High productivity with
ultra precision machining
±0.5 µm

Micro- und Feinwerktechnik

KERN Evo

Ultra Precision
CNC Machining Centre

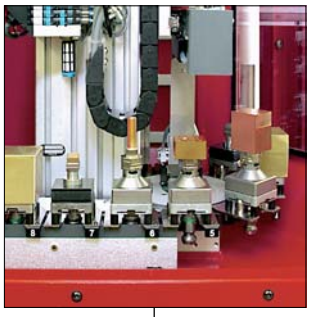
KERN Evo
Evolution

Specific machine characteristics:

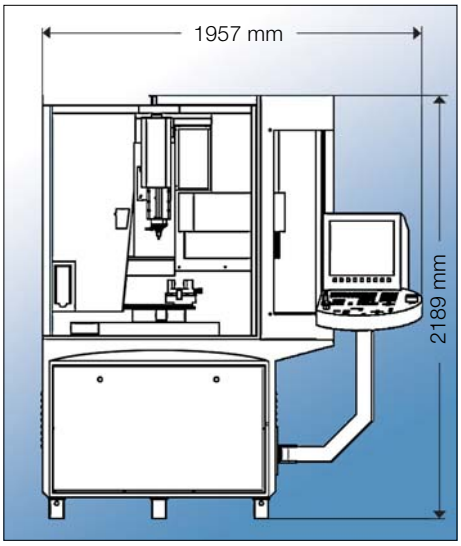
The digital direct feed drives fitted to the KERN Evo ultra precision machining centre provide fast acceleration and feed rates. These forces are absorbed by the polymer concrete monobloc machine frame.

The KERN Evo is specially designed for applications requiring the following features:

- **Highest precision on the workpiece (deviation of position P_a ±0.5 µm according to VDI/DGQ 3441)**
- **Excellent surface quality Ra ≤ 0.1 µm**
- **Milling of critically machinable materials and hardened steel**
- **High productivity**
- **High acceleration rates**
- **High feed rates**
- **Automatic workpiece loading for batch production (available for 3 and 5 axes machining)**



Automatic workpiece changer Workmatic



The KERN Evo ultra precision machining centre can be fitted with a wide range of accessories and options, e.g.:

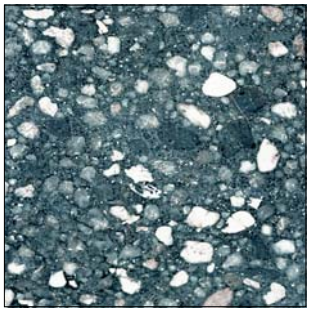
- Powerful vector-controlled spindle (other spindle types available)
- Digital CNC precision dividing head (4th/5th axis)
- Automatic tool changer (ATC) with 32, 63 or 95 positions
- Automatic workpiece changer, integrated with 24 positions (picture), alternatively with 36, 60 and more positions (preparation for retrofitting at a later stage possible)
- Automatic measuring of the workpiece by a touch probe with data transfer by infrared beam (only for vector-controlled or oriented spindles)
- Automatic tool measuring with either a linear measuring system or a laser measuring system for tool length and radius

KERN Evo
Technical machine description

The engineering philosophy of KERN Micro- und Feinwerktechnik GmbH und Co. KG consists in obtaining the maximum machining accuracy. Hence all major machine components vital to reaching the highest precision are manufactured in house with the same precision principles linking the development, design and manufacture of our products.

Axis system (X, Y, Z)

The complex design principle of the axis system is fundamental to the high overall accuracy of KERN machines. High precision roller seated and backlash-free pre-stressed prismatic linear guides ensure constant positioning accuracies on a permanent basis. New digital direct drives optimise contour tracing on dynamic machining and permit high acceleration and high feed rates. Only specially selected precision machined ball screw spindles are used for integration into the axis centre next to the incremental Heidenhain glass scales (resolution 0.1 µm). Thanks to the central alignment of the major drive and command elements, jamming of the axes is avoided. All the slideways and ball screw spindles are permanently lubricated and are therefore maintenance-free.



KERN Polymer Concrete

Machine design

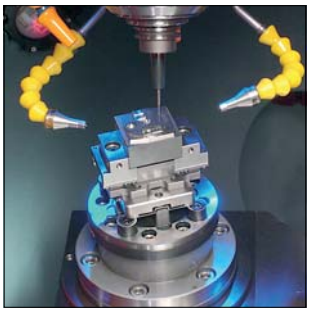
The machine body of the KERN Evo is specially designed to take full advantage of the characteristics offered by the high tech material KERN polymer concrete:

- Maximum rigidity – static and dynamic
- Vibration absorption up to 10 times better than GG20
- Low sensitivity to temperature fluctuations

Spindles

KERN co-operates exclusively with proven spindle manufacturers sharing the same precision philosophy. High speed spindles are necessary to cater for the wide spectrum of application needs of our customers. Moreover, KERN machines can be fitted with several different spindles, these can be easily and quickly exchanged by the user.

