TOOL INDUSTRY

MACHINES + ROBOTIC CELLS FOR

grinding | sharpening | polishing | serrating

BERGER GRUPPE

CONTENTS

MACHINES AND ROBOTIC CELLS

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HAND- AND GARDEN TOOLS

WORKPIECES

MECHANICAL MACHINING OF TOOLS

Grinding, sharpening, polishing, serrating and profile generating

The Berger Gruppe offers a wide range of CNC-controlled machines and robot cells for mechanical processing of hand and garden tools.

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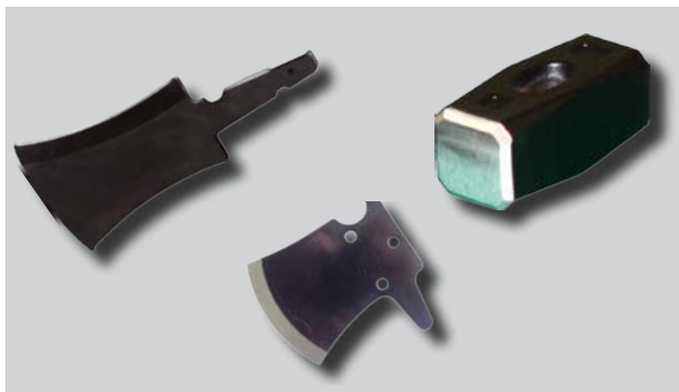

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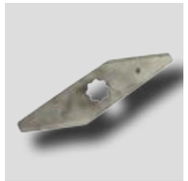
GRINDING MACHINES

FOR SINGLE WORKPIECES

GRINDING
SHARPENING
SERRATING

Grinding with CNC technique

The Berger Gruppe offers a wide range of CNC-controlled machines for processing workpieces of different sizes and geometries.



The following operations can be performed:

- surface grinding
- radii grinding
- flat grinding
- serrated and scalloped grinding
- sharpening
- glazing
- hollow grinding

The following machines are part of the product range:

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

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

Examples of use (pictures)

1. Surface grinding of garden shears with flat bevel grinding machine series BG1/ZA/NT (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 firmer chisels with flat bevel grinding machine BG1/NT (picture 3)

FLAT BEVEL GRINDING MACHINES
FRONT SIDE GRINDING MACHINES

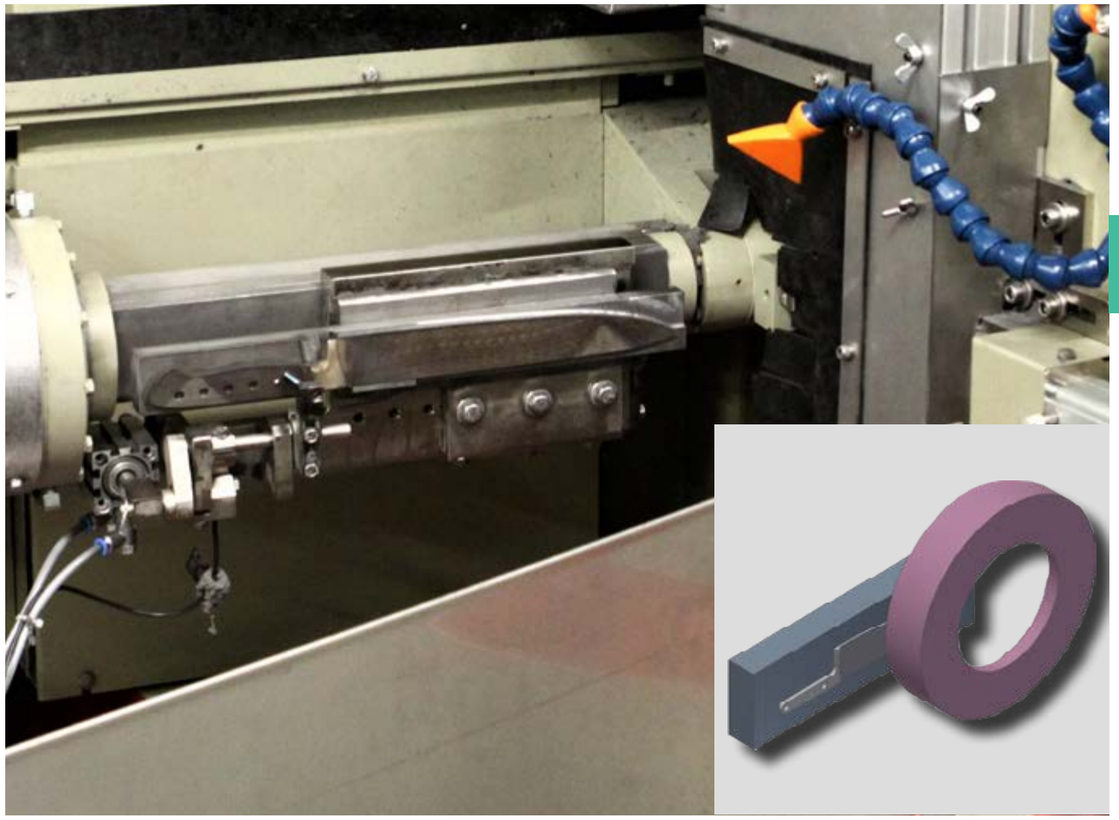
Plane-side transverse or front-side deep grinding process

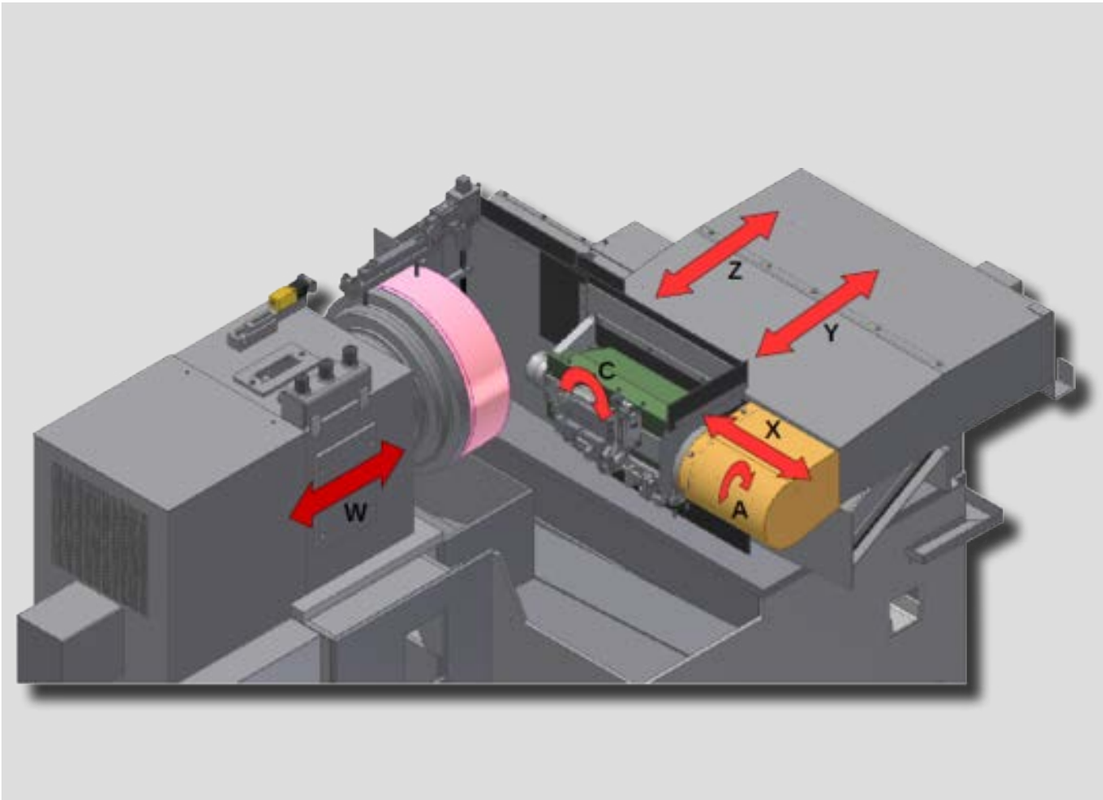
Surface grinding is a widely used grinding process for the machining of machine knives. It is mainly used for processing flat and plane workpieces. Surface grinding can be achieved both in deep grinding and pendulum grinding.

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 (164 ft/s) 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 (47.2") 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.



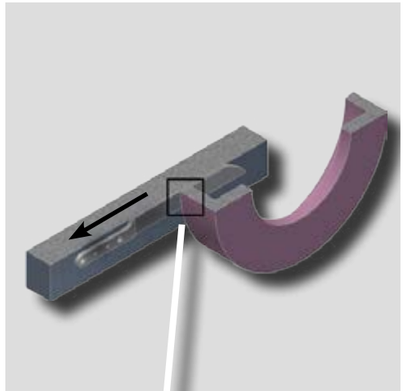


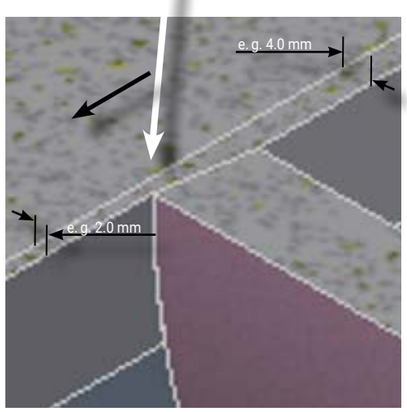
When grinding with the plane side grinding method, the material removal results in a bevel on the wall (drawing p. 9).

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 Ø 450–710 mm (17.7"–27.95")
- Feed speed 30–50 m/s (98.4–164 ft/s)
  Feed 700–2 000 mm/min (27.6"–78.7")
- 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 BG/NT

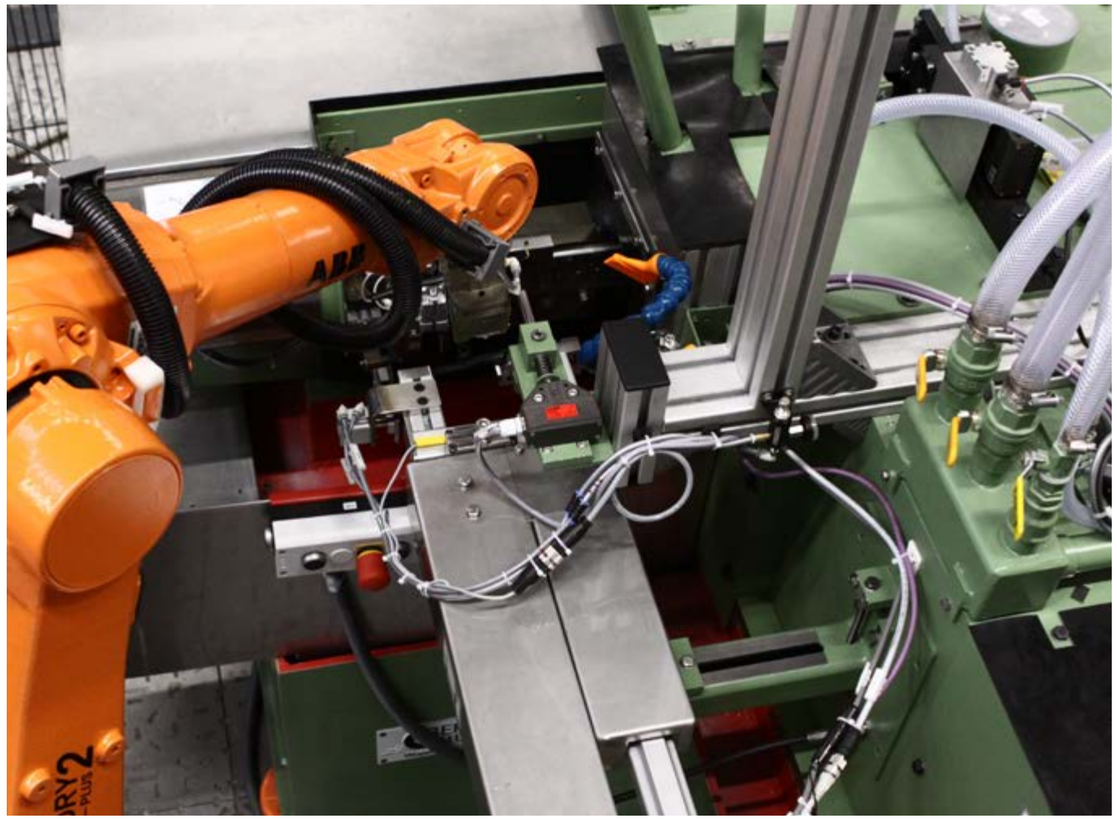
Surface grinding of complex geometries

The BG/NT is the most widely used flat bevel grinding machine of the Berger Gruppe. It achieves surface grinding on workpieces with complex geometries.

Depending on the size of the workpiece, the grinding machine is equipped with grinding wheels with different diameters.

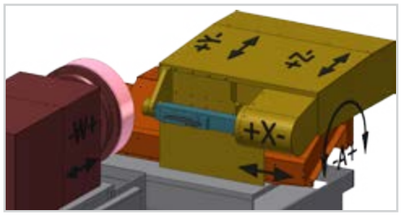
The grinding machine is equipped with four contouring axes and one tool axis.

- grinding length: 300–640 mm (11.8"–25.2")
- grinding wheel Ø 80–710 mm (3.15"–28")
- spindle drive 6.5–45 kW
- spindle with backlash-free preloaded precision bearing, designed for circumferential speeds of up to 50 m/s (164 ft/s)
- five-axle CNC control
- horizontal grinding spindle
- Windows control with interface for robots, PLC, measuring technique and other applications
- automatic, central grease lubrication system



- four standard models with different grinding lengths up to 600 mm (23.6") and workpiece Ø of 200 mm (7.87")
- wear-free main axis drive with linear motor – resulting in rapid traverses of 80 m/min (262.5 ft/min)
- precise positioning without backlash due to direct measuring system
- compact precision gear with high rigidity for controlling the flange angle
- workpiece-oriented programming and NC block
- grinding table with four axes:
  - X-axis = main feed axis, grinding tables driven with linear motor
  - Y- and Z-axis = linear contact pressure axes against grinding wheel
  - A-axis = tilt axis/cutting edge angle
- W-axis = infeed axis grinding wheel, infinitely variable and freely programmable
- digital axis drives on preloaded ball screw Y- and Z-axis or precision reduction gear A-axis, digital axis drive linear motor for X-axis

Axle arrangement BG/NT



Examples of use (pictures)

1. Axe, blade/cutting edge (picture 1)
2. Axe, cutting edge (picture 2)
3. Plate shears (picture 3)
4. Tailor's shears (picture 4)

FLAT BEVEL GRINDING MACHINES BG/RH/NT

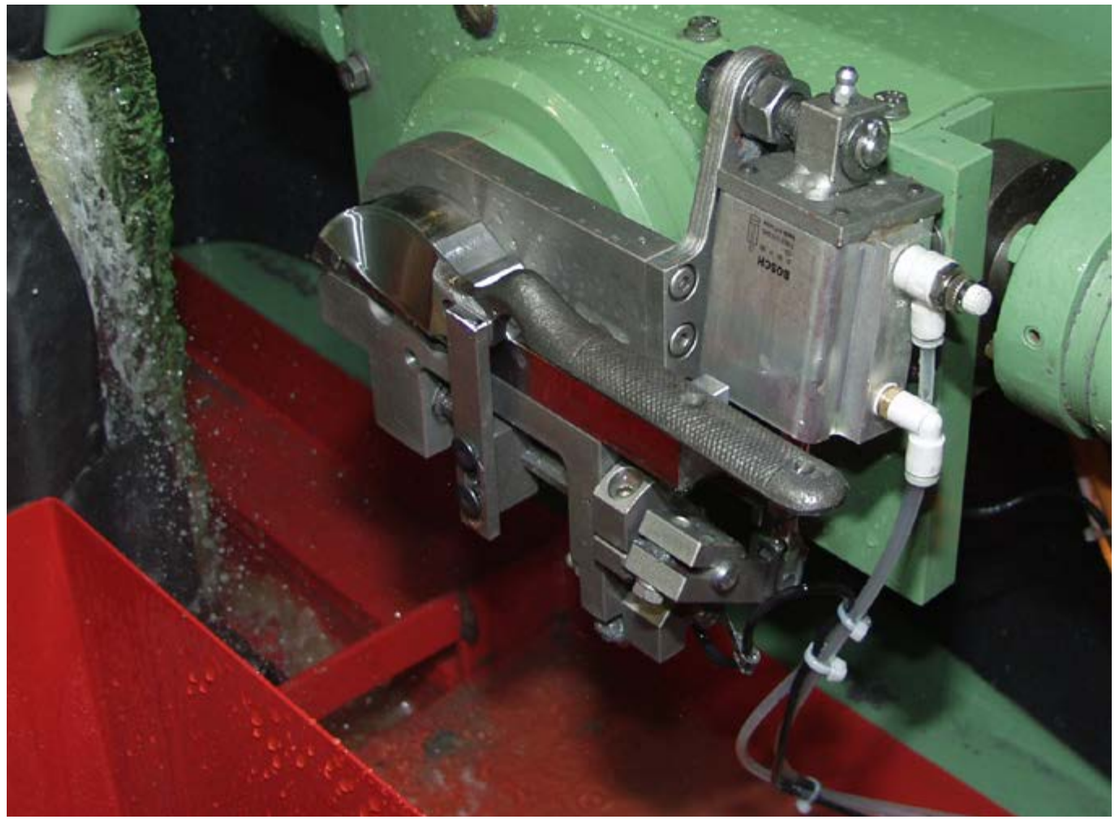
Radii grinding

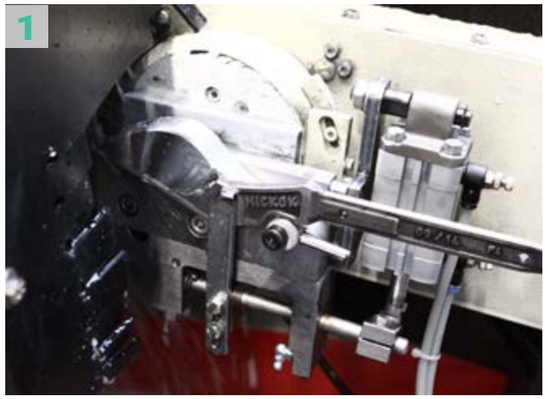
The CNC controlled flat bevel grinding machine of the BG/RH/NT series is designed for grinding curved cutting edges, e.g. on garden shears, branch shears, hedge trimmers, axes, hand tools and circular blades.

It is equipped with up to five contouring axes and one tool axis.

In addition to the technical data listed under BG, the machine has the following specifications:

- grinding length 300–640 mm (11.8"–25.2")
- mounting flange for grinding wheels with Ø 80–710 mm (3.15"–28")
- spindle drive 6.5–45 kW
- spindle with backlash-free preloaded precision bearing, designed for circumferential speeds of up to 50 m/s (164 ft/s)
- six-axle CNC control
- digital axis drives on preloaded ball screw, Y- and Z-axis or precision reduction gear A- and C-axes, digital axis, drive linear motor for X-axis



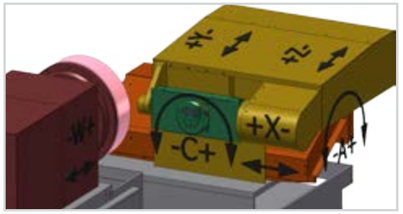


- grinding table with five axes:
  - X-axis = main feed axis, grinding tables driven with linear motor
  - Y- and Z-axis = linear contact pressure axes against grinding wheel
  - A-axis = tilt axis/cutting edge angle
  - C-axis = horizontal axis of rotation
- W-axis = infeed axis grinding wheel, infinitely variable and freely programmable, or with support axis for anvil blade (picture 4) and additional hollow grinding (picture 3)

Examples of use (pictures)

1. Combined radius on the outside of garden shears (picture 1)
2. Constant radius on the outside of garden shears (picture 2)
3. Additional hollow grinding on the outside of garden shears (picture 3)
4. Use of a support axis for grinding on both sides in one clamping (picture 4)

Axle arrangement BG/RH/NT



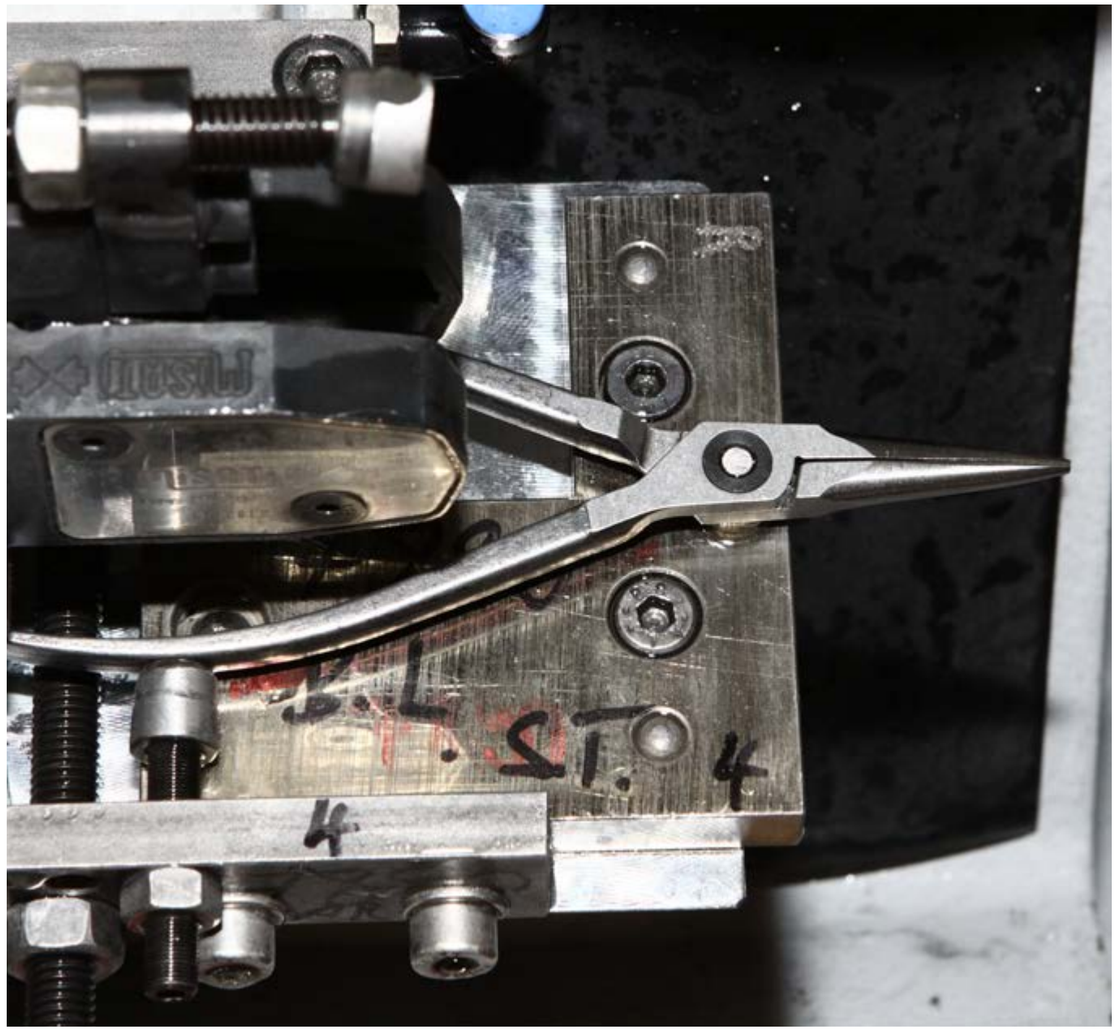
FLAT BEVEL GRINDING MACHINES BG/RV/NT

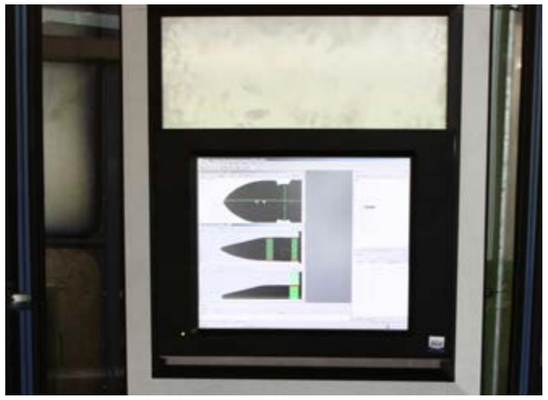
Grinding of extremely curved workpieces

The CNC controlled flat bevel grinding machine of the BG/RV/NT series processes strongly curved radii.

Surgical scissors, manicure scissors, pliers, hooks on garden shears and similarly shaped workpieces can be processed.

