KERN MICRO HD-LINE

Kern Micro HD & Micro HD+

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Kern Microtechnik

WHO WE ARE

Kern Microtechnik GmbH, with its headquarter in Upper Bavaria in Southern Germany, in the unique landscape of the foothills of the Alps, surrounded by high mountains, sparkling rivers and picturesque lakes has achieved a leading position in high-precision technology around the globe over the last decades. With a long-standing focus on technology, innovation and proximity to customers, Kern is an established partner for customers worldwide to realize their ambitious goals in many different industries like medical, aerospace, watchmaking, defense, semiconductors and many others. A common goal is a sustainable cross-generational development. Our innovative strength, our willingness to change and, above all our great team are the secret of our corporate strength and resilience to crises.

“Proof of our strict focus on technology is the fact that we employ as many people in R&D as in our assembly.”

Matthias Fritz | DVP Research/Development

What does Kern do?

Changes in the industrial environment are always taking place. Therefore, our machine must be flexible and adaptable. We offer a wide range of applications and many options to have the best equipped machine for each task. Nothing is as persistent as change, which is why a Kern machine can always be adjusted as needed.
Our commitment to ethics and sustainability cannot only be seen in our business relationships, but also in the way we develop our machines. As a commercial company, honesty and stability are very important for us when dealing with customers, suppliers and partners. For us, sustainability means thinking and acting with the future in mind and how to have a positive influence on society and the environment.
Among other things, we realize this with our supply chain; 85% of our suppliers are within 350 km (220 miles) of our headquarter. We source our parts from reliable partners in Germany, Austria and Switzerland, among others.

Quality, precision and productivity are the key when shaping our future.

With our work and our machines, we make a significant contribution to the products of tomorrow, to new technologies and to progress in general. We are proud of this, and this is also what brings us forward.
Kern and its employees are proud of their machines, their innovations and their technologies standing behind their products. However, the most precise machine does not automatically make good parts; this requires the best process for the respective application and the necessary know-how. And this is why Kern offers more than an extremely accurate and productive machine. We share our knowledge with our customers, help develop new products and technologies and ensure the success for our customers

„It is our goal to exceed the expectations of our customers and to build up a long-lasting partnership.“

Franz Guglhör | Head of Service

The close connection to customers

Sales

The sales team listens carefully and fully understands the needs of customers. Innovations are always adapted to the customers’ needs. Not only the machines, but also the surrounding procedures are considered to provide comprehensive assistance and resolve problems as soon as possible.

Applications

The applications team has the latest equipment, and the team is very experienced and ambitious. It is not about showrooms or laboratories but about the real integration of customers. Reliable processes are being developed for real parts under real conditions – conditions we find at our customers’ sites. Customers gain real insight into the capabilities of the machine – not with sample parts but with real manufacturing of real parts. Limits and capabilities of the machines are being pushed and Kern provides access to a wide range of expertise to ensure the machine is being used in its entirety.

Kern Training Center

The Kern Training Center provides valuable knowhow for all participants. The training shows how to make the best use of the machines and their Heidenhain control. Classes include for example ceramics, deep hole and carbide training and many more are available. With a wide program from basic classes to maintenance, troubleshooting and individualized applications Kern ensures a steep learning curve and efficient operation of the machine.

Service

The Kern Service provides fast and individual support. Specialists are available per phone and e-mail to provide solutions for problems. The quality of the available expertise is unmatched. The available teleservice delivers immediate support. Since our technicians are experts in their field and since they are close by it is easy to maintain machines in best shape.

„I am grateful to be a member of this great team of inventors, pioneers and honest people – the Kern family.“

Simon Eickholt | DVP Business Manager

„We are proud of our team and machine technology. That we took the right path is proven by the fact that neither used Micro machines are available nor are there customers who are not economically successful with their Kern Micro.”

Sebastian Guggenmos | DVP Operations

Robust and high performance

MICRO-GAP HYDROSTATIC ON THREE AXES

In 2019 Kern introduced the micro-gap hydrostatic system. Ever since, this system has proven to be a rigid and powerful system for many different applications. This high-end technology is characterized by a gap height of less than 10 µm and thus saving energy, while conventional hydrostatic systems have a gap height of more than 25 µm. Above all, the micro-gap ensures highest rigidity and perfect damping properties, which is reflected in the excellent accuracy of the workpiece and the surface quality.

The actively cooled aluminum axes and the hydrostatic media guarantee extreme stability even in non-ideal conditions and thus on-going highest quality of the parts in serial production. With hydrostatics, there is no metal to metal contact as they are separated from each other by a fine oil film and work without wear. At the same time, the system provides very good damping, reduction of vibrations, more stable machining processes and longer tool life. Another positive effect of this system is the resistance to unwanted mechanical events, such as for example collisions in the machining process. The electromagnetic field that preloads the three-axes assembly allows the collision energy to be dissipated without mechanical damage to the axes system.

Hydrostatic principle
All linear axes of the Kern Micro HD and the Micro HD+ are equipped with the Kern Micro-gap hydrostatic system

„The additional costs for the hydrostatic axes system pay for themselves in less than twelve months because of a higher performance and increased quality."

Heiko Zimmermann | Industrialization Movement Parts, IWC Schaffhausen

High quality and large dimensions

LINEAR DIRECT DRIVES

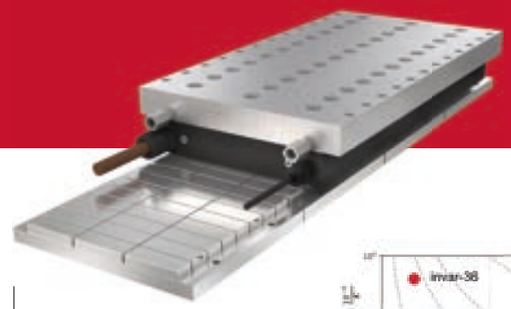
Linear motors are a popular drive system in machine tools with advantages in terms of dynamics and control accuracy. However, due to the enormous heat input and the resulting heat transfer, the system is only partially suitable for high-precision machines. To overcome this challenge, Kern installs high-quality, large-sized and actively temperature-controlled linear motors in the Kern Micro HD and the Kern Micro HD+ for the best drive of the three-axes system in an integral design. This integration into the hydrostatic system serves to minimize heat input and eliminates unwanted side effects. The combination of the Kern micro-gap hydrostatics and the linear motors is unique and unrivaled in terms of performance.

