Kellenberger 1000
Cylindrical Grinding Systems for the most Demanding Applications
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 16 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 superlative precision and productivity. The excellent static and dynamic rigidity of the machine base permits a three-point set-up. The Kellenberger K1000 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 panels require very little maintenance.

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.

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

Software
- Heidenhain GRINDplus 640
- Fanuc 31i

X/C interpolation
- non-circular workpieces
- Thread grinding
- Jig grinding
- Profile grinding
- dressing

X/Z interpolation
- Taper grinding
- Profile grinding
- dressing

X/Z/B interpolation
- Contour B+
- Profile grinding with controlled grinding wheel

Options
- increased coolant pressure up to 10 bar
- Interface for fire extinguisher system
- automatic door drive
- Replacement aid for grinding wheels and tailstock
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 0 542 674 B1
- US patent No. 5.335.454

Contour B+
- Machining also possible in unclamped state
- short cycle times
- new machining methods
- high flexibility

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

Workhead
- Standard, n 1-1000 min⁻¹
- Spindle 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 chucking work
- positioned spindel stop

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.

Tailstock
The tailstock features a large and heavy design. The nitride-coated sleeve runs in sturdy ball-bush bearings.
- excellent rigidity makes it possible to achieve high rates of feed even with heavy workpieces
- sensitive sleeve pressure adjustment
- Micro-corrector for quick and easy cylinder corrections
- pneumatic relief for tailstock movement

Options
- Hydraulic or pneumatic sleeve retraction
- automated cylinder correction
- enlarged travel, 80 mm (3.14 inch)
- reinforced design

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 swiveling grinding wheel
- simple and fast acquisition of the grinding wheel data when retooling the machine
- integrated tool management for external, face- and internal grinding

Roundness of the workpiece DR < 0.2 µm (< 0.008 µinch) on chucking work. 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 chucking work
- Versatile in use
- comes standard with fine adjustment for cylinder correction for chuck work
- ISO 702-1 spindle nose
Modular wheelhead variants

Universal wheelheads
- Motor output 10 kW (13.6hp)
- 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/Tandem-type wheelheads
- Motor output 2x 10 kW (13.6hp)
- 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

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.

Tandem-type wheelheads
- Motor output 2x 10 kW (13.6hp)
- 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 63 (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.

Internal grinding attachment
- high-frequency internal grinding spindle

Water-cooled precision-balanced drive motors
Hydrodynamic multi-surface spindle bearings
HF ID grinding spindles
- MFM 1224-42
- MFM 1242-60
- Frequency converter up to 3000 Hz
Heidenhain control system GRINDplus 640

Monitor
- 19˝ TFT Multitouch
- expanded process data display

Keypad
- Mobile hand panel with handwheel / emergency stop / confirmation key

KEL-PROG
- dialog based ISO programming
- Cycle selection via Softkeys

KEL-FORM
- Standard non-circular contour

KEL-GRAPH
- graphical programming
- Cylinders, cones, radii
- DXF import

KEL-TOOL
- Tool administration
- local dressing devices
- Standard wheel definition

OPTIONS

KEL-TOUCH
- GAP control with up to 6 sensors
- Operation and display integrated in the control system

KEL-BALANCE
- 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

KEL-SOFT OORG
- 3D software for creating non-circular grinding programs
- Algorithms for error detection and correction, Contour and grinding analysis
- Animation of non-circular motion and profile programmes

KEL-SOFT Profil
- Contour grinding or profile dressing programmes
- CAD import, thread, clearing cycles

Remote diagnostics
- Reduced standstill and maintenance times
- Reduction in costs for service and maintenance
- easy operation
- Highest IT security standard
### Technical data

#### Main specifications

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance between centres mm / inch</td>
<td>1000 / 39.37</td>
</tr>
<tr>
<td>Grinding length mm / inch</td>
<td>1600 / 63</td>
</tr>
<tr>
<td>Weight of workpiece between centres kg / lbs</td>
<td>190 / 420</td>
</tr>
<tr>
<td>Weight of unground work</td>
<td>183 / 404</td>
</tr>
<tr>
<td>Voltage required</td>
<td>3 x 400 V / 50 Hz</td>
</tr>
<tr>
<td>Power consumption depending on equipment kW / hp</td>
<td>35-80</td>
</tr>
<tr>
<td>Space required length x width mm / inch</td>
<td>3600 x 2050 / 141.73 x 80.70</td>
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</table>

