MACHINE KNIFE INDUSTRY

MACHINES + ROBOTIC CELLS FOR

grinding | sharpening | polishing | milling

BERGER GRUPPE

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MACHINES AND ROBOT CELLS

MACHINE KNIVES

WORKPIECES

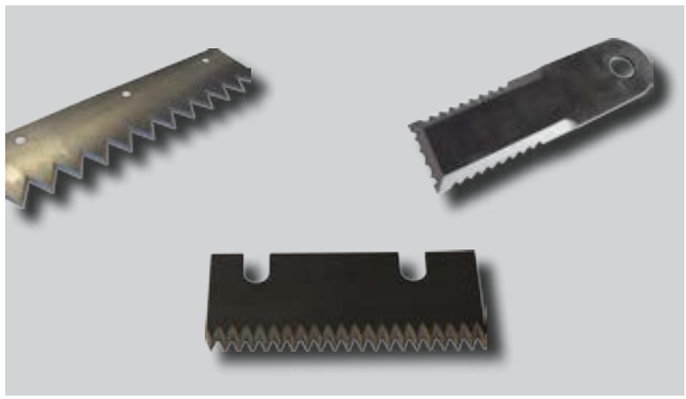
MECHANICAL PROCESSING OF MACHINE KNIVES

The term "machine knives" covers a large number of workpieces of the most varied geometries and sizes.

Due to the multitude of workpiece shapes and the complexity of some geometries, different grinding processes are used.

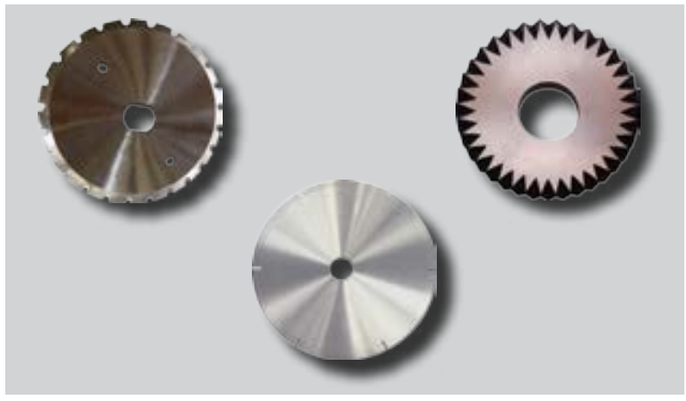
1

Flat and surface grinding on workpieces



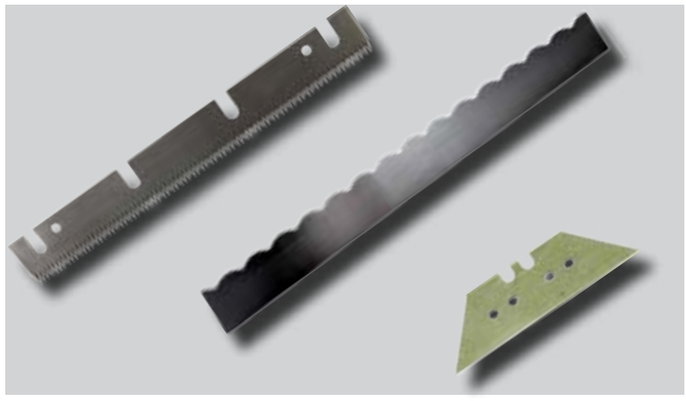
2

Serrated/scalloped grinding of workpieces



3

Bevel/arc and serrated grinding on ciruclar blades



4

Straight finish grinding, serrated and scalloped grinding on steel strips

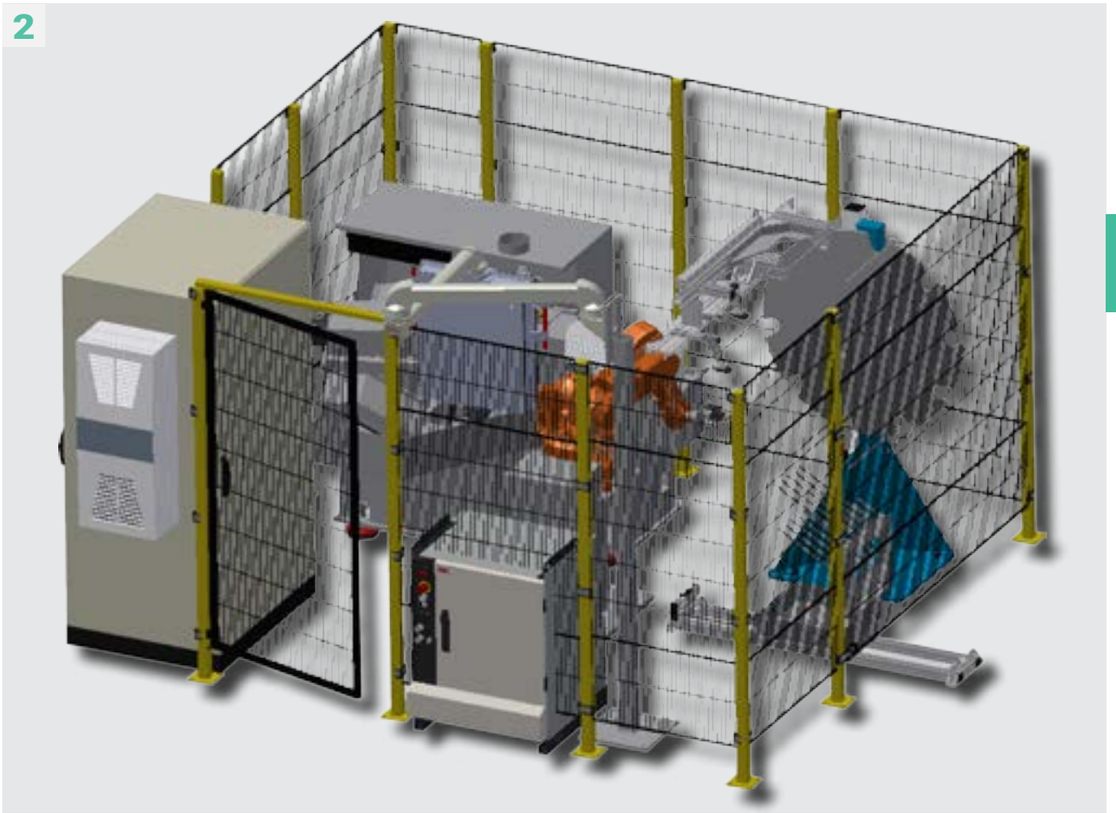
GRINDING MACHINES

FOR SINGLE WORKPIECES

GRINDING
SHARPENING
SERRATING

Grinding with CNC technique

For the processing of machine knives the Berger Gruppe offers a wide range of CNC controlled machines.



Various machining operations can be carried out, such as surface grinding, radii grinding, flat grinding, serrated and scalloped grinding, sharpening, polishing and hollow grinding.

The machines are primarily used in the cutlery, machine knife, tool and surgical industries.

Grinding machines are employed as follows:

- flat bevel grinding machines
- rotary table grinding machines
- peripheral grinding machines
- rotary index table grinding machines
- hollow grinding machines
- contour grinding machines
- sharpening machines

Examples of use (pictures)

1. Flat bevel grinding machine of the series BG1/ZA/NT for surface grinding of gardening shears (picture 1)
2. Exemplary structure of a machining cell with flat bevel grinding machine BG/NT, robot loading and unloading and rotating bar magazine (picture 2)
3. Grinding of circular knives with peripheral grinding machine of the series RFS4 (picture 3)

FLAT BEVEL GRINDING MACHINES
FRONT SIDE GRINDING MACHINES

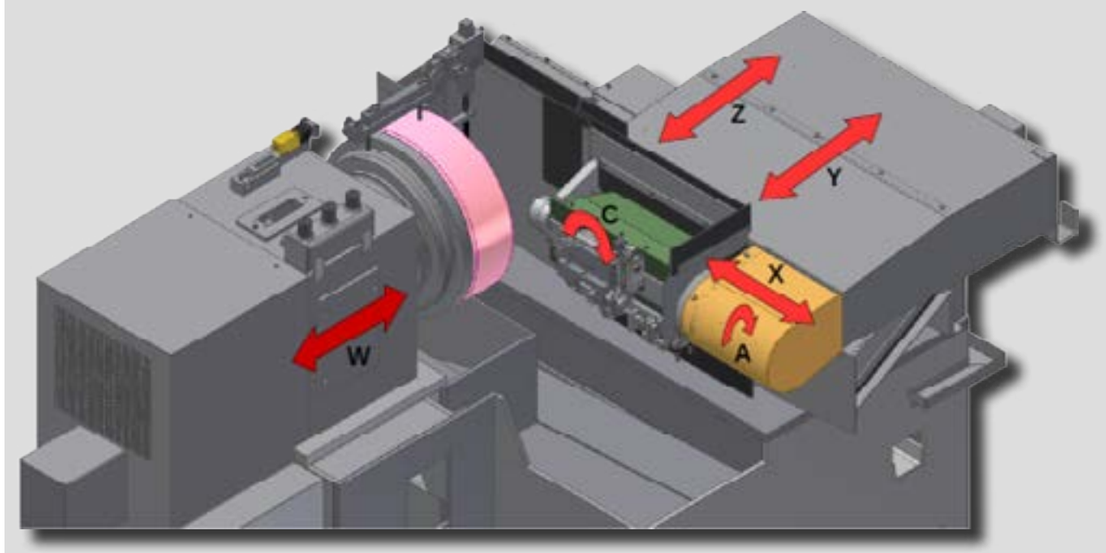
Plane-side transverse or front-side deep grinding process

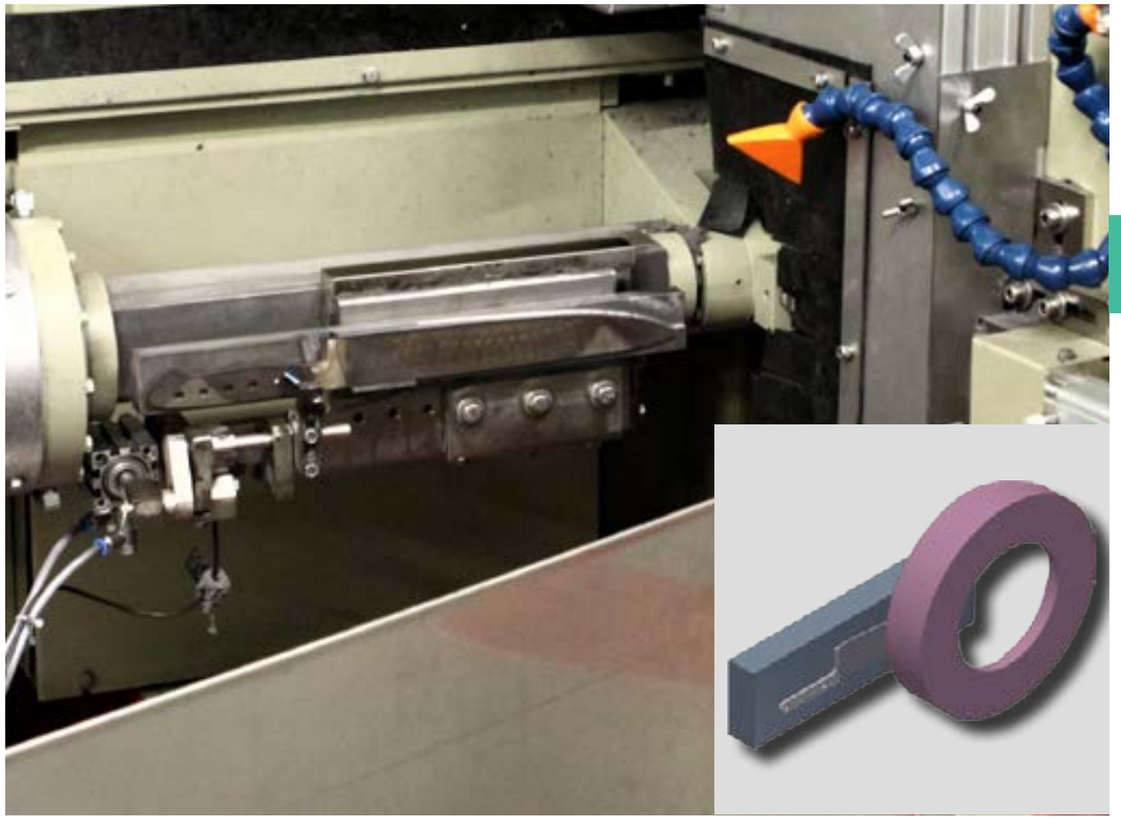
Surface grinding is a widely used grinding process for the machining of machine knives. It is mainly used for processing flat and plane workpieces. Surface grinding can be achieved both in deep grinding and pendulum grinding.

The flat bevel grinding machines – also known as front side grinding machines – process workpieces in plane-side transverse or front-side deep grinding. With a cutting speed of up to 50 m/s, a multi-sided smooth grinding of machine knives is achieved.

The workpiece is machined with the side faces of a cup grinding wheel. Depending on the diameter of the cup grinding wheel, workpieces with a grinding length of up to 1 200 mm can be processed.

If the workpiece is processed in a deep grinding process, a large amount of material can be removed and a good surface quality can be achieved.



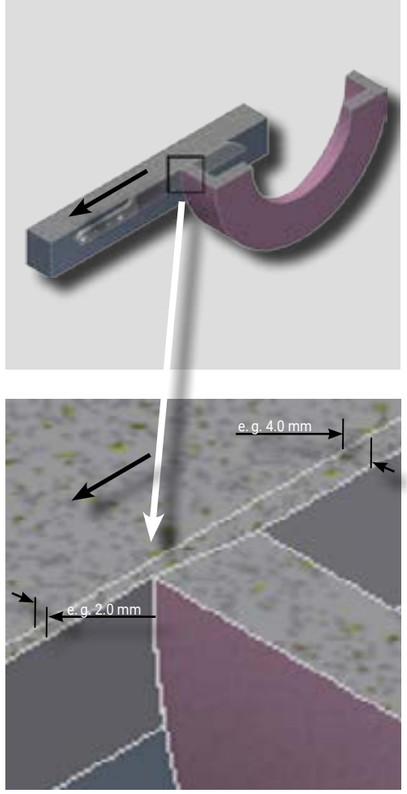


When grinding with the plane side grinding method, the material removal results in a bevel on the wall (drawing p. 9).

Depending on the task and the workpiece, different geometries can be processed.

The solution presented on page 8 involves five workpiece axes and one tool axis.

- Expoxy resin bonded grinding wheels with 450–710 mm Ø
- Feed speed 30–50 m/s
  Feed 700–2 000 mm/min
- Ø Q'_w = 8–12 [mm³/ (mm s)]
- max. Q'_w = 25 [mm³/ (mm s)]
- max. cutting weight 3–10 g/s



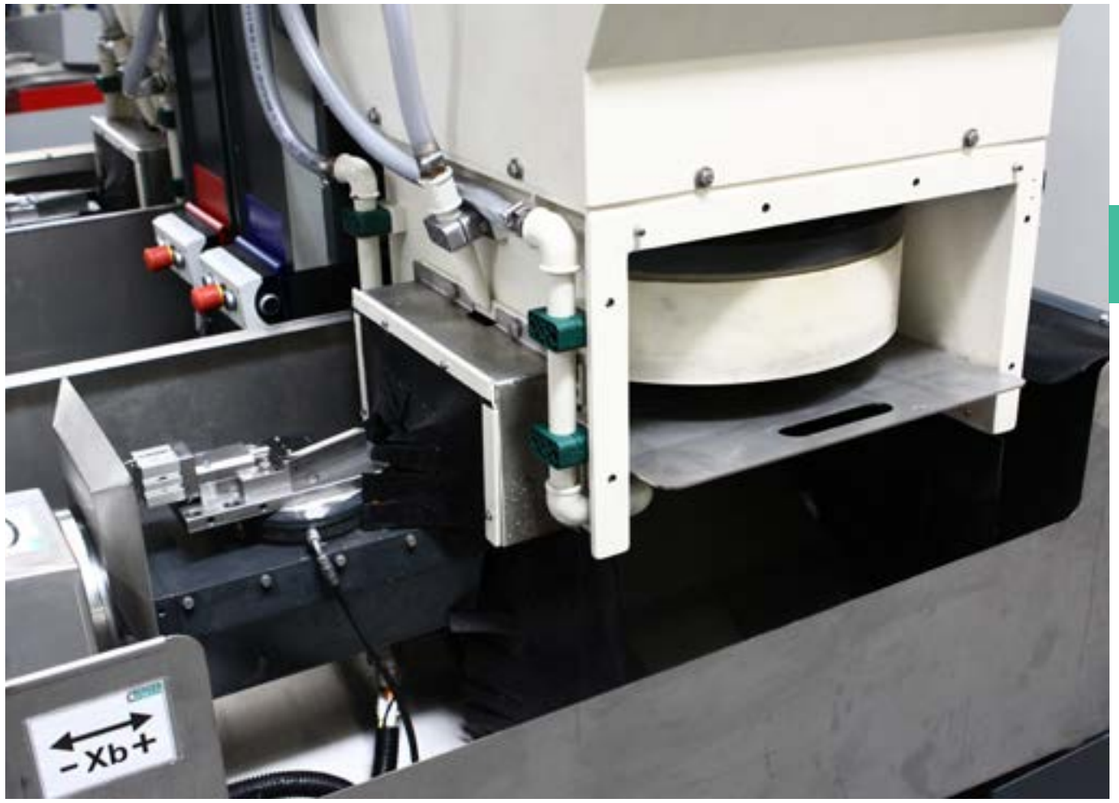
FLAT BEVEL GRINDING MACHINES SERIES DG

Space-saving surface grinding

CNC grinding machine with three or four axes and vertical grinding spindle for the surface grinding of machine knives, hand tools, scissors, and related parts

- grinding length: up to 450 mm
- cup wheel Ø: 500 mm
- spindle drive: 30 kW
- cutting speed: up to 50 m/s

- two to four axes: one tool axis and up to three workpiece axes
- smooth grinding on several sides
- tactile or AE measuring system for grinding wheel wear compensation



- 30% less required space in comparison to the horizontal arrangement of the grinding spindle
- good stability thanks to a solid welded construction of the machine housing
- prevention of vibrations during processing due to a machine housing filled up with mineral cast
- user-friendly, Windows-based controls with interfaces for robotics, PLC, measuring technology and other applications
- “Esprit” CAM interfaces
- wear-free main axis drive with linear motor, achieving rapid traverse speeds of 80 m/min
- precision, backlash-free positioning, using direct measuring system
- compact, precision gearbox with high rigidity to control cutting edge angle
- as a single or a double machine available due to two separate machine housings

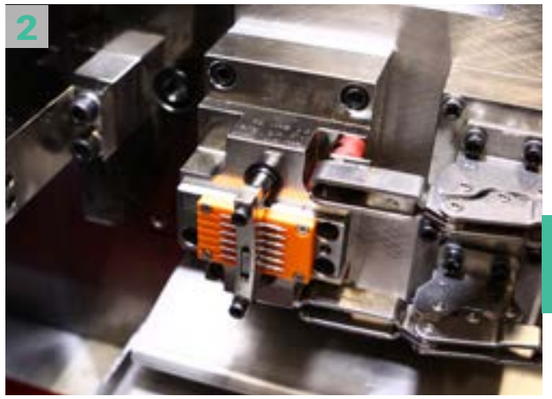
FLAT BEVEL GRINDING MACHINES SERIES BG

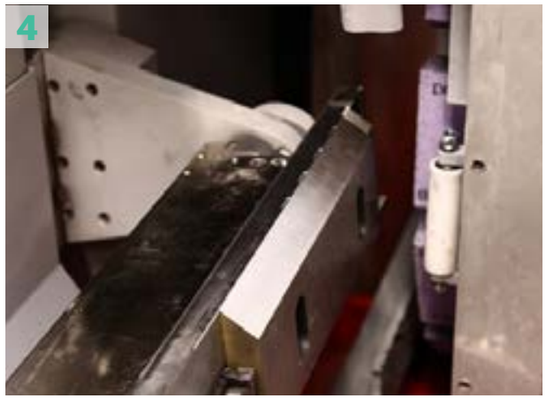
Surface grinding

Depending on the task at hand, different versions with different grinding lengths, grinding wheel diameters or grinding segments and axis geometries are offered.

Here we differentiate between workpiece and tool axes.

The workpieces are held by means of specific clamping devices.



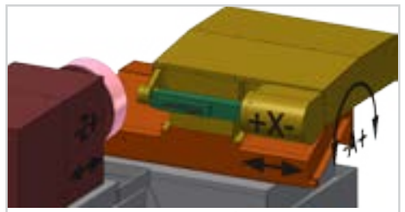


- grinding length: 1 000 mm
- grinding wheel Ø: 80–710 mm
- spindle drive 6.5–45 kW
- cutting speed: up to 50 m/s
- mounting flange for grinding wheel or grinding segments
- spindle with backlash-free preloaded precision bearing, designed for peripheral speed of up to 50 m/s
- workpiece and tool feed with four or five axes and one tool axis (design according to task)
- digital axis drives on preloaded ball screw Y or precision reduction gear

Examples of use (pictures)

1. Workpiece holder in combination with electromagent (picture 1)
2. Grinding of screwdriver blades arranged in magazine (picture 2)
3. Grinding with rotation axis and serrating (picture 3)
4. Grinding of chipper knives with BG/ZA/VSS/NT using segments (picture 4)

BG/NT: Arrangement of the axes



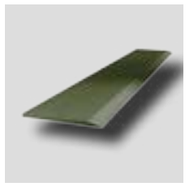
BG/ZA/NT: Arrangement of the axes

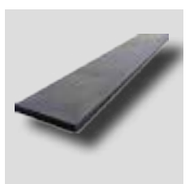
TRAVELLING HEAD SURFACE GRINDING MACHINE SERIES FS

Flat grinding of machine knives

CNC controlled vertical precision flat grinding machine with up to four axes for flat grinding of long knives with a maximum length of 4 000 mm

- grinding length: up to 4 000 mm
- grinding height: 200 mm (or on request)
- cup/segment grinding wheel Ø: 450 mm
- segment head Ø: 450 mm
- grinding motor: 30 kW, 1 000 rpm
- cutting speed: up to 50 m/s
- four-axle CNC control (one tool and three workpiece axes)
- programmable angle adjustment with electronic locking
- tactile measuring system for grinding wheel wear compensation (optional)
- magnetic table with 4 magnets of 1,000 × 250 mm, single magnet with demagnetization unit
- carriage speed 0–60 m/min programmable
- good access to the grinding chamber of the carriage through lateral opening





- four-axle digital CNC control
  - X-axis (carriage) with gear rack in connection with servomotor and gear unit
  - Z-axis (moving of the vertical feed / plunge grinding) on preloaded ball gearing spindle by a brushless AC servomotor, stroke app. 200 mm
  - A'- + A-axis (tool carrier block), swiveling at grinding angle (option)
- coolant supply through hollow shaft in the grinding spindle for internal cooling of the grinding segments
- A-axis/A'-axis: two servomotor gearbox units, each at the end of the shaft for precise angle adjustment or with servomotor
- carriage driven by precision servo gearbox and rack
- double-sided cover with bellows
- 45 mm precision roller linear guide for the carriage
- vertical carriage with ball screw and servomotor
- vertical guide with precision roller linear guidance
- continuous, programmable adjustment
- automatic interval-controlled central grease lubrication with control and fault indication
- designed for wet grinding

Examples of use (pictures)

1. Access to change segments from the front (picture 1)
2. Travelling head surface grinding machine of the series FS (picture 2)
3. Mounting of grinding segments / segment head (picture 3)
4. Travelling head surface grinding machine of the series FS with double version of the A-axis (picture 4)
5. Version with fixed magnet (picture 5)

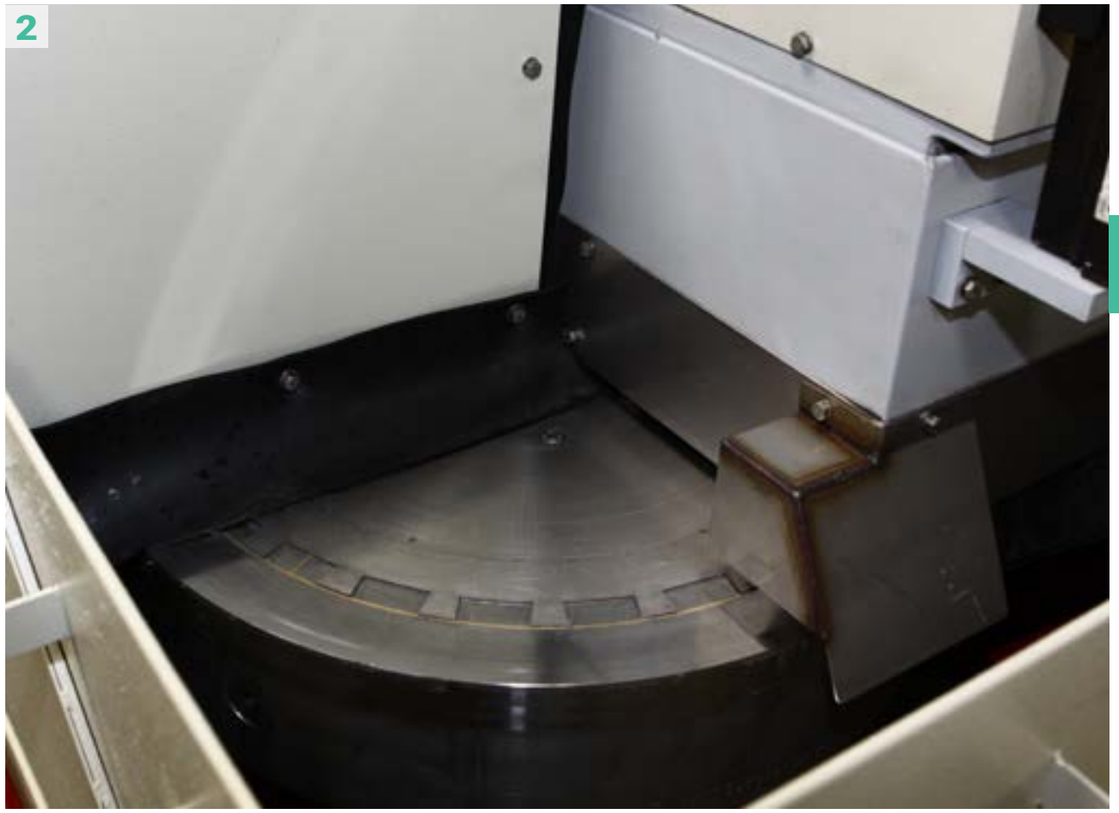
ROTARY TABLE GRINDING MACHINES SERIES RTS

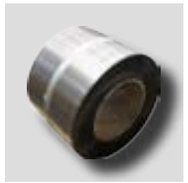
Surface grinding

Grinding machine with vertical adjustable spindle for efficient surface and angle grinding in continuous production of pocket knife components, hand tools and similar parts.

