

KEL-VARIA

Cylindrical Grinding Systems for the most Demanding Applications

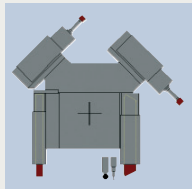


HARDINGE

EXPECT MORE

KELLENBERGER

The innovative grinding system



28 different wheelheads

- Universal
- Diagonal
- Tandem types



KEL-SET

Automatic grinding wheel measuring system (option)



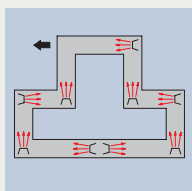
C-axis

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

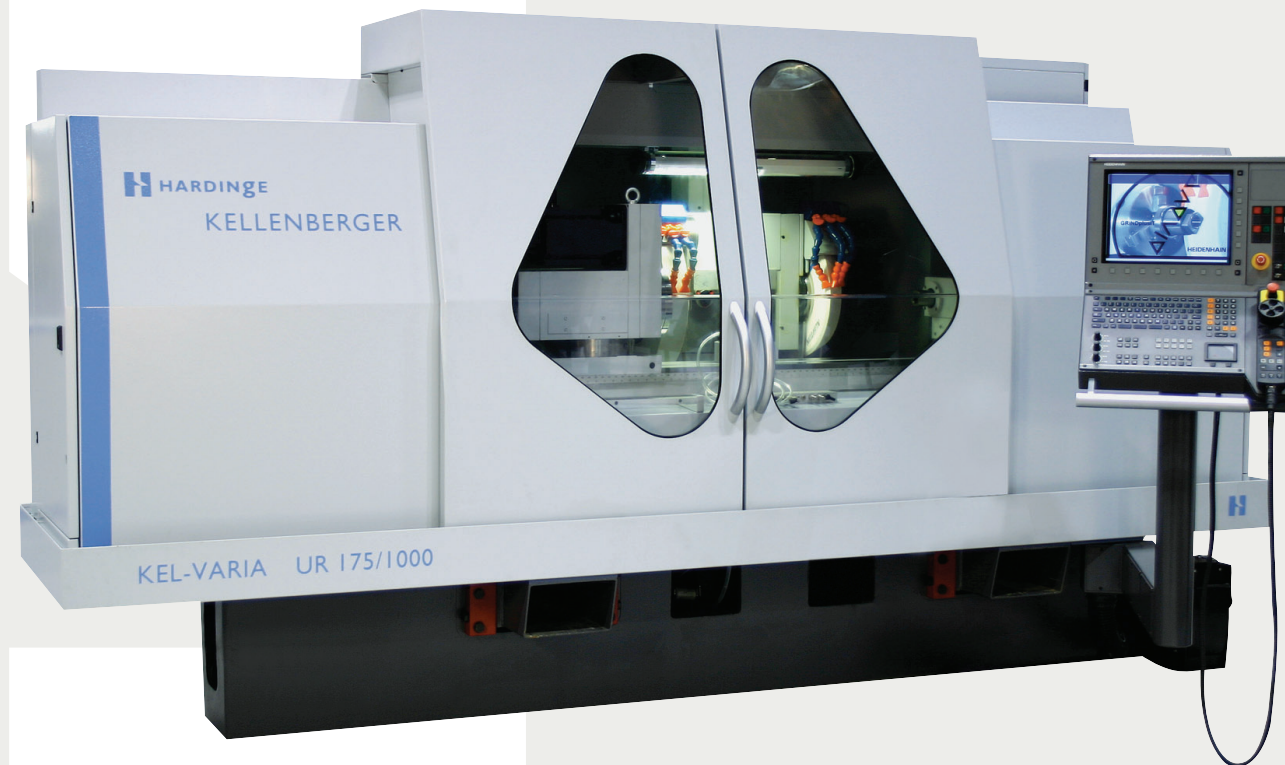
Precision with hydrostatics

These CNC precision cylindrical grinding machines have been developed to satisfy the highest demand 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-axis 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.

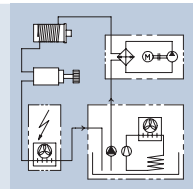


KEL-VARIA

Cooling system

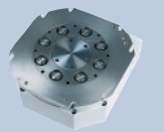
for a stable machine

- Hydrostatics
- Wheelhead
- Spindles



Wheelhead with

- Fixed intermediate section
- Manual indexing
- Automatic indexing
- B-axis



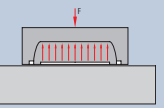
Heidenhain control system GRINDplusIT

- Windows 2000
- 2-processors control system



Hydrostatics

- X- and Z-guideways
- No stick slip
- Good damping



Prepared connecting plates

- For table flooding
- For diamond cooling
- For stabilizing of measuring unit



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

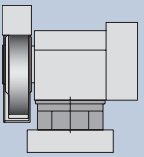
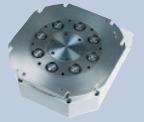
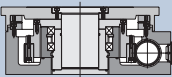
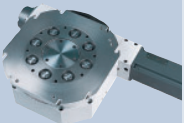

- The infrastructure is modular in design, easy to service and easily accessible, with all important functions being monitored
- Connecting plates for steady-rests / dressing spindles / measuring units
- Prepared for the use of oil as a coolant