Kern Micro HD: Best possible productivity paired with highest precision

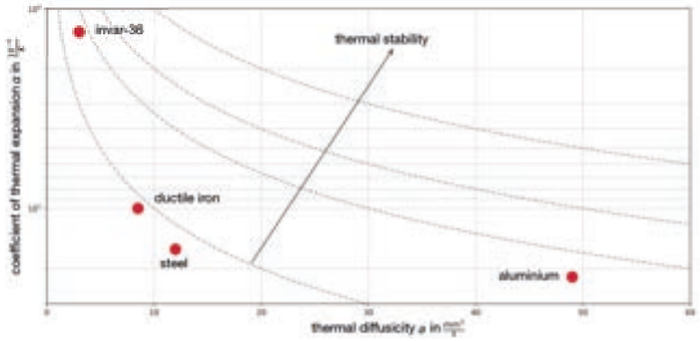
What was long considered incompatible - producing highly productive, sophisticated precision parts in serial production - is now achievable with the Micro HD. Comparable machines in this segment often have to choose between speed and accuracy. With the combination of linear direct drives and the Kern micro-gap hydrostatics, this is no longer necessary when working with the Kern Micro HD line. It achieves both - outstanding precision and exceptional dynamics and productivity. This makes the Kern HD line ideal for demanding applications where both aspects are uncompromisingly important.

Why Aluminum? – Utilization at Kern

In order to achieve high accuracy productively, it is important to reach the thermal steady state in a short time. In the Kern Micro line, this is achieved by using high-strength aluminum alloy for the moving axes parts. The high specific stiffness as well as the good thermal conductivity in combination with the Kern temperature management lead to excellent thermal stability of the entire machine. The Kern three-axes assembly weighs just under 365 kg (805 lbs). A steel axes system would increase the weight to over 1 t (2,205 lbs).



Linear direct drives
The integral design of micro-gap hydrostatics and linear direct drives allows maximum precision and dynamics at the same time



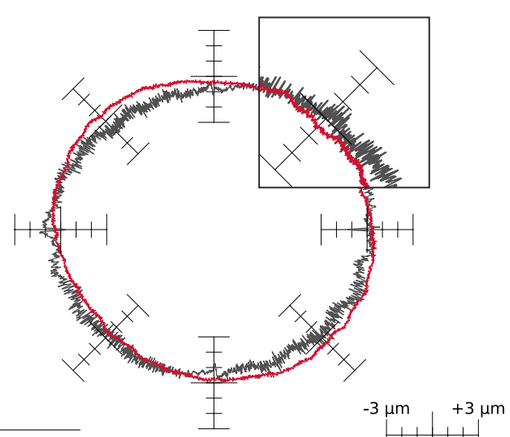
Guide system and drive - Advantages of this combination

+ *No wear* – No wear is a crucial factor for the longevity of Kern machines. Wear and tear are the main reason for change over time, as anything that changes in shape also decreases in accuracy. Kern is aware of this problem and has developed a hydrostatic solution that has already proven itself hundreds of times in the real world.

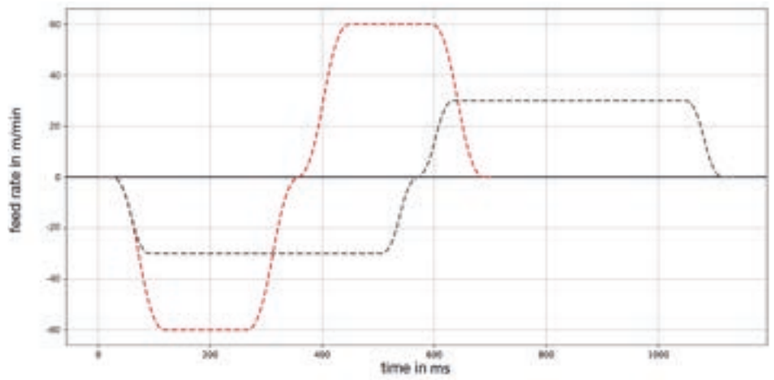
+ *No stick-slip* – The stick-slip effect means that the components of the stationary and moving parts are strongly influenced by solid friction. This applies to every machine tool with conventional bearings and has a significant influence on the accuracy of machining. The non-contact supported axes of the Kern Micro HD and HD+ are not subject to this physical effect. This optimized positioning behavior allows precise changes of direction and low feed speeds, which is ideal for fine machining. With this feature, jig grinding and trochoidal milling are possible without any problems. The result is flawless machining with no reversal marks, the highest possible accuracy and no disruptive dynamic effects across the entire speed spectrum. The axis system can be moved with just one finger, which impressively demonstrates the principle of micro-gap hydrostatics.

+ *High rigidity, damping and accuracy* – Compared to steel structures, the three-axes compound made of aluminum alloy offers increased rigidity with lower mass. This ensures highest contour-accuracy of the tool path and avoids effects such as chatter marks and tool deflection. In addition, the micro-gap hydrostatics create a damping effect, which, in combination with the rigidity of the system, provides greater accuracy and precise machining.

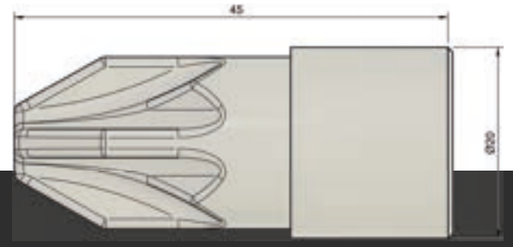
+ *Efficiency of hydrostatic* is increased by using the magnetic forces of the linear motor, as no counter bearings are required. The system minimizes the otherwise harmful or disruptive forces and ensures that damage to the axis assembly is almost impossible, even in the event of unintentional impacts such as a machine crash. The result is a solid system that has low maintenance and operating costs.



