KEL-VERA
The Compact High-Precision Cylindrical Grinding Machine

kellenberger.com
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

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, 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.
Heidenhain control system
GRINDplusIT
- Windows XP
- 2-Processors control system

Fanuc control system
GE Fanuc 310 is
- Windows CE
- 2-Processors control system

B-axis / KEL-SET
- Automatic grinding wheel measuring system (option)

Hydrostatics with holding device
- X- und Z-guideways
  - No stick slip
  - Good damping
  - High dynamics

Cooling system
for a thermally stable machine
- Hydrostatics
- Wheelhead
- Spindles

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 Type of Machine

Universal Wheelheads

- UR 1-3
- RS 1-2

Diagonal Wheelheads

- UR 1-2-3
- UR 1-2-4-7
- 2 R 1-4
- 2 RS 2-5
- UR-RS 1-5-8

Tandem-Type Wheelheads

- RS-R 2-4
- UR-RS 1-5-8

Spindle bearings
- Hydrodynamic multi-surface spindle bearings

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
Bridgeport® GX300

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.

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
- 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

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

KEL-SET

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

Table concept

- Lower table
- Upper table can be swiveled
- Height of centers 175 mm
- Dressing device on WH and TS

Dressing concept Shafts

(up to 400 mm in length)

- Wheel left, behind WH
- Wheel right, behind TS

Dressing concept Flanges

(up to 50 mm in length)

- Wheel left, behind WH
- Wheel right and internal grinding wheel, behind WH or on upper table

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
- 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
UNIVERSAL TYPE OF MACHINE FOR FLANGED PARTS (URF)

Universal Wheelheads
- URS 2-3
- URS 1-2-3

Diagonal Wheelhead
- 2 RSU 2-5-7
- UR-5-1-8

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.
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

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
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
• The high-precision C-axis is available as an option

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</td>
<td>Ø mm</td>
<td>500/600</td>
<td>500/600</td>
</tr>
</tbody>
</table>
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

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
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 $d_R < 0.2 \mu m$ 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
Portal Loader
- Integrated portal on machine
- Two pneumatic lifting modules
  - NC drive longitudinally

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
- 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

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
Bridgeport® GX 1000, 1300, 1600

**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-GRAPH**
- Graphical programming
- Cylinders, cones
- DXF import via KEL-ASSIST

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

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

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-GRAPH
- 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
## 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>GRINDplusT / GE FANUC 310s</td>
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<td></td>
</tr>
<tr>
<td>Distance between centres (mm)</td>
<td></td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Centre height with upper table (mm)</td>
<td></td>
<td>250</td>
<td>175</td>
</tr>
<tr>
<td>Centre height without upper table (mm)</td>
<td></td>
<td></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>
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</tr>
<tr>
<td>Power consumption depending on equipment (A)</td>
<td>35 - 80</td>
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<td></td>
</tr>
<tr>
<td>Space required (mm)</td>
<td>2700 x 2100</td>
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<td></td>
</tr>
<tr>
<td><strong>Weight of workpiece</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Between centres (kg)</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Load on chucked work (Nm)</td>
<td>160</td>
<td>320</td>
<td>160</td>
</tr>
<tr>
<td><strong>Longitudinal slide: Z-axis</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Travel (mm)</td>
<td>600</td>
<td></td>
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</tr>
<tr>
<td>Rapid traverse speed (m/min)</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution (μm)</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Upper Table</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swiveling range of upper table (Grads)</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wheelslide: X-axis</strong></td>
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<td></td>
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<tr>
<td>Travel (mm)</td>
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<tr>
<td>Rapid traverse speed (m/min)</td>
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<td></td>
</tr>
<tr>
<td>Resolution (μm)</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Swivel devices</strong></td>
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<tr>
<td>Swiveling range (Grads)</td>
<td>240</td>
<td>240</td>
<td>0 / 30</td>
</tr>
<tr>
<td>Resolution B-axis (Sec.)</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td><strong>Wheelhead</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version</td>
<td>Universal / Diagonal / Tandem</td>
<td>Production</td>
<td></td>
</tr>
<tr>
<td>Drive motor (kW)</td>
<td>10</td>
<td>15 / 20</td>
<td></td>
</tr>
<tr>
<td>Peripheral grinding wheel speed (m/s)</td>
<td>45</td>
<td>&lt; 80</td>
<td></td>
</tr>
<tr>
<td>Grinding wheel dimensions (mm)</td>
<td>Ø 400 / 500</td>
<td>Ø 500 / 600</td>
<td></td>
</tr>
<tr>
<td><strong>Workhead</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational spindle speed (min⁻¹)</td>
<td></td>
<td>1 - 800</td>
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<tr>
<td>Driving torque spindle (Nm)</td>
<td>60</td>
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<td></td>
</tr>
<tr>
<td>Spindle nose / internal taper</td>
<td>MK 5 / ASA 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base part</td>
<td>Fix / adjustment / Micro-adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tailstock</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal taper</td>
<td>MK 4</td>
<td></td>
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</tr>
<tr>
<td>Retraction of sleeve (mm)</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base part</td>
<td>Fix / Micro-adjustment</td>
<td></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 (mm)</td>
<td>195 x 1100</td>
<td></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 (mm)</td>
<td></td>
<td>195 x 1300</td>
<td></td>
</tr>
<tr>
<td>Upper table front side (mm)</td>
<td></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 (mm)</td>
<td></td>
<td>430 x 710</td>
<td></td>
</tr>
</tbody>
</table>

All specifications and designs are subject to alterations without notice.
Space-assignment

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)
Over the years, The Hardinge Group™ steadily diversified both its product offerings and operations. Today, the company has grown into a globally diversified player with manufacturing operations in North America, Europe and Asia. In addition to designing and building turning centers, and collets, Hardinge is a world leader in grinding solutions with the addition of the Kellenberger, Jones & Shipman, Hauser, Tschudin, Usach and Voumard brands to the Hardinge family. The company also designs and manufactures Bridgeport machining centers and other industrial products for a wide range of material cutting, turnkey automation and workholding needs.

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