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

28 different wheelheads
- Universal
- Diagonal
- Tandem types

KEL-SET
Automatic grinding wheel measuring system (option)

C-axis
For unround components and threads (option)

Scale on upper table
For setting-up of table assemblies
- Metric
- Imperial

Flushing of base pan
For good conveyance of grinding dust
Prevents dirt deposits

Precision with hydrostatics
These CNC precision cylindrical grinding machines have been developed to satisfy the highest demands for quality. Intensive application studies and the use of state-of-the-art technology in development and production have resulted in a universal system of modular construction. 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 KEL-VARIA 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.

Advantages of hydrostatics
- Extremely fine correction possibilities
- Excellent dimensional accuracy in interpolating the X- and Z-axes, both for contour grinding and form dressing
- Even after years of use, no wear on the guideways
- Excellent damping and extremely smooth operation

Cooling system
A comprehensive cooling system which includes the hydrostatics, wheelhead, internal grinding spindles and the heat exchanger of the electrical cabinet ensures an even thermal economy.

Equipment
- The infrastructure is modular in design, easy to service and easily accessible, with all important functions being monitored
- Connecting plates for steady-rests / dressing spindles / measuring units
- Prepared for the use of oil as a coolant

Options
- Increased coolant pressure up to 10 bar
- Interface for fire extinguisher system
- Automatic door drive
Application-specific swivel devices and intermediate section for the wheelhead

- **Intermediate section fixed**
  - Standard for machine type R

- **Manual indexing**
  - Standard for machine types UR, RS and URS

- **Indexing**

- **Automatic indexing**

- **Hirth coupling**

**B-axis**

The B-axis permits automatic positioning of the wheelhead at any angle. A precision worm gear and distortion-free clamping ensure the ultimate in positioning accuracy. The user is supported by comprehensive software. The measuring system provides a resolution of < 0.5 sec.

**B-axis**

- Automatic infinitely variable positioning of the wheelhead
- Direct measuring
- Indirect measuring

**B-axis**

- Precision bearings
- Distortion-free clamping

**Worm – worm wheel**

- Adjustable play

**KEL-SET**

- Automatic grinding wheel measuring system

**KEL-SET**

- EU patent No. EP 0 542 674 B1
- US patent No. 5,335,454

**KEL-SAT**

- Automatic grinding wheel measuring system

**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
Modular wheelhead variants

Universal wheelheads

Universal wheelhead variants cover 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, as shown in the examples.

Belt-driven internal grinding spindle

- Motor output: 2.5 kW
- Water-cooled precision-balanced drive motor
- No belt change required
- H+H N828 / 842 / 860

Wheelhead

- Motor output: 10 kW
- Water-cooled precision-balanced drive motor
- Infinitely variable drive of OD and ID grinding spindles
- Hydrodynamic multi-surface spindle bearings
- Grinding wheel dimensions: 400 x 63 or 500 x 80
- Infinitely variable belt-driven ID grinding spindle or high-frequency ID grinding spindles

HF ID grinding spindles

- MFV 1230
- MSV 1260
- MRM 1224-42
- MRM 1242-60
- Frequency converter up to 3000 Hz
**Modular wheelhead variants**

**Diagonal wheelheads**
- Motor output 2 x 10 kW
- Water-cooled precision-balanced drive motors
- Infinitely variable drive of OD and ID grinding spindles
- Hydrodynamic multi-surface spindle bearings
- Grinding wheel dimensions 2 x 500 x 80
- High-frequency ID grinding spindles
  - Min: 2 OD grinding wheels
  - Max: 2 OD grinding wheels and 2 HF ID grinding spindles

**Tandem-type wheelheads**
- Motor output 2 x 10 kW
- Water-cooled precision-balanced drive motors
- Infinitely variable drive of OD and ID grinding spindles
- Hydrodynamic multi-surface spindle bearings
- Grinding wheel dimensions 2 x 400 x 63
- 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 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.

