KELLENBERGER 1000
Cylindrical Grinding Systems for the most Demanding Applications
The innovative grinding system

**HYDROSTATICS**
- X and Z guideways
- No stick-slip, no wear
- Good damping
- Ultra-fine correction options

**HYDROSTATIC B-AXIS**
- Full-fledged NC axis
- Pre-tensioned hydrostatic guideway
- Direct drive

**C-AXIS**
- For non-circular workpieces
- For threads
- High-precision spindle bearing
- Direct drive
- High flexibility

**PLATFORM CONCEPT FOR MORE THAN 30 DIFFERENT WHEELHEADS**
- Universal wheelheads
- Diagonal wheelheads
- Tandem wheelheads
- Various mounting positions

**DRESSING SYSTEMS**
- Independent interface at table
- Pivotable unit for chucked work
- Rigid diamonds
- Form and profile dressers

**PRECISION WITH HYDROSTATICS**
Hydrostatic guideways and a strict separation of the machine base from the assemblies, generating heat or vibration, provide superb precision and productivity.

The excellent static and dynamic rigidity of the machine base permits a three-point set-up. The Kellenberger 1000 therefore has no particular requirements on the building's foundations. The hydrostatic guides for the longitudinal slide movement (Z-axis) and for wheelslide infeed (X-axis) provide the basis for the machine's extreme accuracy. X- and Z-axes movements are practically frictionless at all speeds. There is no stick slip; even the smallest increments of 0.1 µm can be traveled without a problem, so that the machine features measuring-machine accuracy.

**LARGE WORK SPACE – UNIQUE TABLE CONCEPT**
The machine table has been considerably extended so it allows unmatched, optimal positioning of the grinding wheel and a larger travel distance, but also many machining options and application-specific configurations.

**FUNCTIONAL MACHINE CASING**
The increased sheet metal thickness means even more process reliability, allowing larger internal grinding wheel diameter of up to 125 mm. With their large viewing windows, the generously-sized doors allow optimum control over the work process and make it easier to access the work space. The genuine glass laminated safety panes require very little maintenance.
FUNCTIONAL DESIGN WITH HIGHLY PRECISE TECHNOLOGY

CONTROL SYSTEM
• Heidenhain GRINDplus 640
• Fanuc 31i - B
• 19" Touch Screen

SOFTWARE
• RED Solution
• BLACK CAM Solution

X/C INTERPOLATION
• Non-circular workpieces
• Thread grinding
• Jig grinding
• Groove grinding

X/Z INTERPOLATION
• Taper grinding
• Profile grinding
• Dressing

X/Z/B INTERPOLATION
• Contour B+
• Profile grinding with controlled grinding wheel

COMPACT AND MAINTENANCE-FRIENDLY
Elements such as the power supply, electrical cabinet, and a central connection point for lubricating coolant, water cooling system, and compressed air were all integrated into the casing. Service and maintenance doors for unimpeded access to machine components are integrated into the back.

OPTIMIZED ENERGY MANAGEMENT

EASY COMMISSIONING
The integrated transportation concept (hook machine) shortens commissioning times considerably.

MACHINE RE-COOLING SYSTEM
• Comprehensive cooling system with needs-based design (wheelhead & grinding spindles, direct drive, hydrostatics, electric cabinet)
• Increased flow rates at lower system pressure
• Active cooling principle for optimal temperature stability
• Minimized thermal drift, so smaller deviations on workpiece
• Hydrostatic oil cooled to ambient temperature
• Automatic tracking of surroundings, water cooler: Sensor in bed measures reference temperature of regulator

OPTIONS
• Increased coolant pressure up to 10 bar
• Interface for fire extinguisher system
• Automatic door drive
• Replacement aid for grinding wheels and tailstock
B-AXIS AND AUTOMATIC GRINDING WHEEL MEASURING SYSTEM

HYDROSTATIC B-AXIS
• Pre-tensioned hydrostatic guide
• The direct drive is wear-free
• 180° swiveling in one second

DIRECT DRIVE SYSTEM
• The water-cooled high-torque motor guarantees a high level of torque
• The rotary encoder is integrated in the absolute measuring system of the machine and requires no referencing

CLAMPING
• The B-axis can be clamped in any position without any deformation
• The large dimensions of the clamps guarantee high clamping moment

KEL-SET
• Automatic grinding wheel measuring system
• EU patent No. EP 0542 674 B1
• US patent No. 5.335.454

CONTOUR B+
• Machining also possible in un-clamped state
• Short cycle times
• New machining methods
• High flexibility

HYDROSTATIC B-AXIS
Full-fledged NC-axis with pre-tensioned hydrostatic guideway and direct drive.