On principle, a distinction is drawn between three different series depending on the grinding wheel diameter, the table diameter and the spindle drive.

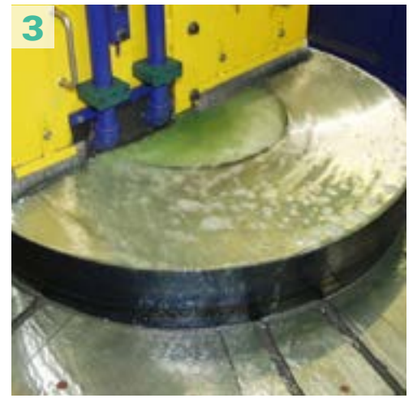
- grinding wheel-Ø: 600 mm
- grinding motor: 37–55 kW
- cutting speed: up to 50 m/s
- two-axle CNC control
- rotary table speed, variable up to 18 rpm
- CNC vertical axes
- mechanical fixture plates or electromagnetic pole plates 600–1 200 mm Ø
- mechanical measuring sensor to gauge the grinding wheel and to adapt to the wear (option: motor adjustment with digital indication)
- adapter flange for grinding wheel Ø 600 mm





Examples of use (pictures)

1. Grinding machine RTS3/2 with device for grinding mower knife edges with automatic loading/unloading and rotary module (picture 1)
2. Rotary table grinding machine of the RTS2 series for surface grinding of machine knives for the textile industry; measuring probe with direct measuring system also for interrupted grinding (picture 2)
3. Rotary table grinding machine RTS3 with six single magnets for surface grinding of coils (picture 3)

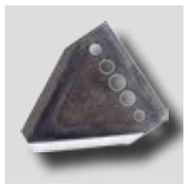


ROTARY TABLE GRINDING MACHINES SERIES RTS3/2

Economic surface grinding of machine knives

Heavy-duty grinding machine with up to two vertically adjustable spindles for economical surface and bevel grinding, e. g. on agricultural knives and large machine knives in continuous operation

- two grinding wheels with 600 mm Ø
- two 55 kW grinding spindles
- cutting speed: up to 50 m/s
- four-axle CNC control
- CNC vertical axis
- 1 000 mm electromagnet with segment pole pitch for continuous surface grinding
- CNC adjustment of the measuring control
- automatic loading/unloading with magazine storage



Examples of use (pictures)

1. + 2. Grinding machine RTS3/2 with device for grinding mower knife blades with automatic loading/unloading and rotary module (picture 1 and 2)

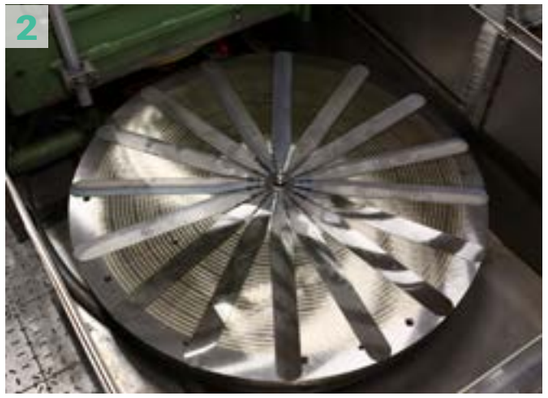
3. Surface grinding of mower blades with rotary table grinding machine RTS3/2 (picture 3)

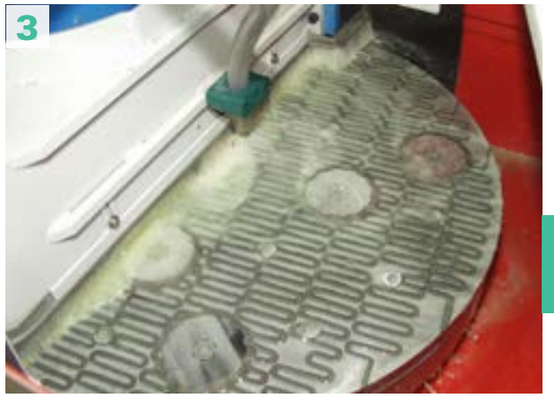
4. Surface grinding on agricultural knives with rotary table grinding machine RTS3 with horizontal rotary axis for loading (picture 4)

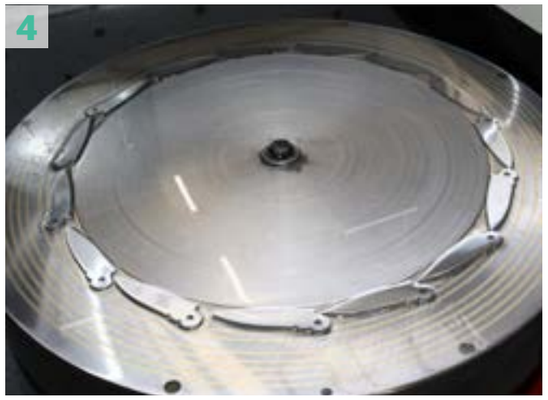
ROTARY TABLE GRINDING MACHINES SERIES DRG

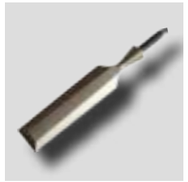
Flat grinding

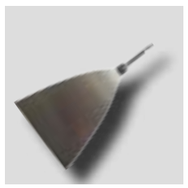
Two-axle CNC double rotary table grinding machine with high productivity for flat or conical surfaces on a variety of workpieces, such as table knives, wood chisels, insides of shears, spatulas, connecting rods or machine knives











- grinding table Ø: up to 450 mm
- spindle drive: up to 45 kW
- cutting speed: up to 50 m/s
- two-axle CNC control
- vertical and horizontal CNC axis
- possibility to set nominal part dimensions on the rotary tables with up to four independent gage controls
- electromagnets with interchangeable pole plates
- mechanical, hydraulic or pneumatic clamping fixtures
- table diameter 500–800 mm
- automatic interval-controlled grease central lubrication with monitoring and fault indication

Example of use (pictures)

1. Rotary table grinding machine of the series DRG (picture 1)
2. Grinding of kitchen spatulas (picture 2)
3. Flat grinding of machine knives (picture 3)
4. Grinding of sports knives (picture 4)
5. Grinding of connecting rods (picture 5)
6. Grinding of the inner sides of shears with additional heel (picture 6)

FLAT BEVEL GRINDING MACHINES SERIES PH/PB

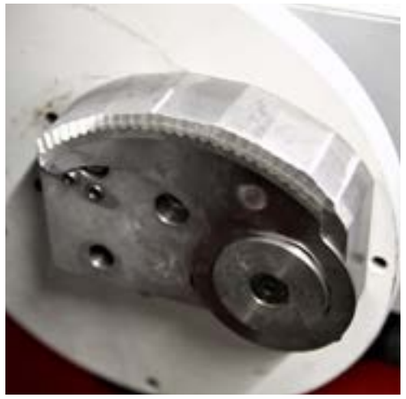
Grinding of multi-edged machine knives

CNC controlled five-axis grinding machine for grinding and serrated grinding of multi-edged machine knives

The grinding machines of the PH/PB series can be designed both as a face grinding machine with a cup wheel and as a peripheral grinding machine with a peripheral grinding wheel.

Equipped with a cup wheel, the PH/PB achieves a smooth grinding and/or serration on machine knives.

- grinding length: up to 450 mm
- cup grinding wheel Ø: 450 mm
- spindle drive: 22 KW
- cutting speed: up to 50 m/s
- five-axle CNC control
- smooth grinding or serrated grinding
- tactile measuring system with compensation of the grinding wheel wear



PERIPHERAL GRINDING MACHINES

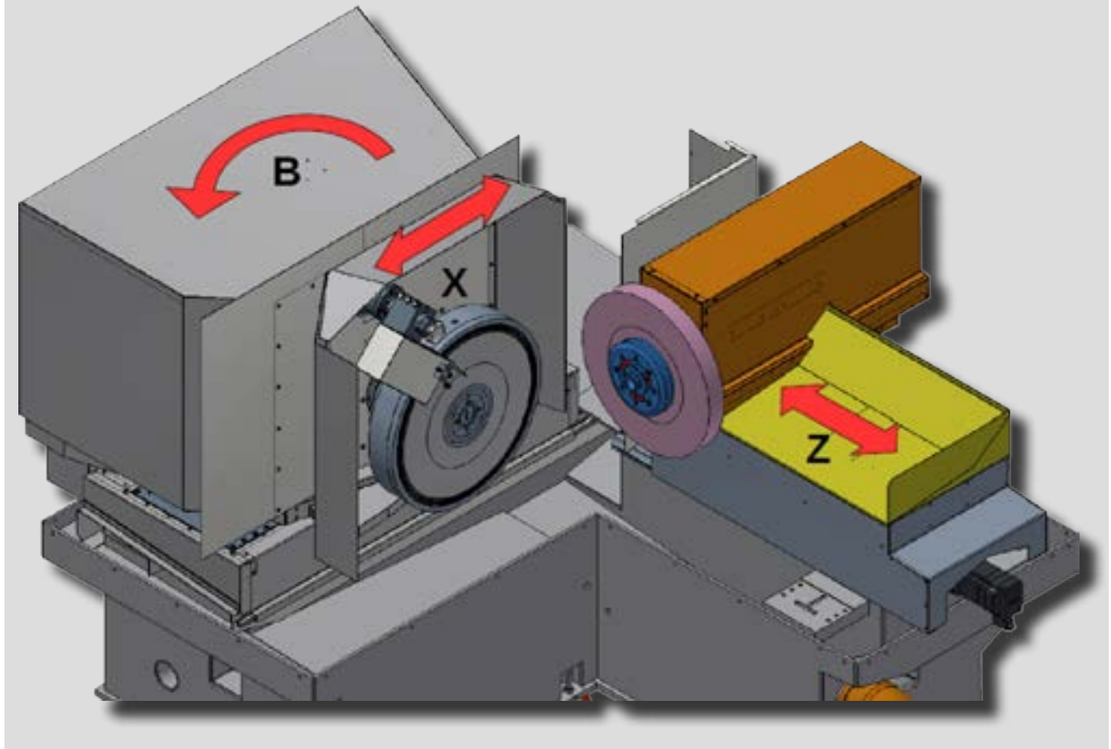
Circumferential, longitudinal and deep grinding processes

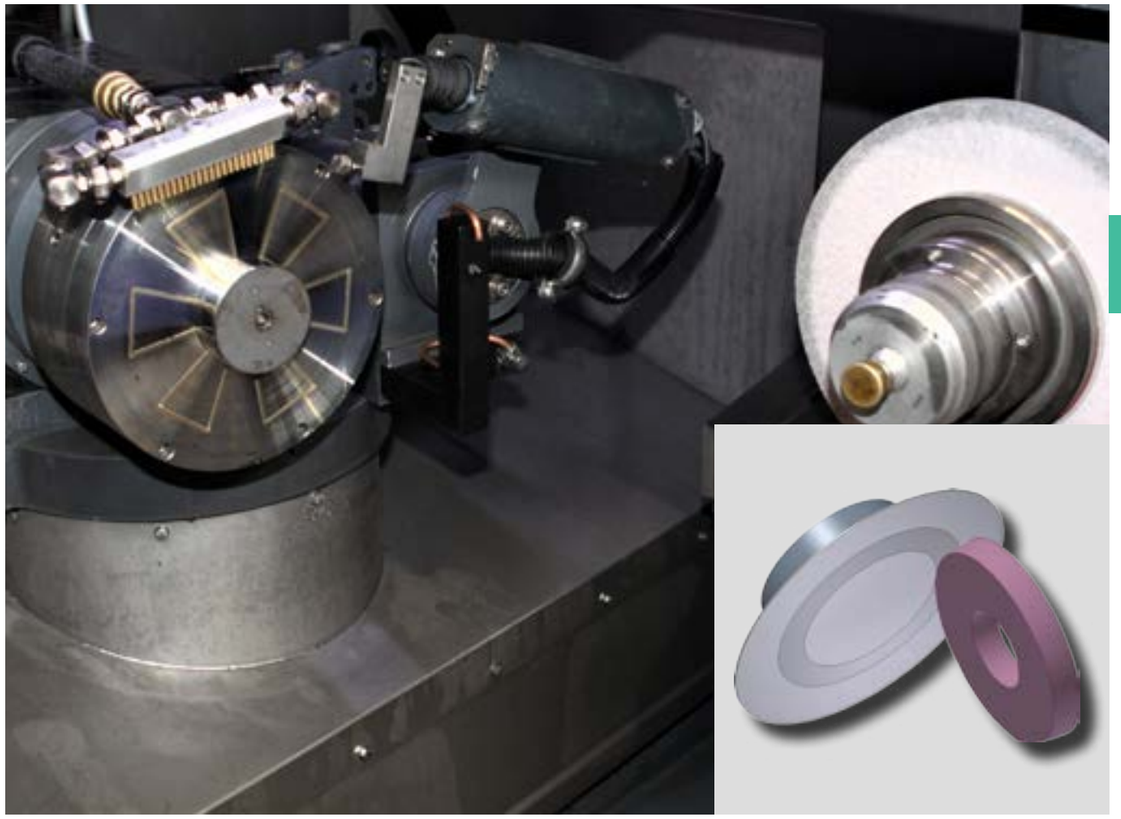
Peripheral grinding machines achieve surface, bevel or serrated grinding on workpieces. The effective area of the longitudinal grinding is the circumference of the grinding wheel.

Depending on the workpiece and the desired material removal rate, the grinding process is either pendulum or creepfeed grinding.

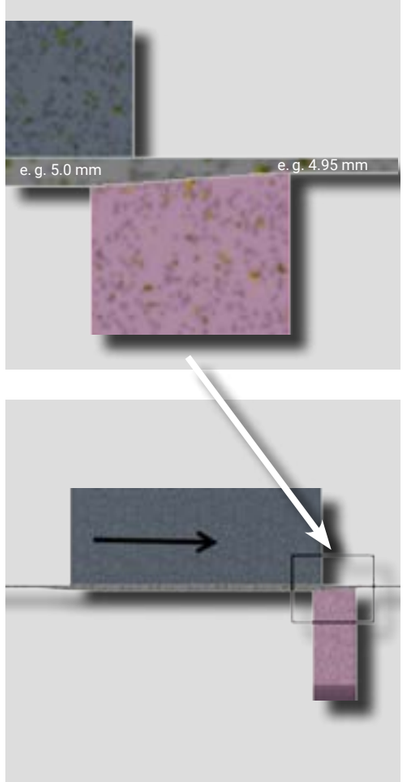
If the workpiece is processed in a deep grinding process, a large amount of material can be removed and a good surface quality can be achieved.

Peripheral grinding wheels are used when a serrated or scalloped grinding and/or a pointed toothing have to be achieved on machine knives.





- bakelite or ceramic-bonded grinding wheel with 200–600 mm Ø
- cutting speed 30–65 m/s
- feed rate 100–2 500 mm/min
- Ø Q'w = 3–12.5 [mm³/(mm s)].
- max. Q'w = 35 [mm³/(mm s)].
- max. cutting weight 16.5 g/s



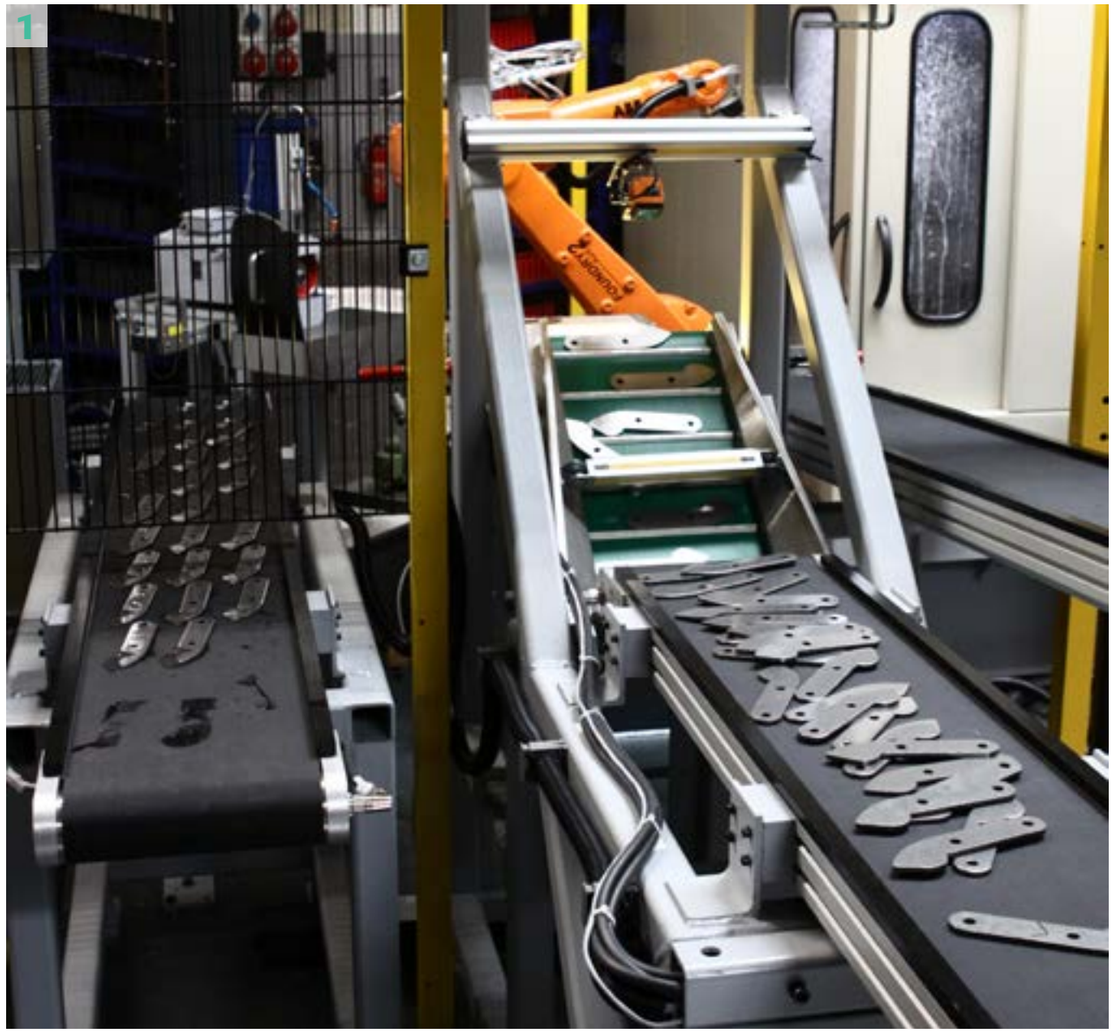
PROFILE AND FLAT BEVEL GRINDING MACHINES SERIES WSL1 AND BG1/RH/NT

Surface and hollow grinding on cutting edges of workpieces

Processing cell for grinding cutting edges of workpieces

- CNC controlled flat bevel grinding machine of the series BG1/RH/NT
- CNC controlled peripheral grinding machine of the series WSL1 with two CNC axes and diamond dressing roll
- automatic, camera-controlled feeding for bulk material (Berger Feeder)
- additional spindle for hollow grinding with radius < 30 mm

1



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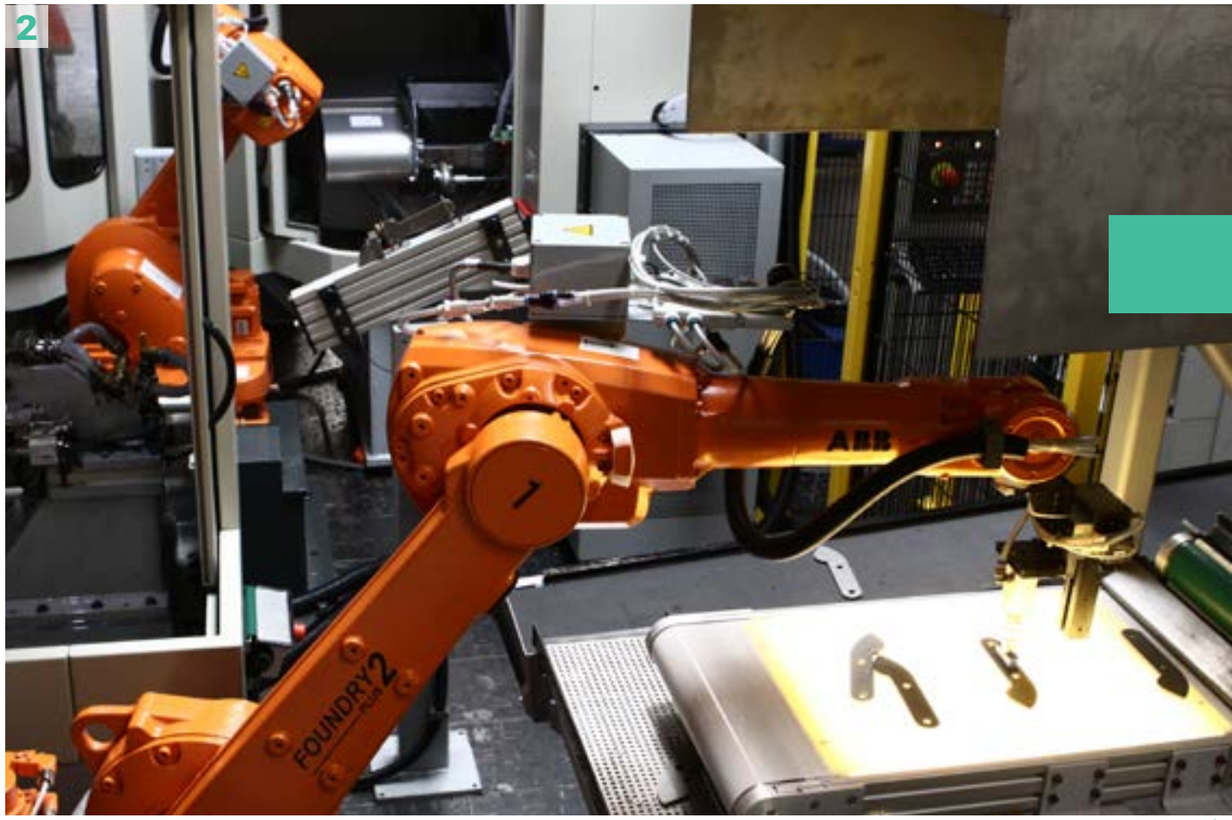


Examples of use (pictures)

1. Processing cell with feeding of bulk material via Berger Feeder (picture 1)
2. Measurement of the workpiece position via camera measuring table (pictures 2)
3. Peripheral grinding machine of the series WSL1 with two CNC axes (picture 3)
4. Measurement of the position of workpieces via camera measuring system (picture 4)

3

4

PERIPHERAL GRINDING MACHINES SERIES PB/PB

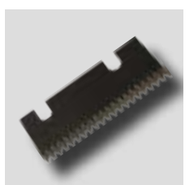
Serrating and deburring of machine knives

CNC controlled peripheral grinding machine with three axes for serrated grinding and deburring of machine blades with a maximum length of 450 mm

- grinding wheel Ø: up to 400 mm
- grinding wheel width: up to 130 mm
- spindle drive: 11–18 kW
- cutting speed: up to 50 m/s
- three- to five-axle CNC control

1

2



- dressing device with driven diamond dressing roll
- robot loading with feeding via stacking magazine
- brushing station for deburring the serration
- X-axis travel (feed axis up to 640 mm)
- dresser of the grinding wheel with diamond-coated dressing roller or diamond fleece
- frequency converter for stepless control of the spindle speed
- automatic interval-controlled central grease lubrication with monitoring and fault indication
- automatic loading/unloading with robot (option)

Example of use (pictures)

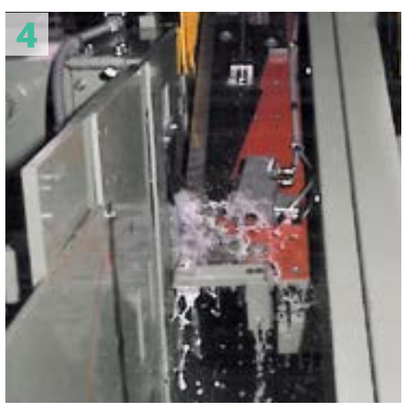
1. Peripheral grinding machine of the series PH/PB3 (picture 1)

2. + 3. Serrated grinding of machine knives with PH/PB3 (pictures 2 and 3)

