

# Media Release

Nidau, June 2010

## **When fractions of a micrometer count**

**Reflective surfaces made on micro-structures in record time. GF AgieCharmilles is setting a new milestone in Swiss machine building with the model series MIKRON HSM 400, 400U, 500 LP Precision.**

### **The best foundations**

A new era has begun on the shores of the Swiss Lake Biel. The high-speed milling machines of the model series MIKRON HSM 400, 400U, 500 LP Precision are being manufactured in recent months in a costly individual manufacturing process. Experienced experts use handpicked machine components to build a MIKRON HSM LP Precision in order to manufacture something unique. No machine leaves the works without proving its unconditional suitability for machining demanding workpieces in extensive test cycles.

GF AgieCharmilles is the only European machine manufacturer to offer a solution for process-reliable tool measurement on the machine tool. The potential for this functionality was recognized quite early on and thus there began evaluation of intelligent alternatives some years ago. The result is now to be marvelled at at GF AgieCharmilles: IntelligentToolMeasurement (ITM) - an optical tool measurement at the full spindle speed. "MIKRON HSM LP Precision with its current features is just not practically conceivable without this groundbreaking technology," stated GF AgieCharmilles Product Manager Georg Scheiba, who emphasized the significance of this smart machine module.

Since technological advances also permit even more efficient operating strategies to be developed, each MIKRON HSM LP Precision customer receives comprehensive support from GF AgieCharmilles. Specific technology training sessions about everything to do with the product and the process control in the high-end precision range offer insights into high-performance and therefore profitable manufacturing.

### **Precision material cutting operations**

The MIKRON HSM LP Precision is ushering precision material cutting into a new era. The tool path must be maintained and followed precisely with a minimum of control noises, even when subjected to the effect of high axial accelerations. Only then is it possible to obtain the surface qualities and contour precisions required on a MIKRON HSM LP Precision. The fact that every electrical machine produces waste heat means that the drive groups on a precision machine tool must be cooled in a targeted manner. Each of the linear axes as well as the rotation/tilt unit has its own cooling circuit. The Opticool concept with its spindle nose cooling also, at the same time, allows a previously unheard of temperature stability. The ingenious cooling management on the MIKRON HSM LP Precision prevents heat flow from the drive motors in the machine bed. This results in a geometric stability which secures the extremely high repeat accuracy in the axial movement management.

But we must be careful! What advantages does the user have if a MIKRON HSM LP Precision can perform the smallest axial movements of 100 nanometres (1/10,000 mm) but lack of precision in detection of the tool geometry frustrates achieving this precision class on the workpiece? Everyone who has sought to exactly meet a milled surface again using different tool diameters will understand the practical impossibility of achieving this task. However, this is necessary, in order to ensure perfect crossovers between sections of areas which have been machined using different tools.

One of the main reasons lies in the mode of operation of conventional laser measurement. Different tool geometries lead to different immersion conditions in the laser beam and therefore to variations in the absolute Z-reference. Dirt particles or oil drops attached to the tool can also lead to a measuring result which deviates from the actual tool contour.

The approach taken by the solution from GF AgieCharmilles is totally different. The exclusive tool measurement ITM (IntelligentToolMeasurement) records the whole tool tip up to 12 mm in diameter on modern image sensors. The digitally recorded tool geometry is cleaned up digitally using special software and only then is it measured: thus ITM, for the first time, allows one to obtain a tool measurement with an absolute Z-reference in micrometre range. This is a breakthrough which allows one to develop new and more efficient operating strategies.

### **Results**

The field of high precision machining ranges from components for minimally invasive surgery over miniaturised flow components through to deep into tool and mould making (e.g. for LED's, reflectors or the smallest structural characteristics).

We will take a closer look at this point as an example of what can be achieved for the precision class in which the MIKRON HSM LP Precision machines operate, at the results which were achieved on a reflector insert.

The basic material to be machined is a high alloy, CrVMo steel (C1.7 Mn0.3 Cr17 Ni- V3 Mo1) manufactured from powdered metal with a hardness of about HRc 60. When removing the average amount of material in a finishing process with a residual oversize of less than 10 µm the whole workpiece surface could be machined to an average roughness of Ra = 0.020 µm = 20 Nanometre = 2 / 100,000 mm. An average roughness of Ra = 0.020 µm represents the ISO roughness class N1. This fantastic result was attained and obtained measured both in the direction of the feed and in the path feed direction.

