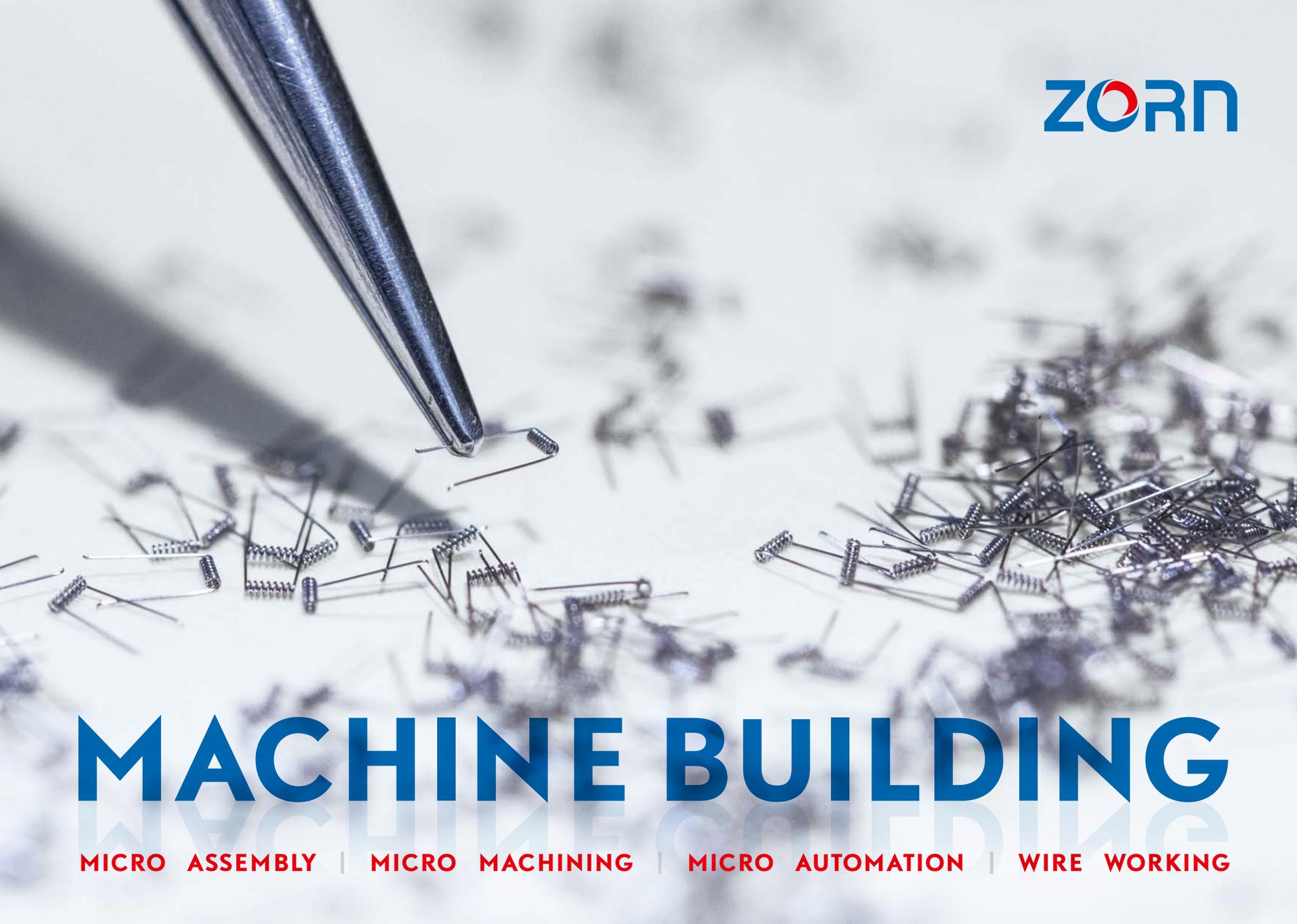


The ZORN logo is located in the top right corner. It consists of the word "ZORN" in a bold, blue, sans-serif font. The letter "O" is stylized with a red semi-circle on its left side, creating a circular shape.

