



Compact, extremely precise, incredibly powerful

KERN MicroVARIO



KERN Micro in action

For more than seven years the KERN Micro has proven to be a market-leading high-precision milling machine, running in large numbers all over the world. The different application areas of this extremely flexible machine provide coverage for all demanding segments in many industries. This is also true for Werner Buschor in Switzerland. The KERN Micro has changed the company sustainably ever since it arrived.



Werner Buschor has placed the two machining centers KERN Micro in such a way that both can be operated by one workpiece changer

HIGHEST PRECISION - 24/7 - NO OPERATOR

At Buschor Präzisionsmechanik AG two KERN Micro deliver highest precision while milling around the clock. Precision, reliability and economic efficiency have the highest priority for Werner Buschor. With two KERN Micro five-axis machining centers, the swiss company has significantly improved its overall performance. The machining centers produce parts with tolerances in the μm range without an operator.

"The KERN Micro is by far the most accurate and most profitable machining center I have", emphasizes Werner Buschor. "It is a real pleasure to be able to produce high-precision parts with such a machine. When we measure, it's always amazing to see how precise the machine works."



Clear and easy to access: the tool magazine offers space for 186 tools as standard, allowing automatic production



Intensive cooperation: Werner Buschor (left) and KERN sales technician Stephan Zeller regularly exchange ideas about optimization possibilities

KERN Micro_{VARIO}

Flexible platform for highest demands

With its new design and advanced developments, the second generation of the KERN Micro sets new standards in flexibility, precision and productivity. Ultra-compact, trimmed for productivity and precision, flexible and application-oriented, the KERN Micro Vario generates the decisive competitive advantage - permanently and efficiently.

The KERN Micro Vario is not a standard milling machine. It is ultra-compact, it provides effortless automation, hassle-free accuracy in the micro range and configuration and equipment can easily be individualized - just as our customers need it.

The KERN Micro Vario is the second generation of the KERN Micro and even more powerful, compact and resistant to external influences. It can be individually configured for the customer-specific application and can be integrated into the production line without any efforts.

With the sophisticated machine design, the unique KERN temperature management and the high-end components, the machine reliably delivers the well-known KERN precision and repeatability. The KERN Micro Vario is at home in the industrial environment. It is reliable, robust and durable - for every kind of application.

Special editions for the perfect machining of graphite or for zirconia machining are also available on the basis of a KERN Micro Vario.



AT A GLANCE

- Compact design and small footprint of only 4 m²/43 sqft
- Supreme machine stability with the advanced KERN Temperature Management
- High productivity with unmatched accuracy
- Best quality, flexibility and competitiveness
- Multi-shift operation with no need for operator with integrated changer for up to 210 tools and a maximum of 60 workpieces
- Certified interfaces for additional accessories and automation systems
- Management and maintenance during operation without interruption while machine is running

” The **KERN Micro_{VARIO}** is the high-performance machining center of KERN which meets the highest demands for flexibility, precision and productivity. “