Circularity test
Circular deviation at radius 30 mm
Feed F = 1.000 mm/min
Kern Micro HD & HD+
Market-leading precision machine



Maximum feed rate – comparison at max. feed rate F = 60 m/min
Kern Micro HD & HD+
Market-leading precision machine

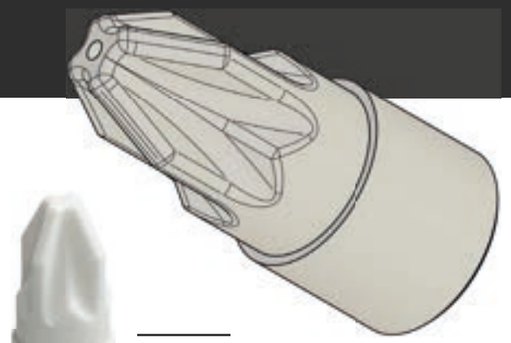


Versatile in every material

Thanks to the extremely rigid hydrostatic axes of the Kern Micro HD, roughing is carried out efficiently and with a high material removal rate using deep grinding. The complex free-form surfaces are then machined using a diamond tool with a geometrically defined cutting edge - the outstanding smoothness and precision of the machine and the special Kern expertise of the „ductile cutting mode“ result in better and chipping-free surfaces and edges.

Sintered zirconium oxide (ZrO_2)

Processing time: 2 h 13 min
Hardness: 1400 HV



Sintered aluminium oxide (Al_2O_3)

Processing time: 1 h 43 min
Hardness: 2800 HV

Tungsten carbide (K40UF)

Processing time: 3 h 3 min
Hardness: 1000 HV

Zerodur

Processing time: 1 h 25 min
Hardness: 600 HV

Sintered silicon carbide (SiC)

Processing time: 1 h 23 min
Hardness: 2800 HV

Brass (Ms58)

Processing time: 56 min
Hardness: 100 HV

Even more precise - even more reliable - even more intelligent

KERN TEMPERATURE MANAGEMENT – BETTER THAN EVER

Decades ago, Kern declared war on the negative influence of temperature deviations in the precision system of a machine tool. A perfectly adapted next-generation Kern temperature management system is installed in the Kern Micro HD and the Kern Micro HD+, which provides the greatest possible stability with significantly higher flow rates and even more precise control in the range of 0.05 K. This leads to unsurpassed accuracy in serial production and the greatest possible independence from external temperature influences. Not only the temperature medium, but also the hydraulic fluids for hydrostatics are controlled with high precision and stability.

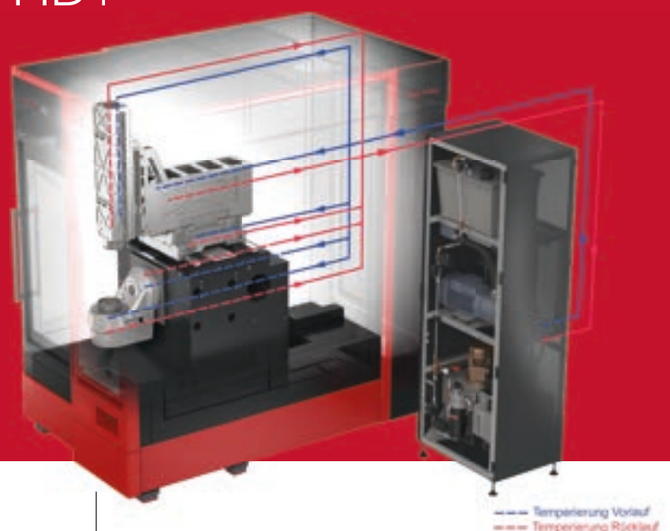
The temperature management is geared towards industrial production processes - it maintains a control accuracy of 0.05 K in all machine states - including heavy-duty operation.

Exclusively designed for the Kern Micro HD+ is a custom-made high pressure heat exchanger. It increases the control accuracy of the hydrostatics significantly and also increases the energy efficiency of the Kern temperature management system.

At a glance

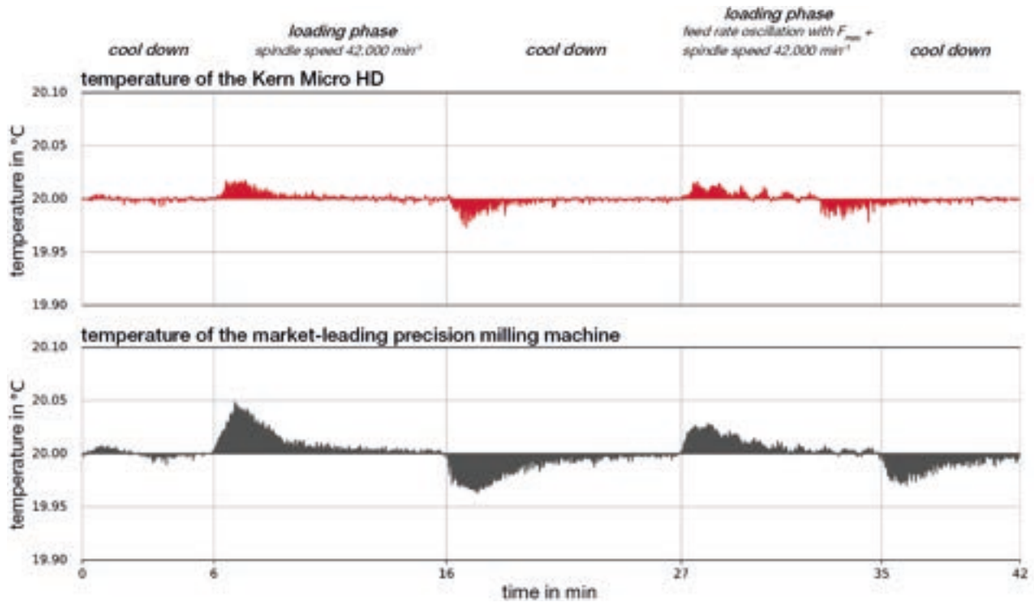
Active Temperature Management of the Kern Micro HD and HD+

