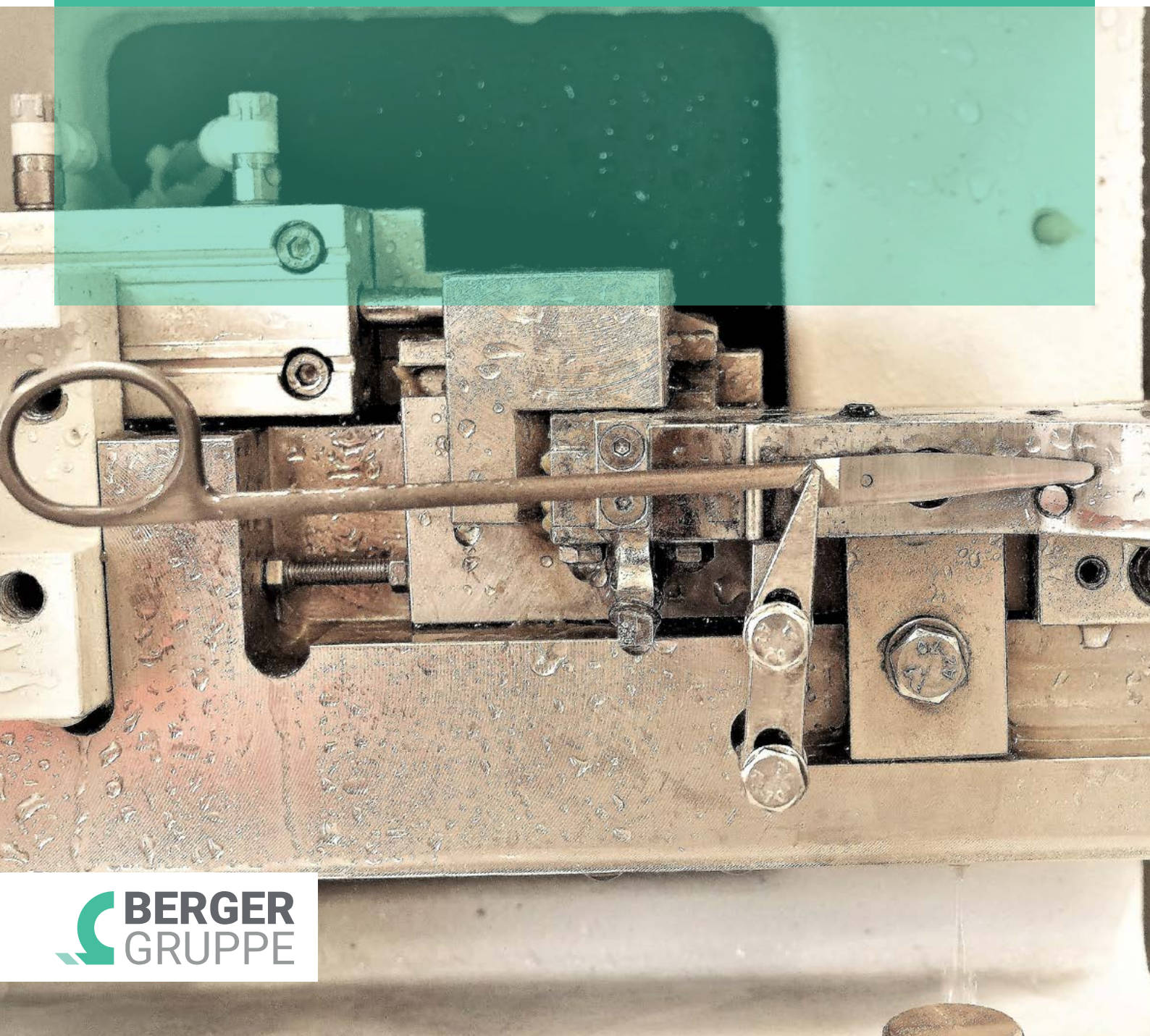




## SURGICAL INDUSTRY

MACHINES + ROBOTIC CELLS FOR  
grinding | sharpening | polishing | milling



CONTENT

MACHINES AND ROBOTIC CELLS

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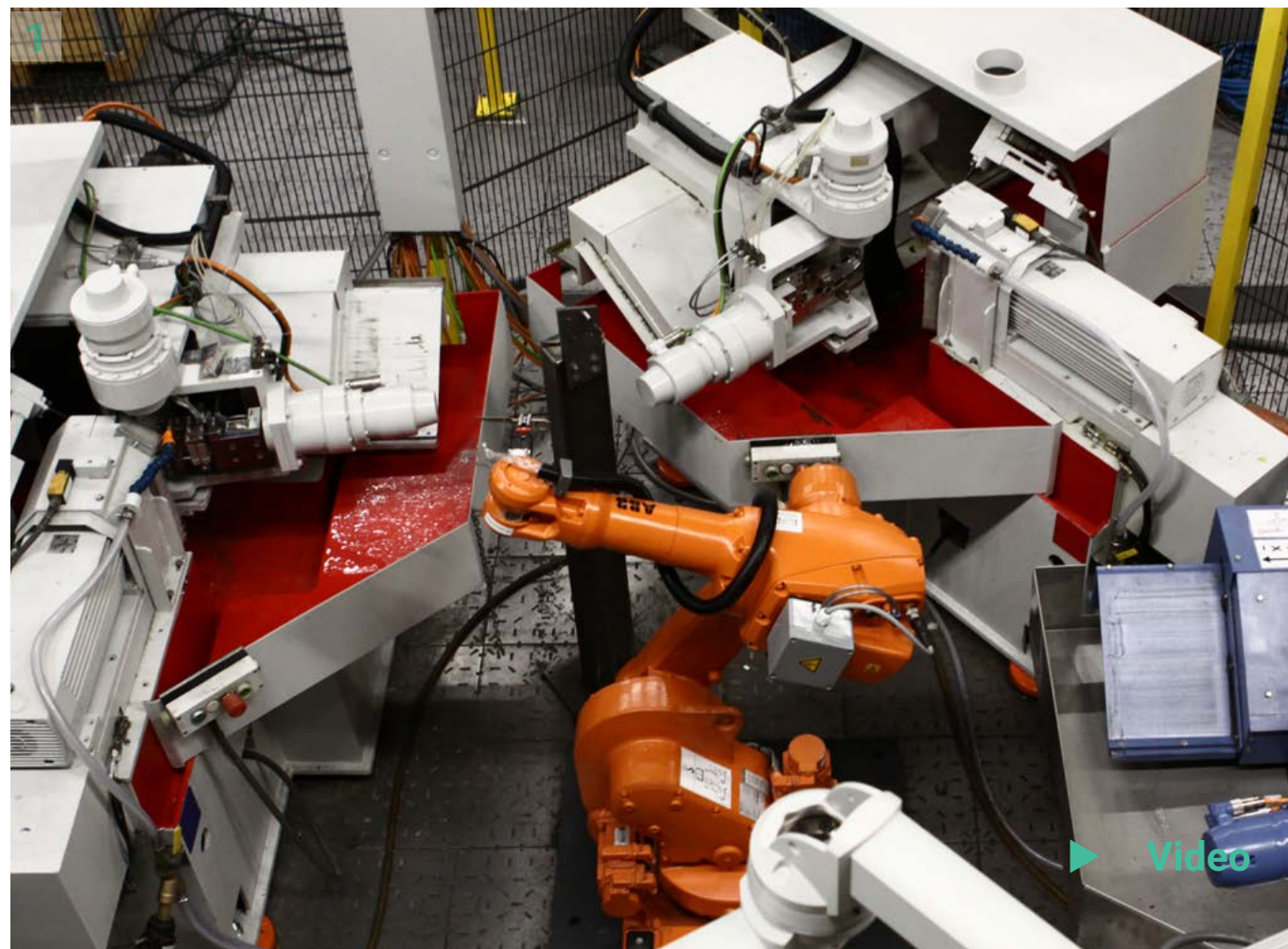
## GRINDING MACHINES

### FOR SINGLE WORKPIECES

#### GRINDING SHARPENING GLAZING

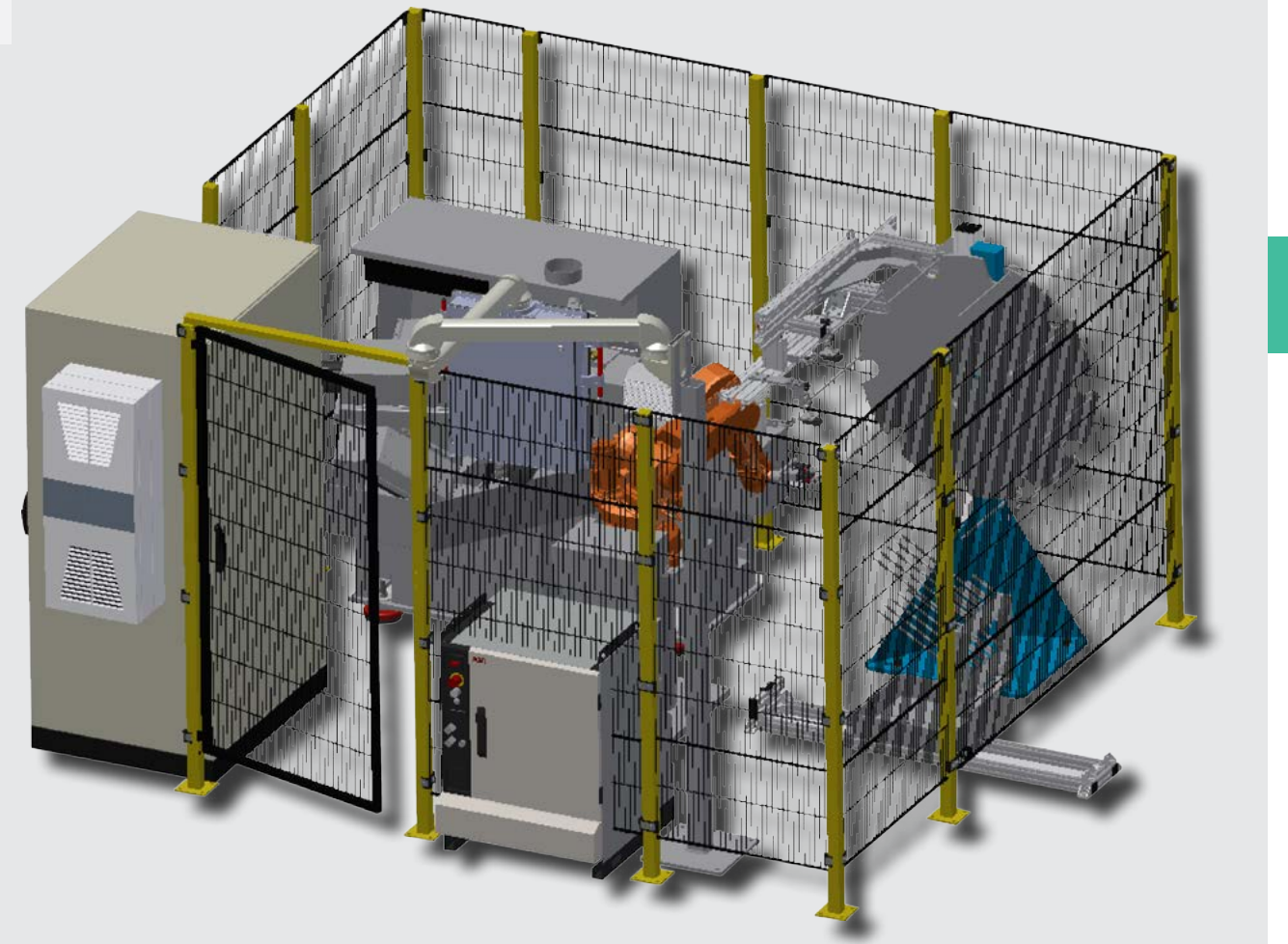
Grinding with CNC technique

The Berger Gruppe offers a wide range of CNC-controlled machines for machining surgical workpieces.