4. Peripheral grinding machine PH/PB with swivel axis for cross toothing on hand saws (picture 4)

3

4



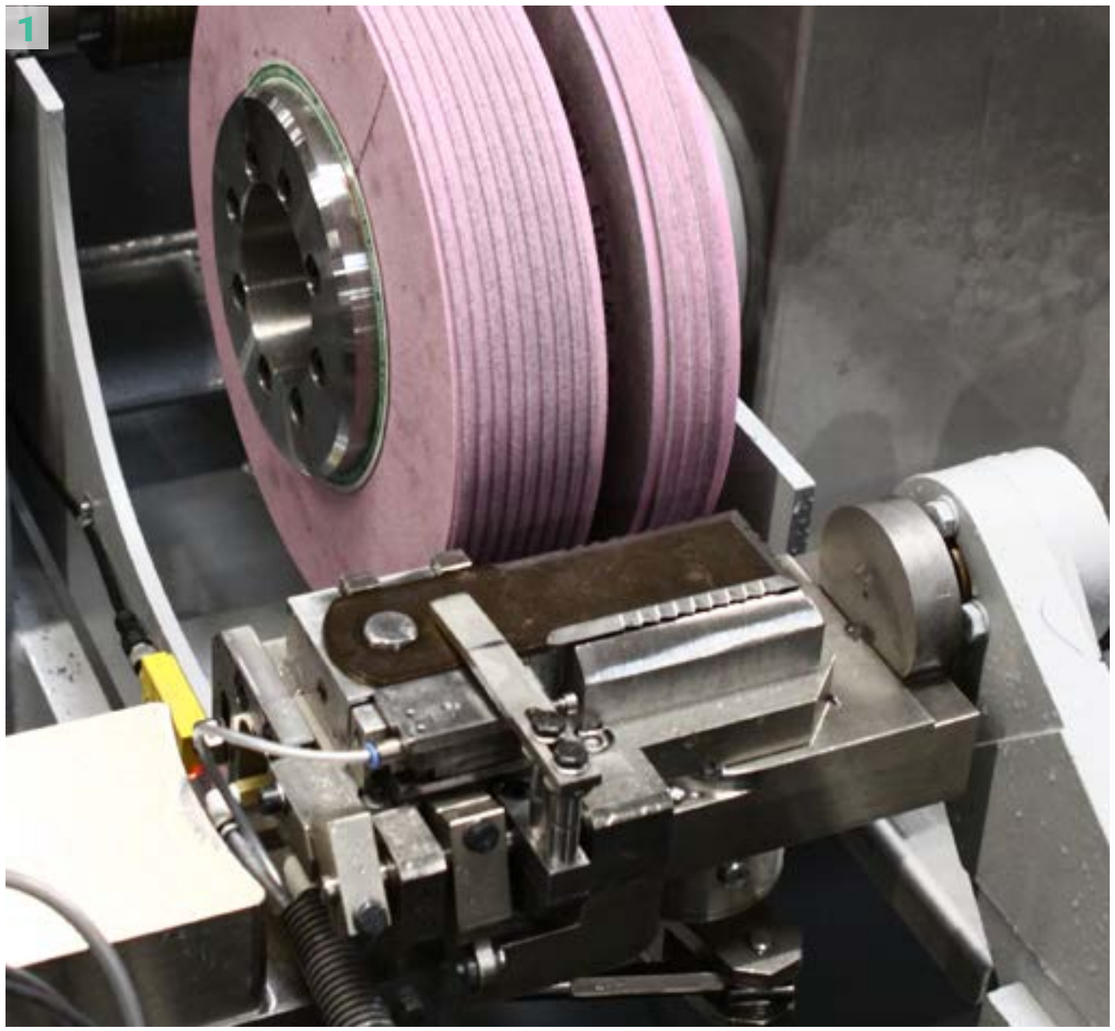
PERIPHERAL GRINDING MACHINES SERIES WS

Serrated grinding, plunge grinding and through-feed grinding

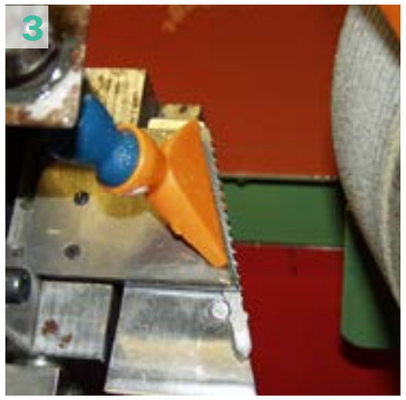
CNC controlled peripheral grinding machine with up to three axes for infeed grinding of serrations on machine knives, blades, shears and similar shaped workpieces

- grinding wheel Ø: 300 mm
- grinding wheel width: up to100 mm
- spindle drive: up to 11 kW
- cutting speed: up to 45 m/s
- three- to five-axle CNC control

1



- CNC control with display for operator guidance/programming of up to three axes
- horizontal movement of the grinding wheel via servo motor and preloaded ball screw
- simple, direct programming via the input of parameters/workpiece data
- interval-controlled dressing of the grinding wheel via diamond-coated profile roller or programmable single-grain diamonds
- automatic compensation of travels after each dressing cycle as well as adaptation to preset peripheral speed via frequency converter integrated in the control system
- programmable positioning at straight grinding wheel
- grinding wheel mounted on cross table for plunge grinding and through-feed grinding (WS6)



Examples of use (pictures)

1. + 2 Serrating of machine knives with WS4 (pictures 1 and 2)

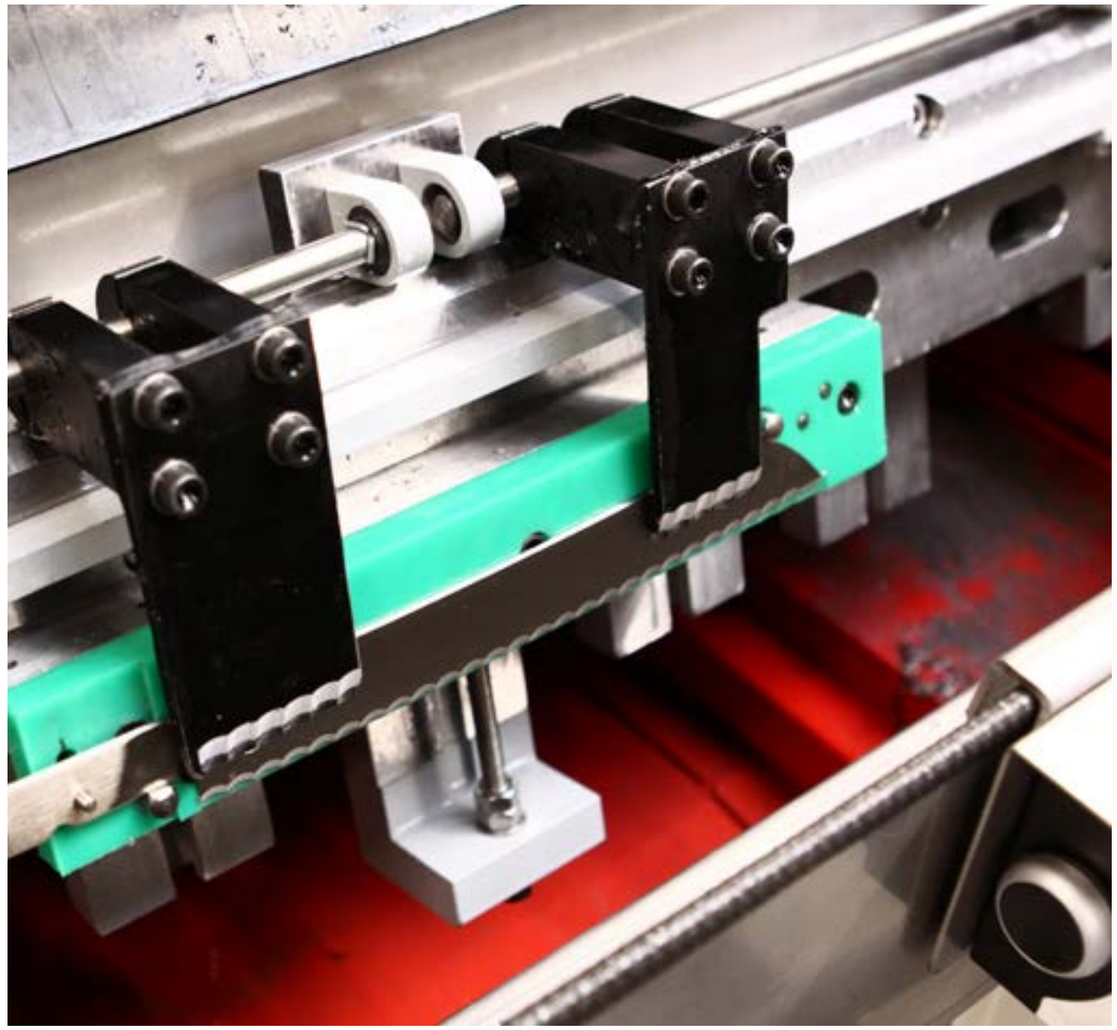
2. Production of saws, cross toothing with additional vertical and swivel axis (picture 3)

PERIPHERAL GRINDING MACHINES SERIES WSM

Serrated and scalloped grinding

CNC peripheral grinding machine with up to three axes for infeed serrated grinding on knives (e.g. bread or steak knives), scissors, machine knives or comparable workpieces

- grinding wheel width: up to 360 mm
- grinding wheel Ø: 300 mm
- spindle drive: 18 kW
- cutting speed: up to 45 m/s
- CNC control with up to three axes



- CNC controlled with display of all operating information on monitor screen
- horizontal wheel motion by AC servo motor driven by preloaded precision ball screw
- simple, direct programming via the input of parameters/workpiece data
- interval-controlled dressing of the grinding wheel via diamond-coated profile roller, dressing roller made of tool steel or programmable single grain diamond
- programmable movement of the workpiece on a straight grinding wheel (e.g. steak knives) using a six-axis robot
- automatic compensation of the travels after each dressing cycle as well as adaptation to the preset circumferential speed via frequency converter integrated in the control
- vertical workpiece movement to the grinding wheel possible

PERIPHERAL GRINDING MACHINES SERIES WSL

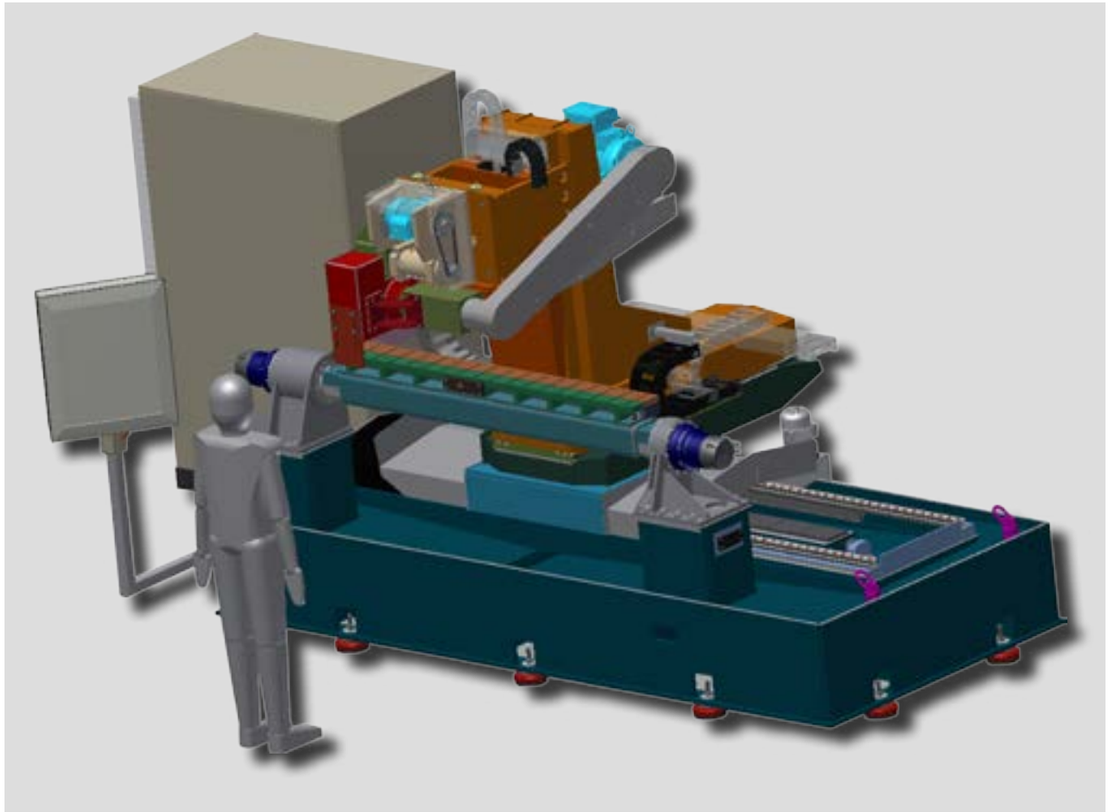
Scalloped and serrated grinding

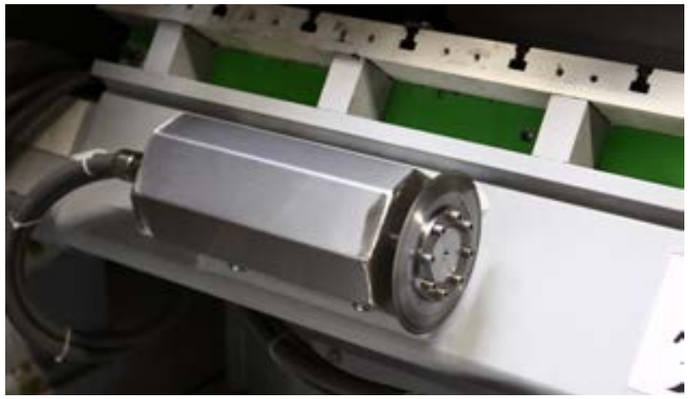
The grinding station of the WSL series is used as a module in different machines to achieve a scalloped and serrated grinding.

By interpolation of the Y and Z axes the grinding machines of the WSL series achieve any desired cutting edge angle.

Depending on the application, the following series are offered for the machining of machine blades:

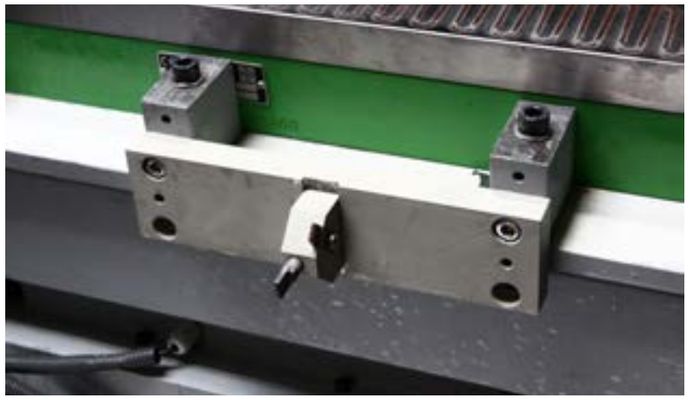
- WSL2 (p. 36 f.)
- WSL3 (p. 38 f.)
- WSL4 (p. 40 f.)
- WSL5 (p. 42 f.)
- BWSL (p. 96 f.)





1

Rotating dresser (PKD grinding wheel) for programmable dressing



2

Fixed single point dresser for programmable dressing

3

Clamping for toothing of circular blades up to 200 mm Ø

4

Swiveling of the grinding station to achieve relief grinding, additional clamping device for larger relief grinding

PERIPHERAL GRINDING MACHINES SERIES WSL2

Scalloped and serrated grinding on hedge trimmer blades

CNC peripheral grinding machine for processing hedge shear blades up to 750 mm

The processing cell is equipped with two two-axis peripheral grinding stations of the WSL2 series as well as a loading and unloading robot.

- grinding length: up to 750 mm
- grinding wheel Ø: 450 mm
- grinding wheel width: 120 mm
- spindle drive: 22 kW
- cutting speed: up to 45 m/s
- two-axle CNC control

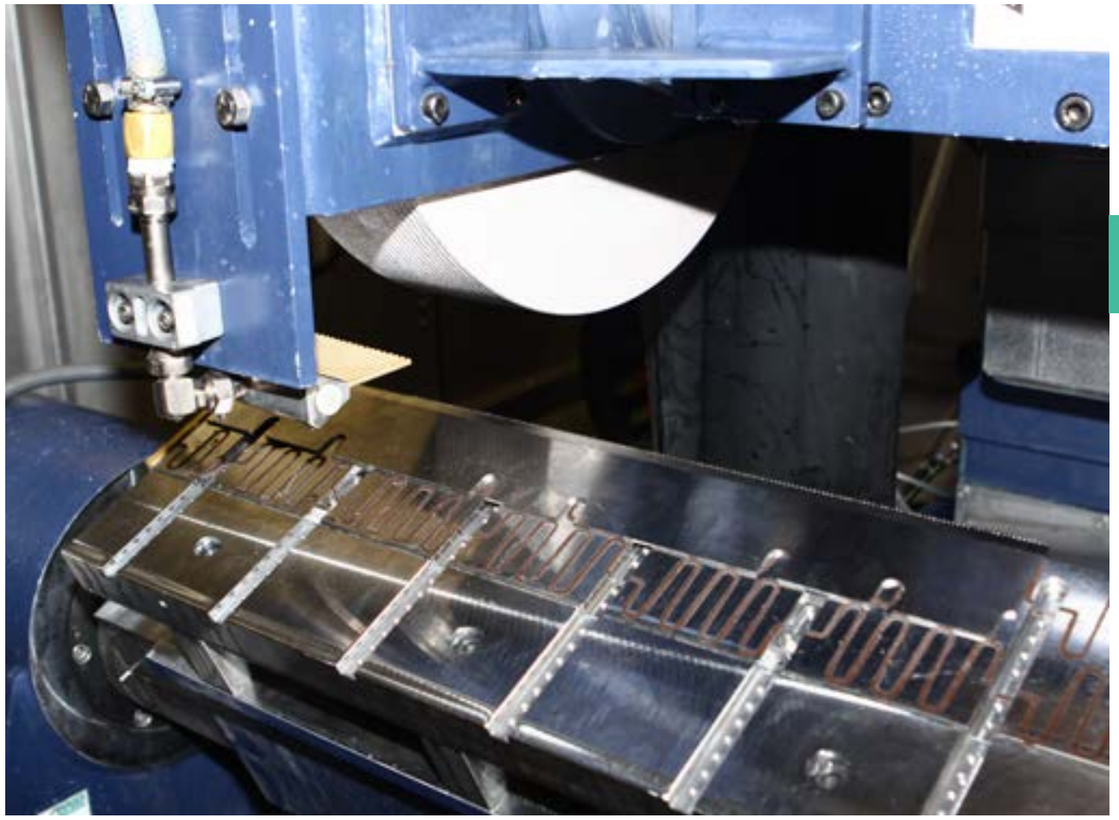
- CNC feed axis for displacing/indexing the hedge trimmer blades with 750 mm stroke
- CNC axis for programmable cutting angle adjustment from 30°–45
- Grinding spindle with precision-bearing shaft and mounting flange for grinding wheels
- dressing/profiling the grinding wheel with diamond-coated profile roller 80 mm Ø; drive 1.5 kW
- dressing intervals programmable with automatic compensation of wheel wear
- grinding station each equipped with a vertical slide for grinding movement and a horizontal slide for moving against workpiece/profile roll
- loading and unloading via robot

PERIPHERAL GRINDING MACHINES SERIES WSL3

Knives with smooth, scalloped or pointed serrated cutting edge

CNC grinding machine with up to seven axes for processing knives with a maximum length of 1 800 mm and for serrating circular knives with a diameter of up to 250 mm (option)

- grinding length: up to 1 800 mm
- grinding wheel Ø: 450 mm: (usable up to 250 mm Ø)
- grinding wheel width: up to 100 mm
- special motor 15 kW with precision-bearing shaft and mounting flange for grinding wheels
- cutting speed: up to 45 m/s
- up to seven axes (four CNC axes for moving the peripheral grinding wheel)
- magnetic clamping table for long knives up to 1 800 mm length
- double-sided CNC angle adjustment of the magnetic clamping table
- direct drive of the grinding wheel
- diamond dresser
- orthogonal creepfeed grinding or plunge-cut grinding
- grinding spindle on CNC rotary table for relief grinding of serrations
- programmable, constant peripheral speed with decreasing pulley diameter 30–45 m/s



Scalloped and serrated grinding

- dressing/profiling of the grinding wheel with diamond-coated profile roller 140 mm Ø, drive 0.75 kW; dressing intervals pre-programmable with automatic compensation of wheel wear
- dressing with single grain diamond
- grinding station each equipped with one vertical slide and one horizontal slide:
  - Y axis = vertical slide for grinding movement
  - Z axis = horizontal slide for moving against workpiece/profile roll
- CNC-axis traversing via AC servo motor with preloaded ball screw spindles
- achieving any desired cutting edge angle by interpolation of Y and Z axis
- automatic interval-controlled central grease lubrication with monitoring and fault indication

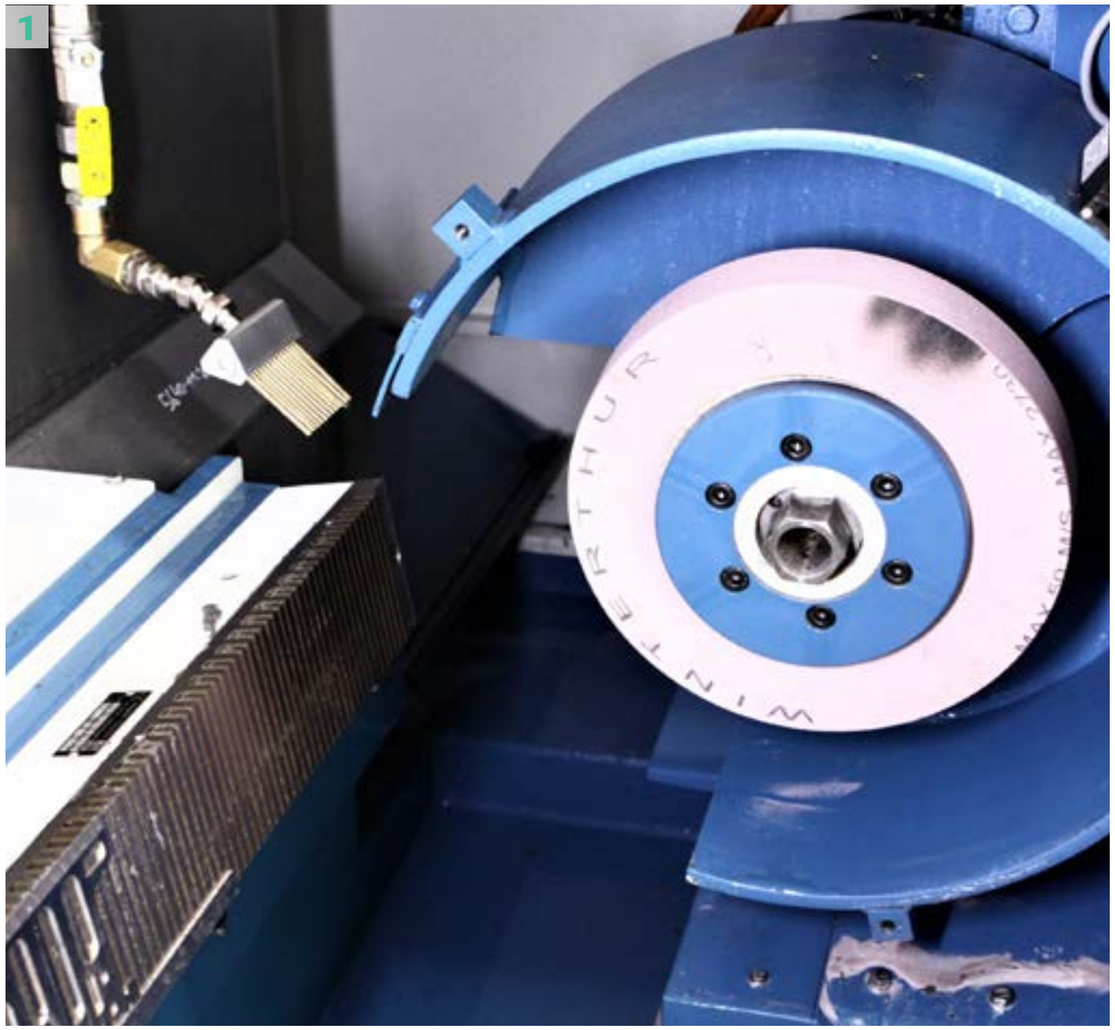
PERIPHERAL GRINDING MACHINES SERIES WSL4

Serrated grinding – straight or with relief grinding

Double-sided CNC grinding machine for serrating machine knives with relief grinding

- grinding length: up to 600 mm
- grinding wheel Ø: 450 mm
- grinding wheel width: 110 mm
- spindle drive: 18.5 kW
- cutting speed: up to 45 m/s
- five CNC axes
- dressing device with diamond dressing wheel for individual tooth profiles (rapid prototyping)
- vertical and horizontal axes with CNC adjustment for relief grinding

1



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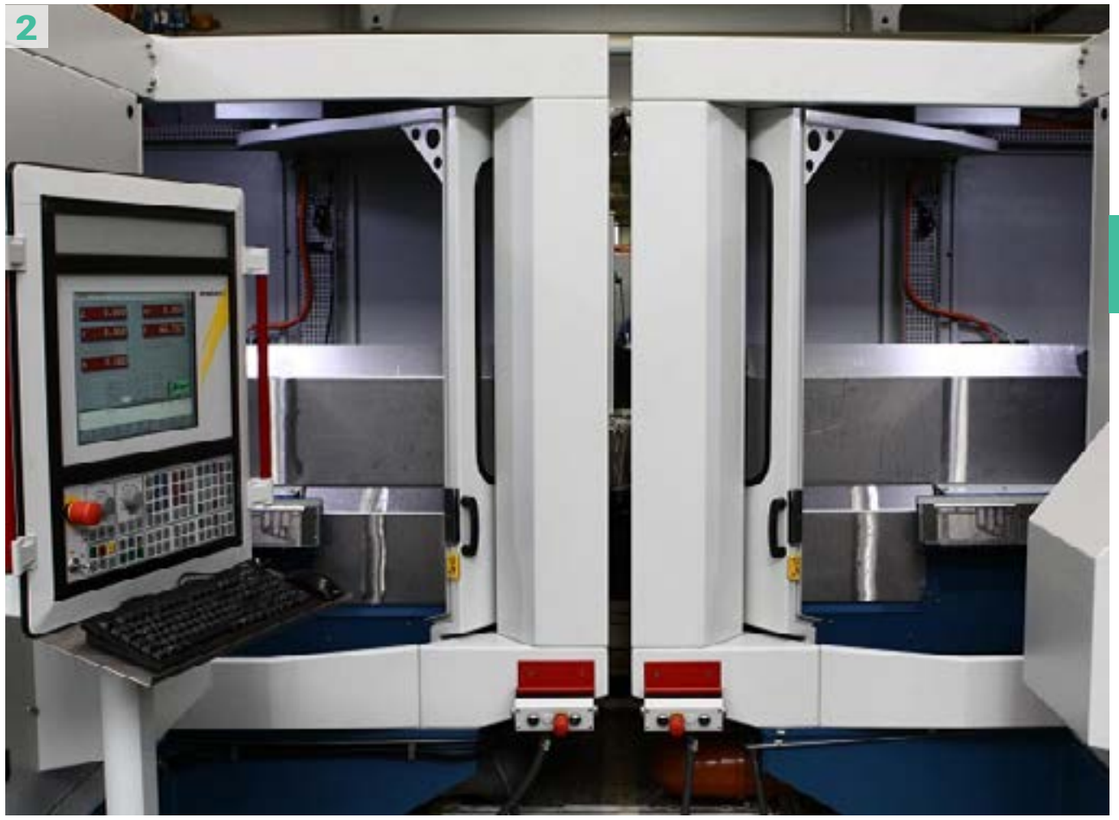
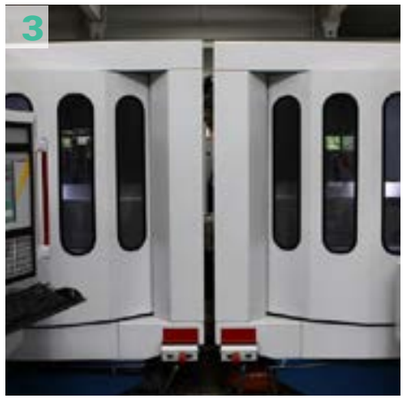


- grinding table with additional X-axis in 30° inclined bed design
- encapsulation of the milling station
- grinding station series WSL
- grinding of knives with straight or serrated cutting edge at programmable angle
- dressing of grinding wheels for frequently used tooth profiles with dressing device for mounting diamond-coated dressing rolls
- optionally with two-axis CNC dresser for user-friendly programming of tooth forms via menu
- this allows fast grinding of almost any tooth profile on long knives, even for small quantities or prototypes (especially pointed or scalloped serration)
- serrating of circular knives possible by additional rotation axis (C axis)
- additional B axis (± 20°) for generating a relief grinding (WSL3)

3



Examples of use (pictures)

1. Peripheral grinding machine of the series WSL4 for serrated grinding of machine knives (picture 1)
2. Serrated grinding of machine knives with relief grinding (pictures 2)
3. Peripheral grinding machine of the series WSL4 with encapsulation

PERIPHERAL GRINDING MACHINES SERIES WSL5

Serrated grinding on saw blades

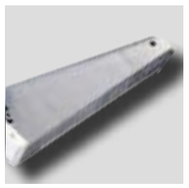
The presented peripheral grinding machine is designed for serrated grinding of saw blades with a maximum length of 650 mm.