The grinding machine is equipped with four contouring axes and one tool axis.

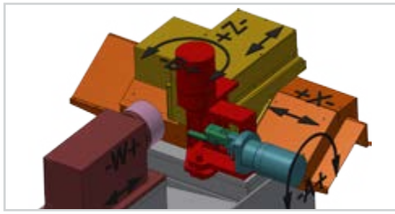




In addition to the technical data listed under BG, the machine has the following specifications:

- grinding length 150 mm (5.9")
- mounting flange for grinding wheels with Ø 80–200 mm (3.15"–7.87")
- precision-bearing grinding spindle, directly driven by special motor, power 6.5 kW
- frequency converter for stepless control of spindle speed 2000– 6000 rpm, power 7.5 kW
- five-axle CNC control
- digital axis drives on preloaded ball screw, Z-axis or precision reduction gear (A- and B-axes), digital axis drive, linear motor for X-axis

Axle arrangement BG/RV/NT



- grinding table with four axes:
  - X-axis = main feed axis, grinding tables driven with linear motor
  - Y-axis = linear contact pressure axes against grinding wheel
  - A-axis = tilt axis/cutting edge angle
  - B-axis = axis of rotation
- W-axis = infeed axis grinding wheel, infinitely variable and freely programmable,

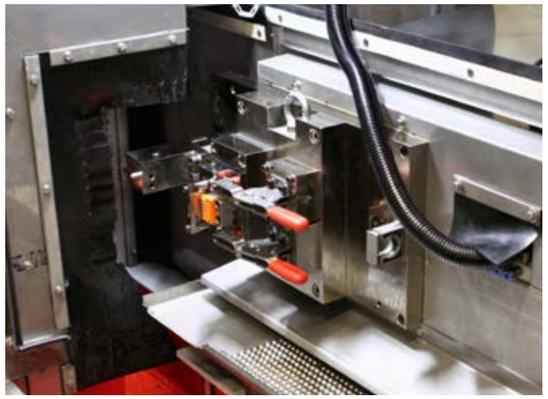
FLAT BEVEL GRINDING MACHINES BG/ZA/NT

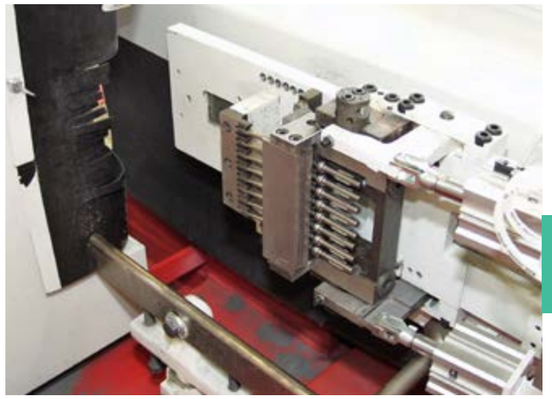
Economic grinding of simple geometries

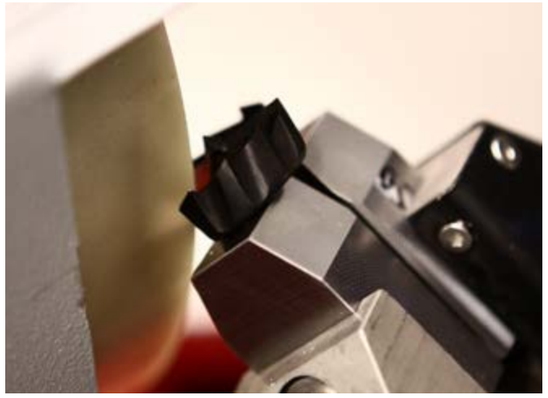
The CNC controlled flat bevel grinding machine of the series BG/ZA/NT is designed for the economical grinding of workpieces with simple geometries.

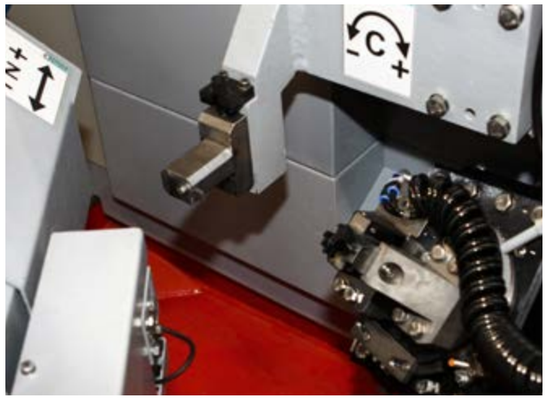
The grinding machine is equipped with three contour giving axes. It is comparable with the DG/NT flat bevel grinding machine.

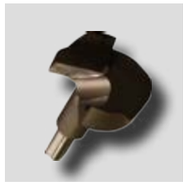
In contrast to the DG/NT, however, the BG/ZA/NT has a horizontal grinding spindle.





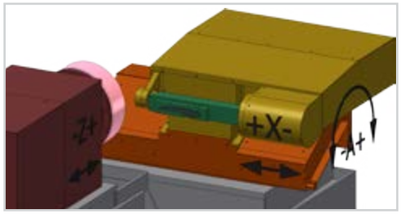






- grinding length 300–640 mm (11.8"–25.2")
- mounting flange for grinding wheels with Ø 80–710 mm (3.15"–28")
- spindle drive 6.5–45 kW
- spindle with backlash-free preloaded precision bearing, designed for a circumferential speed of up to 50 m/s (164 ft/s)
- three-axle CNC control
- digital axis drives on preloaded ball screw, Z-axis or precision reduction gear (A-axis), digital axis drive, linear motor for X-axis
- grinding table with two axes:
  - X-axis = main feed axis, grinding table driven by linear motor
  - A-axis = tilt axis/cutting edge angle
- Z-axis = contour giving infeed axis for grinding wheel

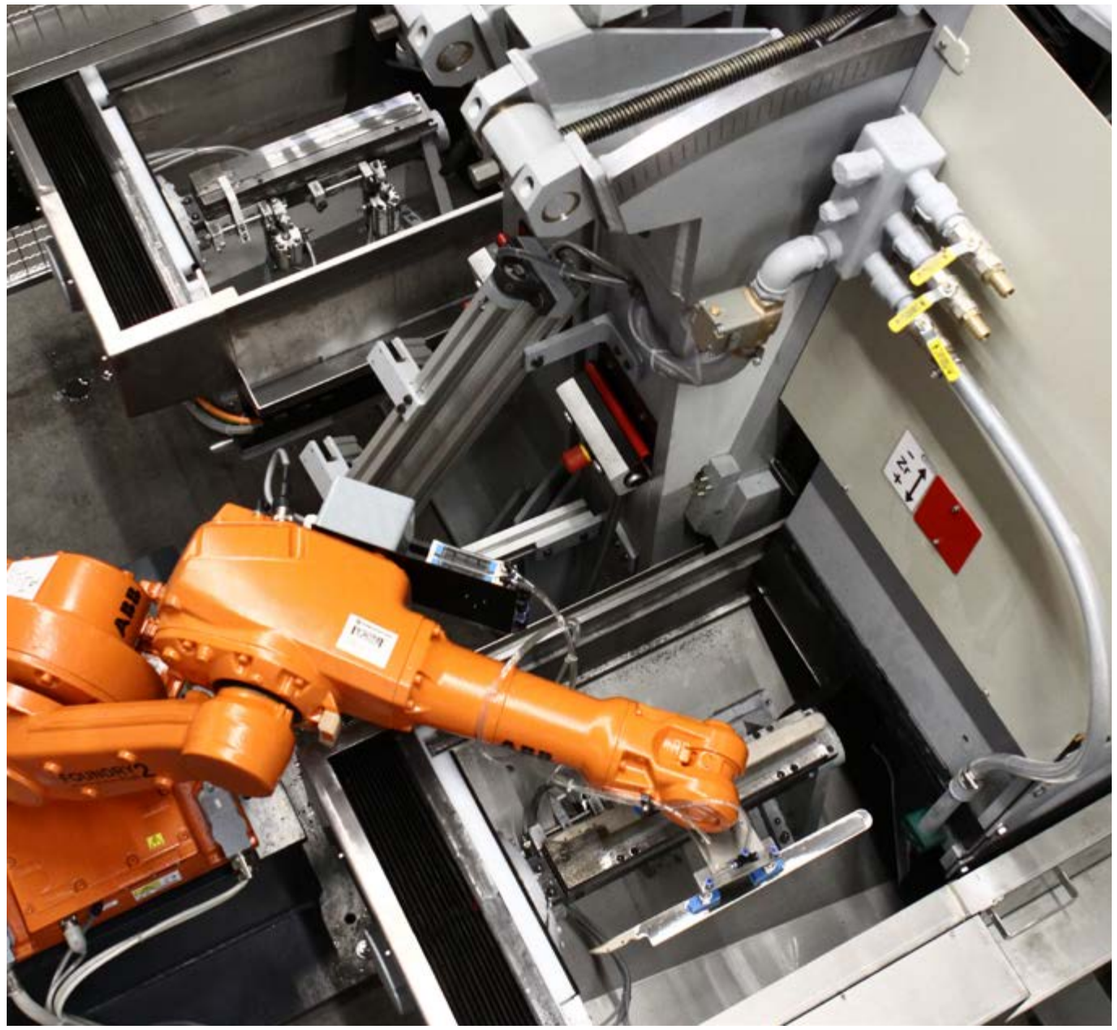
Axle arrangement BG/ZA/NT

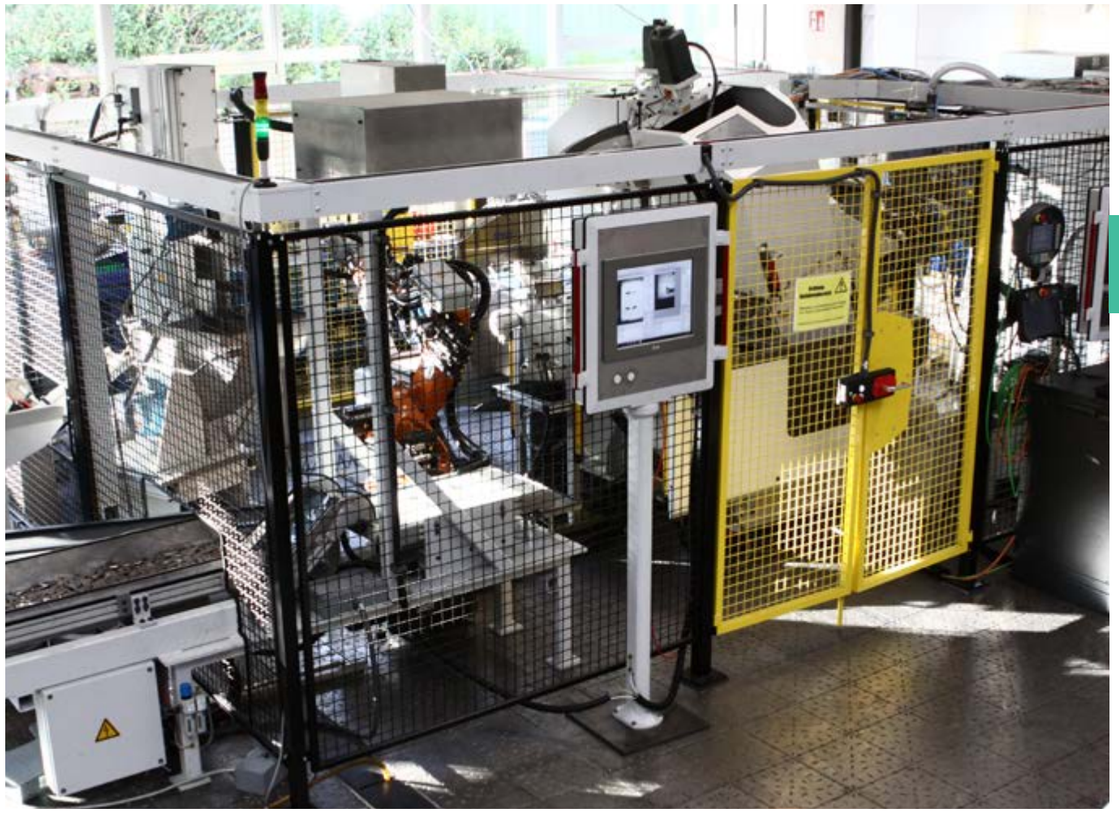


FLAT BEVEL GRINDING MACHINES DG/NT

Space-saving surface grinding

CNC grinding machine with three or four axes and vertical grinding spindle for grinding surfaces e. g. on knives, scissors, hand tools and similar shaped workpieces





- 30% less required space compared 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 (262 ft/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 BG/NT AND DG/NT

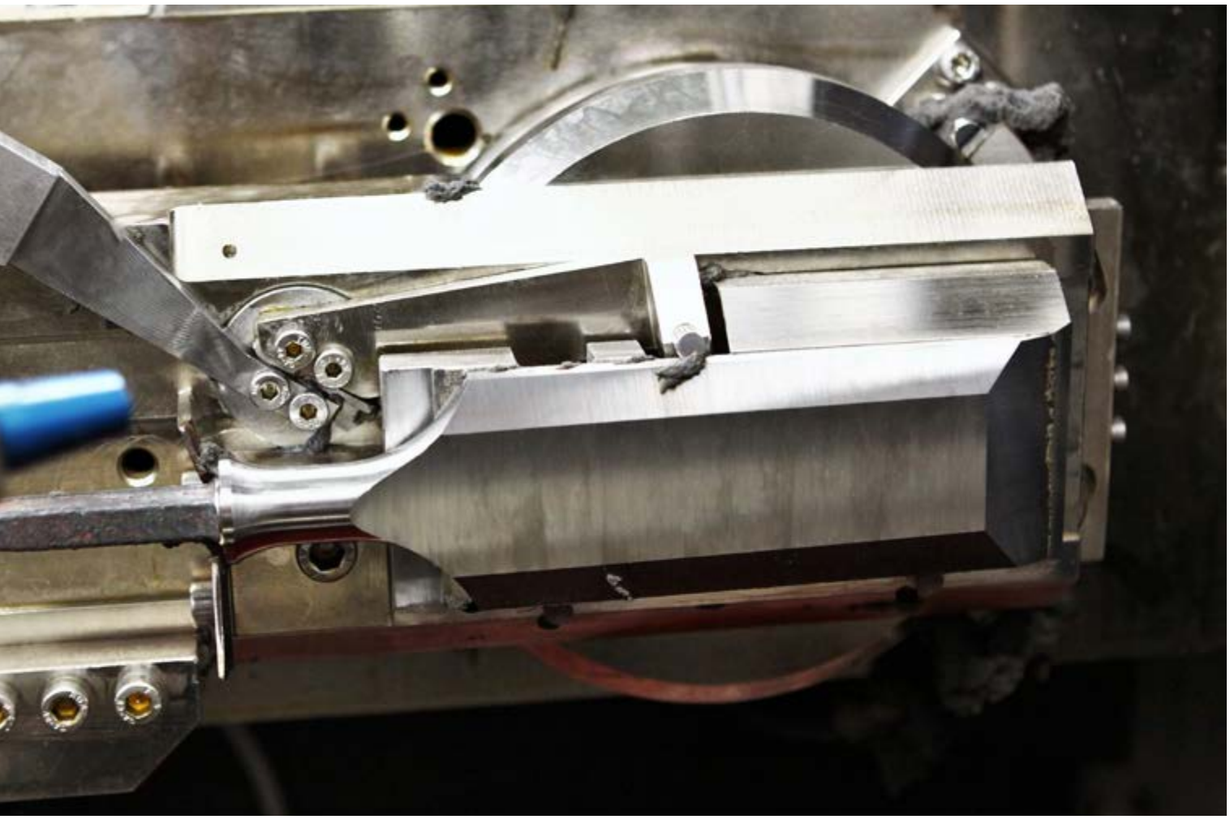
Further applications

Thanks to a wide range of types, the BG/NT and DG/NT series of flat bevel grinding machines machine both straight surfaces on workpieces and workpieces with curved cutting edges and strongly curved radii.

Depending on the size of the workpieces, grinding wheels with different diameters are used.

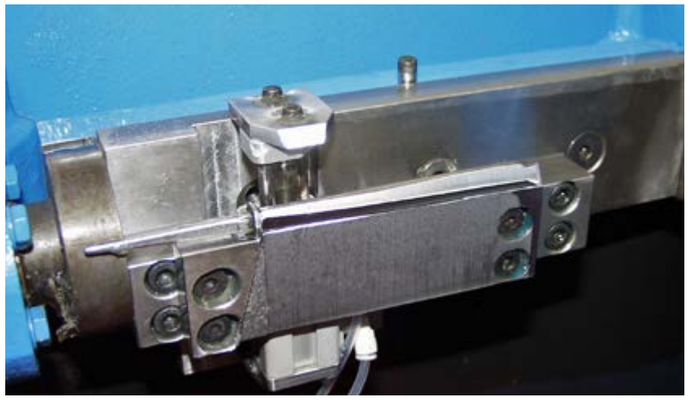
Example of use

- Surface grinding of chisels with flat bevel grinding machine of the BG1/RH/NT series (picture here below)



1

Conical relief grinding on saw blades with flat bevel grinding machine BG/NT



2

Grinding of carving tools with flat bevel grinding machine BG1/NT

3

Surface grinding of plate shears with flat bevel grinding machine BG1/NT

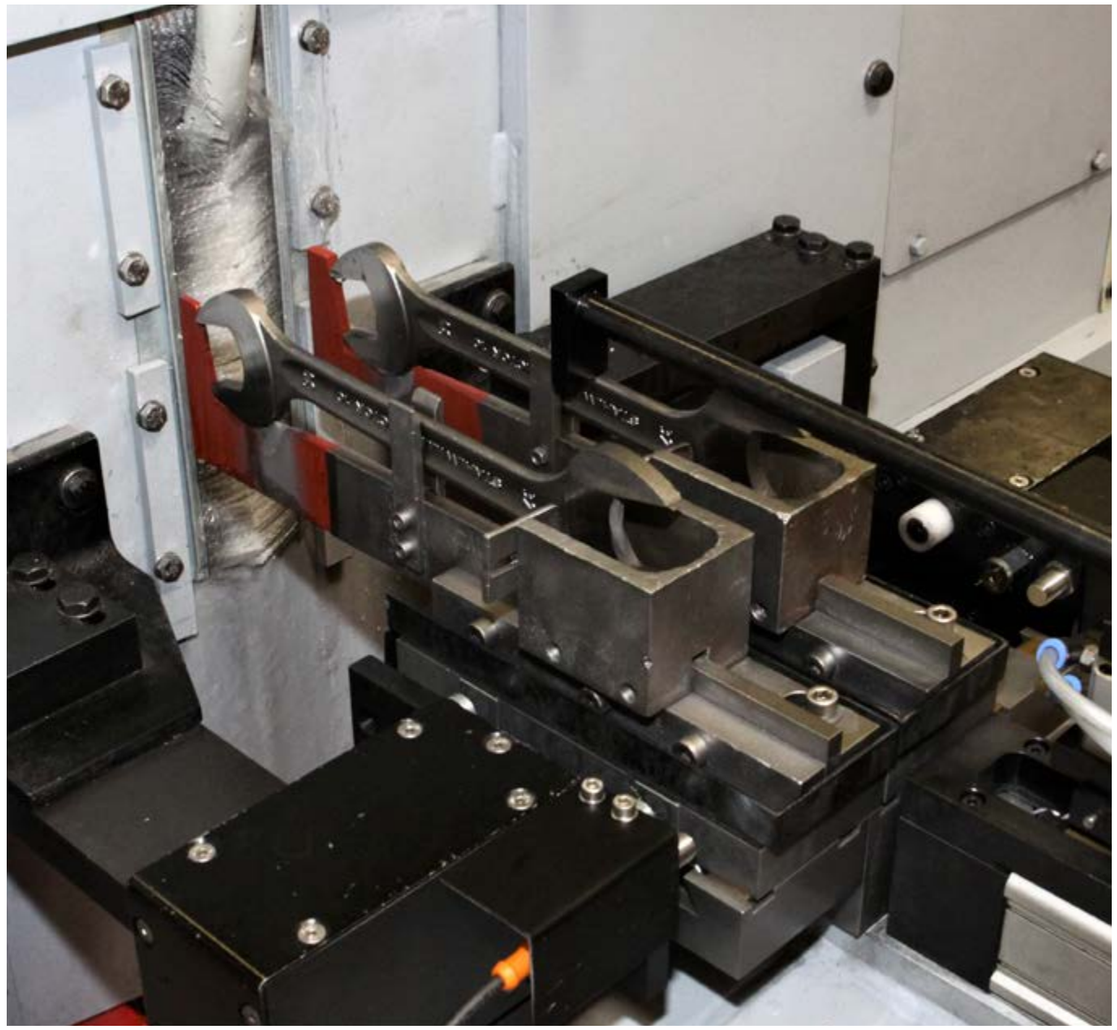
4

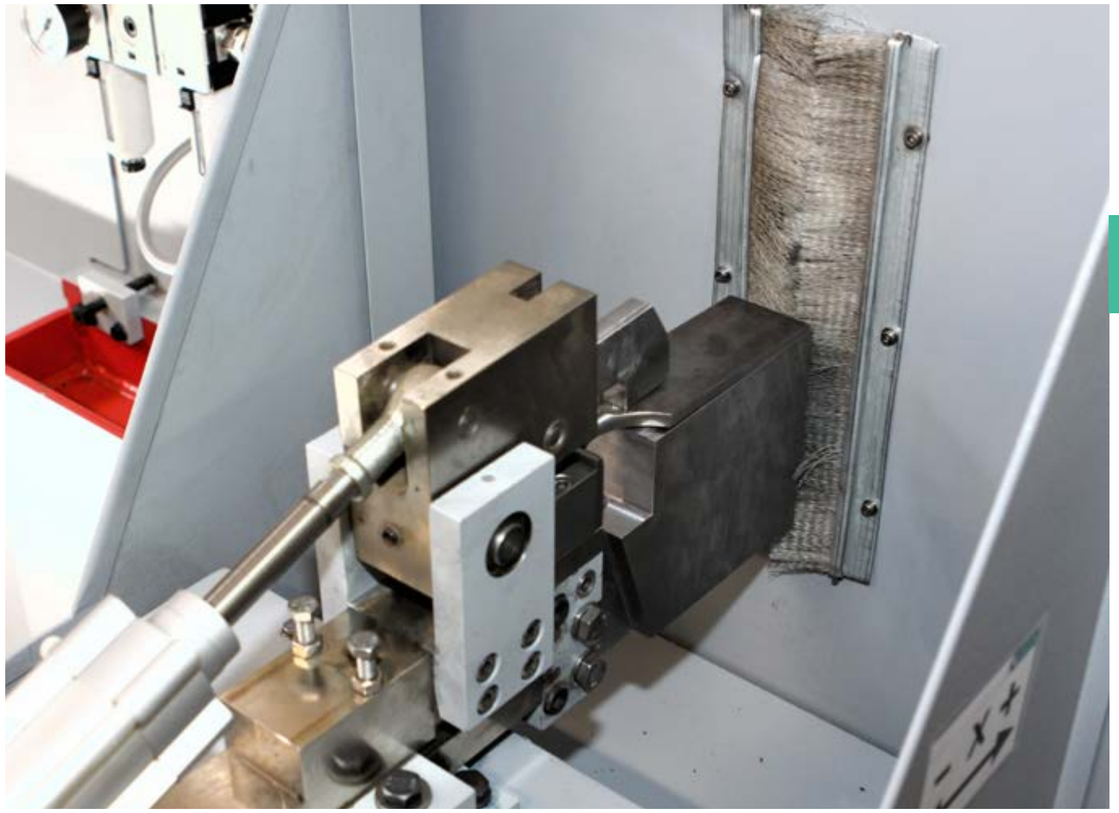
Flat grinding of garden shears with flat bevel grinding machine DG2/NT

FLAT BEVEL GRINDING MACHINES HDS

Double-sided flat grinding

CNC grinding machine with three axes for efficient surface grinding on both sides of parallel surfaces, e.g. on wrenches, pliers, hammers, chisels, swords or conical surfaces, e. g. on adjustable wrenches



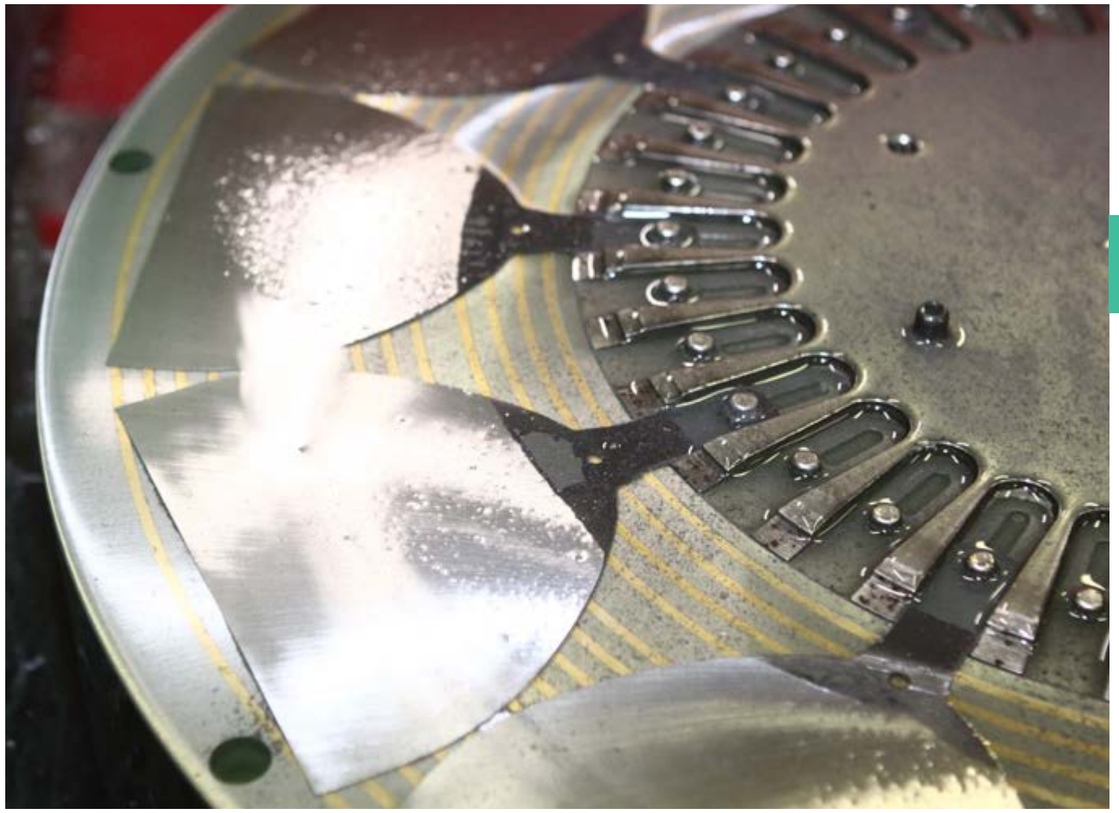


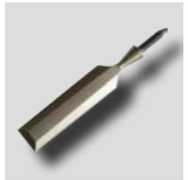
- single grinding (e. g. pliers) or continuous process (e. g. swords)
- grinding wheel Ø 400–700 mm (15.8"–27.6")
- automatic grinding wheel compensation with two independently operating measuring systems
- triaxial CNC control
- central grease lubrication system
- designed for wet processing with grinding emulsion
- two grinding wheels for bilateral processing
- different automatic loading systems

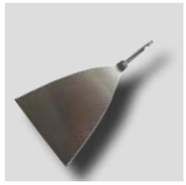
ROTARY TABLE GRINDING MACHINES DRG

Flat grinding

High productivity CNC double rotary table grinding machine with two axes for grinding flat or conical surfaces on a great variety of parts such as table knives, insides of stamped scissors, wood chisels, spatulas or connecting rods







- possibility to set nominal part dimensions on the circular tables with up to four independent gage controls
- electromagnets with interchangeable pole plates
- mechanical, hydraulic or pneumatic clamping fixtures
- table Ø 500–800 mm (19.7"–31.5")

ROTARY TABLE GRINDING MACHINES
RTS

Flat 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.