▶ Video

2



Various machining operations can be carried out, such as surface grinding, radii grinding, flat grinding, serrated and scalloped grinding, sharpening, glazing or 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
- glazing machines
- contour grinding machines
- sharpening machines



#### Examples of use (pictures)

1. Flat bevel grinding machine of the series BG0/RV/NT for radii grinding of surgical scissors (picture 1)
2. Exemplary design of a processing cell for surgical scissors with flat bevel grinding machine BG0/RV/NT, robot loading and unloading and rotating bar magazine (picture 2)
3. Surface grinding of surgical scissors with peripheral grinding machine of the series PH/PB/RV/NT (picture 2)

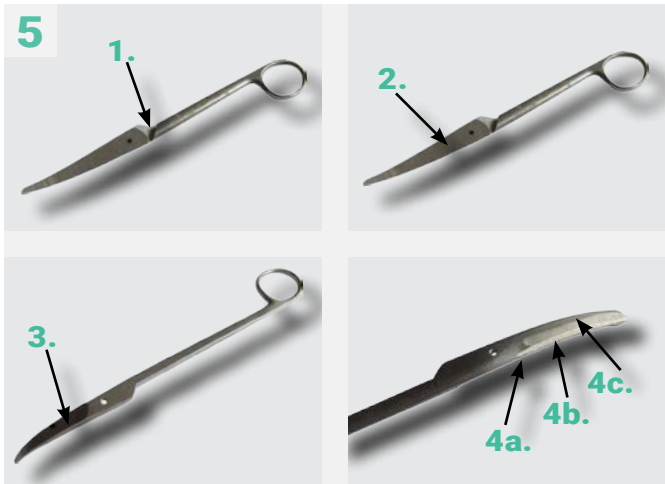
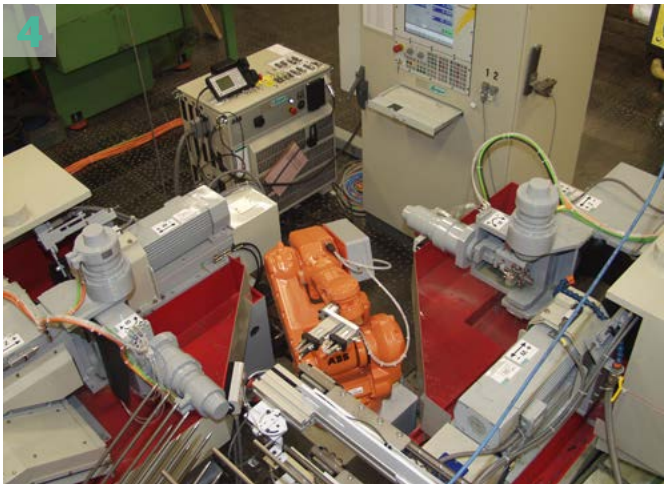
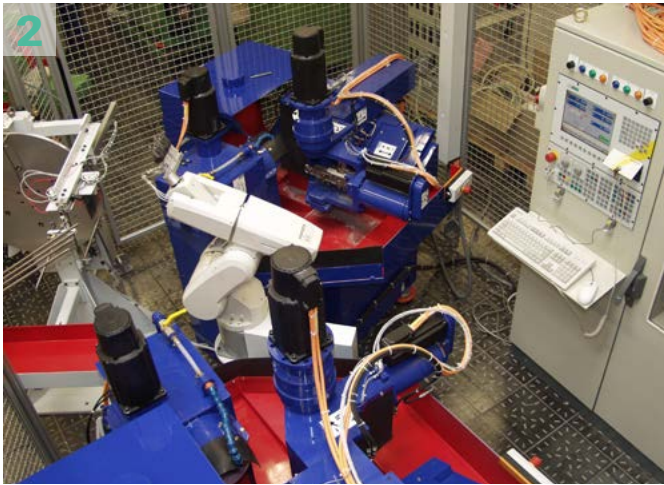
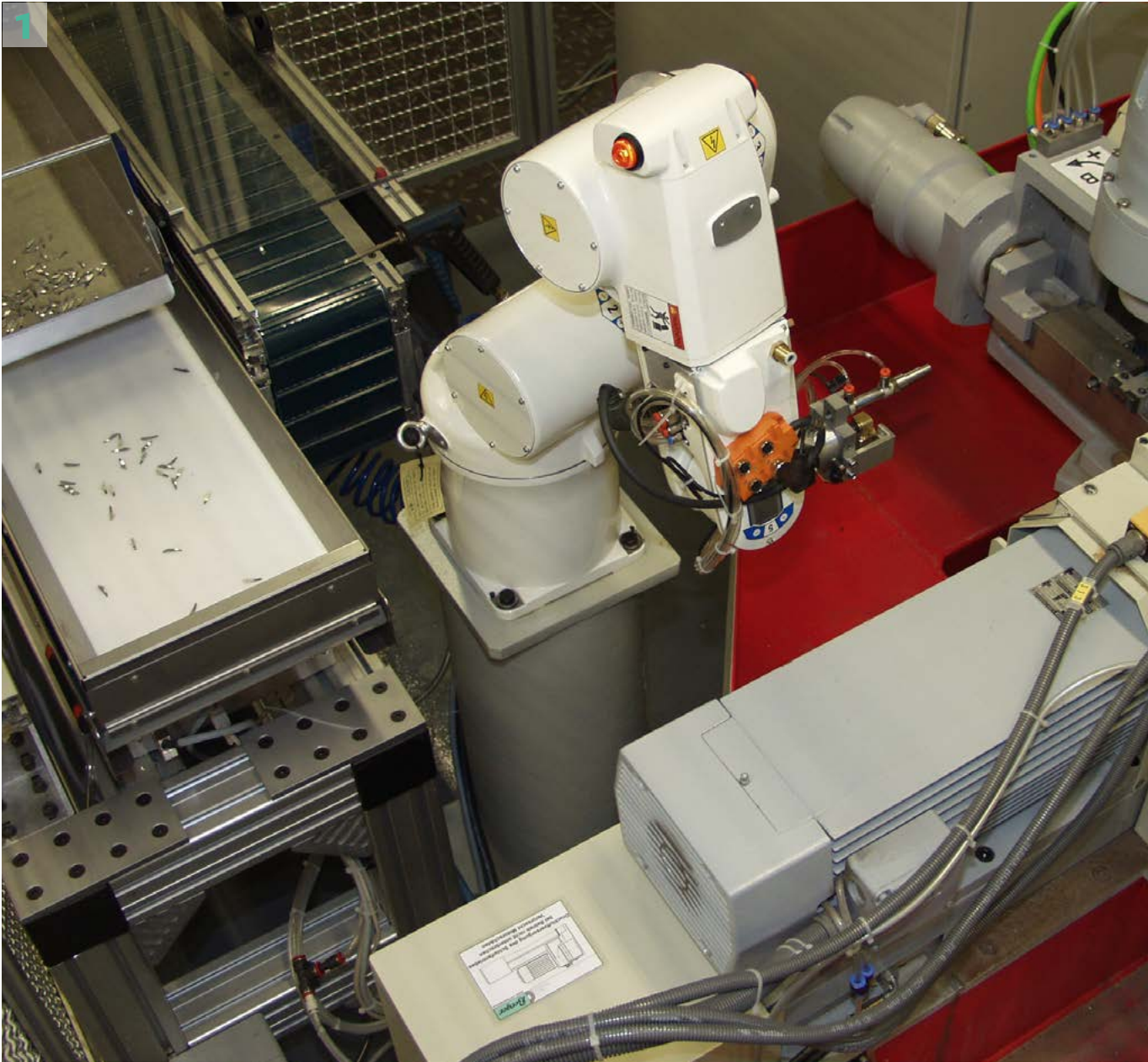


# FLAT BEVEL GRINDING MACHINES BG0/RV/NT

## Grinding of extremely curved workpieces

CNC grinding machine with four-axle grinding table for grinding extremely curved radii of surgical scissors, tweezers, forceps or similar workpieces

- four axes for extremely curved radii: two linear axes and two rotation axes
- laser measurement of the contour and direct export of the recorded dimensions to the programming interface (see also p. 39)



- grinding table swivel angle  $\pm 50^\circ$ , thus programmable hollow angle e.g. on inside of scissors
- economic machining of small series
- four-axle grinding table with digital Windows control
- automatic compensation of the grinding wheel wear via integrated CNC axis in connection with measuring control with measuring probe and digital display of the grinding wheel wear
- automatic interval-controlled lubrication with control and fault display
- remote maintenance, diagnosis and troubleshooting via TeamViewer

## Examples of use (pictures)

1. Automatic loading/unloading, parts feeding by vibratory feeder, position recognition on conveyor using camera system and loading by six-axle robot (picture 1)
2. External machining of surgical scissors (picture 2)
3. Surface grinding of surgical instruments (picture 3)
4. Sequential machining of half-moon and inside of the top and the bottom of shear blades of surgical scissors (picture 4)
  - 4a. Half-moon
  - 4b. Hollow inside
  - 4c. Outside
5. Different machining in separate clamping (picture 5):
  1. Half-moon
  2. Hollow inside
  3. Outside
  4. (a-c) Outside facet grinding



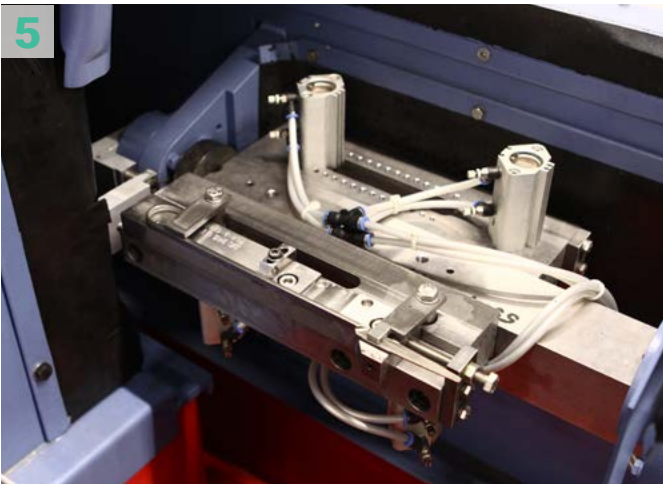
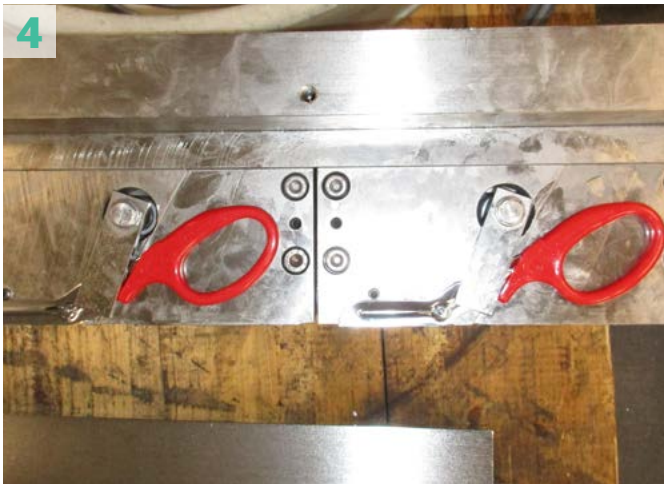
# FLAT BEVEL GRINDING MACHINES BG1/ZA/NT

## Surface grinding

CNC grinding machine with three-axe grinding table for bevel grinding of blades at knives, scissors, hand tools or similar workpieces

In the field of surgery, the BG1/ZA/NT is employed for grinding the inside shank of surgical scissors.

It can be combined with milling centers or bending stations (see p. 36–37).



- three-axe CNC grinding machine
- grinding wheel Ø 350 mm (13.78")
- 11 kW, up to 3000 rpm
- grinding stroke up to 350 mm (13.78")
- automatic robotic loading with ABB, Mitsubishi, Kuka and other
- storing of surgical scissors and instruments

## Examples of use (pictures)

1. Grinding of inside shanks (picture 1)
2. Grinding of springs on tweezer parts (picture 2)
3. Grinding of cutting edges on hoof knives (picture 3)
4. Grinding of cutting edges on disposable shears with double clamping device (picture 4)
5. Internal grinding of stalks on surgical scissors with double clamping device (picture 5)