+ ***Machine cast made*** of Armorith®
+ ***Media and fluids***
  (coolants & hydrostatic lubricant)
+ ***Control cabinet & electronic components***
+ ***Spindle*** (bearings, motor, rotary union),
  CSC-Spindle (additional shaft cooling)
+ ***Rotary and swivel axes*** (direct drive with stator and rotor, bearing, bearing ring)
+ ***Linear axes*** (direct drive, magnetic track, magnetic coils, axes bodies)



How is the temperature being managed?
- Flow Rate: 160 – 200 l/min
- Temperature: 20°C ± 0,05 K
- Temperature difference inlet/return flow: <0,5 K

Temperature management stress test



Temperature management
The new temperature management of the Kern Micro HD & Micro HD+ is impressive in the stress test under the toughest conditions for the temperature stability of the machine.

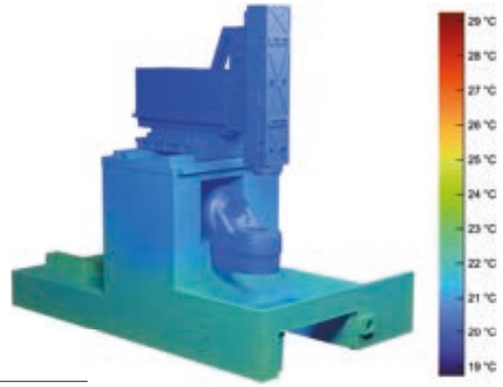
„Even if the Kern Micro HD has not been set up in an optimally temperature-controlled room and is therefore exposed to all sorts of unpleasant environmental influences, you can rely on the quality of the HD.
Its thermal stability ensures that high-precision components can be reliably manufactured in the µm range."

Gerhard Weber | Carl Zeiss Oberkochen

Temperature management of the axes on four levels

To achieve perfect workpiece geometries controlling the influence of temperature on a machine tool is very important. Even more so in 5-axes machining. This is the reason why Kern uses a four-level temperature management system on the linear axes of the Kern Micro HD and Kern Micro HD+.
In the first level, a major part of the heat is dissipated directly at the source, i.e. at the magnetic coils of the linear motors. In the second level, the heat from the entire magnetic track is dissipated. The third level prevents the transport of heat from the drives into the structural components of the machine. In the fourth level, the structure itself is cooled, thereby eliminating disruptive influences from operation. All four levels make the machine very resistant against changing heat influences from the workshop environment, self-controlled without human interaction.

All four levels of axes temperature control are supplied by the Kern temperature management. This system is in a separate hybrid unit, which is placed next to the machine to avoid the transmission of disturbing vibrations.



Cooling concept
The test in the climate chamber shows the performance of the Kern temperature management system via the colour gradation

„The thermal stability and reliability of the Kern Micro HD enables us to no longer look at the machine when developing and improving processes, but rather concentrate on all other aspects of the entire process.“

Alexander Stauder | Head of Application Technology

One step further with the Kern Micro HD+

Here a dedicated cooling of the stator on the fourth and fifth axis is active. The lubricant of the microgap hydrostatic is also temperature controlled and provides a steady temperature in all moving parts of the turntable.

This results in a superior thermal stability of the rotational and swivel axes and provides the basis for future mechanical and control related improvements.

At a glance

KERN MICRO HD-LINE

+ ***Compact design and small footprint*** of less than 5 m² (54 sq. ft.)
+ ***Highest machine stability*** with improved Kern Temperature Management
+ ***High dynamic and productivity*** with internal linear drives
+ ***Best quality of parts, no wear and tear and long durability*** because of the innovative Kern micro-gap hydrostatic
+ ***Operation in several shifts without operator*** with integrated tool changer for up to 210 tools and 60 workpieces
+ ***Certified interface*** for external transformers and automation systems
+ ***Non-stop control and maintenance*** while machine is in operation

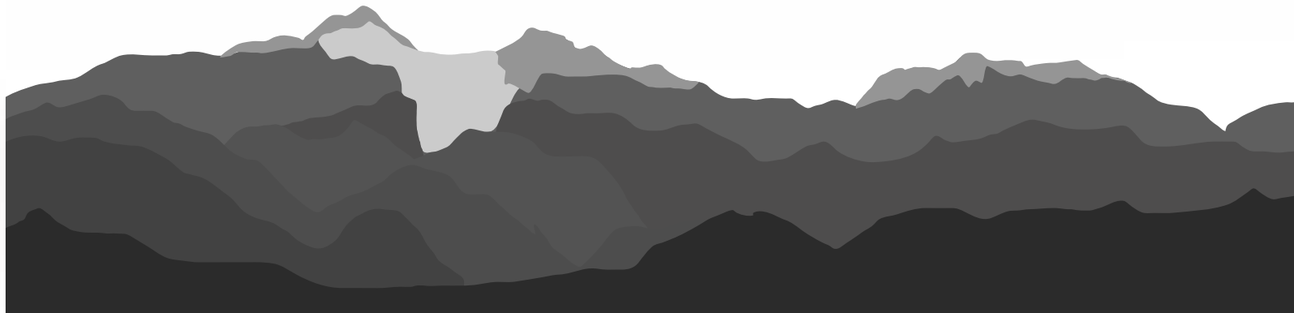
Kern Micro HD

Since 2020 the Kern Micro HD sets the standard for high-precision machining. With micro-gap hydrostatic, integrated linear drives and the unique Kern temperature management system the Kern Micro HD remains unmatched when it comes to precision, long time stability and dynamic. Developed with the knowledge of our customers and our application team the Kern Micro HD is only surpassed by the Kern Micro HD+.

Kern Micro HD+

The Kern Micro HD+ replaces the roller-bearing turntable of the Micro HD with an innovative hydrostatic turntable. The plus in the name stands for an improvement in axial and radial runout, dynamics, stiffness and thermal stability - ready for tomorrow's applications.

