The Compact
High-Precision Cylindrical
Grinding Machine

KEL-VERA

TURNING MILLING GRINDING WORKHOLDING
www.kellenberger.net

KELLENBERGER®
EXPECT MORE™
The innovative grinding system

**Constructional variants**
- Universal type
- Universal type for flanged components
- Production type

**Different wheelheads**
- Universal
- Diagonal
- Tandem types
- Production type

**C-axis**
For unround components and threads (option)

**Table concept**
Individual table configuration based on lower table

**Platform concept**
Optimal arrangement of the wheelhead in relation to the workpiece

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**The truth of the highest precision**
KEL-VERA – the on-going consequent development has led to the introduction of this extremely compact machine which is based on a visionary modular concept. The new design of the hydrostatic guideways is meeting even the extremest requirements on universal as well as on production grinding.

Building-up on their experience of more than 15 years with hydrostatic guideways, KELLENBERGER is launching a completely new range of machines. The objective rigorously striven for had been to develop a compact machine which can be used for the grinding of any kind of components with a length of up to 400 mm.

The concept is based on platforms for the table slide and wheelhead supports, and also for applications where the table slide is the direct starting basis. The new machine models are offered in their standard configuration. Application- and customer-specific versions, however, are also available.

**Highly dynamic and rigid guiding and driving systems**
The new very rigid hydrostatic guideways provide the basis for higher performance and dynamics in the X- and Z-axes. Further, the productivity and precision on unround grinding are significantly enhanced.

Stronger drives for the axes of the KEL-VERA are permitting rapid speeds of up to 30 m/min. on the longitudinal axis, and of 15 m/min. on the infeed axis, both movements with higher accelerations.
Advantages of hydrostatics
- Extremely fine correction possibilities
- Excellent dimensional accuracy on 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 complete cooling system is ensuring an even thermal economy for the machine. The hydrostatics, wheelhead, internal grinding spindles and the heat exchanger of the electrical cabinet are included in this cooling cycle.

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
- Loading systems
Universal Cylindrical Grinding Machine

The universal model is designed for the grinding of small and medium-sized batches of components. Equipped with table slide and upper table for cylindricity corrections it can be delivered with 175 mm height of centres. Both external and internal contours can be ground. Different wheelhead configurations, different swivel devices and their corresponding table assemblies are available so that shafts and flanged parts with different contours and profiles can be manufactured in one setting. Our high-precision B- and C-axes complete the application range.

Universal wheelheads
- Motor output 10 kW
- Infinitely variable drive of OD and ID grinding spindles
- Grinding wheel Ø 400 x 63 or 500 x 80 mm

Diagonal wheelheads
- Motor output 2 x 10 kW
- Infinitely variable drive of OD and ID grinding spindles
- Grinding wheels 2 x Ø 400 x 63 or 500 x 80 mm

Spindle bearings
- hydrodynamic multi-surface spindle bearings
**Tandem-type wheelheads**
- Motor output 2 x 10kW
- Infinitely variable drive of OD and ID grinding spindles
- Grinding wheels 2x Ø 400 x 63 mm
- High-frequency ID grinding spindles

**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 < 0.1 sec.

**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 account of.

- 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

**Advantages for the user**
- Programming takes place with the actual dimensions according to the components drawings and independently of the swivel angle of the wheelhead
UNIVERSAL type of machine for flanged parts (URF)

Universal wheelheads

Diagonal wheelhead

Tandem-type wheelhead

HF ID grinding spindles
- MFM 1224-42
- MFM 1242-60
- MFM 1290
- Frequency converter

Drive motors
- Water-cooled precision-balanced drive motors

Universal Cylindrical Grinding Machine for Flanged Parts (URF)

In contrast to the universal model, the URF model is designed specifically for flanged parts up to 500 mm. Internal and external grinding operations can be completed in one single setting. Even larger components can be ground, without any loss of performance, by mounting the workhead directly onto the table slide. Application specific solutions are given, as e.g. for measuring and dressing units, since the relevant equipment can be fixed onto the table slide in different optional positions.

The high-precision B- and C-axes are available for this machine version also.
B-axis
- Automatic infinitely variable positioning of the wheelhead
  - Direct measuring
  - Indirect measuring

KEL-SET
- Automatic grinding wheel measuring system
  - EU patent No EP 0 542 674 B1
  - US patent No 5.335.454

Table concept
- Lower table
  - Intermediate plate for mounting of devices with interface for dressing units
  - Height of centers 250 mm

Dressing concept Shafts
(up to 400 mm in length)
- Wheel left, behind WH
- Wheel right behind TS

Dressing concept Flanges
(up to 150 mm in length)
- Wheel left, behind WH
- Wheel right and internal grinding wheel on lower table

**Dressing concept**
The unique table concept used in this extremely compact grinding machine makes applications possible which use up to four grinding wheels. The dressing concepts as tailored to the three configuration variants permit the use of different dressing tools.
The location of the wheelhead, adjusted optimally to the component and the dressing unit, can be achieved by using the ideal position for attaching the wheelhead-slides and of the B-axis (various positions provided for), in accordance with the wheelhead variant and the wheel diameter selected.