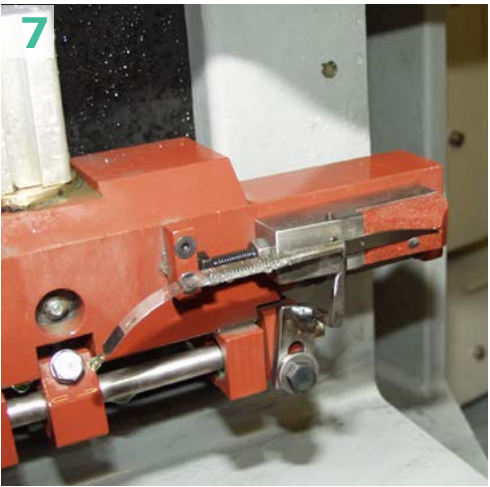
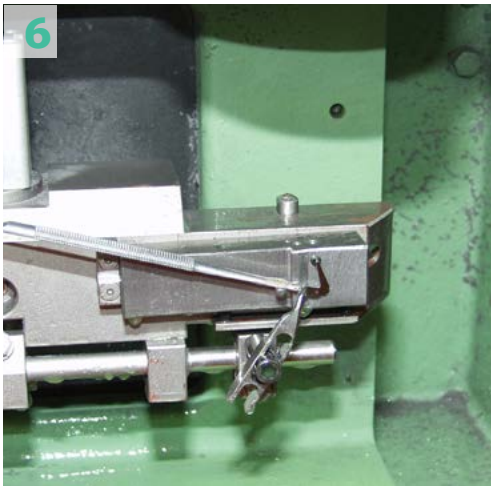
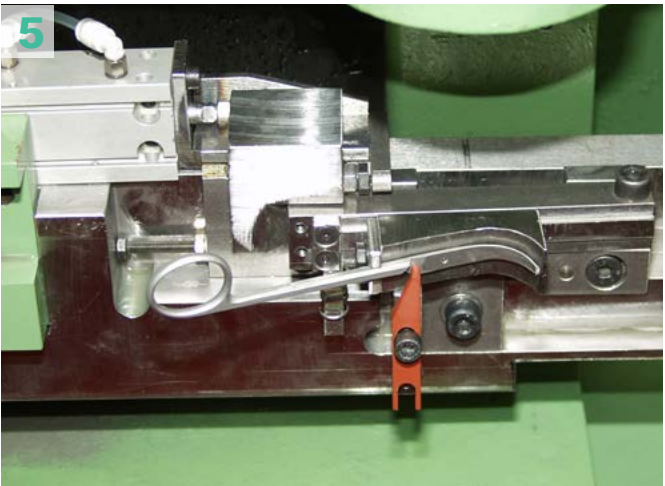
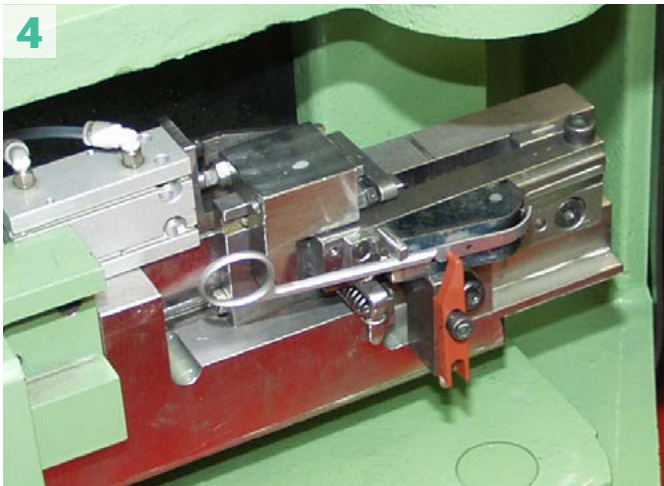
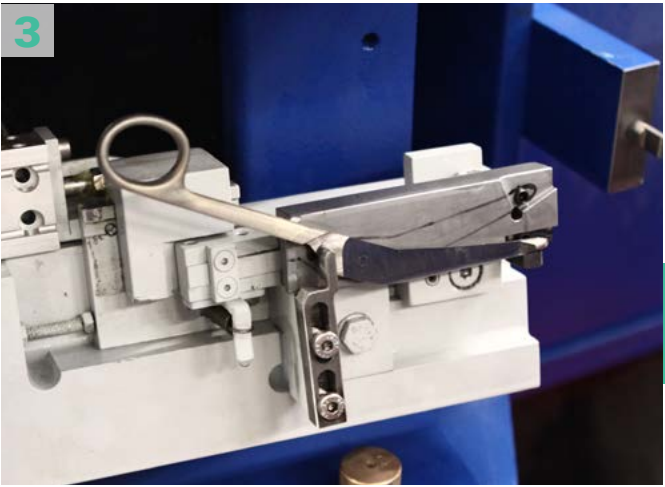


# FLAT BEVEL GRINDING MACHINES BG

Surface and radii grinding of surgical scissors

The grinding machines of the series BG are designed for grinding of surfaces at e.g. knives, scissors, hand tools and similar workpieces.

Polyester bonded grinding wheels are used for grinding the inside and outside.



## Examples of use (pictures)

- 1. Clamping device for receiving half-moon, top and bottom of shear blades (picture 1)
- 2. Surgical scissors, external blade machining (picture 2)
- 3. Processing of the inside of bandage scissors (picture 3)
- 4. Machining of the inside of extremely curved scissors (picture 4)
- 5. Processing of the outside of strongly curved surgical scissors (picture 5)
- 6. Machining of the blade of micro scissors and spring shears (picture 6)
- 7. Machining of the inside of spring shears (picture 7)



# FLAT BEVEL GRINDING MACHINES

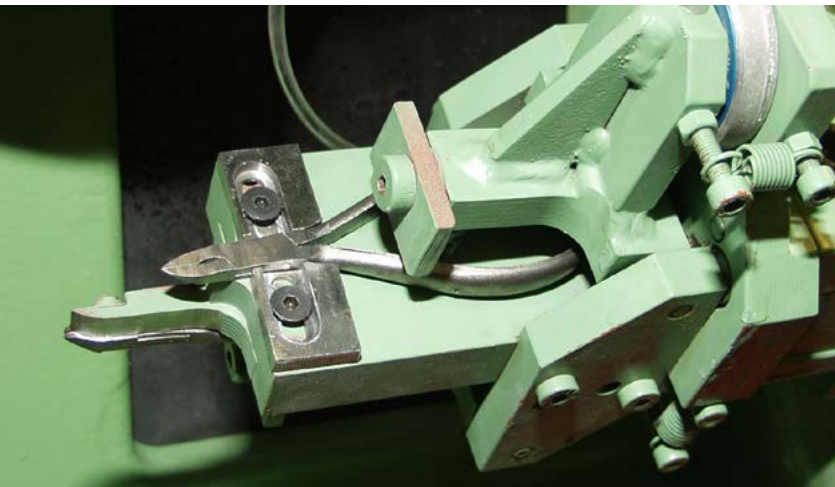
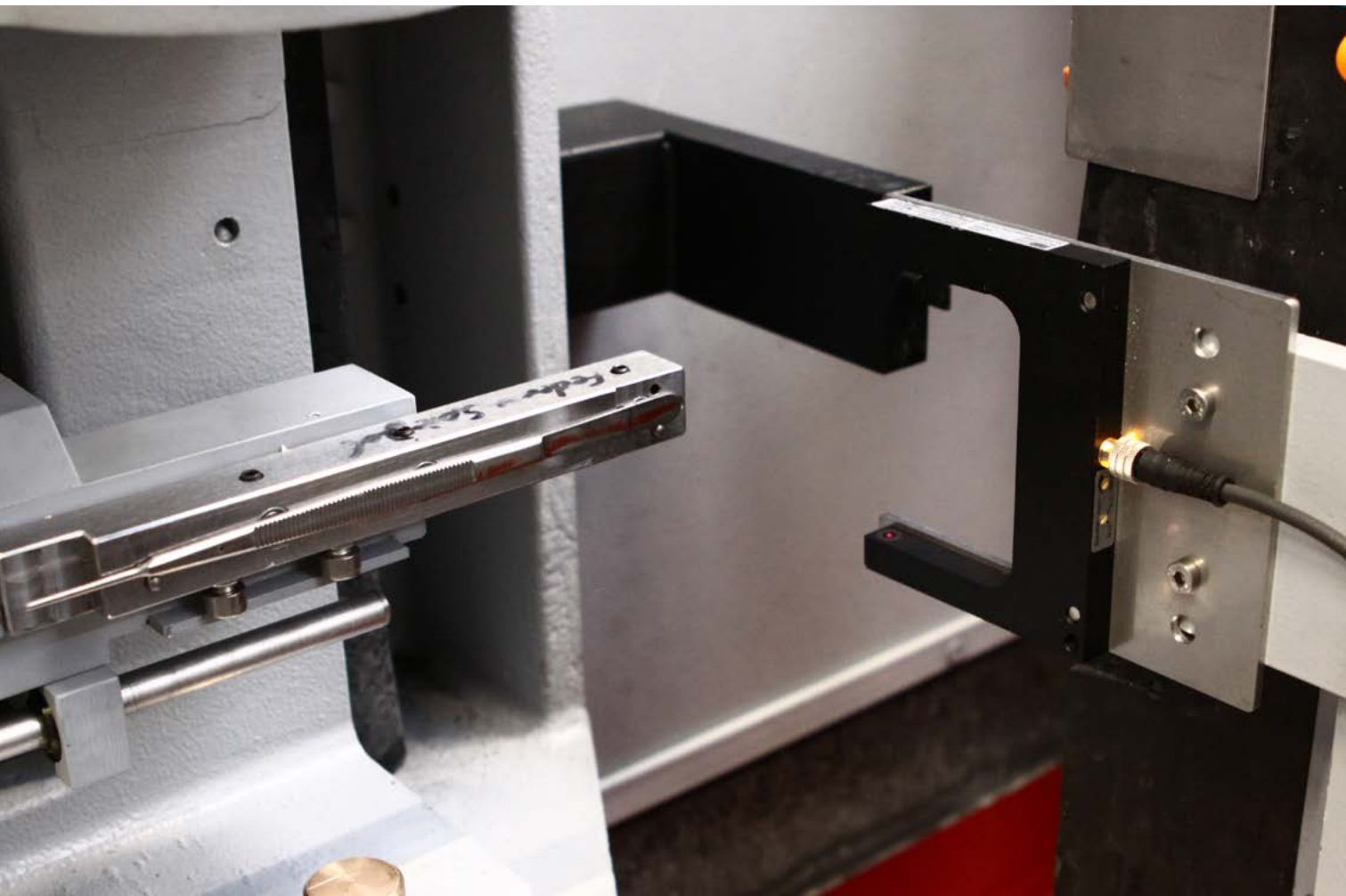
## BG

### Further applications

Thanks to a large number of types of flat bevel grinding machines, straight surfaces on workpieces can be machines (BG/NT) as well as workpieces with curved cutting edges (BG/RH/NT) and strongly curved radii (BG/RV/NT).

### Example of use:

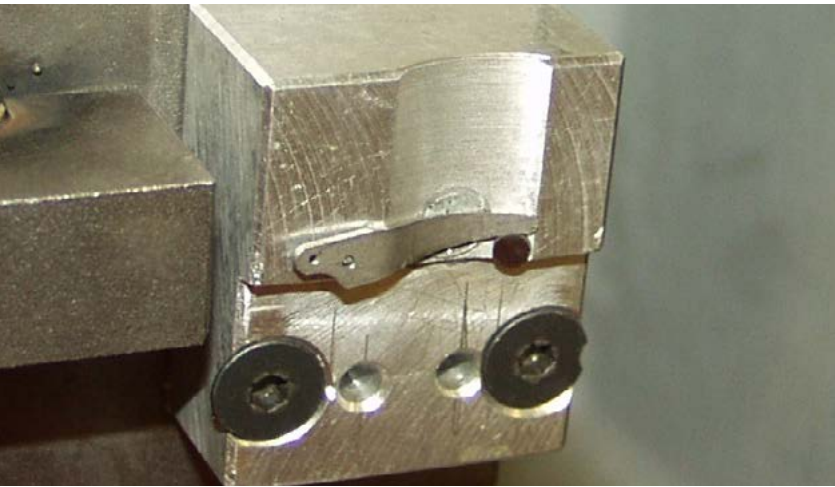
- grinding of tweezers springs (picture here below)



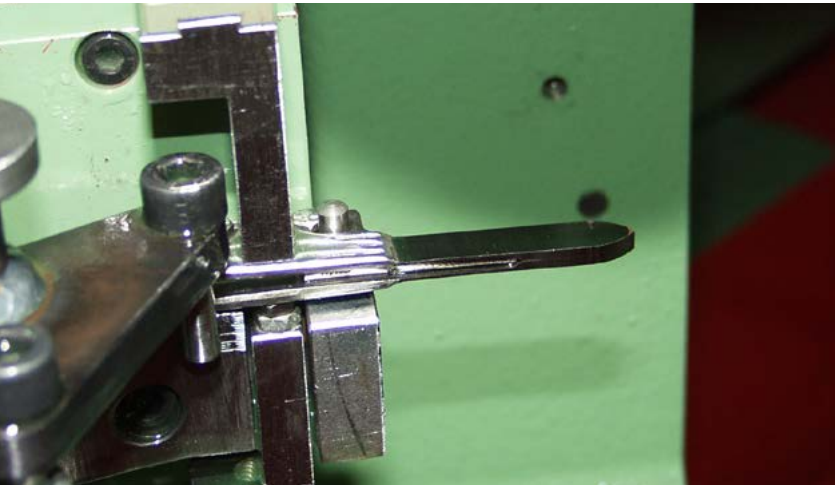
1  
Head processing on surgical forceps with manual loading