The Micro HD+ provides best stability for processes with different combinations of machining. Furthermore, there is no wear and tear, and the fully automated serial production of extremely precise parts can be taken for granted.



Compact shaft cooling

SHAFT-COOLED HIGH - SPEED SPINDLE

In high-precision machining, the demands on the milling spindle are always increasing, and many conventional spindle concepts are reaching their limits. The new generation of the CSC spindle (Compact Shaft Cooling) with HSK 40 interface is a high-frequency spindle that stands out because of its shaft cooling, non-contact rotary union and an extended speed range of up to 45,000 rpm. The stator, front and rear bearings, the housing and, as a special feature, the shaft are being cooled. This results in less spindle growth and a minimal thermal settling time. The temperature control is in a separate unit, which can be positioned on the hybrid cabinet or next to the machine. Unlike the industry standard, this unit is being actively cooled with a very high precision.

In addition, the CSC spindle provides unrivaled performance in a wide variety of applications. The high speed, thermal stability and exceptional smooth-running push the limits of machining. The non-contact rotary union allows the use of internally cooled tools with compressed air, lubricants or oil without any restrictions.

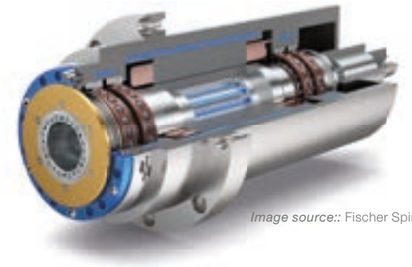
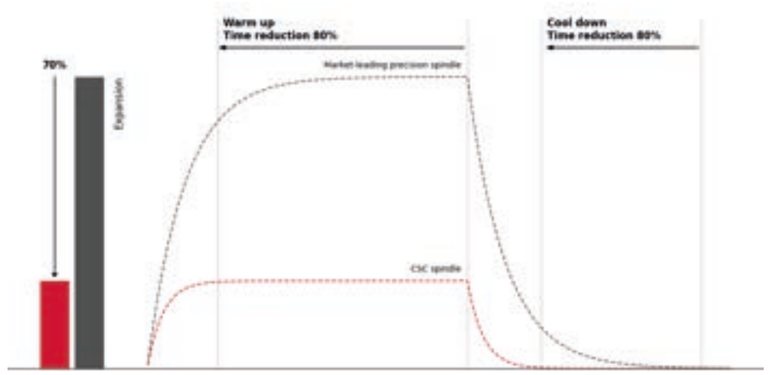
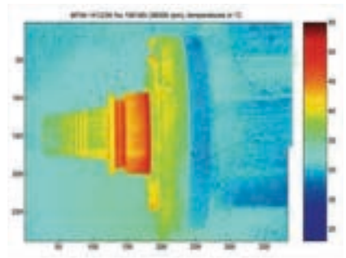


Image source:: Fischer Spindle AG

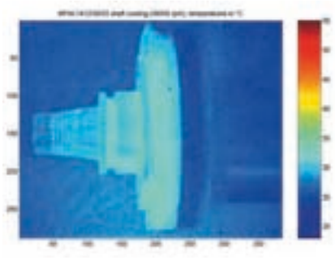


Shaft cooling
Temperature curve with or without shaft cooling



Without shaft cooling

Image source: Fischer Spindle AG



With shaft cooling

Image source: Fischer Spindle AG

Spindle Options

+ ***HSK-E 25:*** 50.000 rpm, 6 kW (S1) ball bearing

Image source: Fischer Spindle AG

+ ***HSK-E 40:*** 42.000 rpm, 15 kW (S1) ball bearing

Image source: Fischer Spindle AG

+ ***HSK-E 25:*** 80.000 rpm, 5,5 kW (S1) Luftlager

Image source: Levicron GmbH

+ HSK-***E 40:*** 45.000 rpm, 15 kW (S1) ball bearing (CSC)

Image source: Fischer Spindle AG

Ergonomic & comfortable

HEIDENHAIN CONTROL TNC7

With Heidenhain's new TNC7 control operators receive full support from the first idea up to the finished part – no matter whether it's a prototype or serial production. The TNC7 includes a new touch-based concept – this makes working with the software dynamic and intuitive. Perfectly coordinated software and hardware components of the TNC7 also enable extremely ergonomic and comfortable working. At Kern, the new high-resolution widescreens have been integrated into the folding and pivoting control console to make them fully accessible. The familiar and proven Heidenhain control now shines with sparkling new functionalities. The fast block processing time in combination with the advanced path planning of the Heidenhain control enables 5-axis-simultaneous machining with the highest precision and speed. Together with Kern's machine concept, the most challenging parts can be machined most efficiently.

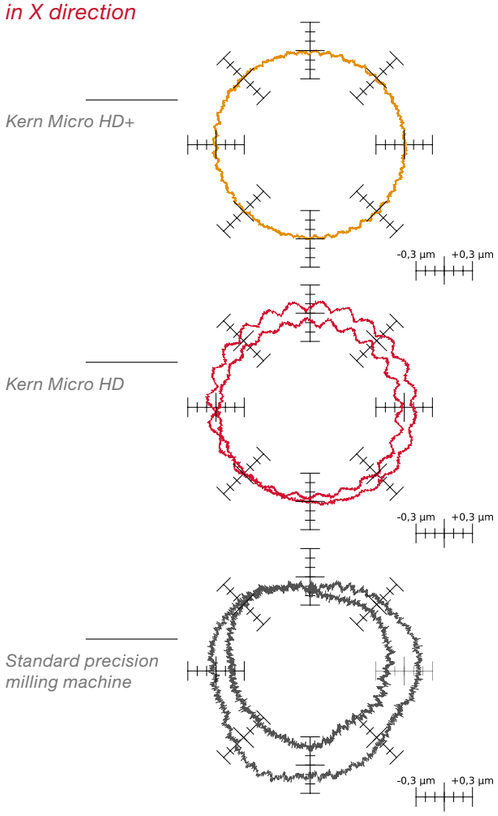
Technological leap

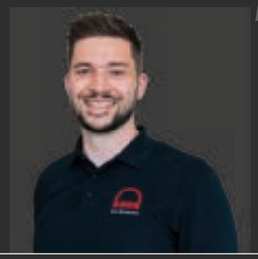
REVOLUTIONIZING THE ROTARY AND SWIVEL AXES

In high-precision five-axis machining, there is always a high pressure to innovate and the need to always be faster, more precise and more stable. To become significantly better, it is often not enough to optimize details or improve existing systems. That‘s why Kern decided to take a technological leap forward. The development of the hydrostatic turntable at Kern is based on pure pioneering spirit. Based on our experience over the last few years, we have been able to identify roller and ball bearings as the cause of displacements in the sub-micrometer range. They are a limiting factor for the machining quality in many processes.