**Advantages for the user**
- optimal utilization of space available
- short strokes on automatic feeding
- high productivity
- good grinding wheel utilization
PRODUCTION type of machine

Wheelhead for production

- Pos. 0°
- Pos. 30°

Grinding wheel
- Grinding wheel up to Ø 600 x 150 mm
- Standard 45 m/sec.
- Optionally up to 80 m/sec.

Integrated balancing
- balancing head inside the grinding spindle
- separate GAP sensor

Spindle bearings
- high-accuracy spindle bearings, pre-stressed

Cylindrical Grinding Machine for Production
The production model is designed for medium and large-sized batches of components. The height of centers of 175 mm from the lower table guarantees the highest stiffness. External contours can be ground exclusively, using a grinding wheel on the righthand side at 0°/30°. The machine does not have an upper table. The processing forces are thus operating close to the guideways, resulting in greater performance and productivity. Any cylindricity deviations can be corrected by means of the appropriate fine adjustment devices mounted on the tailstock or the workhead.

Wheelhead for production
- Motor output up to 20 kW
- Infinitely variable drive of OD grinding spindle
- Grinding wheel up to Ø 600 x 150 mm

Performance table

<table>
<thead>
<tr>
<th>Drive motor</th>
<th>15kW</th>
<th>20kW</th>
<th>20kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>m/s</td>
<td>50</td>
<td>63</td>
<td>80</td>
</tr>
<tr>
<td>Grinding wheel Ø mm</td>
<td>500/600</td>
<td>500/600</td>
<td>500</td>
</tr>
</tbody>
</table>

- The high-precision C-axis is available as an option
**Manual swiveling**
- Can be swiveled manually
  - 0° / 30°
- Pneumatic relief

**Center of rotation**
- Short wheel edge stroke

**Table concept**
- Lower table
- Height of centers 175 mm

**Dressing concept Shafts**
(up to 400 mm in length)
- Wheel straight, behind TS
- Angular wheel, behind TS

**Dressing concept Flanges**
(up to 200 mm in length)
- Wheels straight and angular on upper table right hand side

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**Applications**
- High removal rate and lower wear rate using 600mm grinding wheel diameter
- The permissible wheel width of up to 150 mm allows workpiece processing in one operation or multiple O.D.s with wheel sets
- Short change-over times for straight and angular infeed grinding
- Customized dressing units are available
Workhead and C-axis, Tailstock

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

**Options**
- Roundness of the component: \(dR < 0.2 \mu m\) on chucked work
- Microadjustment for quick and easy cylindricity corrections on chucked work
- Swiveling base
- Positioned spindle Stop
- Swivel-angel display

**Workhead with rotating spindle, only**
- 1-800 min-1

**Tailstock**
- Morse taper 4
- Retraction of sleeve 50 mm

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

**Swivel angle display**
- For manual swiveling of the workhead

**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**
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 infeed even with heavy workpieces
- Sensitive sleeve pressure adjustment

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

**Portal loader**
- Collision-free loading
- Universal solution with feeding cycleband
- Integrated assembly with machine including coolant return
- High dynamics with short change-over times
- Cost-optimized solution
- Short change-over times using teach functions and parametric cycles

**Loading cell**
- Fixed to the machine
- Fixed cycle feed for shaft parts
- Extendable with palettes

**Robot cell**
- Loading cell mounted to the side
- Accessibility without limitation

**Free access**
- For setting
  - For process monitoring
  - For single component grinding

**Loading**
- Standardized palette concepts
- Platform for individual applications

**Portal loader**
- Integrated portal on machine
- Two pneumatic lifting modules
  - NC drive longitudinally

**Robot cell**
- High flexibility with a 6-axis robot
- Individual gripping arrangements possible
- Individual palette systems can be considered
- High autonomy
- Cell unit mounted to the side without limiting ease of use
- Short change-over times using teach functions and parametric cycles
- Integration of additional operations inside the robot cell
Heidenhain control system GRINDplusIT

**Monitor**
- 15” TFT
- Softkeys
- Expanded process data display

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

**KEL-PROG**
- Operator-controlled ISO programming
- Cycle selection via Softkeys
- Form editor
- TNC editor

**KEL-TOOL**
- Tool administration
- Local dressing devices
- Standard wheel definition

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

**KEL-TOUCH**
- GAP control with up to 3 sensors
- Operation and display integrated in the control system

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

**KEL-GRAPH**
- Graphical programming
- Cylinders, cones
- DXF import via KEL-ASSIST
GE FANUC control system 310is

Monitor
- 15” TFT
- Softkeys
- Expanded process data display

Keypad
- Handwheel with confirmation key
- Travel stick
- Mobile handpanel as an option

KEL-PROG
- Operator-controlled ISO programming
- Cycle selection via Softkeys
- Form editor

KEL-GRAF
- Graphic programming
- Cylinders, radii, facets, tapers and contours
- DXF import via KEL-ASSIST

KEL-TOOL
- Tool administration
- Local and global dressing devices
- Standard wheel definition with multiple reference points

KEL-POLY
- SW package for the preparation of unround-grinding programmes
- Correction of deviations in heights of centres