2  
Grinding of the inside of eye tweezers



3  
Grinding of the inside of micro scissors



4  
Head processing of welded tweezers



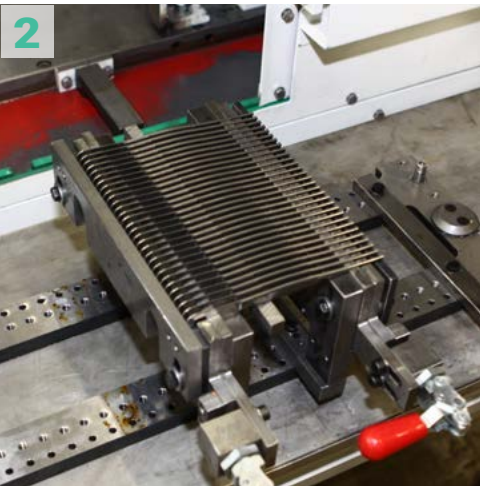
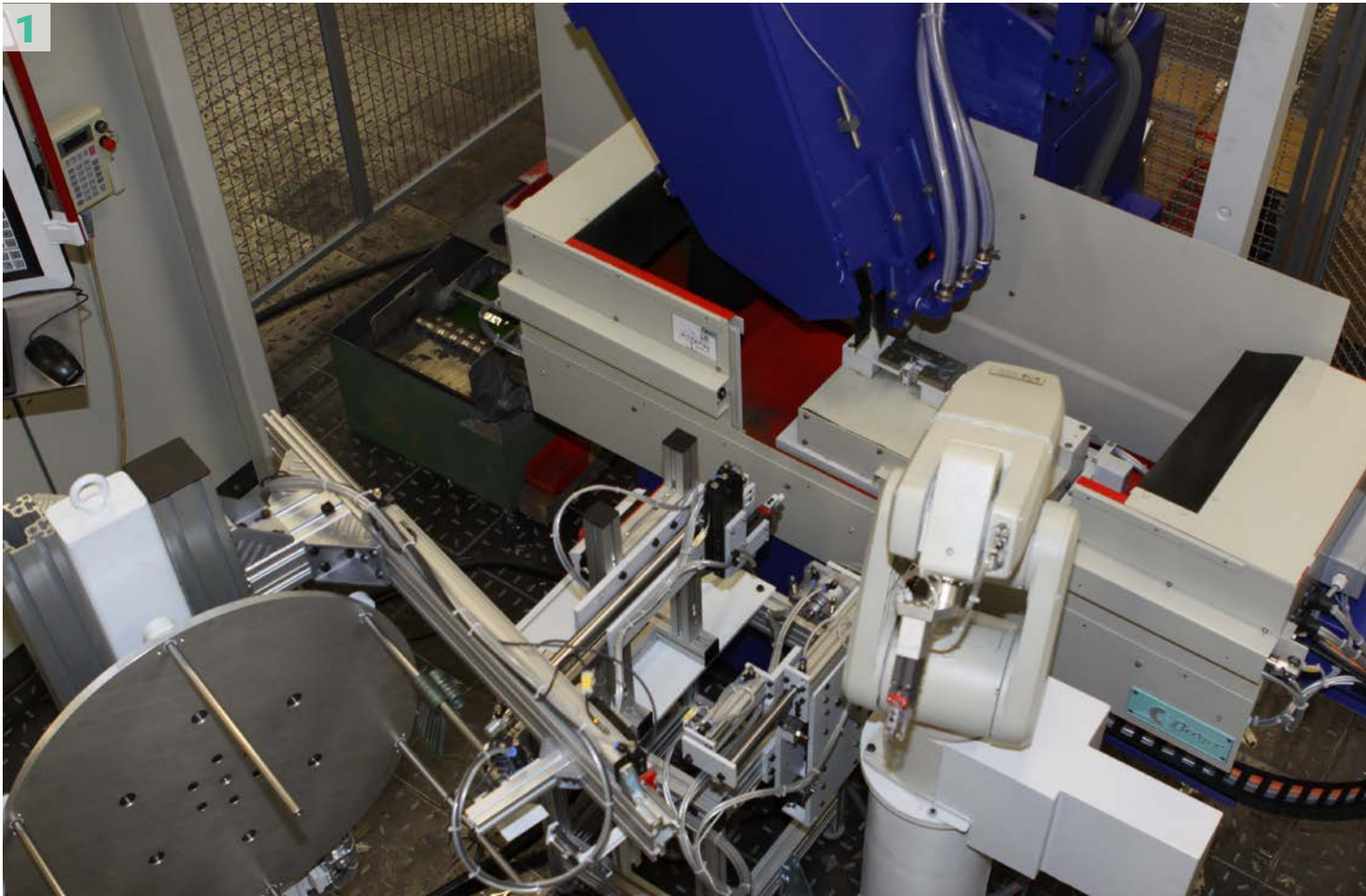
# CONTOUR GRINDING MACHINES

## CG

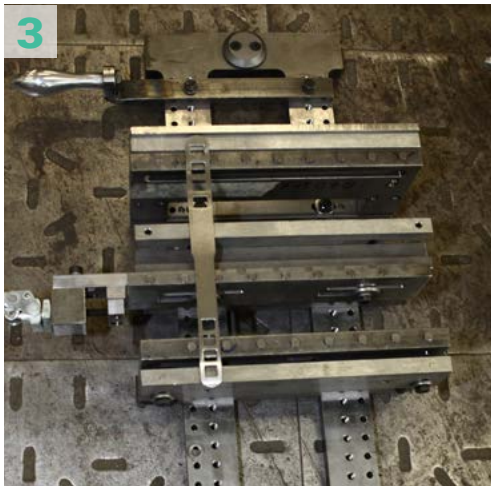
### Contour grinding

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

- CNC wet belt grinding machine with belts with a length of 3.500 mm x 200 mm (137.8" x 7.9")
- 15 kW, up to 4000 rpm
- contact roller holder in two versions: 80–200 mm (3.2"–7.9") Ø or 30–100 mm (1.2"–3.9") with additional counter bearing
- grinding stroke up to 550 mm (21.7"), 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 strap arm 0–45°
- sensor programming by scanning of the contour and direct export of the recorded dimensions to the programming interface, use of raw or finished parts



- magazine identification system for automatic program calling
- remote maintenance, diagnosis and troubleshooting via TeamViewer
- different magazine constellations for processing tweezers / tweezer parts such as e. g.
  - loading magazine for surgical forceps, welded, high edge (picture 2)
  - loading magazine, inside grinding of single parts (picture 3)



Example of configuration:

- grinding machine CG1 with drum magazine and turning station for processing surgical scissors (picture 1)

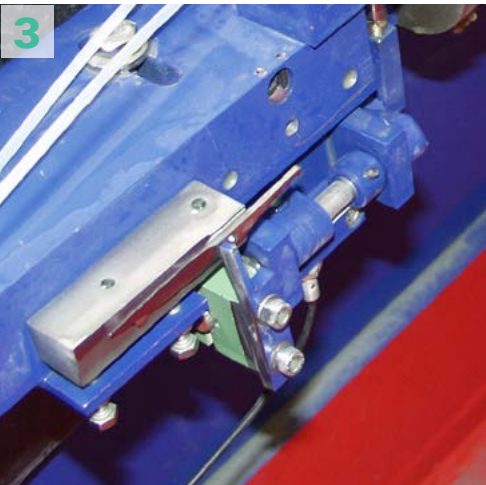
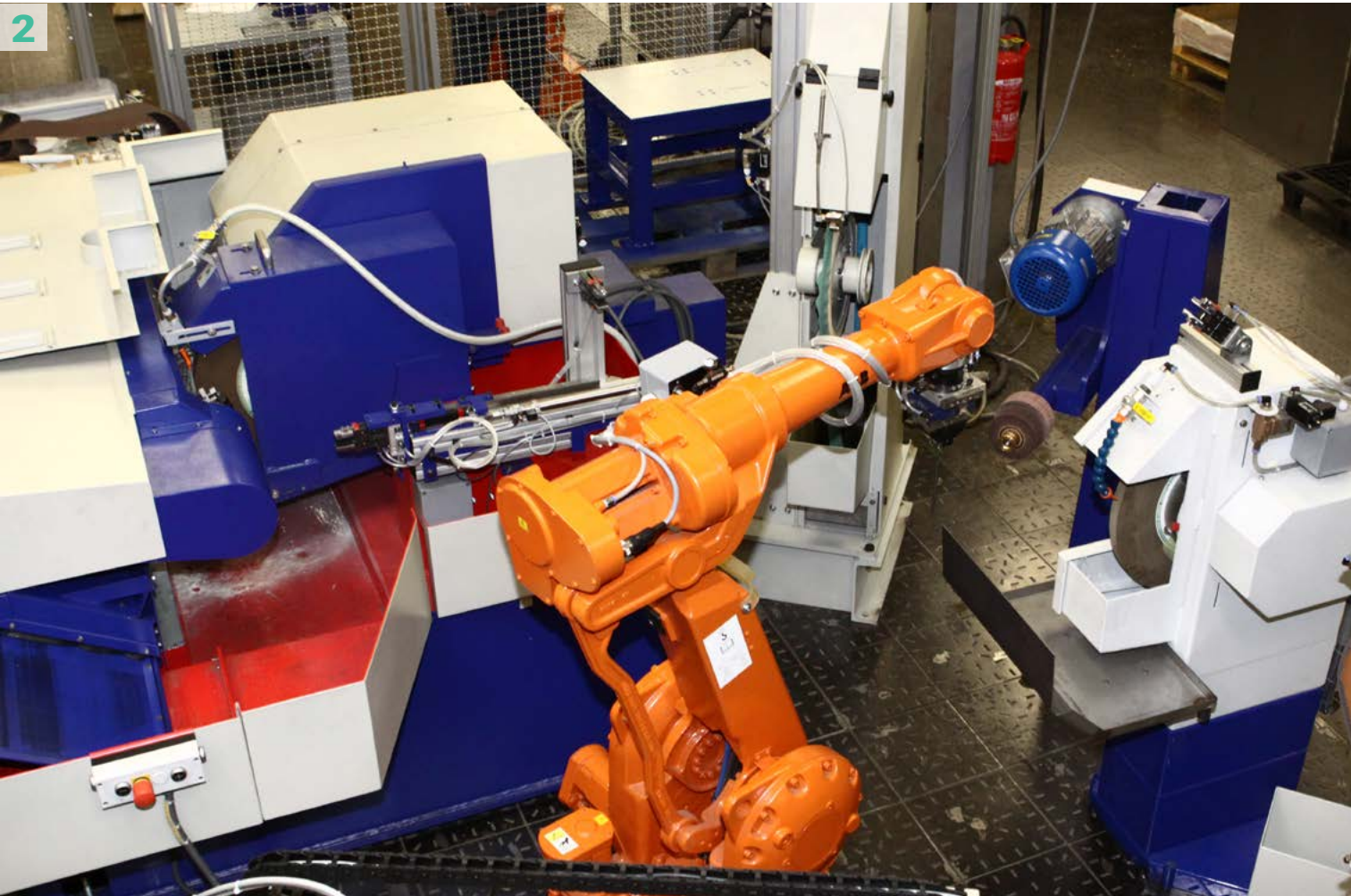


# PERIPHERAL GRINDING MACHINES PB/PB/NT

## Surface grinding

CNC-controlled peripheral grinding machine with three- to five-axe grinding table for grinding the crowned outside and hollow in-side of scissors.