Grinding is performed in a package with a thickness of up to 40 mm. Approximately 45 saws (depending on the material thickness) can be ground in one package.

- grinding length 150–650 mm
- grinding wheel-Ø: 500 mm with HSK receptacle (hollow shank taper receptacle)
- grinding wheel width: 130 mm
- spindle drive: 80 kW
- cutting speed: 30–50 m/s
- five-axis CNC control (Siemens)

1

2



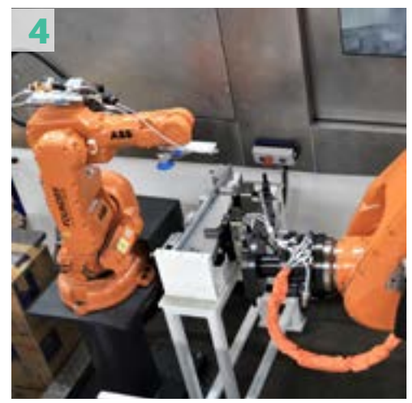
- workpiece length: 150–650 mm
- workpiece thickness: 0.4–1.3 mm
- two grinding stations with one vertical and two horizontal slides, one rotation axis -40°-0° for grinding saw blades in a package
- automatic change of dressing system
- automatic change of grinding wheel
- exchangeable dressing system
- automatic central lubrication system
- coolant supply with programmable adjustment
- loading and unloading of the saw packages

Examples of use (pictures)

1. Insertion of saw package into peripheral grinding machine WSL5 (picture 1)
2. Gripper change from workpiece gripper to grinding wheel gripper (picture 2)
3. Grinding wheel exchange (picture 3)
4. Deposit of the saw package and separation of the saws by means of a spreading magnet integrated in the second robot (picture 4)

3

4



PERIPHERAL GRINDING MACHINES SERIES RVZ

Serrated grinding on circular and cutter knives

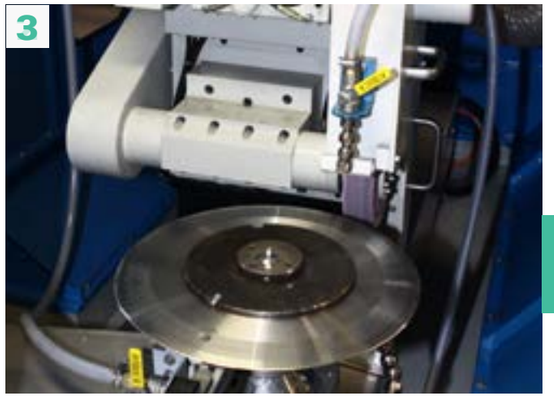
CNC controlled serrated grinding machine for processing circular and cutter knives as well as for grinding panel seats on circular saw bodies

- workpiece Ø: up to 1 000 mm
- grinding wheel Ø: 300 mm
- spindle drive: 7.5 kW
- cutting speed: up to 45 m/s
- four-axle CNC control for programming the machine and the tooth profile

1

2

3



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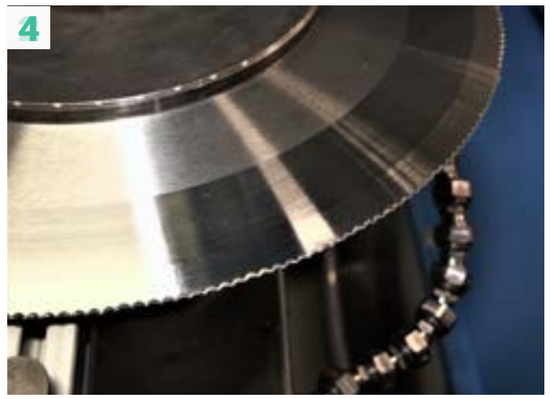
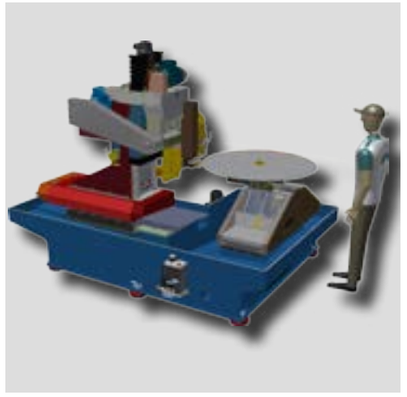


5

- diamond roll and single grain dresser
- following the contour on straight grinding wheel
- automatic diameter measurement
- serrated grinding of cutter knives (option)
- grinding the panel seats on the base bodies of circular saws in deep grinding
- CNC servo motor gear unit
- single point dresser
- diamond roller dresser
- grinding spindle with precision-bearing shaft
- grinding station designed for wet processing



Examples of use (pictures)

1. Serrated grinding of circular knives (picture 1)

2. + 3. Peripheral grinding machine of the RVZ series (pictures 2 + 3)

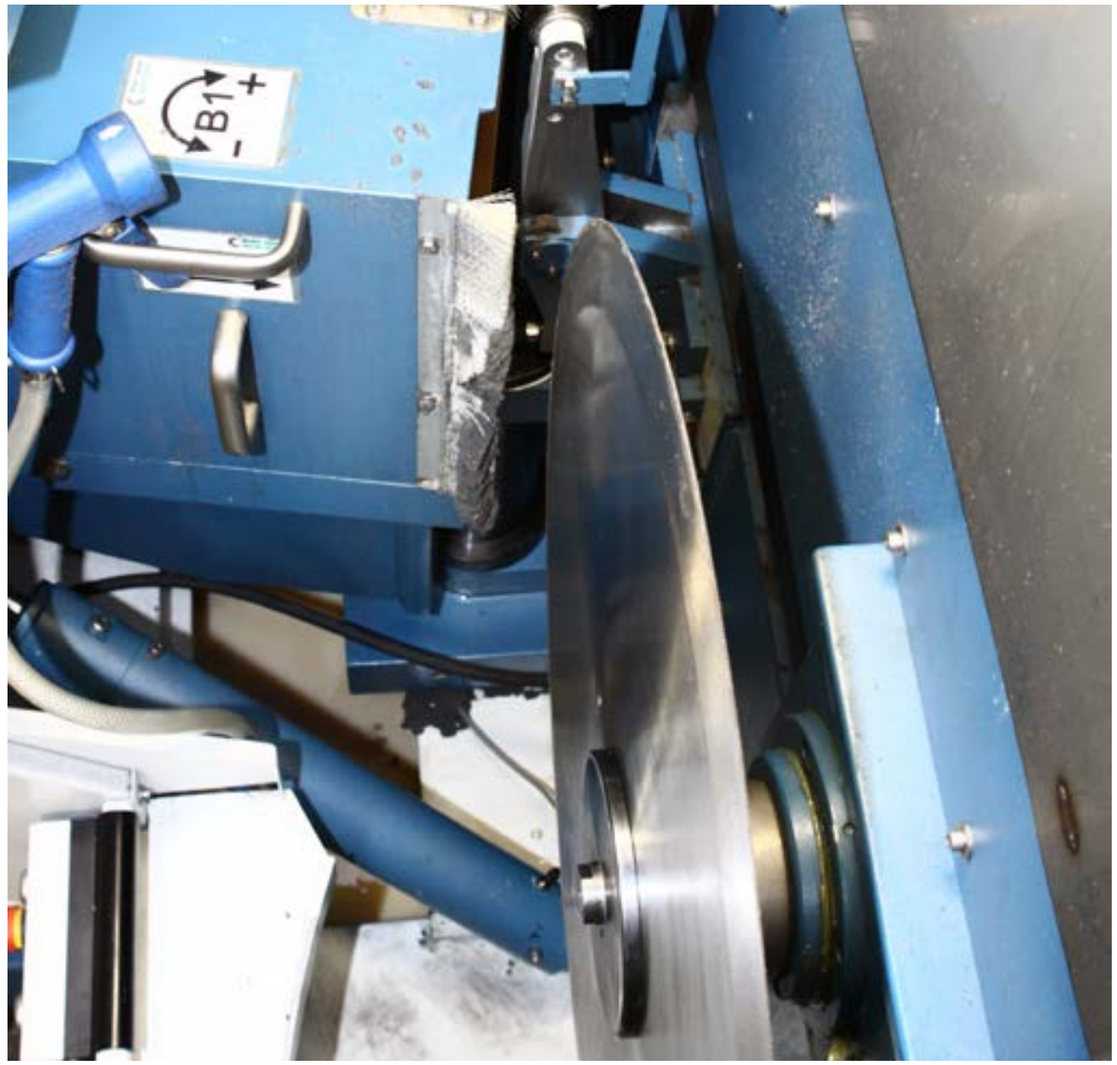
4. + 5. Different geometries (pictures 4 + 5)

ROTARY TABLE GRINDING MACHINES SERIES RMS

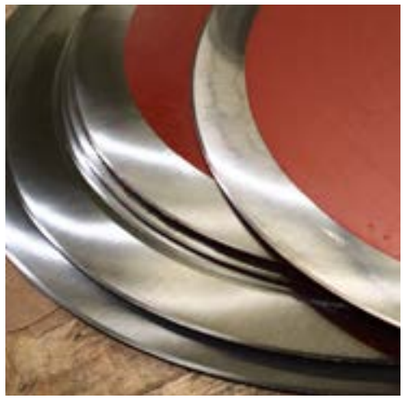
Cutting edge grinding of circular and cutter knives with arc grinding method

CNC grinding machine with three or four axes for grinding cutting edges and chamfers on circular knives using a cup wheel for high chip removal and programmable angle setting for subsequent machining

- workpiece Ø: up to 1 000 mm
- grinding wheel Ø: 400 mm
- spindle drive: up to 11 kW
- cutting speed: up to 45 m/s
- three-axle CNC control



- rotation speed of the workpiece adjustable 100–240 rpm
- headstock with cup grinding wheels with 450 mm Ø
- automatic tactile compensation of the grinding wheel wear
- automatic diameter measurement
- simple, direct programming with input of workpiece data/parameters
- CNC controlled adjustment of the angle range 0°–30° with hydraulic clamping
- clamping of workpieces via permanent magnet, electromagnet, mechanical or pneumatic device



ROTARY TABLE GRINDING MACHINES SERIES RMS/RSP

Cutting edge grinding of circular knives with arc grinding method

Robot with grinding spindle and two-axis CNC grinding machine for cutting edge grinding on circular knives

- headstock with cup grinding wheels with 450 mm Ø
- tactile stone wear compensation
- automatic diameter measurement

1

Mounting of circular knives with additional seventh axis integrated in robot control

2

Production cell with four-sided safety fence

3

Diameter measurement for regrinding

4

Different models of circular knives

ROTARY TABLE GRINDING MACHINES SERIES VR

Cutting edge grinding of circular knives with arc grinding method

CNC grinding machine for grinding cutting edges and bevels on circular knives with a maximum diameter of 400 mm using a cup wheel for high chip removal

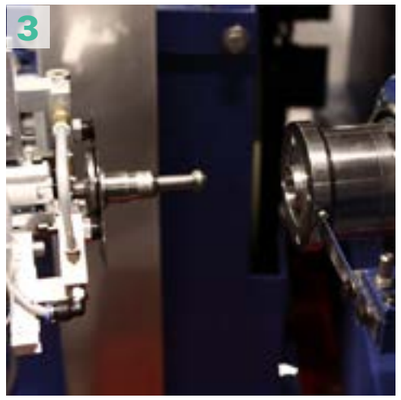
- workpiece Ø: 50–400 mm
- grinding wheel Ø: 300–400 mm
- spindle drive: 15 kW
- cutting speed: up to 50 m/s
- two-axle CNC control
- tactile measuring system for wear compensation of the cup grinding wheel
- polishing station for polishing the cutting edge
- camera measuring system for measuring the outer diameter and residual thickness of the cutting edge
- robot loading and unloading system (option)

- simple, direct programming with input of workpiece data/parameters
- manually adjustable cutting edge angle up to 45°
- automatic compensation of the grinding wheel wear
- clamping of workpieces via permanent magnet, electromagnet, mechanical or pneumatic devices
- rotation speed of the workpiece adjustable
- robot-controlled loading system with stacking magazine
- simultaneous, additional deburring possible with bevel grinding

Examples of use (pictures)

1. Grinding machine VR2/NT (picture 1)
2. Rotary table grinding machine VR0 combined with chamfer polishing machine FPV for bevel grinding and polishing (picture 2)
3. Workpiece pick-up by means of a clamping mandrel (picture 3)

4 Arc grinding of circular knives (picture 4)

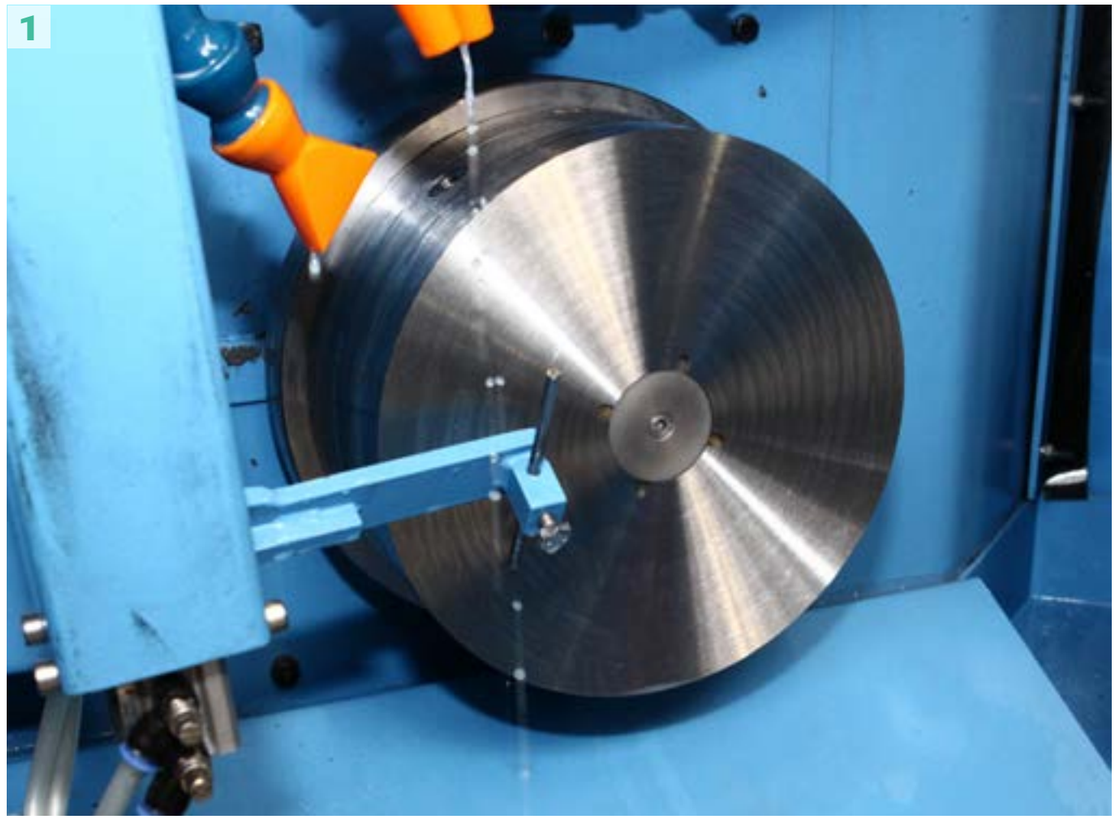


PERIPHERAL GRINDING MACHINES SERIES RFS

Surface and bevel grinding of circular knives

CNC peripheral grinding machine with six axes for grinding surfaces, cutting edges and contours on circular knives, saw blades or blanks with oscillating or plunge grinding process

- workpiece Ø: 50 mm (RFS2) up to 1 100 mm (RFS5)
- grinding wheel Ø: up to 600 mm
- spindle drive: up to 75 kW
- cutting speed: up to 63 m/s
- CNC control with up to three axes
- linear motor in main axis for oscillating the workpiece spindle
- direct probing measuring system for thickness measurement or tactile measuring system for stone wear compensation
- automatic grinding wheel radio control
- CNC diamond roll dresser (optional)
- horizontal movement of the grinding wheel via AC servo motor with preloaded ball screw
- automatic compensation of the travels after each dressing cycle and adaptation to the preset circumferential speed via frequency converter integrated in the control



- simple, direct programming via input of workpiece data/parameters
- processing of subsequent grinding in one clamping in connection with an additional grinding axis
- circular knives taken up in rotating workpiece holder and held by mechanical clamping devices via permanent magnet or electromagnet
- rotating workpiece holders infinitely variable via servo motor or frequency converter
- different dressing systems, permanent or interval controlled
- processing of interrupted grinding in connection with measuring system "Marposs"

Examples of use (pictures)

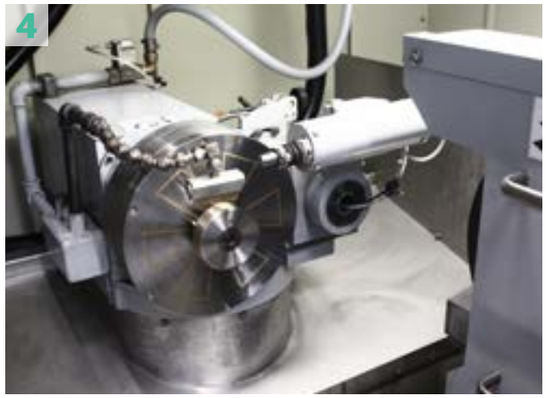
1. Surface grinding of circular knives with RFS (picture 1)
2. Peripheral grinding machine RFS2 with robot loading and unloading (picture 2)
3. Peripheral grinding machine RFS2 with cleaning system (picture 3)
4. Peripheral grinding machine RFS3 with robot loading and unloading (picture 4)
5. Peripheral grinding machine RFS4 with robot loading and unloading (picture 5)

PERIPHERAL GRINDING MACHINES SERIES RFS/RT

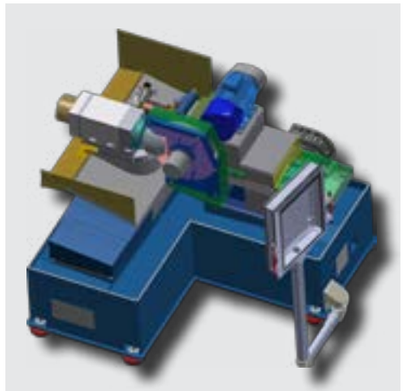
Surface and edge grinding of circular knives

Four-axis CNC grinding machine for surface and edge grinding on circular knives with up to 300 mm diameter with high concentricity and surface grinding accuracy

- workpiece Ø: up to 500 mm
- grinding wheel Ø: up to 500 mm
- spindle drive: up to 22 kW
- cutting speed: up to 63 m/s
- four-axle CNC control



- workpiece spindle driven on rotary table with high-precision torque motor
- linear motor in main axis for oscillating the workpiece spindle with magnetic or mechanical clamping
- direct probing measuring system for thickness measurement of circular knives
- automatic grinding wheel radio control
- high concentricity and surface grinding accuracy
- magnetic clamping, mandrel with clamping plate or tie rod with clamping plate
- needle nozzles with cooling lubricant pressure cooling > 9 bar



Examples of use (pictures)

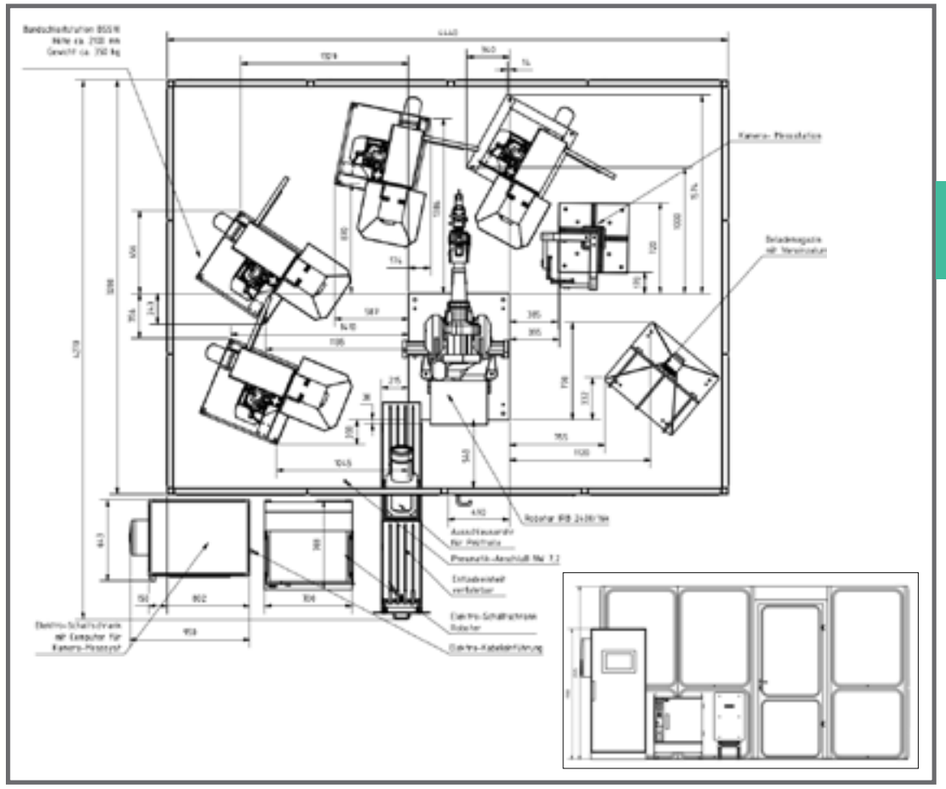
1. Peripheral grinding machine of the series RFS2/RT (picture 1)
2. Pick-up of workpiece (picture 2)
3. + 4. Machine assembly with workpiece/tool (pictures 3 + 4)
5. Drying of circular knives (picture 5)

ROBOTIC GRINDING AND POLISHING SYSTEMS

GRINDING AND POLISHING WITH ROBOT TECHNOLOGY

The Berger Gruppe offers solutions for robot processing of workpieces with different sizes and geometries.

The focus is on partly standardized robot cells with different conceptual approaches.



Depending on the nature of the workpiece, the robot cell is equipped with different processing stations. Either the workpiece or the tool can be guided by the robot.

If the tool is robot-guided, the workpiece can be aligned via CNC axes so that all-round machining is possible without additional changeover time.