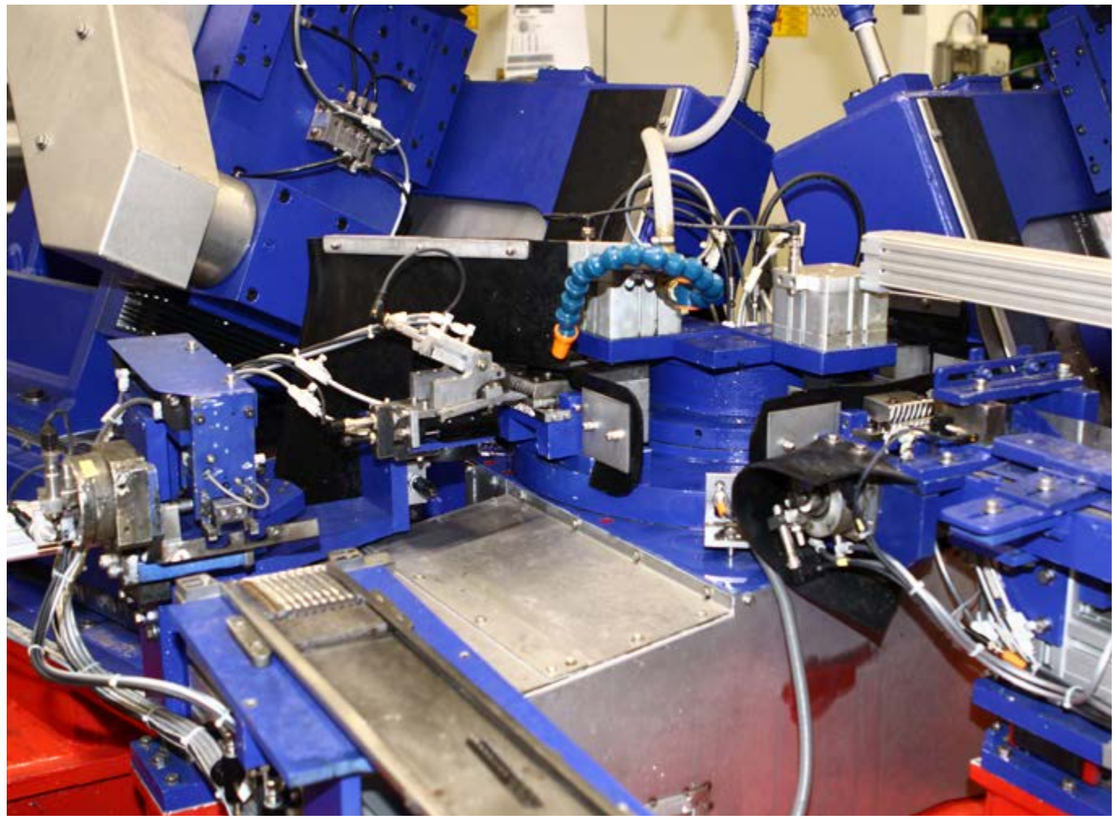
- grinding motor power 37–55 kW
- adapter flange for grinding wheel Ø 600 mm (23.6")
- rotary table speed, variable up to 18 rpm
- mechanical fixture plates or electromagnetic pole plates 600–1 200 mm (23.6"–47.2")
- mechanical measuring sensor to gauge the grinding wheel and to adapt to the wear (option: motor adjustment with digital indication)
- central grease lubrication system
- designed for wet processing with grinding emulsion

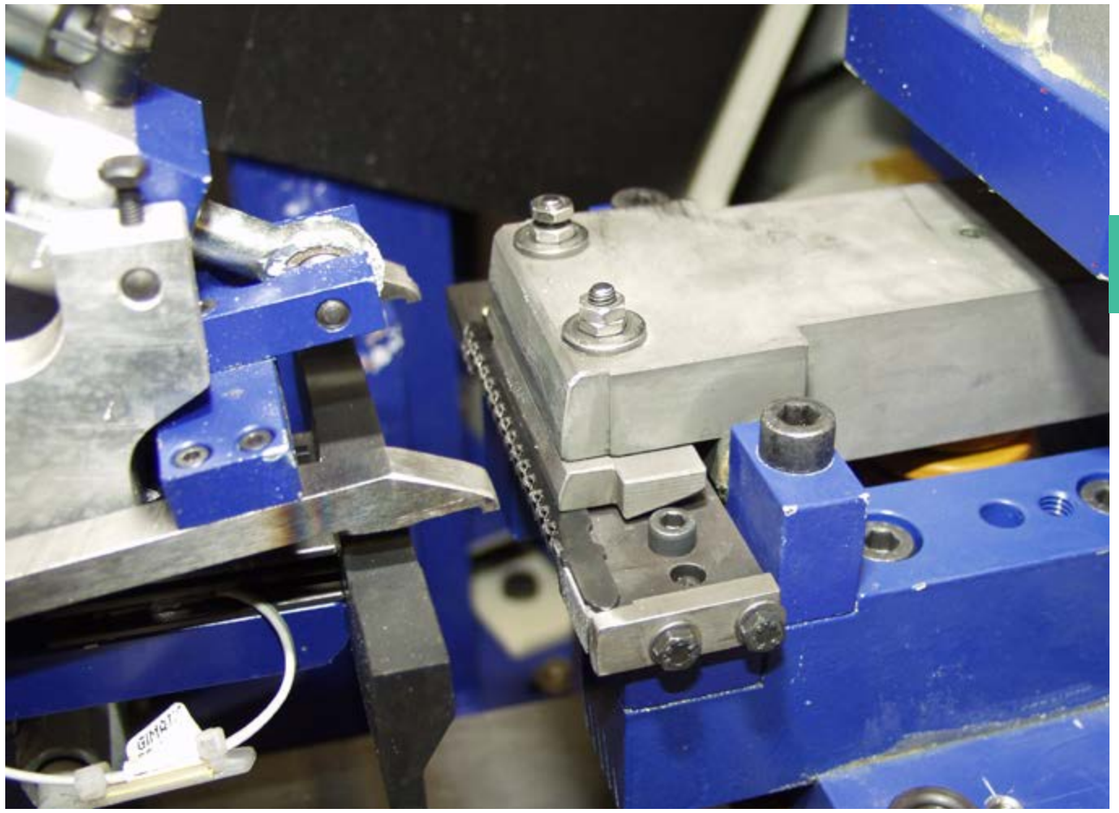
ROTARY INDEX TABLE GRINDING MACHINES RST

Serrated grinding

Rotary index table grinding machines available in various configurations for grinding of steak knives, jigsaws or grinding of blades with serration

- attribution of an adequate grinding station to a precision rotary index table
- working with cup wheels or as plunge grinding process with profiled wheels
- integration of manual or automatic loading and unloading systems possible





Example of use: jigsaws

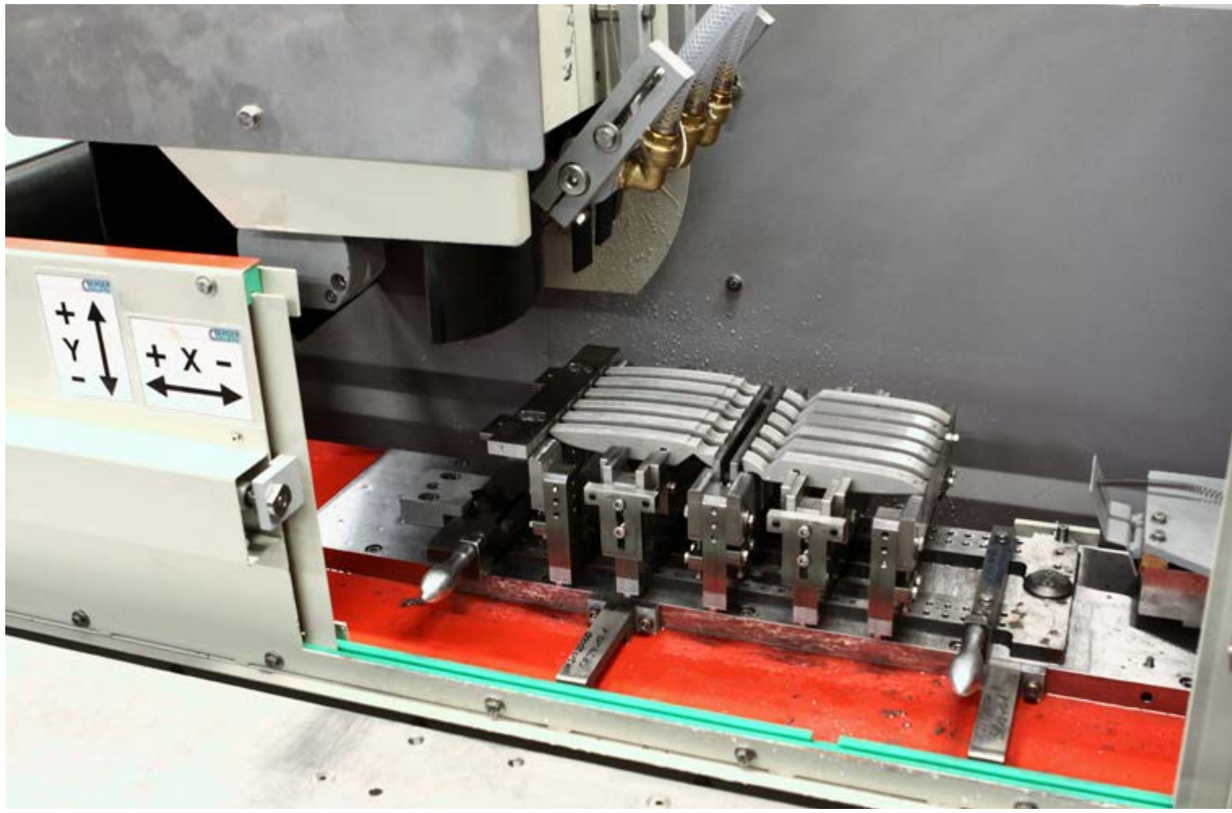
- two grinding stations of the WSL series
- positioning of the grinding station for staggered tooth system e.g. in 25°
- positioning of the grinding station for relief grinding
- feeding by stacking magazine with loading capacity of 1 000 mm (39.37")
- separating of workpieces
- feeding of workpieces by pick and place unit
- precision rotary index table with four positions
- unloading into stacking magazine
- capacity: app. 300–350 jigsaw blades/hour

CONTOUR GRINDING MACHINES
CG

Contour grinding

CNC belt or stone grinding machine with two axes for contour processing of tweezers, knives, scissors, hand tools and similar workpieces

- CNC controlled wet belt grinding machine with grinding belts width 3 500 mm x 200 mm (137.8" × 7.87")
- 15 kW, up to 4000 rpm
- contact roller holder in two versions: Ø 80–200 mm (3.15"–7.87") or 30–100 mm (1.18"–3.94") with additional counter bearing
- grinding stroke up to 550 mm (21.65"), grinding width 180 mm (7.1")
- automatic magazine recognition for subsequent processing of different workpieces
- interval-controlled, automatic grease central lubrication
- automatic oscillation of the grinding belt
- adjustable belt arm 0–45°
- sensor programming by scanning the contour and direct export of the recorded dimensions to the programming interface
- use of raw or finished parts



- identification system for magazines for automatic program recall
- remote maintenance, diagnosis and trouble-shooting via TeamViewer
- different magazine constellations for the processing of scissors and shears such as:
  - loading magazine for scissors (picture at the right side)

PERIPHERAL GRINDING MACHINES

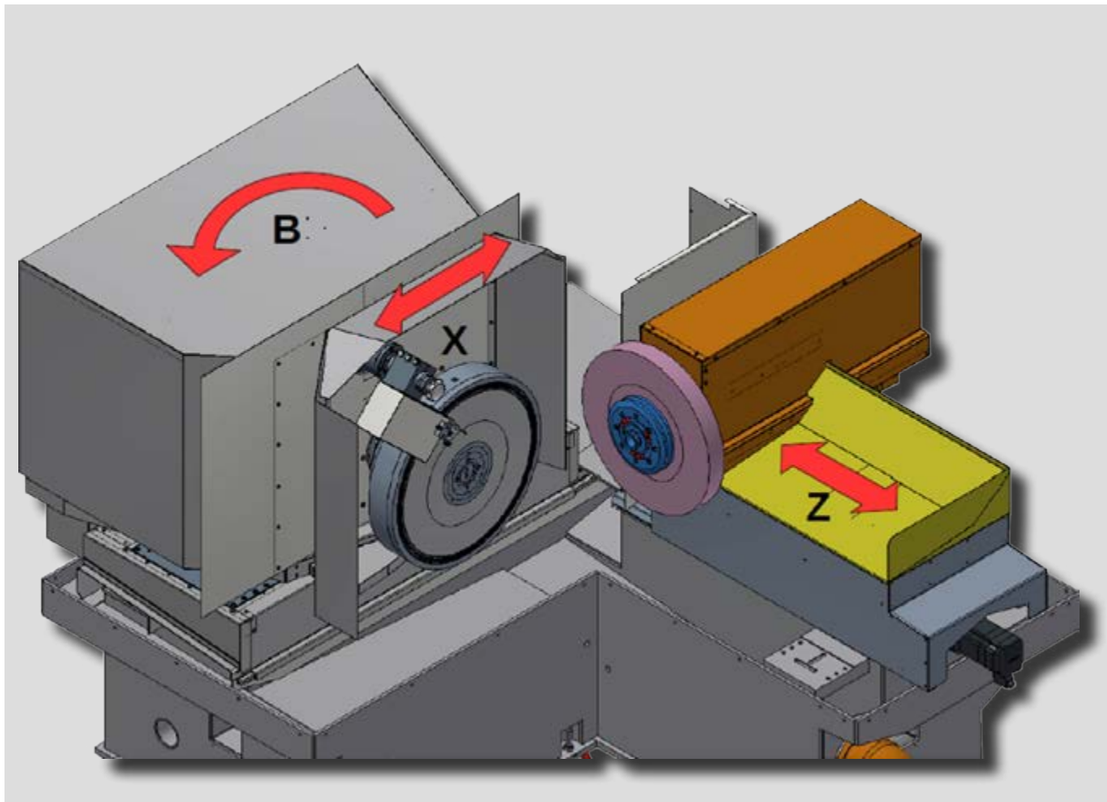
Circumferential, longitudinal and deep grinding processes

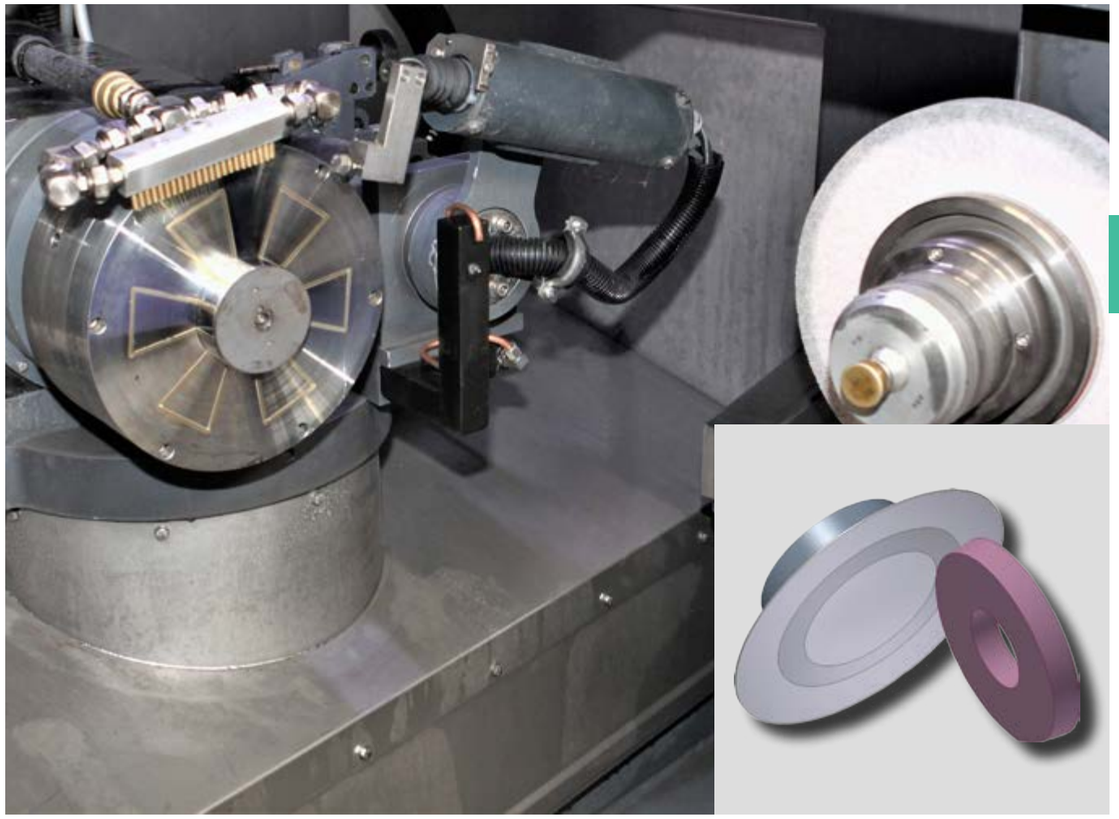
Peripheral grinding machines achieve surface, bevel or serrated grinding on workpieces. The effective area of the longitudinal grinding is the circumference of the grinding wheel.

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

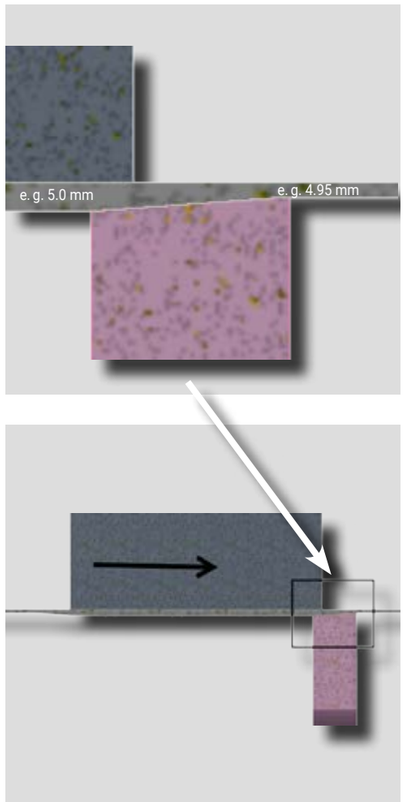
If the workpiece is processed in a deep grinding process, a large amount of material can be removed and a good surface quality can be achieved.