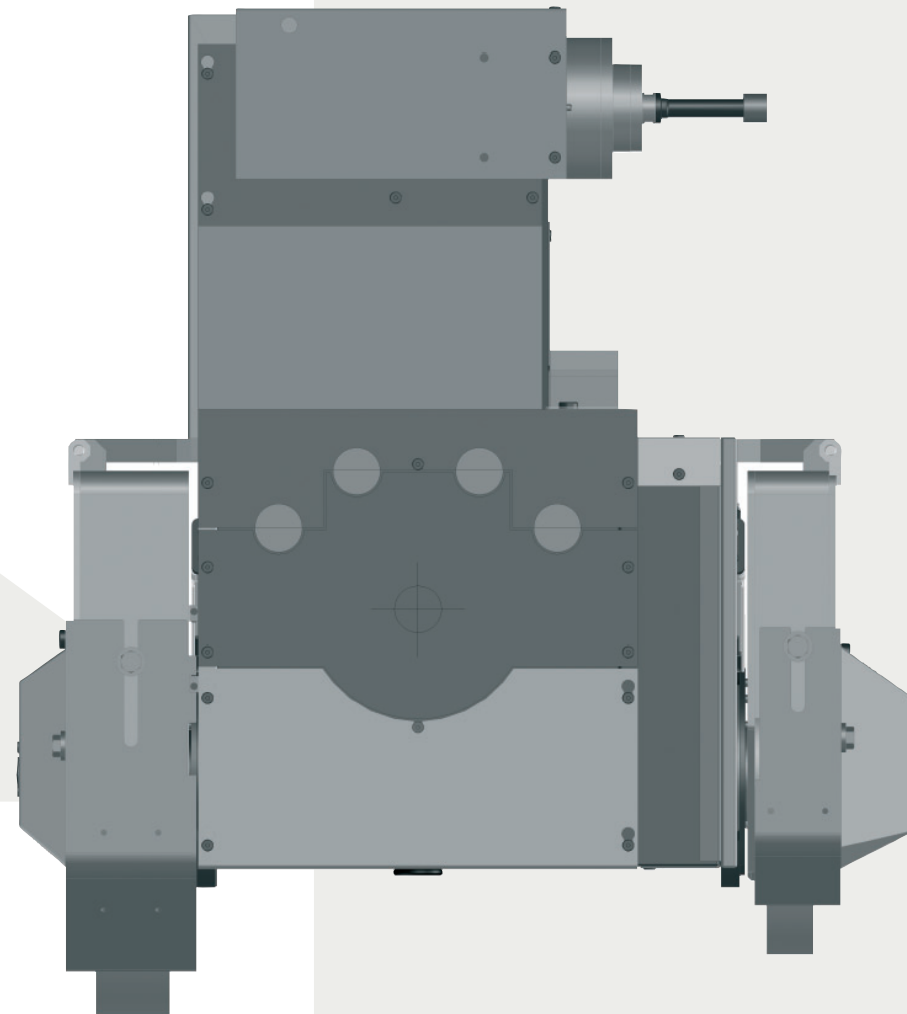
Options

- 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

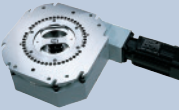
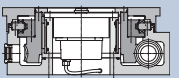

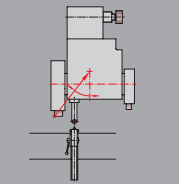

4

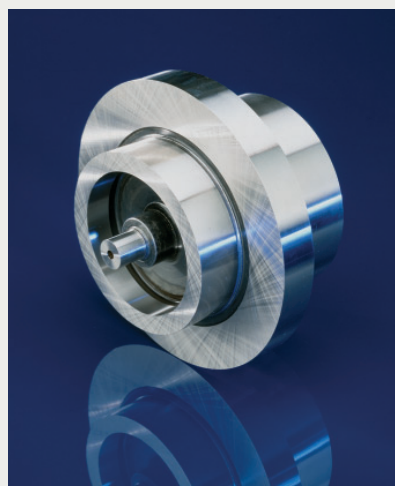
	<p>Intermediate section fixed</p> <ul style="list-style-type: none"> Standard for machine type R
	<p>Manual indexing</p> <ul style="list-style-type: none"> Standard for machine types UR / RS and URS
	<p>Indexing</p>
	<p>Automatic indexing</p>
	<p>Hirth coupling</p>



B-axis and automatic grinding wheel measuring system

5

<ul style="list-style-type: none"> B-axis <ul style="list-style-type: none"> Automatic infinitely variable positioning of the wheelhead <ul style="list-style-type: none"> Direct measuring Indirect measuring 	
<ul style="list-style-type: none"> B-axis <ul style="list-style-type: none"> Precision bearings Distortion-free clamping 	
<ul style="list-style-type: none"> Worm – worm wheel <ul style="list-style-type: none"> Adjustable play 	
<ul style="list-style-type: none"> KEL-SET <ul style="list-style-type: none"> Automatic grinding wheel measuring system 	
<ul style="list-style-type: none"> KEL-SET <ul style="list-style-type: none"> EU patent No. EP 0 542 674 B1 US patent No. 5.335.454 	



Indexing axis

The Hirth coupling with indexing every 2.5° ensures excellent positioning and repetition accuracy. Manual indexing is standard on machine types UR, RS and URS, whereas automatic indexing is available as an option. Depending on the application, swivel devices for manual or automatic positioning of the wheelhead can be supplied with machine type R.

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.

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.