ZORN

The background of the entire image is a close-up, high-magnification photograph of a micro-assembly process. A sharp, metallic needle-like tool is positioned in the upper left, with its tip hovering just above a small, intricate metal component. The surrounding area is filled with a large number of similar, tiny metal parts, some of which are in sharp focus while others are blurred, creating a sense of depth and precision. The lighting is bright and even, highlighting the metallic textures and fine details of the components.

MACHINE BUILDING

MICRO ASSEMBLY | MICRO MACHINING | MICRO AUTOMATION | WIRE WORKING

ZORN MASCHINENBAU



Quality
Made in Germany



Martin Zeiher, Managing Director

“First we analyse your manufacturing processes,
and then we develop a suitable machine ...”

IT ALL BEGAN WITH THE PRODUCTION OF INCANDESCENT LAMPS FOR MEDICAL TECHNOLOGY

1951

Company founded

1987

Special machine building founded as an offshoot of production equipment fabrication

2013

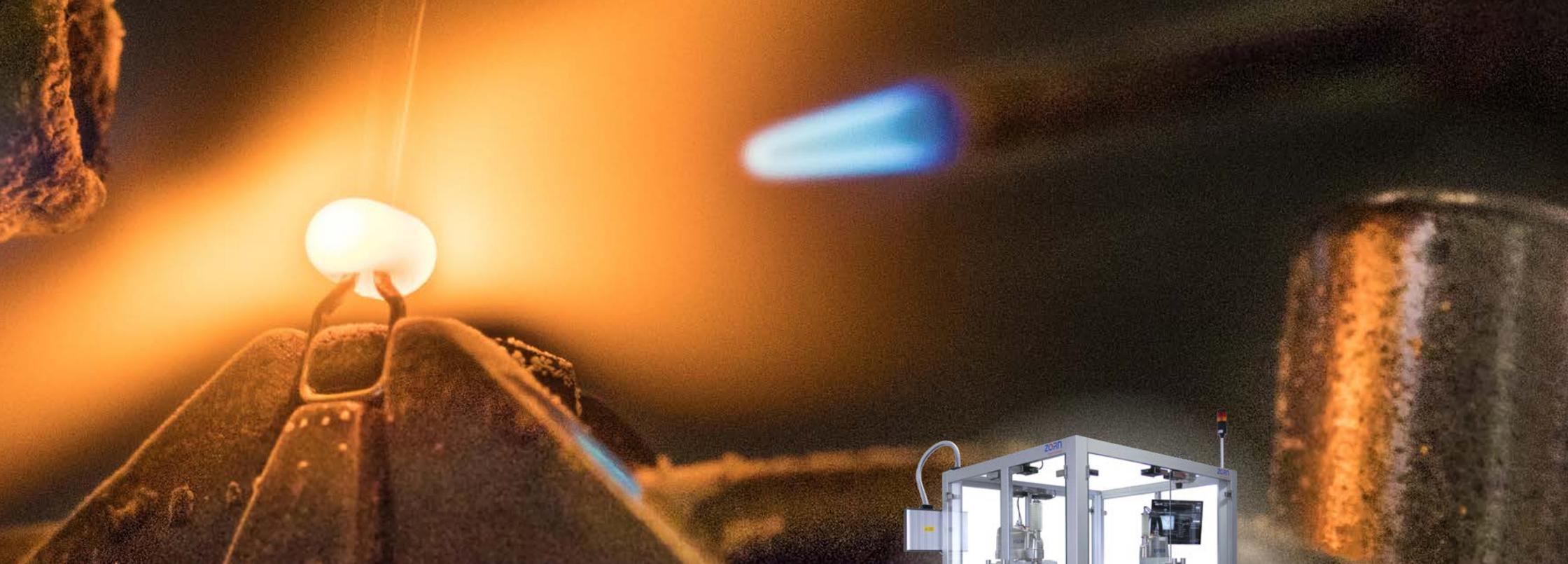
ZORN Maschinenbau integrated into the inpotron group as an independent company

2015

Development of a miniature machining center

Figure 3:1





It's the little things that have made us big

Our team of highly motivated employees and a network of creative partners have been implementing standard solutions as well as individualised projects in accordance with customer specifications for decades.