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 Ø 200–600 mm (7.87"–23.6")
- cutting speed 30–65 m/s (98.4–213. ft/s)
- feed rate 100–2 500 mm/min (3.9"–98.4"/min)
- Ø Q'w = 3–12.5 [mm³/(mm s)].
- max. Q'w = 35 [mm³/(mm s)].
- max. cutting weight 16.5 g/s

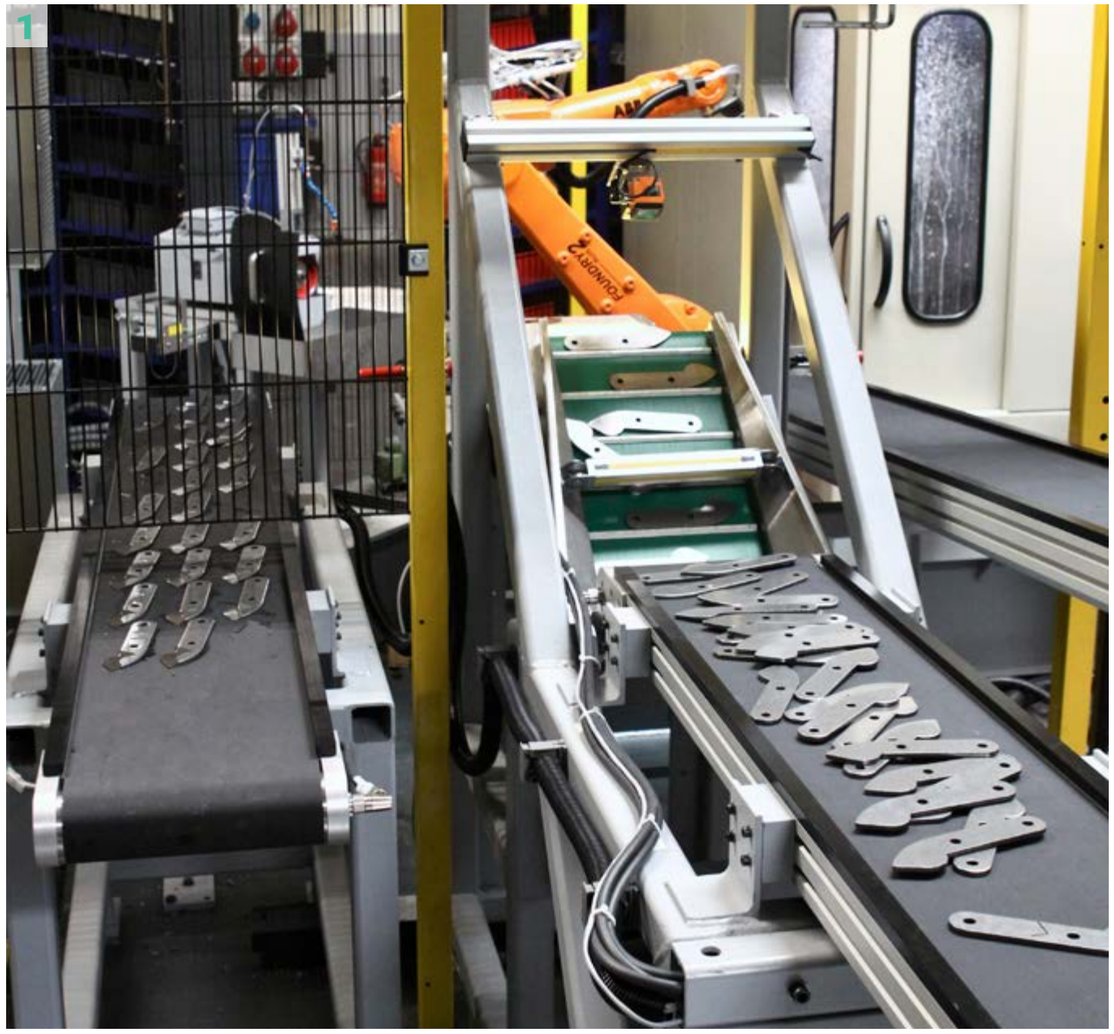


PROFILE AND FLAT BEVEL GRINDING MACHINES SERIES WSL1 AND BG1/RH/NT

Surface and hollow grinding on cutting edges of workpieces

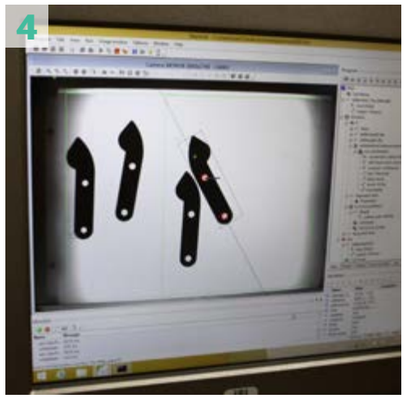
Processing cell for grinding cutting edges of workpieces

- 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 (1.18")



Examples of use (pictures)

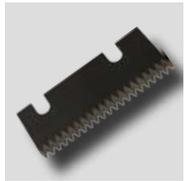
1. Processing cell with feeding of bulk material via Berger Feeder (picture 1)
2. Measurement of the workpiece position via camera measuring table (pictures 2)
3. Peripheral grinding machine of the series WSL1 with two CNC axes (picture 3)
4. Measurement of the position of workpieces via camera measuring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



PERIPHERAL GRINDING MACHINES PH/PB/NT

Contour grinding

CNC controlled peripheral grinding machine with additional vertical axis for contour grinding



- grinding wheel width up to 130 mm (5.1")
- X-axis travel up to 640 mm (25.2")
- grinding wheel Ø 400 mm (15.75") – up to 300 mm (11.8") to be machined
- spindle drive 11 kW
- four-axle CNC control
- frequency converter for stepless control of the spindle speed
- three-axle grinding table
  - X-axis = main feed with linear motor
  - A-axis = tilt axis/cutting edge angle
  - V-axis = vertical axis
- Z-axis = horizontal traverse axis on grinding wheel or dresser
- dresser with driven profile roller or single grain diamond
- automation in connection with robot loading

Example of use: pliers

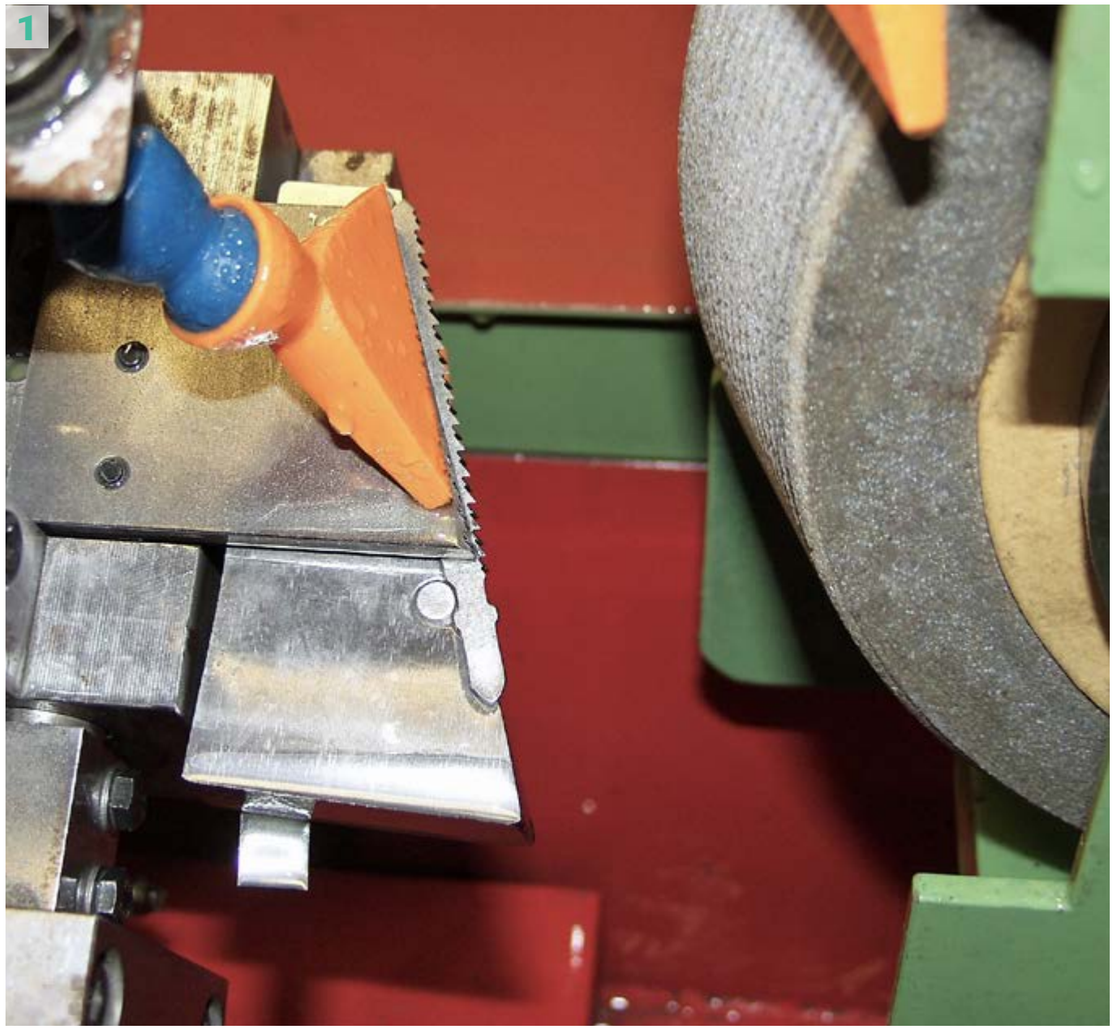
- two milling stations
- peripheral grinding machine PH/PB/NT
- Berger Feeder
- camera measuring system

PERIPHERAL GRINDING MACHINES
WS

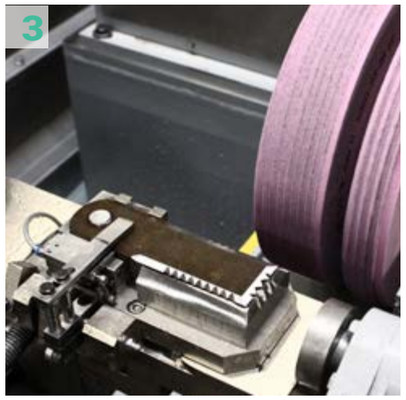
Scalloped and serrated grinding

With up to three axes, the CNC peripheral grinding machine is designed for infeed grinding of gears on knives, surgical blades, scissors, saws or similar workpieces.

- CNC control with display of all operating information / programming of up to three axes
- horizontal wheel motion by AC servomotor driven with preloaded precision ball screw
- maximum grinding width 100 mm (3.94")



- simple workpiece oriented programming with entry of dimensions / parameters
- dressing of the grinding wheel with diamond coated dressing roll, tool steel crush roll or programmable single point diamond
- automatic compensation of workpiece plunge travel after each dressing cycle and maintenance of selected rotational wheel speed (by frequency variation)
- programmable moving at a straight grinding wheel
- composition of the grinding wheel at cross table for plunge grinding and through-feed grinding (WS6)
- cross tooth grinding of saws in connection with a vertical and a pivot axis for saws with a maximum length of 650 mm (25.6") during indexing operation



Examples of use (pictures)

1. Production of saws, cross toothing with additional vertical and tilt axis (picture 1)
2. Production of gouge blades with camera measuring system and automatic loading and unloading (picture 2)
3. Production of mechanical knives (picture 3)

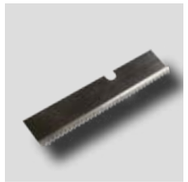
PERIPHERAL GRINDING MACHINES SERIES WSL2

Scalloped and serrated grinding on hedge trimmer blades

CNC peripheral grinding machine for processing hedge shear blades up to 750 mm (29.5")

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 (29.5")
- grinding wheel Ø: 450 mm (17.7")
- grinding wheel width: 120 mm (4.7")
- spindle drive: 22 kW
- cutting speed: up to 45 m/s (147 ft/s)
- two-axle CNC control



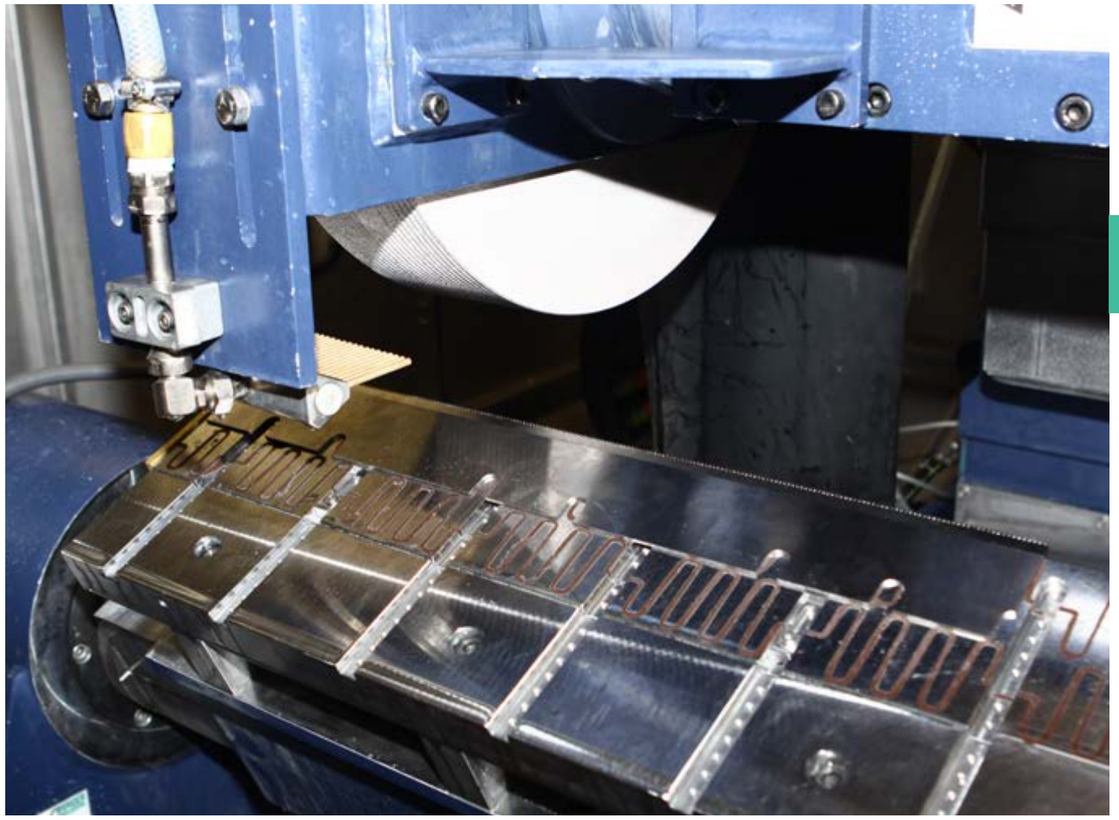
- CNC feed axis for displacing/indexing the hedge trimmer blades with 750 mm (29.5") stroke
- CNC axis for programmable cutting angle adjustment from 30°–45°
- Grinding spindle with precision-bearing shaft and mounting flange for grinding wheels
- dressing/profiling the grinding wheel with diamond-coated profile roller Ø 80 mm (3.15"), 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

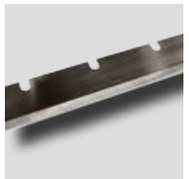
PERIPHERAL GRINDING MACHINES SERIES WSL3

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 (9.8") (option)

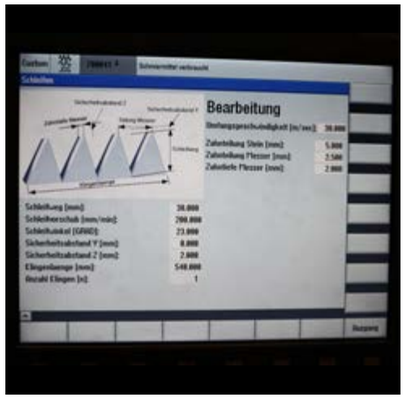
- grinding length: up to 1 800 mm (70.87")
- grinding wheel Ø: 450 mm (17.7"), usable up to 250 mm (9.8")
- grinding wheel width: up to 100 mm (3.94")
- special motor 15 kW with precision-bearing shaft and mounting flange for grinding wheels
- cutting speed: up to 45 m/s (147 ft/s)
- up to seven axes (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 (98.4–147 ft/s)





Scalloped and serrated grinding

- dressing/profiling of the grinding wheel with diamond-coated profile roller Ø 140 mm (5.5"), 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

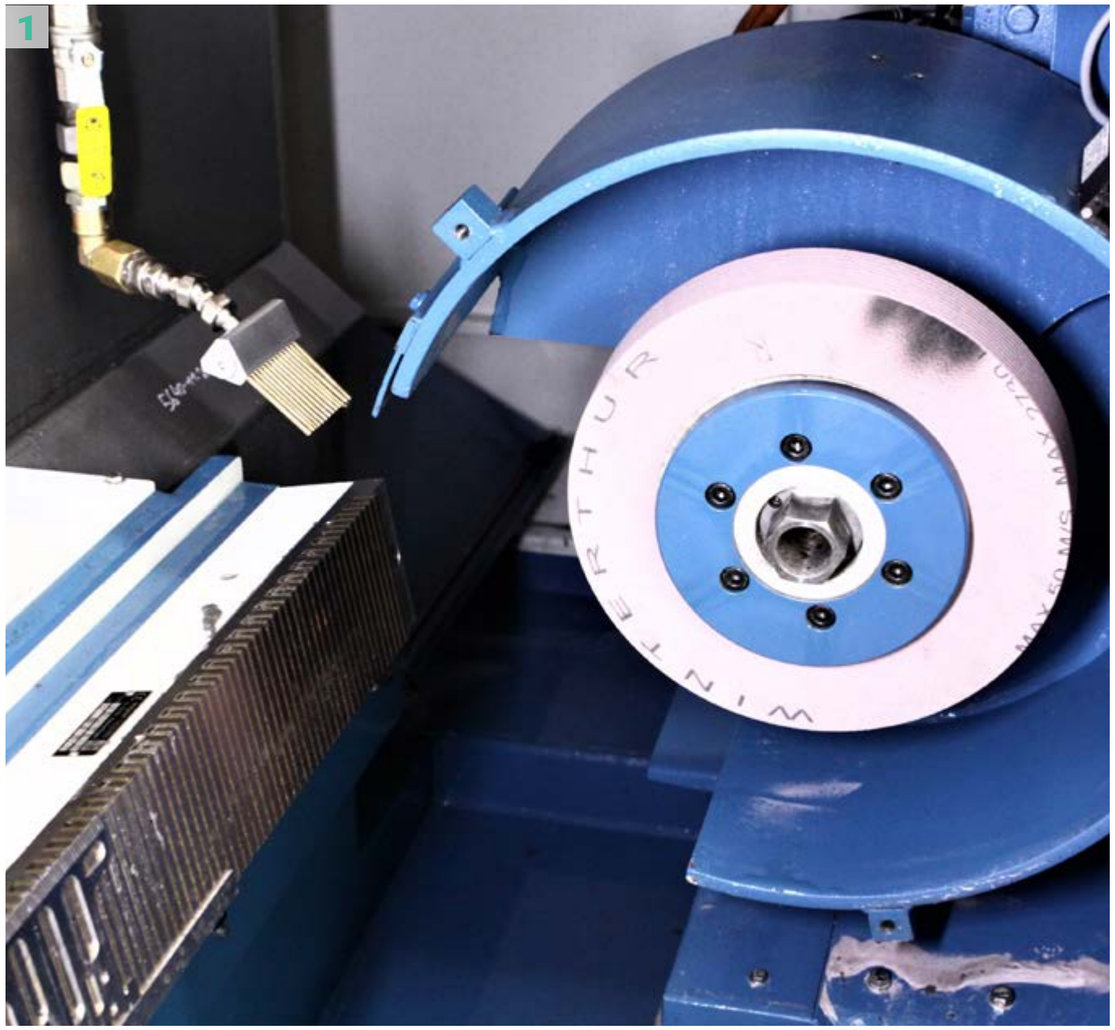


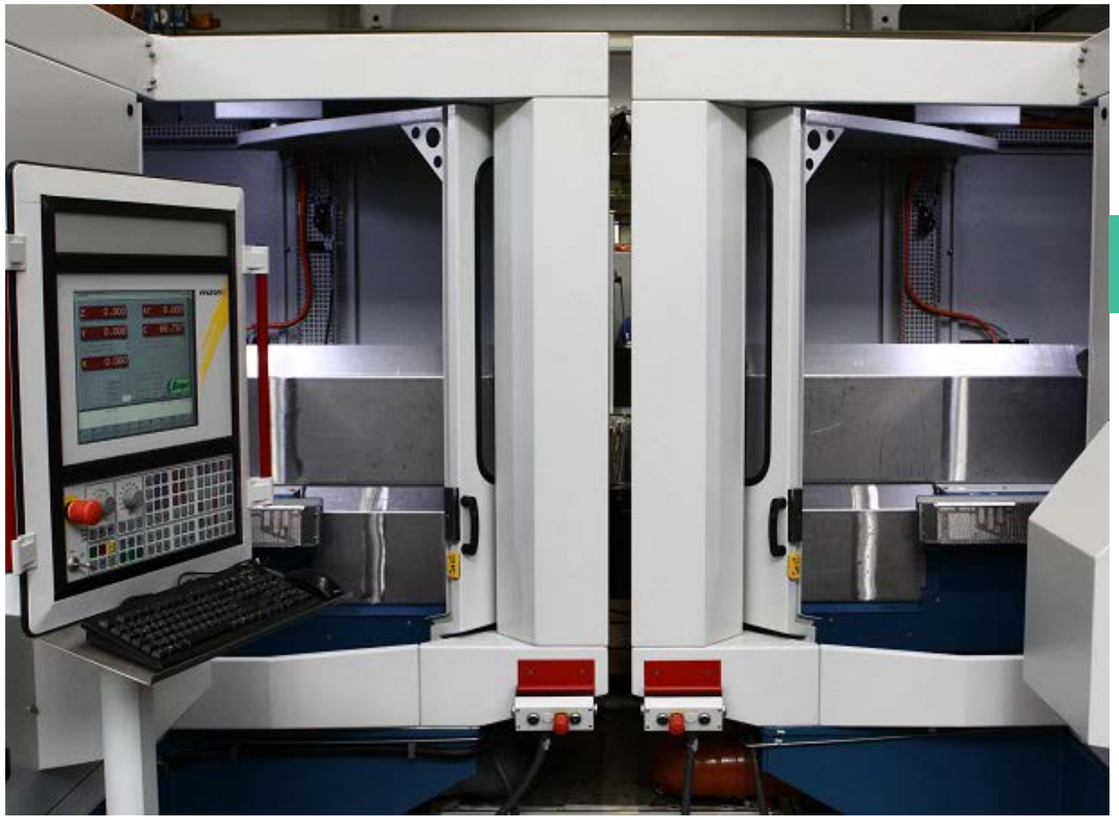
PERIPHERAL GRINDING MACHINES SERIES WSL4

Serrated grinding – straight or with relief grinding

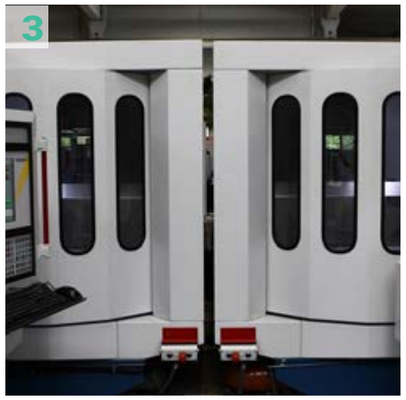
Double-sided CNC grinding machine for serrating machine knives with relief grinding

- grinding length: up to 600 mm (23.6")
- grinding wheel Ø: 450 mm (17.7")
- grinding wheel width: 110 mm (4.3")
- spindle drive: 18.5 kW
- cutting speed: up to 45 m/s (147 ft/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





- 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)



Examples of use (pictures)

1. Peripheral grinding machine of the WSL4 series 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

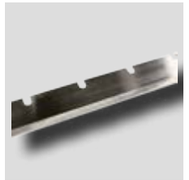
PERIPHERAL GRINDING MACHINES SERIES WSL5

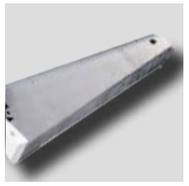
Serrated grinding on saw blades

The presented peripheral grinding machine is designed for serrated grinding of saw blades with a maximum length of 650 mm (25.6").

Grinding is performed in a package with a thickness of up to 40 mm (1.57"). Approximately 45 saws (depending on the material thickness) can be ground in one package.

- grinding length 150–650 mm (5.9"–25.6")
- grinding wheel-Ø: 500 mm (19.7") with HSK receptacle (hollow shank taper receptacle)
- grinding wheel width: 130 mm (5.1")
- spindle drive: 80 kW
- cutting speed: 30–50 m/s (98.4–164 ft/s)
- five-axis CNC control (Siemens)

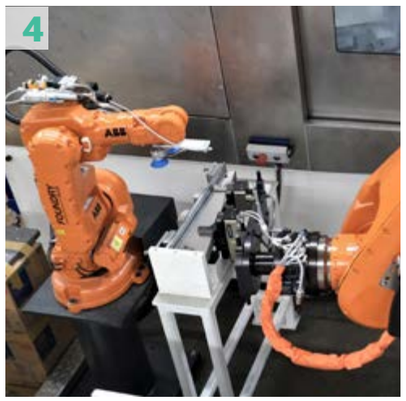




- workpiece length: 150–650 mm (5.9"–25.6")
- workpiece thickness: 0.4–1.3 mm (0.016"–0.05")
- two grinding stations with one vertical and two horizontal slides, one rotation axis -40°-0° for grinding saw blades in a package
- automatic change of dressing system
- automatic change of grinding wheel
- 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)

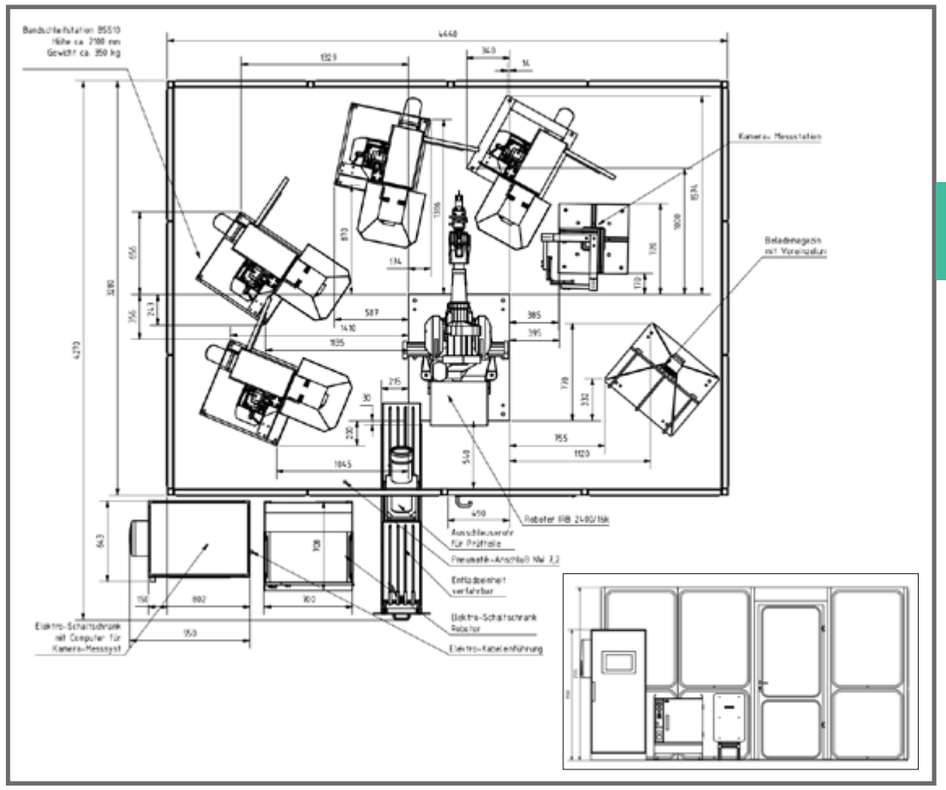


ROBOT GRINDING AND POLISHING SYSTEMS

GRINDING AND POLISHING WITH ROBOTIC TECHNIQUE

The Berger Gruppe offers solutions for robotic processing of workpieces of various sizes and geometries.