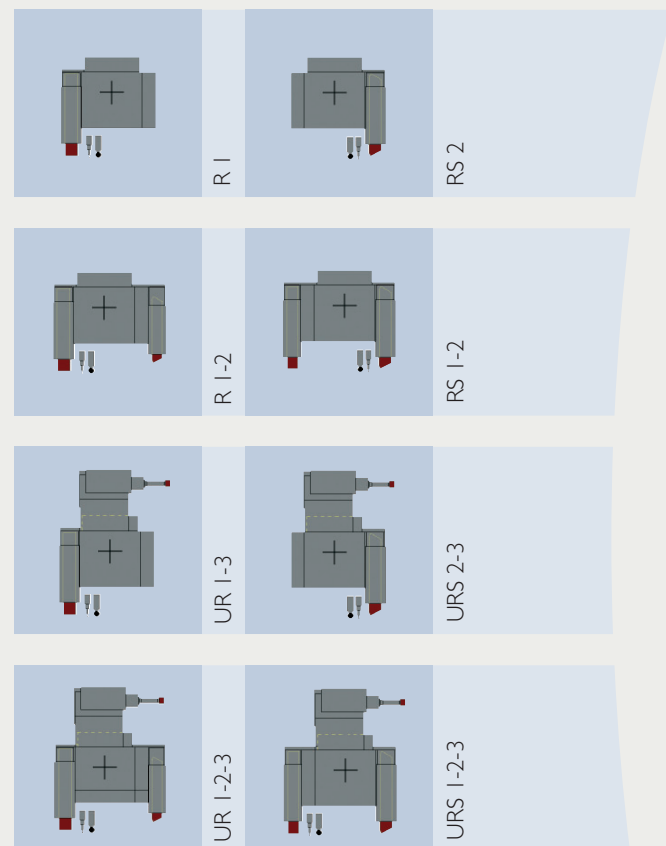
Advantages for the user

- Programming takes place with the actual dimensions according to the 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



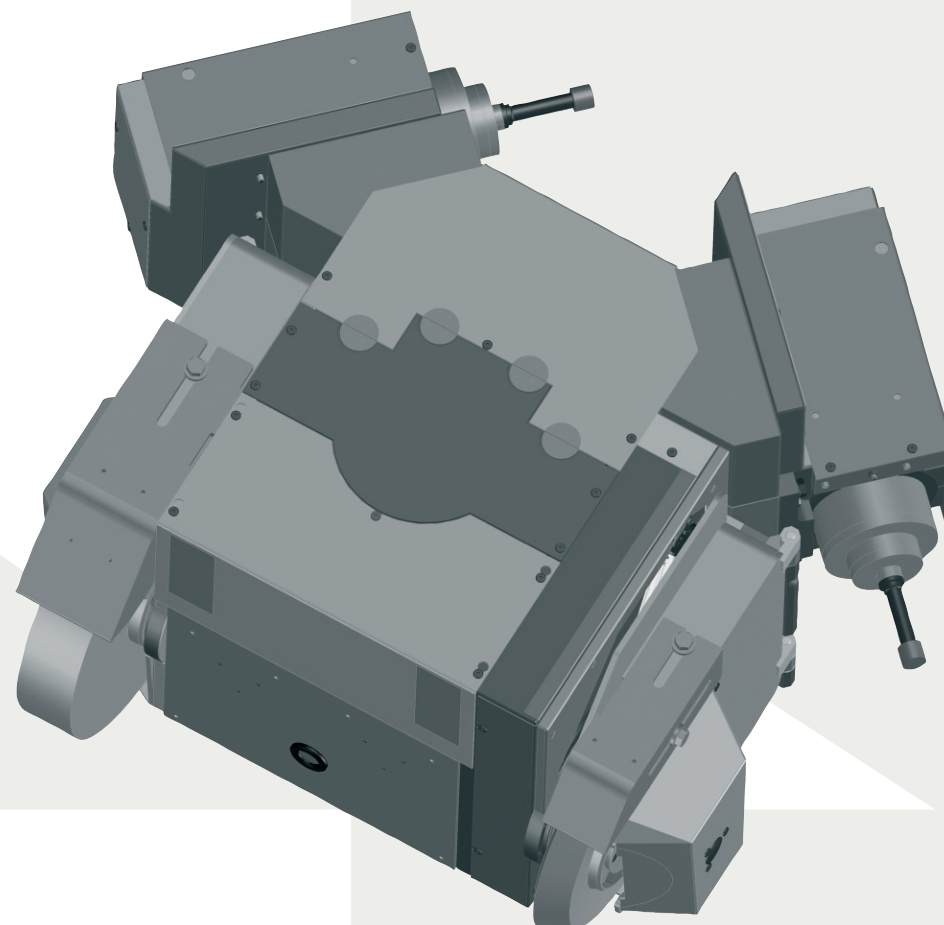
Modular wheelhead variants

Universal wheelheads

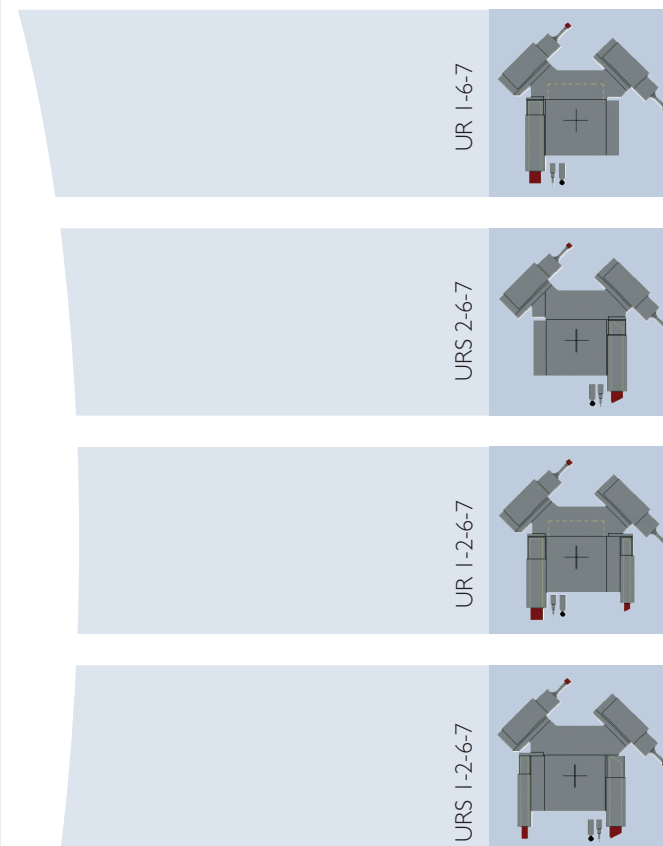


Internal grinding attachment

- Belt-driven internal grinding spindle



Universal wheelheads



Internal grinding attachment

- High-frequency internal grinding spindle



Universal wheelheads

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, as shown in the examples.