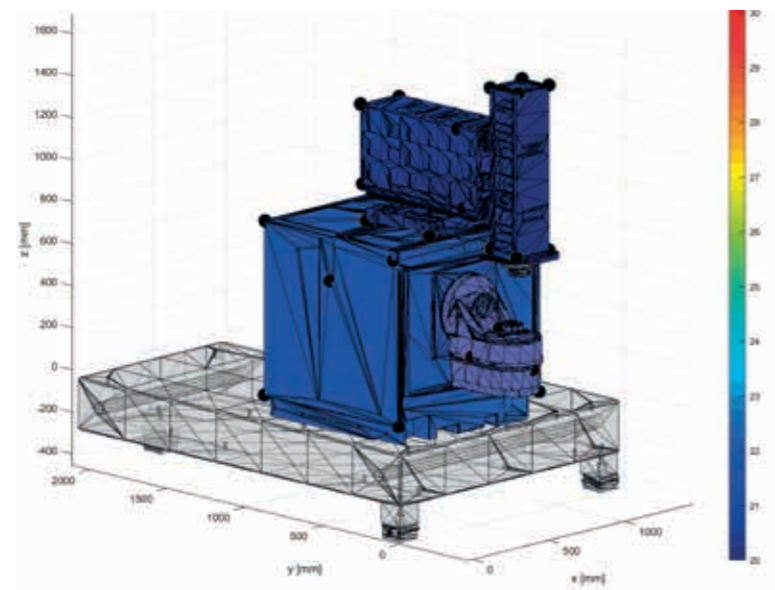
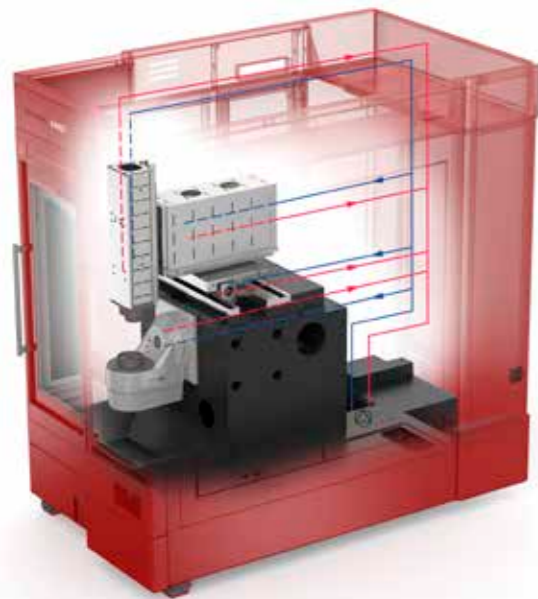
KERN Temperature Management of second generation

Already many years ago KERN announced the fight against the negative influence of temperature deviations in the accuracy system of a machine tool. Great efforts have been made to develop methods that eliminate these effects. In the KERN Micro Vario the KERN temperature management system of the next generation is implemen-

ted. This new system generates significantly higher flow rates and an even more precise control, both lead to the greatest possible stability. This stability allows a very high repeatability of parts and the greatest possible independence from external influences.

Temperature of coolant in
Temperature of coolant out

Flow: 60 l/min
Temperature: 20 °C ± 0,075 K



Temperature management
All components necessary for the accuracy of the KERN Micro Vario are being actively kept on temperature

Cooling Concept
The test in the climatic chamber shows the performance of the KERN temperature management via colour graduation

ACTIVE TEMPERATURE MANAGEMENT OF

- **Control Cabinet**
- **Spindle**
- **Linear axes**
- **Rotary and swivel axes**
 - Direct drive
 - Bearings and rotor
- **Coolants**
 - Cooling lubricants

Simultaneous machining

The KERN Micro Vario is characterized by its long-term stability and the smooth running, which makes this machine the perfect choice for this kind of machining. For the production of a Cloud Gate Sculpture/Chicago replica simultaneous machining for several hours with optimum surface finish was proceeded.



"The bean" was not polished but only milled on KERN Micro with this reflective surface

DESCRIPTION

- Process time ALU > 27 h
- Process time Stavax ~ 120 h
- 4-axes simultaneous machining without interruption
- B-axis additionally switched on (moving)
- Raw material: 70x55x130 mm – Finished part: 56x100 mm

RESULT

- Permanent precision during simultaneous machining
- Long-term TCP stability during simultaneous machining
- Robustness towards thermal environmental influences

Smart aluminium as construction material

A very important factor for achieving perfect workpiece geometries is the control of temperature influences on a machine tool. This is especially true in 5-axis machining. KERN therefore uses tempered aluminium as the construction material for the linear axes of the Micro Vario.

