

- **Levicron goes international –*Precitech Inc.*** becomes sole distributor for Levicron spindles in the Americas and Asia



- **ASD010P/012P** – First batch of our work-holding spindle is now ready
- **ASD-H25/Cx** – Some new customer parts and applications
- **Balancing techniques** – A new dimension in balancing tool holders with Levicron's air bearing and balancing technology
- **Levicron expands premises and is hiring**



Levicron goes international

One of **Levicron's** goals is to offer spindle solutions to the ultra-precision machining market which are more robust, automated and thus more efficient, without sacrificing accuracy. The technical aspects of this goal are accomplished in the design of our tool spindles, the **ASD-H25** and **ASD-Cx**. These spindles feature automatic tool clamping, tool clamping status monitoring, a robust and patented air bearing system as well as efficient liquid cooling.

By joining forces with **Precitech**, a global manufacturer of innovative ultra-precision machining solutions, **Levicron** is able to bring these benefits to a broader market. With an installed base of over 1.500 systems in 22 countries **Precitech** is the leader in ultra-precision machining. Their worldwide sales, service, and application engineers enable them to solve their customers most complex machining challenges. **Precitech** has a relentless drive to provide its customers with innovative ultra-precision machining technologies.

Both **Precitech** and **Levicron** have recognized that by working together, each can achieve their goals. Thus Levicron is delighted to announce **Precitech** as their distributor for the Americas and Asia. **Precitech's** customer centers in the US and China will be upgraded to provide field service and sales consultation for **Levicron** spindles. **Precitech** and **Levicron** are looking forward to an exciting partnership and continuing to provide our customers with the most innovative ultra-precision machining solutions.



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EMA GmbH

Sales point for Switzerland

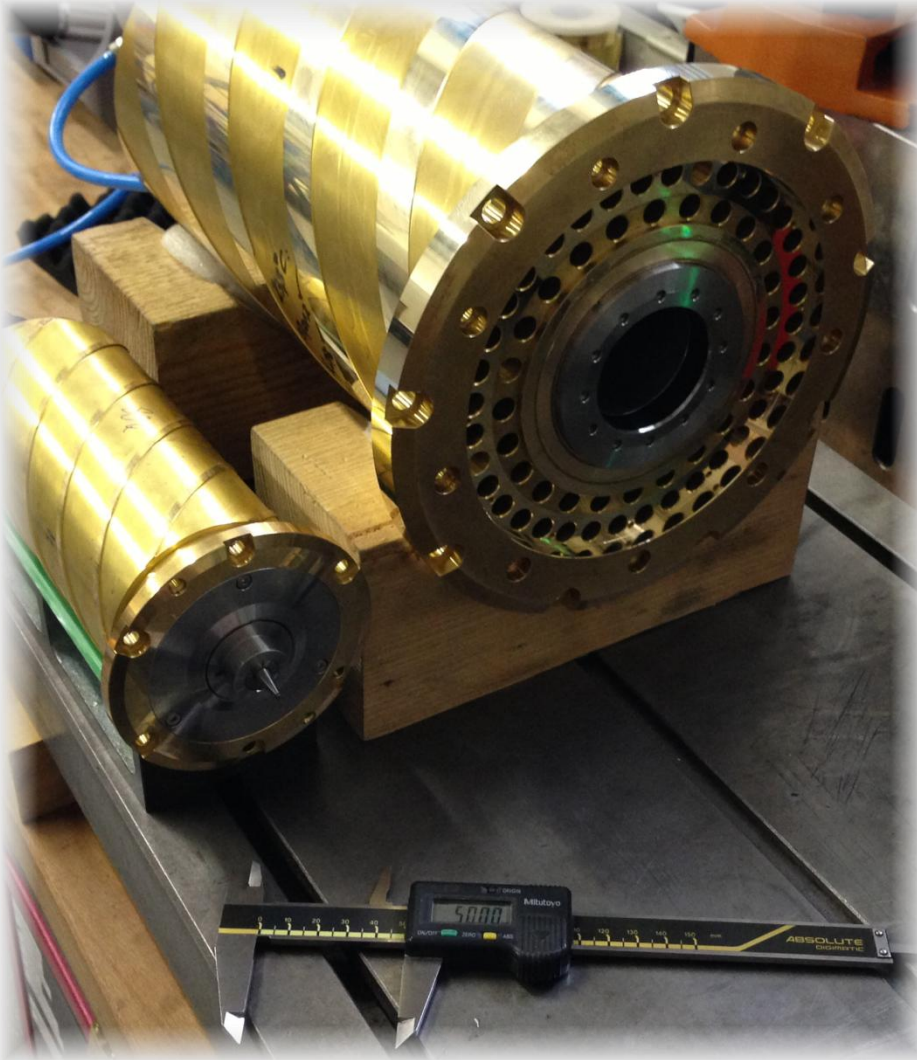
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LEVICRON