Belt-driven internal grinding spindle

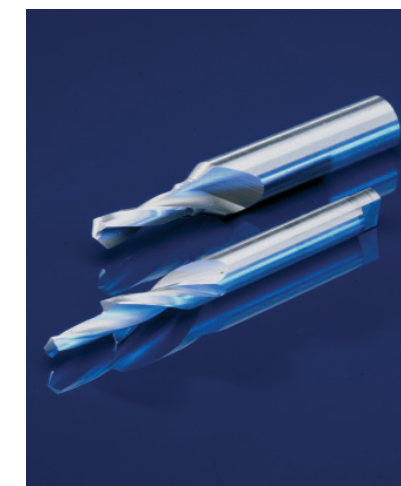
- Motor output 2.5 kW
- No belt change required
- HJN 828 / 842 / 860

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

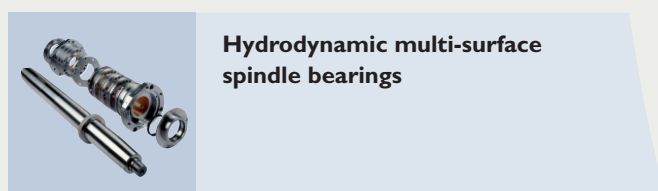
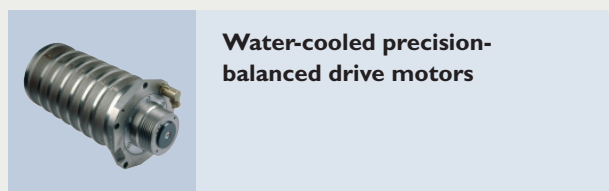
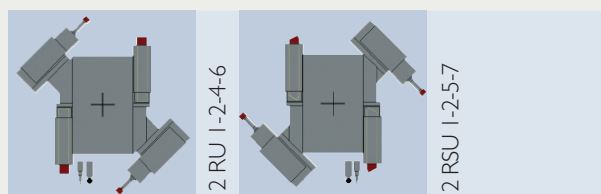
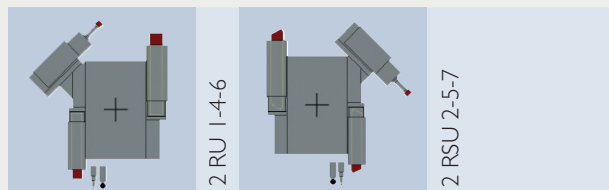
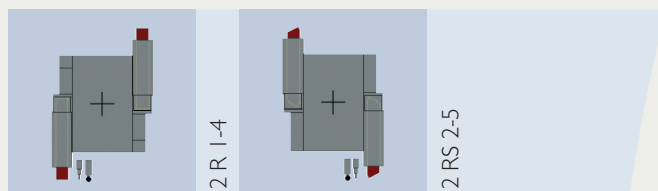
HF ID grinding spindles

- MFV 1230
- MFV 1260
- MFM 1224-42
- MFM 1242-60
- Frequency converter up to 3000 Hz