The construction material 'tempered aluminium' consists of two elements: The material aluminium and a multitude of cooling channels, which are supplied and used by the second-generation KERN Temperature Management. With regard to its density-related rigidity, the material aluminium is superior to traditional machine tool materials such as cast iron, steel or polymer concrete. The density-related bending stiffness of aluminium is about twice that of steel. The thermal conductivity is another important factor. Good thermal conductivity ensures that no temperature gradients build up and that heat can be released quickly into the cooling system. If aluminium is now provided with cooling channels and is combined with an efficient and precisely controlled temperature control system, such as the KERN Temperature Management, the temperature can be kept consistent throughout the entire structural components of the machine tool. In this way, the large thermal expansion coefficient of aluminium even plays an important role in the accuracy of a KERN machine. In addition, the low weight of the aluminium-axes system provides high dynamics and low wear for a long lifespan.

The combination of the KERN Temperature Management of the second generation and the structural aluminium components with cooling channels results in tolerances in the single-digit micrometer range as well as high surface qualities over a long period of time due to the thermal stability.



SMALL AND POWERFUL

Compact and powerful because of the smart one-box design. All accessories are integrated in the machine. With a footprint of only 4 m² (43 sqft), an optimized height of only 2.63 m (8.8 ft) and a narrow width of only 1.63 m (5.42 ft). The weight is less than 5.5 t (12126 lbs).



PERFECTLY INTEGRATED

Additional components such as a flood cooling unit can be integrated into the machine without requiring additional space. Also, the connection of the optional belt filter system and the chip conveyor has been optimized to save space.

SOLID BASIS

Innovative machine stand made of UHPC (Ultra High Performance Concrete). No disruptive interfaces, thermo-symmetrically constructed, made from a single casting and equipped with unique material properties.



100% AUTOMATION

An effective automation solution is often the key to cost-effectiveness. The integrated tool cabinet for up to 210 tools and a maximum of 60 workpieces allows unattended operation without additional space requirements. Whether external or internal workpiece changer, the KERN Micro Vario is perfectly prepared.



UNMATCHED IN THE 5TH DIMENSION

Powerful and highly dynamic rotary / swivel axis with torque motors for simultaneous 5-axis machining, market-tested and continuously optimized. Perfect use of available working space and thus it is possible to work on larger workpieces - smart design and best possible arrangement of the 5 axes offer more space.



INTEGRATED CONTROL PANEL

There is no better way to integrate an ergonomic control panel into a machine to save space. When not in use, the control panel can be folded down and swiveled back to align straight with the machine and does not require additional space in front of the machine. Completely swung out, it offers the same ergonomics as a control panel supported by an extendable supporting arm, no compromise necessary.

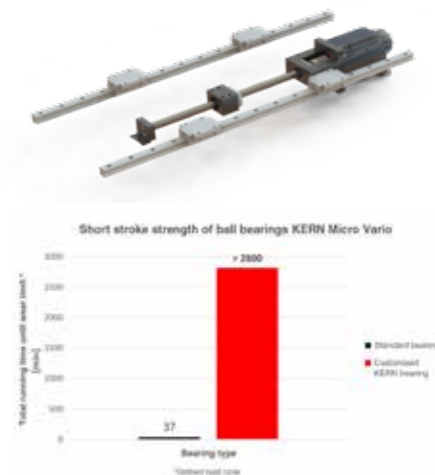
MAINTENANCE AND PRODUCTION – ALL AT THE SAME TIME

The well-arranged and fully accessible maintenance area on the side of the machine allows checks and re-filling of lubricants without machine downtime. In addition, necessary maintenance work can be recognized at a glance.



INNOVATIVE AXIS SYSTEM

The KERN Micro Vario has a proven and constantly improved axis system which allows high dynamics and unmatched wear resistance without any negative influence on the machine accuracy. Due to innovative materials and uncompromising material quality, the system achieves the highest possible operational stability.