The machinery manufacturing division evolved from the production equipment fabrication department of an incandescent filament lamp factory. All of the fixtures and machines required for the production of precision miniature

incandescent lamps were developed and manufactured in-house over a period of decades. Initial systems used for the processing of glass and wire were followed by many other special machines for precision-engineering assembly tasks. Today as well, wire in a wide variety of formats is routinely processed with our systems. This includes feeding as well as assembly and further processing of small and miniature parts, for example by means of bending, riveting, swaging, soldering, welding, labelling and much more.

THE ART OF FLEXIBILITY



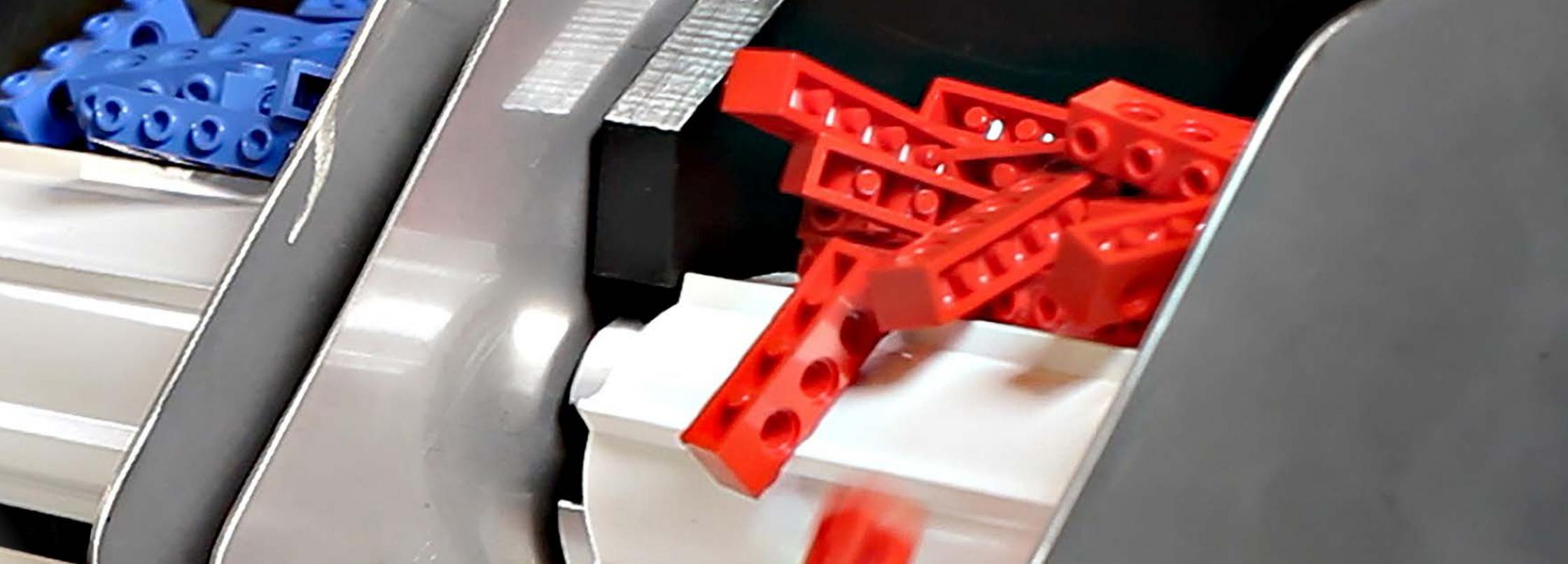
Flexible part feeding

The feed technology developed by a partner, which has proven it's worth over a period of years and makes use of a vibratory light table and optical parts detection in order to separate components, has been further evolved by ZORN Maschinenbau GmbH.

The goal was to make the system more flexible without generating manual setup costs. Flexibility was achieved through the use of multiple component bins.

The bins were arranged, for example, in a linear array. Each component bin can be used for separate orders so that various parts can be stockpiled.

Due to the fact that an undefined number of components is conveyed when the light table is filled, excess material inevitably remains on the vibratory light table after the order has been completed. This material must be removed in order to process the next order automatically.



After the camera has detected that the surface of the table is empty, the vibratory light table can be advanced to the next order bin. The entire setup procedure is thus fully automated.

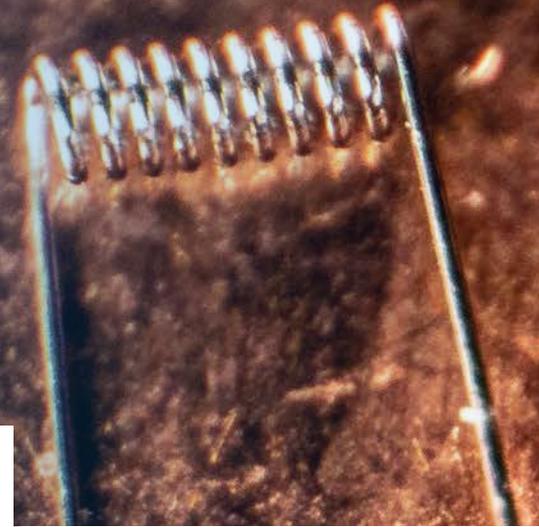
All detectable components are picked up by the robot and returned to the bin. The bin is modified accordingly for this purpose.

Depending on order selection, the separating platform, including camera, is positioned parallel to the bin. As a result, different shapes can be fed within the same system.

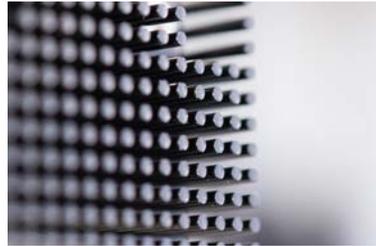
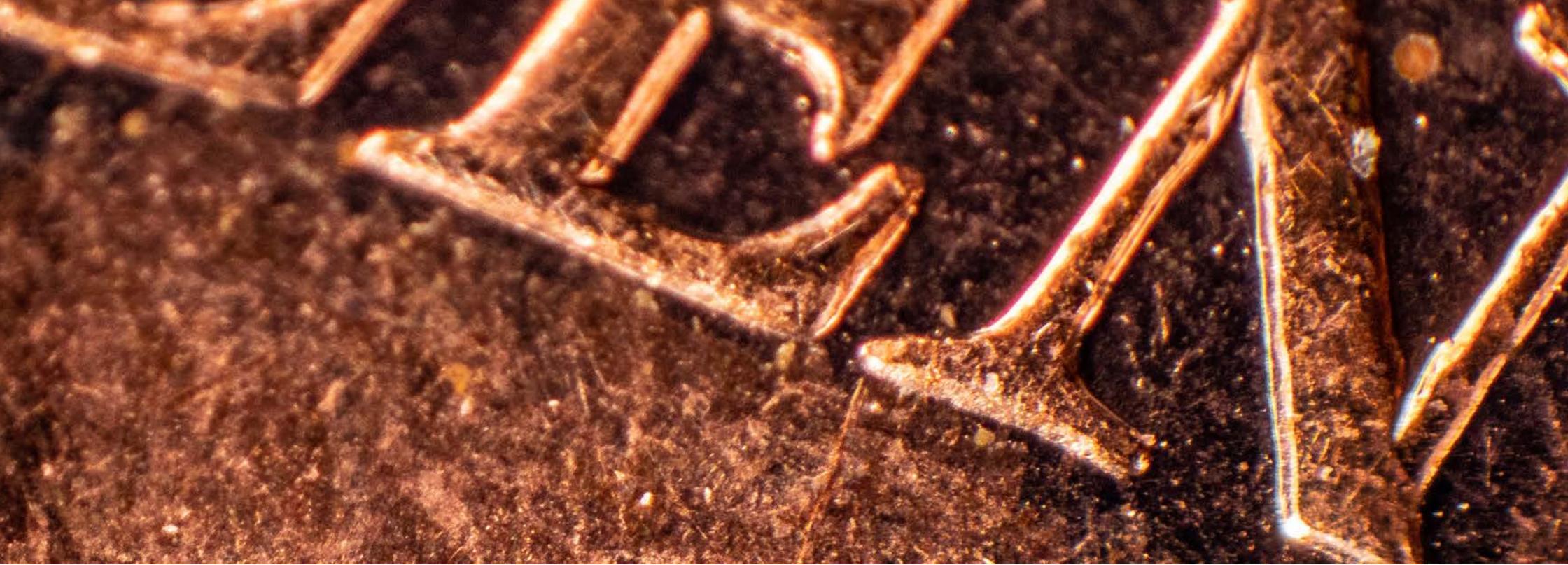
Since it's always possible that parts which cannot be gripped are lying on the vibratory light table, a further option was developed in order to empty the table.

A side panel can be pneumatically opened making it possible to convey components into a no-go container by means of targeted vibration.

MASTERFUL MINIATURISATION



Wires made of precious and semiprecious metals (gold, silver, platinum, tungsten, nickel, molybdenum, copper, steel)	
Smallest diameter to date	17 μm
Largest diameter to date	2 mm
Hollow wires for medical applications (cannulae)	
Smallest diameter	0.3 mm
Largest diameter	2 mm
Component and assembly weights	
Smallest weight to date for an individual component	0.5 kg
Largest weight to date for an individual component	3 kg
Largest weight to date for an assembly	5 kg
Component and assembly dimensions	
Smallest dimensions to date for an individual component	0.5 mm^3
Largest dimensions to date for a component	1,000,000 mm^3 (1,000 cm^3)
The feasibility of processing smaller or larger dimensions/weights is examined case by case by means of preliminary testing.	



Genuine greatness is in the details

One of ZORN's most important tasks is the integration of a great variety of technologies, amongst others joining, printing and testing. We unite the necessary components procured from specialised suppliers to this end on the basis of our process knowledge, assuming overall control of the respective project.

Industrial miniaturisation is resulting in more and more precise and ever smaller mechanical components.

Zorn is specialised in the development of the respective production processes and in making use of them in its high performance machines.

MACHINE BUILDING WITH INSTINCTIVE FEELING



Wire Cutting Machine

Possible wire diameters	0.04 to 0.8 mm
Wire length	10 to 300 mm
Materials processed to date	Copper, platinum, silver, gold, tungsten, molybdenum, plastics, VA etc.
Processing methods	Cutting, bending, soldering, welding, laser machining



Precision processing of finest wires

The wire cutting machine is suitable for the production of various lengths of wire.

Depending on how the sections of wire will be used, they may also have to be straightened or otherwise further processed.

Zorn has developed its own system to this end, by means of which even the finest of wires can be straightened. Separated products can also be further processed in many different ways.

Our know-how also encompasses automated downstream bending tools, transfer and assembly tasks, as well as complex assembly systems and production lines.

Zorn Maschinenbau GmbH develops separating devices for extremely thin wires and tubing, e.g. cannula tubes. Two devices are available to this end, which differ above all with regard to cycle time.

ZERO ERROR TOLERANCE



Inspection machines

Zorn inspection machines have been specially designed for critical components such as curved surfaces, discontinuous structures and highly reflective materials. Zorn utilises only the most up-to-date technologies from selected partner companies for the development of inspection machines: optical inspection through the use of ultramodern illumination technology has been perfected as a result. This has led to more accurate statements regarding test results and significantly more efficient inspection procedures.

The optical inspection process takes place in a shielded "dome". The utilised technology eliminates the textural characteristics of the surface.

Zorn uses the entire spectrum of sensor technology and photo-optic systems for component inspection. The inspection units are seamlessly integrated into the machine concept, and matched to it perfectly.



Tobias Mülhaupt, Technical Director

“Extremely small details – enormous problems?
If necessary, we reinvent the wheel ...”

MACHINING TECHNOLOGY FOR PRECISION MICRO-PARTS

ZORN **micro**one

5-axis precision CNC micro machining centre

What's so special about the micro one? The micro one is the professional micro machining centre which can be adapted to a broad range of requirements in a highly flexible fashion. It's not only distinguished by its extremely compact layout and top quality design, it's also equipped with removable modules.

Modularity with a "miniature footprint". At the most, 0.9 square metres of precious floor space is all you need to invest for a full-fledged 5-axis machining centre. Plug & play not only describes the utilised product technology, it applies to

transport as well: the micro one fits through any standard door without a hitch.

Maximum flexibility and outstanding ease of operation were the inspiration for developing the micro one. Best possible access and an ideal view of the workpiece permit efficient and effective machine operation. The micro one's worktable height contributes to ease of operation as well – it ensures good visibility and easy gripping of even the smallest components.





Perfect ergonomics with a focus on the essentials at an ideal distance from the workpiece. Ample access from two sides underscores user-friendliness. The modular design makes it possible to integrate the machining module into assembly systems separately, whereas the supply unit remains outside.

The microone is currently laid out as a classic machining centre. However, further development is also planned – including the integration of additional machining methods. For example, the currently used high-performance spindle can be replaced by laser optics or a dosing unit, thus making additional applications possible such as laser welding, labelling and bonding, as well as other dosing and inspection tasks.

ZORN micro one – Features

Footprint < 1 m²

5-axis simultaneous machining

CNC: Siemens 840D SL

Automatic tool changer

Controlled spindle speed: 75,000 RPM

Water cooling of the direct drives and spindle

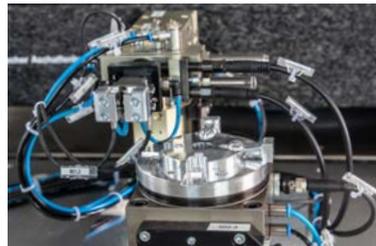
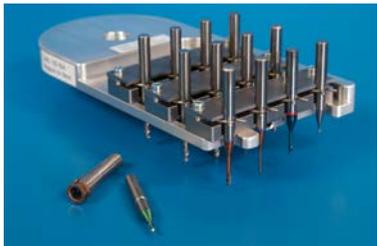
CAD/CAM

Modular design

Smallest drill: 0.06 mm

Smallest milling cutter: 0.1 mm

ZORN MICRO MODULES



Machine components with modular expandability

A special module has been developed in-house for automated production with the micro one. Its size and design are matched to the micro one. Thanks to the fact that the robot is mounted to the ceiling, all of the module's floor space is available for your products.

A further extraordinary characteristic of the module has proven itself highly valuable: the utilized robot is capable of reaching out of the cell on all sides and can thus be used with

three micro one systems! Consequently, roughly 1.8 square metres of valuable floor space is all that's required in order to automate a single micro one, or roughly 6.5 square metres with a maximised layout for three micro one systems.



ZORN micro one – energy-efficiency and ergonomics

Outstanding ergonomics

Extremely low noise thanks to the use of linear direct drives

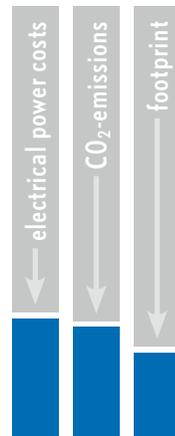
Environmentally-friendly due to minimum lubrication

Minimal current consumption thanks to less moving mass

72% lower electrical power costs*

74% lower CO₂ emissions *

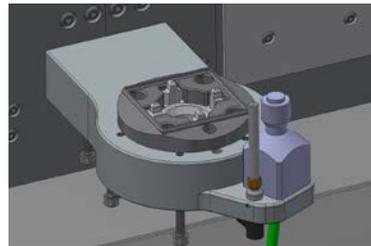
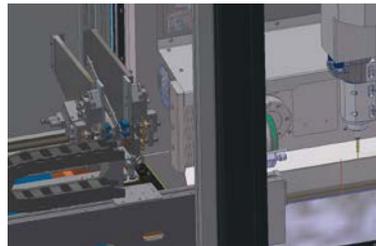
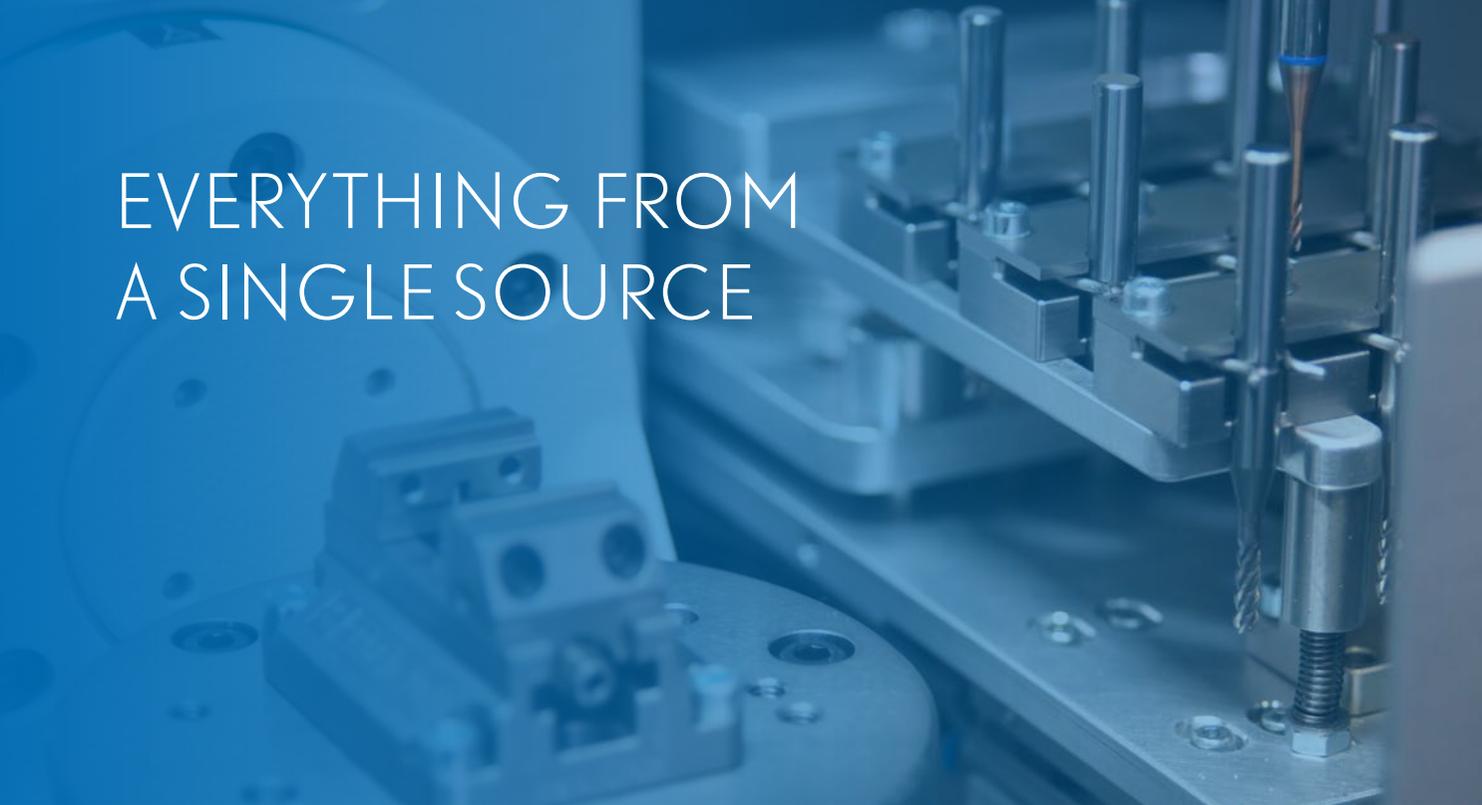
80% smaller footprint*



** as compared with a conventional CNC machine*

Modular, flexible, compact. As a rule, the automation module is used as a feed and removal unit. Several feed technology variants are available to this end. As an alternative, or as a supplement to this type of use, it's also possible to incorporate other manufacturing processes and to link up other modules instead of additional micro one systems.

EVERYTHING FROM A SINGLE SOURCE



Automation at its best

Already during development of the micro one, careful attention was given to getting everything ready for future automation. 30 years of experience in the field of special machinery manufacturing at Zorn Maschinenbau GmbH has clearly made an impact in this regard. A great wealth of experience is available, especially where the handling of small parts is concerned.

Corresponding modification of the machine is an important part of the ideal automation solution – with precise matching to the materials to be machined. Whether blast air fed through the centre of the spindle in order to clean the clamping device or an exhaust system for the machine is involved, you get a complete solution. If flammable materials will be machined, we can also provide a suitable fire extinguishing system. We work with specialists from the respective industry sector to this end.



Hubert Truckenbrod, Division Manager

“Building machines alone would be boring.
Reinventing production processes day after day is
what drives us ...”

The inpotron group – Quality made in Germany



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