The pre-tensioned hydrostatic is the basis for higher accuracy and better surface quality. Steps of 0.0001” can be traveled with ease.

KEL-SET
Automatic grinding wheel measuring system. Movements to the measuring ball and to the grinding wheels occur automatically, with their position information being stored in the control system. When swiveling the wheelhead into any angle, the positions of the grinding wheel edges are automatically taken into account.

ADVANTAGES FOR THE USER
• Programming takes place with the actual dimensions according to the work drawings and independently of the swivel angle of the wheelhead
• No need for renewed calibration of the swiveled grinding wheel
• Simple and fast acquisition of the grinding wheel data when retooling the machine
• Integrated tool management for external, face and internal grinding

WORKHEAD
Robust and rigid design on a solid base. Strong motor. Infinitely variable spindle speed. Airlock seals prevent ingress of dirt or water as well as the formation of condensation.

• Excellent roundness and dimensional accuracy thanks to pre-tensioned high-precision antifriction bearings
• Roundness of the workpiece dR < 0.4 µm (< 0.016 µinch) on chucked work
• Versatile in use
• Comes standard with fine adjustment for cylinder correction for chuck work
• ISO 702-1 spindle nose
**Workhead, C-axis and Tailstock**

**Workhead with direct drive**
- n 1-1000 min⁻¹ with direct drive 200
  - Spindel nose ISO 702-1, size 5
- n 1-500 min⁻¹ with direct drive 300
  - Spindel nose ISO 702-1, size 8

**Workhead**
- Standard, n 1-1000 min⁻¹
  - Spindel nose ISO 702-1, size 5
- As desired, with fixed or rotating center

**Tailstock**
- Morse taper 4
- Retraction of sleeve 50 mm (1.96 inch)

**Synchronized tailstock**
- With integrated sleeve
- Morse taper 4
- Retraction of sleeve 50 mm (1.96 inch)

**Micro-adjustment**
- Adjustment range +/- 150 µm
- Optionally with automatic cylinder correction

**Options**
- Roundness of the workpiece 
  dR < 0.2 µm (< 0.008 µinch) on chucked work
- Positioned spindle stop
- Excellent rigidity makes it possible to achieve high rates of infeed even with heavy workpieces
- Sensitive sleeve pressure adjustment
- Micro-corrector for quick and easy cylinder corrections
- Pneumatic relief for tailstock movement
- Hydraulic or pneumatic sleeve retraction
- Automated cylinder correction
- Enlarged travel, 80 mm (3.14 inch)
- Reinforced design

**C-axis**
The option of interpolating the X- and C-axes makes it possible to use the cylindrical grinding machine also for unround shapes such as polygons, free contours and eccentric forms. The rotary encoder with a resolution of 0.0001° is installed directly on the workhead spindle. The non-circular movement is superimposed on the grinding movements so that the grinding machine can use all the grinding cycles on unround grinding too, including the handwheel release for the X-axis.
MODULAR WHEELHEAD VARIANTS

INTERNAL GRINDING ATTACHMENT
• High-frequency internal grinding spindle

UNIVERSAL WHEELHEADS
• Motor output 10 kW (13.6 hp)
• Water-cooled precision-balanced drive motor
• Infinitely variable drive of OD and ID grinding spindles
• Hydrodynamic multi-surface spindle bearings
• Grinding wheel dimensions Ø 500 x 80 mm (20 x 3.15 inch)
• High-frequency ID grinding spindles

The universal wheelhead covers various user needs. In addition to external, face- and internal grinding, the use of two internal grinding spindles or the option of thread grinding or unround grinding are now increasingly in demand. Grinding in one setting allows shorter processing times and improves the quality of the workpieces considerably.

