

Nano precision  $\pm 0.3 \mu\text{m}$   
Ra  $0.05 \mu\text{m}$

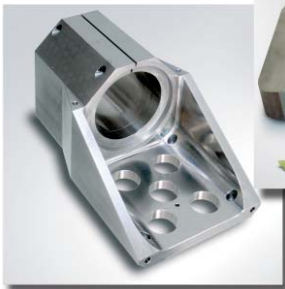
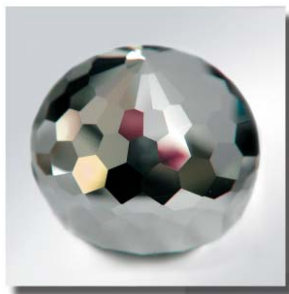


Micro- und Feinwerktechnik

# Pyramid Nano

CNC Machining Centre

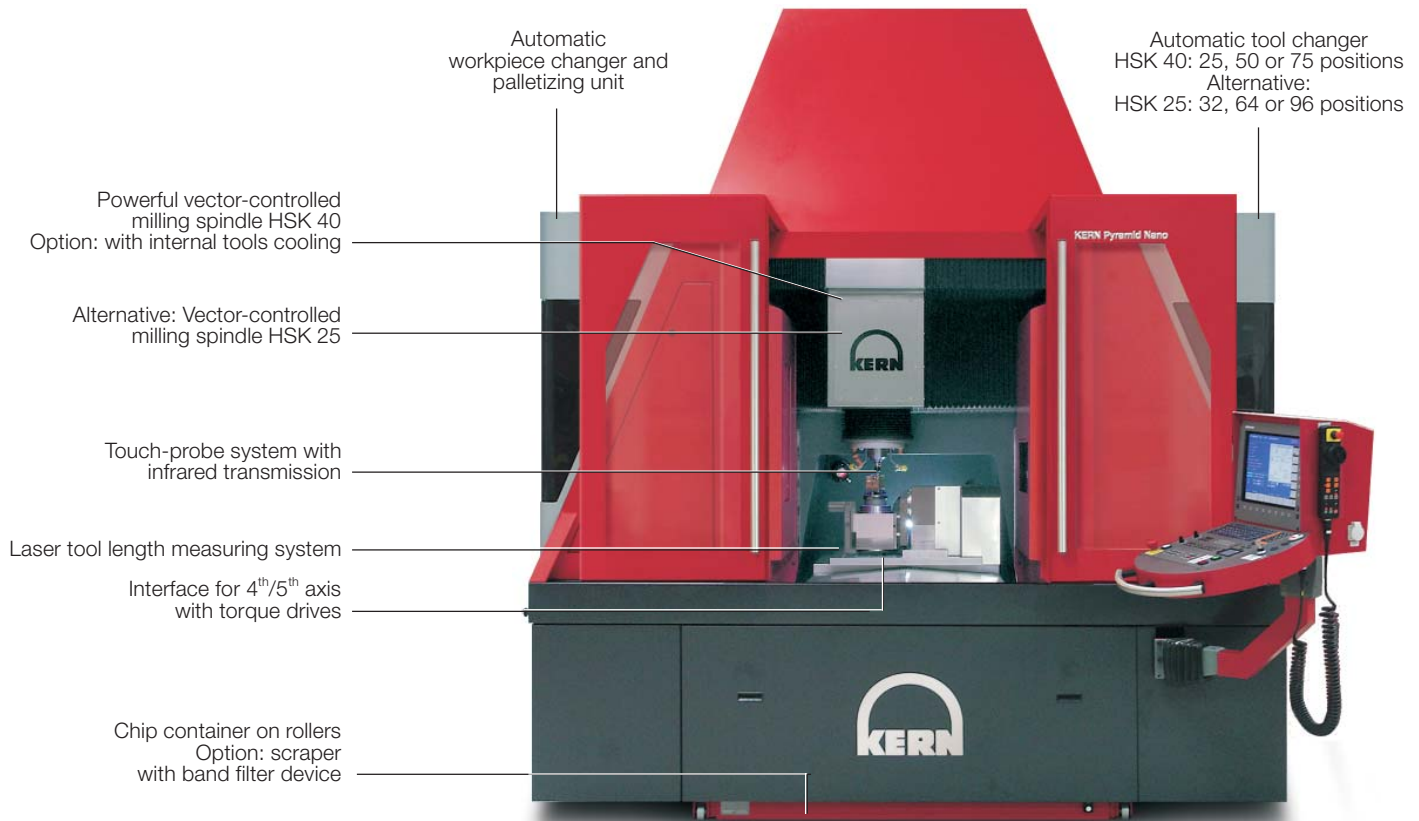
Hydrostatic axes and guideways  
Large chip production