Please do not hesitate to contact us for further information.



Ultra precision machining in hardened steel 47 HRC

Handwheel

Contouring Control

KERN machining centres are equipped with the latest Heidenhain contouring control systems. Even in their standard version, our Heidenhain controls are fitted with all the major functions required by a workshop. All Heidenhain contouring controls offer up to 5-axes interpolation, functions like rigid tapping, various milling and drilling cycles, parametric and subprogramming, teach-in programming, graphic display and simulation, tool management, tool radius correction for 5-axes simultaneous operation and DNC operation... but often with other manufacturers these features have to be ordered separately at additional cost.

Maintenance

The KERN machines are in general maintenance-free. They simply require regular thorough cleaning as well as high-level professionalism in their operation. Machine operators will be instructed in the technical details of their KERN machine during commissioning.

Environmental conditions

To obtain the best machining results, it is necessary to pay due care and attention to the working environment and avoid fluctuations in temperature.

KERN Evo
Options and accessories

Achieving the optimal results in machining operations depends on a variety of factors. One of these factors is the use of original KERN accessories.

Spindles

500 – 30,000 rpm	permanently grease lubricated, oriented		2.5	kW
500 – 50,000 rpm	permanently grease lubricated, vector-controlled	0.8 Nm	3.4	kW
500 – 50,000 rpm	permanently grease lubricated, vector-controlled	1.5 Nm	6.4	kW
30,000 – 90,000 rpm	permanently grease lubricated		0.17	kW
60,000 –160,000 rpm	oil-mist lubricated		0.5	kW

Further spindle alternatives on request.

Tool changer
Standard 32 tools, optionally 63 or 95 tools
Tool changing time: about 3 s
Average chip-to-chip time: about 7 s (depending on spindle configuration)
Tool length max. 105 mm
Tool diameter max. 50 mm
Tool shank diameter max. 10 mm

Digital CNC precision dividing head (4th/5th axis)
Rotational and swivelling axis, 2 axes or 1 axis system
Brushless servo motors, digital drive system
Diverse interfaces: collet chuck (max. chucking capacity Ø 26 mm, max. passage Ø 14 mm), System 3R or Erowa
Feed rate C/B 7000 / 3000 °/min
max. swivelling range from -10° to +100°
Height of centres 100 mm
Positioning scatter $P_S \leq 1$", precision on the workpiece ≤ 5"

Tool length measuring: Laser
A laser beam with a diameter of 30 µm permits non-contact measuring of the smallest tool according to length, radius and concentric accuracy even at high spindle speeds. The measured data is transferred automatically into the Heidenhain contouring control and are taken into consideration in the active programme. In case of deviations from individually defined tolerances, for example automatic change of a sister-tool will take place (programmable).

Touch probe system with wireless infrared transmission
for measuring of the workpiece to be machined. An infrared touch probe which can be transferred automatically from the tool magazine to the spindle and measures the height and position of the workpiece. Can only be used in combination with vector-controlled or oriented spindle.

Vice with gripping jaws
for clamping of tools/collets in a collet chuck

Optical measuring device
Centring and controlling microscope with HSK interface
Magnification 30-times, alternatively 50- or 100-times

not illustrated:
Coolant device with reservoir of 42 litres
Oil mist lubrication / cooling unit
Special coolant system for temperature control of workpiece
Special coolant system for temperature control of spindle
Inductive shrink unit for
Shrink tool holder HSK 25 (KERN Special)
Tool holder HSK 25 (KERN Special)
EX 16 high precision collet chuck
ESX 16 precision collet chuck
D 14 high precision collet chuck
Precision vice for workpieces

Fully automatic

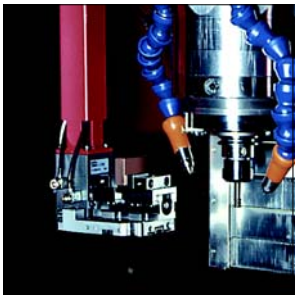
Machining Centres

KERN Micro- und Feinwerktechnik GmbH & Co. KG is a pioneer in the development of fully automatic workpiece loading systems for batch machining of high precision workpieces. The micro milling machine shop of KERN's subcontracting division has for some years used unmanned production systems for high precision parts.