The new modular system makes it possible to supply the universal wheelhead to customer specifications, from a simple wheelhead with one tool to a configuration with up to four tools; see examples.

DIAGONAL WHEELHEADS
• Motor output 2x 10 kW (13.6 hp)
• Water-cooled precision-balanced drive motors
• Infinitely variable drive of OD and ID grinding spindles
• Hydrodynamic multi-surface spindle bearings
• Grinding wheel dimensions 2x Ø 500 x 80 mm (20 x 3.15 inch)
• High-frequency ID grinding spindles
• Min. 2 OD grinding wheels
• Max. 2 OD grinding wheels and 2 HF ID grinding spindles

The diagonal wheelheads provide the option of rough and finish grinding in one setting. The additional use of HF ID grinding spindles also allows universal OD, face-and ID grinding.
Modular wheelhead variants

Water-cooled precision-balanced drive motors

Hydrodynamic multi-surface spindle bearings

TANDEM-TYPE WHEELHEADS
- Motor output 2x 10 kW (13.6 hp)
- Water-cooled precision-balanced drive motors
- Infinitely variable drive of OD and ID grinding spindles
- Hydrodynamic multi-surface spindle bearings
- Grinding wheel dimensions
  2x Ø 500 x 80 mm (20 x 2.5 inch)
- High-frequency ID grinding spindles
- Min. 2 OD grinding wheels
- Max. 4 OD grinding wheels or 2–3 OD grinding wheels and 1 HF ID grinding spindle

The tandem-type wheelheads are designed for the possibility of carrying out straight and angular infeed operations in the same setting. With an additional HF internal grinding spindle it is possible to also process internal grinding work. The ideal equipment for these wheelheads can be determined by the nature of the workpieces to be ground.

HF ID GRINDING SPINDLES
- MFM 1224-42
- MFM 1242-60
- Frequency converter up to 3000 Hz

WATER-COOLED PRECISION-BALANCED DRIVE MOTORS

HYDRODYNAMIC MULTI-SURFACE SPINDLE BEARINGS
GREEN SOLUTION
• Dialogue guided set-up and programming
• G-Code based
• Tool Management

ADVANTAGE
• Safe set-up and programming
• Defined G-Codes
• Multiple tool reference points

BENEFITS
• Ideal for high complex workpieces
• Unlimited combination of G-Codes
• Complete machining with ease

RED SOLUTION
• GRAPHIC Guide with integrated technology processor

ADVANTAGE
• Interactive
• Visualized part programming
• Quick set-up and results

BENEFITS
• Set-up of simple parts at minimized time
• No G-Code needed
• Less downtime

ACOUSTIC EMISSION
• GAP control with up to 6 sensors
• Operation and display integrated in the control system

BALANCING
• Semi-automatic or automatic balancing of the grinding wheels
• Operation and display integrated in the control system

IN-PROCESS GAUGE SYSTEM
• Up to 4 gauge heads
• Interrupted diameters
• Non-interrupted diameters
• Passive longitudinal positioning
**FANUC CONTROL SYSTEM 31i**

**MONITOR**
- 19” TFT Touch
- Expanded process data display

**RED SOLUTION**
- ICON Guide
- GRAPHIC Guide with integrated technology processor

**ADVANTAGE**
- Unlimited G-Code programming
- Interactive
- Visualized part programming
- Quick set-up and results

**BENEFITS**
- Complex parts at minimized cycle time
- No G-Code needed
- Less downtime

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**BLACK CAM SOLUTION**

**NON-ROUND, PROFILE; AND THREAD**
- Full project management
- Simplified creation of Out of round and profile contours
- Integrated technology processor
- Simple CAD system features
- Create contours and profiles or import DXF and step-files
- Error Analysis and Simulation

**ADVANTAGE**
- No separate CAD system necessary
- Creation of complex contours and profiles no more challenging

**BENEFITS**
- Grinding process technology available at a click

**SECURITY INTERFACE / REMOTE DIAGNOSTICS**
- Security Interface / Remote Diagnostics
- Highest IT Standard
- Industry 4.0 ready
- Reduced down- and waiting time
- Cost reduction at Service and Maintenance
- Preventive Maintenance
## TECHNICAL DATA