- robot grinding and polishing stations either integrated into existing production lines or designed as separate cells
- standard interfaces to all established robot manufacturers such as ABB, KUKA, Stäubli and Fanuc
- programming in touch-in mode or with a CAD/CAM interface
- integration of measurement systems for compensation of workpiece tolerances in position and dimensions
- various machining stations with different tools (e.g. grinding belts, grinding stones, polishing wheels) available

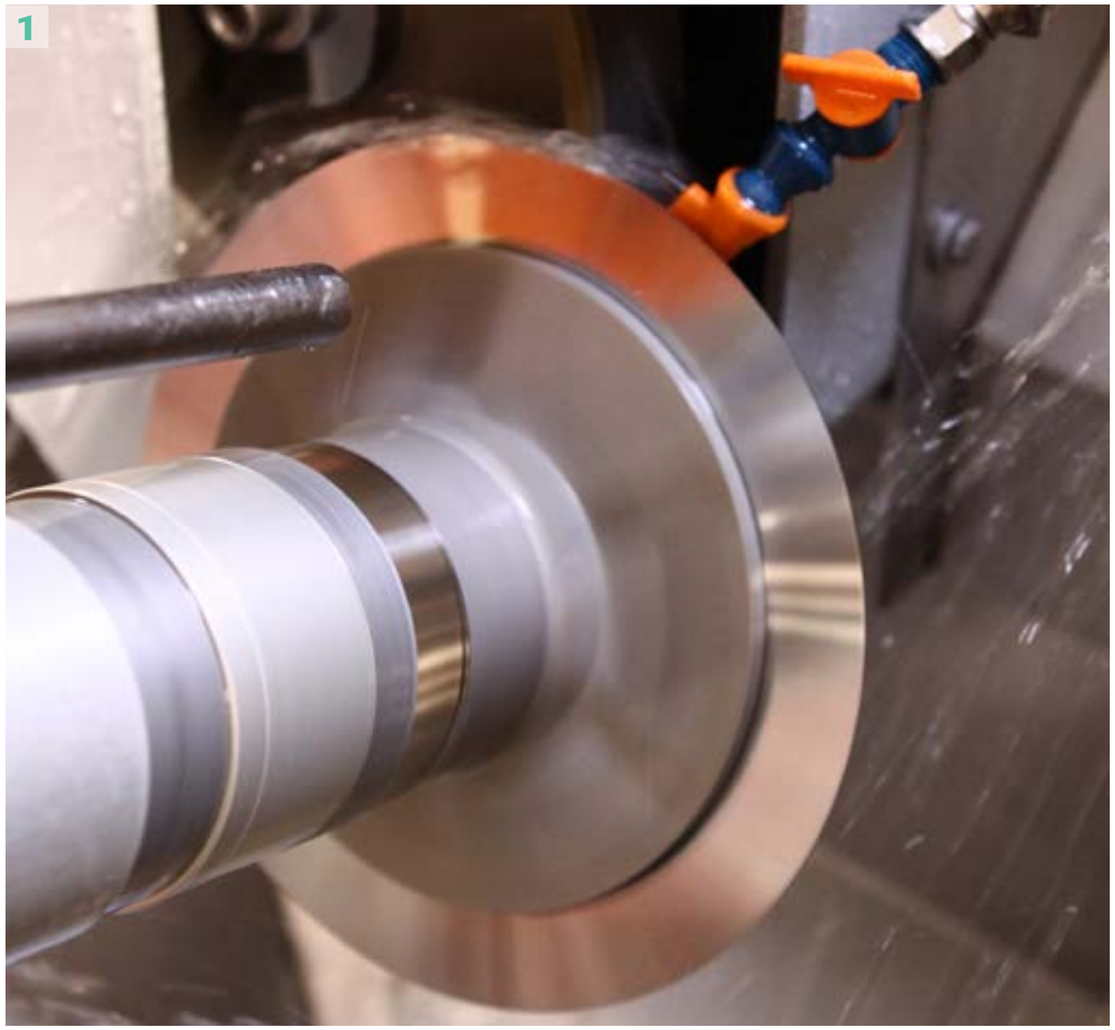
ROBOTIC GRINDING AND POLISHING SYSTEMS

Resharpening/sharpening of circular or crush cut knives

The modular RSP/2S robot grinding station shown here is designed for processing circular knives with a diameter of 70 to 200 mm.

The outer diameter is measured with a laser measuring station.

1



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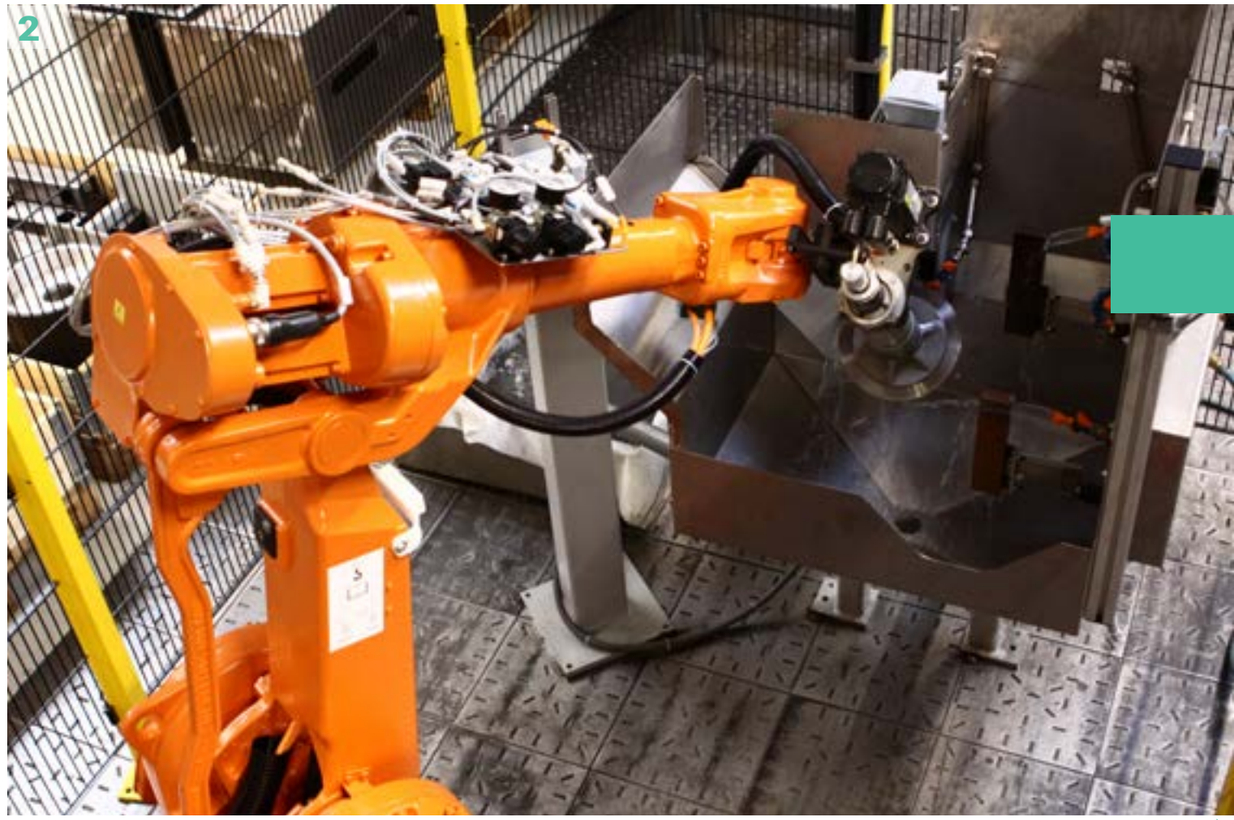

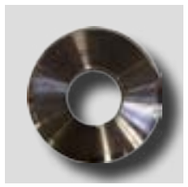

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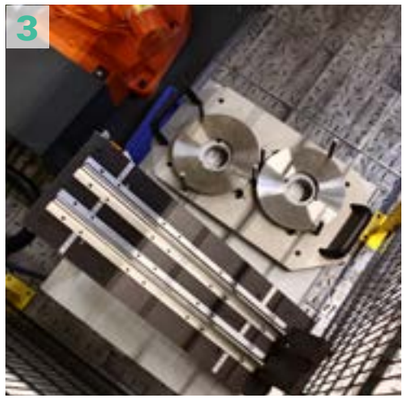


4

- single-sided machining station of the series P3/T with diamond grinding wheel (see also machining stations p. 69 f.)
- stacking via stacking magazine with subsequent deposit on mandrel
- workpiece spindle for holding the circular knife for continuous turning after measuring the outside diameter

Examples of use (pictures)

1. Processing station P3/T (picture 1)
2. Robotic cell RSP/2S for processing circular knives (picture 2)
3. Stacking via stacking magazine (picture 3)
4. Workpiece spindle with workpiece (picture 4)

ROBOTIC GRINDING AND POLISHING SYSTEMS

Serrating of circular knives

The robot grinding station shown here is designed for serrated grinding and brushing of circular blades.

A peripheral grinding machine of the WS4 series and a brushing station of the SM2 series are integrated in the robot cell.

A robot picks up the workpiece from a stacking magazine, feeds it to a machining/measuring station and places it finally in another stacking magazine.

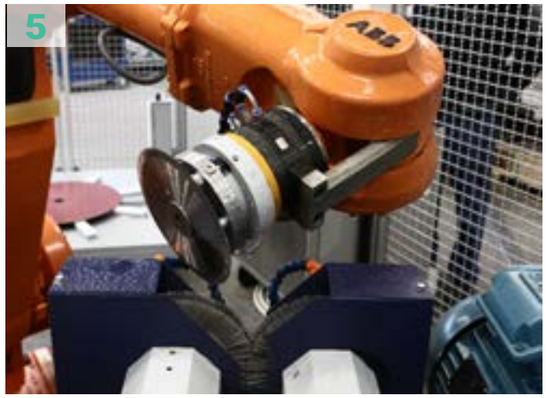
1

2

3

4

5



- processing robot with vacuum robot gripper for picking up circular blades up to 35 kg/ piece
- peripheral grinding machine WS4
- max. grinding width 100 mm
- grinding wheel Ø 300 mm
- measuring station with probe to detect the outer diameter
- two vertical stacking magazines for holding circular knives up to 1 000 mm Ø
- magazine for holding circular knives of 300 mm Ø with a stacking height of 500 mm.
- processing machine of the SM2 series with spiral brushes

Examples of use (pictures)

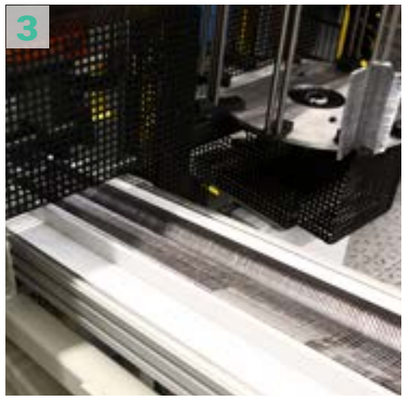
1. Serrated grinding of circular knives with peripheral grinding machine WS4 (picture 1)
2. Robot feeding of a circular knife (picture 2)
3. Stacking magazine for circular knives with cylinder for lifting the workpiece (picture 3)
4. Measuring station to measure the outer diameter (picture 4)
5. Processing station SM2 with two spiral brushes (picture 5)

ROBOTIC GRINDING AND POLISHING SYSTEMS

Sharpening of machine knives

The modular RSP/2B robot grinding station shown here is designed for sharpening machine knives.

The robot cell consists of two belt grinding stations and a processing robot. The workpieces are provided by a conveyor belt.



- conveyor belt of 2 000 mm length for a correct positioning of the workpieces
- separating and centering station
- vertical bar magazine
- processing and loading/unloading robot
- parallel gripper for workpiece fixture including 180° rotation module
- two one-sided belt grinding stations of the BSS10 series

Examples of use (pictures)

1. Robot processing cell for sharpening machine knives (picture 1)
2. Belt grinding station of the series BSS10 (picture 2)
3. Conveyor belt for workpiece positioning (picture 3)
4. Robot gripper with 180° rotation module (picture 4)

ROBOTIC GRINDING AND POLISHING SYSTEMS

Sharpening and polishing of machine knife blades

The robot cell shown here is designed for sharpening and polishing machine knife blades and similarly shaped workpieces.

The cell is equipped with three processing stations of the P3 series as well as a stacking magazine used for loading and separating the workpieces. The workpieces are placed on a rotary transfer magazine after processing.

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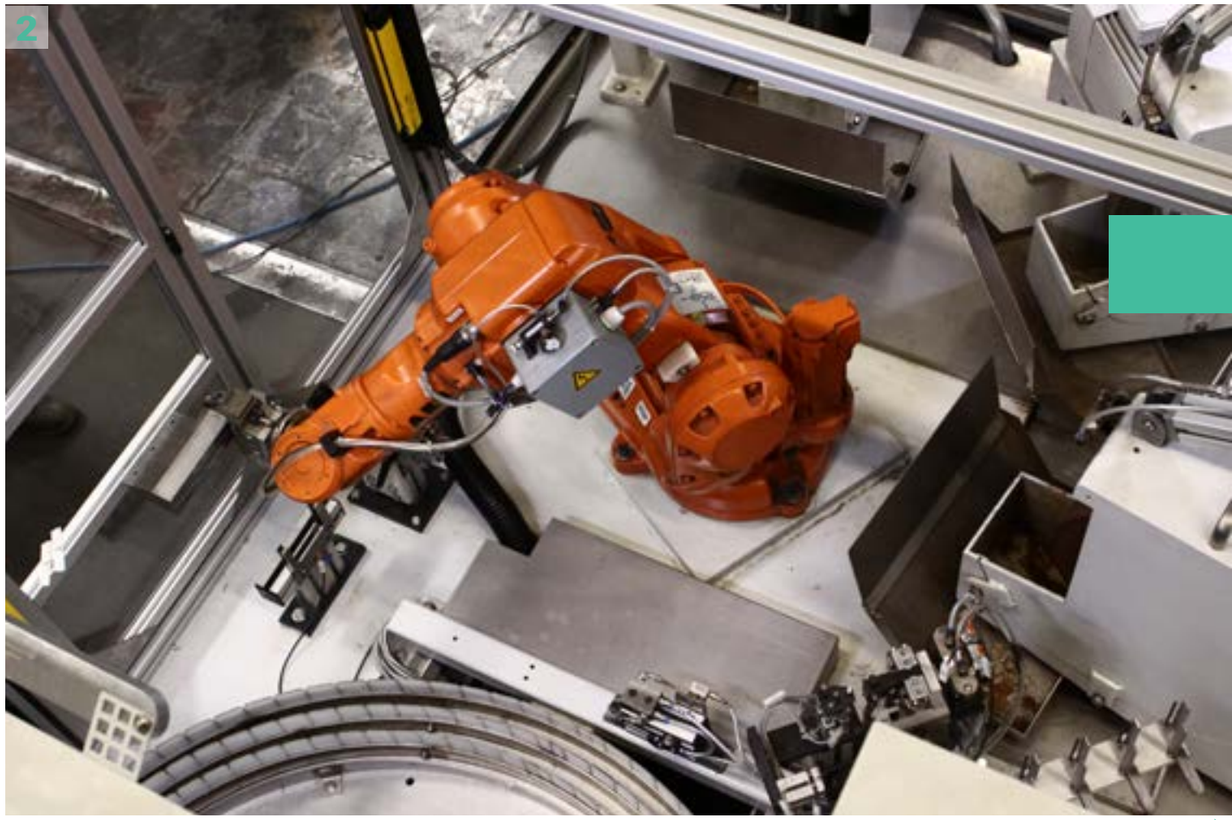

- indexing rotary table magazine with Ø of 1 200 mm for 80 workpieces
- vertical stacking magazine for loading and separation of the workpieces
- robot with stirrup bearing for measuring of new blades or position check in the gripper
- three single-sided machining stations of the P3 series
- coolant system

Examples of use (pictures)

1. RSP/3P/1M robot processing cell for processing machine knives (picture 1)
2. Integration of three processing stations of the P3 series for sharpening and polishing the blades (picture 2)
3. Simulation via RobotStudio (picture 3)

3

ACCESSORIES

FOR ROBOT CELLS AND GRINDING MACHINES

PROCESSING STATIONS FOR ROBOT CELLS

Various processing stations such as polishing and grinding stations or CNC controlled sharpening machines can be integrated into a robot cell and combined with each other.

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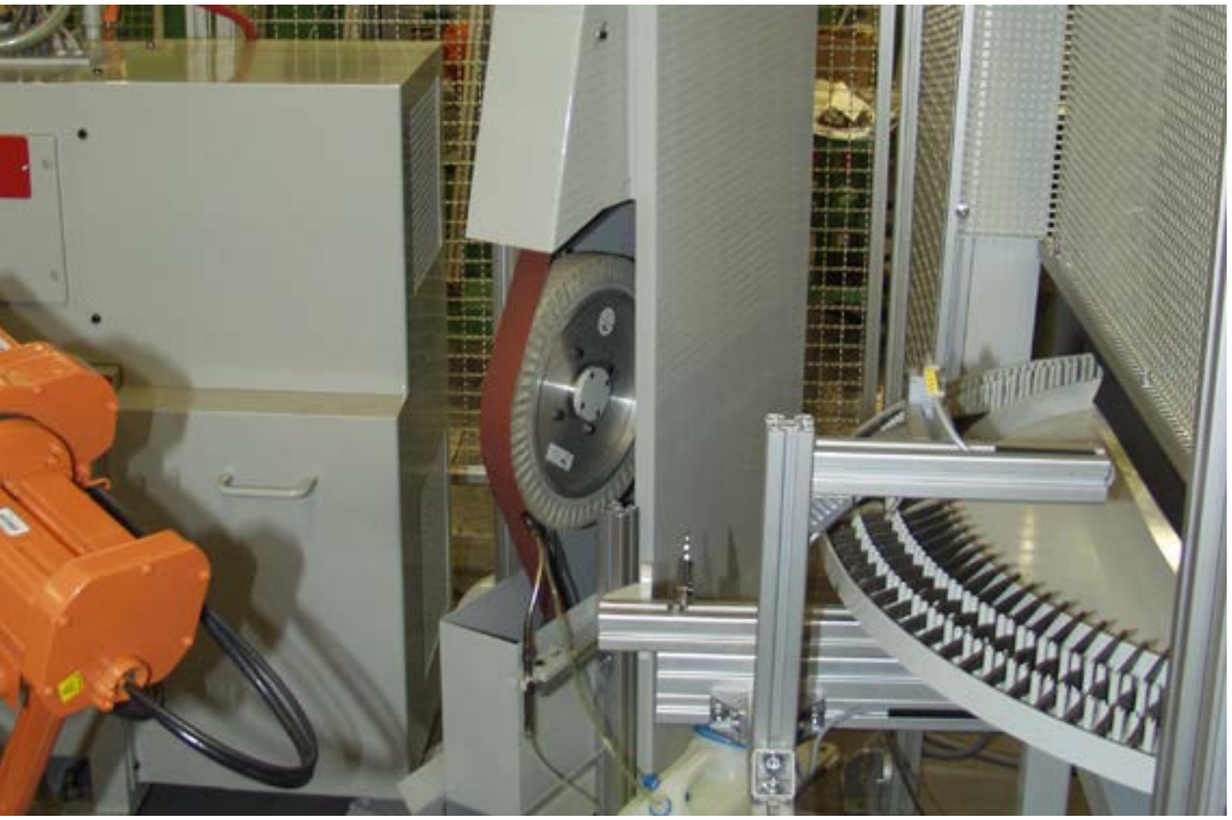
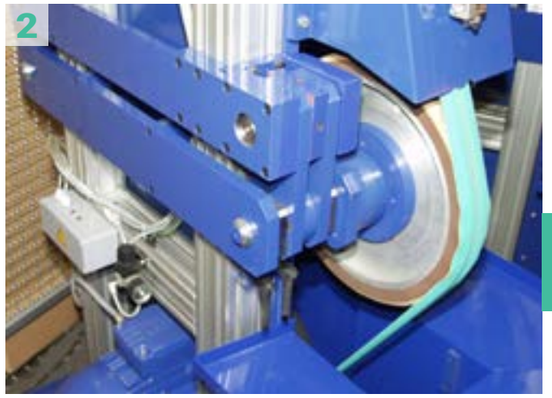




Belt grinding stations BSS

Belt grinding stations of the series BSS are designed for use in robot cells.

- pneumatic belt tensioner
- belt breakage control
- preparation for customer provided suction
- preparation for connection 400 Volt/50 Hz, single control cabinet or central control point
- minimum quantity cooling (optional)
- robot control with 16 belt speeds programmable (optional)

Examples of use (pictures)

1. One-sided belt grinding station BSS12 with revolver head (picture 1)
2. One-sided belt grinding station BSS14 with pressure control (picture 2)
3. One-sided belt grinding station BSS20 with horizontal abrasive belt (picture 3)
4. One-sided belt grinding station BSS22 with oscillating movement (picture 4)

Model	BSS10	BSS12	BSS14	BSS20	BSS22
Main control (kW)	4.0	4.0	4.0	4.0	4.0
Contact roll Ø (mm)	80–400	100–200	150–400	50–150	50–150
Contact roll width (mm)	10–130	10–130	10–130	10–130	10–130
Weight (kg)	150	180	350	200	200
Dimensions - length (mm) - width (mm) - high (mm)	 850 650 2 100	 900 800 2 100	 1 200 600 2 100	 1 500 600 1.500	 1 500 600 1 500

ACCESSORIES

Grinding and polishing stations

The Berger Gruppe offers grinding and polishing stations of various types. Polishing, grinding and belt grinding stations can be combined in a robot cell.

Picture below: Polishing wheel change system integrated in a robot grinding and polishing system for hollow goods

Polishing stations P1 (picture 1)

- polishing wheel Ø: 500 mm
- polishing width: 100 mm
- drive: 5.5 kW, 750 rpm
- optional with frequency converter

Grinding and polishing stations P3 (picture 2)

- grinding and polishing wheel Ø: 300 mm
- wheel width: 100 mm
- drive: 3 kW, 2 800 rpm
- spindle speed frequency controlled

Polishing stations P5 (picture 3)

- polishing wheel Ø: 500 mm
- polishing width: up to 300 mm
- drive: 7.5 kW, 2 000 rpm
- spindle speed frequency controlled

Polishing stations P3/T (picture 5)

- mounting cup wheel, Ø 200 mm
- drive 1.5 kW; 1 400 rpm
- spindle speed frequency controlled

Grinding stations SS1 (picture 4)

- grinding with headstock
- grinding wheel Ø: 450 mm (cup wheel)
- spindle drive: as required 15–22 kW

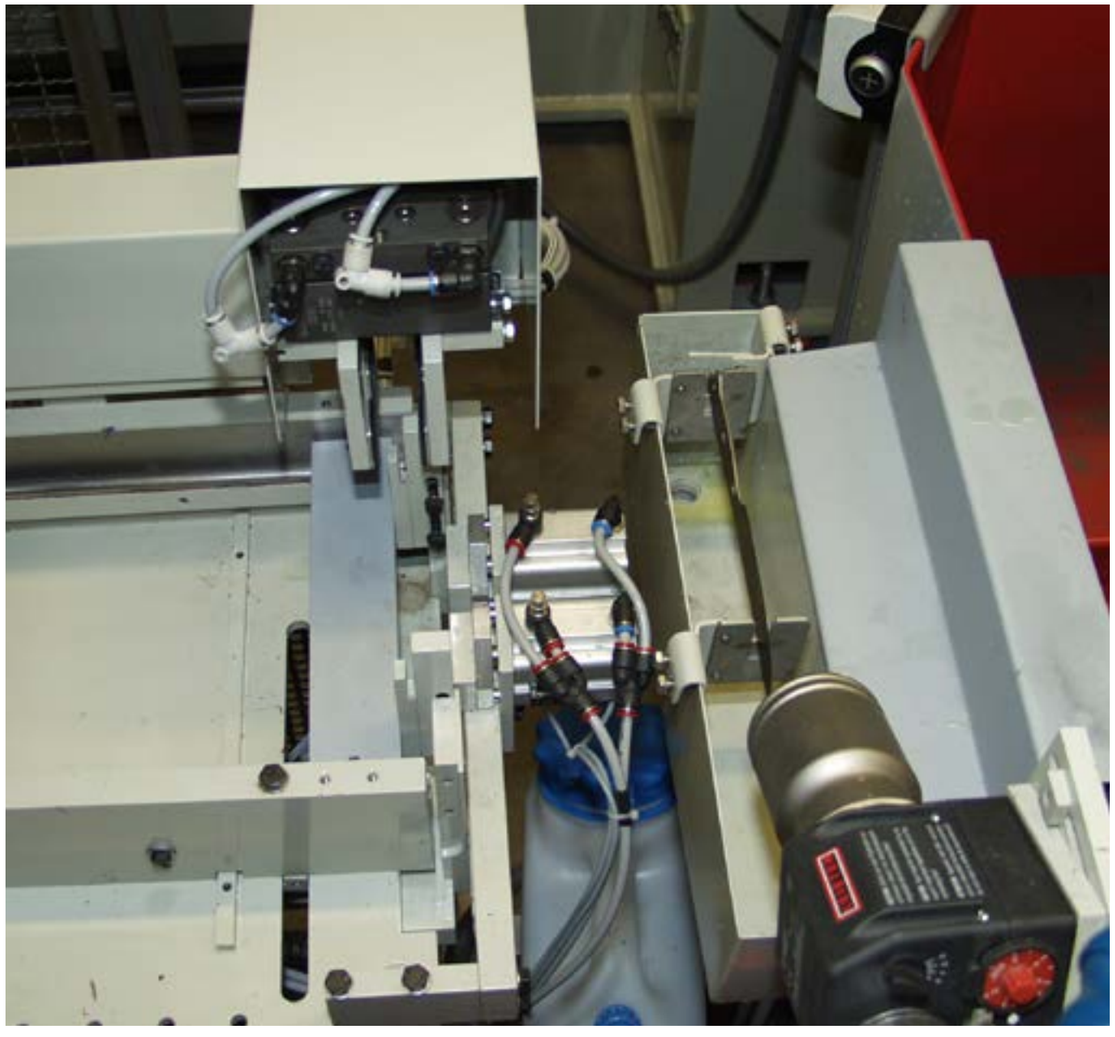
ACCESSORIES

Cleaning systems

Berger grinding machines can be combined with various cleaning systems. The workpiece is positioned in the transport chain.

Cleaning and drying take place in different stages.

As an alternative, the workpiece can be placed in one position by the loading/unloading robot. Here the workpiece is cleaned, dried and finally stacked in a sliding magazine.



Cooling systems

In combination with Berger machines, a large number of different cooling water installations for grinding emulsion are offered. The design of these systems depends primarily on the requirements for water quantity, water pressure and degree of purity.

Use of different cleaning stages:

- magnetic pusher
- paper and/or fleece filter
- ultra-fine filter

These components can be combined as required. Depending on requirements, water recooling must also be taken into account.

Additionally can be installed:

- flow monitor for monitoring the coolant flow level
- magnetic switch (water stand-/stop)
- float switch for level monitoring
- cooling unit for constant temperature of coolant

ACCESSORIES

Magazine systems

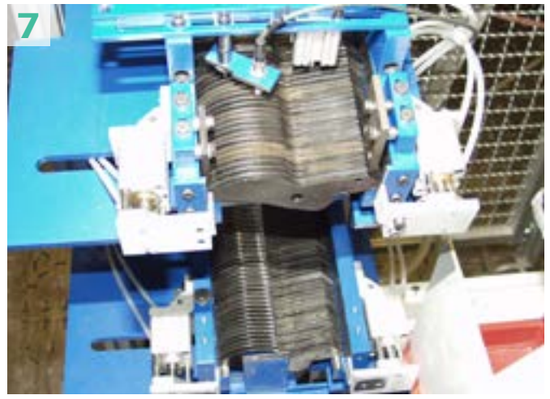
Robot cells as well as machining cells with CNC grinding machines can be equipped with different feeding and magazine systems for stackable and non-stackable workpieces.