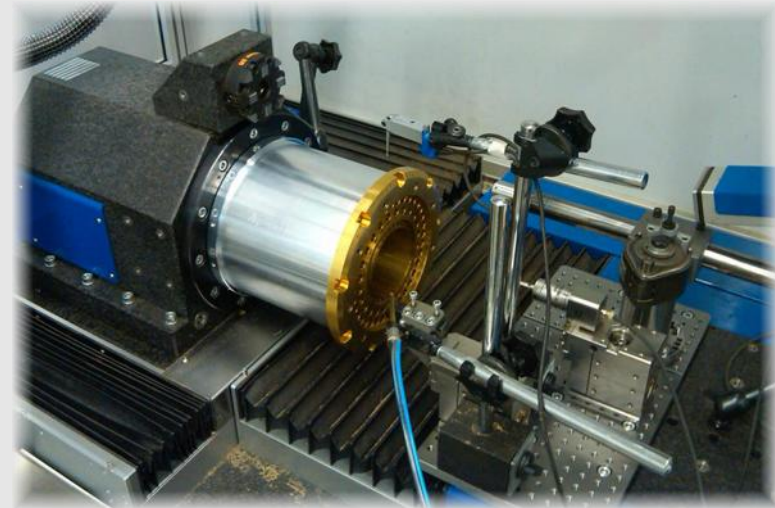


ASD010P/012P



The first batch of our work-holding spindle ASD010 is ready. Actual results of radial and axial stiffness tests showed even higher values than calculated. To date we have confirmed the following results:

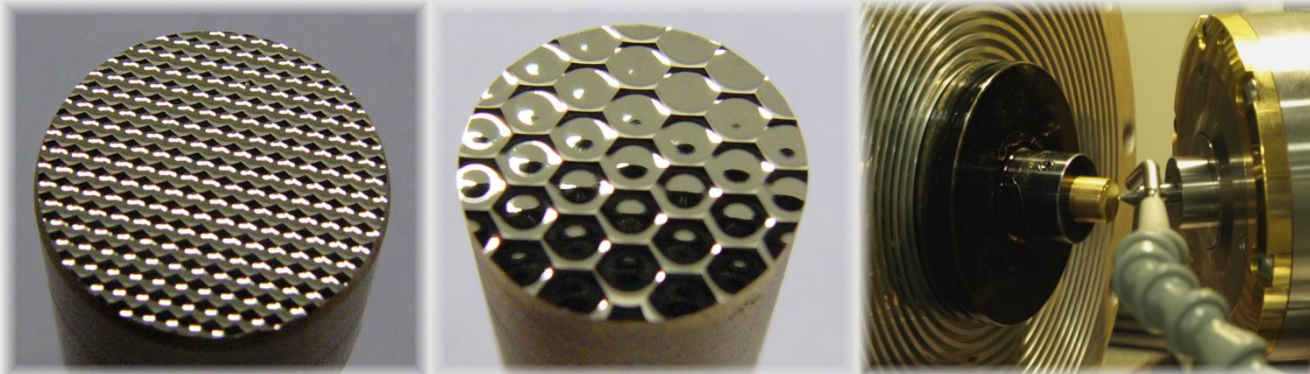
	Stiffness @ 6 bar / 87 psi	Ultimate Load Capacity @ 6 bar / 87 psi
	<i>N/μm (lbs/μin)</i>	<i>kg (lbs)</i>
radial, at face plate, static	220 (1.25)	1800 (183)
axial	270 (1.54)	2400 (245)



ASD-H25/Cx – New customer parts and applications

In general it's very difficult for us to get permission to use information and pictures of parts manufactured by customers. However some of them have shared their experience and results with us.