Modular wheelhead variants

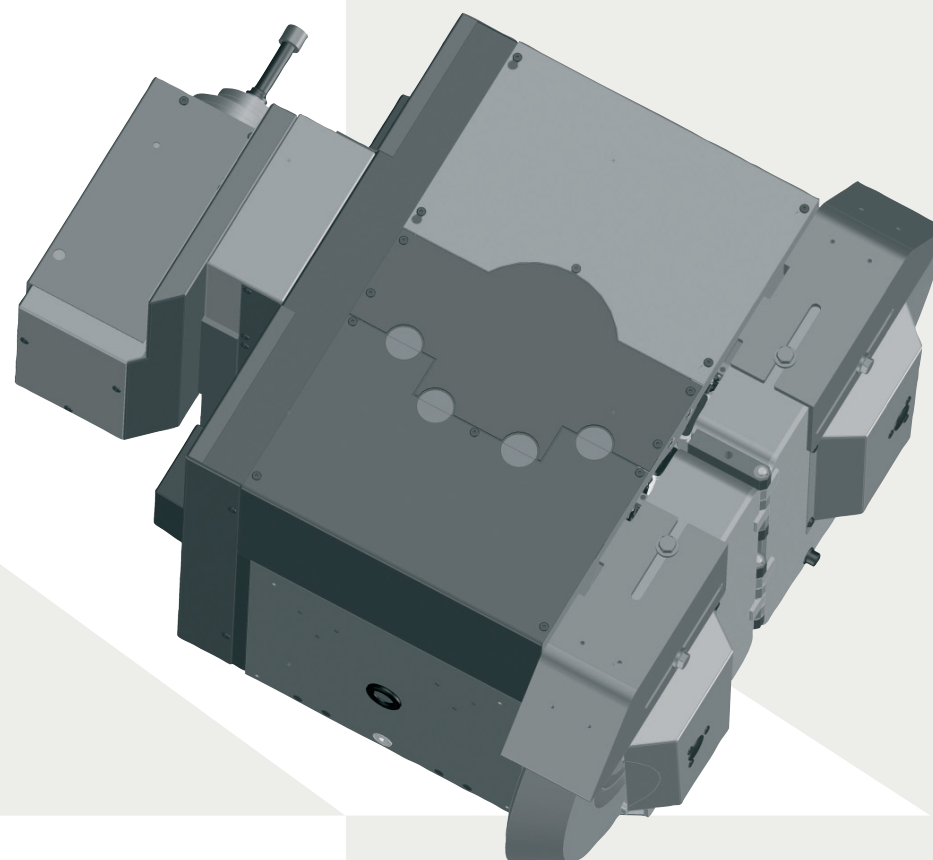
Diagonal wheelheads



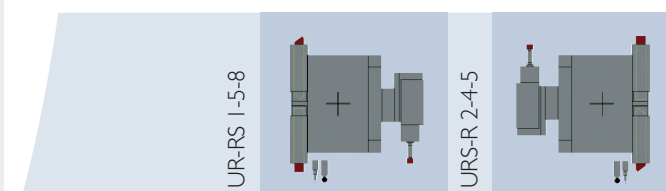
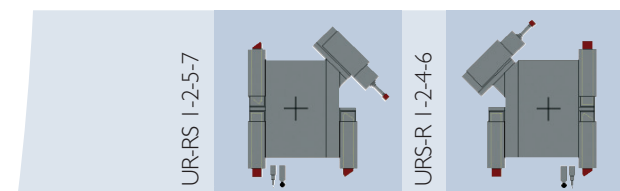
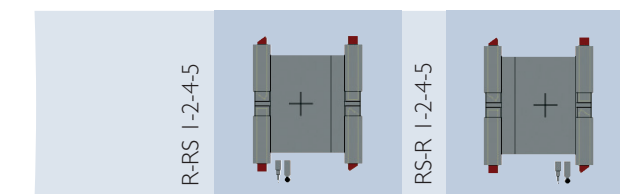
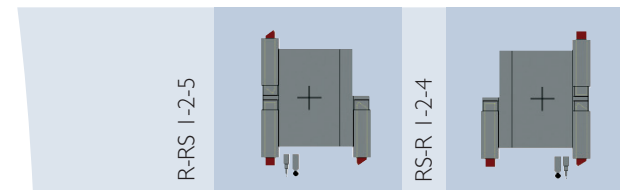
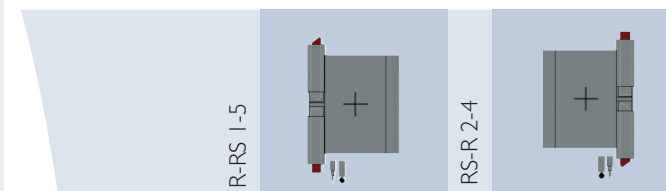
Diagonal wheelheads

- 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

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.



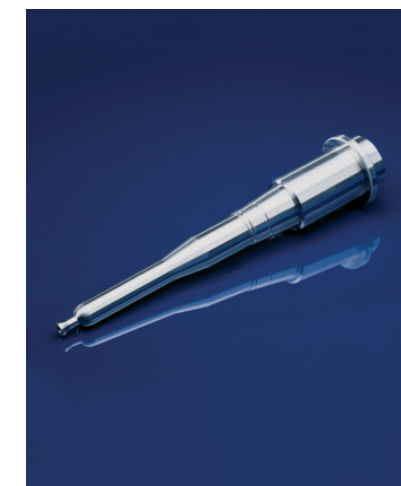
Tandem-type wheelheads



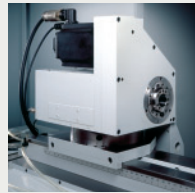
Tandem-type wheelheads

- 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 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.



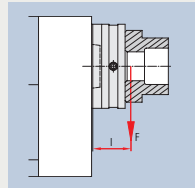
Workhead and C-axis



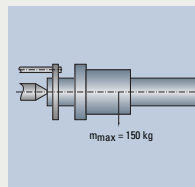
- Workhead**
- n 8-800 min-1



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



- Load with chucked work**
- Standard 160 Nm
 - Rotating only 320 Nm



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



- Spindle nose**
- Size 5 DIN 55026
 - Morse taper 5

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 $dR < 0.5 \mu\text{m}$ on chucked work
- Versatile in use