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.
Workhead and C-axis

Workhead
- n 8-800 min⁻¹

Workhead with rotating spindle, only
- n 8-800 min⁻¹

Load with chucked work
- Standard: 160 N
- Rotating only: 320 N

Load between centres
- Standard: 150 kg
- Rotating: 150 kg

Spindle nose
- Size 5 DIN 55026
- Morse taper 5

Options
- Roundness of the workpiece dR < 0.2 µm on chucked work
- Microadjustment for quick and easy cylindricity corrections on chucked work
- Roundness of the workpiece dR < 0.5 µm on chuck work
- Versatile in use

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 0.001° 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 and longitudinal slide

Tailstock
- Morse taper 4
- Retraction of sleeve 50 mm

Micro-adjustment of tailstock
- Adjustment range +/- 150 µm

Upper table swiveling

Upper table with air cushioning feature

Options
- Hydraulic or pneumatic sleeve retraction
- Micro-adjustment for fast and easy cylindricity corrections
- Air-cushioning for ease of tailstock repositioning

Longitudinal slide
The air-cushioning (option) and the backlash-free pivot pin permit an easy and accurate swiveling of the rigid upper table.
- Grinding length: 600 1000 1500 mm
- Swiveling range: 9° 9° 7°
More powerful motors and a still faster control system ensure highly dynamic unround and thread-grinding operations. The highly capable new machine features absolute measuring in the B-axis, incremental, distance-coded scales in the X- and Z-axes, ultra-high resolution in the C-axis and expansion options with the addition of a second B-axis, thus ensuring the ultimate in dimensional stability and profile accuracy of the workpieces produced.

**KEL-VARIA**

**Heidenhain control system GRINDplusIT**

- **Monitor**
  - 15˝ TFT
  - Softkeys

- **Keypad**
  - KELLENBERGER push-key strip
  - Mobile hand panel with handwheel / emergency stop / confirmation key

- **KEL-BALANCE**
  - Semi-automatic balancing for 1 or 2 wheel / s
  - Operation and display integrated in the control system

- **KEL-ASSIST**
  - SW package for the preparation of contour-grinding or profile-dressing programmes
  - DXF import, threads, clearing cycles

- **KEL-POLY**
  - SW package for the preparation of unround grinding programmes
  - Correction of differences in the height of centres

**HIGH LIGHT’s**

- Windows 2000
- KEL-PICTO
- Graphics editor
- DXF import
- Form editor
- Expanded grinding cycles
- Intermediate dressing at the push of a button
- Comprehensive tools management
- Several reference points for each grinding wheel
- Remaining-travel display
- Simple correction options

**Electrical cabinet**

- Standard cabinet for EU and US
- HF-drives integrated in the electrical cabinet
- CE conformity
- Electrical cabinet with generous spare space
- Excellent overview and accessibility in the entire cabinet
- Heat exchanger integrated in the machine’s coolant system

**Power supply**

- Coolant circulation system for hydrostatics / wheelhead / HF ID grinding spindle and electrical cabinet

**CE conformity**

- Machine directive
- Low-voltage directive
- Electromagnetic-compatibility directive

**Additional panel**

- For Movomatic or Marposs in-process gauging systems
- For auxiliary units

**KEL-TOUCH**

- Gap control with up to 3 sensors
- Operation and display integrated in the control system

**Swivel angle display**

- Integrated in the KELLENBERGER push-key strip
- For manual swiveling of the workhead

**Hardware**

- Compact converter
- Controller unit for 4 axes and 1 spindle
- Expandable to cover 1 additional B-axis B 1

**Swiveling dressing unit**

- Operated with an additional B-axis
- For special profiles

**KEL-POLY**

- SW package for the preparation of unround grinding programmes
- Correction of differences in the height of centres