- CNC-controlled three- to five-axe grinding machine
- peripheral disc with 200–400 mm (7.78"–15.75") Ø (depending on application)
- grinding wheel dresser with diamond-coa-ted dressing roller or diamond fleece



- 11–18 kW, up to 5000 rpm
- grinding stroke up to 350 mm (13.8") or up to 490 mm (19.3")
- automatic robotic loading with e. g. ABB, Mitsubishi or Kuka
- storing of surgical scissors and instruments

## Examples of use (pictures)

1. Grinding of a cross toothing at bone saws (picture 1)
2. Peripheral grinding machine of the PH/PB/NT series with robot loading (picture 2)
3. Grinding the crowned outside of scissors (picture 3)
4. Grinding of the hollow side in the recess with 150 mm hollow radius (picture 4)

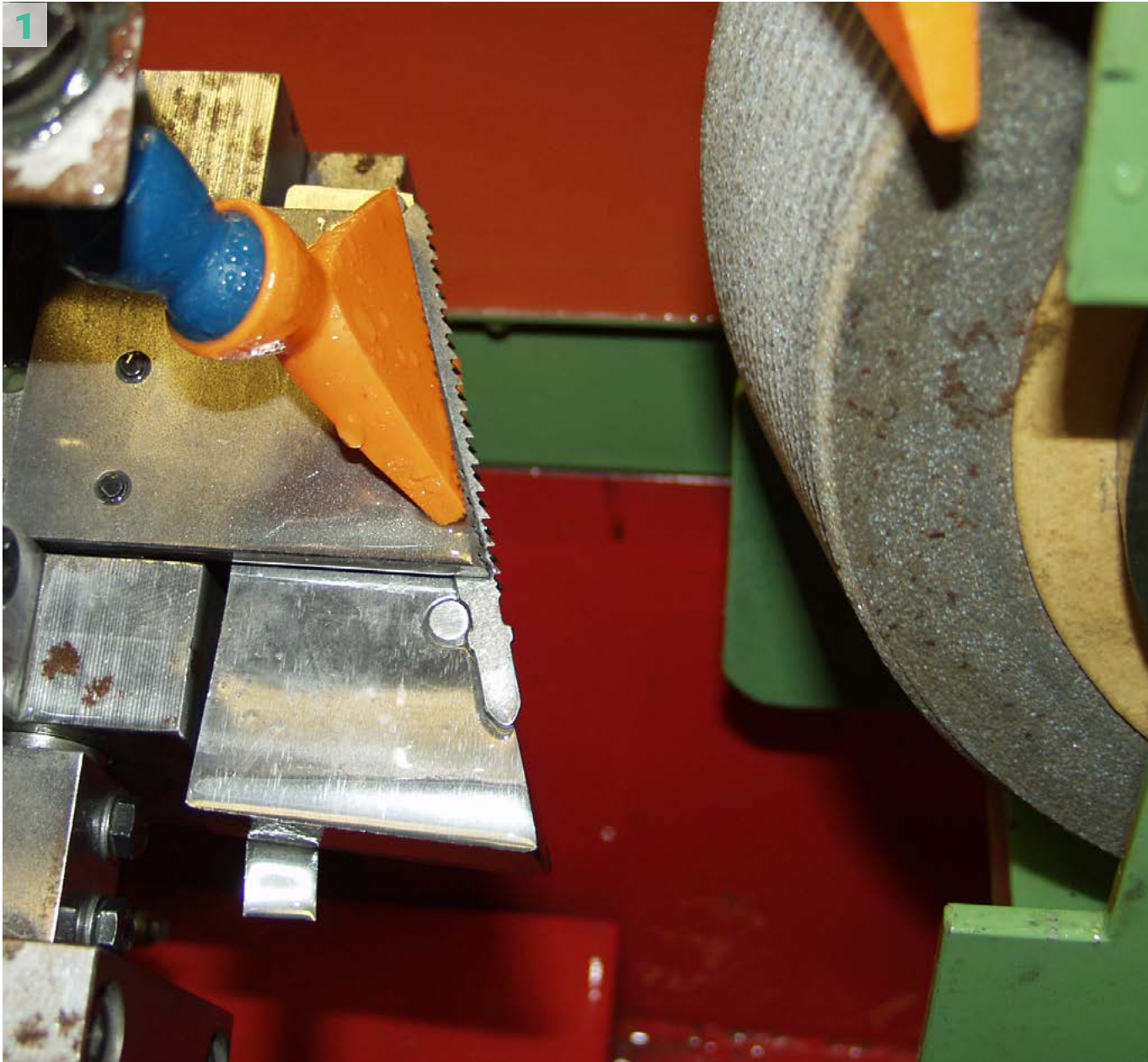


# PERIPHERAL GRINDING MACHINES WS

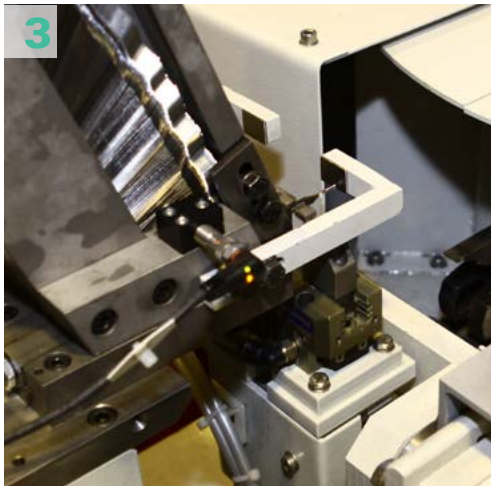
## Serrated grinding, plunge grinding and through-feed grinding

CNC-controlled peripheral grinding machine with up to three axes for plunge grinding of serrations at knives, surgical blades, scissors or similar workpieces

- CNC control with display of all operating information / programming of up to three axes
- horizontal wheel motion by AC servo motor driven by preloaded precision ball screw
- max. grinding width 100 mm (3.4")



- 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)
- cross tooth grinding on saws in conjunction with vertical and swivel axis for saws up to 650 mm length in indexing operation



## Examples of use (pictures)

1. Production of saws, cross toothing with additional vertical and swivel axis (picture 1)
2. Production of gouge blades in conjunction with camera measuring station and automatic loading and unloading (picture 2 + 3)



# ROTARY INDEX TABLE GRINDING MACHINES

## RST

### Single grinding of scalpel blades

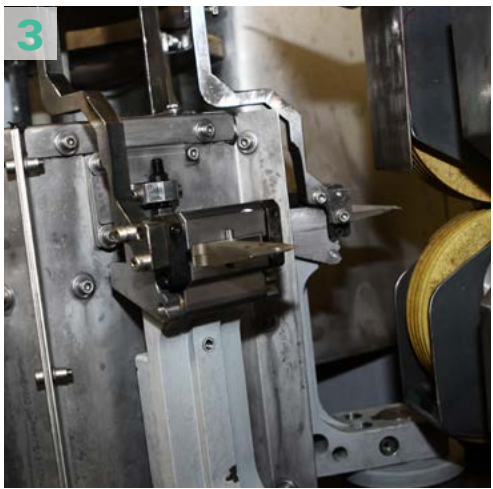
CNC-controlled rotary index table grinding machine of the series RST consisting of:

- eight position rotary indexing table for indexing
- two rotary modules for the spiral grinding stations 1 and 2 with CNC axis for both rotary modules, integrated in CNC control (B-axis)
- six mechanical clamping devices
- six workpiece supports that can be changed depending on the model
- two spiral grinding stations
- workpiece feed via pneumatic pick-and-place unit for feeding scalpel blades from magazine
- feeding magazine consisting of two vertical stacking magazines
- workpiece unloading via pneumatic pick-and-place unit for removal of scalpel blades from device and deposit in unloading magazine
- unloading magazine consisting of two magazine swords
- ten-axle CNC control



### Examples of use (pictures)

1. Corresponding grinding stations assigned to a precision rotary table (picture 1)
2. CNC-controlled rotary index table grinding machine with four grinding tables for grinding scalpel blades by through-feed method (picture 2)
3. Working the grinding and polishing stations in pulling grinding with spiral discs (picture 3)



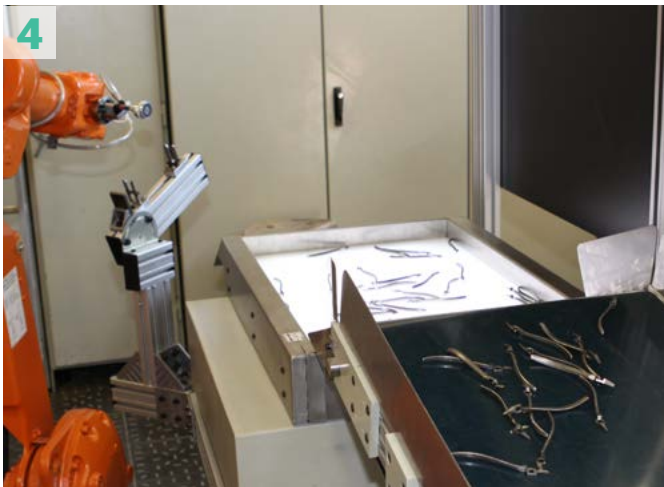
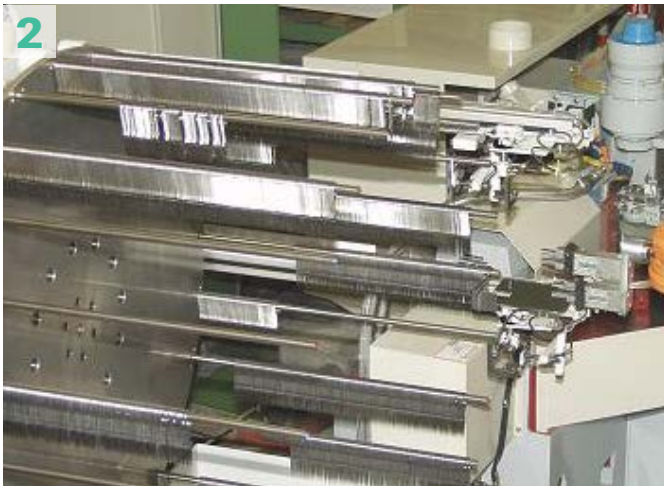
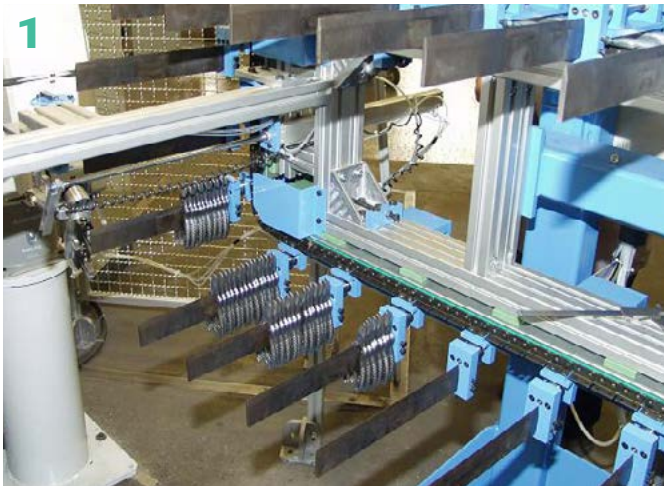


# ACCESSORIES FOR GRINDING MACHINES AND ROBOTIC CELLS

## Magazine systems

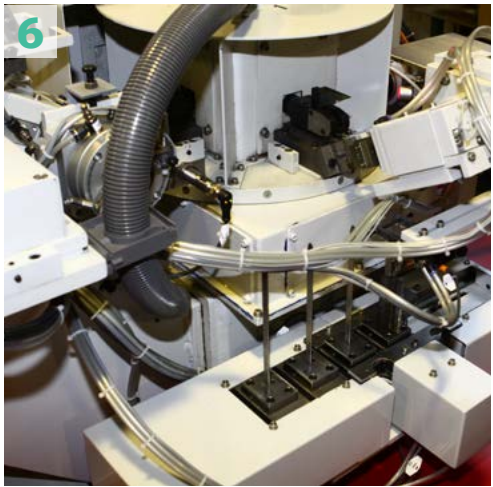
The design of loading and unloading magazines depends on various requirements such as:

- required magazine capacity (e.g. one hour or one complete shift)
- shape of the workpiece (forged, conical or flat)
- variety of workpiece shapes / dimensions, that should be processed
- integration in the preceding production stage (e. g. stamping) or subsequent processing (e. g. polishing or glazing)
- in which way the pieces are orientated (e. g. disordered in a glide grinding line)



## Examples of use (pictures)

1. Drum magazine designed for surgical forceps (picture 1)
2. drum magazine designed for surgical scissors (picture 2)
3. Stacking magazine designed for tweezer parts (picture 3)
4. Partial sort up by vibrating plate (picture 4)
5. Loading from Schäfer box (picture 5)
6. Stacking magazine designed for surgical blades and scalpel blades (picture 6)
7. Bar loading magazine designed for tweezers with position recognition for surgical scissors and instruments (picture 7)