Kern‘s Micro HD+ is the most accurate, most dynamic and most productive industrial 5-axes milling machine. The integration of Kern’s micro-gap technology into the rotary and swivel axis leads to a significant improvement in all key performance metrics - in particular runout, stiffness, thermal stability and dynamics.

Radial guide accuracy
in X direction





“Hydrostatic micro-gap bearing supports enable the design of highly rigid rotary axes with running properties that cannot be achieved with conventional rolling bearing supports.
Combined with the wear-free bearing principle, these form the basis for a highly precise and robust rotary and swivel unit.”

Fabian Tripkewitz | Engineer

At a glance

Advantages of a turntable with micro-gap technology

+ *Improved Runout*
The high-precision bearings, which are manufactured in-house in the sub-µm range on a Kern machine, offer the best conditions for outstanding accuracy of flatness and runout.
The hydrostatic system creates an additional averaging effect of the bearings, which neutralizes any remaining shape deviations and shifts the running accuracy into the nanometer range.

+ *Higher Dynamics*
By installing more powerful motors with higher nominal and peak torques as well as an improved topological structure, the Kern Micro HD+ achieves significantly higher dynamics than comparable turntables. In combination with Kern’s temperature management, dynamic machining takes place at high speeds over a long period of time with excellent machining accuracy.

+ *High Stiffness*
A real advantage of the hydrostatic micro-gap turntable is the stiffness. Combined with improved topology of the housing and reinforcement of the swivel housing, we provide steadfast rigidity. The use of hydrostatic bearings also contributes significantly to the stiffness. This system is designed to provide highest precision even under high loads.

+ *Best Thermal Stability*
Another advantage is the increased thermal stability. While systems with roller bearings only cool the bearing plate and the stator, the HD+ also actively cools the bearing and housing in the swivel axis and the bearing shaft, bearing and stator in the rotation axis. The improved temperature management significantly increases the performance of the machine, even when machining processes are changing fast, and conditions are not perfect.

One-sided Mounting

An important principle of precision engineering is the so-called „exact constraint design“ (also known as „kinematic design“), i.e. maintaining the static determinacy of the system. If more degrees of freedom are blocked than is required for static determinacy, this results in increased rigidity, but also causes constraint forces. An overdetermined system reacts unpredictably to geometric errors in the components, e.g. from manufacturing and assembly errors, as well as environmental influences such as temperature changes. The rotary and swivel unit of the Micro HD series therefore offers the significant advantage of reproducible and robust behavior under a variety of influencing factors from the production environment.
The design also offers improved ergonomics and accessibility for workpiece handling and process control, allowing the processes in the work area to be controlled in the best possible way.

James Clerk Maxwell, 1890 [MAX90]: „Hence if a solid piece is constrained in more than six ways it will be subject to internal stress and will become strained or distorted, and this in a manner which, without the most exact micrometrical measurements, it would be impossible to specify.” *

Combining different Technologies all in one Process

JIG GRINDING

Why Jig-Grinding?

The jig grinding option on the Micro HD allows not only high-precision milling but also grinding in one clamping.

Jig grinding is not only an additional option for the Kern Micro HD and HD+. Kern is also realizing the goal of building the most powerful 5-axis milling machine with market-leading grinding technology. The integration of grinding, milling and drilling in one system significantly increases capacity and flexibility and at the same time provides optimized machining for the entire process.

The grinding strikes not only with an extreme speed, but also with an exceptional cost-effectiveness and productivity. The combination of milling and grinding is now providing a level of precision in machining which was previously not reachable.

Optimized cycles for different grinding applications are integrated directly into the Heidenhain TNC7 control and simplify the entire process. This is essential for efficient machining with highest accuracies.

Modularity for maximum flexibility

The jig grinding options are modular and can be selected with a rotating or fixed diamond dresser or grinding pins and a dressing spindle that is directly integrated into the machining process.

Benefits & Solutions

+ ***Highest accuracy*** in jig grinding, without high additional investments
+ ***Wear-free*** because of the specially developed machine concept
+ ***Combined machining*** of grinding, milling and drilling in one clamping
+ ***Machine savings*** because several processes are running on one machine
+ ***Diverse applications*** with 5-axes technology, ideal for complex geometries and free-form surfaces
+ ***Integrated sensor technology*** for automated and reliable processes

dressing spindle

fixed dresser

scraper block

Best process control

Acoustic Emission Sensors (AE Sensor):

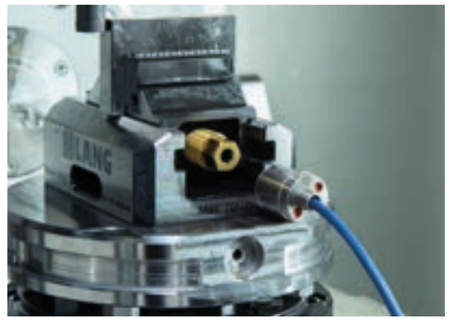
Our AE sensors work like microphones, detecting frequencies that detect changes in the process when the grinding pin touches the workpiece or the grinding process is complete.