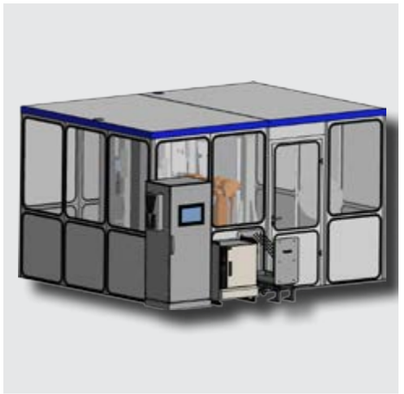
The focus is on partly standardized robot cells with different conceptual approaches.



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 set up as separate cells
- standard interfaces to all common robot manufacturers such as ABB, KUKA, Stäubli and Fanuc
- programming using the touch-in method or with a CAD/CAM interface
- integration of measuring systems for compensation of workpiece tolerances in position and dimensions
- various processing stations with different tools (e.g. grinding belts, grinding stones, polishing wheels) available



Example of use (drawing)

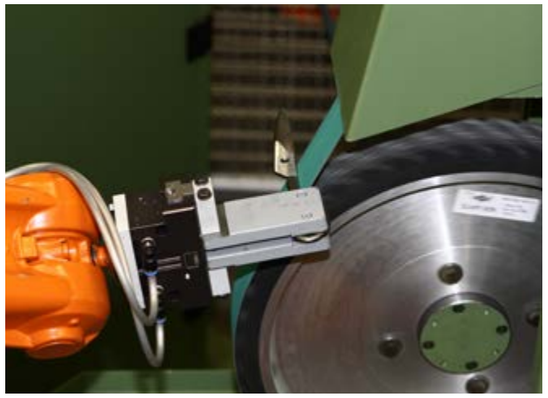
- enclosure
- provision/removal of workpieces
- measuring technique
- robots
- robot grippers
- machining systems (e. g. belt grinding or milling stations)
- software

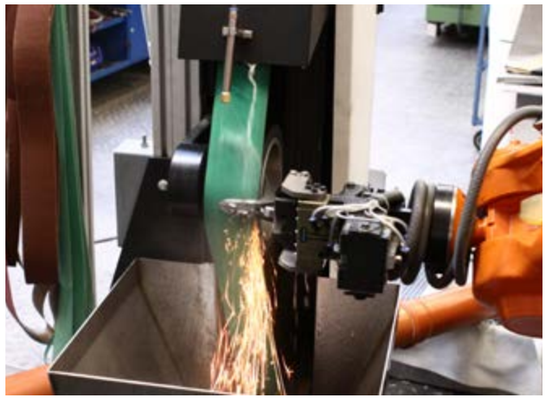
ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding and deburring with robotic technique

With the appropriate geometry, the workpiece can be guided by the robot.

The robot feeds the workpiece to the appropriate processing stations and places it in a magazine after processing.





The processing takes place in the following steps:

- robot grips the workpiece from magazine or disordered, e. g. from Schäfer box
- if necessary, measuring of the workpiece at the measuring station
- processing of the robot-guided workpiece at the various processing stations of the robotic cell
- depositing the workpiece in the magazine

Depending on requirements, the robot cell can be equipped with the following processing stations:

- belt grinding stations
- polishing stations
- milling stations
- CNC milling stations
- grinding stations with headstock

The robotic cell can also be equipped with a CNC rotary table on which the various processing stations are mounted.

Due to a gripper changing system, it is possible to grip or machine workpieces of different geometries.

Further options:

- magazine systems
- measuring systems
- cleaning and drying stations

ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding and polishing of tongs and pliers

The Berger Gruppe offers robot cells for the processing of hand and garden tools. The robotic cell shown below is designed for the machining of tongs and pliers.

It is equipped as follows:

- four belt grinding stations of the series BSS10
- loading and unloading magazines for tongs and pliers
- camera measuring station

When machining hand and garden tools, the workpiece is guided by the robot. Here the workpiece is fed either via loading magazine or unordered as bulk material via Berger Feeder.

The robot grips the workpiece and feeds it to the individual processing stations. Depending on requirements, the processing cell is equipped with different processing stations, such as belt grinding or polishing stations.

The robot cell can also be equipped with a flat bevel grinding machine, which is loaded and unloaded by a robot.

Examples of use (pictures)

1. + 2. Grinding of tongs and pliers with robotic station RSP/4B/1M (pictures 1 and 2)

3. Robotic polishing of pliers (picture 3)

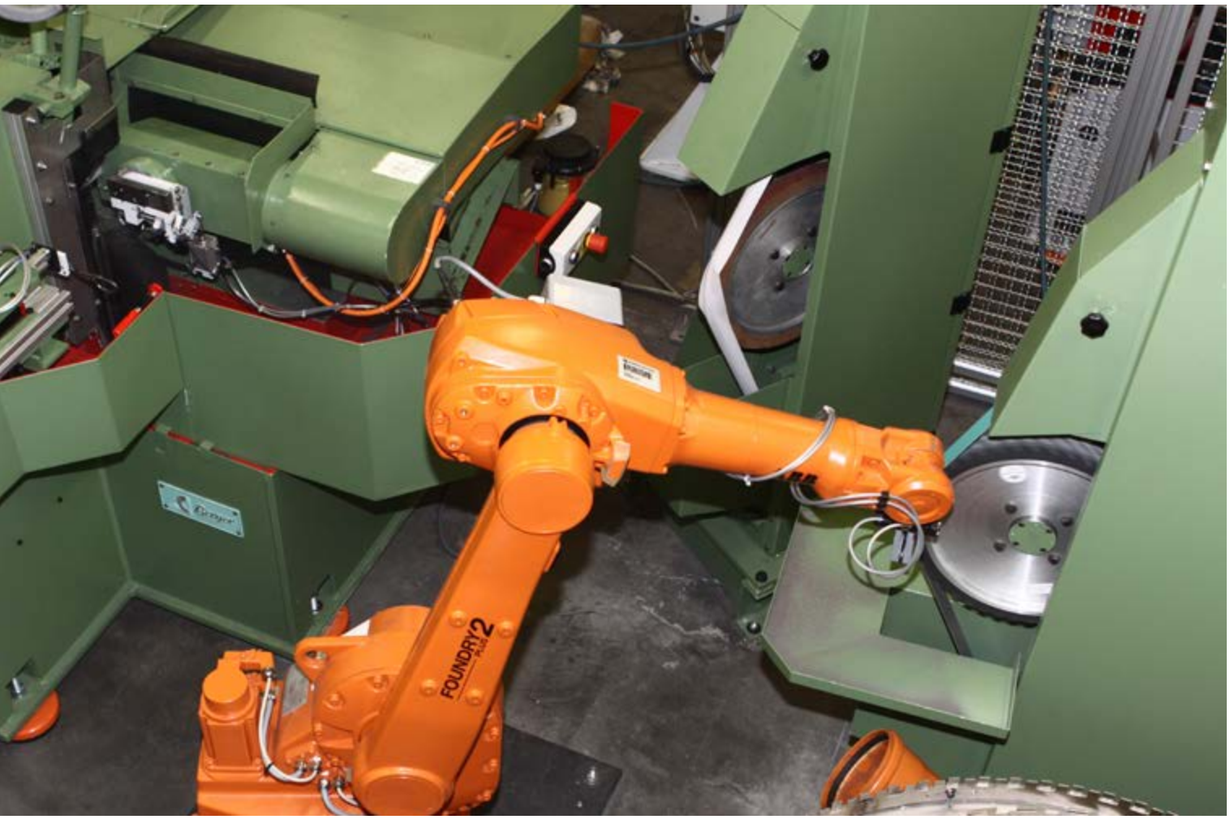
4. Camera measuring system for pliers integrated into a robotic cell (picture 4)

ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding of garden shears

The robotic cell here below is equipped as follows:

- flat bevel grinding machine of the BG1/RH/NT series for surface and radii grinding of garden shears
- belt grinding station BSS10
- robtary magazine for garden shear parts
- camera measuring station



In robot cells for processing garden shears parts the workpiece is guided by the robot.

For grinding garden shears, the robot cell is often combined with flat bevel grinding machines of the series BG/RH/NT or DG/NT.

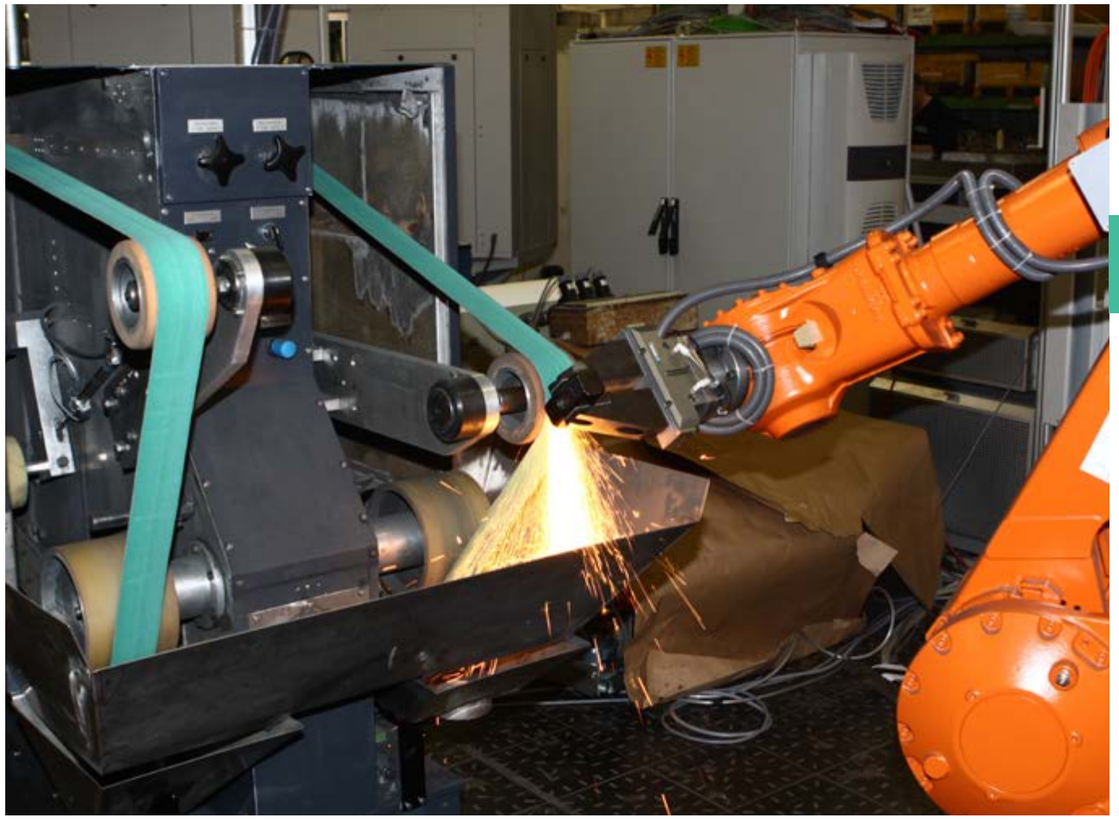
Examples of use (pictures)

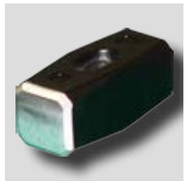
1. Back grinding of garden shears with belt grinding station BSS10 (picture 1)
2. Grinding the tip of garden shears with belt grinding station BSS10 (picture 2)
3. Belt grinding station for finishing the opposite side (picture 3)
4. Camera measuring table integrated in a robotic cell (picture 4)

ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding of hammer heads

The robot cell can be equipped to perform double-sided processing of hammers, axes, hatchets and similar shaped workpieces.





The robotic cell shown here is designed for grinding hammer heads.

It is equipped as follows:

- double-sided belt grinding stations
- conveyor belt for loading and unloading

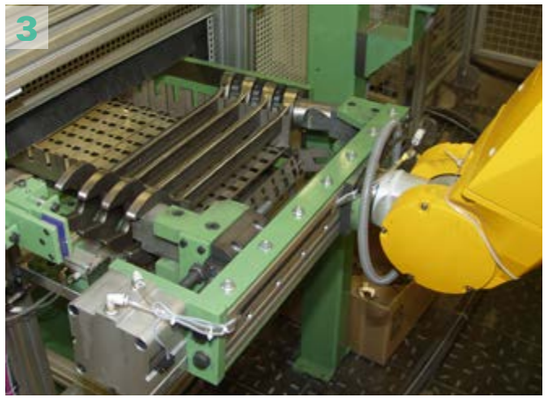
ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding of wrenches

The robotic cell shown here below is designed for the machining of wrenches.

It is equipped as follows:

- two one-sided belt grinding stations
- two conveyor belts for loading and unloading of workpieces



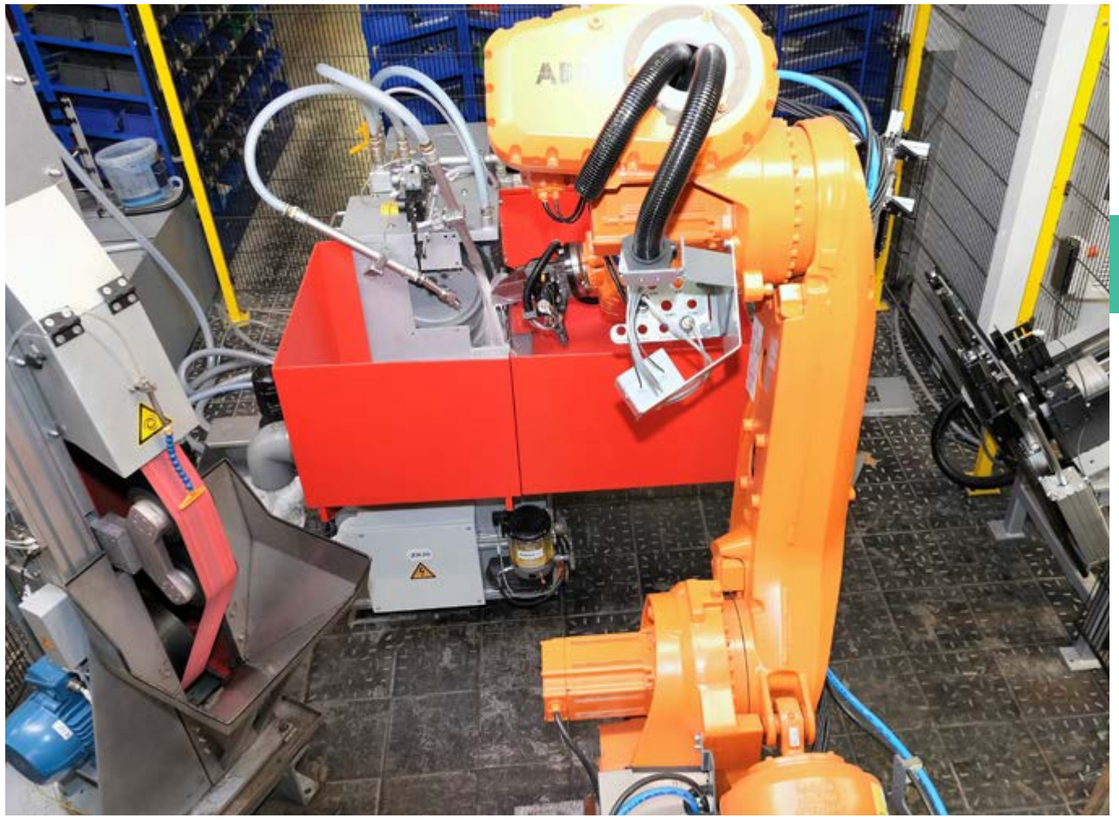
Machining of the edges of wrenches (pictures)

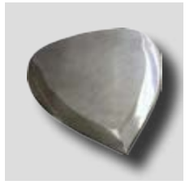
1. Spherical machining with oscillating belt (picture 1)
2. Straight machining (picture 2)
3. Storing in chain magazine (picture 3)

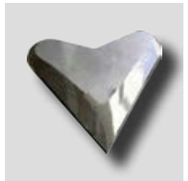
ROBOTIC CELLS WITH ROBOT-GUIDED WORKPIECE

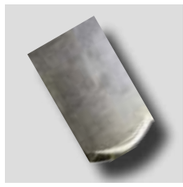
Grinding of spades and garden tools

The presented robotic cell is designed for grinding spades and similar garden tools.









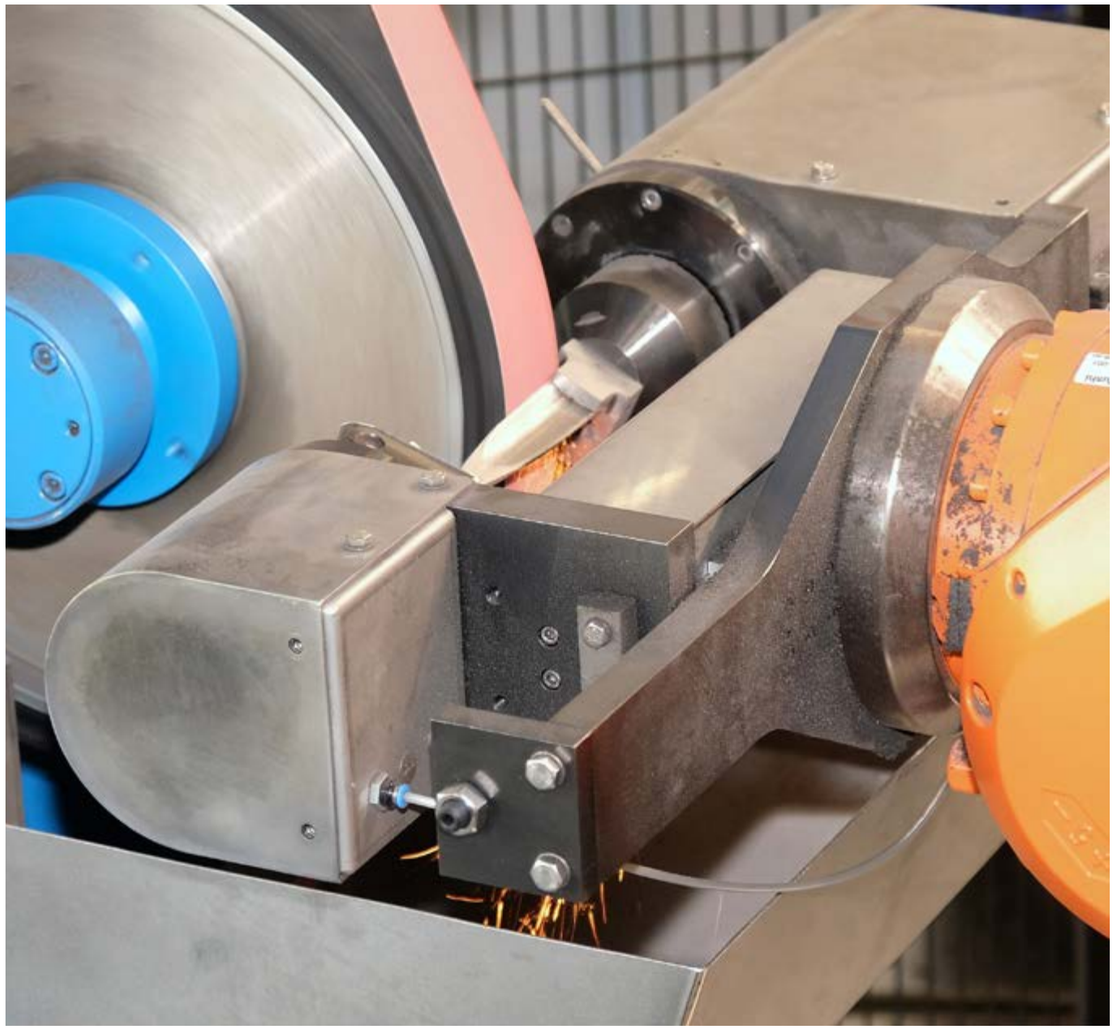
The robotic cell is equipped as follows:

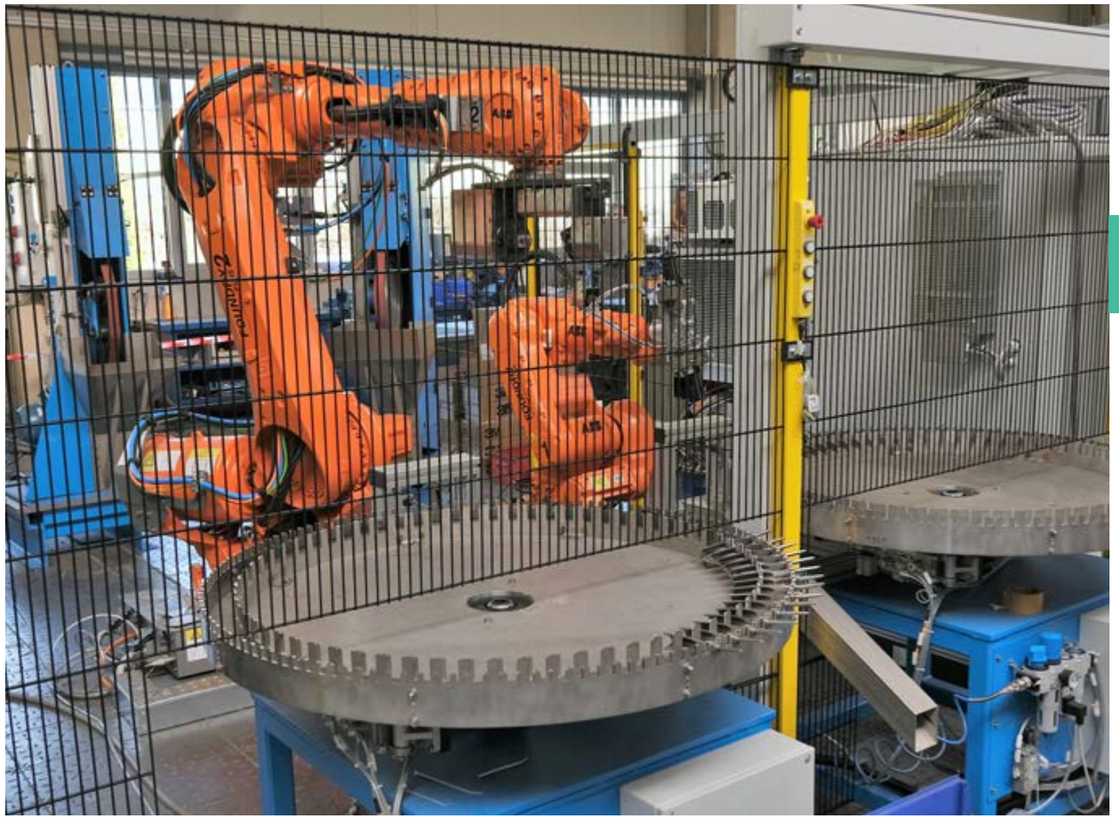
- handling robot of the ABB IRB 6700/2.7m/300kg series
- robot gripper with pneumatic clamping for spades and garden tools
- belt grinding station BSS10
- grinding station series SS1 for the use of grinding wheels with Ø 450 mm (17.7")
- cutting speed of the grinding wheel programmable 25–45 m/s (82–147.6 ft/s) with frequency converter
- compensation of grinding wheel wear by CNC axis with 140 mm (5.51") stroke
- measuring control type BEM digital/diamond with tactile probe for stone wear measurement
- central grease lubrication
- stacking magazine with a loading capacity of 1 000 mm (39.4") for spades, stacking stroke adjustable to different dimensions, unloading in box

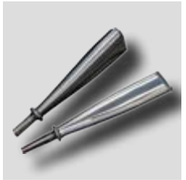
ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding of carving knives

The robotic cell of the RSP/2B/2R series is designed for the machining of carving knives and similarly shaped workpieces.