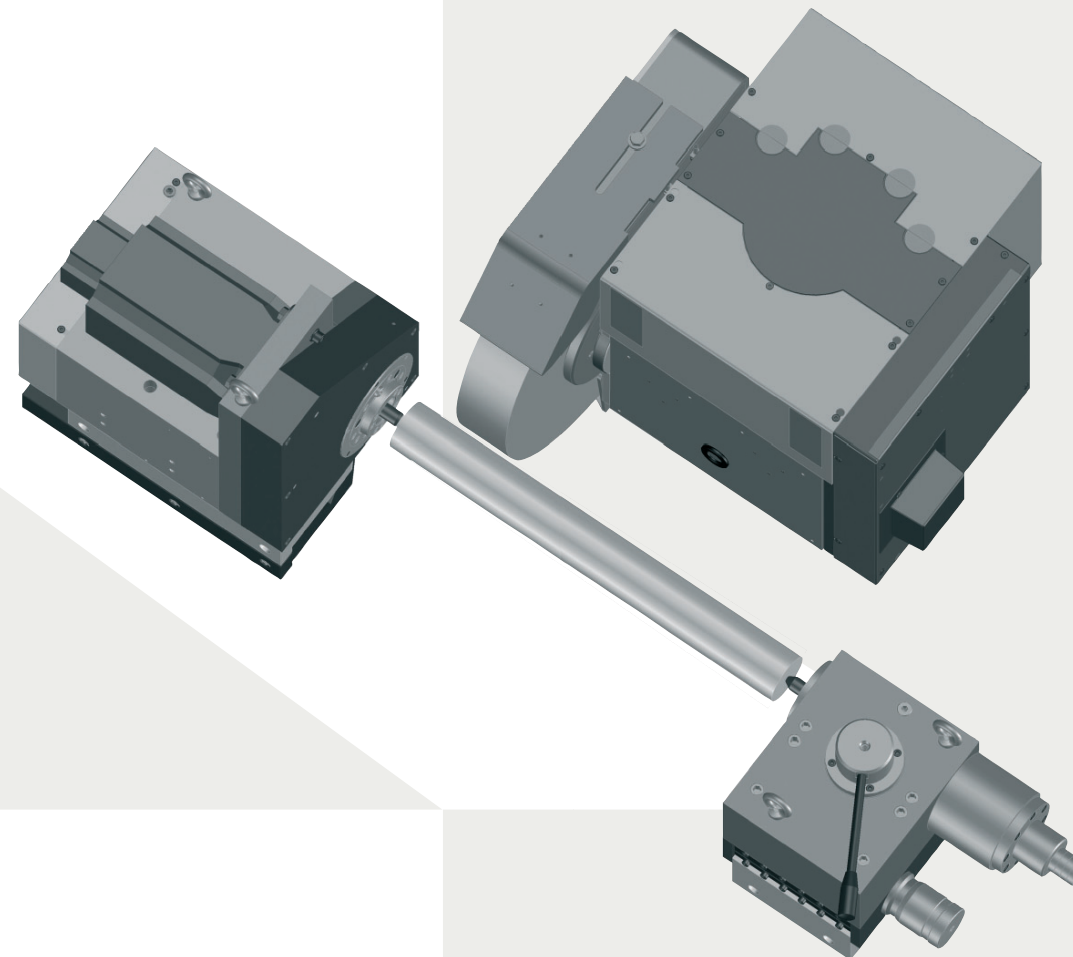
Options

- Roundness of the workpiece $dR < 0.2 \mu\text{m}$ on chucked work
- Microadjustment for quick and easy cylindricity corrections on chucked work
- Swiveling base
- Positioned spindle stop
- Swivel-angle display

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.

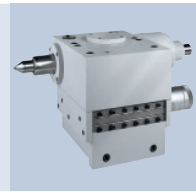
Tailstock and longitudinal slide



KEL-VARIA

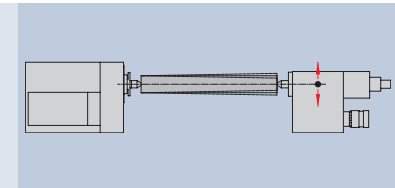
Tailstock

- Morse taper 4
- Retraction of sleeve 50 mm

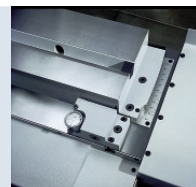


Micro-adjustment of tailstock

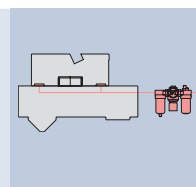
- Adjustment range $\pm 150 \mu\text{m}$



Upper table swiveling



Upper table with air cushioning feature



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

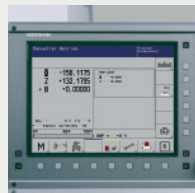
- Hydraulic or pneumatic sleeve retraction
- Micro-adjustment for fast and easy cylindricity corrections
- Air-cushioning for ease of tailstock repositioning

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°

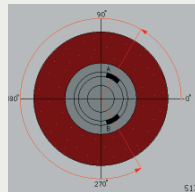
Heidenhain control system GRINDplusIT



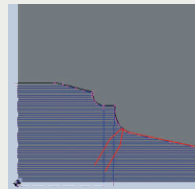
- Monitor**
- 15" TFT
 - Softkeys



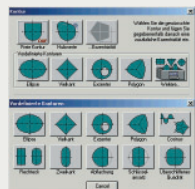
- Keypad**
- KELLENBERGER push-key strip
 - Mobile hand panel with handwheel / emergency stop / confirmation key



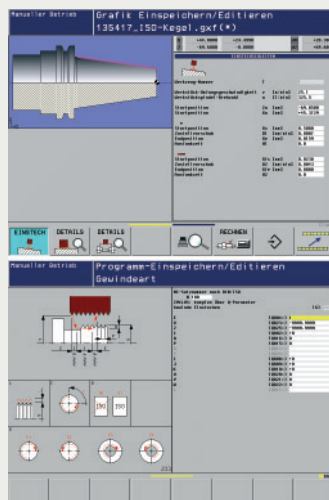
- KEL-BALANCE**
- Semi-automatic balancing for 1 or 2 wheel / s
 - Operation and display integrated in the control system