#### Longitudinal slide Z-axis

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
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<tbody>
<tr>
<td>Travel mm / inch</td>
<td>1170 / 46.06</td>
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<tr>
<td>Rapid traverse speed m/min / ipm</td>
<td>20 / 78.7</td>
</tr>
<tr>
<td>Resolution µm / µinch</td>
<td>0.1 / 0.004</td>
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#### Wheelslide X-axis

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
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<tbody>
<tr>
<td>Travel mm / inch</td>
<td>365 / 14.37</td>
</tr>
<tr>
<td>Rapid traverse speed m/min / ipm</td>
<td>10 / 39.3</td>
</tr>
<tr>
<td>Resolution µm / µinch</td>
<td>0.1 / 0.004</td>
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</table>

#### B-axis

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution ° / °</td>
<td>0.0001 / 0.0001</td>
</tr>
<tr>
<td>Swiveling range ° / °</td>
<td>max. 240 / max. 240</td>
</tr>
</tbody>
</table>

#### Wheelhead General

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water-cooled kW / hp</td>
<td>10 / 13.4</td>
</tr>
<tr>
<td>Peripheral grinding wheel speed m/s / ft/min</td>
<td>35 / 45 / 6890 / 8860</td>
</tr>
</tbody>
</table>

#### Wheelhead Universal

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding wheel dimensions, lefthand side mm / inch</td>
<td>400 / 16</td>
</tr>
<tr>
<td>Grinding wheel dimensions, righthand side mm / inch</td>
<td>300 / 12 / 400 / 16 / 500 / 20</td>
</tr>
</tbody>
</table>

#### Wheelhead Tandem-type

<table>
<thead>
<tr>
<th>Metric</th>
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<td>Grinding wheel dimensions, righthand side mm / inch</td>
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</table>

#### Wheelhead Diagonal

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
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<tbody>
<tr>
<td>Grinding wheel dimensions, lefthand side mm / inch</td>
<td>400 / 16</td>
</tr>
<tr>
<td>Grinding wheel dimensions, righthand side mm / inch</td>
<td>400 / 16</td>
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</tbody>
</table>

#### Internal grinding attachment

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore for spindles up to mm / inch</td>
<td>120 / 4.72</td>
</tr>
<tr>
<td>Spindles MFM kW / hp</td>
<td>10 / 13.4</td>
</tr>
<tr>
<td>Rotational speed min-l / rpm</td>
<td>20000 / 42000</td>
</tr>
<tr>
<td>Rotational speed min-l / rpm</td>
<td>60000 / 120000</td>
</tr>
<tr>
<td>Workhead Standard / Direct drive 200 / Direct drive 300</td>
<td></td>
</tr>
<tr>
<td>Internal grinding attachment mm</td>
<td>63</td>
</tr>
<tr>
<td>Micro-adjustment µm / µinch</td>
<td>+/- 30 / +/- 0.01</td>
</tr>
</tbody>
</table>

#### Tailstock

<table>
<thead>
<tr>
<th>Metric</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation of sleeve mm / inch</td>
<td>50 / 1.97</td>
</tr>
<tr>
<td>Micro-adjustment µm / µinch</td>
<td>+/- 1.5 / +/- 0.04</td>
</tr>
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</table>

#### CNC control system

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>Heidenhain</td>
<td>GRINDplus 640</td>
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<tr>
<td>Fanuc</td>
<td>31i</td>
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</tbody>
</table>

#### Measuring systems

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>Gap Control</td>
<td>KEL-TOUCH</td>
</tr>
<tr>
<td>Balancing</td>
<td>KEL-BALANCE</td>
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All specifications and designs are subject to alterations without notice.
Over the years the Hardinge Group has constantly evolved its range of products and areas of activity. As a globally active and diversified company, the Hardinge Group has production sites in North America, Europe and Asia.

In addition to the development and construction of turning machines and work-holding fixtures, with Bridgeport the Hardinge Group also has a manufacturer of machining centers.

The Hardinge Group is a major global provider of customer-specific solutions for grinding applications. The Hardinge Grinding Group encompasses all activities in the areas of cylindrical, surface and jig grinding, and includes the well-known brands of Kellenberger, Hauser, Tschudin, Jones & Shipman, Usach and Voumard.

The Hardinge Grinding Group has a global network of partners with trained staff in sales, service and application engineering. This guarantees competent advice and support for evaluation, purchase, and use of the grinding systems.

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