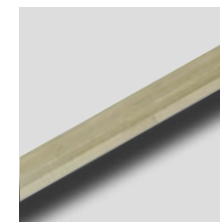
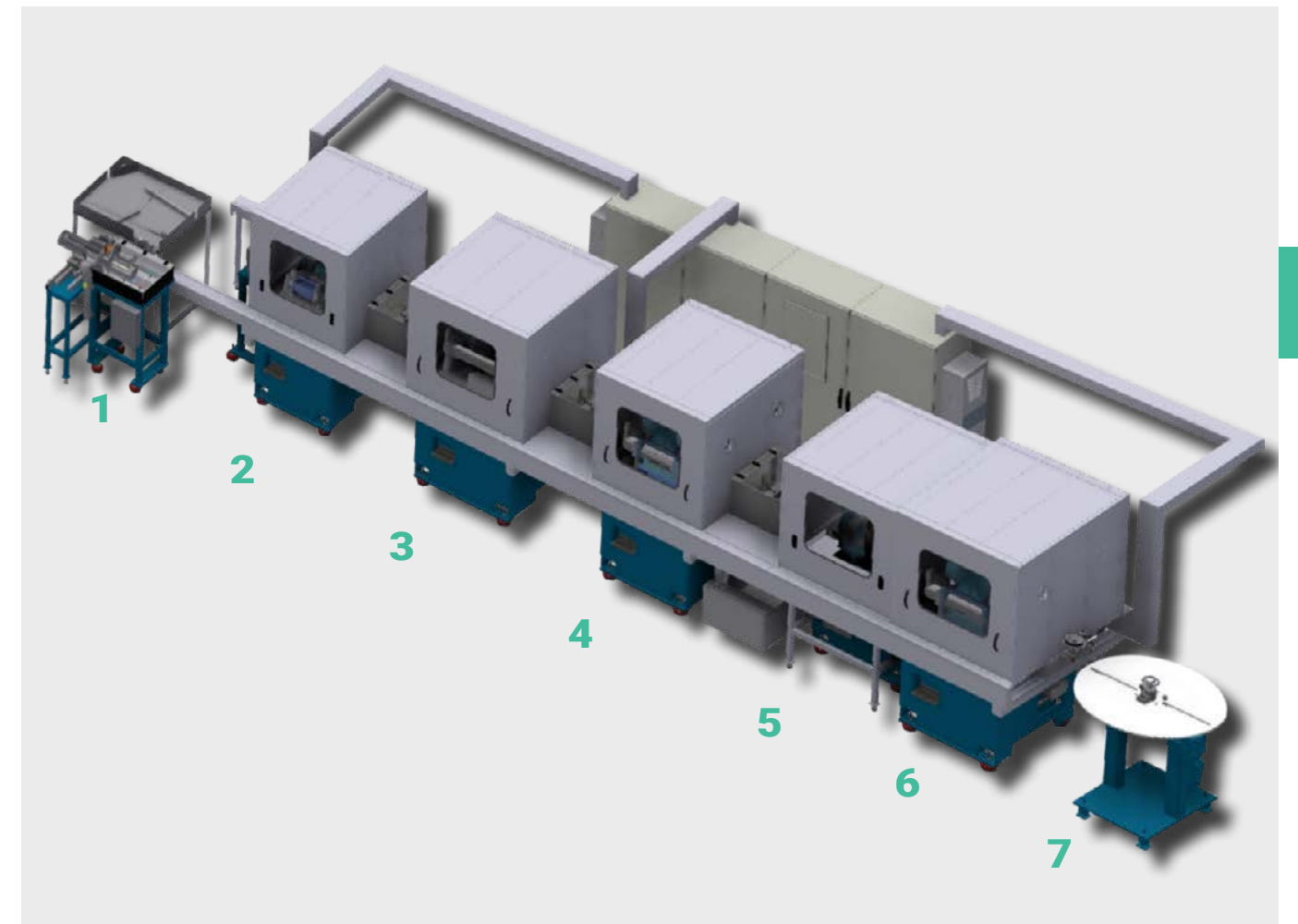
## GRINDING MACHINES

### FOR STEEL STRIPS

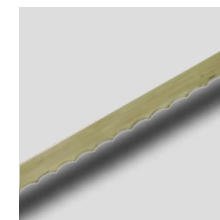
#### STRAIGHT FINISH GRINDING SCALLOPED GRINDING SERRATED GRINDING

Precision grinding machines for straight finish grinding of strips

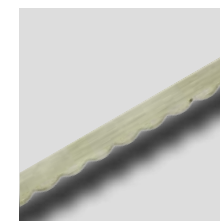
Work is carried out either from coil to coil or from coil to a breaker. The strip material is processed as slit strip or machined at the edge with strip edge trimming machines.



The machines are configured as one- or two-sided grinding stations with tooling, e. g. grinding wheels, positioned at an angle similar to a butterfly wings. The angle spread between the stations can be adjusted by motor from 0 to 35°, depending upon application and configuration.



The adjustment takes place at the set angle so that the cutting angle on the belt remains constant even with decreasing grinding stone diameter.



The grinding wheel wear is compensated by a guide carriage with precision guides, ball screws and an AC servo motor. The adjustment values can be determined using camera or laser measurement technology.

The use of different tools allows grinding, honing as well as polishing of strips.

1. Loop control with breaker and magazine
2. Steel strip deburring and polishing machine of the series BSM3000/P
3. Steel strip grinding machine of the series BSM1500/TT
4. Steel strip grinding machine of the series BSM3000/D
5. Steel strip grinding machine of the series BSM3000/E/R
6. Steel strip grinding machine of the series BSM3000/E/L
7. Spool plate



# STEEL STRIP GRINDING MACHINES

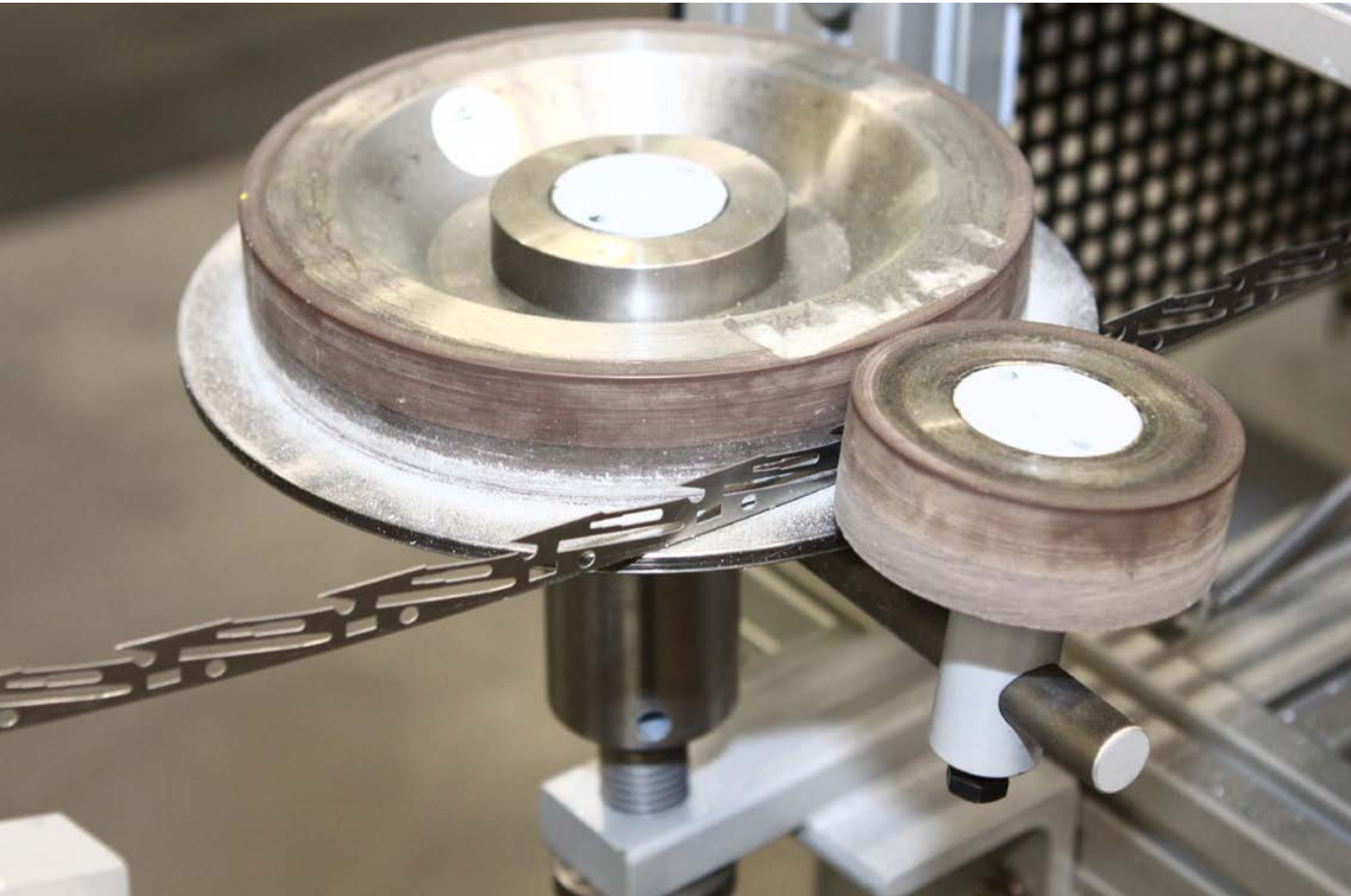
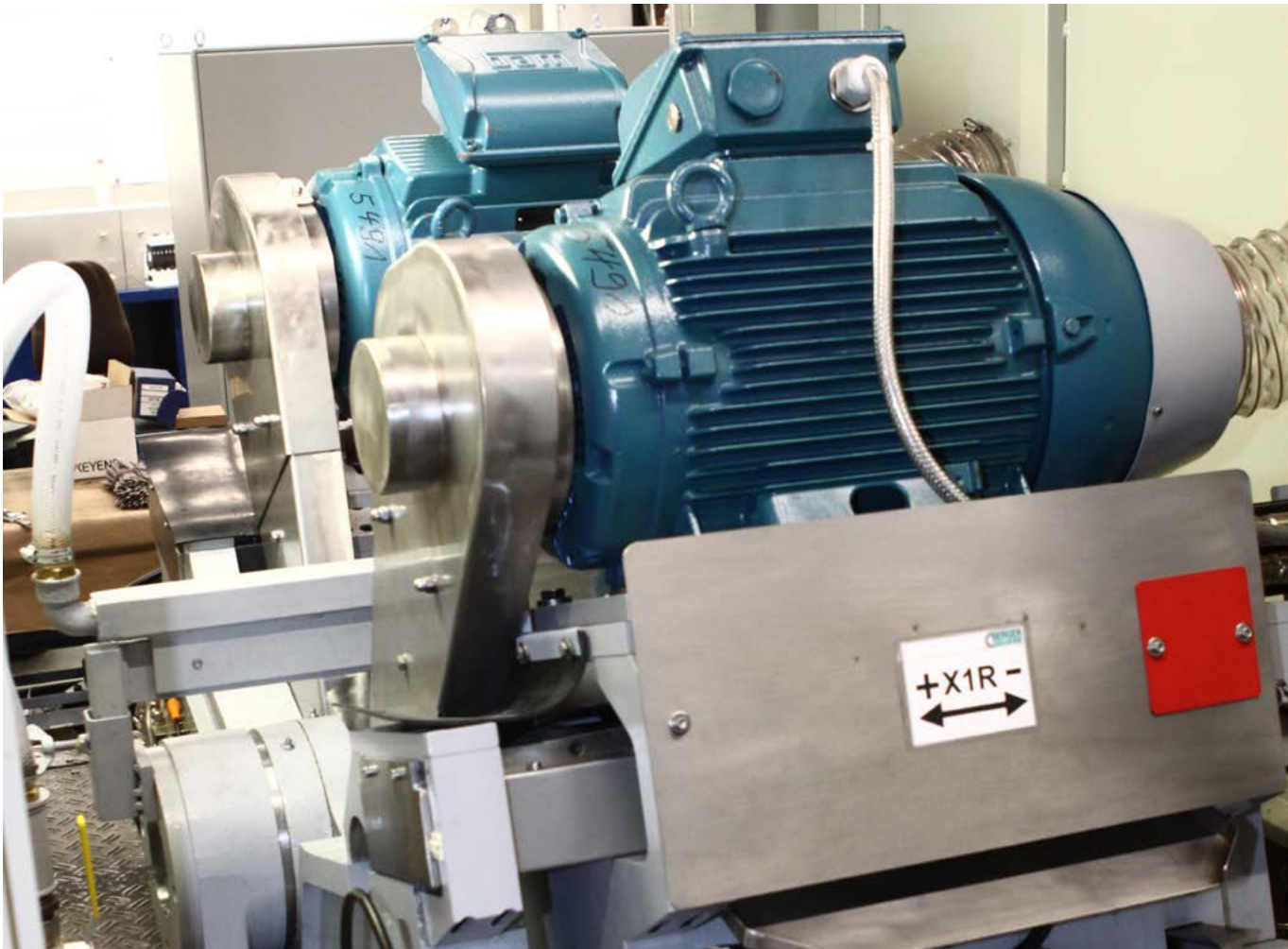
## BSM3000

### Straight finish grinding Continuous grinding

The modular steel strip grinding station of the BSM3000 series can be designed differently depending on the application:

- one-sided grinding station of the series BSM3000/E
- double-sided grinding station of the series BSM3000/D
- double-sided grinding station of the series BSM3000/DP

In conjunction with decoiler, measuring technique and recoiler respectively breaker, 150 straight scalpel blades per minute can be continuously ground and polished on both sides (scalpel type 11).