# KERN Pyramid Nano

**Cost effective nano precision machining and large cutting volumes**

The KERN Pyramid Nano has been developed for applications which require maximum accuracy and surface finish on larger workpieces. An integrated automatic workpiece changer allows unmanned operations even for 5 axes simultaneous jobs.



Automatic workpiece loading

## Specific machine characteristics:

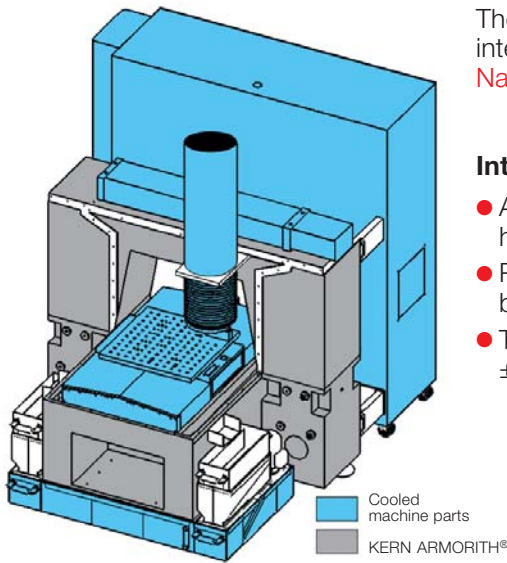
- Positioning scatter  $P_S \pm 0.3 \mu\text{m}$
  - Surface finish  $R_a 0.05 \mu\text{m}$
  - Acceleration  $10 \text{ m/s}^2$  (1 g)
  - Feed rate 30 m/min
  - Digital CNC precision dividing head with torque drives for high dynamics when milling 5 axes simultaneously
  - Vector-controlled milling spindle HSK 40 with oriented tool change  
Option: coolant through the center of the tool
  - Vector-controlled milling spindle HSK 25 with oriented tool change
  - Automatic tool changer HSK 40: 25, 50 or 75 positions
  - Automatic tool changer HSK 25: 32, 64 or 96 positions
  - Integrated workpiece changer with up to 20 positions (pallet size max. 70 x 70 x 150 mm)
  - Alternatively: External workpiece changer (pallet size max. 300 x 300 mm)
  - Automatic tool measuring by laser for length, radius and concentric accuracy
  - Automatic workpiece measuring with a touch probe system and infrared data transmission
- 
- Milling in hardened steel (up to 64 HRC)
  - Machining of graphite and ceramics
  - KERN ARMORITH® machine base giving optimum vibration dampening
  - Hydrostatic axes guideways
  - Hydrostatic drives
  - Integrated central temperature management for constant cooling of spindle, hydraulic system, electrical cabinet and flood coolant unit
  - Integrated associated facilities provide a compact machine
  - Jig-grinding cycle as option

**KERN ARMORITH®**  
**A new material giving maximum rigidity and stability**

The portal machine frame of the **KERN Pyramid Nano** is symmetric. This design concept allows for maximum rigidity and thermo-symmetric stability.

High shear and tensile strength combined with an extraordinary vibration dampening are the main features of the new material **KERN ARMORITH®**.