### **When the machine becomes "smart"**

Just as is the case in modern motor sport where vehicles are only drivable at the limits of their performance if the driver activates the electronic support functions, the high speed milling machines in the MIKRON HSM LP Precision series can also only be brought up to their performance limit if the electronic software support is used in the form of the patented "smart-machine" module OSS Precision (Operator Support System).

As the machine operator is guided through the intuitive user guide, he has the decisive control lever for influencing the parts' costs of the workpieces produced. Drive and control parameters should be overwritten by the control system in such a way that the customer can use the machine either for highly productive speed control, an excellent surface quality or absolutely precise

contouring. No matter what the tasks are, the objectives set can be reached more rapidly and more reliably. A leap in productivity which will surely pay off for the customer since the MIKRON HSM LP Precision remains the full-blooded high-speed machine with an axial dynamic which is unmatched anywhere.

### Further information

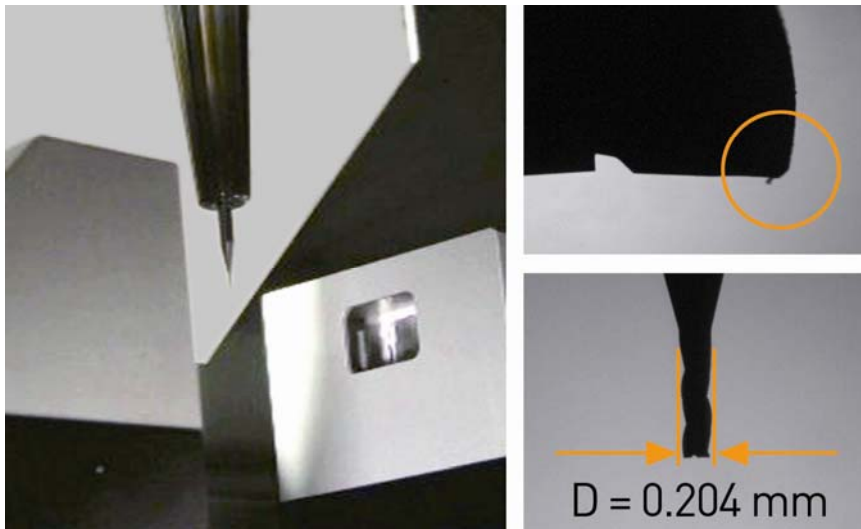
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### Picture legends

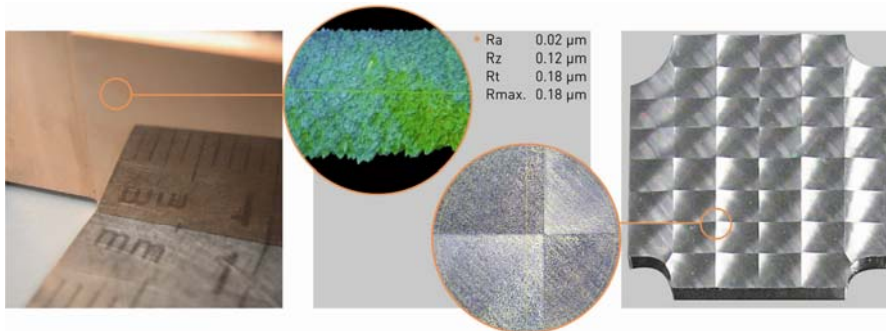
1. The basic machine: MIKRON HSM LP Precision with the smallest axial movements of 100 Nanometres



## 2. ITM tool measurement: a strong duo and not just some vision for the future - ITM and MIKRON HSM LP Precision



## 3. An example application: a reflective mirror insert - machined on a MIKRON HSM 400U LP Precision



### Profil von GF AgieCharmilles

GF AgieCharmilles is the world's leading provider of machines, automation solutions and services to the tool and mold making industry and to manufactures of precision components. The product range from electric discharge machines, high-speed and high-performance milling machines, including clamping and palettization systems, 3D laser surface texturing machines, services, spare parts and expendable parts, consumables and automation solutions. As a globally active group, GF AgieCharmilles, a consortium belonging to Georg Fischer Group (Switzerland), maintains a presence on 50 sites worldwide within its own organization. Its 2'542 employees generated sales of CHF 578 million in 2009. More information can be found at [www.gfac.com](http://www.gfac.com).