Advantages:
+ *Real-time process monitoring and optimization*
+ *Extremely helpful when dressing to determine the exact time of completion*

1. Fluid sensors:

A machining medium is directed at the workpiece during machining. When the workpiece and tool touch each other, the sound waves are fed back via the fluid jet – very helpful for automated 5-axes machining.

Advantage: Non-contact measurement



2. Magnetic sensors/solid-state sound sensor:

The sensor is attached directly to the workpiece using a magnet. The touches can thus be measured precisely. (Piezo element)

Integration of the sensors directly into the machine: optimization of the entire processing.

Pentalobe

+ ***Material:*** Carbide K40UF
+ ***Technology:*** Jig Grinding & 5-Axes Grinding
+ ***Surface:*** Ra 0,02 µm

Options

Filtration

+ *Band filter in different stages of expansion:*
  Options are with high pressure up to 80 bar for internal coolant supply and 490 l (130 gallon) tank capacity. The system is also available in different levels to suit different machining processes; also, with the selection of the IDV cartridge filter for certain applications.

Cooling, Lubrication, Chip Management

+ *Coolant through spindle:*
  Optional rotary union for the use of internal cooled tools with air, emulsion or oil in combination with bandfilter. Pressure: Cooling lubrication 80 bar / compressed air 6 bar.
+ *BEMA nozzles:*
  The automatic coolant nozzles adjust individually and precisely to the respective tool length. As a result, the cooling medium arrives where it is needed and ensures optimal cooling and flushing.
+ *Scraper belt conveyor:*
  Integrated chip conveyor with ejection at the backside of the machine. Only available in combination with a band filter.
+ *Internal chip container:*
  The chip collection container with temperature management has 100 l (26 gallon) capacity and is made of powder coated steel. It is one part of the machine‘s central temperature management system and is also suitable for wet machining. The flow rate of the cooling lubricant is 25 l (6.6 gallon)/min at 4 bar.
+ *Minimum quantity lubrication:*
  Micro dosing pumps with double dosing device and two coaxial nozzle arms with stainless steel nozzles. For each application the amount of oil can be adjusted with a specific function. Oil reservoir is 1.5 l (0.4 gallon).

Integrated Tool Management System

+ *Tool Identification DMC Scan:*
  Automatically scans all tool holders and their tools each time the tool changer door closes and identifies saved, tool-specific information.
+ *Tool cleaning:*
  Automated system for prompt „fine cleaning“ of cutting tools inside of the Kern machine. Cleaning nozzle to remove oil and dirt on the tools before laser measurement.
+ *3D Tool Comp:*
  Provides a powerful, three-dimensional tool radius correction, as well as the measurement of 3D geometries. For this purpose, angle-dependent offset values can be defined via correction value tables, which describe the deviation of the tool from the ideal circular shape. In addition, it is possible to compensate for the radius value defined at the current contact point of the tool with the workpiece.
+ *Spindle Control:*
  Innovative visualization and evaluation software for DIGILOG laser measuring systems from BLUM. An analysis of critical vibrations of the entire system consisting of spindle, tool holder and tool itself is carried out. In the next step vibrations are tested at different speeds and in a last step the process is optimized is by shifting the spindle speed away from a critical range.
+ *Form Control X:*
  User-friendly measurement and automation software for automated quality control of workpieces coming out of prototype or serial production. The system provides extremely high productivity as well as minimal scrap because of control measurements between and after machining, static process control based on the recorded measured values and re-machining parts if needed in the original clamping.
+ *BLUM Laser LC50 with Digilog function:*
  The Digilog technology works with a scanning process and higher sampling rates. This results in up to 60% percent shorter measurement and testing times and an increased process reliability in the event of contamination and coolant adhesion on the tool’s cutting edge.

OPTIONS | *Kern Microtechnik*

Automation

+ *Integrated tool and workpiece changer:*
  Multi-shift operation without operator with integrated changer for up to 210 tools and a maximum of 60 workpieces.
+ *External automation:*
  as described on page 21

Productivity

+ *Kern Advanced Surface:*
  Kern Advanced Surface includes technical solutions to fully exploit the machine’s technology for best surface qualities.
+ *Kern Adapted Machining:*
  A combination pack of the highest possible surface quality combined with the Kern machine‘s specialization in machining. This allows for optimization of machining with a focus on either speed, surface quality or best contour accuracy.
+ *Energy Saving Pack:*
  To optimize overall energy consumption and to increase productivity and provide ideal machine availability.
+ *Productivity Pack 2:*
  Individual compensation of all heat-dissipating parts of the machine for highest accuracy and productivity without any additional warm-up time.

Safety

+ *Collision Monitoring – DCM V2:*
  Software for permanent monitoring of workspace components. Endangered envelopes of predefined components are compared in real time with machine movements. In the event of a possible collision, machining is interrupted.
+ *Fire extinguishing system:*
  Safety function in case of fire made of die-cast aluminum with adjustable trigger temperature between 50°C and 150°C (120° F and 300° F).
+ *Teleservice:*
  Kern Service Team has remote diagnostic access to the Heidenhain control and other parts of the machine via Internet and customer network to perform rapid analyses and process optimization.

Information

+ *PDA interface - 3 signals can be selected:*
  Software for permanent collision monitoring of the components in the work area (rotary and swivel table, laser, clamping device, spindle and tool holders) in manual and automatic operation.
+ *UPC UA interface:*
  Secure and stable interface for connecting modern industrial applications. Easy to use since standardized concepts are being used and it is possible to combine different interfaces.
+ *DNC 18:*
  Software function that enables a higher-level cell computer to communicate with the Heidenhain control.

The Kern Micro HD & Micro HD+

CHARACTERISTICS

Best conditions

Compact

Powerful and space saving with the one – box design.
All units are integrated into the machine and hybrid unit, resulting in a footprint of less than 5 m² (54 sq ft), low height of 2,63 m (8.6 ft), and a narrow width of only 1,69 m (5.5 ft). Including the hybrid unit the weight is 5,9 t (13,0073 lbs.).

Fully accessible

Productive management

The well-structured and fully accessible maintenance area on the side of the machine allows checking and filling of lubricants without the need of a machine stop. In addition, necessary maintenance work can be identified immediately.