**Monitor**

- 15˝ TFT
- Softkeys
### Technical data

#### Wheelhead types

<table>
<thead>
<tr>
<th>Type</th>
<th>Universal</th>
<th>Tandem</th>
<th>Diagonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main specifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance between centres (mm)</td>
<td>800 / 1000 / 1200</td>
<td>800 / 1000 / 1200</td>
<td>800 / 1000 / 1200</td>
</tr>
<tr>
<td>Grinding length (mm)</td>
<td>1500 / 1600 / 1700</td>
<td>1500 / 1600 / 1700</td>
<td>1500 / 1600 / 1700</td>
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<tr>
<td>Number of spindles</td>
<td>3-6</td>
<td>3-6</td>
<td>3-6</td>
</tr>
<tr>
<td>Weight of various distance centres (kg)</td>
<td>150</td>
<td>150</td>
<td>150</td>
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<tr>
<td>Load on medium (kg)</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Max. voltage required (V)</td>
<td>3 x 380 / 500</td>
<td>3 x 380 / 500</td>
<td>3 x 380 / 500</td>
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<tr>
<td>Power consumption (depending on equipment) (kW)</td>
<td>5-10</td>
<td>5-10</td>
<td>5-10</td>
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<tr>
<td>Space required (angle width) (mm)</td>
<td>315 x 2000 / 3600 x 2000</td>
<td>360 x 2000 / 4600 x 2000</td>
<td>460 x 2000 / 6000 x 2000</td>
</tr>
<tr>
<td>Grindig length</td>
<td>600 / 1000 / 1500</td>
<td>600 / 1000 / 1500</td>
<td>600 / 1000 / 1500</td>
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<tr>
<td>Grinding wheel speed</td>
<td>60</td>
<td>60</td>
<td>60</td>
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<tr>
<td>Feed rate</td>
<td>60</td>
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</tbody>
</table>

#### Wheelhead: X-axis

<table>
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<th>Specification</th>
<th>Universal</th>
<th>Tandem</th>
<th>Diagonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel (mm)</td>
<td>800 / 1000 / 1200</td>
<td>800 / 1000 / 1200</td>
<td>800 / 1000 / 1200</td>
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<tr>
<td>Rapid traverse speed (m/min)</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Resolution (µm)</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Swivel range (degree)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Wheelhead general

<table>
<thead>
<tr>
<th>Specification</th>
<th>Universal</th>
<th>Tandem</th>
<th>Diagonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding wheel dimensions (mm)</td>
<td>400 / 500</td>
<td>400 / 500</td>
<td>400 / 500</td>
</tr>
<tr>
<td>Grinding wheel dimensions (mm)</td>
<td>300 / 400 / 500</td>
<td>300 / 400 / 500</td>
<td>300 / 400 / 500</td>
</tr>
</tbody>
</table>

#### Wheelhead types - Specification of spindles (model string)

<table>
<thead>
<tr>
<th>Type</th>
<th>Universal</th>
<th>Tandem</th>
<th>Diagonal</th>
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</thead>
<tbody>
<tr>
<td>Workhead</td>
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<tr>
<td>BPM spindle speed (m/min)</td>
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<tr>
<td>Telescopic spindle speed (m/min)</td>
<td>40</td>
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<tr>
<td>Spindle nose / internal taper (mm)</td>
<td>36</td>
<td>36</td>
<td>36</td>
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<tr>
<td>Setting accuracy (µm)</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
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<tr>
<td>Internal taper</td>
<td>114</td>
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<tr>
<td>Taper of spindles</td>
<td>1:5</td>
<td>1:5</td>
<td>1:5</td>
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<tr>
<td>CNC control system</td>
<td>KEL-TOUCH</td>
<td>KEL-TOUCH</td>
<td>KEL-TOUCH</td>
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</tbody>
</table>

#### Measuring systems

<table>
<thead>
<tr>
<th>System</th>
<th>Universal</th>
<th>Tandem</th>
<th>Diagonal</th>
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<tbody>
<tr>
<td>Gap Control</td>
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<td>KEL-TOUCH</td>
<td>KEL-TOUCH</td>
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<td>Measurement and positioning</td>
<td>KEL-TOUCH</td>
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<td>KEL-TOUCH</td>
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<tr>
<td>Positioning and positioning</td>
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<tr>
<td>To point by point</td>
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<td>KEL-TOUCH</td>
<td>KEL-TOUCH</td>
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<tr>
<td>Limiting</td>
<td>KEL-TOUCH</td>
<td>KEL-TOUCH</td>
<td>KEL-TOUCH</td>
</tr>
</tbody>
</table>

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**Separate infrastructure**

1. Power supply
2. Pneumatic supply
3. Vibration damping bases
4. Leveling elements
5. Coolant unit
6. Cooling unit
7. Coolant outlet

(All measures L1 and L2 are depending on type of filtration unit)

Distance between centres in mm

- **Type**
  - 600: 300 / 775 / 300 / 1550
  - 1000: 3600 / 1175 / 300 / 1550
  - 1500: 4600 / 1675 / 600 / 1850

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All specifications and designs are subject to alterations without notice.
Competence and a world-wide partnership

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