The design of the loading/unloading magazines depends on requirements such as

- required magazine capacity
- shape of the workpieces
- variety of workpiece shapes
- integration into previous production stage
- orientation of the workpieces

A wide range of magazine systems is available such as:

- indexing rotary magazine
- indexing chain magazine for conical material
- indexing vertical rotary magazine
- circulating bar magazine
- feeding of bulk material via
  - circular conveyor
  - Berger Feeder



Examples of use (pictures):

1. **Berger Feeder**: disordered feeding (here of garden shears parts) via conveyor belt in connection with camera system (picture 1) (see also p. 26: feeding of tongs and pliers with Berger Feeder)
2. **Circulating chain magazine**: loading magazine for tongs and pliers (picture 2)
3. **Circular conveyor**: disordered feeding of workpieces (picture 3)
4. **Schäfer box:** removal of the workpieces (here shears and scissors) from Schäfer box (picture 4)
5. **Chain magazine**: feeding of wrenches to rotary table grinding machine HDS3 (picture 5)
6. **Indexing rotary table magazine**: unloading magazine for non-stackable workpieces – in this case garden shears parts (picture 6)
7. **Stacking magazine:** for flat material (here garden shears parts), loading capacity from 500–2 000 mm, adjustable length stops (picture 7)
8. **Step feeder**: feeding of screwdrivers for processing in a profile generating center (picture 8)

ACCESSORIES

Dressing systems

Depending on the machine type or the application, there are different dressing systems for grinding wheels or polishing discs, such as the two-axis CNC dresser for profiling the grinding wheel or the diamond-coated dressing roller for peripheral grinding machines of the WSM2.

Examples of use (pictures)

1. Two-axis CNC dresser for profiling the grinding wheel (e. g. with RFS, p. 52) (picture 1)
2. Driven diamond-coated dressing device for consistent quality of the bolster (e. g. BG) (picture 2)
3. Diamond-coated dressing roll designed for peripheral grinding machines of the WSM2 series (picture 3)
4. Movable single grain/contour dresser (e. g. WSM2) (picture 4)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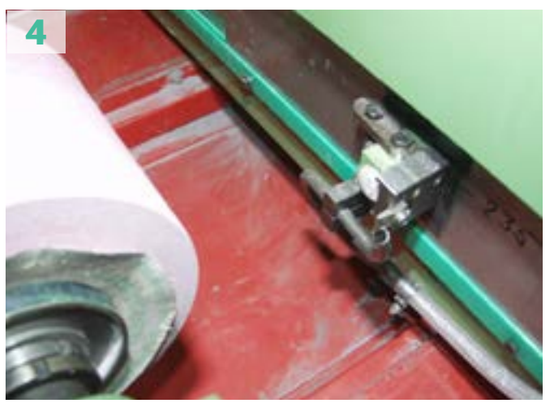
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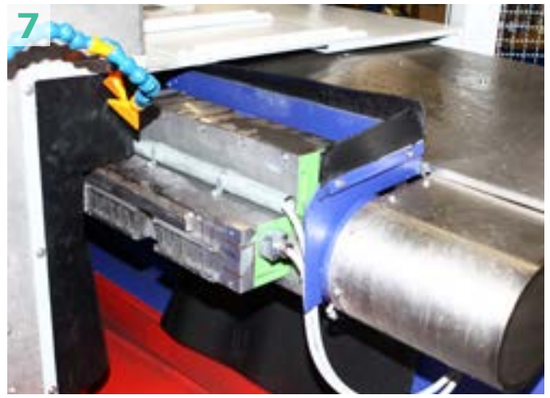
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8

Workpiece holder

The Berger Gruppe offers a wide range of mechanical, hydraulic and pneumatic clamping devices for grinding and polishing machines for individual workpieces.

Examples of use (picture)

5. Clamping device with additional clamping finger (picture 5)
6. Pressure roller programmable via CNC control (picture 6)
7. Electromagnetic workpiece holder integrated in a flat bevel grinding machine of the BG series (picture 7)
8. Workpiece holder for flat bevel grinding machines of the BG series (picture 8)

Full enclosure

The Berger Gruppe offers full enclosure for flat bevel grinding machines, peripheral grinding machines and glazing machines. (pictures 9 + 10)


9

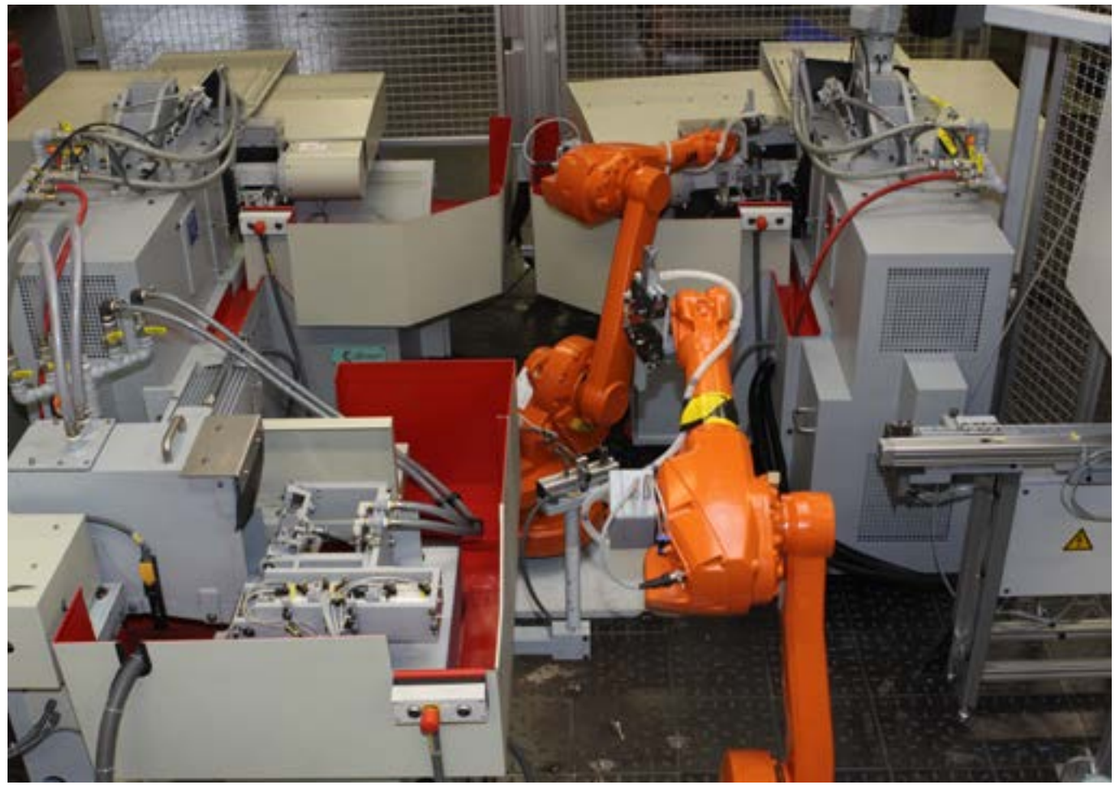

10

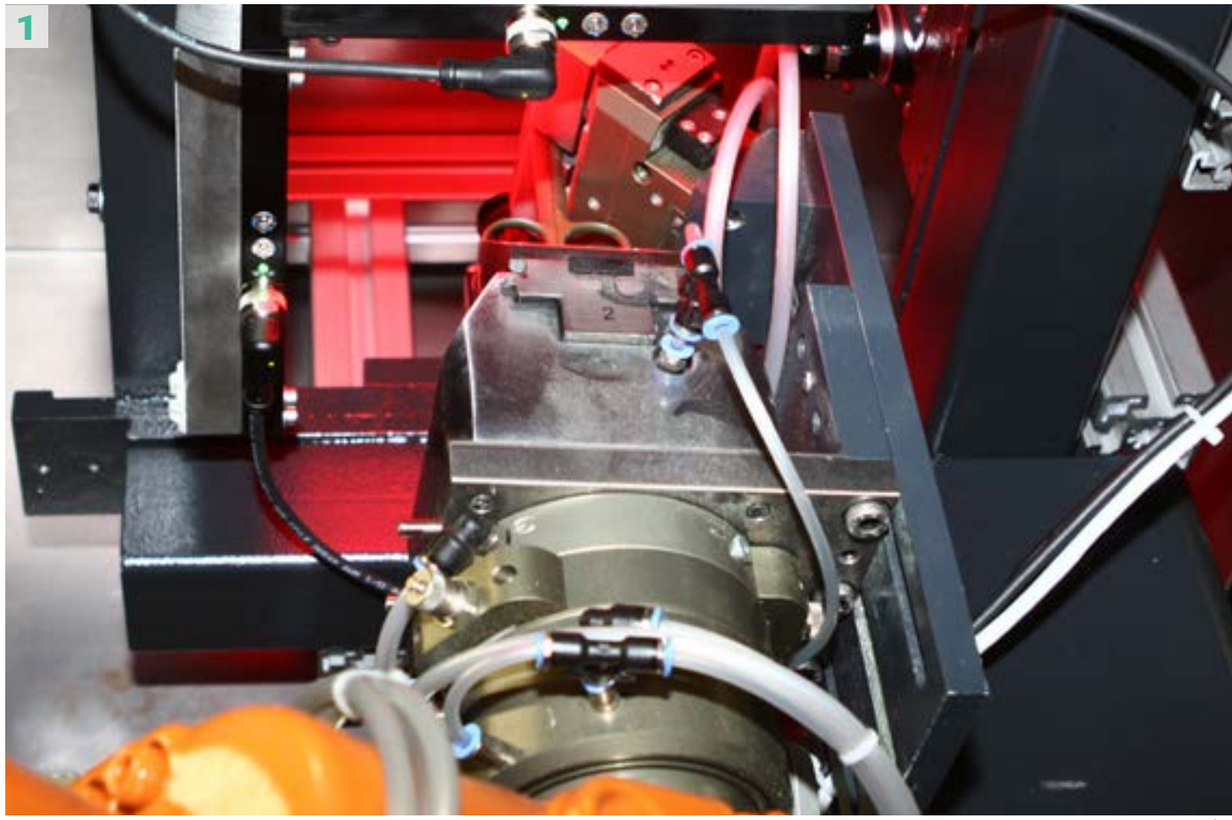
ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

INTEGRATION AND AUTOMATION

Integration of production processes

Various production processes can be integrated in a robot cell, such as deposition welding, bending presses, drilling, countersinking, hardening systems, painting systems and packaging machines.





Measurement technology

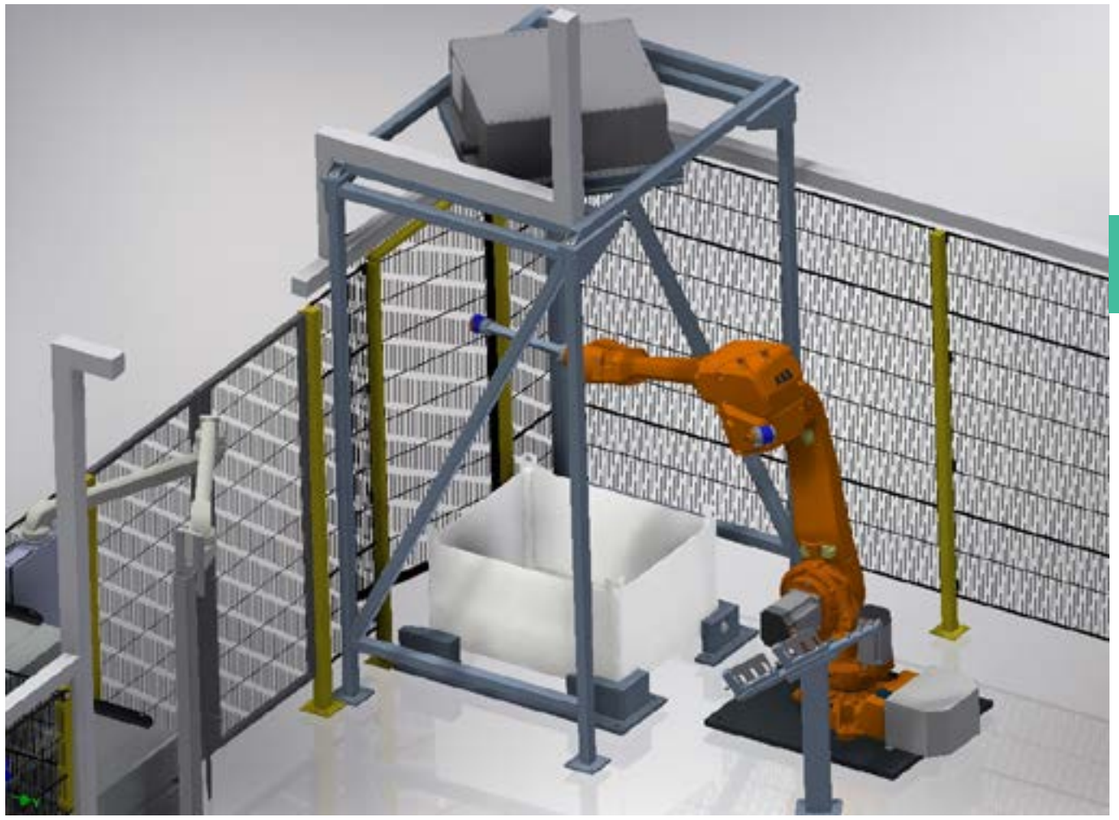
Development of standard measuring systems for different applications for the acquisition and compensation of automated dimensions/ contours or position detection

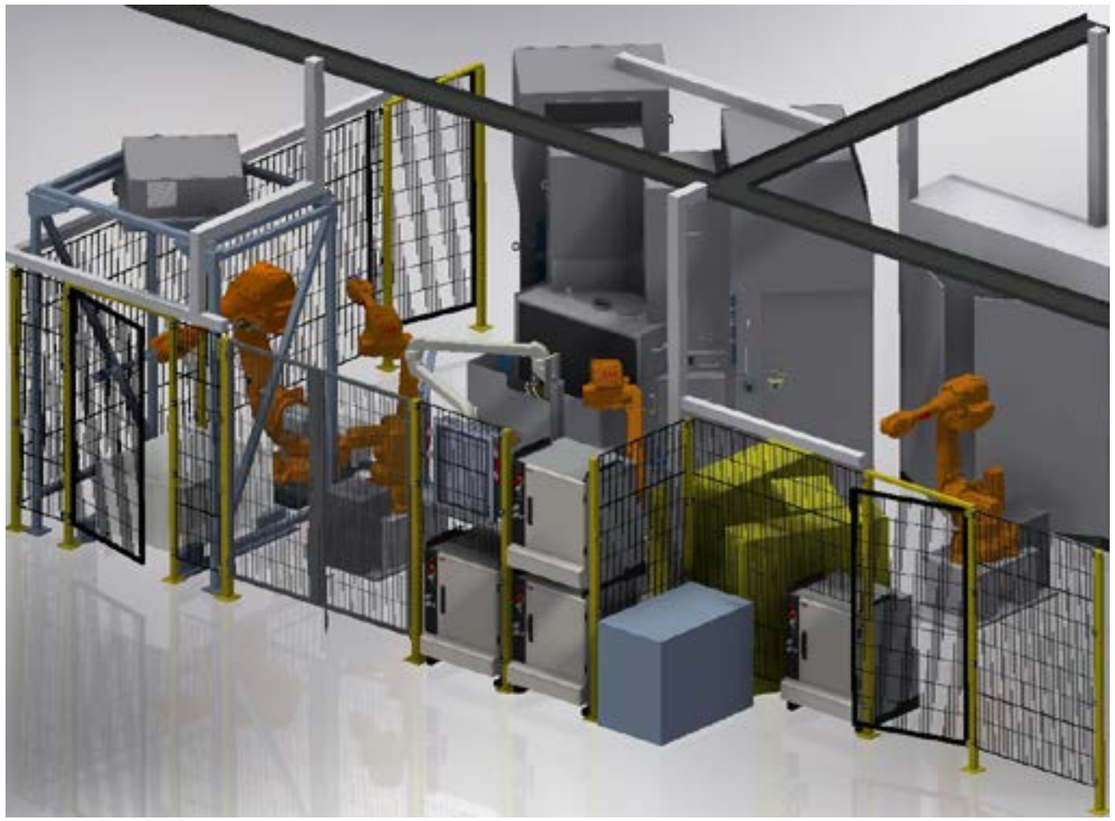
- measuring systems for automated contour detection and measurement of workpieces (picture 1)
- separation and position detection on measuring table (picture 2)
- evaluation software for position detection (picture 3)

BIN PICKING

Handling of non-sorted workpieces

A camera system with high-resolution cameras – in this case from Keyence – detects the position of the workpieces, which are lying disorderly in a skeleton box or Schäfer box, and passes the data to the handling robot.





- provision and feeding of disordered workpieces with bin-picking from two KLT boxes
- docking stations for KLT containers with repeatable positioning via stops
- bin-picking robot ABB
- double gripper with two magnetic grippers with adjustable magnetic force for removing workpieces from KLT box
- 3D robot vision
- camera-controlled turning and centering station
- 3D position detection via camera measuring system with high-resolution cameras
- automatic calculation of the optimal robot path
- special robot gripper depending on the workpiece
- loading robot with adjustable magnetic force for loading and unloading the grinding machine and loading the cleaning and drying station

BERGER MASCHINE INTERFACE 4.0

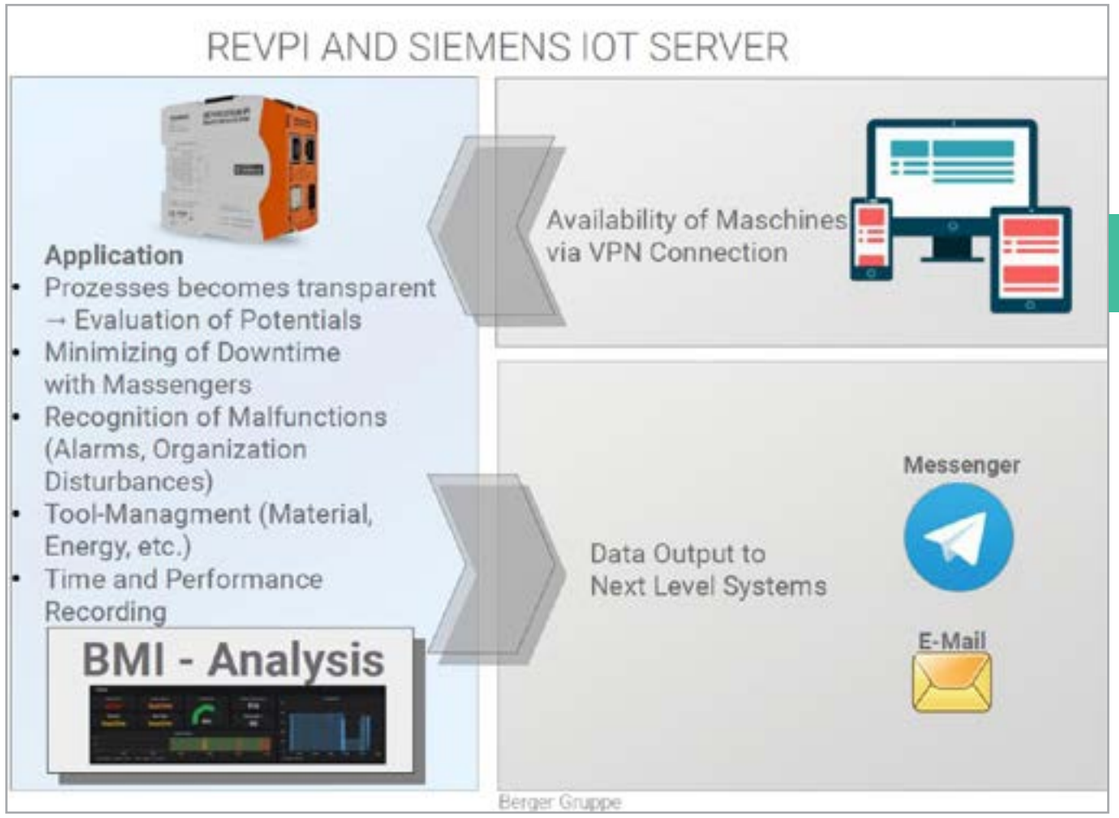
Acquisition and evaluation of machine data

Berger Machine Interface 4.0 (BMI4.0), in conjunction with KEBA/Andronic and Windows 10, enables bus-based acquisition of sensor signals on a machine and evaluation of the machine data.

Definition of universal protocol

(1. Definition of a universal protocol on 20/02/2019, use with KEBA/Andronic/Siemens control)
Example of a universal protocol. The parameters can be compiled as required.

Variable	Type	Unit	Comment
General information			
Alarm active	BOOL		0=no alarm, 1=alarm activated
Machine ready/autorun	BOOL		NC activated, green button
Rob1 Automatic/Autorun Rob1	BOOL		
Rob2 Automatic/Autorun Rob2	BOOL		
Rob1 Alarm	BOOL		
Rob2 Alarm	BOOL		
Feed rate (feed potentiometer position)	INT	(%)	0...100% of potentiometer position
Total piece counter	INT32		Total piece counter (not resettable)
Piece counter1 resettable	INT		Piece counter 1 (resettable)
Piece counter2 resettable	INT		Piece counter 2 (resettable)
Target batch counter	INT		
Actual batch counter	INT		
Machine-specific/channel-specific			
Current program	STRING (24)		
Grinding activated	BOOL		0=inactive, 1=grinding activated
Measuring activated	BOOL		0= inactive, 1=grinding activated
Dressing activated	BOOL		0= inactive, 1=grinding activated
Grinding time	REAL	s	
Loading time	REAL	s	
Cycle time	REAL	s	Grinding time + loading time
Piece per hour	INT		
Grinding motor utilization	INT	%	0...100% of rated current
Peripheral speed	REAL	m/s	
Remaining stone	REAL	mm	Remaining stone diameter or remaining stone height
Stone wear	REAL	mm	

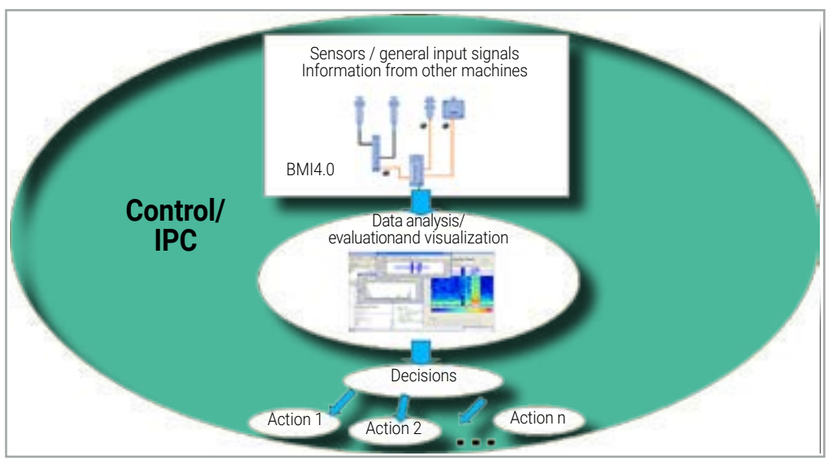


Functions of BMI4.0

- universal bus-based acquisition of sensor signals on a machine such as coolant temperatures, motor load, AE signals for spindle monitoring, air pressure and quantity
- data reduction and visualization with evaluation software
- networking with IOT or company network
- programming of interfaces for individual connection to existing PDA or ERP systems with OPC server

Advantages of BMI4.0

- prerequisite for intelligent resource management (IRP)
- prerequisite for preventive maintenance and real-time monitoring of the machine park
- acquisition of process data for process optimization and detection of process dependencies
- optimization of downtimes and set-up times, thus optimal capacity planning

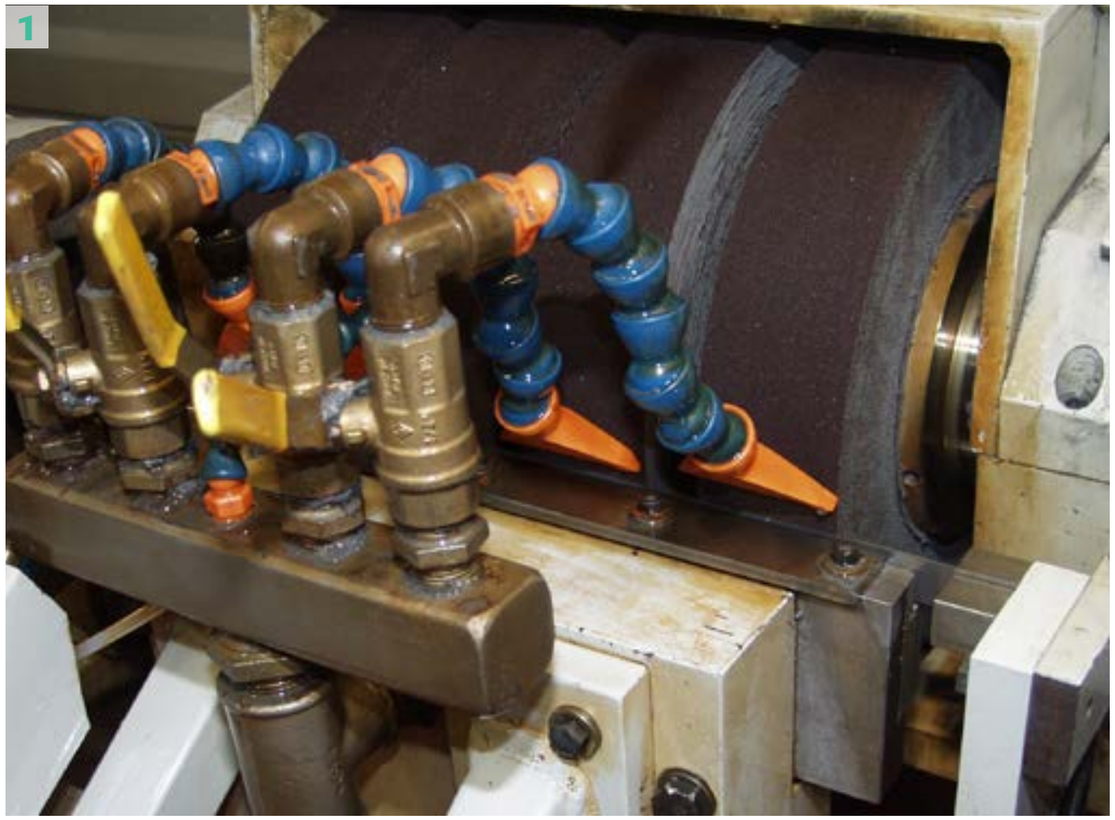


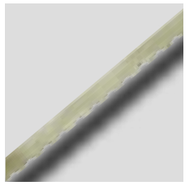
STEEL STRIP GRINDING MACHINES

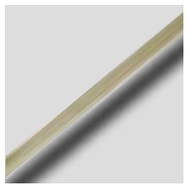
CUTTING EDGE GRINDING ON STEEL STRIPS

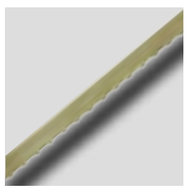
Series BSM and BGM

One or two-sided smooth grinding of cutting edges on steel strips









- smooth grinding of cutting edges with angles from 0–30°
- single or double sided grinding
- camera measurement of the ground section width
- laser strip height measurement
- CNC dressing systems with stationary and driven tools

Examples of use (pictures)

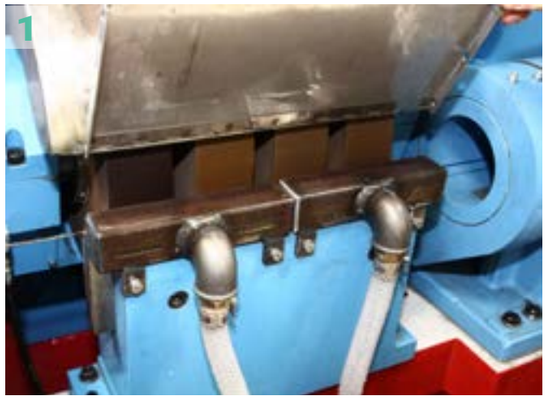
1. One-sided steel strip grinding station of the series BSM3000/E
2. Steel strip grinding machine of the BSM series designed for steel strip grinding for the production of pencil sharpener blades
3. Breaking unit with sliding magazine

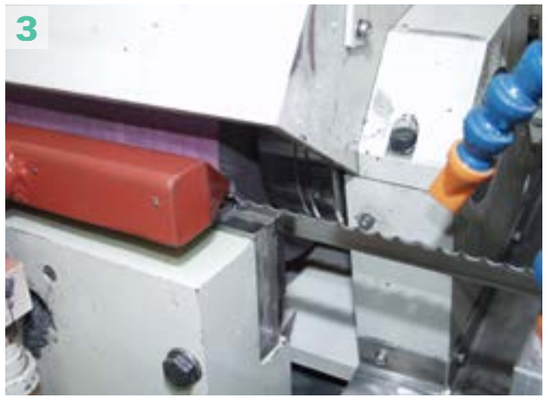
STEEL STRIP GRINDING MACHINES SERIES BSM3000/E

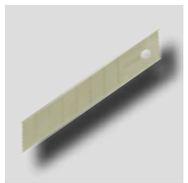
One-sided processing

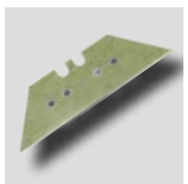
The one-sided grinding station is used e. g. for grinding pencil sharpener blades, curette bands and machine blades.