The robot cell is equipped as follows:

- ABB robot type IRB 140 F with double gripper for workpiece removal from the magazine, alignment and provision for the machining robot
- ABB IRB 6700/235 kg series robot with additional seventh axis (rotation axis) and double-sided robot gripper
- two belt grinding stations of the BSS10 series
- two rotary table magazines of the RT series

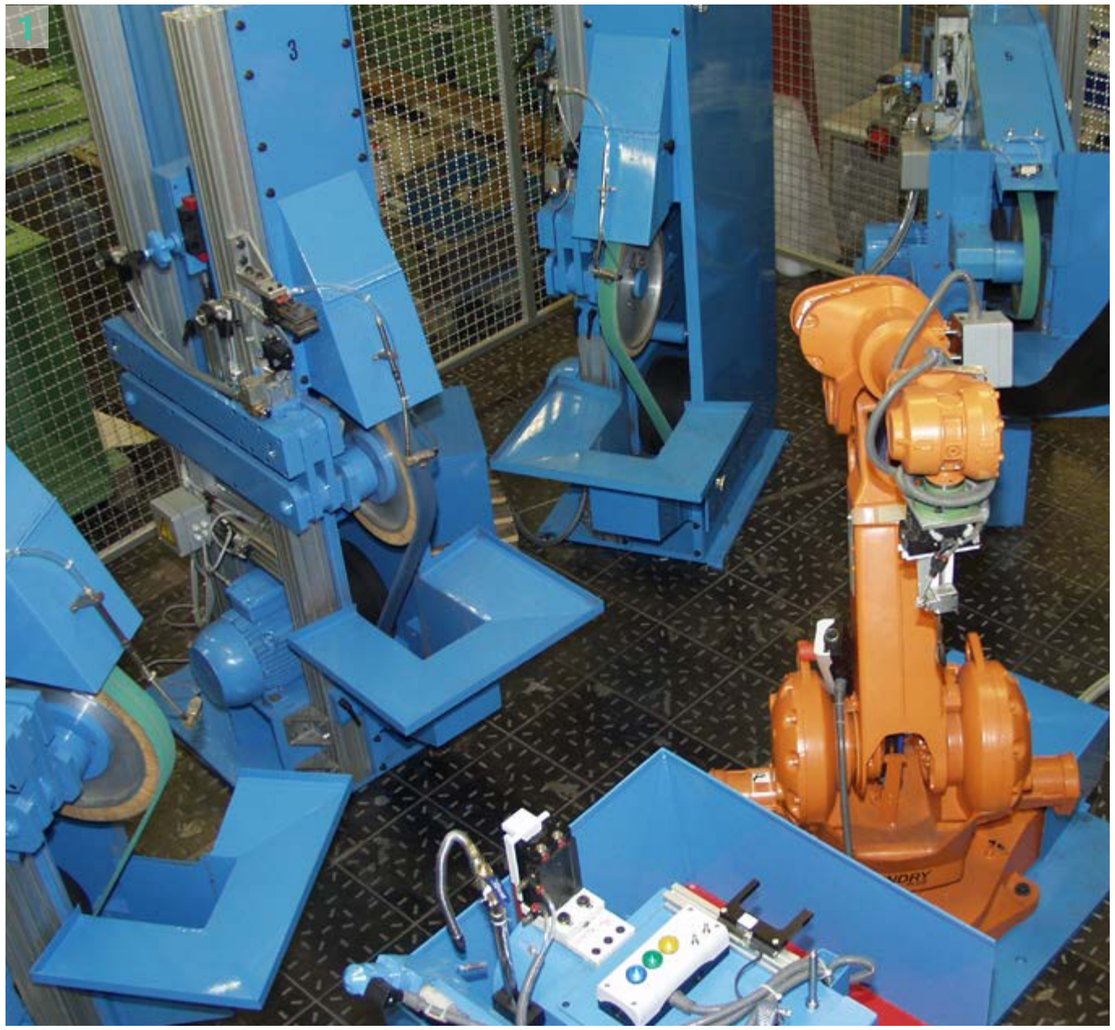
ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

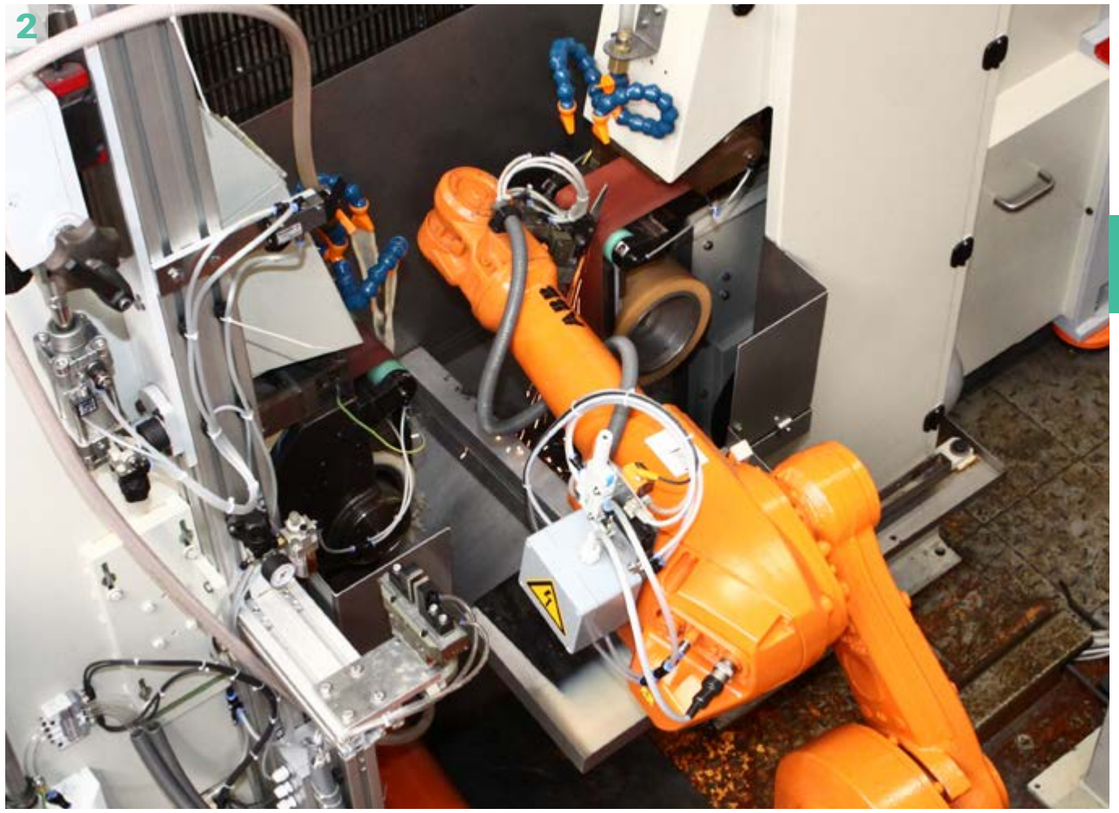
Machining of scissors

The robot grinding stations can be used to process hair scissors, garden shears, nail scissors, surgical scissors and similar shaped workpieces.

Depending on the workpiece shape and the type of machining, the robot cell is configured with appropriate stations such as

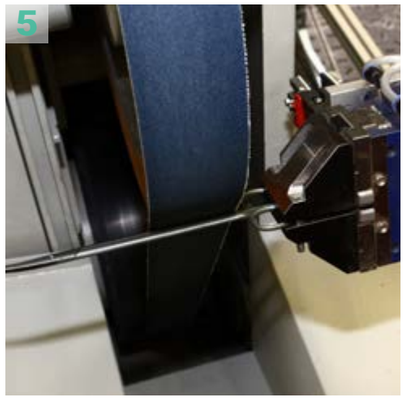
- belt grinding stations
- indexing rotary magazines
- camera measuring systems





Examples of use (pictures)

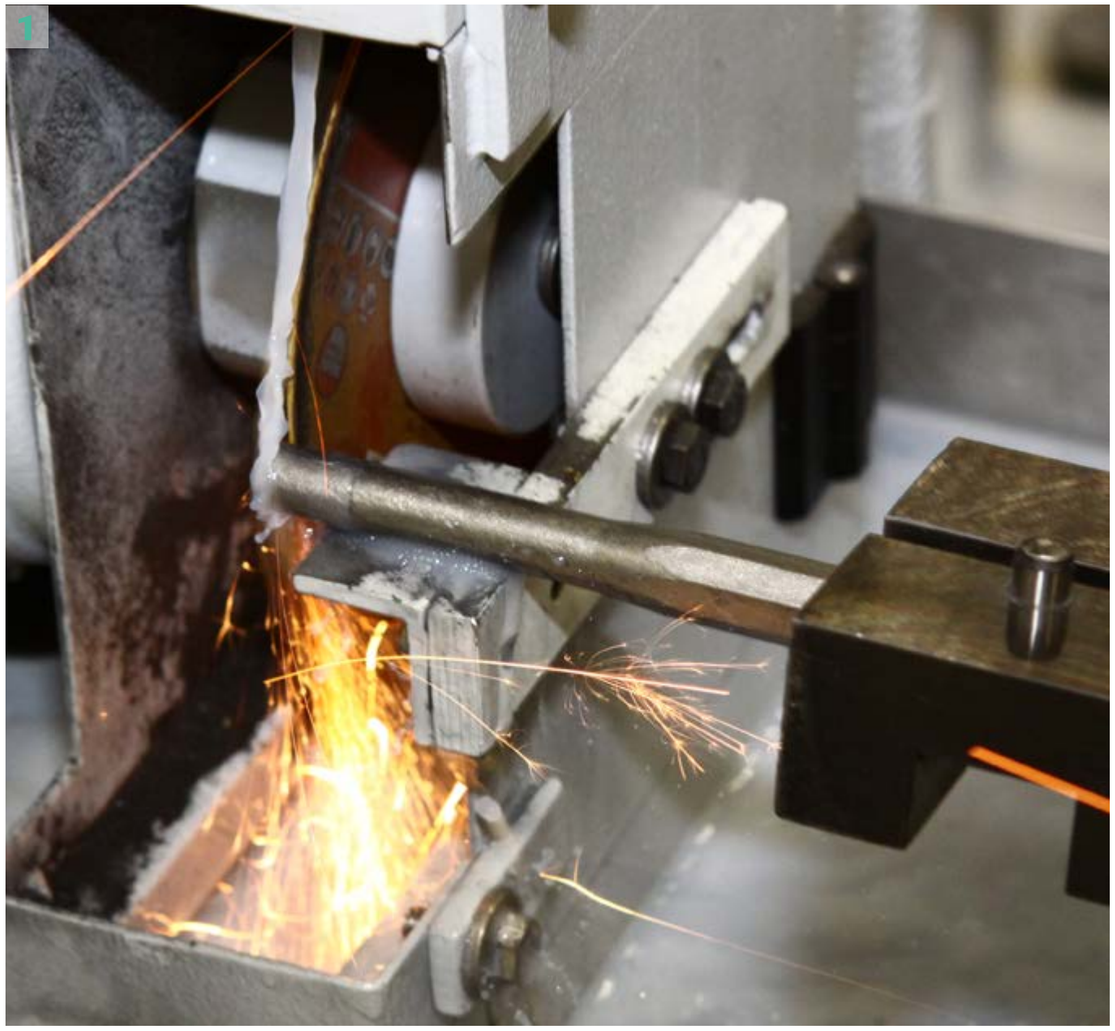
1. Grinding of scissors with four belt grinding stations (picture 1)
2. Back grinding of scissors (picture 2)
3. Grinding of mounted scissors (picture 3)
4. Grinding of the outside with high material removal (picture 4)
5. Grinding and contour machining of scissors (picture 5)

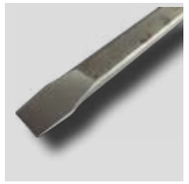


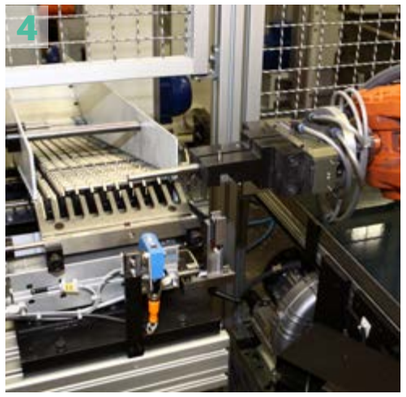
ROBOT CELLS
WITH ROBOT-GUIDED WORKPIECE

Grinding of punches / centre punches

The robot grinding station shown here is configurated to process punches, centre punches and similar shaped workpieces.







Examples of use (pictures)

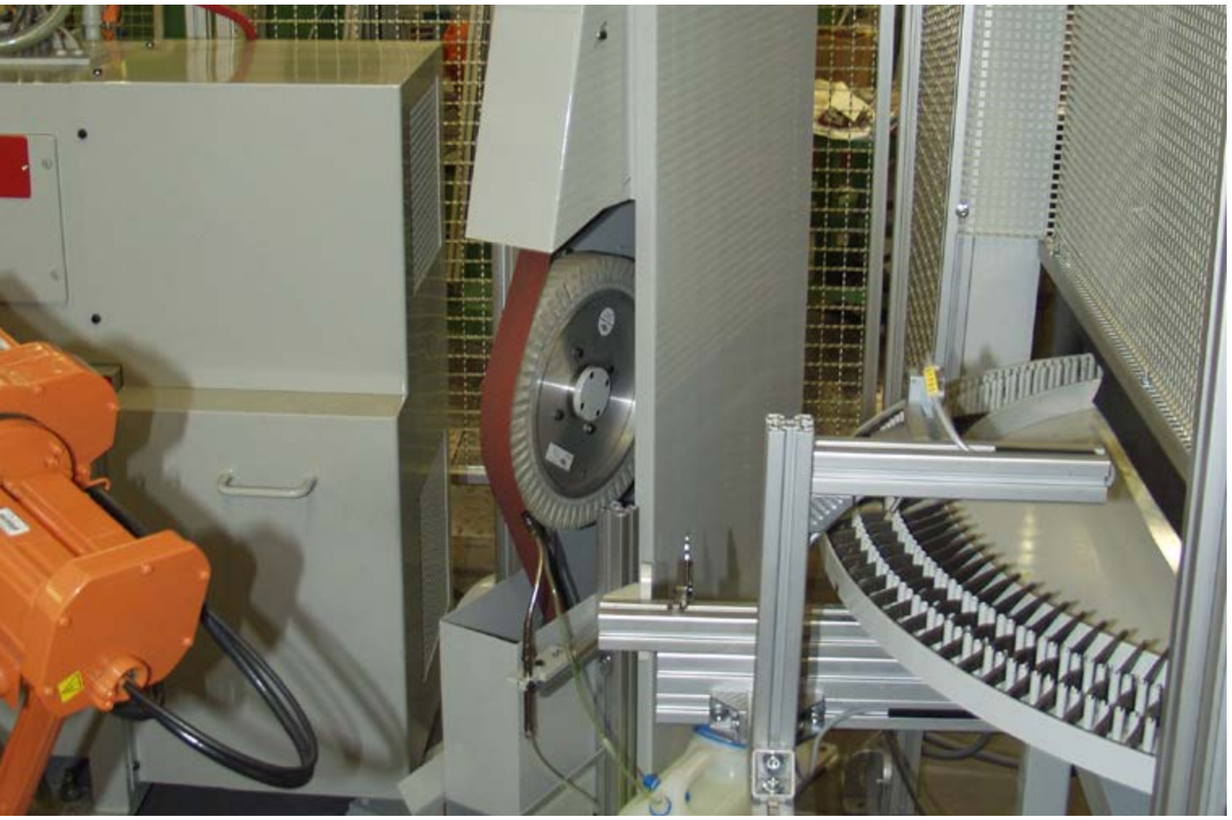
1. Machining with cut-off wheel (picture 1)
2. Machining with two one-sided belt grinding stations (picture 2)

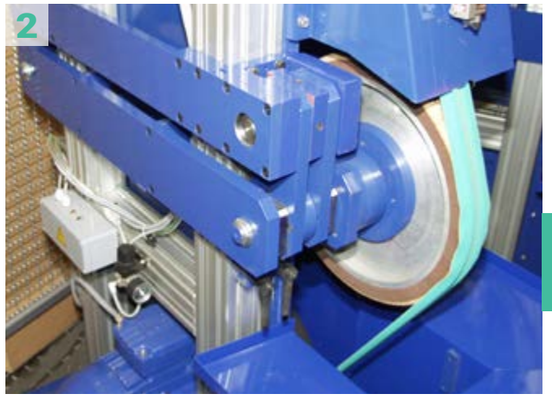
3. + 4 Feeding via step feeder with separation (pictures 3 + 4)

PROCESSING STATIONS FOR ROBOT CELLS

The Berger Gruppe offers different processing stations for robot cells.

Belt grinding stations are the processing stations that are most often integrated into a robotic cell of the Berger Gruppe.





Belt grinding stations BSS

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

- pneumatic belt tensioning
- belt damage monitoring
- preparation for extraction system to be provided by customer
- fittings for 400 Volt/50Hz connection, single switch cabinet or switch point
- minimum quantity cooling (optional)
- robotic 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 grinding belt (picture 3)
4. One-sided belt grinding station BSS21 with oscillation attachment (picture 4)

Model	BSS10	BSS12	BSS14	BSS20	BSS22
Main control (kW)	4,0	4,0	4,0	4,0	4,0
Contact roll Ø	80–400 mm 3.14"–15.7"	100–200 mm 3.9"–7.87"	150–400 mm 5.9"–15.7"	50–150 mm 1.97"–5.9"	50–150 mm 1.97"–5.9"
Contact roll width	10–130 mm 0.39"–5.12"	10–130 mm 0.39"–5.12"	10–130 mm 0.39"–5.12"	10–130 mm 0.39"–5.12"	10–130 mm 0.39"–5.12"
Weight	150 kg	180 kg	350 kg	200 kg	200 kg
Dimensions - Length - Width - High	850 mm (33.46") 650 mm (25.5") 2.100 mm (82.7")	900 mm (35.4") 800 mm (31.49") 2.100 mm (82.7")	1.200 mm (47.2") 600 mm (23.6") 2.100 mm (82.7")	1.500 mm (59") 600 mm (23.6") 1.500 mm (59")	1.500 mm (59") 600 mm (23.6") 1.500 mm (59")

ACCESSORIES

Grinding and polishing stations

The Berger Gruppe offers grinding and polishing stations of different types which can be combined in one robot cell.

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

Polishing stations P1 (picture 1)

- polishing wheel Ø: 500 mm (19.69")
- polishing width: 100 mm (3.94")
- drive: 5,5 kW, 750 rpm
- optional with frequency converter

Grinding and polishing stations P3 (picture 2)

- grinding/polishing wheel Ø: 300 mm (11.81")
- grinding/polishing wheel width: 100 mm (3.94")
- drive: 3 kW, 2 800 rpm
- spindle speed frequency controlled

Polishing stations P5 (picture 3)

- polishing wheel Ø: 500 mm (19.7")
- polishing width: up to 300 mm (11.8")
- drive: 7,5 kW, 2 000 rpm
- spindle speed frequency controlled

Polishing stations P3/T (picture 5)

- mounting cup wheel, Ø 200 mm (7.87")
- drive 1,5 Kw; 1 400 rpm
- spindle speed frequency controlled

Grinding stations SS1 (picture 4)

- grinding with headstock
- grinding wheel Ø : 450 mm (17.7") (cup wheel)
- spindle drive: as needed 15–22 kW

ACCESSORIES

Coolant systems

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

Use of different cleaning stages:

- magnetic pusher
- paper and/or fleece filter
- ultrafine filter

These components can be combined according to requirements. Water recooling must be taken into account as required.

Additionally can be installed:

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

Cleaning and drying station for jigsaws

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 also be placed in a specific position by the loading/unloading robot.

Here, cleaning and drying and subsequent stacking into a sliding magazine take place.

The cleaning and drying station shown here is used in a production cell in connection with a flat bevel grinding machine of the DG/NT series and a linear transfer, which is designed for processing jigsaws.

ACCESSORIES

Magazine systems

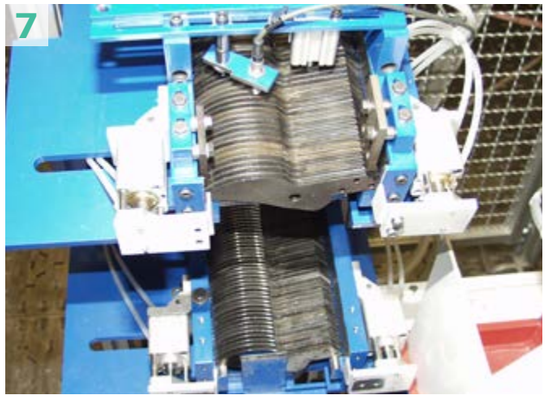
Robot cells as well as machining cells with CNC grinding machines can be equipped with different feeding and magazine systems for stackable and non-stackable workpieces.

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 table magazines (e. g. for knives)
- indexing chain magazines (for forceps and other conical material)
- indexing vertical rotary table magazines (for scissors and similar workpieces)
- circulating bar magazines (e. g. for forceps and pliers)
- guidance 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. 31: 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 flat bevel 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 (19.69"–78.7"), adjustable length stops (picture 7)
8. Step feeder: feeding of screwdrivers for processing in the roller impact centre (picture 8) (feeding of punches via step feeder see also page 67)

ACCESSORIES

Automated storage of hand tools

The robotic cell presented here is designed for processing wood chisels. Using a specially designed gripper, the robot changes complete magazines.