Automatic workpiece pallet changing systems are available from different suppliers with a variety of pallets sizes, each being able to be integrated.

KERN HSPC with System 3R WorkPal

Automatic individual palletising for up to 32 different pallets for 3 to 5 axes machining. Workpieces are mounted onto System 3R Macro or Magnum holders.



KERN HSPC with Erowa

Automatic pallet changing for up to 90 different pallets for 3 to 5 axes machining. Workpieces are mounted onto Erowa ITS holders.

KERN Evo with integrated System 3R Workmatic

Automatic pallet changing for up to 36 different pallets for 3 to 5 axes machining. Workpieces are mounted onto System 3R Macro holders.

Maximum workpiece size: 70x70x100 mm

IMPORTANT space saving solution!

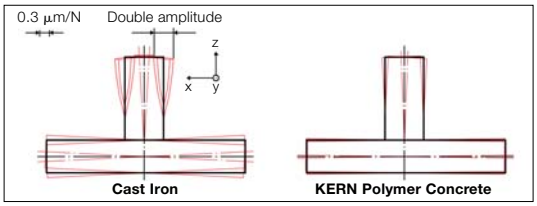
Additional integration of workpiece identification chips permits optimal control of the loading and machining process with maximum logistical flexibility using a cell computer.

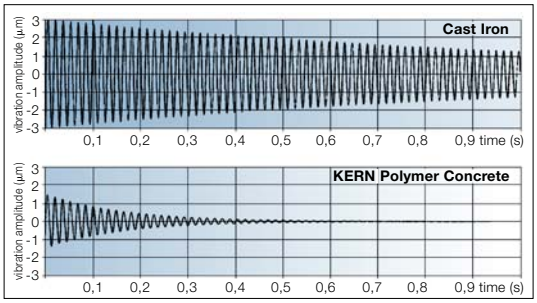
Technical Data
KERN Evo

Axes:	
Travel X/Y/Z	300/280/250 mm (11.81/11.02/9.84")
Clamping area max.	350 x 230 mm (13.78 x 9.06")
Drives	digital (AC Servo)
Workpiece weight max.	50 kg
Feed rate	0.01-16,000 mm/min (0.00039-629.92 "/min)
Acceleration	8 m/s² (314.96 "/s²)
Precision according to VDI/DGQ 3441:	
Resolution	0.1 µm (0.0000039")
Positioning scatter P_S	±0.5 µm (0.0000196")
Positioning tolerance P	±1.0 µm (0.0000393")
Precision on the workpiece (3-axis)	±2.0 µm (0.0000787")
Choice of spindles:	up to 30,000; 50,000; 90,000;160,000 rpm etc.
Taper	HSK 25 (using spindles up to 50,000 rpm max.)
Tool changer capacity	32 tools, optionally 63 or 95 tools
Tool changing time	approx. 3 s
Chip to chip	approx. 7 s
4th / 5th axis:	
Rotational	360° continuous
Swivelling	-10° up to +100°
Precision	≤5"
Feed rate C/B	7000 / 3000 °/min
Automation:	
Automatic workpiece changing system	24, 36, 60 and more positions
Kern Evo:	
Space requirements min.	2.80 x 2.50 x 2.20 m (110.24 x 98.43 x 86.61")
Weight	approx. 3,000 kg
Controller	Heidenhain

Subject to technical changes

Machine design with polymer concrete





Maximum rigidity – static and dynamic
Cross-sections with exceptionally big dimensions are used on the KERN machines, thanks to the 1.8 tonnes polymer concrete construction on a 2.5 m² footprint. The static and dynamic rigidity inherent in our polymer concrete machine frame is much higher than the limits of a cast iron structure.

Vibration absorption 10 times better
The vibration dampening characteristics of the monobloc frame are of paramount importance to balance the high dynamic forces exerted by our digital direct feed drives. Polymer concrete monobloc absorbs up to 10 times more vibrations than cast iron, resulting in longer tool life of up to 30 % and superior surface quality with Ra ≤ 0.1 µm.

Low sensitivity to temperature fluctuations
The polymer concrete monobloc frame of KERN machines is known to have a 50 % lower heat conductibility than that of a steel or cast iron design. Polymer concrete does not react to short temperature fluctuations. The very low thermal conductivity minimises any deformation due to temperature variations. This in turn increases the workpiece accuracy.

KERN Micro- und Feinwerktechnik GmbH & Co. KG
Ammergauer Strasse 11, 82418 Murnau-Westried, Germany
Phone: +49 (0)8841 6130-0, Fax: +49 (0)8841 6130-40
Email: mtsales@kern-microtechnic.com
Internet: http://www.kern-microtechnic.com

07/2005e