- grinding wheels with 300 mm Ø mounted on a double-sided precision spindle
- grinding wheel width max. 240 mm
- used for pre-grinding, e.g. for high material removal rates on one side of the strip









Example of applications (pictures)

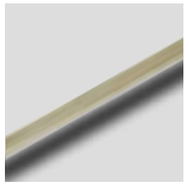
1. Straight finish grinding for the production of curettes (picture 1)
2. Serrated grinding with CBN grinding wheel to produce cutting rules (picture 2)
3. Scalloped grinding for the production of machine knives by means of a profiled grinding wheel (picture 3)
4. Straight finish grinding for the production of industrial blades (picture 4)
5. Straight finish grinding for the production of pencil sharpener blades (picture 5)
6. Steel strip grinding station of the series BSM3000/E (picture p. 84)

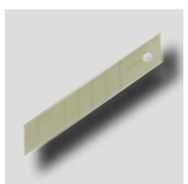
STEEL STRIP GRINDING MACHINES SERIES BSM3000/D

Double-sided processing

The double-sided grinding station processes steel strip for the production of cutting lines, technical blades, scalpel blades and similar shaped work-pieces.

- integration of two opposite grinding spindles
- both spindles equippable with six grinding wheels of 20 mm width
- spindles for plunging mounted offset against each other
- effective grinding width of 120 mm per side (or 240 mm in total)
- used for finish grinding on pre-ground or pre-chamfered strips (abrasive grit 150–320)





Examples of use (pictures)

1. Straight finish grinding of cutting edges for the production of industrial blades (picture 1)
2. Straight finish grinding of cutting edges for the production of cutting lines (picture 2)

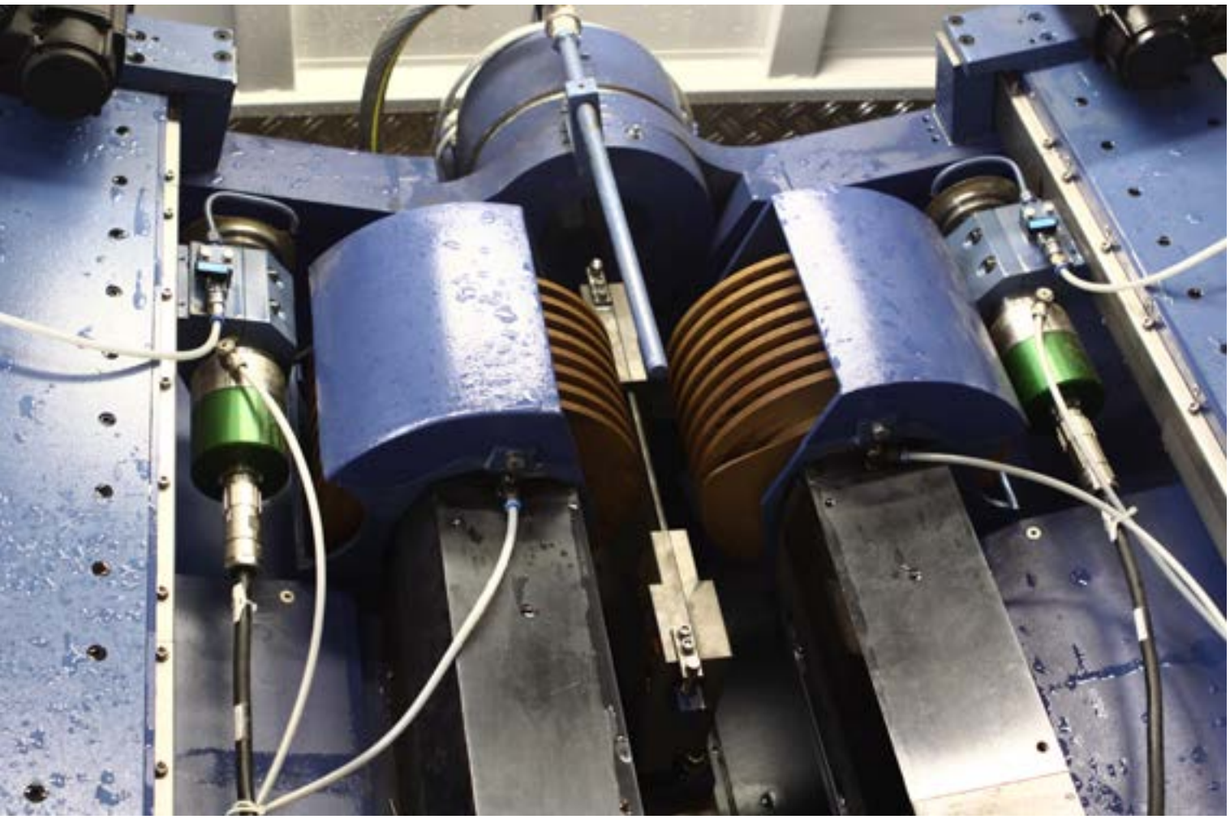
STEE STRIP GRINDING MACHINES SERIES BSM1500/TT

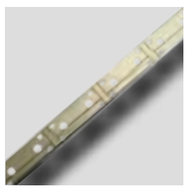
Straight micro-grinding

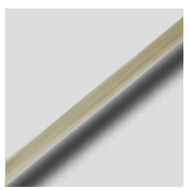
The BSM1500/TT machining station is used for deburring finely ground blades. The steel strip grinding machine works with six CNC axes.

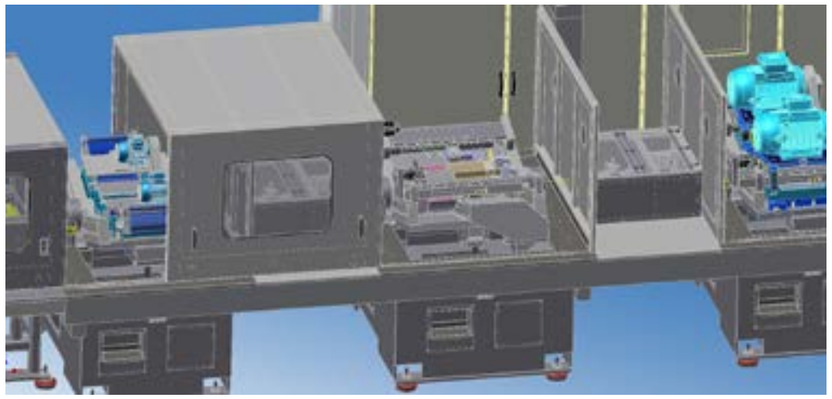
Core application of the station is the micro-grinding of cutting rules with grits up to 1 200.

- mounting of grinding wheels with Ø of 150–250 mm
- electronic synchronization of the spindles with AC servo technology
- additional vibration damping through mineral cast filled machine body for precision grinding of highest quality
- design of the grinding spindle for up to 8 000 rpm, encoder for position synchronization, precision spindle of the highest quality
- spindle bearing arrangement: hydrostatic or roller bearing
- programmable, constant peripheral speed with decreasing grinding wheel Ø
- peripheral speed: 20–65 m/s
- motorized angle adjustment: 0–35°.
- grinding width/wheel width: max.: 150 mm
- spiral grinding wheel Ø: 150–250 mm









- AC servo motor/drive control unit for synchronisation of the grinding wheels, max. synchronous deviation 2° at 8 000 rpm
- central lubrication
- design for wet machining with grinding emulsion
- mounting of guides made of carbide or with carbide inserts
- integration of different dressing systems for profiling the grinding wheels possible

Examples of use (pictures)

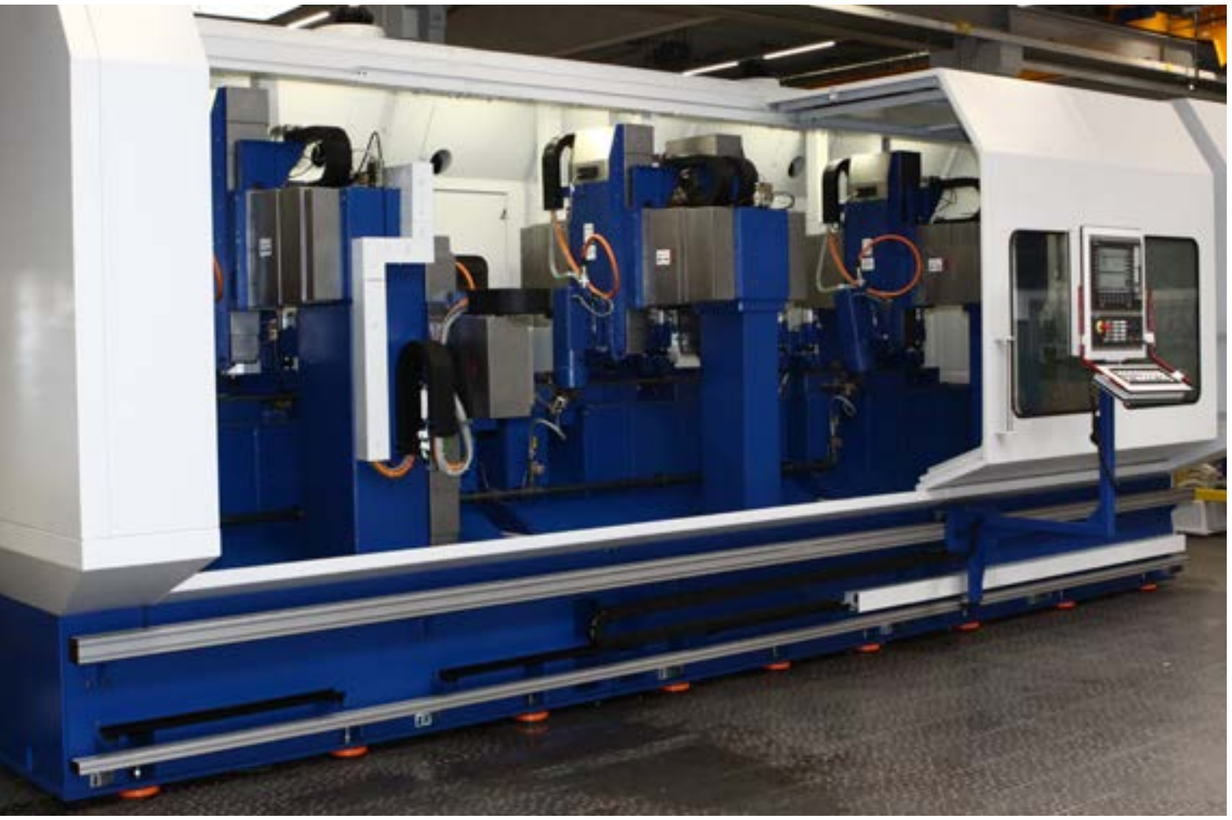
1. Steel strip grinding plant consisting of two grinding stations BSM3000/E, one grinding station BSM3000/D, one grinding station BSM1500/TT, one decoiler, one recoiler, two camera measuring systems and one laser measuring system (picture 1)
2. Deburring of steel strip for the production of precision knives for the food industry (picture p. 88)

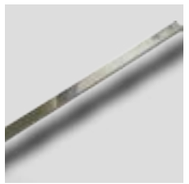
STEEL STRIP GRINDING MACHINES SERIES BDG1500

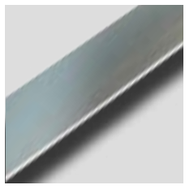
Squeegee edge grinding

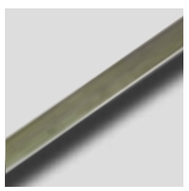
The BDG1500 series steel strip grinding system consists of up to five vertical strip grinding stations and is designed for the production of squeegees, doctor blades and similarly shaped workpieces.

It achieves a bevel grinding on both sides as well as a straight cutting edge grinding with 90° to the workpiece.









- cutting speed: up to 50 m/s
- pull-through speed: 5 m/min
- CBN cup wheel Ø: 125 mm
- precision-bearing grinding motor spindle driven by a special motor
- frequency converter for programming the spindle speed

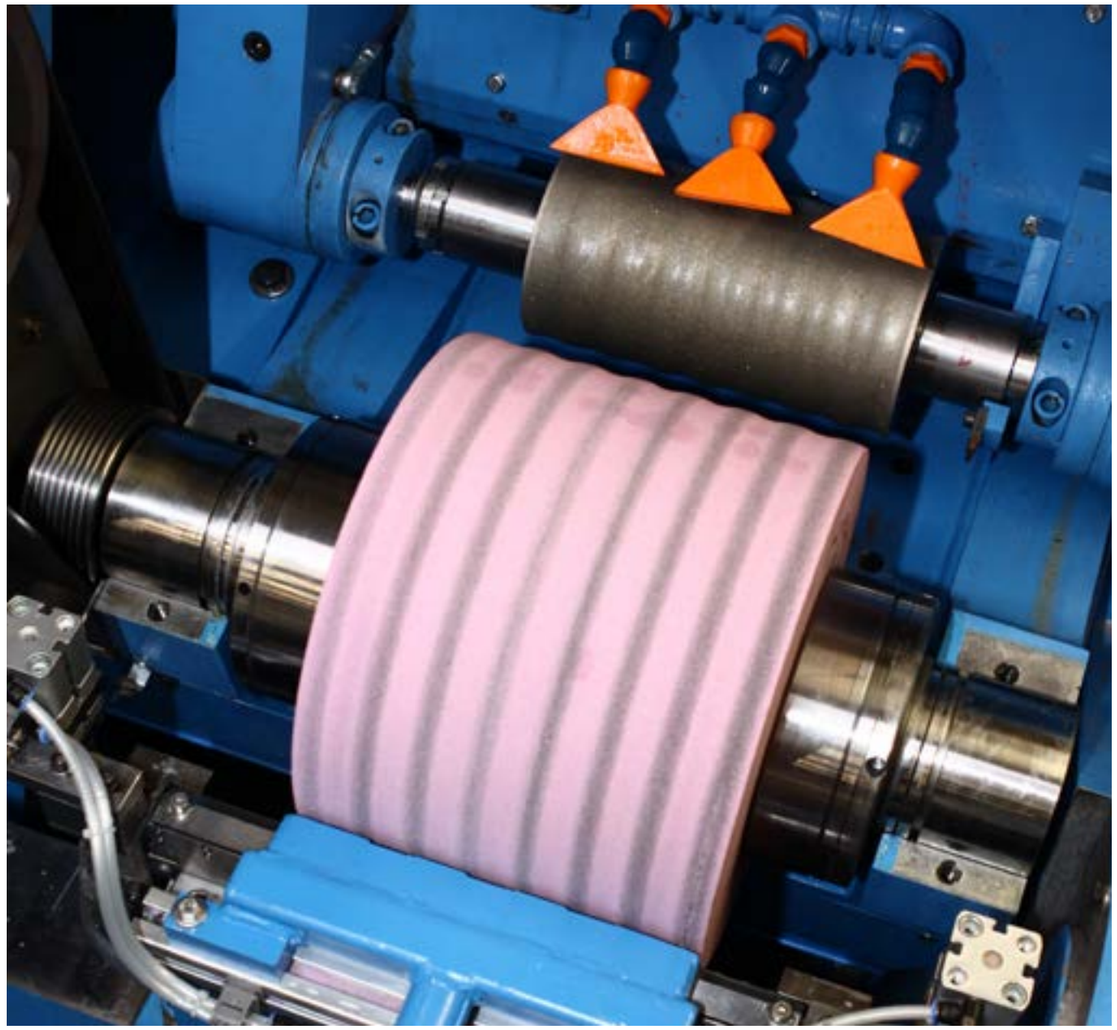
- design for wet machining with grinding emulsion
- central lubrication
- direct measuring system integrated in the guides of Z- and Y-axis

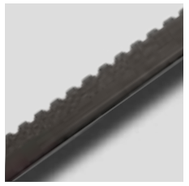
STEEL STRIP GRINDING MACHINES
SERIES BSM3000/2E/BS

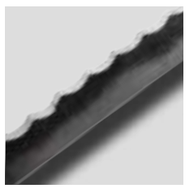
Scalloped and serrated grinding of steel strips

The presented steel strip grinding machine is designed for scalloped and serrated grinding of steel strip.

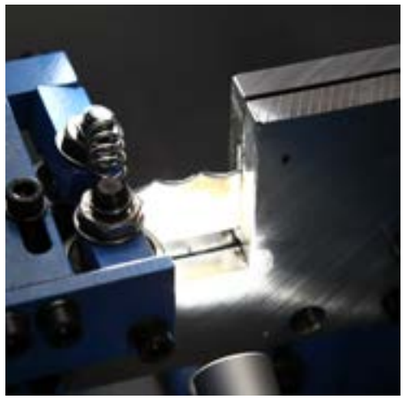
- serrated grinding on steel strips with angles of 0–30
- camera measurement of the serration
- camera strip height measurement
- CNC dressing systems with stationary and driven tools







- recoiler with spool plate Ø 1 250 mm
- two single-sided grinding stations of the BSM3000/E series
- deburring station BSM3000/SP
- strip drying
- camera and laser measuring system
- strip pull-through system
- coolant supply
- central lubrication



STEEL STRIP GRINDING MACHINES SERIES BSM1500/TTGB

Gothic arch grinding of razor blade strips

The presented steel strip grinding machine achieves a gothic arch on cutting edges of steel strip.

- grinding of steel strip with 0.075–0.1 mm thickness (razor blade strip)
- gothic arch in the cutting area with continuous angle progression from 6°–8° to 12°–15°
- grinding spindle with high-precision hydrostatic bearing
- CNC dressing system on machine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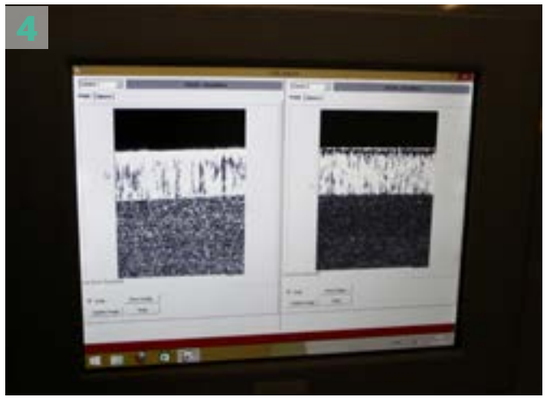
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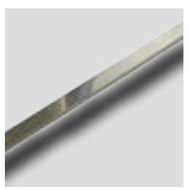


- mounting of spiral grinding wheels with 150–250 mm Ø
- electronic synchronization of the spindles with AC servo technology
- additional vibration damping through mineral cast filled machine body for precision grinding of highest quality
- design of the grinding spindle for up to 8 000 rpm, encoder for position synchronization, precision spindle of the highest quality
- spindle bearing arrangement: hydrostatic
- programmable, constant peripheral speed with decreasing grinding wheel Ø
- peripheral speed: 20–65 m/s
- grinding width/wheel width: max. 150 mm
- spiral grinding wheel Ø: 150–250 mm
- AC servo motor/drive control unit for synchronization of the grinding wheels, max. synchronous deviation 2° at 8 000 rpm
- central lubrication
- design for wet machining with grinding emulsion
- mounting of carbide guides
- integration of different dressing systems for profiling the grinding wheels possible

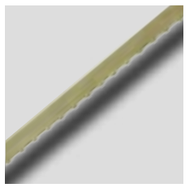
Examples of use (Bilder)

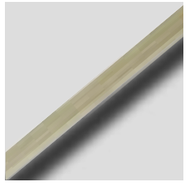
1. Steel strip grinding station BSM1500/TTGB for grinding razor blades (picture 1)
2. Cleaning station for metal strips (Bild 2)
3. Dryer integrated into a cleaning station (picture 3)
4. Camera measuring system for measuring the strip height (picture 4)
5. Gothic arch grinding on razor blade strips (picture 5)

STEEL STRIP GRINDING MACHINES SERIES BWSL1000/E

Straight finish grinding with relief grinding, scalloped and serrated grinding

The grinding stations of the BWSL1000/E series achieve one-sided straight edge grinding, scalloped and serrated egde grinding on steel strip.





The strips can be used in the food industry, the paper and packaging industry or for the production of saws, among others.

- achieve any cutting edge angle by interpolation of the Y- and Z-axes
- dressing the grinding wheel by means of diamond dressing rolls or single grain dressers
- integration in a steel strip grinding system as BWSL

STEEL STRIP GRINDING MACHINES SERIES SVZ

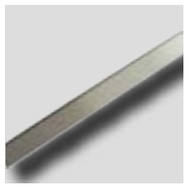
Serrated grinding simultaneously on up to 44 multiple strips

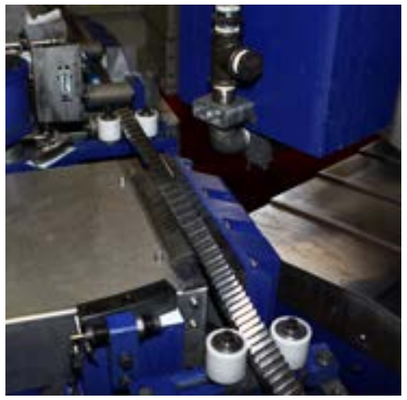
The grinding machine of the SVZ series achieves serrated grinding on metal strips.

On the machine shown here, up to 44 strips with a maximum strip thickness of 1.5 mm can be processed simultaneously.

The line consists of two vertical decoilers, a steel strip grinding station SVZ and a recoiler.