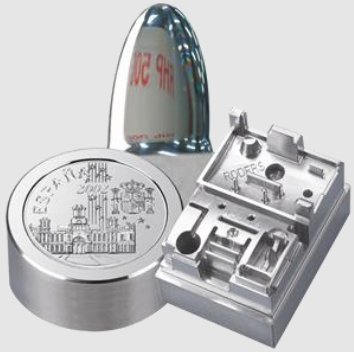
Lenslet arrays in brass/nickel – milled with our ASD080C6 on a Precitech machine tool



lens arrays made from aluminum – milled with our ASD060H25 in IPT Fraunhofer, Aachen



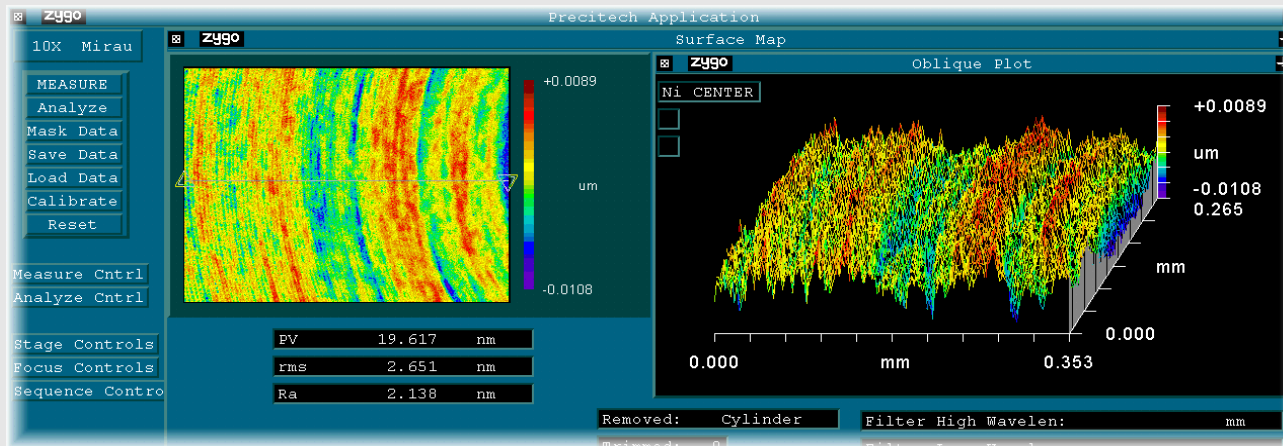
Molds in hardened steel – milled with our ASD060H25 on a Machine tool from Rödgers GmbH



Reflectors made from steel & brass – milled at Levicron with an ASD080C6 (click for machining video)



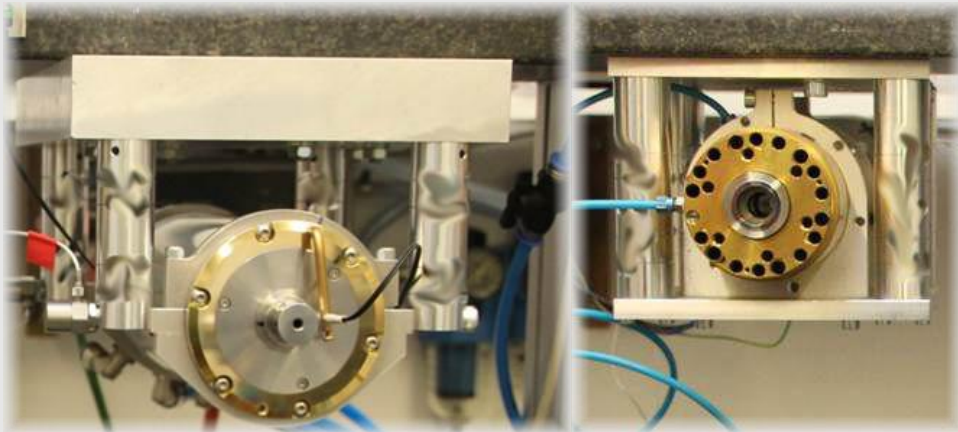
Flat nickel mirror milling results – machined with an ASD080C6 on a Precitech machine



Balancing techniques – A new dimensions in balancing tool holders with Levicron's air bearing and balancing technology

