

# m&h PROBING SYSTEMS AND SOFTWARE

miTec - Mikrotechnologie GmbH, Limbach Oberfrohna, Germany



Small and fine

von Karl-Heinz Gies

**Small and fine, this is the motto used in precision manufacturing at the East German company miTec. Moulds and tools for the manufacture of precision parts and precision components with microstructures are checked for tolerance compliance using m&h hardware and software while still clamped on the machine. This saves 50% of manual work.**

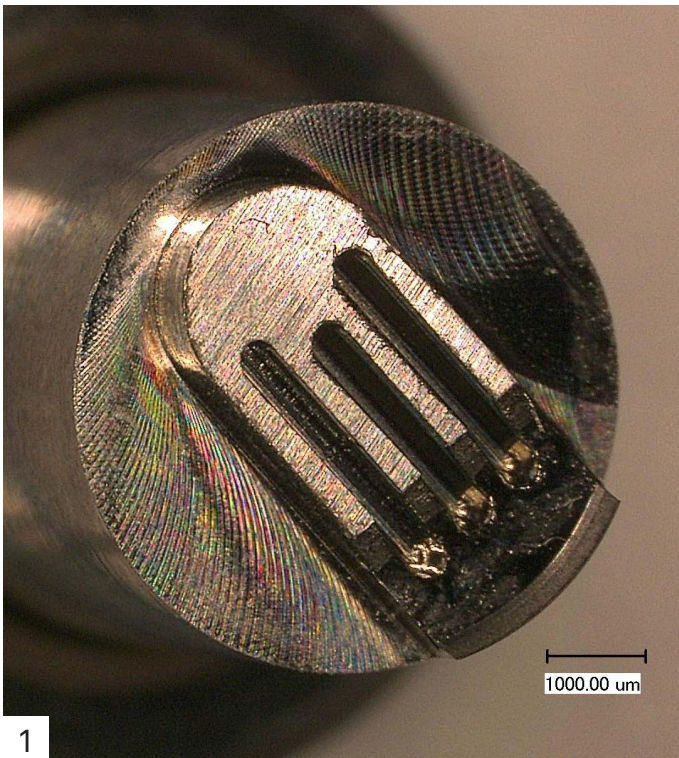
Particularly fine parts for the optical industry, medical engineering, fluid and sensor technology come from moulds and tools manufactured at miTec Mikrotechnologie GmbH in Limbach-Oberfrohna in the Vogtland. The young company, only founded in 2008, has already established an excellent reputation manufacturing precision parts for the business sectors listed above.

Established on a greenfield site, the company is entirely geared to high-precision manufacturing of the finest structures. Airlocks inside the production facility enable virtually clean room conditions. Machinery comprising Huron and Makino machines is installed in temperature controlled rooms ensuring constant machining conditions. The Makino machining centre is equipped with both spindle cooling and cooled bed slideways – an important prerequisite for manufacturing precise parts with small geometries and tolerances of  $\pm 2,5 \mu\text{m}$ . With fluids, often there are capillary structures with ducts only  $50 \mu\text{m} \times 50 \mu\text{m}$  in size. Appropriate electrodes are milled from graphite with dimensions of  $30 \mu\text{m} \times 30 \mu\text{m}$ . For hard machining, they mill with HSC technology using milling cutters down to a diameter of only  $100 \mu\text{m}$ .

The Huron VX6 with Siemens 840D control is used for rough machining. The Makino V33 and the 5-axis Makino V22, both with Fanuc controls, are exclusively used for finishing and fine machining. The Huron VX6 is equipped with m&h type 32.00 touch probe type and type 35.70 toolsetter. Both devices communicate with the control by means of infrared data transmission via the same receiver. Tool lengths and actual tool diameters are measured with the toolsetter and subsequently processed as correction values in the control. This enables precise work, taking into consideration the respective clamping situation of the tools. Since large diameter tools are mostly used on the machine, the cost-efficient toolsetter 35.70 with its probing disc is perfect. The 3-axis Makino V33 machining centre is also equipped with an m&h type 32.00 touch probe.

During set-up, workpiece edges are found by the touch probe, considerably reducing the normally time-consuming set-up. After workpieces have been machined, contours are measured at critical points using the m&h 3D Form Inspect software and a nominal/actual comparison is made with the CAD drawing. This allows tool wear to be precisely monitored and the operator knows immediately whether or not he needs to make adjustments. Possible displacement of tools during machining is detected at an early stage. In the event of a problem, mechanical reworking is done while the workpiece is still clamped on the machine. This allows keeping close tolerances and avoids time-consuming rework.