Movomatic
- Control unit ESZ 400
- Maximum 4 digital measuring heads
- Display and operation on ancillary panel

Marposs
- Control unit P7 ME
- Maximum 4 analogue measuring heads
- Display and operation on ancillary panel
### Technical data

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Universal</th>
<th>Universal for Flanged Parts (URF)</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main specifications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNC control system</td>
<td></td>
<td>GRINDplusIT / GE FANUC 310i</td>
<td></td>
</tr>
<tr>
<td>Distance between centres</td>
<td>mm</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Centre height with upper table</td>
<td>mm</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>Centre height without upper table</td>
<td>mm</td>
<td>250</td>
<td>175</td>
</tr>
<tr>
<td>Mains voltage required</td>
<td>3 x 400 V / 50 Hz / 3 x 460 V / 60 Hz</td>
<td>35 - 80</td>
<td></td>
</tr>
<tr>
<td>Power consumption depending on equipment</td>
<td>A</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Space required</td>
<td>mm</td>
<td>2700 x 2100</td>
<td></td>
</tr>
<tr>
<td><strong>Weight of workpiece</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between centres</td>
<td>kg</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>Load on chucked work</td>
<td>Nm</td>
<td>160</td>
<td>120</td>
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<tr>
<td><strong>Longitudinal slide: Z-axis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>mm</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Rapid traverse speed</td>
<td>m/min</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>µm</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td><strong>Upper-Table</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swiveling range at upper table</td>
<td>Grad</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Wheelslide: X-axis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>mm</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>Rapid traverse speed</td>
<td>m/min</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>µm</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td><strong>Swivel devices</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swiveling range</td>
<td>Grad</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Resolution B-axis</td>
<td>sec</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Wheelhead</strong></td>
<td>Universal / Diagonal / Tandem</td>
<td>Production</td>
<td></td>
</tr>
<tr>
<td>version</td>
<td></td>
<td>15 / 20</td>
<td></td>
</tr>
<tr>
<td>Drive motor</td>
<td>kW</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Peripheral grinding wheel speed</td>
<td>m/s</td>
<td>45</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Grinding wheel dimensions</td>
<td>mm</td>
<td>Ø 400 / 500</td>
<td>Ø 500 / 600</td>
</tr>
<tr>
<td><strong>Workhead</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational spindle speed</td>
<td>min⁻¹</td>
<td>1 - 800</td>
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</tr>
<tr>
<td>Driving torque spindle</td>
<td>Nm</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Spindle nose / internal taper</td>
<td></td>
<td>MK 5 / ASA 5</td>
<td></td>
</tr>
<tr>
<td>Base part</td>
<td></td>
<td>Fix / adjustment / Micro-adjustment</td>
<td></td>
</tr>
<tr>
<td><strong>Tailstock</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal taper</td>
<td></td>
<td>MK 4</td>
<td></td>
</tr>
<tr>
<td>Retraction of sleeve</td>
<td>mm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Base part</td>
<td></td>
<td>Fix / Micro-adjustment</td>
<td></td>
</tr>
<tr>
<td><strong>Clamping area upper table</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table mounted units</td>
<td>mm</td>
<td>195 x 1100</td>
<td></td>
</tr>
<tr>
<td><strong>Clamping area table slide</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table mounted units</td>
<td>mm</td>
<td>195 x 1300</td>
<td></td>
</tr>
<tr>
<td>Upper table front side</td>
<td>mm</td>
<td>90 x 1300</td>
<td></td>
</tr>
<tr>
<td><strong>Clamping area cross slide</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support on cross-slide</td>
<td>mm</td>
<td>430 x 710</td>
<td></td>
</tr>
</tbody>
</table>

All specifications and designs are subject to alterations without notice.
1 Power supply  
2 Pneumatic supply  
3 Vibration damping bases  
4 Leveling elements  
5 Filtration unit  
6 Cooling unit  
7 Coolant supply  
8 Coolant outlet  
9 connect a dust-extraction unit

(Measures L11 and L12 are depending on type of filtration unit)
Competence and a world-wide partnership

First-class sales and service organization for all the major international markets with local well-trained staff. KELLENBERGER guarantees expert advice and support for evaluation, purchase, installation and services of her high-quality grinding systems.

**L. Kellenberger & Co. AG**
Heiligkreuzstrasse 28
9009 St.Gallen / Switzerland
Phone +41 (0) 71 242 91 11
Fax +41 (0) 71 242 92 22
www.kellenberger.net
info@kellenberger.net

**Sales and service in USA and Canada:**

**Hardinge Inc.**
One Hardinge Drive
P.O. Box 1507
Elmira, New York 14902-1507 USA
Phone +1 (607) 734 2281
Fax +1 (607) 735 0570
www.hardinge.com
www.kellenberger.com
info@kellenberger.com

**Sales and service in Great Britain and The Republic of Ireland:**

**Hardinge Machine Tools Limited**
Silvertron Road, Matford Park,
Marsh Barton, Exeter,
Devon EX2 8NN
Phone +44 (01) 392 208 181
Fax +44 (01) 392 208 199
www.hardinge.com

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