Along with the introduction of HSK tool holder sizes 25 and 20 (according to DIN 69893) requirements on dynamics increase dramatically as vibrations caused by imbalances climb quadratic with speed. Our milling spindle type **ASD-H25** with HSK-E25 taper interface already can be delivered with 100.000 rpm and leaves our premises with a **balance quality of < G0.05 mm/s @ 80.000 rpm** what is in accordance of a residual imbalance mass of **< 400 µg** per balancing plane according

$$G = e \cdot \omega = \frac{U}{m} \cdot \omega = \frac{U \cdot r}{m} \cdot \omega = \text{Güte} \left[\frac{\text{mm}}{\text{s}} \right]$$



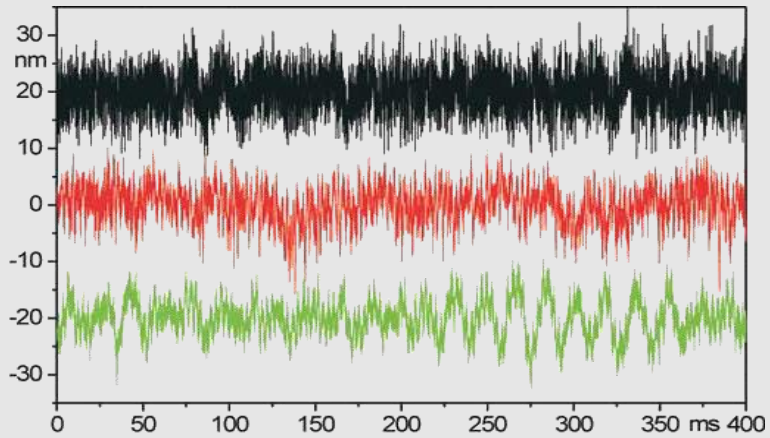
If you now use a **standard tool holder with a balance quality of G2.5 mm/s @ 25.000 rpm** this would mean a balance quality of G6 mm/s @ 60.000 rpm and a residual imbalance mass of about **15 mg**.

Thus and for the same diameter this means

$$\frac{\text{Residual imbalance mass tool holder}}{\text{Residual imbalance spindle shaft (cpl.)}} = \frac{25}{1}$$

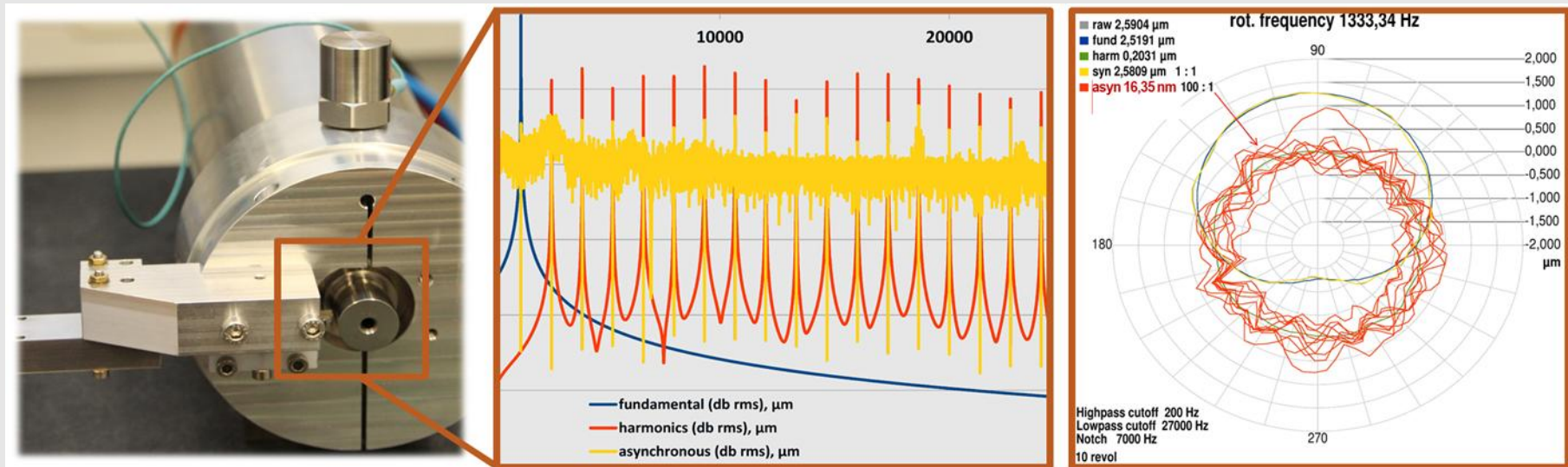
Impact of large imbalances:

1. Speed-synchronous vibrations – obvious
2. Synchronous and asynchronous vibrations due to axis reactions – vibrations mean accelerated masses and thus displacements. Machines with glass scales interpret this displacement as position error and try to counteract. As there are other masses involved like motors and tables and additional damping phase shifts can occur which often cause an amplification of the imbalance-induced vibrations.

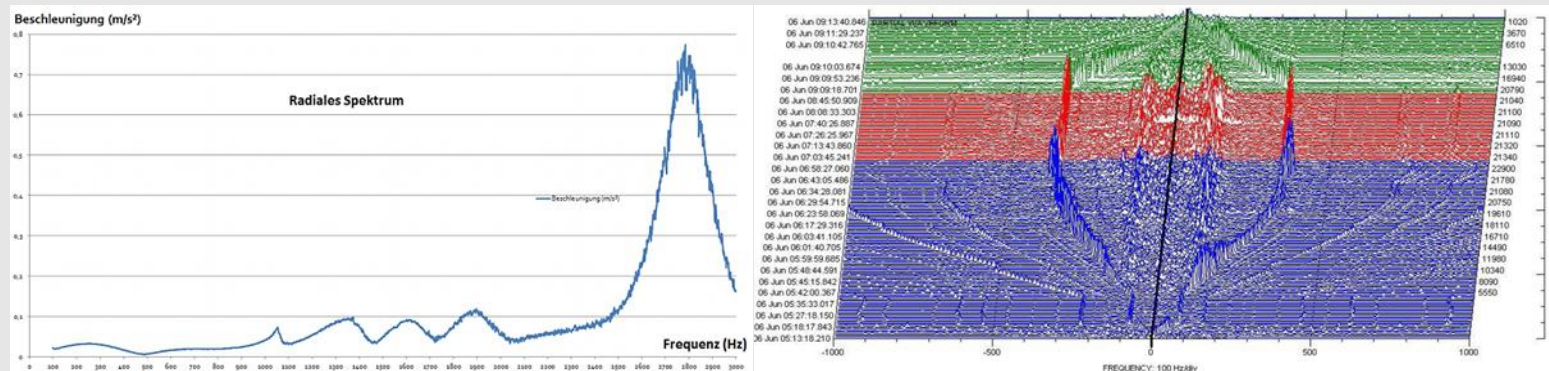


It's obvious that for ultra-precision machining such axis reactions don't allow machining of optical parts and lead to a lack of accuracy and increased tool wear. Considering the **asynchronous motion error** to be smaller than **30 nm** to machine optical parts vibrations coming from axis reactions are supposed to be smaller than **15 nm** which wouldn't be the case for the vibration chart shown to the left.

The very low asynchronous motion errors of our spindles with **17 nm at 80.000 rpm** in the example underneath as well as the resulting ability to create optical surfaces would be useless without a sophisticated multi-plane balancing and dynamics analysis.



For a final assessment of the spindle dynamics we perform a **waterfall-FFT** analysis where we record the vibration spectrum (amplitude with frequency) with speed in at least two Z-Positions of the spindle. This gives a broad overview of natural frequencies, system stiffness and damping.