COOLANT THROUGH SPINDLE

Optional rotary union to cool tools internally with water-based coolant or cutting oil in combination with belt filter.
Pressure: Cooling lubricant 80 bar / compressed air 6 bar.



Source: Walter AG

POWER PACK

To optimize the overall energy consumption as well as to increase the productivity and to ensure maximum availability of the machine.

**BAND FILTER AND CHIP CONVEYOR**

Integrated chip conveyor with ejection to the rear. Connected to the external belt filter system, optionally with high pressure for ICS. Tank capacity: 490 l (108 gallons).

WORKPIECE CHANGER

Integrated workpiece changer for up to 60 work pieces allow unmanned operation without additional space requirements. The KERN Micro Vario runs fully automated via internal, external workpiece changers or hybrid variants.

**SPINDLE ALTERNATIVES**

KERN provides a great variety of spindles for the Micro Vario, which is ideal for the individual demand of each customer. Standard spindles are available for roughing and finest finishing as well as ultra-precision high-frequency spindles for surfaces in demand of highest optical quality.

BDE INTERFACE

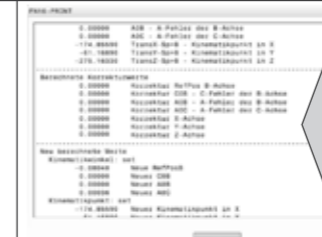
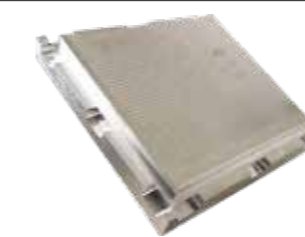
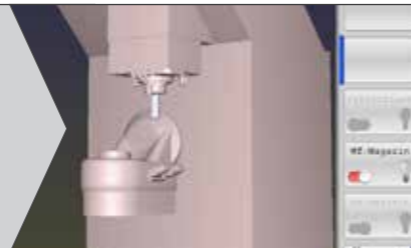
Individual monitoring of machine and operating data for control and evaluation in the customer's own system (Industry 4.0).

**ENLARGED SWIVEL RANGE**

Extension of the swivel range of the B axis. Easy cleaning of workpieces, especially in automated operation.
Swivel range: $-180^\circ / +110^\circ$ (standard $\pm 110^\circ$).

DYNAMIC COLLISION MONITORING (DCM)

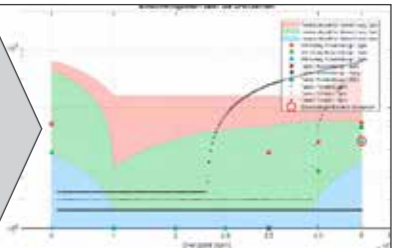
Software for real-time collision monitoring of the workspace components (rotary and swivel table, laser, clamping device, spindle and tool holder) in manual and automatic operation.

**INNOVATIVE CALIBRATION PACK**

Automatic checking, verification and fine adjustment of the kinematics directly on the machine by the customer.

PRODUCTIVITY PACKAGE 2

Individual compensation of all heat-introducing components of the machine for highest accuracy and productivity without additional warm-up times.

**REMOTE SERVICE**

Remote diagnostic with online access for a fast analysis by the KERN service department and process optimization of the KERN Micro Vario through KERN application engineers.

**BLUM LASER LC 50**

Laser measuring system with DIGILOG technology. For tool presetting as well as breakage and wear control. Also suitable for smallest tool diameters. Including calibration mandrel with tool holder.