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

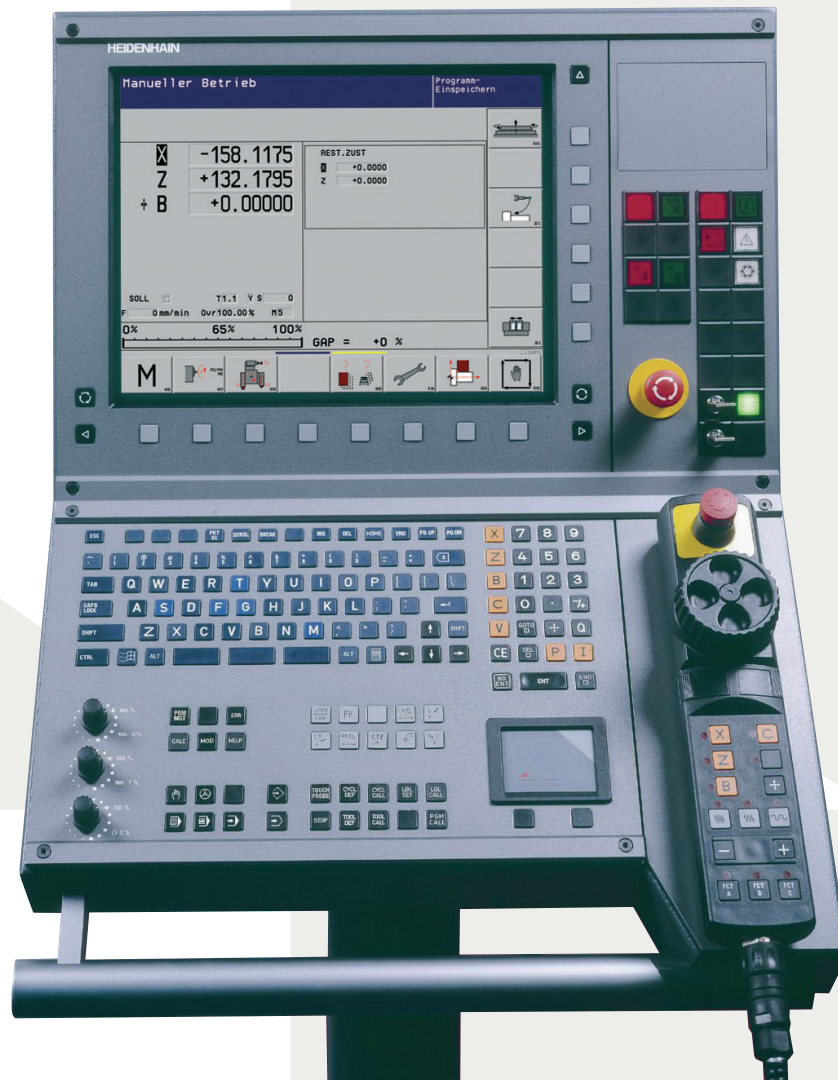


- KEL-POLY**
- SW package for the preparation of unround grinding programmes
 - Correction of differences in the height of centres



GRINDplusIT 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



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.

Electrical cabinet

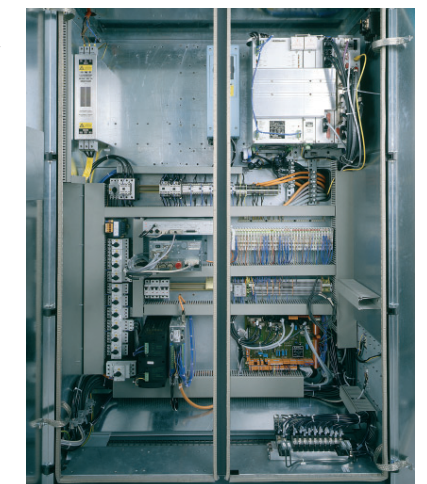
- Standard cabinet for EU and US
- HF drives integrated in the electrical cabinet
- CE conformity
- Electrical cabinet with generous spare space
- Excellent overview and accessibility in the entire cabinet
- Heat exchanger integrated in the machine's coolant system

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



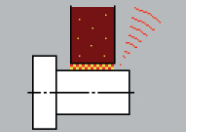
Additional panel

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



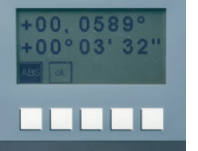
KEL-TOUCH

- 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 I



Swiveling dressing unit

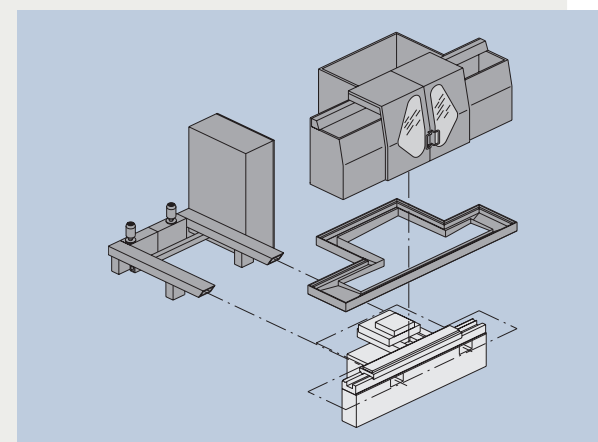
- Operated with an additional B-axis
- For special profiles