The low thermal conductivity of the material in combination with the integrated temperature management system of the **KERN Pyramid Nano** desensitises the entire system against variations in temperatures.



Intelligent temperature management in five separate cooling circuits

**Intelligent temperature management system:**

- A separate water cooling system for the milling spindle, dividing head, hydraulic unit, electrical cabinet and the coolant device
- Permanently cooled circulating hydraulic oil flows through machine base, guideways and drives of the axes
- Temperature management of the central cooling tower within  $\pm 0,25^{\circ}\text{K}$



**CNC controls**  
**from the market leader in shop floor programming**

Handwheel for Heidenhain control



Heidenhain, the market leader in shop floor programming, supplies the CNC controls of the **KERN Pyramid Nano**. Maximum comfort and performance even allow programming of 3, 4 or 5 axes applications directly on the machine.

**Fully comprehensive package**

Heidenhain controls are fully equipped with all software packages required in a tool shop. This includes up to 5 axes interpolation, pre-programmed cycles for rigid tapping, various drilling and milling cycles, subprogramming, teach-in programming, cylinder barrel programming, graphical simulation, tool administration, tool radius correction, etc. ... no additional software packages required.



## Options and accessories

The KERN Pyramid Nano can be configured individually according to the customers requirements.



### Spindles

HSK 40: 200 – 36,000 rpm, 4 Nm, 11 kW (vector-controlled)  
permanently grease lubricated

Option: with rotary feedthrough for use of internal tools cooling

HSK 25: 500 – 50,000 rpm, 1.5 Nm, 6.4 kW (vector-controlled)  
permanently grease lubricated

### Tool changer HSK 40

Standard 25 tools, optionally 50 or 75 tools

Tool changing time approx. 3 s

Average chip-to-chip time approx. 6 s

Tool length max. 100 mm

Tool diameter max. 50 mm

Tool shank diameter max. 20 mm

### Tool changer HSK 25

Standard 32 tools, optionally 64 or 96 tools

Tool changing time approx. 3 s

Average chip-to-chip time approx. 6 s

Tool length max. 100 mm

Tool diameter max. 50 mm

Tool shank diameter max. 10 mm



### Automatic workpiece changer

Integrated workpiece changer with up to 20 positions  
(pallet size max. 70 x 70 x 150 mm)

Alternatively: External workpiece changer  
(pallet size max. 300 x 300 mm)



### Digital CNC precision dividing head with torque drives (4th/5th axis)

Rotational and swivelling axis, 2 axes or 1 axis

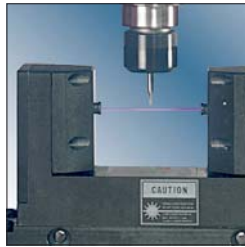
Interfaces: collet chuck (max. chucking capacity  $\varnothing$  26 mm),

System 3R or Erowa

Feed rate A/C 800 rpm

max. swivelling range from  $-20^\circ$  to  $+110^\circ$

Positioning scatter  $P_s \leq 1''$ , precision on the workpiece  $\leq 3''$



### Tool length measuring: Laser

A laser beam with a diameter of 30  $\mu\text{m}$  permits non-contact measuring of the smallest tool checking for length, radius and concentric accuracy even at high spindle speeds. The measured data are 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.

### Inductive shrink unit

for shrink tool holder HSK 25  
or HSK 40 (KERN Special) for  
shrinking of HM-shafts.



not illustrated:

### Coolant device with temperature control

### Oil mist lubrication / cooling unit

### Scraper with band filter device

### Tool holder HSK 25 and HSK 40 (KERN Special)

### EX 16/20 high precision collet chuck

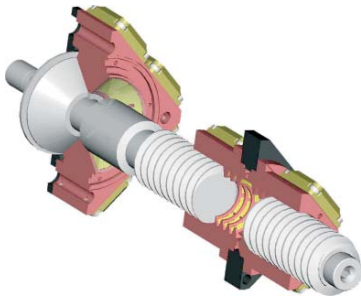
### D 14/20 high precision collet chuck

### Precision vice for workpieces

Further accessories on demand.