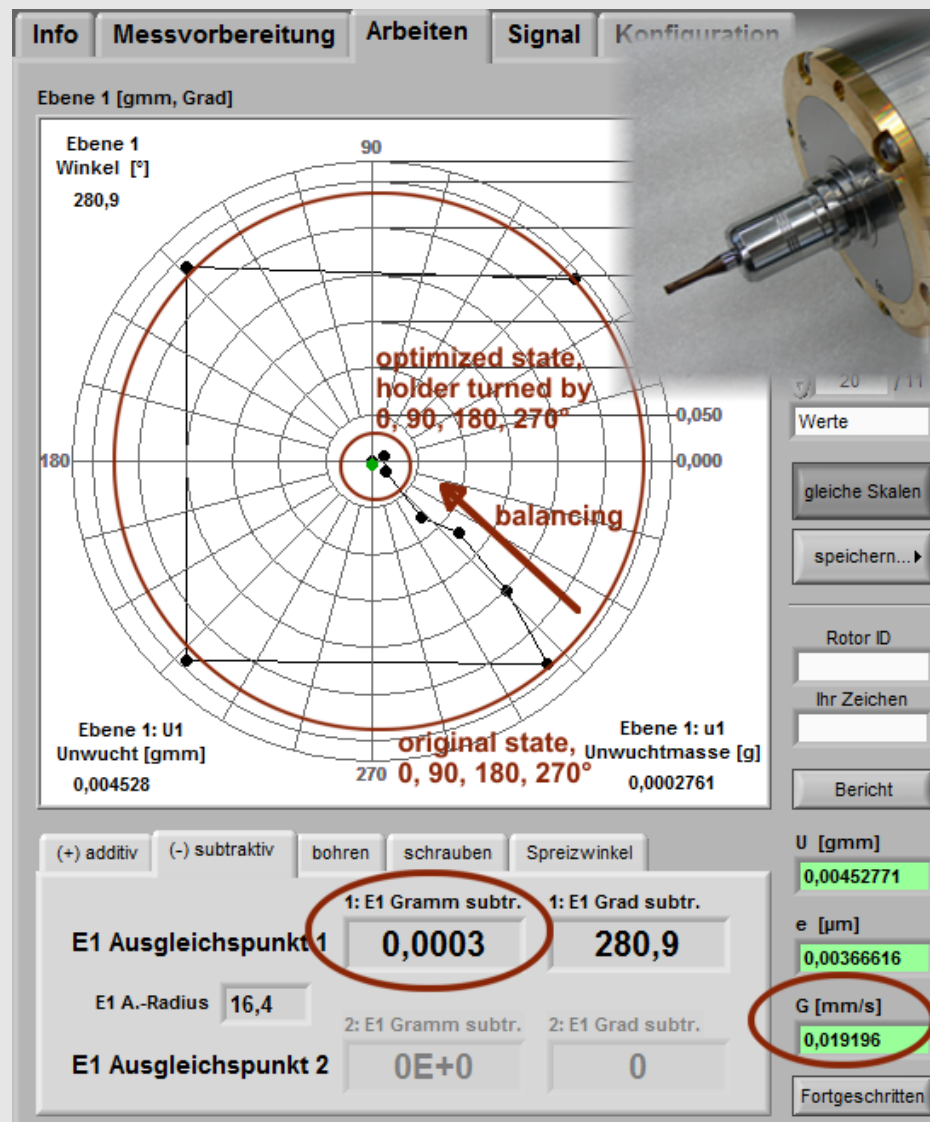


With respect to balancing at Levicron three unique features are combined:

1. The compensation ability of an air bearing gap allows very low synchronous and asynchronous motion errors and thus extremely good balance qualities as there are no cross couplings and overlapped frequencies from roller elements or a bearing cage.
2. The Insito-treatment of the shaft taper – ground in an air bearing system with an air bearing spindle - at the very end of the manufacturing process taper run-outs of < 50 nm and a **tool clamping repeatability of < 0.3 µm** can be guaranteed where of course the last value also is a function of the tool holder itself.
3. Tool holders can be **directly balanced in a spindle** what again would mean 1-to-1 conditions as later with the customer.

Tool holder balancing:

Multi plane balancing to the mentioned qualities and outside any system frequencies is crucial for precision and high-speed spindles. Levicron has design and built bespoke balancing rigs for spindle and **tool holder** multi-plane balancing and guarantees a repeatable balance quality for **tool holders of $G0.1 \text{ mm/s}$ @ 60.000 rpm. Please find an example of balancing a tool holder underneath, rotating the tool holder by 3 x 90° show the repeatability.**



Levicron expands their premises and is hiring

In the course of increased spindle sales and new products we are expanding our plant to make space for additional machinery and personnel. We are thus hiring:

1. *Master- / degree thesis:* "Applied Marketing of high-tech products",
2. *Master- / degree thesis:* "Production and quality control of non-state of the art products",
3. *Permanent employment:* Production and quality control engineer,
4. *Permanent employment:* CNC-Turner / -Miller / -Grinder.

Please refer to our [website](#) for details.