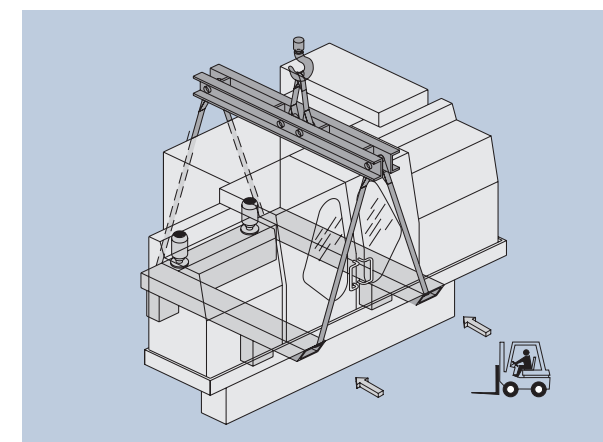
Technical data

Wheelhead type		Universal	Tandem	Diagonal
Main specifications				
Distance between centres	mm		800 / 1000 / 1500	
Grinding length	mm		600 / 1000 / 1500	
Centre height	mm		175 / 225	
Weight of workpiece between centres	kg		150	
Load on chucked work	Nm		160 standard	
Mains voltage required			3 x 400 V / 50 Hz / 3 x 460 V / 60 Hz	
Power consumption depending on equipment	A		35 – 80	
Space required / length x width	mm		3010 x 2000 / 3600 x 2000 / 4600 x 2000	
Longitudinal slide: Z-axis				
Travel	mm		750 / 1150 / 1650	
Rapid traverse speed	m/min		15	
Resolution	µm		0.1	
Swiveling range of upper table	degree		9 / 9 / 7	
Wheelslide: X-axis				
Travel	mm		320	
Rapid traverse speed	m/min		7.5	
Resolution	µm		0.1	
Swivel devices				
B-axis			option / partly standard	
Resolution	sec		0.1	
Autom. indexing/2.5° Hirth coupling			option	
Man. indexing/2.5° Hirth coupling			partly standard	
Swiveling range	degree		240	
Fixed intermediate section			standard for R	
Wheelhead general				
Drive motor water-cooled	kW		10	
Peripheral grinding wheel speed	m/s		35 / 45	
Wheelhead Universal				
Grinding wheel dimensions, lefthand side	mm		400 / 500	
Various options	mm		various dimensions on request	
Grinding wheel dimensions, righthand side	mm		300 / 400 / 500	
Various options	mm		various dimensions on request	
Wheelhead Tandem-type				
Grinding wheel dimensions, lefthand side	mm		400	
Various options	mm		various dimensions on request	
Grinding wheel dimensions, righthand side	mm		400	
Various options	mm		various dimensions on request	
Wheelhead Diagonal				
Grinding wheel dimensions, lefthand side	mm		400 / 500	
Various options	mm		various dimensions on request	
Grinding wheel dimensions, righthand side	mm		400 / 500	
Various options	mm		various dimensions on request	
Internal grinding attachment				
Bore for spindles up to	mm		80 / 120	
Rotational speed of spindle, motor infinitely variable	min-1		6000 – 21000	
Motor output	kW		2.5	
HF spindles MFV, optional	kW		5.2 / 8	
Workhead standard				
Rotational spindle speed	min-1		8 – 800	
Driving torque spindle	Nm		36	
Spindle nose / internal taper			ASA 5 / MT 5	
Swiveling range option	degree		- 10 + 100	
Micro-adjustment	sec		+ / - 60	
Tailstock				
Internal taper			MT 4	
Retraction of sleeve	mm		50	
Micro-adjustment optional	µm		+ / - 150	
CNC control system				
Heidenhain			GRINDplusIT	
Measuring systems				
Gap Control			KEL-TOUCH	
Active longitudinal positioning			Movomatic / Marposs	
Passive longitudinal positioning			Movomatic / Marposs	
In-process gauging			Movomatic / Marposs	
Balancing			KEL-BALANCE	

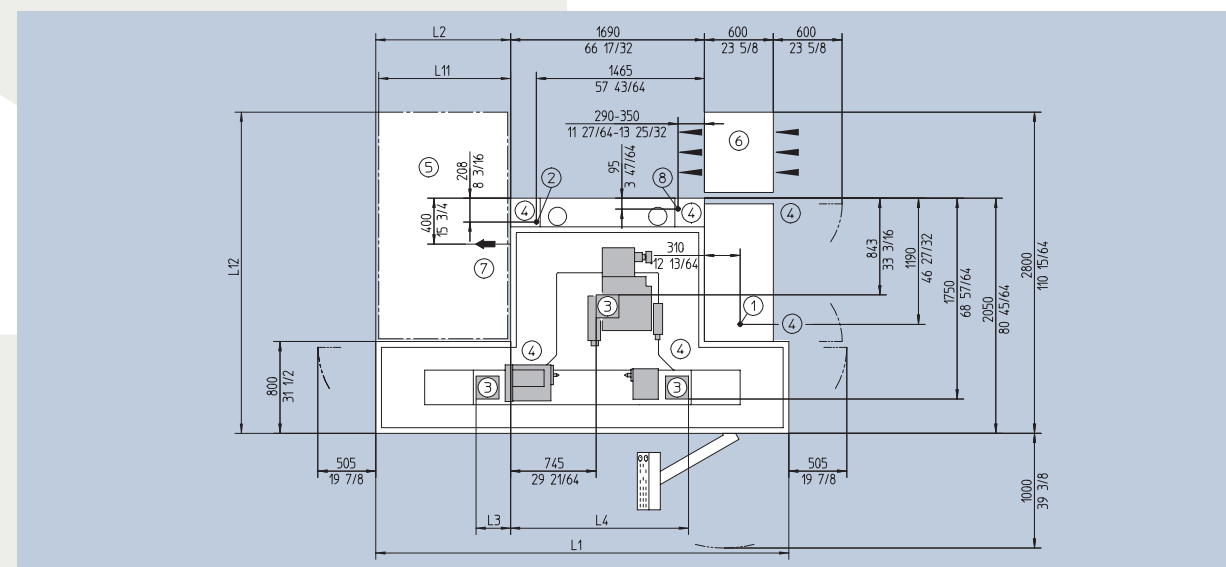
All specifications and designs are subject to alterations without notice



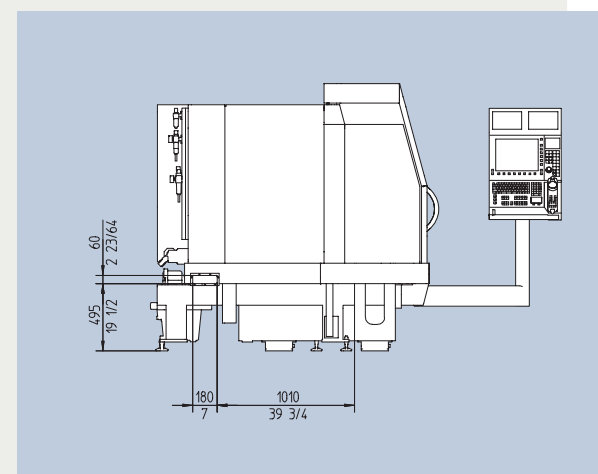
Separate infrastructure



Easy transport



Space-assignment plan



Coolant outlet

- 1 Power supply
 - 2 Pneumatic supply
 - 3 Vibration damping bases
 - 4 Leveling elements
 - 5 Coolant unit
 - 6 Cooling unit
 - 7 Coolant outlet
- (Measures L11 and L12 are depending on type of filtration unit)

Type	L 1	L 2	L 3	L 4
600	3010	775	300	1550
1000	3600	1175	300	1550
1500	4600	1675	600	1850

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 our 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

Silverton Road, Matford Park,
Marsh Barton, Exeter,
Devon EX2 8NN
Phone +44 (01) 392 208 181
Fax +44 (01) 392 208 199
www.hardinge.com



KELLENBERGER

Your local KELLENBERGER Partner:

