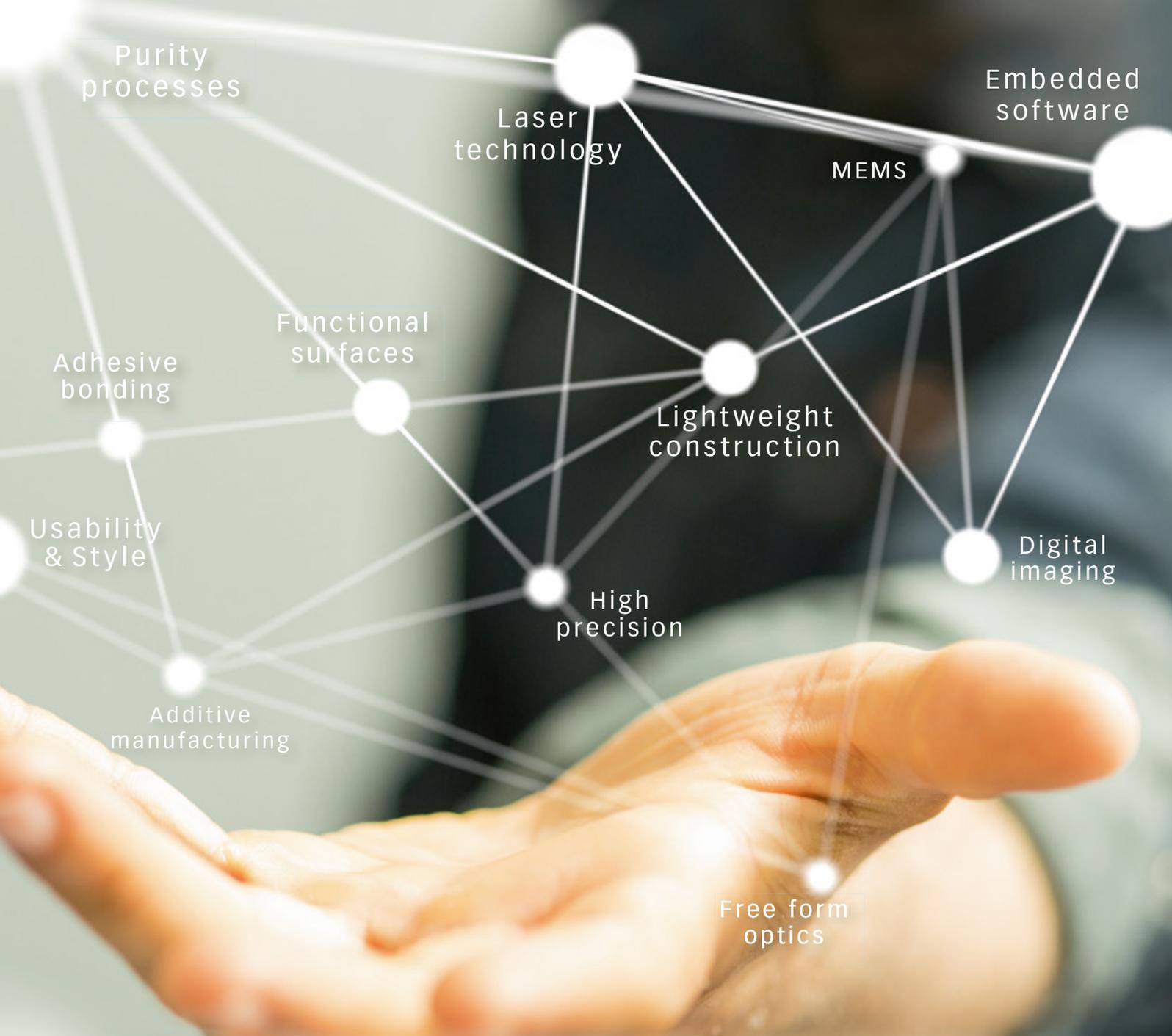


# TRM

Version 2.0



**WILD**

**PHOTONIC**

The Technology Roadmap of the WILD Group



## ➤ EDITORIAL

# *Shaping tomorrow's technologies today*

Which technological advancements are going to shape future product generations? How can we succeed in mastering these technologies in time and in their full complexity so we can develop innovative solutions for the future? WILD has a clear answer to these questions: a Technology Roadmap (TRM) developed specifically for this purpose. It guarantees that we constantly maintain a lead in as many as 12 technological areas, making us fit for innovations and their implementation. With targeted groundwork, we create speed. When a customer requires know-how, we can step in immediately at a very high level.

Such a comprehensive knowledge buildup, however, can only be achieved if one is open to new ideas. The TRM is primarily the reason why we think in international, highly competent networks. We have learned not only to develop and build by ourselves, but also to manage demanding networks. We have succeeded in forging strategic partnerships with, e.g., research organisations, universities, and technology clusters to secure the necessary flexibility for new topics. One of the most significant sources that feed our technology work, however, continues to be the particularly close contact we maintain to our customers.

At the same time, a fundamental cultural shift has taken place within the WILD Group. After all, technology work must not end in the development department. It must extend throughout the entire company. Therefore, our first step was to synchronise the customer, development, capital expenditure, SCM, and production areas.

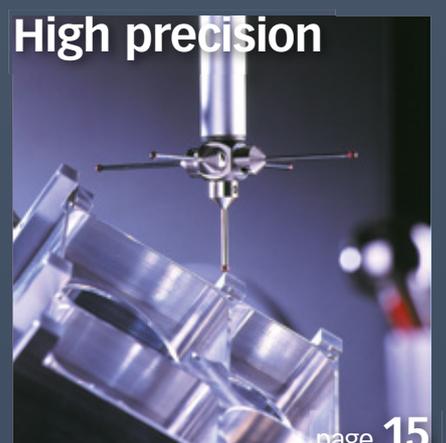
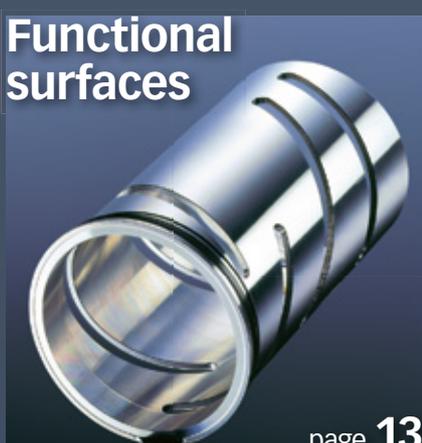
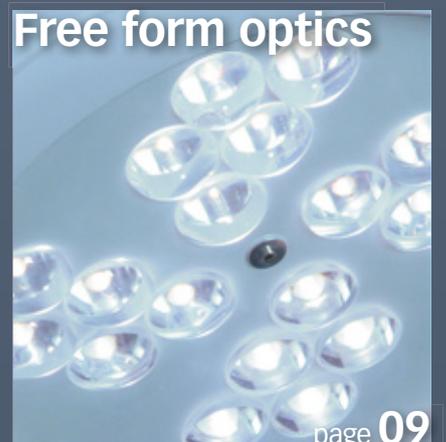
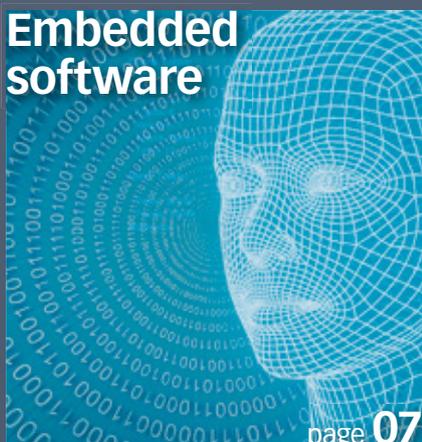
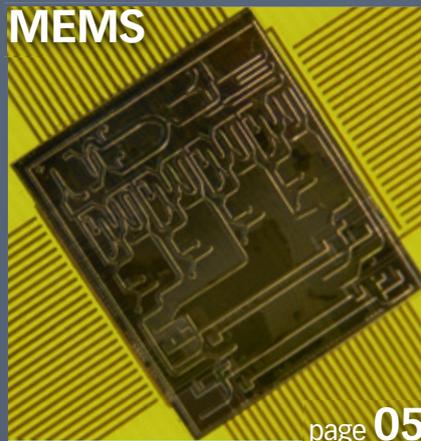
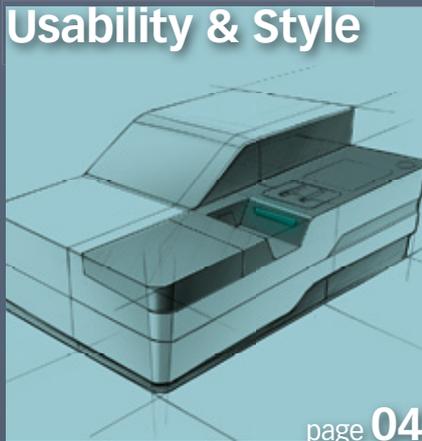
We are all now familiar with our common course. The feedback from the customers confirms that we are right on trend with our topics. Parallel to our own activities, some of these technologies have gained great significance in the market. Usability, for instance, is no longer a voluntary exercise but a necessity and has become an integral part of medical technology regulations. There is no getting around additive manufacturing either. Thus, the Technology Roadmap remains a „living organism“ at WILD. Once they are sufficiently mature, some topics will eventually form part of everyday work and will be replaced by new ones. In recent months, we have placed a strong focus on the areas of laser technology and digital imaging.

So the journey continues and with the Technology Roadmap we have a navigation instrument in place to keep us on the right course. The destination is clear: we intend to remain the best possible technology partner for our customers in the future.

**Dr. Josef Hackl & Ing. Wolfgang Warum**

CEO WILD Group and Managing Director WILD Electronics

# THE 12 TECHNOLOGY TOPICS AT A GLANCE:



# Usability & Style

## Design is more than styling

**Especially in medical technology, WILD focuses on the issue of usability already during the development process, since a product's usability is a condition for its approval.**

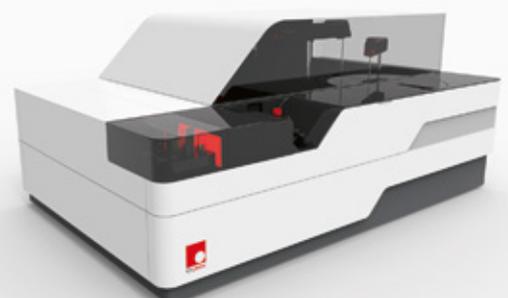
**The quality** of high-tech equipment is no longer determined solely on the basis of technical requirements, but also increasingly depends on how well it meets the user's demands. The latest standards in medical technology place an even greater priority on this factor, so that WILD decided to involve usability experts as early as in the development stage. „This is essential, since intuitive operation can save lives and almost rule out operating errors“, says Markus Possegger.

**How well** a product can be adjusted to the users' demands can be demonstrated by the Biochemistry Analyser, a radically new, complete device for in-vitro diagnostics. For the first time, it was possible to separate the user and process areas in a compact benchtop device, making operation both easier and safer. In conventional devices, users must manually intervene in the hazardous analysis area, thus exposing themselves to infection risks. The Biochemistry Analyser, however, which can analyze more than 50 values, independently conducts up to 400 individual measurements per hour, and stores data and status information directly into the laboratory database. A camera system identifies the sample containers and evaluates the barcode data, thus reducing sample mix-ups caused by the user to a minimum.

**Visually** the Biochemistry Analyser stands out through high-contrast design, which translates into clear, sleek shapes and structures. The graphical user interface is also reduced to a maximum of two colours per screen. This clarity takes into account the fact that the device will be operated by users of very different levels of education.

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# MEMS

## Super small, super smart

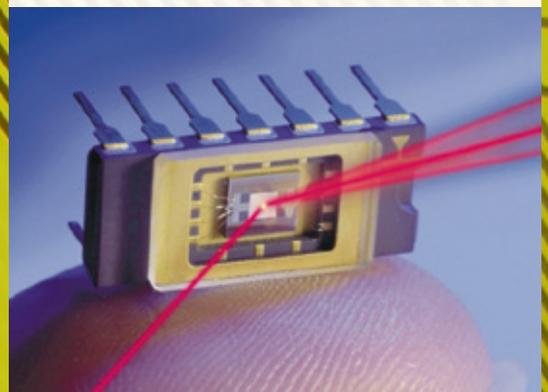
**Micro Electro Mechanical Systems, or MEMS, are extremely miniaturised systems that combine electronic and mechanical components. Thanks to MEMS, it is also possible to implement the functions of optomechatronic systems in a single component.**

**Though tiny,** they are more versatile, intelligent and powerful: MEMS systems have already revolutionized several products and brought forth ground-breaking innovations. Thanks to their small size, higher efficiency and multifunctionality at lower costs, they have become the standard solution for smartphones and tablets. In medical technology they also offer the potential to expand or replace conventional systems. In addition, since connectors and cables are no longer required and there is virtually no mechanical wear and tear, they are usually more reliable than conventional systems.

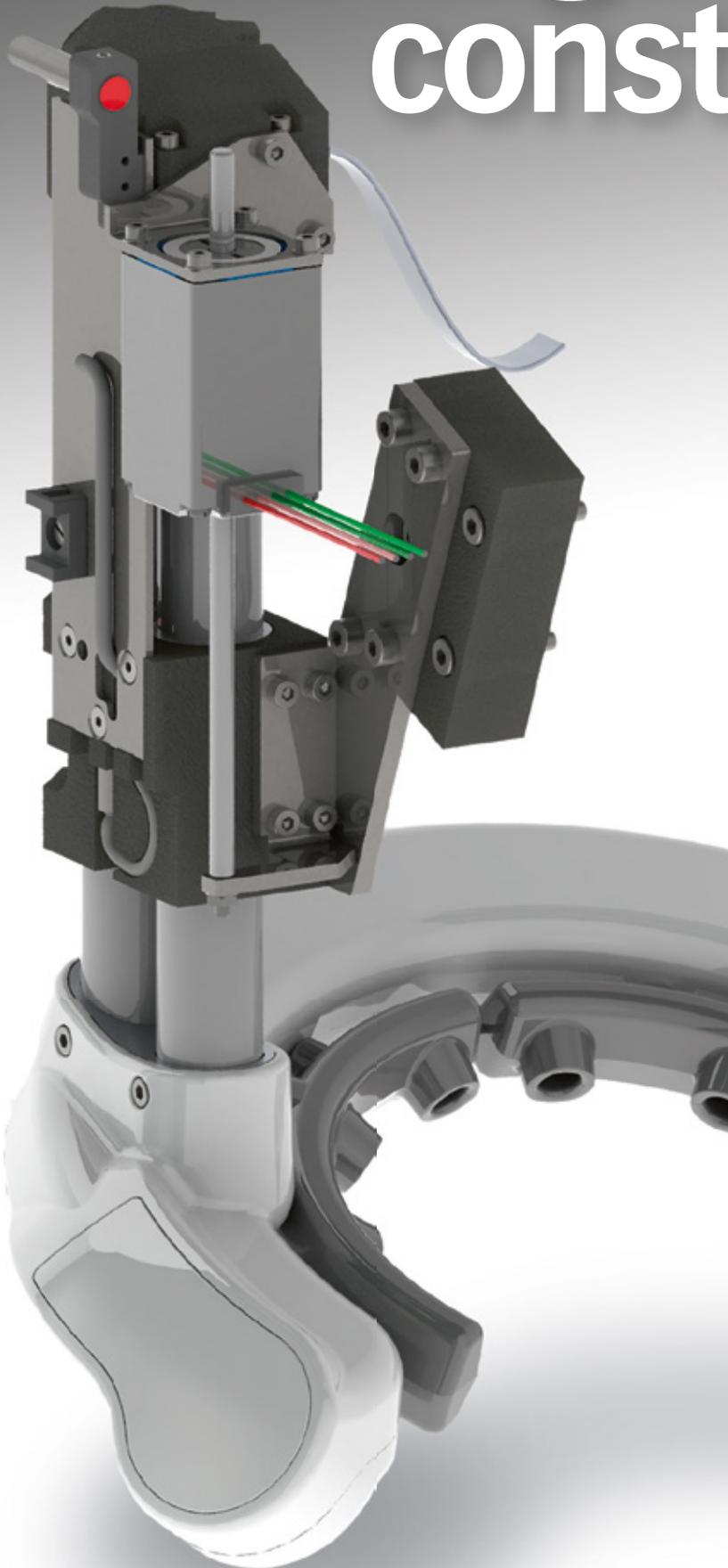
**Smart analysis system.** Among other things WILD builds MEMS in a grating spectrometer used in pharmacies. The ingredients used to mix medicines usually look identical and therefore, pharmacists are obliged to control the raw materials for a recipe to rule out any mistakes. So far, this analysis has been very time-consuming and cost-intensive. The Apo-Ident device now allows pharmacists to carry out a medication identity check in just a few seconds. The centerpiece of this system, a scanning grating spectrometer, is made by WILD. Compared to conventional spectrometers it can identify more chemical compounds and mixtures and determine the concentrations of their ingredients at a lower investment cost. Its reference database contains more than 1,100 raw materials, ranging from powders to ointments to liquids. As an affordable OEM component, this compact system also opens completely new possibilities in process and quality control for the food, plastics, recycling and chemical industries.

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# Lightweight construction



## On the way up

**In almost all industrial sectors intelligent lightweight construction systems are considered a key technology that carries with it competitive and cost advantages.**

**Lightweight construction technologies** are a central element of WILD's Technology Roadmap and are used, for instance, in vibration-sensitive optomechatronic systems. Saving weight while increasing rigidity, however, is also a core criterion in the manufacturing of medical technology products such as prosthetic limbs. Apart from the requirement to save material during manufacturing and to save energy while moving them, the dynamic properties of prosthetic limbs are also becoming increasingly important.

**Light is the trend.** Lightweight construction, especially in combination with additive manufacturing, creates structures and designs that would have been unthinkable with conventional construction approaches. One example is a system co-developed by WILD, which allows the use of more effective lasers in eye surgery. Since these lasers work with very high pulse repetition frequencies, surgery time is significantly reduced, but the ablation of the corneal tissue leads to the formation of a laser aerosol plume consisting of solid fragments, liquid drops, and gases, which impairs surgery.

**In cooperation with its customer,** WILD has developed a unique suction and filter assembly that removes this aerosol plume. The assembly is directly integrated in the laser system; using a positioning unit, it is placed in the eye of the patient without contact or vibration shortly before surgery and then gives clearance for the laser process to begin. This solution is made possible by a multi-material casing design with multifunctional parts. The stable and biocompatible casing provides support and also integrates the electronic systems, the suction and cable channels, the mounting for lighting elements and the thermal management.

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# Embedded software

## Quality-assured software engineering

Today, software is taking over an increasing number of functions previously reserved for hardware, thus becoming the driving force for product innovations.

**The requirements** for the software and its security and documentation increase dramatically when used in medical products, since lives will depend on it in extreme cases. Therefore, WILD has implemented a dedicated process for quality-assured software engineering. As a result, the company is now in a position to develop software that complies with the standards, ranging from simple microprocessors to comprehensive PC applications and apps. The tasks cover a range from requirement management and risk analysis to design and documentation.

**At the same time,** WILD is closely monitoring new approaches in software engineering aimed at making rigid development projects more flexible. WILD identifies benefits in these „agile“ methods and is currently examining whether they could be applicable in the highly regulated environment of medical products.

**Latest standards.** The great extent to which software influences the innovation content and the usability of a product can be demonstrated by the example of a new complete device for in-vitro diagnostics, which WILD significantly contributed to developing. The machine independently controls the measuring processes and stores data and status information in the laboratory database. It is even possible to connect it to a smartwatch. In addition, the software-controlled system is capable of granting preferential treatment to urgently needed samples in a sample tray on a turntable, which was previously not possible with conventional devices. Moreover, WILD developed valuable „add-ons“ such as a camera system for the identification of sample containers, which reduces mix-ups caused by the user to a minimum.

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# Digital imaging

## Digital vision and intelligent detection

The digital revolution has long entered the realm of conventional optics, which is increasingly expanding with components such as visual sensors or displays. As a result, an ever growing number of devices are now learning to „see“ and “evaluate“ thanks to digital imaging.

Because digital imaging systems examine objects with higher precision, speed, and endurance than humans, they systematically detect errors and thus guarantee defect-free products and flawless manufacturing processes. Digital imaging is also reaping significant benefits for patients in medical technology. WILD applies these principles to a majority of its projects and has developed several innovative solutions. As part of its Technology Roadmap, WILD is now working with external experts to further expand its know-how in the area of digital imaging and machine vision. The following priorities were defined: object recognition (automatic detection, counting, and measurement), quality assurance, image processing hardware (camera and lighting systems), digital microscopy and hyperspectral imaging (image processing in the non-visible range), as well as 3D image processing, and image processing in portable devices.

**Dust detection program.** At WILD, the principles of digital imaging are applied, among others in a lens testing system that detects even the smallest surface defects. The latter penetrates the lenses of a laser optics system with diffuse light. A camera focuses on the individual lens surfaces and detects even the smallest particles, scratches, or bubbles in the glass thanks to its micrometer-level resolution. In addition, WILD has developed a device in cooperation with the CTR research institute which supports doctors in the classification of skin abnormalities. The device creates images of the skin and is capable of distinguishing between benign (e.g. birthmarks) and malignant abnormalities (skin cancer).

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# Free form optics

## More freedom for form and function

**Free form optics are customized, high-performance optics which combine several optical functions in a single component. They are extremely precise, lightweight, small, and offer completely new functionalities.**

**As a rule,** optical assemblies or beam-guiding systems are based on a sophisticated system of precisely coordinated mirrors, lenses, and prisms. In the case of free form optics, however, ideally a single component will suffice. In optical applications, they enjoy a special status and are primarily used where several optical-functional components or surfaces must be combined due to limited space. Due to their low weight and compact design, free form optics can be installed where very little room is available. In addition, their surfaces can be designed in any desired shape, allowing for the manufacturing of particularly flexible optical systems.

**Hybrid lens LED light source.** Free form optics are also used in a hybrid lens of an LED light source built by Photonic, a company of the WILD Group. This hybrid lens forms part of a lighting system in which several LED light sources are focused on a fiber optic output. Were these individual LEDs to be fitted with an ancillary lens each, it would result in a very large diameter light source. By using its own free form optics hybrid lens, WILD achieved a significantly more compact design, which presents a decisive advantage for applications in microscopy or industrial endoscopy.

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# Laser technology

## A bright future

**Lasers have long become an established factor in manufacturing, medicine, and in various areas of everyday life. In future, their areas of application will expand dramatically.**

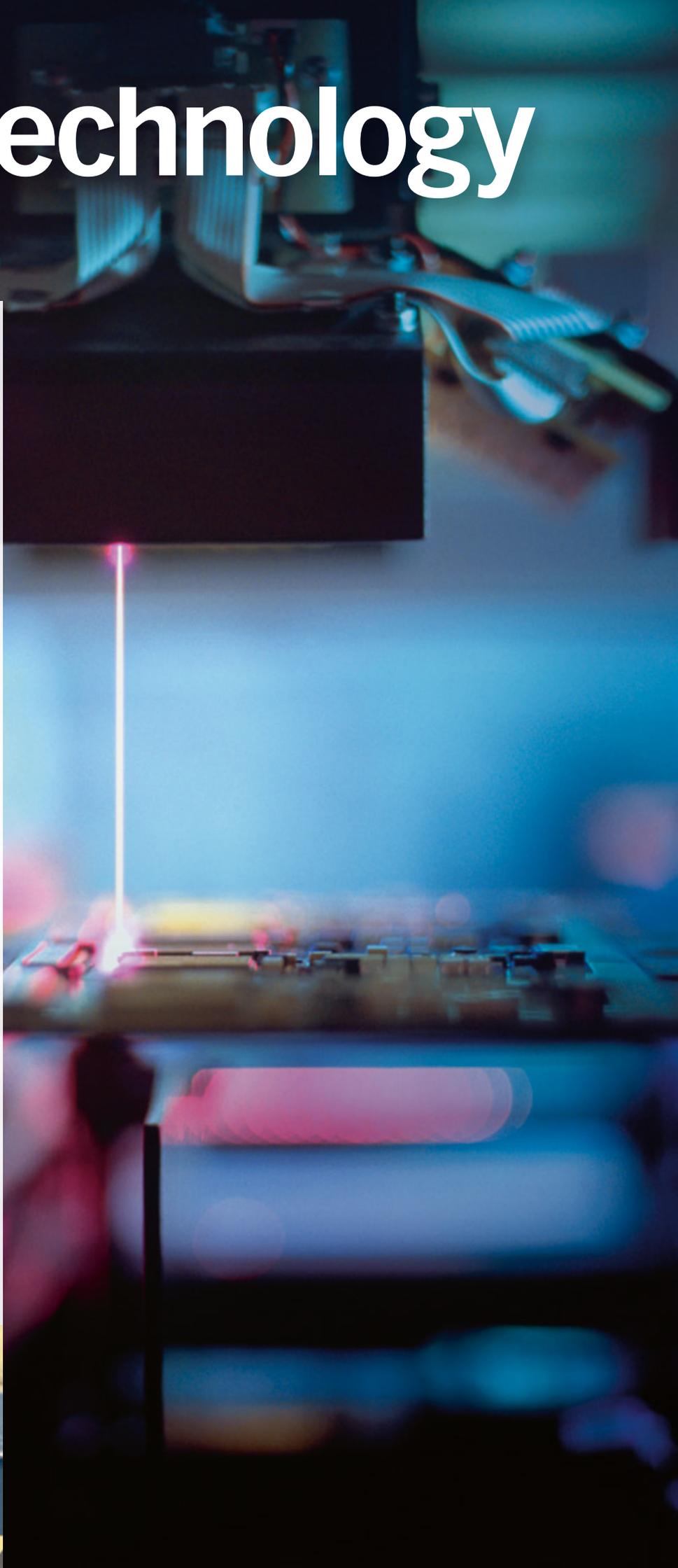
Although laser technology is the latest topic added to the Technology Roadmap, WILD already has 25 years of experience in this area, and is now pressing ahead with it. „For many of our customers, lasers are the key topic par excellence. We are convinced that a lot of progress and, accordingly, several new applications are possible in this area“, stresses Johannes Macher, Optics Designer and Development Project Manager.

**WILD is best positioned** to emerge as a strategic partner for laser technology, since the company possesses know-how in all the processes required – from optics design and precision manufacturing to ultrafine cleaning and cleanroom assembly.

**The range of services** it provides is accordingly wide. From laser equipment to laser sources, WILD guarantees highest manufacturing precision. This also applies to a Smart-Beam DPSS (diode-pumped solid-state) laser. It constitutes the centrepiece of a mass spectrometer, which laboratory workers use to collect and analyse data from minute sample quantities. In practice, it emits short laser flashes onto biological samples, causing these to evaporate and ionize. The ions are accelerated in an electric field – large ones less than the small ones – so that one can determine the molecular mass very precisely based on the flight time to a given target. A special area of application is the analysis of tissue sections, helping to illustrate the distribution of substances in two dimensions. As a result of the highly focused laser beam, the achievable resolution is 20µm, which corresponds to the size of a single human cell.

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# Additive manu- facturing

## Innovation workshop

**Design parts, technical components, or innovative demonstration and functional models: additive manufacturing opens new horizons for the entire manufacturing process.**

**A key technology** is about to turn an industry on its head: with additive manufacturing using 3D printing, huge production costs and long lead times are a thing of the past. Materials such as metals, plastics, and composites are deposited on top of each other in layers, allowing for the production of components whenever they are needed, even in small batch sizes and at reasonable costs. This not only has an effect on the time to market, now one of the most decisive success criteria for companies. Where additive manufacturing really demonstrates its strengths is where conventional manufacturing reaches its limits. It begins precisely at those points where design and manufacturing need to undergo a fundamental change. „The process chain of additive manufacturing demands a significant amount of know-how from WILD, such as the right choice of technology, but in turn offers enormous opportunities“, sums Medical Technology Project Manager Alexander Böhm.

**Freedom of design and function optimization.** For example, it is possible to already produce components in a phase in which it would be too early to manufacture the expensive tools required for serial production. Moreover, one can now produce components that almost defy the limits of conventional manufacturing. Moving mechanisms can now be manufactured in one go, just as structured surfaces or coloured designed samples, including labelling and logos. WILD today already assembles such complex components in series, e.g. in cool air ducts or panellings. The use of additive processes is boosted for the serial manufacturing of small components in medical and dental technology, but also for geometrically intricate parts with additional integrated functionality.

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# Purity processes

## Pure perfection

**WILD uses secured cleaning processes to systematically increase its cleanliness standards.**

**Optical assemblies** and components used in laser, laboratory and security technology are subject to the most stringent cleanliness requirements. They must be completely free of particulate, film-forming or other production residues. „To ensure the highest level of cleanliness and analytical purity in our manufacturing, we place a strong focus on the development of a secure, closed process chain. This extends from goods receipt to packaging and shipment“, explains Gerd Schweiger.

**WILD has already built up** a dedicated process for the germ-controlled production of sterile products. Germ control ranges from goods receipt to assembly in the so-called „white room“. In addition, the company invested in a new process-controlled precision cleaning machine. The latter guarantees the analytical purity and drying of parts of different materials. Moreover, the cleanroom was enlarged and structurally adapted to higher cleanliness requirements in the summer of 2015. An additional stage ensures the material flow through a new airlock system. A staff airlock system will be installed for the personnel.

**These highest cleanliness requirements** are also essential in the production of a DPSS laser that WILD is building for the mass spectrometer of a leading worldwide manufacturer of analytical measuring systems. After all, the reliability of this device used for laboratory applications depends on the clean processing of the components in the cleanroom. In order to guarantee this, WILD continuously evaluates new cleaning methods and processes together with its customers.

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# Functional surfaces



## Layer by layer

**WILD is intensively researching into innovative methods for the manufacturing of functional surfaces.**

**Functional surfaces** expand the range of applications of available materials and play a decisive role in practically all industries. Especially in medical technology, but also in components and complete devices for optical technology, the demand of high-quality surfaces is on the rise. Sophisticated basic materials often have a determining influence on the development of new products. The objective is not only to meet the necessary requirements with regard to wear and tear, environmental performance, and cost effectiveness. For example, these surfaces must be biocompatible and also meet individual decorative requirements.

**WILD has various surface treatment methods** in its portfolio, ranging from anodising, hard-anodising, chemical nickel plating to passivating of aluminium, blue annealing of brass, glass bead blasting, and silk screen or pad printing. The most important topics for the future include biocompatible varnishes and dyeing with special colours in decorative anodising. WILD is also expanding its know-how in chemical nickel plating methods that offer ideal protection against wear and corrosion.

**Dimensionally accurate coating.** A special adaptation of the surface structure and colour was also required for a touchscreen hinge in an FT-NIR spectrometer which is used, among others, in process analysis and final product inspection. The application required a dimensionally accurate, decoratively anodised surface in a special RAL colour. The challenge was to take into account even the smallest details already during pre-treatments, such as the different exposure states of the raw materials.

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# Adhesive bonding

## Glued to the future

Glueing has risen to the joining technology of the 21st century. WILD covers a wide spectrum of glueing processes.

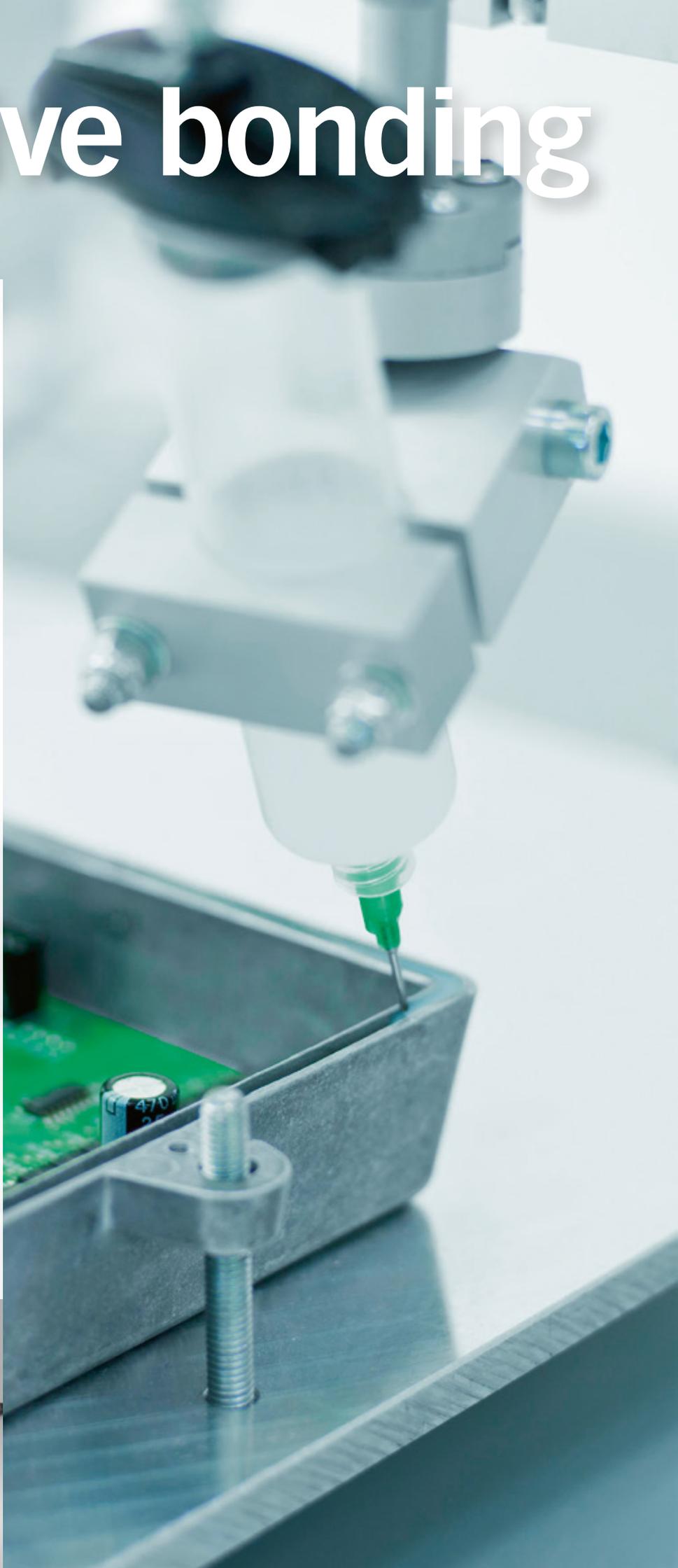
**When it comes to joining** materials, there is no getting around glueing. In medical technology products, for instance, which have to be autoclavable, the combination of material and adhesive will decide whether the bond can withstand the sterilization cycles. Glueing has numerous advantages over traditional joining technologies: it allows, for instance, materials of different thermal expansion coefficients to be easily joined at an even distribution of tension and forces. In addition, it is easily possible to create liquid-tight and gas-tight connections and vibration-absorbing, rigidity-enhancing joints.

**It takes much more** than the simple choice of suitable glues to guarantee all these properties. The staff at WILD must structurally adjust the joint geometries, choose suitable surface treatments, ensure the glue's resistance to ageing, and determine its precise dosage. Even the glueing equipment itself mostly requires a separate construction concept. Special initial and further training is needed to cover this know-how.

**A solid bond.** A project in which it was decided as early as during the development phase to glue the casing parts was an autoclavable instrument for navigation during surgery - one that is also used to carry out neurosurgical interventions. One can thus achieve the balancing act between tool and production costs with small quantities. At the same time, one can guarantee tightness for at least 20 sterilisation cycles and ensure the precise positioning of the metallic sensor tip with the required tolerances.

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# High precision

## Precision<sup>2</sup>

**In mechanical manufacturing, precision tolerances of a thousandth of a millimetre are no longer the exception. WILD is facing up to this challenge and is already working with tolerance requirements of +/- 0.002 mm.**

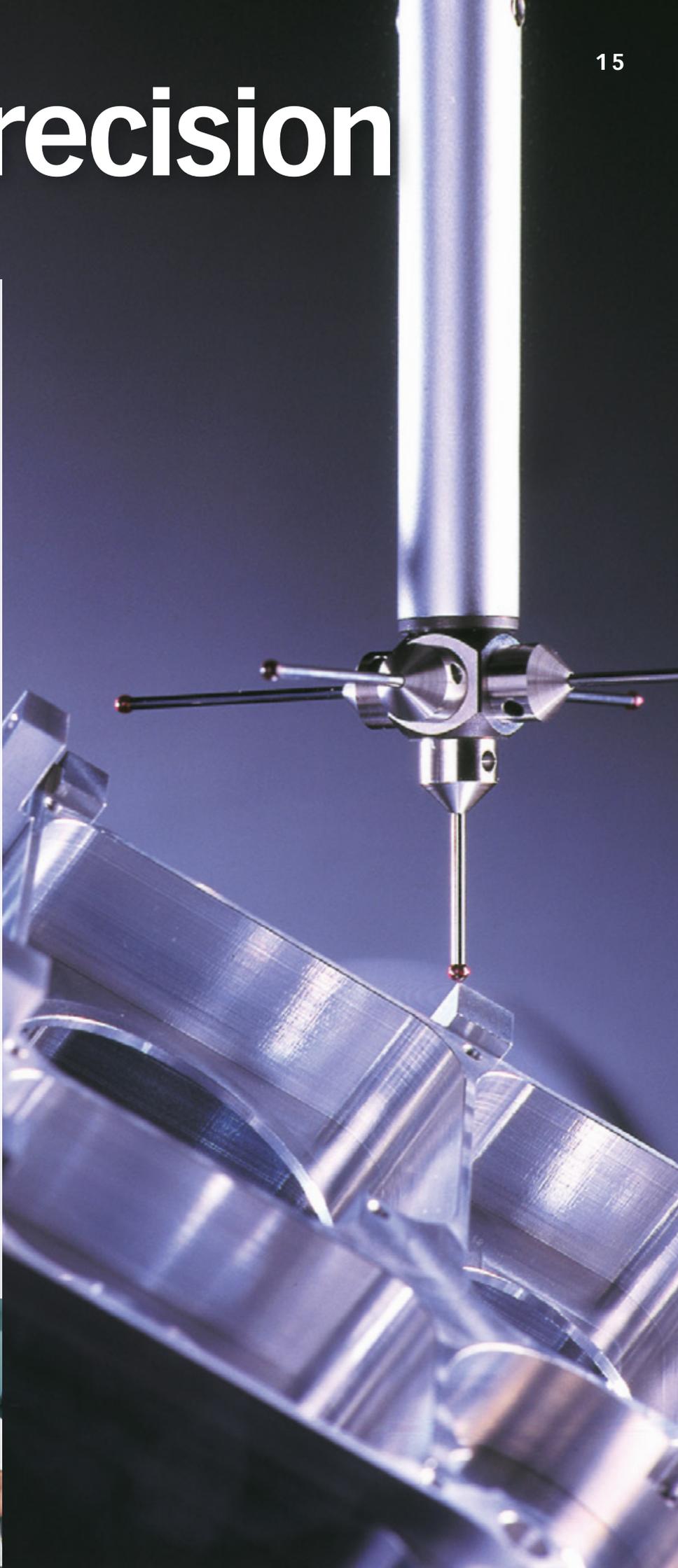
**Demand for components** with micron-measured tolerances is rising steadily. At WILD, the highest tolerance requirements for mechanical parts are currently at +/- 0.005 mm. „We realize, however, that customers want to manufacture with even greater precision in the future. Tolerance requirements are aiming toward +/- 0.002 mm, which corresponds to the size of a bacterium“, explains Head of Mechanical Production Robert Lackner. In addition to many years of experience in tool and components manufacturing, this requires a reliable positioning of the CNC machine spindle with more than twice the precision than previously.

**Precise requirements.** High-precision parts manufactured with a repeating accuracy of thousandths of a millimetre are used, for instance, in optical frames, components in analytics or prosthetics, or in special tools for semiconductor technology to apply adhesives in layers of 10 to 15 micrometres. WILD manages these precision tasks thanks to specially trained staff, state-of-the-art CNC machines, and an air-conditioned measurement room equipped with two automated 3D measuring machines. In addition, WILD maintains a network that includes special machine manufacturers.

**Investment in high-precision lathe.** To further optimise the process of high-precision manufacturing and to systematically rule out size fluctuations, WILD has invested in a state-of-the-art production lathe. With a concentricity of < 0.001 mm for the main spindle, the company guarantees the lathing of very tight tolerances and precise surfaces in the future.

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# The Networkers

Thinking out of the box, always open for new inputs. As the Technology Roadmap project leader, Wolfgang Stiegmaier coordinates a vibrant network that provides customers with quick access to innovative solutions.



## What does WILD mean by networked thinking?

On the one hand, we are networked with external specialists who assist us in accomplishing our tasks quicker and more effectively. On the other, the different technologies we focus on can no longer be seen in isolation. It's possible to think out of

the box everywhere. In this manner, we manage to develop new interdisciplinary ideas and implement innovative solutions. Take the topic of lightweight construction, for instance, where we apply the latest approaches from additive manufacturing, adhesive bonding, and functional surfaces. So the great advantage of our network is that it is very wide-meshed on the outside and close-knit inside the group.

## How do you succeed in managing such a network?

The sources that feed our technology work are external advisors from clusters, research institutes, and universities, and 12 internal theme promoters, each of them in charge of a technology area. Their tasks include, e.g. technology scouting and potential analyses. In addition, the creation of the WILD Integrated Network – WIN for short – has provided us with a tool with which we can systematically search for and assess technology partners. This allows us to get the best players in the industry for each field. Knowledge transfer within the Group works through a technology information portal, a kind of Wikipedia, to which all company members can contribute their specific knowledge. Last but not least, WILD creates a budget for the TRM each year, to which all company executives must commit themselves.

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## The WILD Group

The WILD Group comprises the WILD brands based in Völkermarkt, Wernberg (Austria) and Trnava (Slovakia), the Vienna-based Photonic, and solar-semi in Radolfzell (Germany). We are your reliable partner on a path of continuous growth. We generate an annual group turnover of 100 million euros with a staff of 400 highly qualified workers and employees.