# KERN Pyramid Nano

Maximum surface quality and nano precision

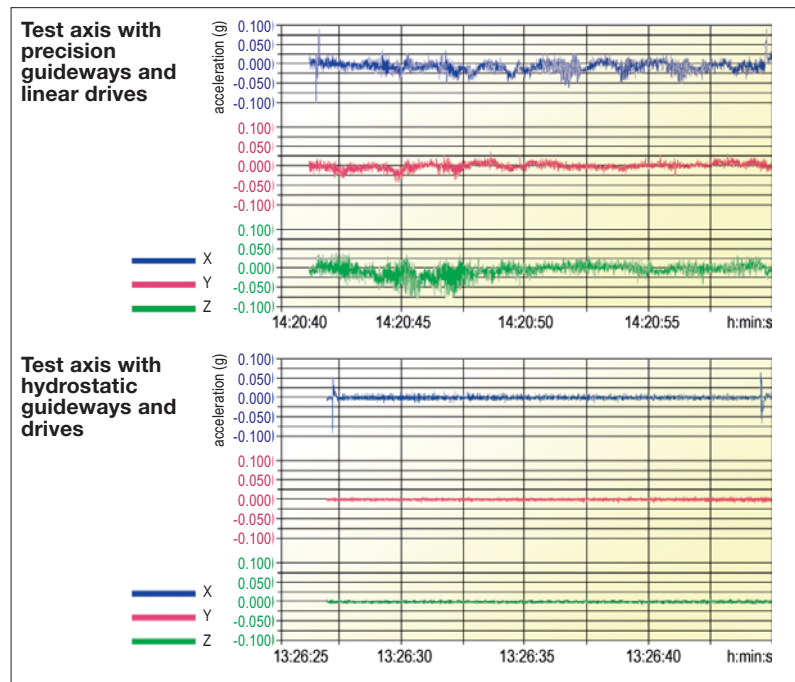


Hydrostatic drives and guideways of the X-, Y- and Z-axes allow maximum surface finishes in nano precision. The hydrostatic drives provide fast acceleration with maximum vibration dampening.

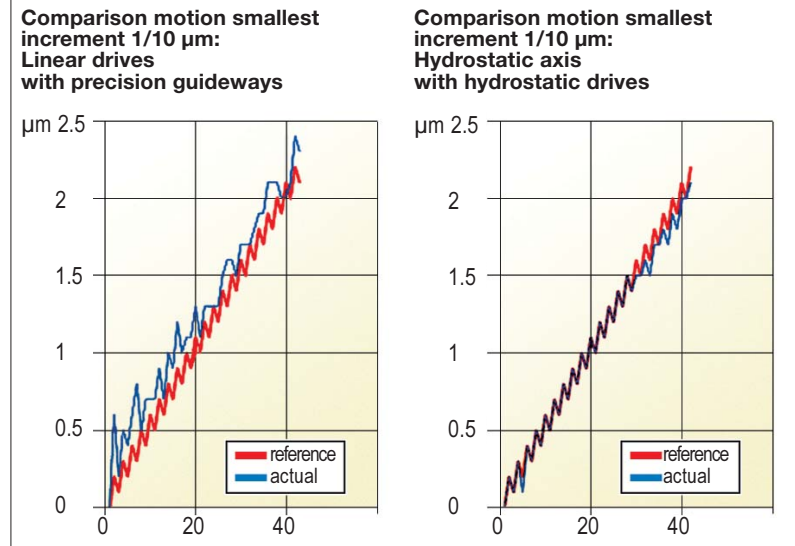
## Advantages of the hydrostatic system:

- Finest surface finishes with hydrostatic dampening
- Smallest movements of the axes 0.1  $\mu\text{m}$
- Wear-free guideways and drives
- Almost frictionless movements – no "slip stick" effect, even when moving in small increments
- Low sensitivity at high machining forces
- High dynamic rigidity
- Permanently cooled circulating hydraulic oil flows through axes, drives and machine frame
- The highly dynamic third axis construction does not require counter-balance weights
- All motors are mounted outside of the axes – thus minimizing possible temperature influence
- Approx. 50% lower energy costs in comparison to linear drives
- No unacceptable cogging effects, as seen with linear drives

Comparison:  
Axis movement/dampening



Comparison:  
Feed motion on workpiece



# Technical Data KERN Pyramid Nano



### Maintenance:

Like all KERN machining centres the **KERN Pyramid Nano** is in general maintenance-free. It simply requires regular thorough cleaning as well as high-level professionalism in its operation.

Machine operators will be instructed in the technical details of their KERN machine during commissioning.



### Axes:

Travel X/Y/Z	500/500/400 mm (19.69/19.69/15.75")
Clamping area	max. 600 x 600 mm (23.62 x 23.62")
Drives	hydrostatic
Guideways	hydrostatic
Workpiece weight	max. 250 kg
Feed rate	0.01-30,000 mm/min (0.00039-1181.10 "/min)
Acceleration	10 m/s <sup>2</sup> (1g) (393.70 "/s <sup>2</sup> )

### Precision according to VDI/DGQ 3441:

Resolution	0.1 µm (0.0000039")
Positioning scatter P <sub>s</sub>	±0.3 µm (0.0000118")
Precision on the workpiece (3-axis)	±1.0 µm (0.0000393")

### Choice of spindles:

Taper	HSK 40: 200 – 36,000 rpm, 11 kW (S1) HSK 25: 500 – 50,000 rpm, 6.4 kW (S1)
Tool changer capacity	HSK 40: 25, 50 or 75 tools HSK 25: 32, 64 or 96 tools
Tool diameter	max. 50 mm (1.97")
Tool length	max. 100 mm (3.94")
Tool changing time	approx. 3 s
Chip to chip time	approx. 6 s

### 4th / 5th axis:

Rotational	360° continuous
Swivelling	-20° up to +110°
Precision	≤ 1"
Feed rate	A/C 800 rpm

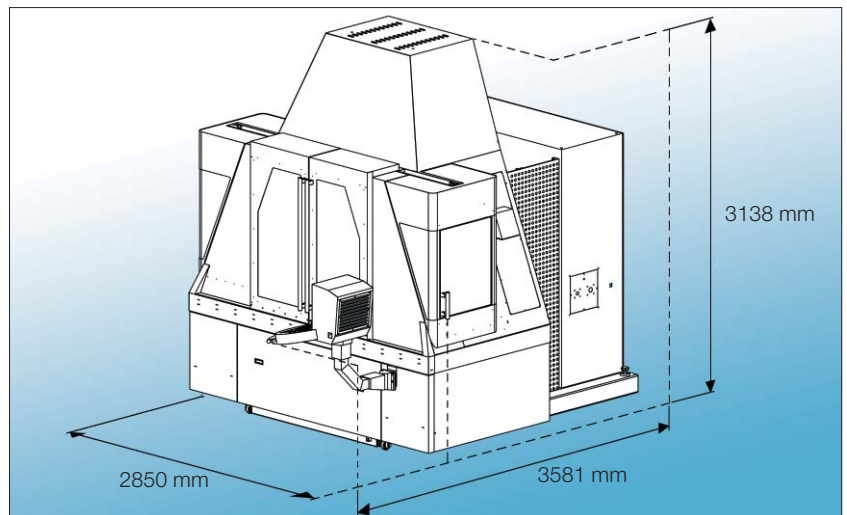
### Automation:

Automatic workpiece changing system	20 up to 200 positions and more
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### Kern Pyramid Nano:

Space requirements min.	2.85 x 3.58 x 3.14 m (112.21 x 140.95 x 123.54")
Weight	approx. 8,000 kg
Controller	Heidenhain

Subject to technical changes



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