<table>
<thead>
<tr>
<th>Main Specifications</th>
<th>Metric</th>
<th>Imperial</th>
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<tbody>
<tr>
<td>Distance Between Centres</td>
<td>mm</td>
<td>inch</td>
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<tr>
<td>Grinding Length</td>
<td>mm</td>
<td>inch</td>
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<tr>
<td>Centre Height</td>
<td>mm</td>
<td>inch</td>
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<tr>
<td>Weight of Workpiece Between Centres</td>
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<td>lbs</td>
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<td>Load on Chucked Work</td>
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<td>lbft</td>
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<tr>
<td>Mains Voltage Required</td>
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<td>3 x 400 / 50 Hz / 3 x 460V / 60Hz</td>
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<tr>
<td>Power Consumption Depending on Equipment</td>
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<td>A</td>
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<tr>
<td>Space Required / Length x Width</td>
<td>mm</td>
<td>inch</td>
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</table>

## Longitudinal Slides Z-Axis

| Travel | mm | inch | 1170 / 1670 | 46.06 / 65.74 |
| Rapid Traverse Speed | m/min | ipm | 20 | 787 |
| Resolution | um | uinch | 0.1 | 0.004 |

## Wheelslides X-Axis

| Travel | mm | inch | 365 | 14.37 |
| Rapid Traverse Speed | m/min | ipm | 10 | 393 |
| Resolution | um | uinch | 0.00001 | 0.0000004 |

## B-Axis

| Resolution | 0.0001 | 0.0001 |
| Swiveling Range | max. 240 | max. 240 |

## Wheelhead General

| Drive Motor Water-Cooled | kW | hp | 10 | 13.4 |
| Peripheral Grinding Wheel Speed | m/s | ft/min | 45 m/s standard / up to 63 m/s optional |

## Wheelhead Universal

| Grinding Wheel Dimensions, Lefthanded Side | mm | inch | 400 / 500 | 16 / 20 |
| Grinding Wheel Dimensions, Righthanded Side | mm | inch | 300 / 400 / 500 | 12 / 16 / 20 |

## Wheelhand Tandem-Type

| Grinding Wheel Dimensions, Lefthanded Side | mm | inch | 400 / 500 | 16 / 20 |
| Grinding Wheel Dimensions, Righthanded Side | mm | inch | 400 / 500 | 16 / 20 |

## Wheelhand Diagonal

| Grinding Wheel Dimensions, Lefthanded Side | mm | inch | 400 / 500 | 16 / 20 |
| Grinding Wheel Dimensions, Righthanded Side | mm | inch | 400 / 500 | 16 / 20 |
### Internal Grinding Attachment

<table>
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<th>inch</th>
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<tr>
<td>Bore for Spindles Up to</td>
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<td>HF Spindles MFM</td>
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<td>Rotational Speed 1224 / 42</td>
<td>42,000</td>
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<tr>
<td>Rotational Speed 1242 / 60</td>
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### Workhead Standard/Direction Drive

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<td>Rotational Spindle Speed</td>
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<td>Internal Taper</td>
<td>MT5 / MT5 / MT6</td>
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<td>Short Taper Holder, Outside</td>
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<td>Micro-Adjustment</td>
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### Tailstock

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<td>Internal Taper</td>
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<tr>
<td>Retraction of Sleeve</td>
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<td>Micro-Adjustment</td>
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### CNC Control System

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<td>Fanuc</td>
<td>Fanuc 3li</td>
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### Measuring Systems

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<td>Gap Control</td>
<td>Acoustic emission</td>
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<tr>
<td>Balancing</td>
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All specifications and designs are subject to alterations without notice.
Hardinge is a leading international provider of advanced metal-cutting solutions. We provide a full spectrum of highly reliable CNC turning, milling, and grinding machines as well as technologically advanced work-holding accessories.

The diverse products we offer enable us to support a variety of market applications in industries including aerospace, agricultural, automotive, construction, consumer products, defense, energy, medical, technology, transportation and more.

We’ve developed a strong global presence with manufacturing operations in North America, Europe, and Asia. Hardinge applies its engineering and applications expertise to provide your company with the right machine tool solution and support every time.