- grinding width: 120 mm
- grinding length in package: 66 mm
- max. strip width: 30 mm
- grinding wheel Ø: 500 mm





Four CNC axes:

- Z-axis: horizontal axis for the grinding movement, drive with linear motor and direct measuring system for highest precision
- Y-axis: vertical axis for moving in the direction of the workpiece, drive with ball screw and servo motor
- C-axis: programmable axis for a relief grinding from 0°–18°
- X-axis: cycle feed of the strip, drive with linear motor and direct measuring system for highest precision

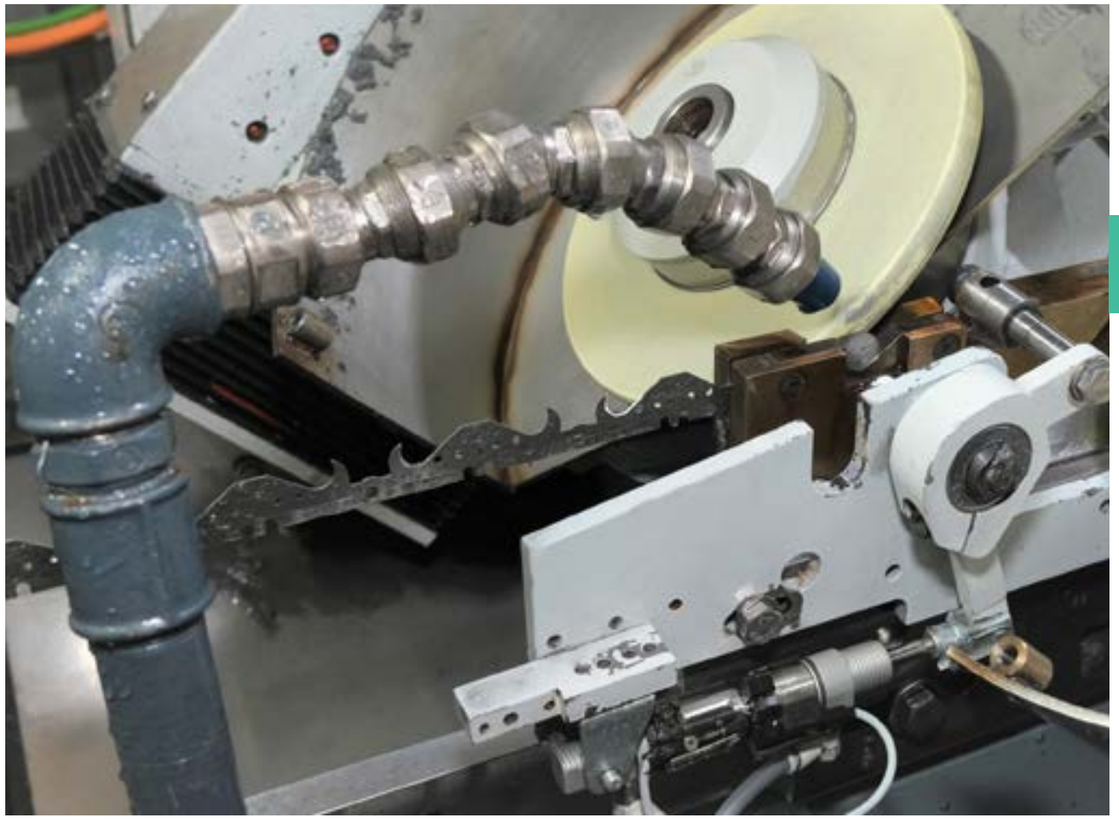
- diamond-coated profile roll, bearings on both sides of the dressing roll
- precision-bearing shaft with 30 kW main drive
- pre-programmable dressing intervals with automatic compensation of the grinding wheel wear

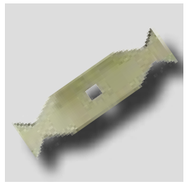
STEEL STRIP GRINDING MACHINES SERIES BSM500/HK

Plunge grinding and polishing

The processing station BSM500/HK is specially designed for grinding and polishing hook blades.

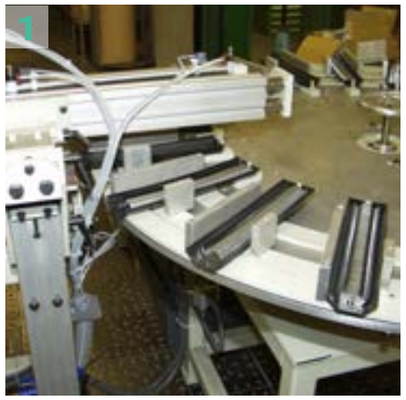
- double-sided grinding operation with four grinding units, each arranged at different grinding angles
- definition of the grinding wheel geometry via dressing unit with diamond-coated rolls
- polishing of the cutting edge using felt or leather wheels in a second, similarly constructed processing station
- constant polishing result ensured by intelligent pressure control of the polishing wheels
- automatic feeding of the polishing agent





- main engine: 4 × 2.6 kW
- frequency converter: 4 × 4 kW for programmable, constant peripheral speed with decreasing grinding wheel Ø 30–50 m/s
- dressing motor: 4 × 0.8 kW
- one-sided precision spindle bearing arrangement
- central lubrication
- designed for wet processing with grinding emulsion or for use of polishing paste
- breaker with sliding magazine (picture 1)
- horizontal decoiler plate (picture 2)

1



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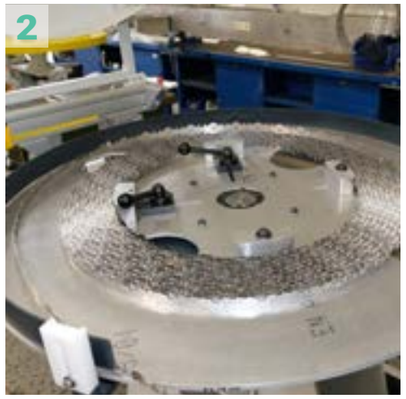
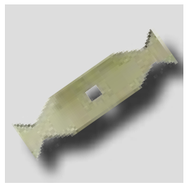


ACCESSORIES

FOR STEEL STRIP GRINDING MACHINES

BREAKERS The breaking machines can be integrated into existing steel strip grinding plants or used as a separate breaking unit with decoiler.



- use as single station or integration of blade breaking machines into an entire system
- stacking of the blades in magazine units
- up to 500 breaking cycles per minute
- designed for one- and double-sided blades

Example of applications (pictures)

1. Magazine table Ø of 1 500 mm for holding up to 65 magazines (picture 1)
2. Breaker with horizontal rotary table holding magazine cassettes (picture 2)
3. Breaker with sliding magazine (picture 3)
4. Separate breaker with decoiler (picture 4)

ACCESSORIES
FOR STEEL STRIP GRINDING MACHINES

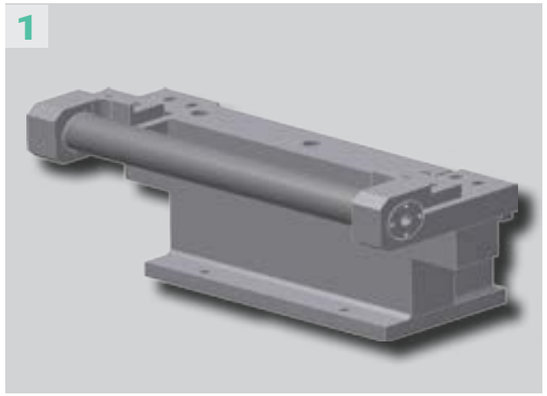
Magazine systems

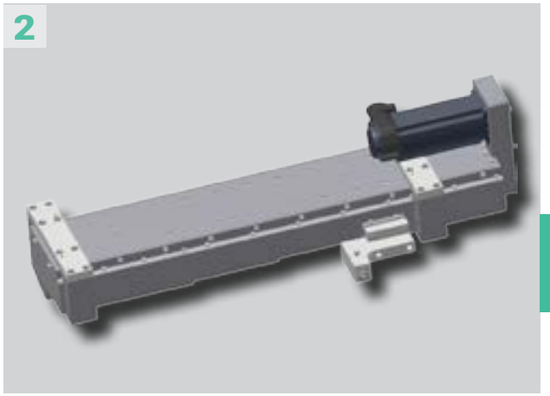
The Berger Gruppe offers various magazine devices for different applications

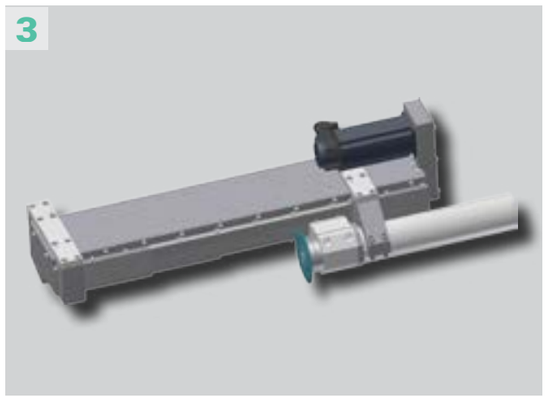
- horizontal rotary table magazines holding magazine cassettes
- magazine for breakers
- magazine devices for operator assistance
- pneumatic indexing
- variable number of swords
- vertical stacking magazines
- fully automatic blade magazines

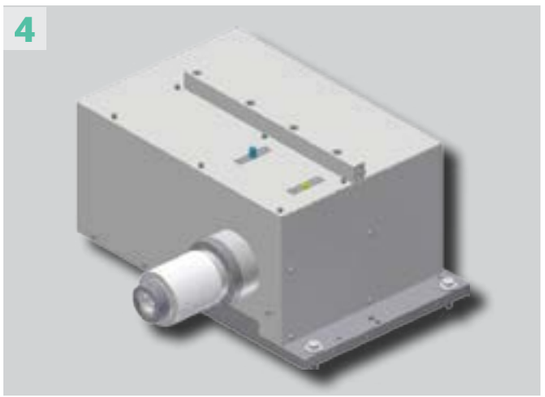
Example of applications (pictures)

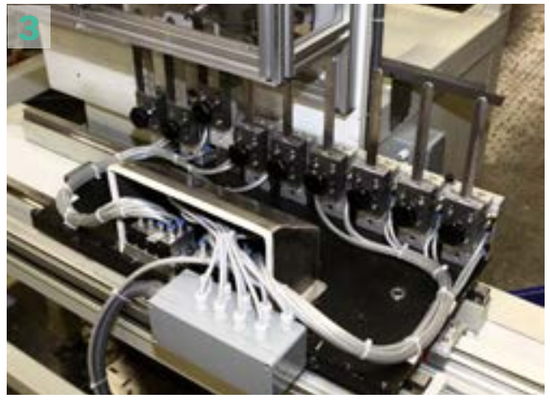
1. Horizontal rotary table magazine holding magazine casettes (picture 1)
2. Vertical stacking magazine storing double-sided razor blades (pictures 2)
3. Vertical stacking magazine storing scalpel blades (picture 3)
4. Horizontal rotary table magazine (picture 4)











Dressing systems

Various types of dressing systems for steel strip grinding machines are part of the Berger Gruppe product range such as

- diamond-coated dressing roller for straight dressing of new grinding wheels (non-driven dressing unit)
- CNC movable single grain diamond or diamond fleece for dressing the grinding wheel
- CNC dresser for contour dressing of the grinding wheel, e.g. for shaft or tooth profiles with a driven diamond dressing wheel
- dresser for the use of diamond-coated dressing rolls 100–300 mm wide for scalloped or serrated grinding

Example of use (pictures)

1. Diamond-coated dressing roll (picture 1)
2. CNC single-point diamond dresser (picture 2)
3. CNC diamond wheel dresser (picture 3)
4. Diamond roll dresser (picture 4)

ACCESSORIES
FOR STEEL STRIP GRINDING MACHINES

Spooling systems

- guides in the area of the working stations
- spool plate outer Ø max. 1 200 mm
- inner Ø 200–600 mm (other dimensions available by agreement)
- cycled configuration (gear motor 0.12 kW)
- quick clamp for clamping the coils
- motor-driven swivelling of spool plate from vertical to horizontal
- spool equipped with protective cover
- spool decoiler for decoiling from cassettes

Example of use (pictures)

1. Vertical decoiler integrated into a steel strip serrating line (picture 1)
2. Spool plate (picture 2)
3. Spool plate rotatable from horizontal to vertical position by motor (picture 3)
4. Spool decoiler for decoiling from cassette (picture 4)
5. Aspiration of cooling lubricant mist integrated in a steel strip grinding machine (picture 5, p. 107, above)


1


2


3


4

5

Pulling system (picture 6)

- transport of the strip material via CNC controlled pull-through with programmable speed of 0–100 m/min
- both continuous strip feed for straight finish grinding as well as indexing mode for serrated or saw cut can be programmed
- guarantee of tolerance values of ± 0.015 mm during indexing


6

Strip welding (picture 7)

- strip width: 2–50 mm (wider on request)
- strip thickness:
  - up to 1 mm (plasma arc welding)
  - 0.4–4 mm (butt welding)
- cutting of the beginning and the end of the strip (option)
- grinding of the bead seam (option)


7

ACCESSORIES
FOR STEEL STRIP GRINDING MACHINES

Cleaning systems

The steel strip grinding machines of the Berger Gruppe can be combined with various cleaning systems. The cleaning systems are designed for cleaning coils in a continuous process.

- cleaning and drying with a max. speed of 50 m/min
- cleaning by means of a high-pressure module (high-pressure cleaner) followed by a drying unit
- impurity separator
- particle filter
- high pressure circuit
- differential pressure measurement at the filter

Coolant systems

The design of coolant systems used in grinding machines depends on the requirements for water quantity, pressure and purity of the water.

Options: e.g. flow monitor, magnetic switch or float switch

These components can be combined depending on the requirements. Water recooling has to be taken into account depending on the requirements.

Additionally can be installed:

- flow monitor (for monitoring the level of the coolant flow)
- magnetic switch (water level/stop)
- float switch (level monitoring)
- cooling unit for constant temperature of the coolant

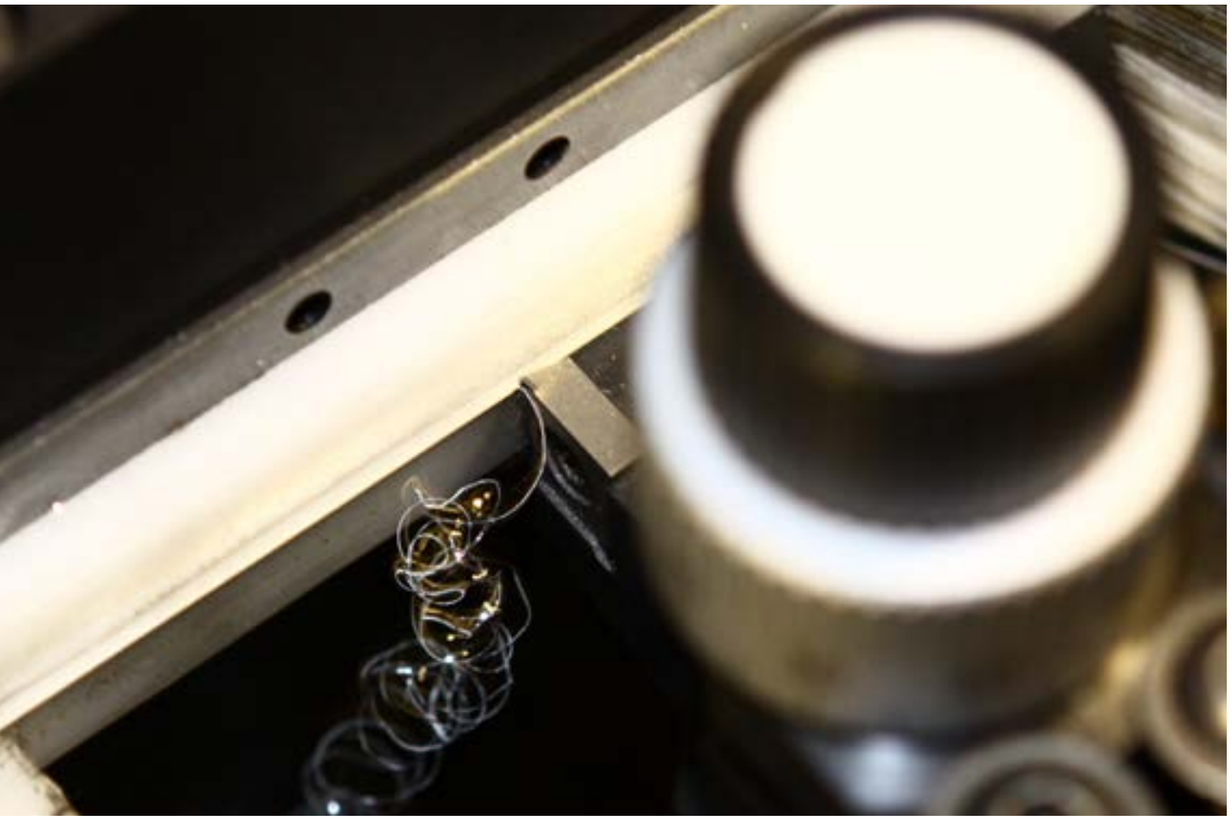
METAL-CUTTING MACHINES

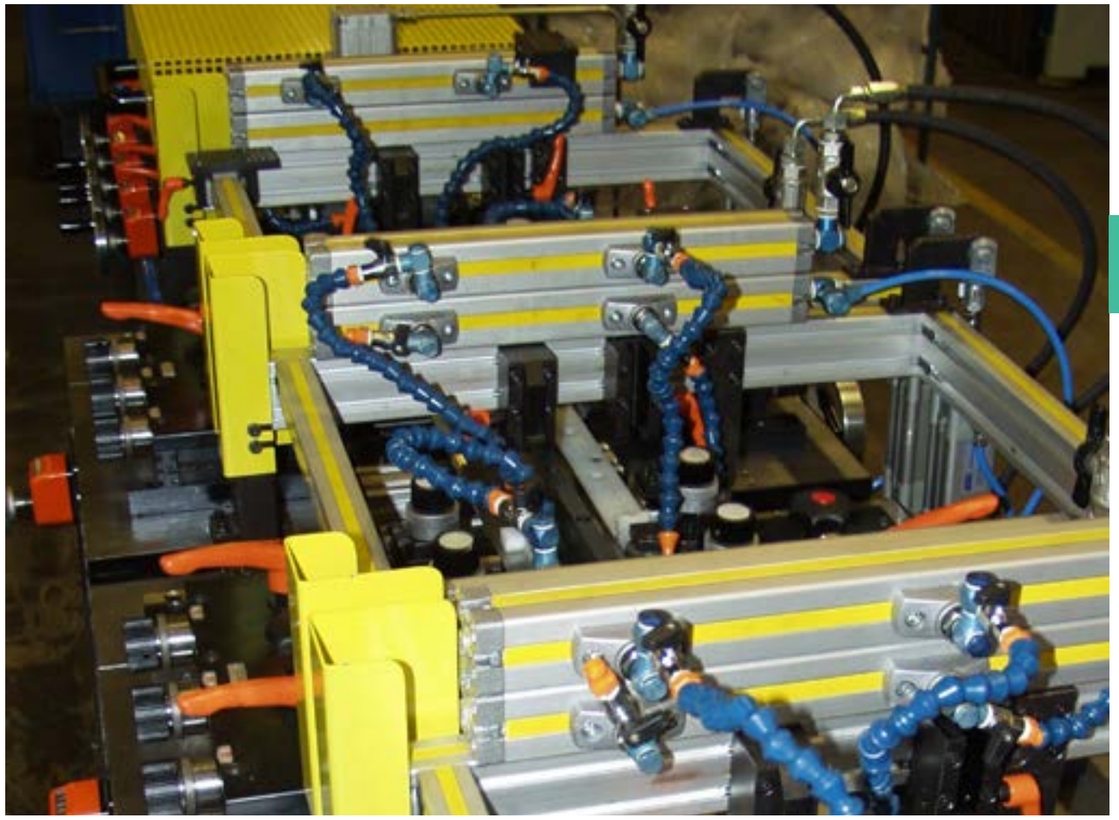
FOR STEEL STRIPS

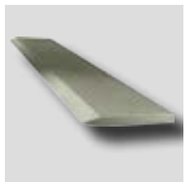
FROM CUTTING EDGE TO FUNCTIONAL EDGE

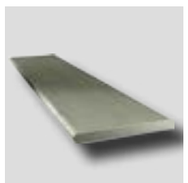
Strip processing by metal-cutting

If the cut edge is to become a functional edge, the quality of the edge of slit strips does not meet the requirements of the processing industry.









During strip edge trimming with the JULIUS system, the burr is removed from the strip edge and any desired contour is chamfered to the strip edge.

The resulting swarfs are removed via scrap conveyor systems.

This means that no burrs can come off during further work processes such as die cutting or profiling.

In contrast to rolling, the material is not changed during strip edge trimming by metal-cutting. The structure of the material surface is retained.

Precise adjustment of the tools and a well thought-out system of broaching arrangement ensure that even complex chamfers and contours are machined to the strip edge without affecting the surface structure.

THE MODULAR SYSTEM – LINES SERIES BHR

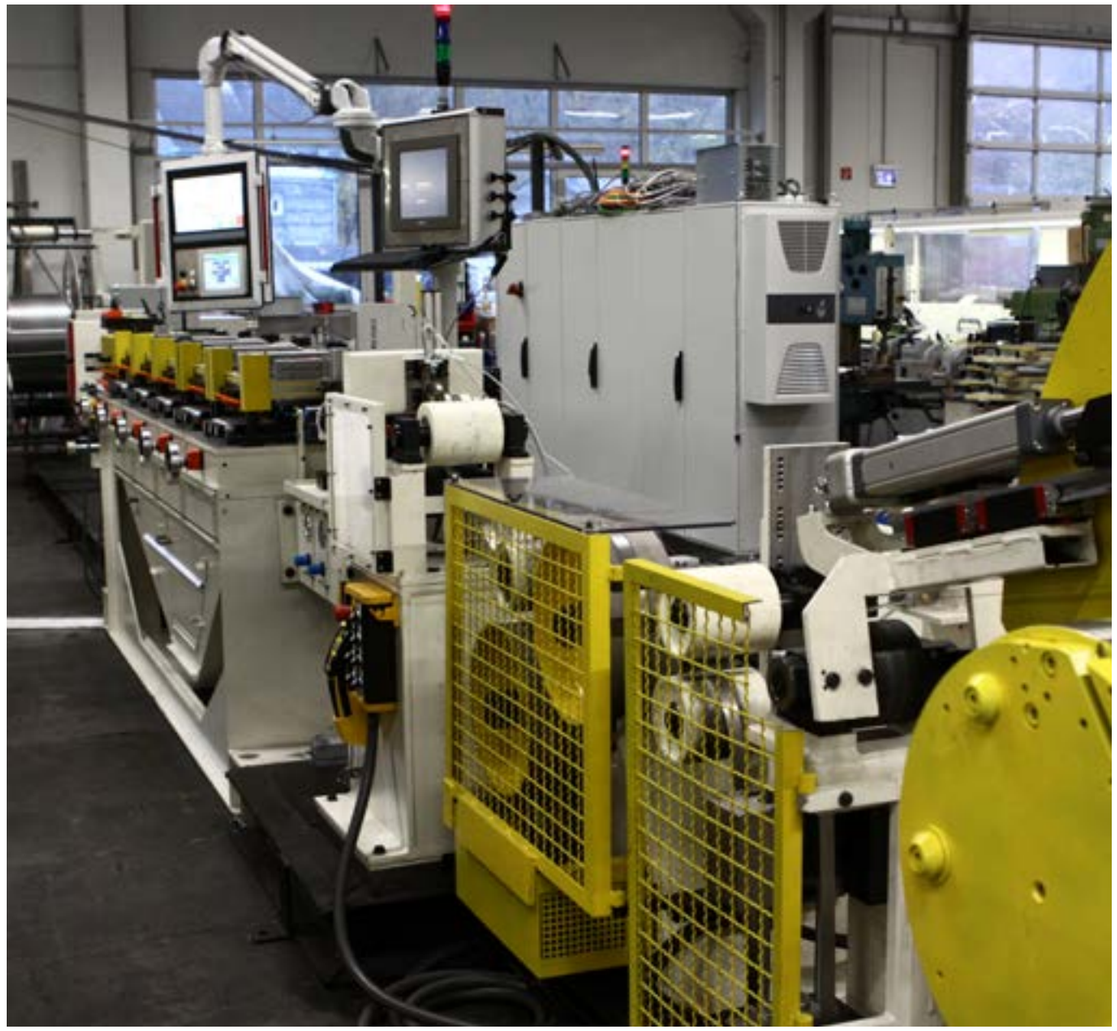
Modular strip edging

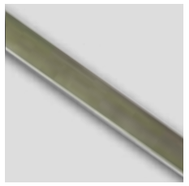
The modular concept allows different modules to be integrated into a full operational line.

It facilitates other modules to be added later if and when demand changes.

The following modules can be integrated into a strip processing line:

- strip edge trimming machines
- strip surface treatment machines
- traverse winding and multi-coil systems
- strip tension technique
- levelling machines
- measuring devices





Example of a modular strip edge trimming line (drawing here above) with (f. l. t. r.):

- decoiler with strip tension technique and multi-coil system
- brushing machine
- flat levelling machine
- UNO deburring device with brushing machine and disk brake
- two calibrating rolls
- vertical levelling machine
- QUINTO strip edge trimming machine
- stripper
- speed measurement
- S-block and dancer
- pneumatical guiding arm
- recoiler with traverse winding system
- pressing arm and turnstile

THE MODULAR SYSTEM – LINES SERIES BHR/BKB/S

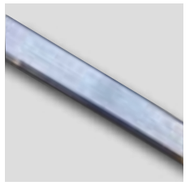
Strip edge trimming by metal-cutting for heavy-duty applications

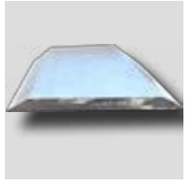
With large cutting cross-sections and high power, the stress during metal-cutting machining of the strip edges is very high.

For this case, the Berger Gruppe has developed the strip edge trimming machines of the BHR/S series.

They are designed for processing under high loads with high material removal.

While maintaining the most precise tolerance values, they can also work a complex contour with wide chamfers on thick and/or hard strips.





A new concept of support arrangement has optimized the swarf removal. It is now possible to work with a thick swarf and eliminate a maximum of material in one pass.

The arrangement of the hydraulic clamping in the guide rails on both sides and the use of additional cylinders have increased the capacity so that the machine can work vibration-free even under high loads.

- strip width: max. 2 000 mm
- strip thickness: 0.15–8 mm
- contours: all contours/chamfers
- speed: up to 300 m/min
- strip material: all machinable materials

REQUEST FOR QUOTATION

QUESTIONNAIRE FOR TECHNICAL DATA

Company	_____
Contact	_____
E-Mail	_____
Phone/Fax	_____

WORKPIECE	Workpiece			
	Lot size			
	Batch size			
	Number of types			
	Sample			
	Drawing			
PROCESSING	Contour milling	Serrated grinding		
	Back grinding	Scalloped grinding		
	Flat grinding	Sharpening / Re-sharpening		
	Flat bevel grinding	Smooth grinding of steel strip		
	Hollow grinding	Serrated grinding of steel strip		
	Polishing	Strip processing by metal-cutting		
MACHINE	Automatic loading/unloading	central	decentralized	
	Autonomy, capacity magazine			
	Coolant system			
	Flow Control for coolant supply			
	Magnet valve for coolant flow start/stop			
	Chiller for coolant system			
	Coolant tank	single-shell	double-shell	
	Exhausting device			
	Connection	central	decentralized	
	Full enclosure			
	Safety fence			
	Tension			
	Preferences control	Andron	Bosch	Siemens
	Preferences robot	ABB	KUKA	
	Starting up	customer's site		
	Transport			
	Guarantee extension			

Please send the questionnaire to sales@bergergruppe.de.

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