Linear axes

Travel X/Y/Z: 350/220/250 mm
 Max. clamping surface: Ø 350 x 200 mm
 Max. workpiece weight: 50 kg (110,23 lbs)
 Feed rate: 30 m/min (1,181in/min)
 Acceleration: up to 10 m/s²

Rotary and swivel axes

Rotary axis: 360° infinite / 200 rpm
 Swivel axis: 220° (opt. 280°) / 100 rpm
 Clamping swivel axis: 300 Nm

Spindle options

HSK 25-E: 50.000 rpm 6 kW (S1) Roller bearing
 HSK 25-E: 80.000 rpm 5,5 kW (S1) Air bearing
 HSK 32-E: 40.000 rpm 6,3 kW (S1) Roller bearing
 HSK 40-E: 42.000 rpm 15 kW (S1) Roller bearing

Workpiece size

Height up to 200 mm (7.88 in)
 Diameter up to 350 mm (13.78 in)

Accuracies (VDI/DGQ 3441)

Positioning accuracy P: < 1,5 µm
 Repeatability Ps: < 1 µm

Accuracies (ISO 230-4)

Circular deviation Gy_x: < 3 µm
 Circular deviation G_{xy}: < 3 µm

Tool changer

HSK 40: 18-, 102- and 210-pockets
 Max. tool diameter: 70 mm (2.76 in)
 Max. tool length: 155 mm (6.10 in)
 Optional: Combination of tool and workpiece changer

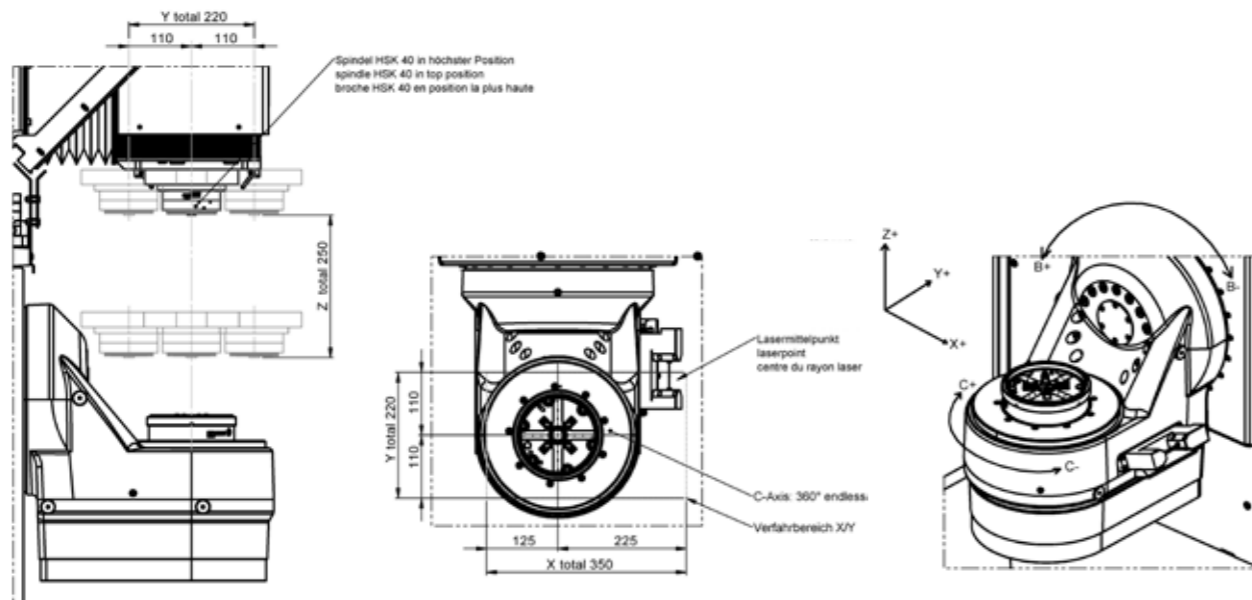
Technology

Internal temperature management with ± 80 mK control accuracy
 5-axis simultaneous machining
 Heidenhain control TNC 640
 Ultra-compact one-box design

Dimension and Weight

Weight: 5.200 kg (11,464.04 lbs)
 Min. space required W / D / H: 1.63 x 2.66 x 2.63 m
 (4.92 x 8.73 x 8.63 ft)

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 Technical details may change





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