in business relations developed over several years. These partners produce the mold components according to CAD and CAM specifications with a precision below $\pm 5 \mu\text{m}$ for all stages and parts. Ejectors and drillings with a diameter of $200 \mu\text{m}$ alone present a special challenge in terms of manufacturing processes and accuracy. Only few manufacturers are able to fulfill the stringent requirements imposed by Franz Hirt. For example, the suppliers, which are selected according to strict criteria use $100 \mu\text{m}$ tools for cutting. Nevertheless, the success rate for the new molds is no more than 70% in the first step.

Manufacturing of the products developed at MTH is only possible with the best high-tech 5-axis machines and experienced staff. For example, MTH drills bore holes into hard mold components with a $65 \mu\text{m}$ drill at about 60,000 to 80,000 revolutions per minute. Moreover, micro wire cutters with 0.03 mm wire diameter are used to cut extremely fine geometries, inclined parts produced in pairs and subsequently assembled into functional groups using special technologies. One customer of MTH is REINZ-Dichtungs-GmbH, domiciled in Neu-Ulm, Germany, an automotive supplier.

Maximilian Birk, project leader for application technology projects in the area of plastics systems at REINZ, and his colleague Philipp Zedelmaier, who is responsible for developing plastics systems, are both impressed by the products coming from MTH. "Micro parts such as those we develop and produce with MTH are hardly available anywhere else on the market. For us, MTH is exactly the partner we need for new developments in the micro parts segment", says Maximilian Birk.

Strategically, MTH with its current workforce of three is on a course of expansion and will continue to develop into a specialist in the course of 2017. MTH is working on projects which, from today's point of view, are expected to provide work for several machines. There is no doubt that the micro sector will continue to grow due to the trend towards miniaturization, and the next step will be nano technology. Franz Hirt is certain that the hybrid micro sector is still in its infancy and has enormous potential, especially in medical technology, electronics, communication and satellite technology, as well as in the automotive industry.

WITTMANN BATTENFELD and REINZ-Dichtungs-GmbH wish mikrotechnik HIRT the best of luck and success for the future.



Fig. 1: from the left: Philipp Zedelmaier and Maximilian Birk from REINZ-Dichtungs-GmbH, Franz Hirt, MTH, Wolfgang Straubinger and Martin Philipp-Pichler, WITTMANN BATTENFELD, in front of the *MicroPower 15/10*

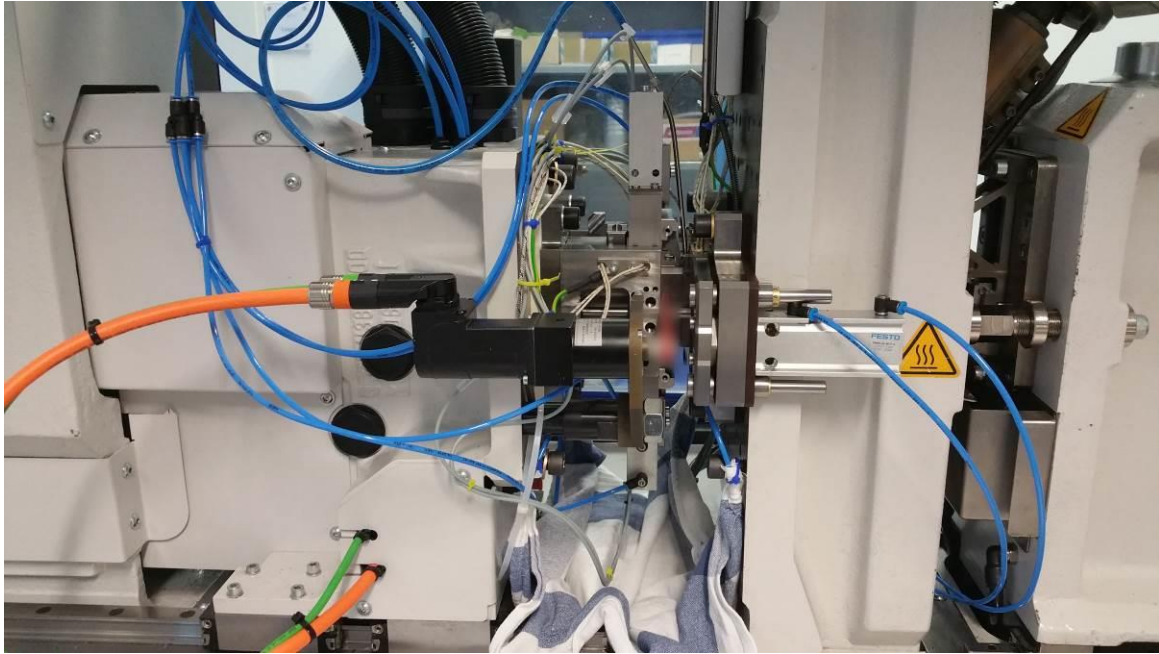


Fig. 2: Mold with integrated unscrewing unit (photo: courtesy of mikrotechnik HIRT)

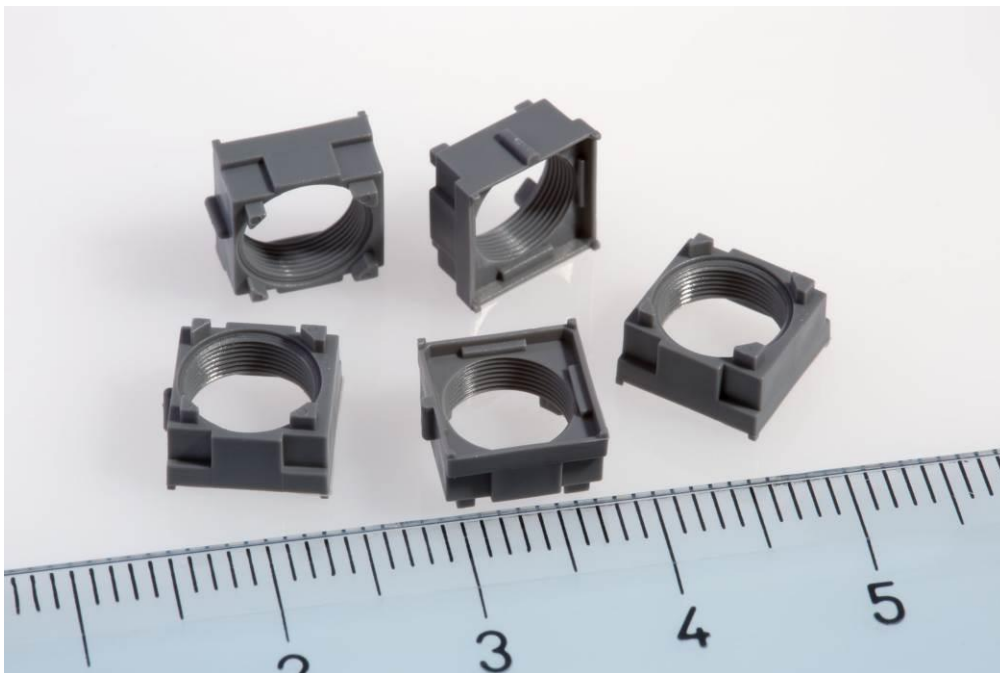


Fig. 3: Focusing device – example of a part with an internal thread produced industrially on a *MicroPower*

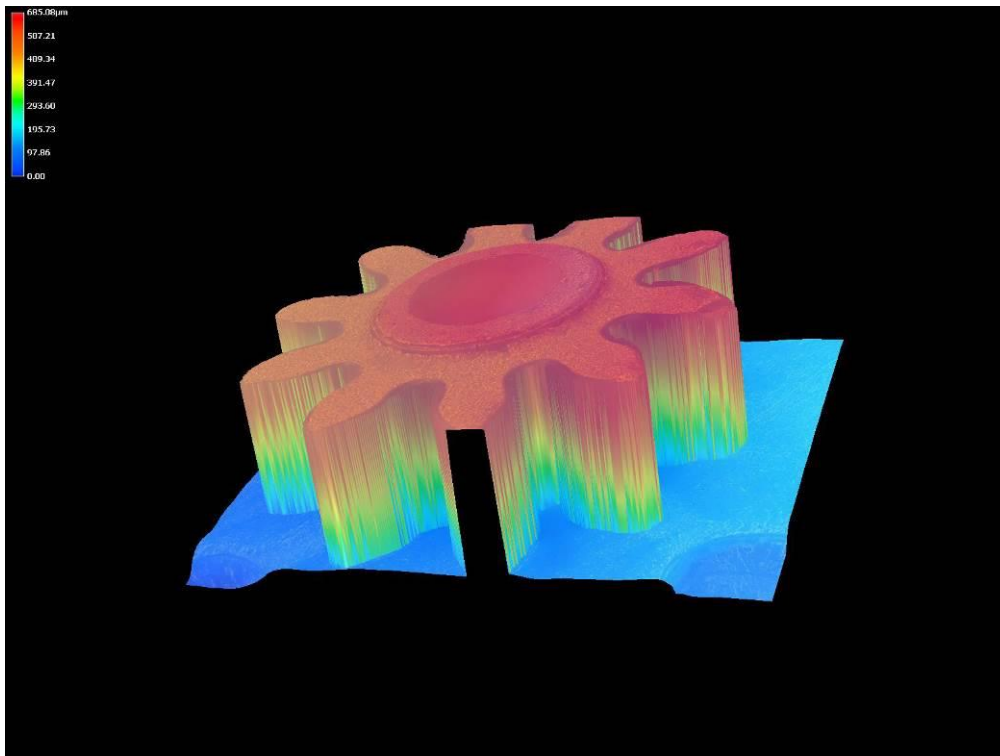


Fig. 4: 3D scan of a component (photo: courtesy of mikrotechnik HIRT)

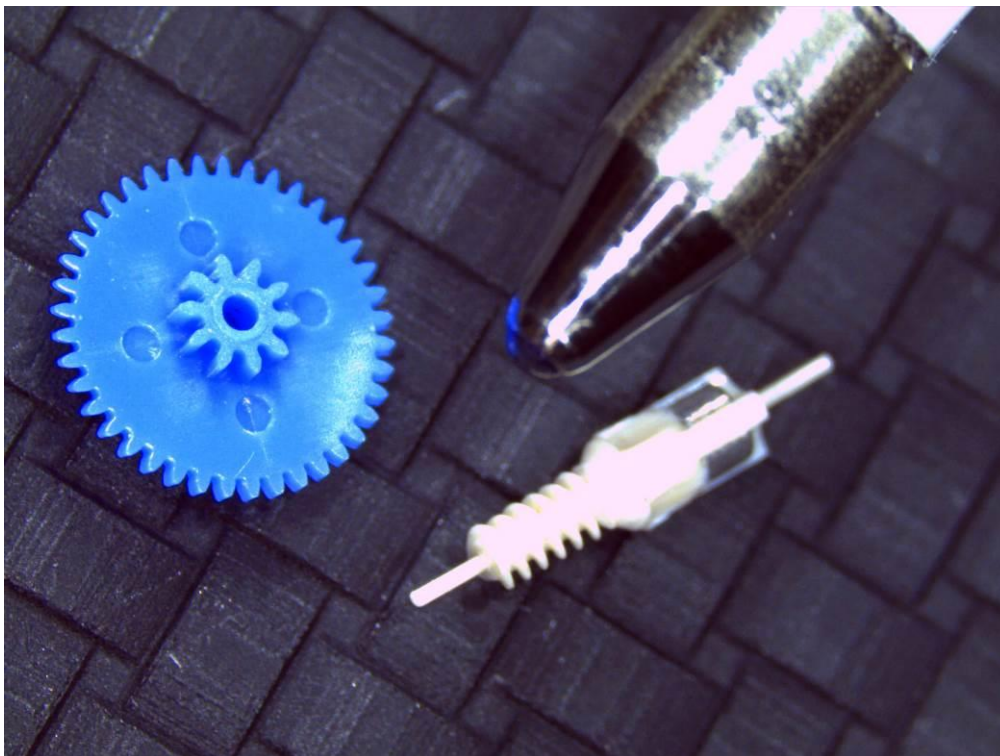


Fig. 5: Cogwheel compared with other objects to illustrate its size (photo: courtesy of mikrotechnik HIRT)

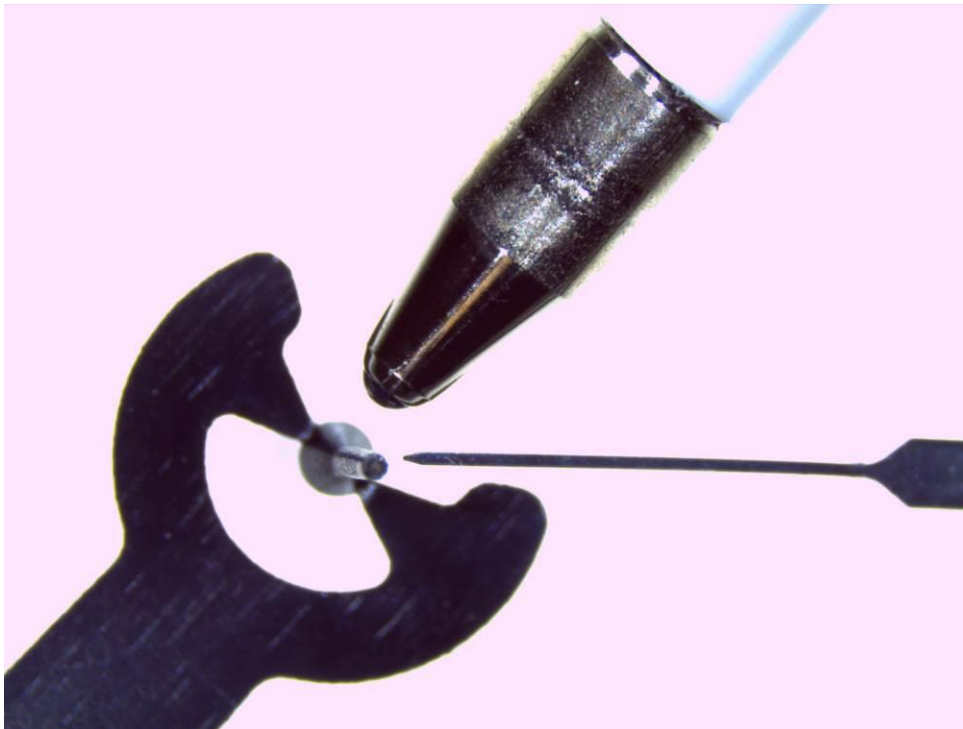


Fig. 6: Drain tube compared with other objects to illustrate its size (photo: courtesy of mikrotechnik HIRT)

The WITTMANN Group

The WITTMANN Group is a worldwide leader in the manufacturing of injection molding machines, robots and peripheral equipment for the plastics industry. Headquartered in Vienna/Austria, the WITTMANN Group consists of two main divisions, WITTMANN BATTENFELD and WITTMANN, which operate 8 production facilities in 5 countries, including more than 33 direct subsidiary offices located in all major plastics markets around the world.

WITTMANN BATTENFELD focuses on independent market growth in the manufacturing of state-of-the-art injection molding machines and process technology, providing a modern and comprehensive range of machinery in a modular design that meets the actual and future requirements of the plastic injection molding market.

WITTMANN's product range includes robots and automation systems, material handling systems, dryers, gravimetric and volumetric blenders, granulators, mold temperature controllers and chillers. With this comprehensive range of peripheral equipment, WITTMANN can provide plastics processors with solutions that cover all production requirements, ranging from autonomous work cells to integrated plant-wide systems.

The syndication of the WITTMANN Group has led to connectivity between all product lines, providing the advantage plastics processors have been looking for in terms of a seamless integration of injection molding machines, automation and auxiliary equipment – all occurring at a progressive rate.

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