The machining cell is equipped as follows:

- five-axis CNC flat bevel grinding machine BG1/RH/NT
- turning station for pre-positioning (first side/ second side)
- two ABB robots for loading and unloading the workpieces
- laser marking
- cleaning and drying station
- loading and unloading magazinesne

Examples of use (pictures)

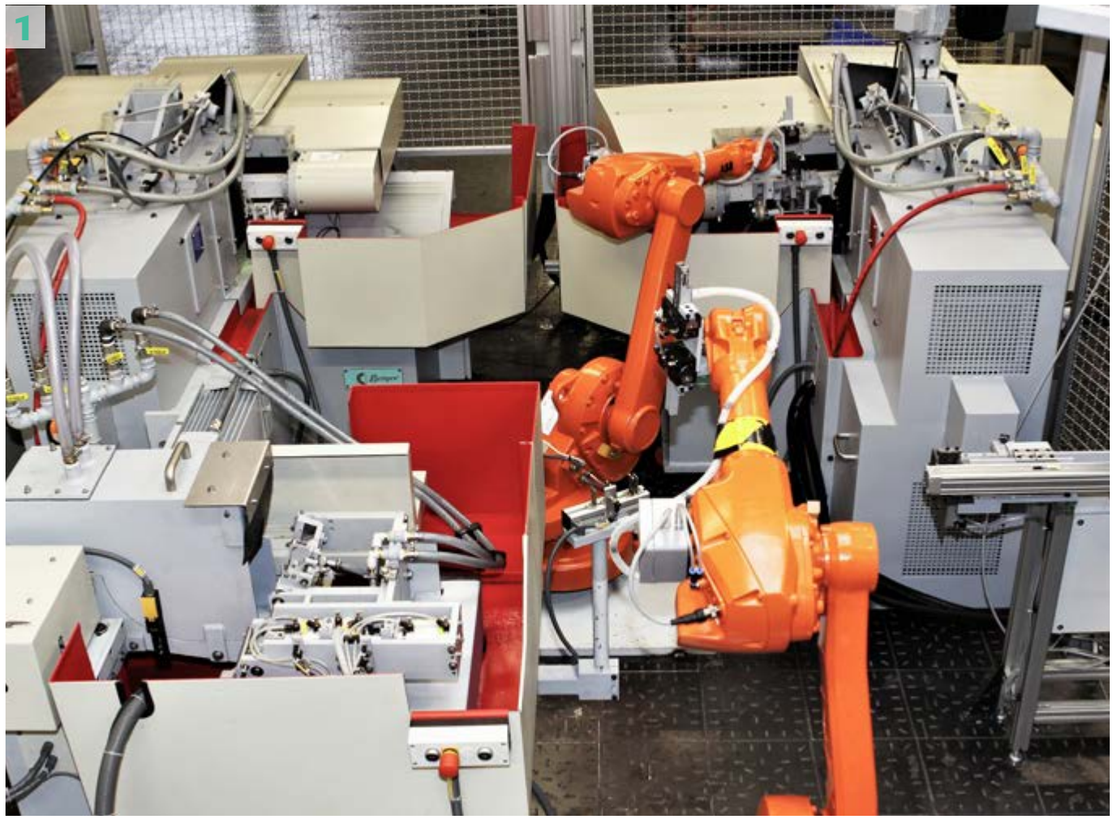
1. Machining cell for wood chisels with flat bevel grinding machine of the BG1/RH/NT series (picture 1)
2. Changing of magazines by robot with specially designed gripper (picture 2)
3. Laser measuring system (picture 3)
4. Magazine change in carriage (picture 4)
5. Unloading magazine (picture 5)

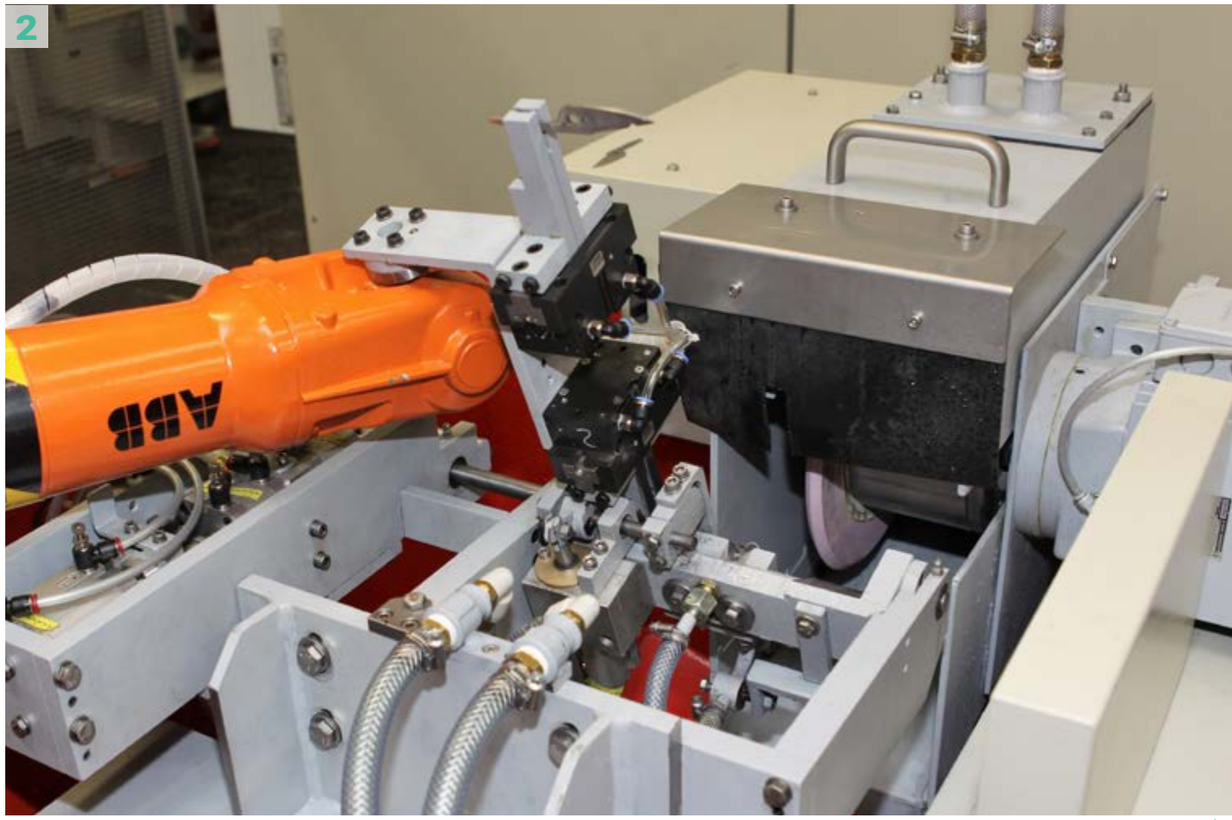
ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

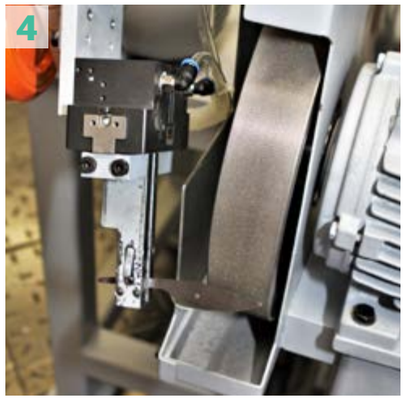
INTEGRATION AND AUTOMATION OF PRODUCTION PROCESSES

Integration of production processes

Various production processes can be integrated into a robot cell, such as build-up welding, bending presses, drilling/countersinking, hardening systems, painting systems or packaging machines.







Process automation: production cell for cable shears

- surface grinding of the outside of cable shears with flat bevel grinding machine of the BG1/NT series (picture 1)
- profile grinding on cable cutter with peripheral grinding machine of the WS4 series (picture 2)
- surface grinding of the inside of cable shears with flat bevel grinding machine of the BG1/NT series (picture 3)
- micro-serrating and deburring of the cutting edges with robot grinding station with profiled CBN wheel and deburring wheel (picture 4)
- robotic loading and unloading into/from sliding magazine

ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

Process integration: laser marking

In the robot cell of the RSP/1B/1P/1L series shown here, a marking laser is integrated into a robot grinding cell.

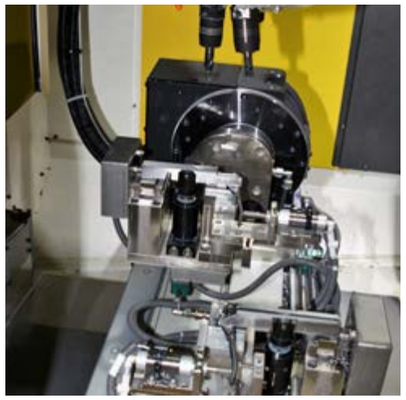
The laser is loaded and unloaded by robots.

The robot cell is equipped with

- loading/unloading and processing robot
- belt grinding station BSS10
- polishing station P3
- marking laser station
- rotary magazine for loading and unloading

Process integration: milling of tongs and pliers

- preparation of the workpieces for subsequent grinding
- special device for CNC milling centers for centering, drilling, thread cutting and milling (picture right)
- fixture construction and development
- robot automation and process connection with grinding or deburring station



ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

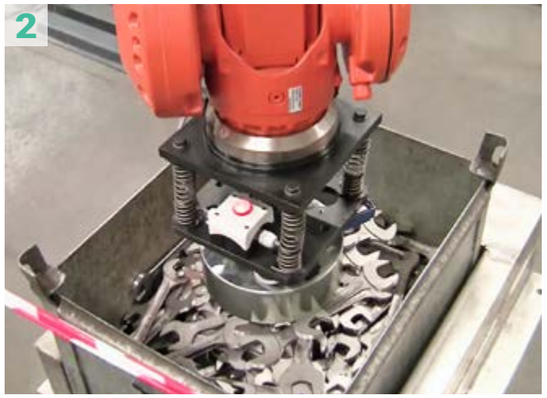
Process automation: Bin-Picking

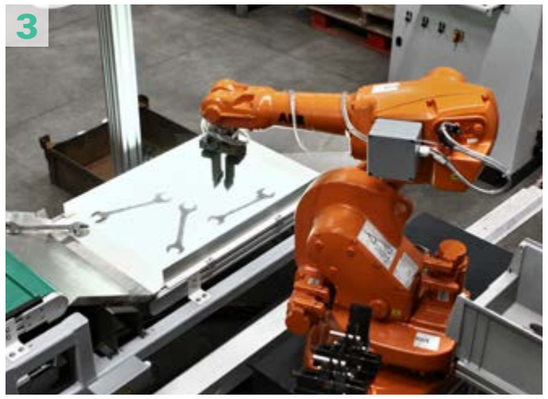
The Berger Gruppe offers automation in the field of picking from containers.

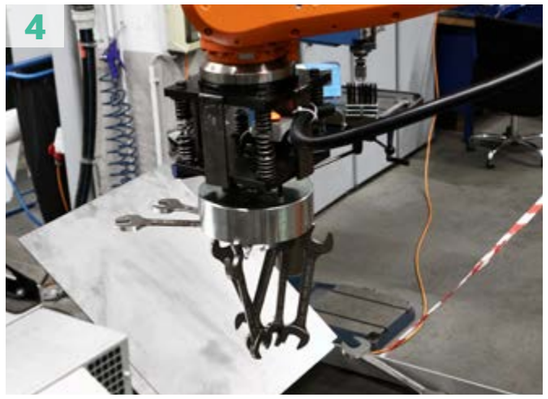
- unordered feeding of workpieces from KLT or skeleton container in connection with two robots (picture 1)
- lifting out by means of an electromagnet with the help of robot 1 (picture 2)
- separation and position detection (picture 3)
- deposit in defined position with the help of robot 2

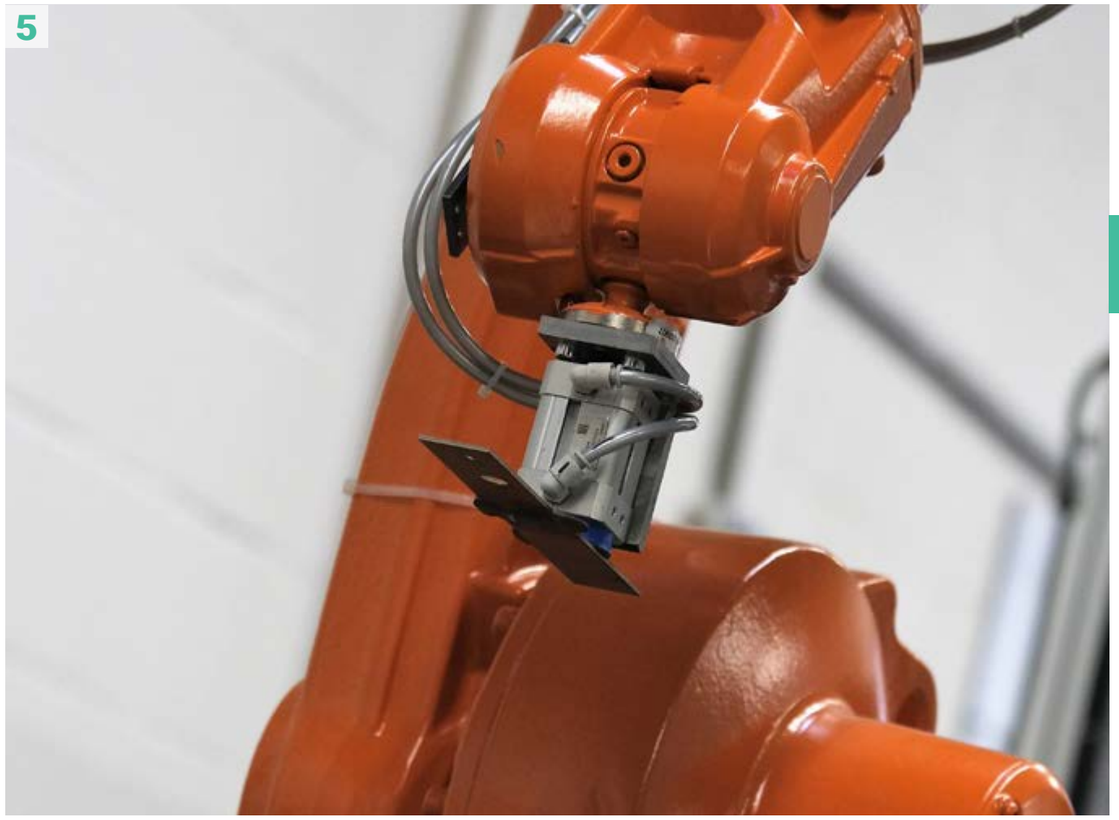
Handling of non-sorted workpieces

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 container or Schäfer box, and passes the data to the handling robot (pictures 5 and 6).







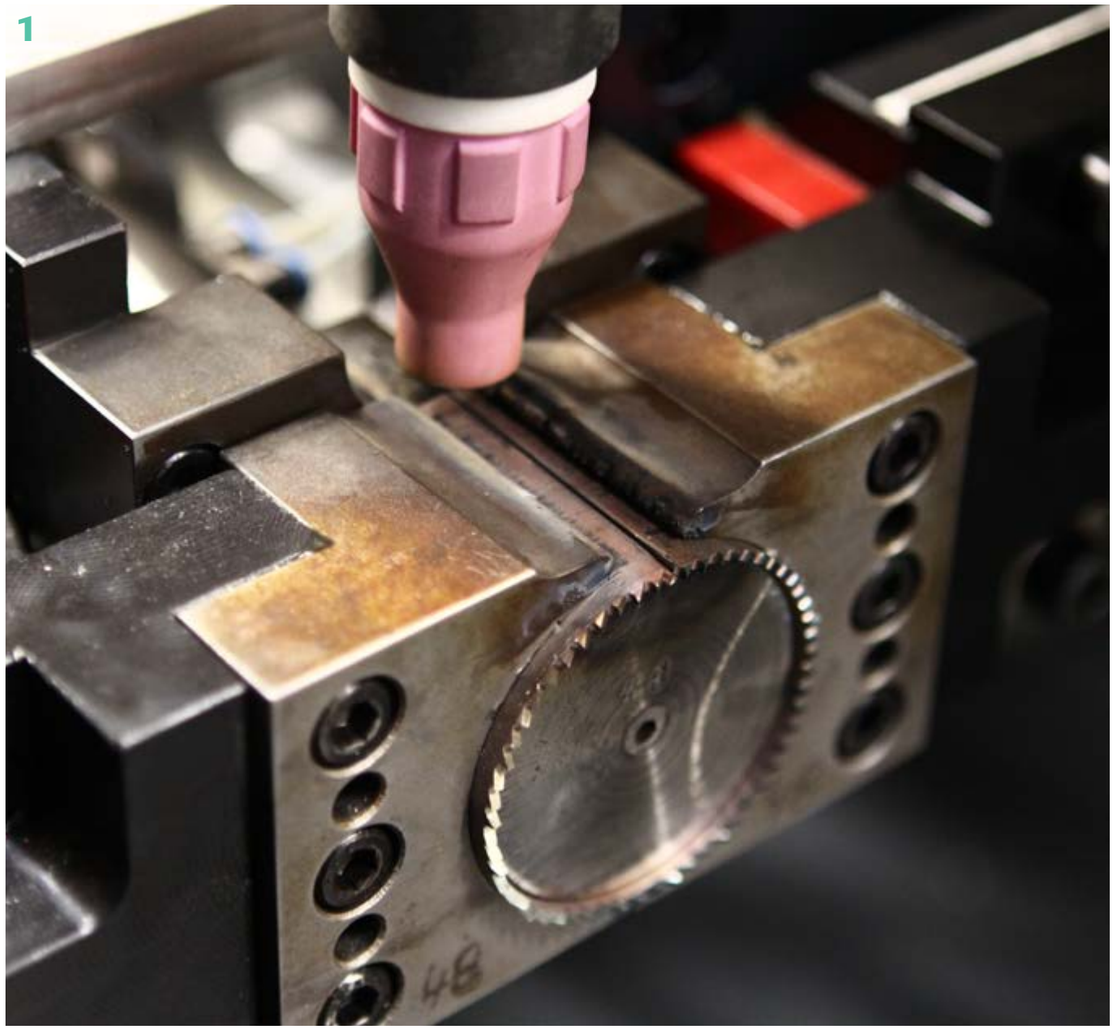


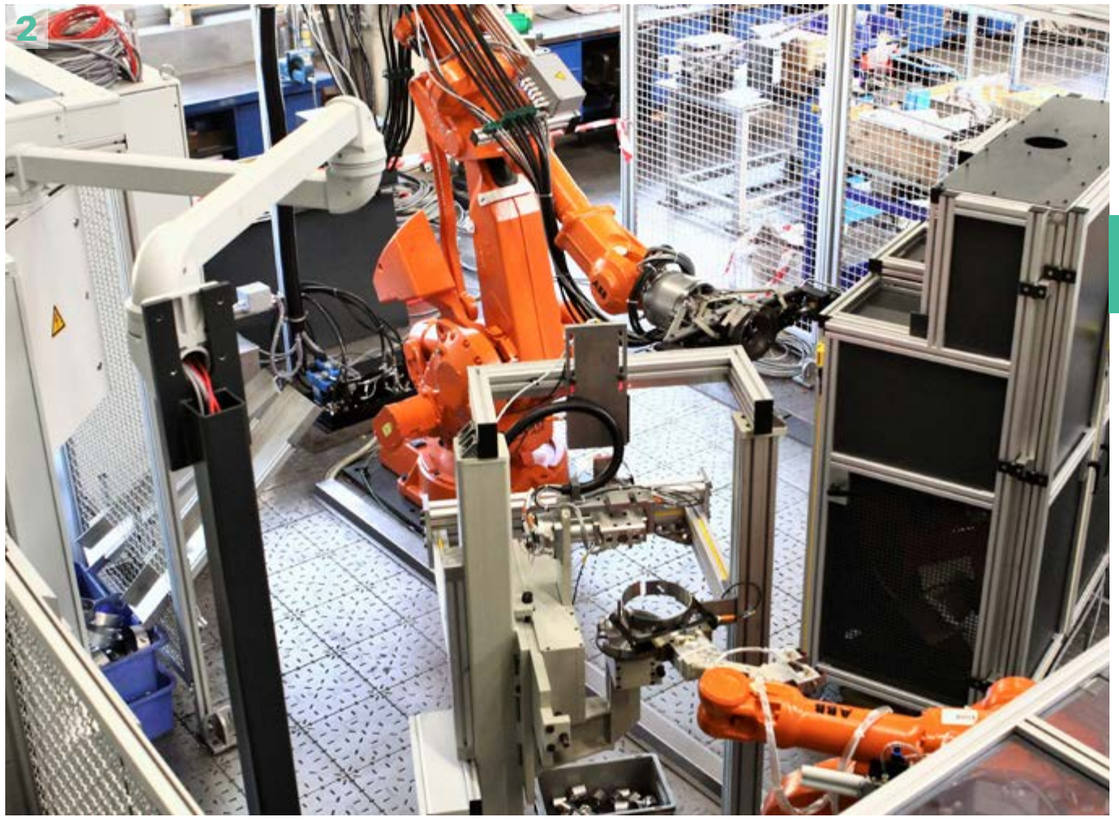
- provision and feeding of disordered workpieces with bin-picking from two KLT boxes
- docking stations for KLT containers with repeatable positioning via stops
- bin-picking robot ABB
- double gripper with two magnetic grippers with adjustable magnetic force for removing workpieces from KLT box
- 3D 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

ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

Process automation: longitudinal welding of hole saws

Robot automation unit for automating the longitudinal welding of hole saws and similar shaped workpieces



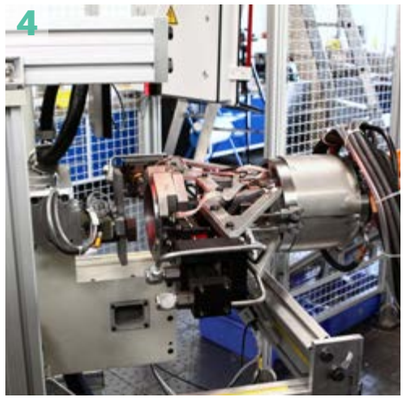


- depositing the hole saw from the upstream process in the parallel gripper
- turning device placing the workpiece in the right position for the robot grippers
- mounting with parallel gripper and pressure plate on toothing
- camera measuring station

Examples of use (pictures):

1. Longitudinal welding of hole saws (picture 1)

2.–4. Machining cell for hole saws (pictures 2–4)



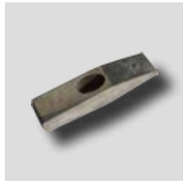
ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

Process automation: hardening machine for hammers

In the robot cell of the RAA series shown here, feeding of the workpiece as well as loading and unloading of the hardening plant is automated.

The robot cell is quipped with

- loading and unloading robot
- hardening machine
- conveyor belt
- separating station with pusher in centering position



Process automation: Hardening plants for garden shears

Feeding of garden shear raw parts:

- feeding of garden shear parts with Berger Feeder with three connected feeding belts and camera control
- Epson Scara robot for removing the workpieces from the Berger Feeder and loading the turning and insertion station
- turning and insertion station with two Schunk parallel grippers for picking up two garden shear parts

Automation of a hardening plant:

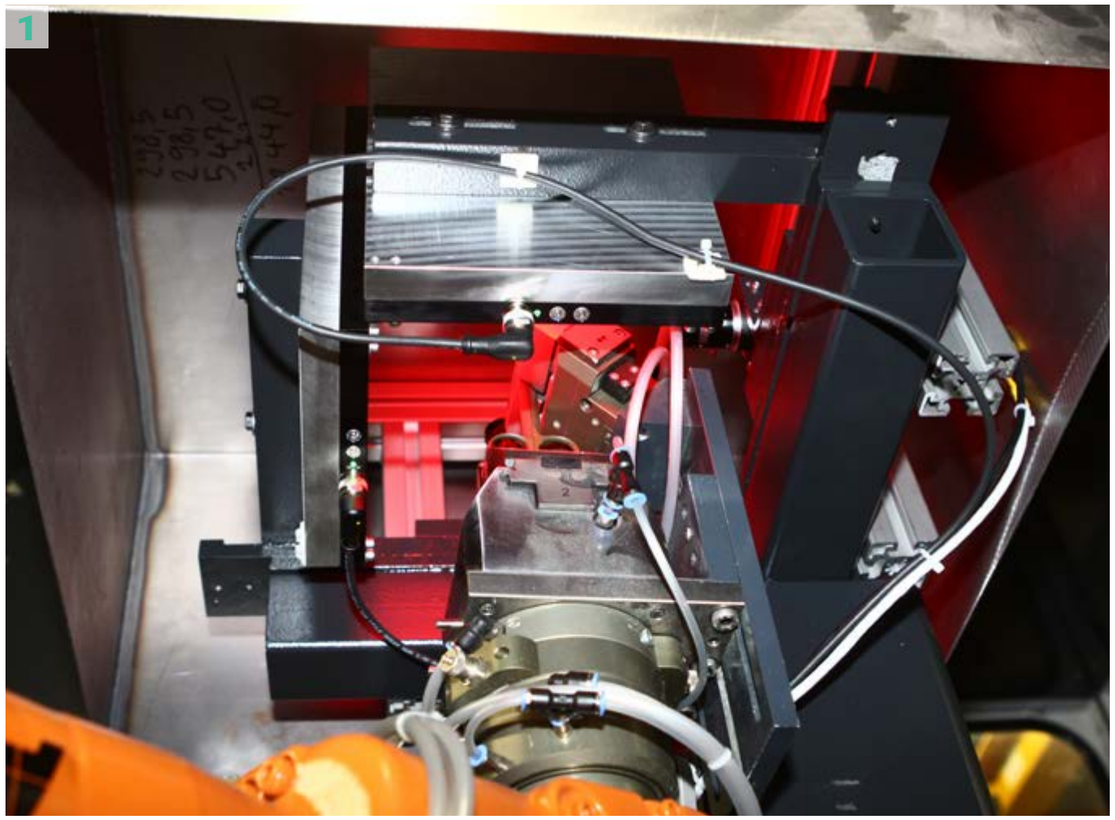
- Epson Scara robot 2 with gripper with 90° tilting device to pick up the flat lying parts from the turning and insertion station and place them upright in the magazine cassettes in front of the hardening furnace in two rows one after the other
- feed conveyor belt in front of hardening unit
- two stationary lifting devices and two magazine towers
- loading station incl. measuring system for determining/measuring the loading position
- infeed and outfeed conveyors

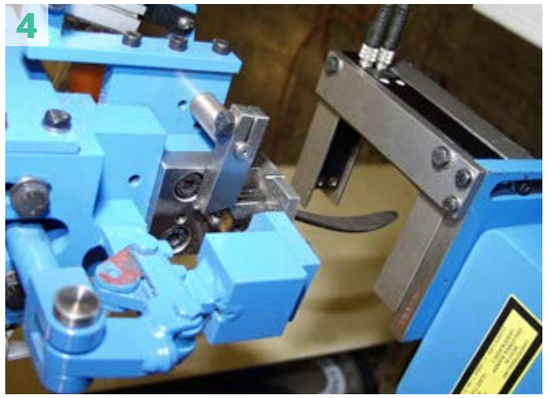
ROBOTER-PROZESSTECHNIK / AUTOMATION

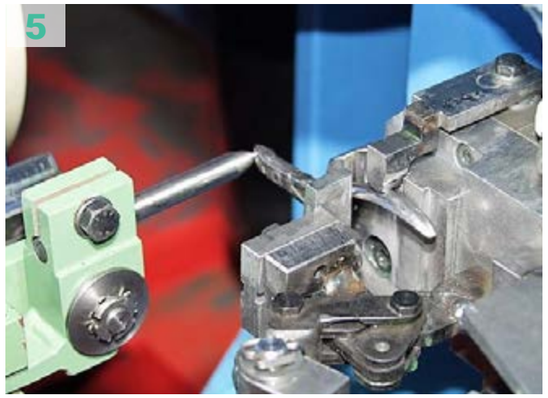
Measuring technique

Development of standard measuring systems for different applications for detection and compensation of automated dimensions/contours