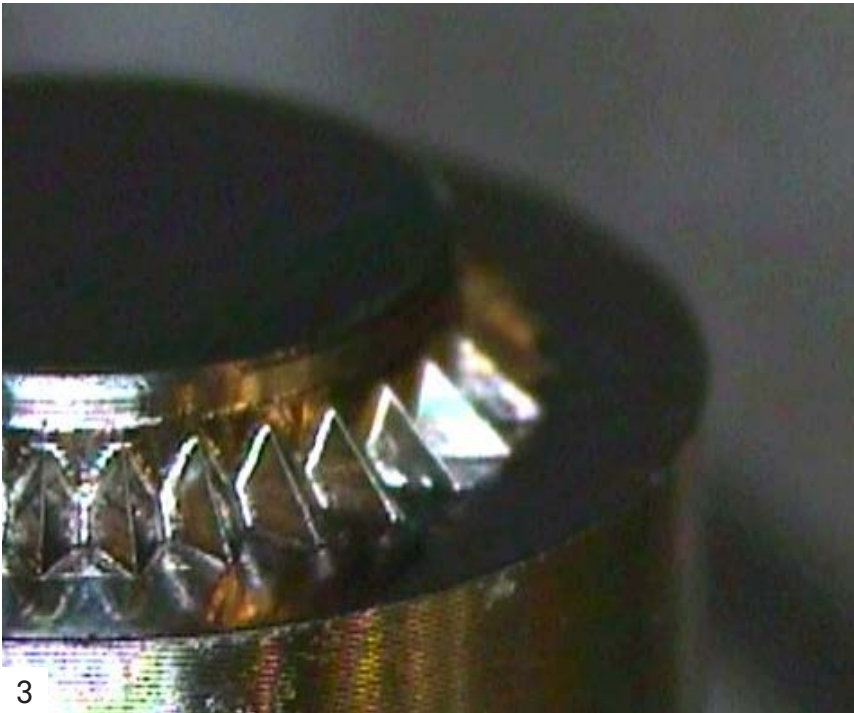
On the Makino V33, workpiece measuring while still clamped is now an inherent part of the machining cycle at MiTec. Even during workpiece setting-up, when they sometimes see deformation due to hardening, 3D Form Inspect is used for checking. For this purpose, the m&h software module Best Fit is used. This finds the position of the workpiece based on important contours and transmits correction values to the control. The control then shifts the workpiece zero points accordingly and adjusts the position of the machining program to the actual position of the workpiece. This means that the workpiece only needs to be clamped approximately in the intended position. This way, not only is the set-up procedure shortened but it also ensures the workpiece is machined in the optimum way without "air cutting", which is quite often the case after serious deformation has taken place. Particularly for mould constructions, using several plates that merge within the



1| Microstructures on 3D surfaces are checked using m&h while still clamped on the machine



2| Maik Harbich, managing director of miTec, is more than satisfied with m&h touch probes and 3D Form Inspect software



3| Microstructures milled in 60 HRC 4| State-of-the art machinery at miTec is geared to precision

3D contours, electronic alignment using 3D Form Inspect and Best Fit is an indispensable aid. Maik Harbich, head of milling technology at miTec, is enthusiastic describing his experience with m&h 3D Form Inspect: "With mould facets and tangential transitions, which must have certain verifiable radii, 3D Form Inspect is simply indispensable." As an example he refers to a bending tool that has been built using several plates, which had to show these transitions in the contour. On the tool, a tolerance of only  $\pm 5\mu$  was allowed. The inserts were prefinished with an allowance of 2 - 3 hundredths. They were measured with 3D Form Inspect and then finished to size based on the measured results. "Everything fitted perfectly," tells Maik Harbich. "There was not even need for die spotting!"

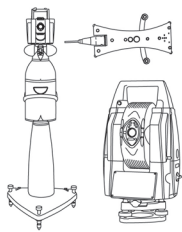
In another case an injection mould was manufactured, also without die spotting. "When sampling the mould we could completely seal it by simply increasing the contact pressure," reports Maik Harbich with pride. After introducing the measuring software on the machine, manufacturing cycles at miTec were considerably shortened. "We have reduced subsequent manual work by a good 50%," tells Maik Harbich. This gives the company a competitive edge against their competitors. "Customers increasingly require short delivery times. Today the time between release and finished tool is very short," Maik Harbich describes the realities he faces. Software and touch probes from m&h have been very helpful in this respect. Especially simple handling and the possibility for easy programming in the workshop at the machine are praised by MiTec. "We quickly sorted out initial handling questions with the m&h service department," explains

Maik Harbich. "After the first calibration and adjustment of machine parameters by Makino all is now running trouble-free".

Naturally at first miTec made a comparison with results from their measuring machine. Particularly critical tools for fluids with stepped geometries and very tight tolerances were used as test specimens. The deviations detected were in microns with the maximum deviation detected being about  $8\mu$ . "3D contours simply have to be correct", says Maik Harbich. "To check this, we need m&h 3D Form Inspect. This means safety for the machine operators and we know at an early stage that our workpieces are precise and will fit." This is why it is only a matter of time before the 5-axis Makino V22 is also equipped with m&h touch probes.

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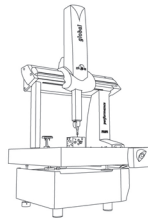




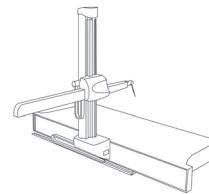
LASER TRACKERS  
& STATIONS



PORTABLE MEASURING ARMS



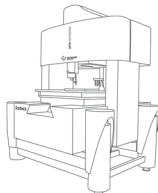
BRIDGE CMMs



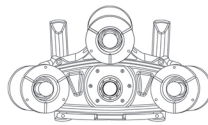
HORIZONTAL ARM CMMs



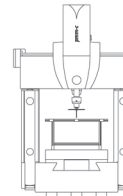
GANTRY CMMs



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