Effective and prepared

Fully automated

Often, full automation is the key to profitability. Whether with integrated workpiece changer for up to 60 parts or external solution – Kern Micro HD and Kern Micro HD are perfectly prepared for shifts without operators.

The Kern Micro HD & Micro HD+

CHARACTERISTICS

Perfectly prepared

External automation

The Kern Micro HD and Kern Micro HD+ are easily compatible with external automation for optimum workpiece changeover. Both machines are perfectly prepared and suitable for unmanned operation.

Hybrid Unit

... of Kern Micro HD

Best quality and flexibility for the set-up. The hybrid unity of the Kern Micro HD includes the Kern temperature management system as well as the hydraulic system and reliably separates the source of vibrations from the machine's cast. The hybrid unit can be placed anywhere around the machine, providing even more flexibility.

... of Kern Micro HD+

The hybrid unit of the Kern Micro HD+ is a little wider than the standard hybrid unit. This unit provides more space for the upgraded Kern temperature management system of the Kern Micro HD+ and for the cooling of the turntable.

At a glance

TECHNICAL DETAILS

Linear Axes
Travel X/Y/Z: 350/220/250 mm (13.8/8.7/9.8 inch)
Feed Rate: 60 m/min (2362 inch / min)
Acceleration: up to 20 m/s² (2 g)

Rotary and Swivel Axes
Rotary axis: 360° infinite / 200 min⁻¹
Swivel axis: 220° (opt. 280°) / 100 min⁻¹
Clamping force swivel axis: 300 Nm (HD+: 450 Nm)

Max size of workpiece
max. volume of workpiece: Ø 350 x 200 mm (13.8 x 7.9 inch)
max. weight of workpiece: 50 kg (110 lbs.)

Accuracy (VDI/DGQ 3441) (X/Y/Z)
Position Accuracy P: < 1 µm
Repeatability Ps: < 0,5 µm

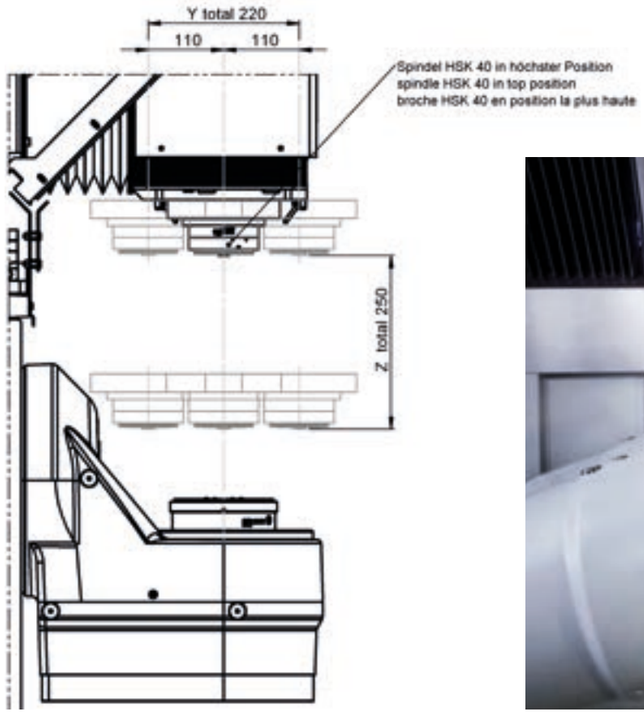
Accuracy (ISO 230-4)
Circular shape deviation Gyx: ≤ 1,5 µm
Circular shape deviation Gxy: ≤ 1,5 µm

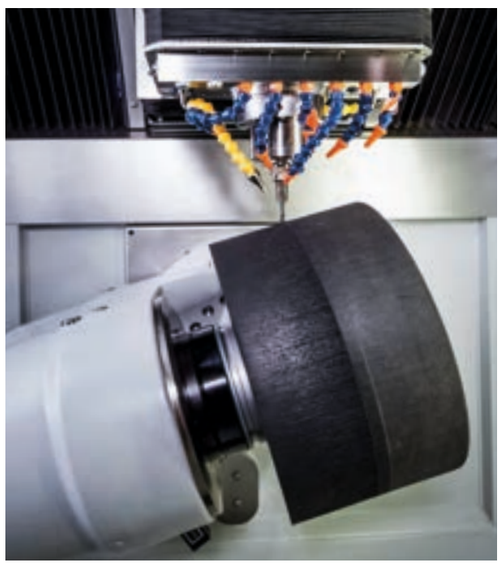
Tool Changer
Tool Changer HSK 40: 90-, 102-, 186- and 210-fach
max. tool diameter: 70 mm (2.76 inch)
max. tool length: 155 mm (6.10 inch)
Option: Upgrade to combined tool and workpiece changer

Technical concept
Internal temperature management with ±0,05 K steady state
5-axes simultaneous machining
Heidenhain Control TNC7
Ultra compact one-box design with hybrid unit
Integrated design with micro-gap hydrostatic and linear direct drives

Dimension and weight
Weight: 5.500 kg (12,000 lbs.)
(+ hybrid unit 400 kg (882 lbs.)
min. footprint W/D/H: 1,68 x 2,70 x 2,65 m (5.5 x 8.9 x 8.6 ft.)

Status 09/2024
Subject to technical changes





Front view

The compact front enables ergonomic processing with a width of 168.5 cm and a height of 265 cm.

Left side view

The machine is only 270 cm long and allows productive maintenance and inspection through the side door.

Right side view

The Micro HD & Micro HD+ offer very good accessibility to the workpiece changer, tool changer and the hybrid unit, which can be positioned within a radius of 5 m.

**Source S. 19:*
MAX 90 Maxwell, J.C.: General considerations concerning Scientific Apparatus. In: Niven, W. D.; The Scientific Papers of James Clerk Maxwell. Band 1. Cambridge, UK: University Press, 1890.

KERN

CNC machines | Contract manufacturing | Manufacturing processes | Automation

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