- measuring systems for automated contour detection and measurement of workpieces
- compensation of forging part tolerances
- applicable for machines of the CG and CG series and various robot cells
- robot automation and process connection with grinding or bending machines







Examples of use (pictures):

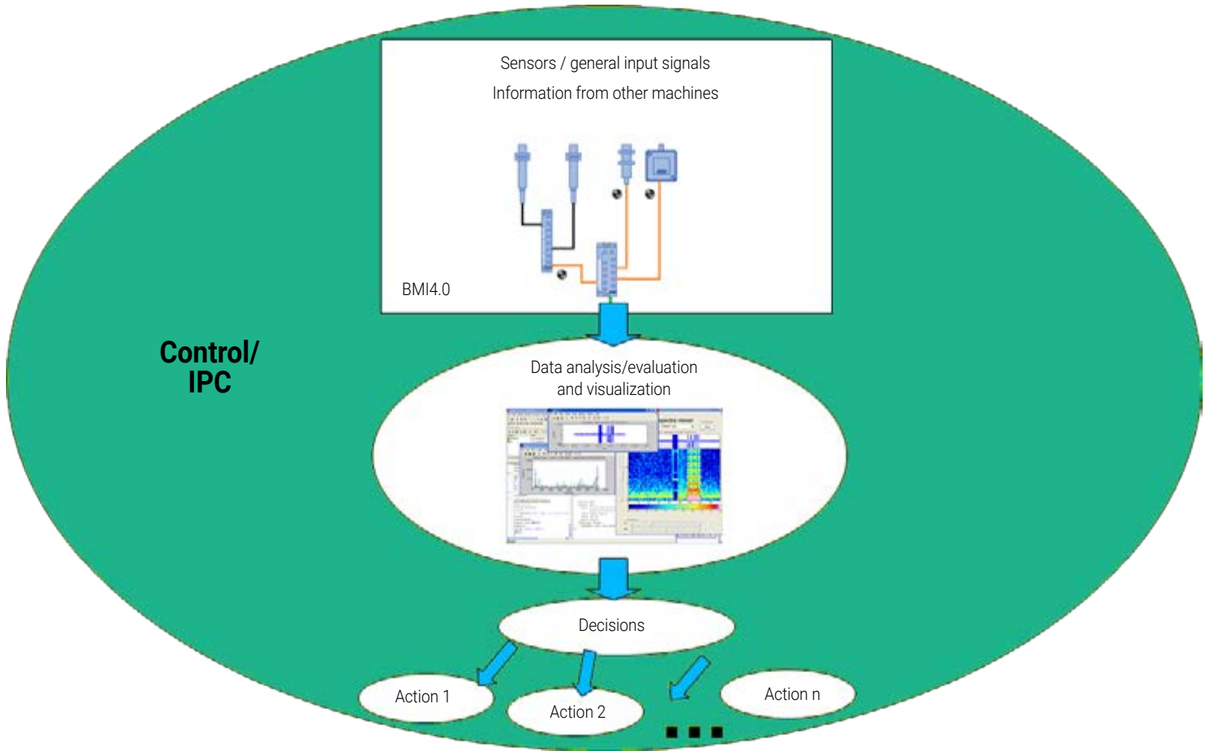
1. Measuring systems for automated contour detection and measurement of workpieces (picture 1)
2. Separation and position detection on measuring table (picture 2)
3. Display on screen (picture 3)
4. Laser measuring system for robot cell for the external measurement of pliers parts (picture 4)
5. Measuring system for automatic center measurement of pliers (picture 5)

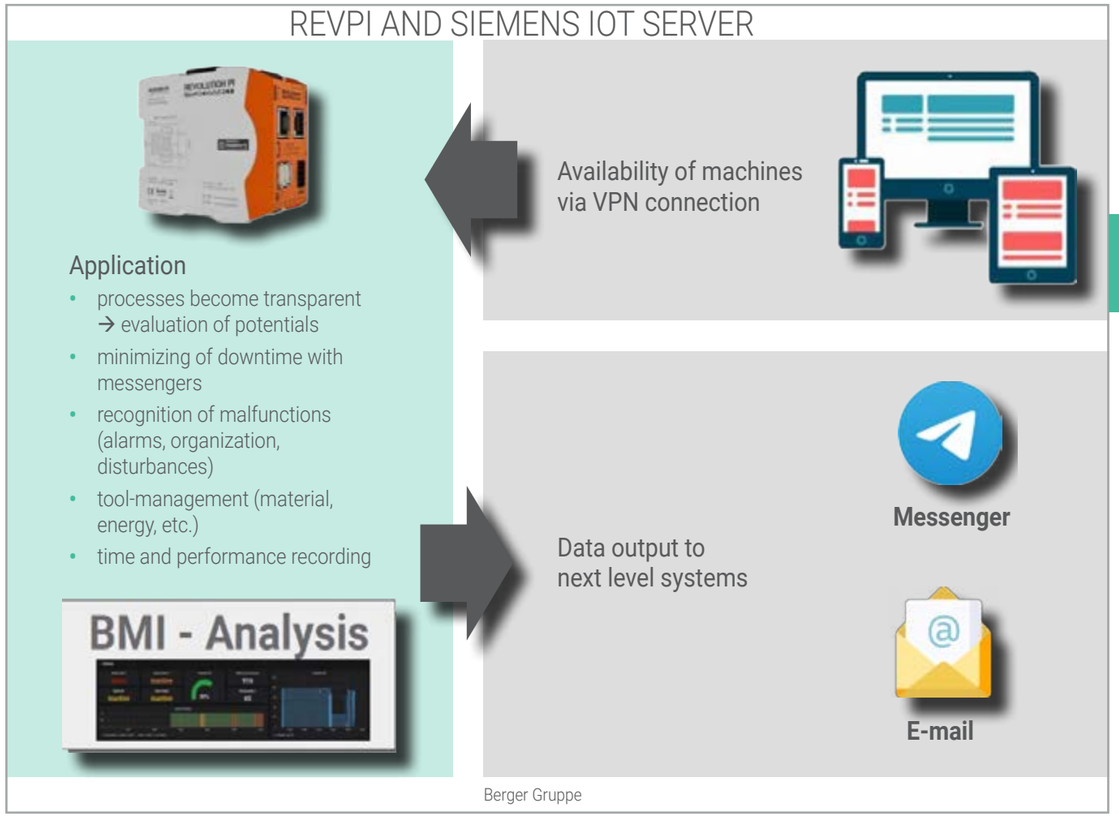
BERGER MACHINE INTERFACE 4.0

SENSOR TECHNOLOGY, DATA EVALUATION/REDUCTION AND RESOURCE CONTROL WITH ACTIONS

Functions of BMI4.0

- universal bus-based detection of sensor signals at a machine such as coolant temperatures, engine load, AE signals for spindle monitoring, air pressure and volume
- data reduction and visualization with evaluation software
- networking with IOT or company network
- programming of interfaces for individual connection to existing BDE 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 recognition of process dependencies
- optimization of downtimes and set-up times, thus optimal capacity planning

Industry 4.0

Robotics and KI, IO-Link system description: Sensor Signal Acquisition

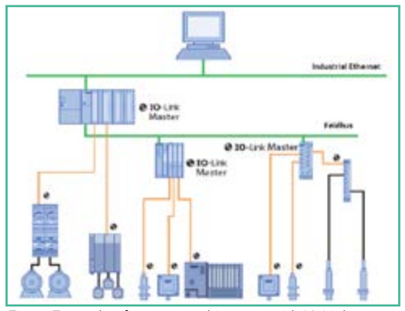


Fig. 1: Example of system architecture with IO-Link

Examplel: Berger Maschine Type RFS4/NT
Application O-Link for the detection of sensor signals

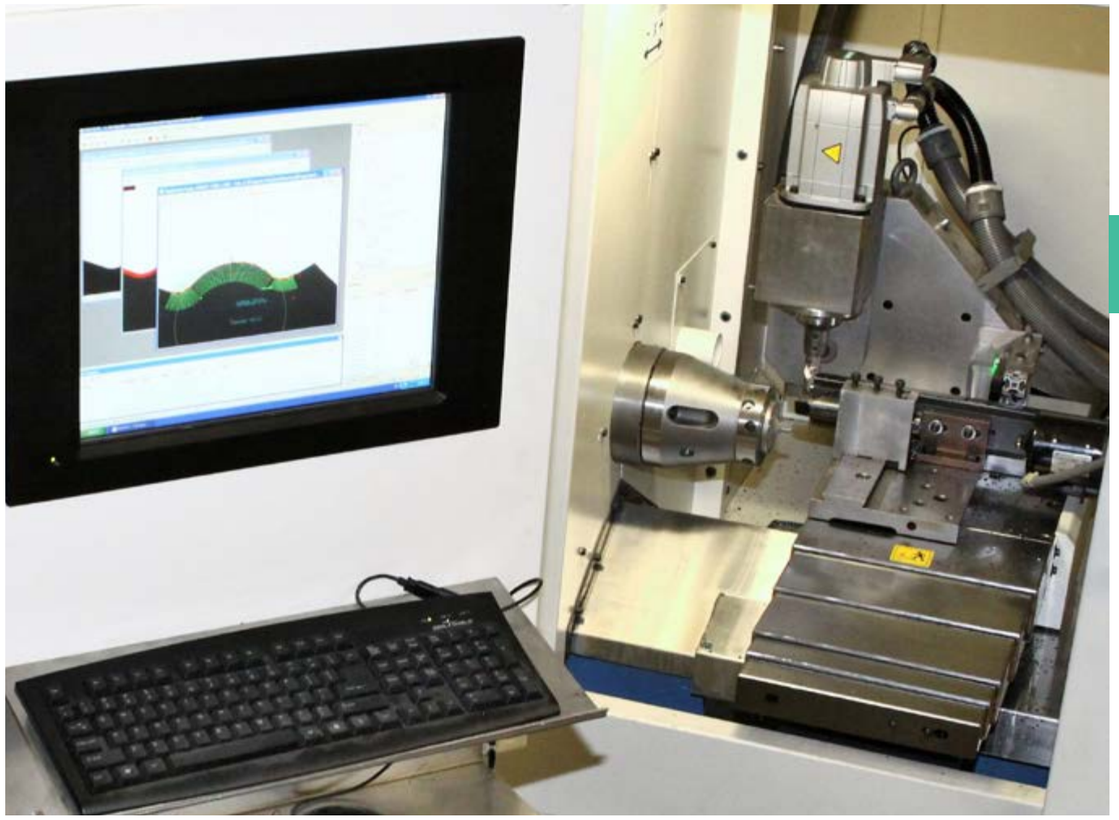
db888.dbd18	Spindle flow rate (l/min)	F	16.0000
db888.dbw4	Flow rate grinding water (%)	D	128
db888.dbd18	Temp. grinding water (°C)	F	34.0000
db888.dbd22	Temp. spindle water (°C)	F	29.7932
db888.dbd26	Total air consumption (m³)	F	4984.9510
db888.dbd38	Act. air consumption (m³/h)	F	4.3000
db888.dbd34	Temp. compressed air (°C)	F	38.6000
db888.dbd44	Temp. control cabinet	F	32.2000
db888.dbd54	Hydraulic pressure (bar)	F	0.0000
db888.dbd48	Hydraulic temperature (°C)	F	31.9000

PROFILE GENERATING CENTERS

PROFILE GENERATING

Drilling and milling technology

The profile generating center LP110 streamlines the machining processes in the field of polygonal generating and tooth profiling.



The rotary machining process of the profile generating center combines drilling and milling technology. The machines incorporate an electronic synchronization system which controls the workpiece spindle and the tool spindle. The fully integrated CNC control is easily programmable and guarantees maximum positioning accuracy.

Due to short machining and storing times, cycle times are dramatically improved. With the hollow spindle system cylindrical parts can easily be fed through the spindle.

With a large sliding door the machine is designed for easy operation, change over and maintenance. The manual swivelling tool unit of the LP110 can be swivelled from polygonal generating to tooth profiling without changeover.

The toolslide is designed to accommodate additional tools for a variety of operations such as drilling, milling, threading etc.

- control Siemens CNC
- generating spindle adapters:
  - KK 3 – H 28 – horizontal
  - D 28 – H 28 – horizontal
  - D 20 K – V 28 – vertical
- work spindle bore: Ø 30 mm (1.18")
- feedrate X- and Z-axis: up to 700 mm/min (27.59"/min)
- rapid travel speeds X- and Z-axis: 15 m/min (49.2"/min)
- travel X-axis, radially: 300 mm (11.8")
- travel Z-axis, axially: 280 mm (11")
- generating spindle speed: up to 6 000 rpm.
- rotary positioning accuracy of the main spindle: 0.01°
- workpiece spindle torque: 35 Nm
- tool spindle torque: 7 Nm, optional 16 Nm
- total power: 20 KW, 30 A
- standard voltage: 400 V, 50 Hz (or on request)
- pneumatic power: 5–8 bar
- hydraulic power: 20 bar
- weight: approx. 3,500 kg (7800 LBS) – depending on the equipment

PROFILE GENERATING CENTERS LP110

Example of use: PlusMinus screwdriver

Five-axis CNC profile generating center for processing screwdriver blades

- raw parts Ø 2–10 mm (0.079"–0.39") workpiece lengths 50–320 mm (1.97"–12.6")
- workpiece spindle head LP110 with chuck holder, brake disc for cycle operation and AC servo motor
- milling system manually tiltable from horizontal to vertical position
- milling spindle for machining PlusMinus tool profiles
- puncture magazine for lift loader
- NC loading system
- screw tool profiles:
  - cross recess PH 00 – PH 4
  - Torx T1 to T60
  - Pozidrive Pz 0 – Pz 4
  - hexagon SW 2 to SW 10
  - hexagonal ball head SW 2 to SW 10
- processing steps:
  - separation of the cut-off/sawed-off sections via lift loading magazine into blade magazine
  - pushing the sections from behind by means of NC loading system through the workpiece spindle head into clamping position
  - production of the turning operations required for cross slot and Torx profiles in one clamping

1

Turning the flat surface

2

Profile generating of PlusMinus screwdriver blades

3

Milling of the protruding edges

4

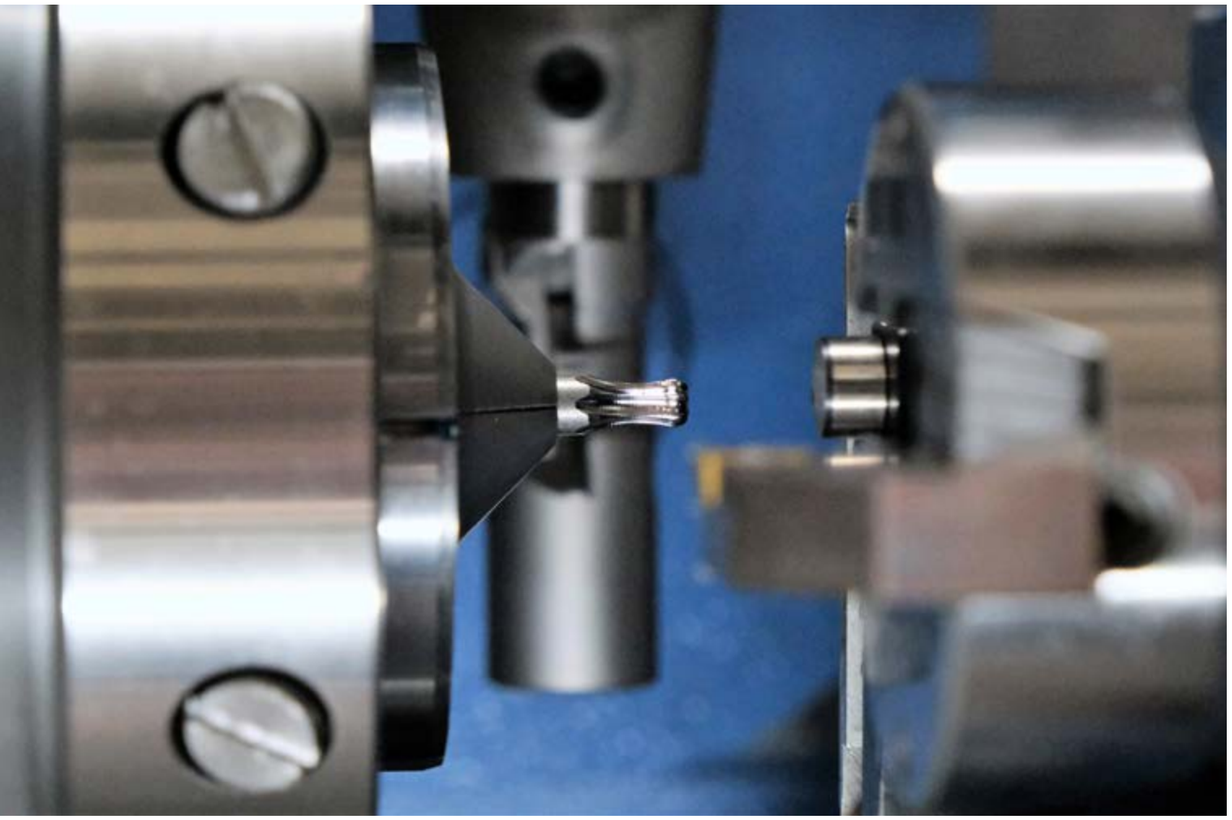
PlusMinus screwdriver blades after machining

PROFILE GENERATING CENTERS LP110

Example of use: Torx ball head screwdriver

Five-axis CNC profile generating center for processing screwdriver blades

- raw parts Ø 2.5–10 mm (0.098"–0.39")
- workpiece lengths 50–320 mm (1.97"–12.6")
- workpiece spindle head LP110 with chuck holder, brake disc for cycle operation and AC servo motor
- milling system manually tiltable from horizontal to vertical position
- puncture magazine for lift loader
- NC loading system
- screw tool profiles:
  - cross recess PH 00 – PH 4
  - Torx T1 to T60
  - Pozidrive Pz 0 – Pz 4
  - hexagon SW 2 to SW 10
  - hexagonal ball head SW 2 to SW 10
- processing steps
  - feeding of the raw part via LP step conveyor
  - turning the flat surface
  - profile generating of the Torx ballpoint screwdriver blade in one clamping

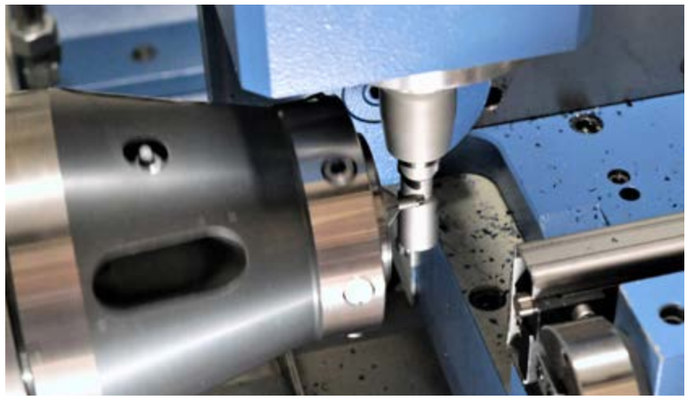


1

Feeding via LP step conveyor

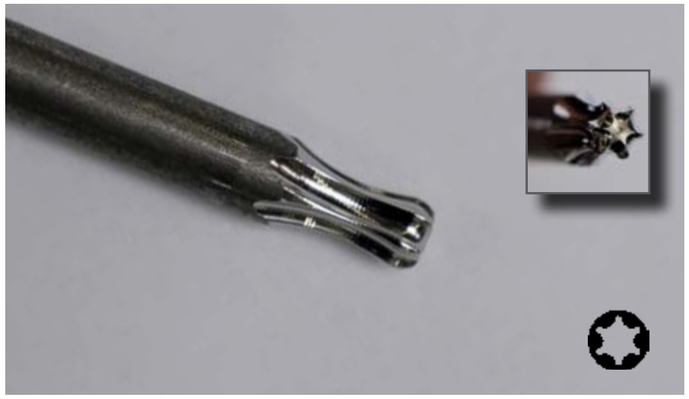
2

Feeding of the workpiece



3

Profile generating of ball end screwdriver blade



4

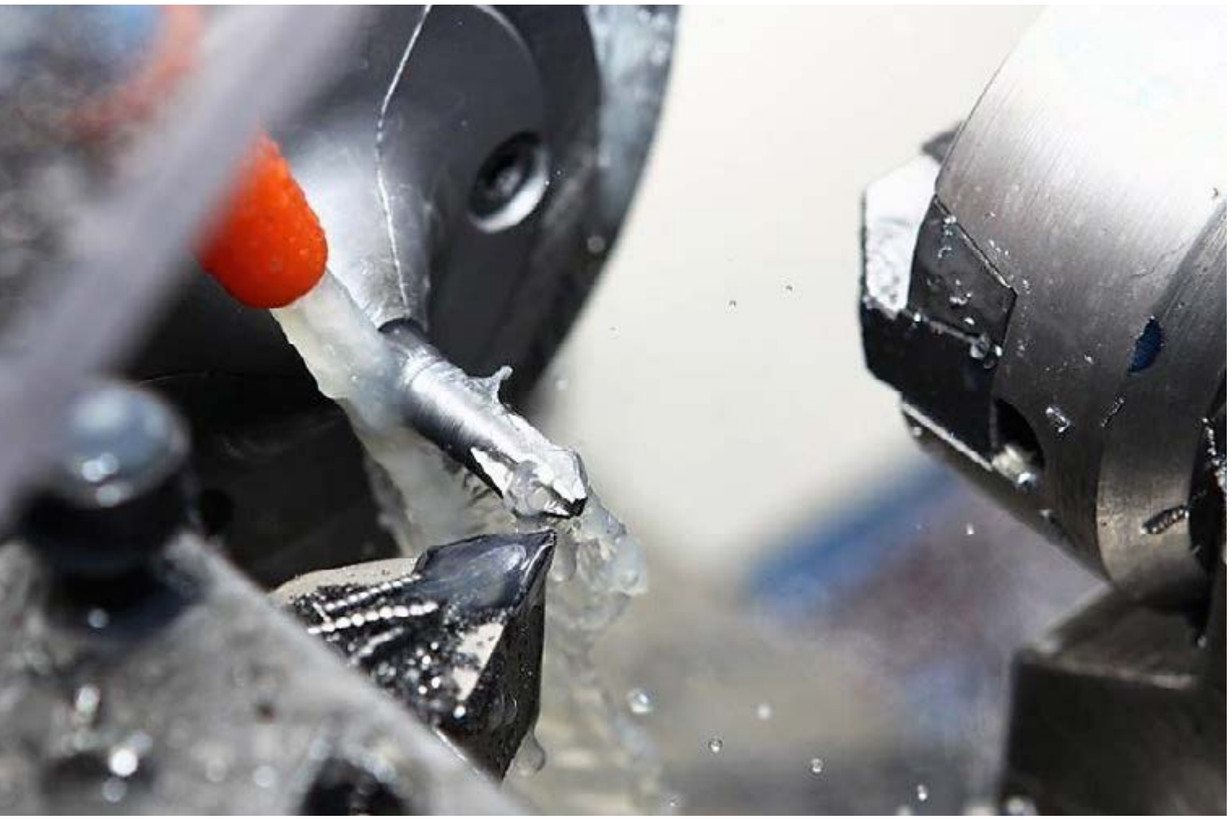
Torx ball end screwdriver blade after machining

PROFILE GENERATING CENTERS LP110

Example of use: Cross-recess screwdriver

The profiling generating center shown here is designed for the machining of cross-recess screwdrivers.

- feeding of the blanks (round or hexagonal) via step conveyor
- blank Ø 2–4 mm (0.079"–0.16")
- workpiece length 80–200 mm (3.15"–7.87")
- profiles: cross recess, torx, pozidriv, hexagon, hexagon ball head
- machine with five CNC axes
- push-through magazine for lift loaders designed for workpiece Ø 2–12 mm (0.079"–0.47")



1

Turning the flat surface

2

Profile generating

3

Long turning and ejection of the finished workpiece

4

Cross-recess screwdriver blade after machining

REQUEST FOR QUOTATION

QUESTIONNAIRE FOR TECHNICAL DATA

BERGER GRUPPE

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

WORKPIECE	Workpiece			
	Lot size			
	Batch size			
	Number of types			
	Sample			
	Drawing			
PROCESSING	Contour grinding	Polishing		
	Back grinding	Scalloped grinding		
	Flat grinding	Serrated grinding		
	Flat bevel grinding	Bolster Machining		
	Hollow grinding	Handle Machining		
	Glazing	Sharpening		
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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