- main motor: 15 kW or 2 x 15 kW
- frequency converter: 18.5 kW for programmable, constant peripheral velocity
- peripheral velocity: 30–50 m/s (98–164 ft/s)
- motorized angle adjustment: 0–35° with butterfly wings
- grinding wheel Ø: max. 300 mm (11.81")
- wheel/grinding width: max. 300 mm (11.81")
- bilateral precision spindle bearing
- cutting speed: max. 50 m/s (164 ft/s)
- central lubrication
- configured for wet machining with grinding emulsion
- guideways are solid carbide or with carbide inserts
- various dressing systems available for grinding wheel profiles

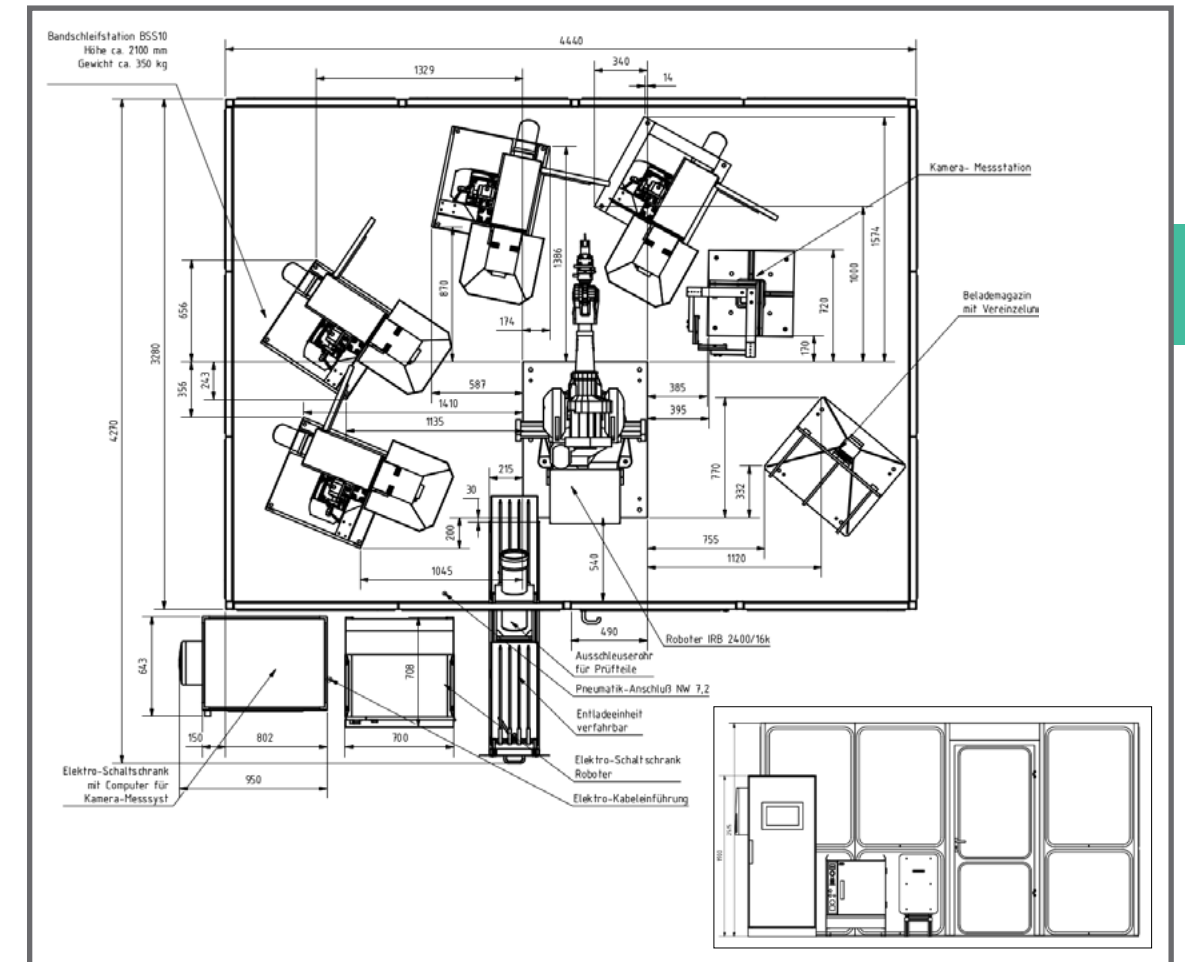


## ROBOTIC GRINDING AND POLISHING SYSTEMS

## GRINDING AND POLISHING WITH ROBOTIC TECHNIQUE

The Berger Gruppe offers solutions for robotic 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 robotic 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 common robot manufacturers such as ABB, KUKA, Stäubli and Fanuc
- programming in touch-in mode or with a CAD/CAM interface
- integration of measuring 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



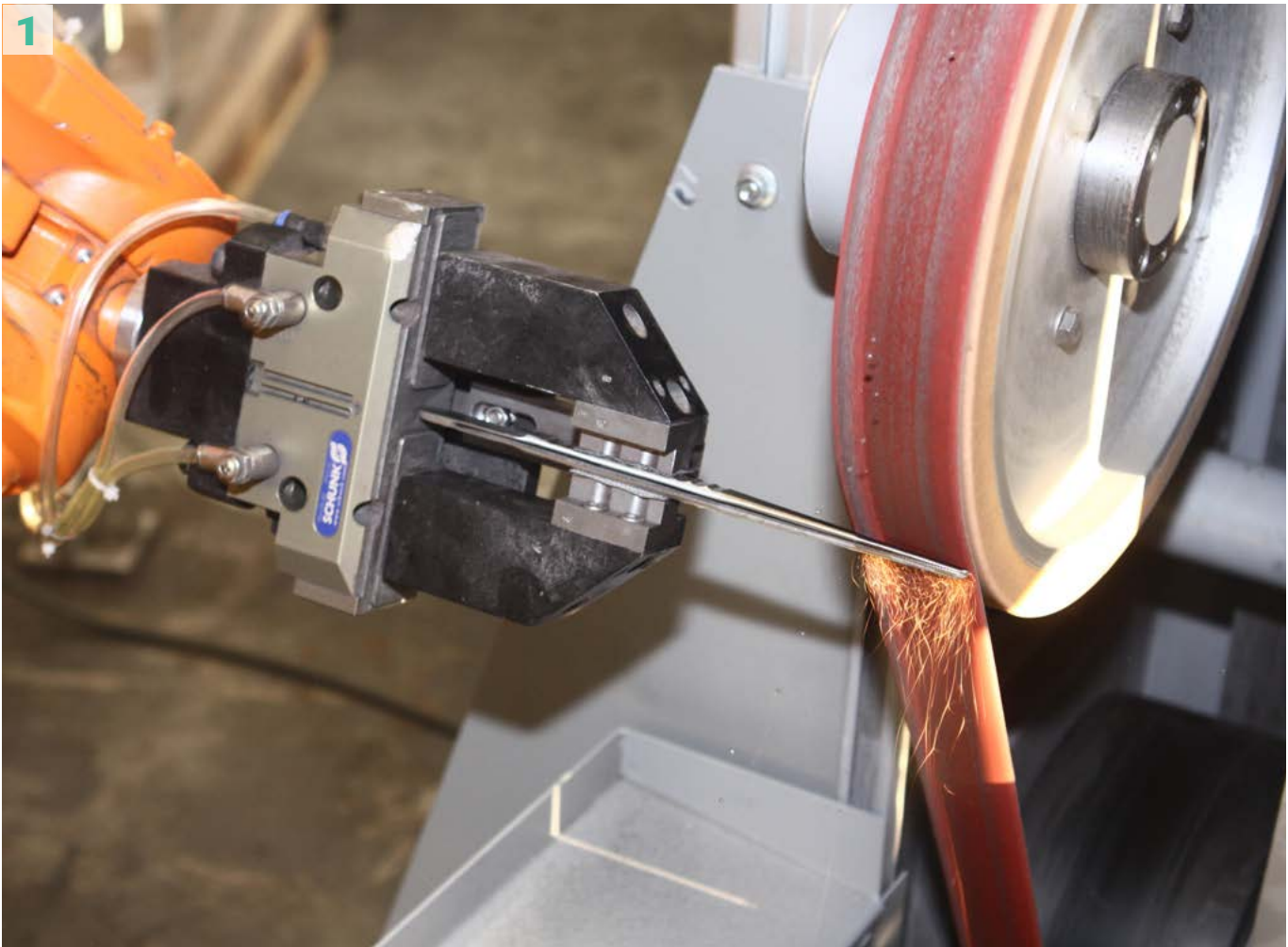
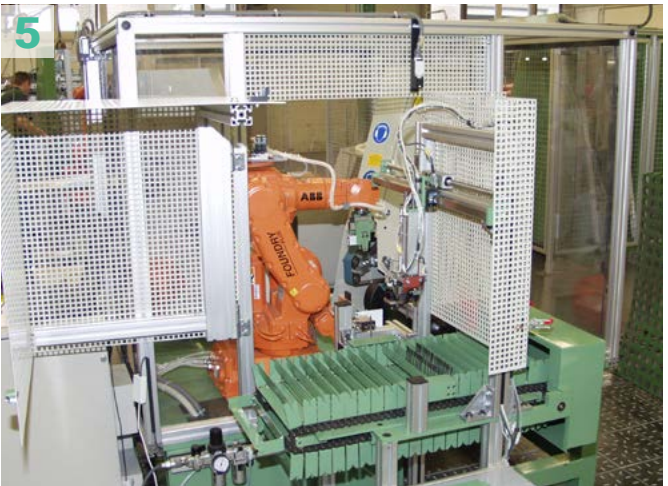
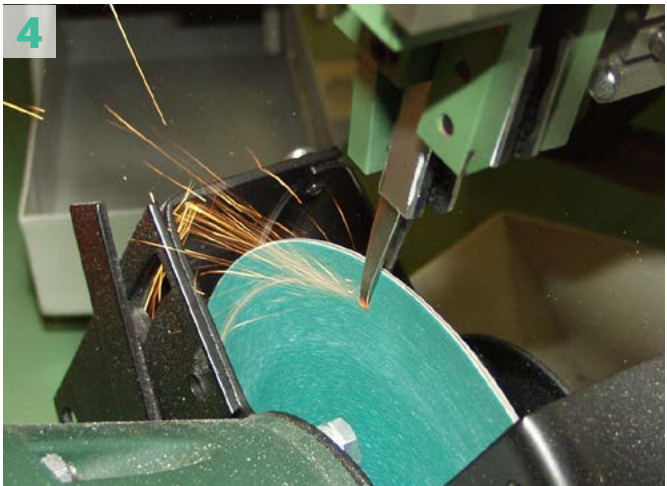
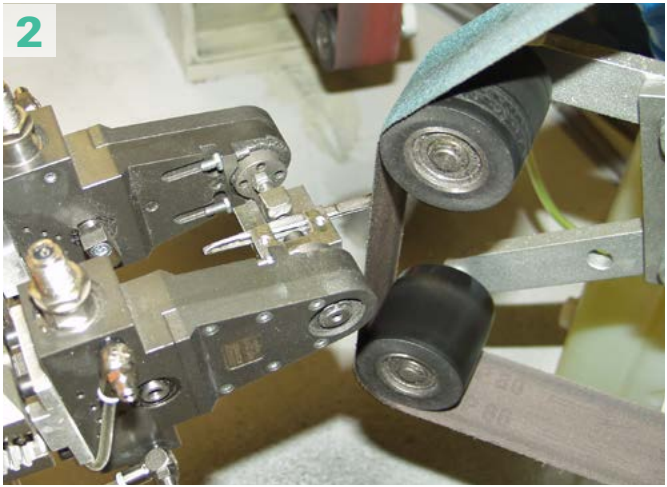


# ROBOTIC GRINDING AND POLISHING STATION RSP

## All-around machining of surgical tweezers

The robot cells can be equipped with various processing stations such as belt or stone grinding stations or polishing machines.

For the production of tweezers, the robotic cell can be assembled in such a way that all-round machining of the workpiece is possible.



### Examples of use (pictures)

- 1. Machining of tweezer spring and tweezer tip at belt grinding station (picture 1)
- 2. Gripping station for all-round machining: machining the tweezer spring on the belt grinding station (picture 2)
- 3. Robot grinding station RSP/4B/1P for all-round processing of tweezers (picture 3)
- 4. Seal grinding of the tweezer tip on the grinding wheel (picture 4)
- 5. Robot grinding station with rotating bar magazine for tweezers (picture 5)





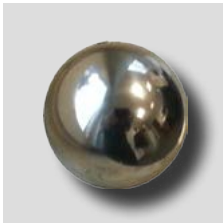
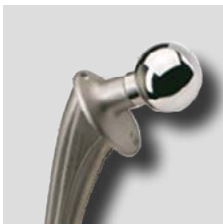
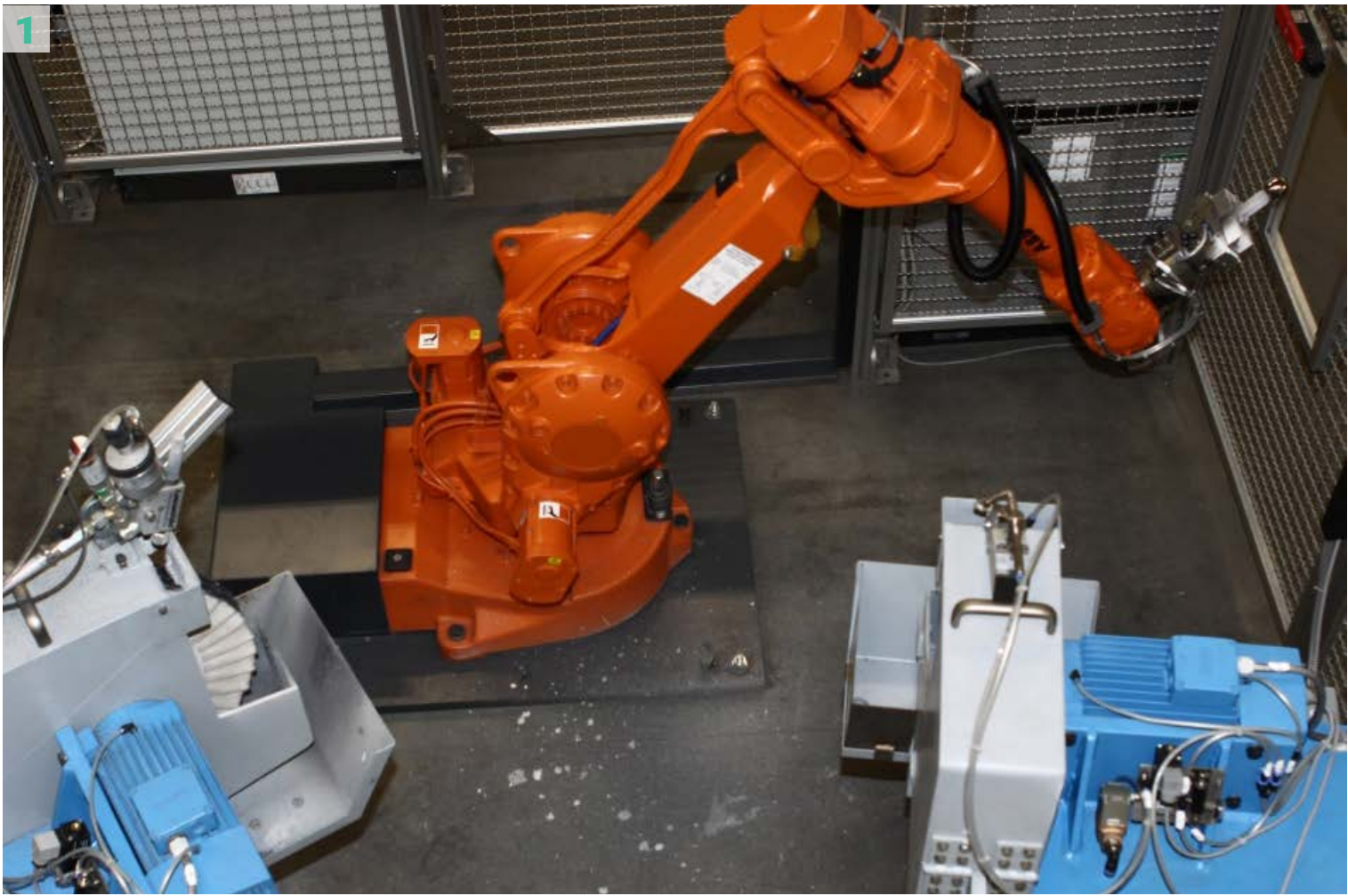
# ROBOTIC GRINDING AND POLISHING STATION RSP

## Rough and final polishing of prostheses and artificial hip joints

The robotic polishing station RSP/2P machines artificial hip joints, prostheses and similar workpieces.

A robot gripper specially developed for artificial hip joints grips the workpiece. The position and dimensions of the workpiece are measured to compensate for workpiece tolerances.

At two polishing stations, the workpiece is first pre-polished and then final polished to a high gloss.



- two polishing stations of the series P3
- robot polishing station constructed as separate cell (picture 1)
- programming in touch-in mode 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 available (e.g. grinding belts, grinding stones and polishing wheels)
- robot gripper specially developed for artificial hip joints (picture 2)





# ROBOTIC GRINDING AND POLISHING STATION RSP

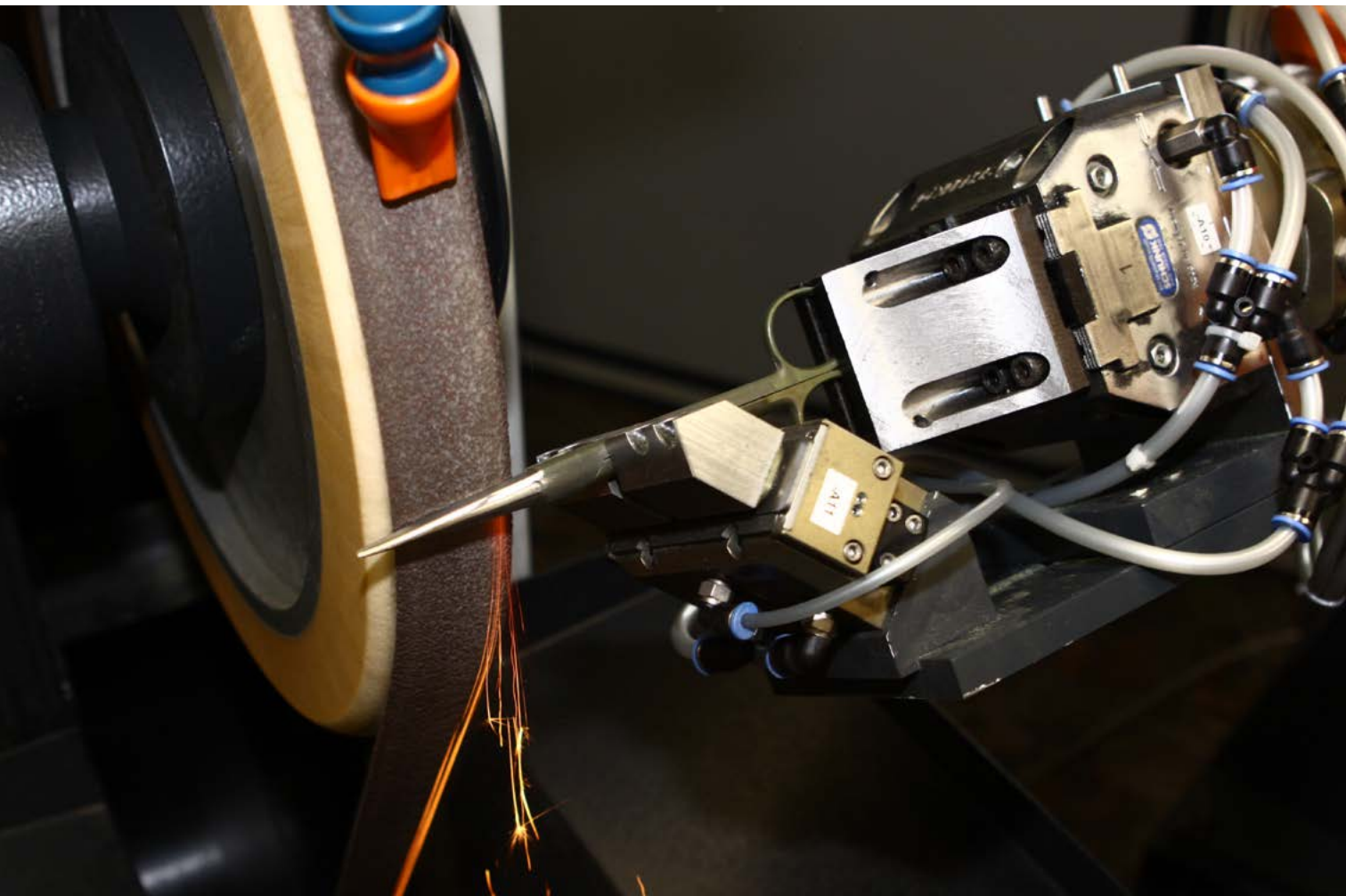
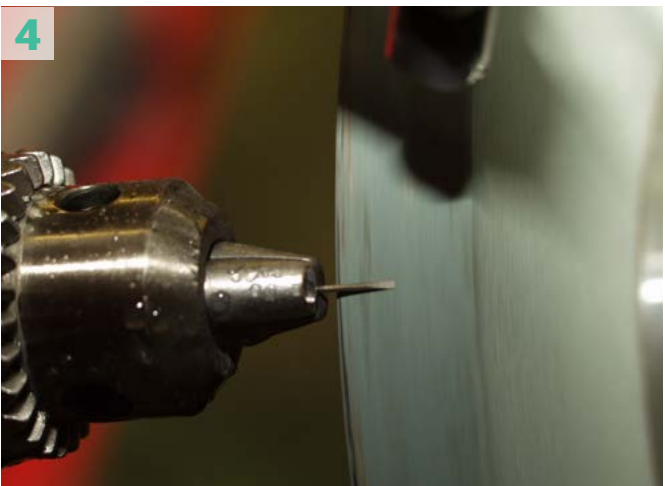
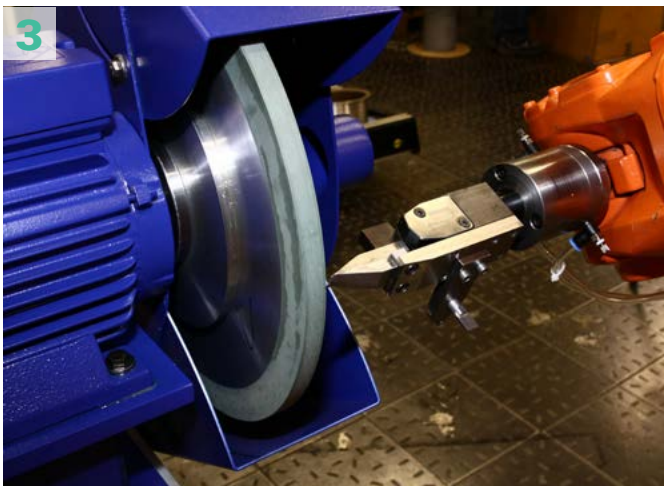
## Facet grinding on surgical scissors

The robot grinding stations of the RSP series can be configured to achieve facet grinding on mounted coated shears.

Depending on the requirements and the work-piece, different processing stations are used.

The robot cell RSP4B/1K/1M shown here is equipped with:

- four belt grinding stations of the series BSS10
- vertical rotary table magazine
- camera measuring station integrating two cameras



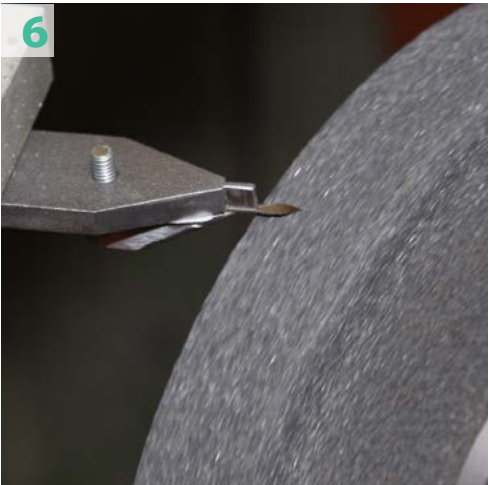
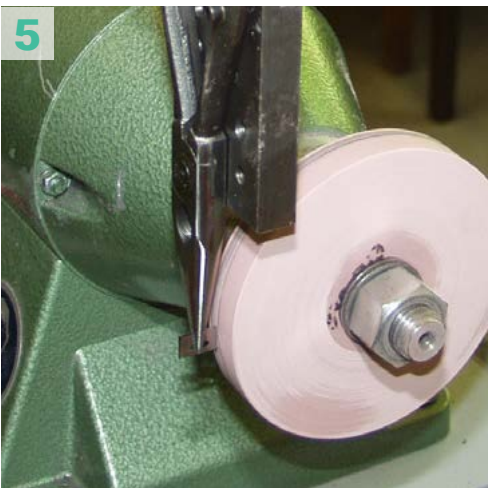
## Sharpening of micro scissors

The robot sharpening station RSP/1S is designed for double-sided sharpening of disposable blades and disposable micro scissors.

- double-sided sharpening station of the DS series
- workpiece-oriented programming
- robot gripper with holder for dresser

## Examples of use (pictures)

1. Sharpening of micro scissors (picture 1)
2. Robotic machining of micro scissors (picture 2)
3. Machining of disposable micro scissors (picture 3)
4. Grinding of lancets (picture 4)
5. Robotic deburring of blades for eye surgery (picture 5)
6. Robotic grinding of lancets (picture 6)

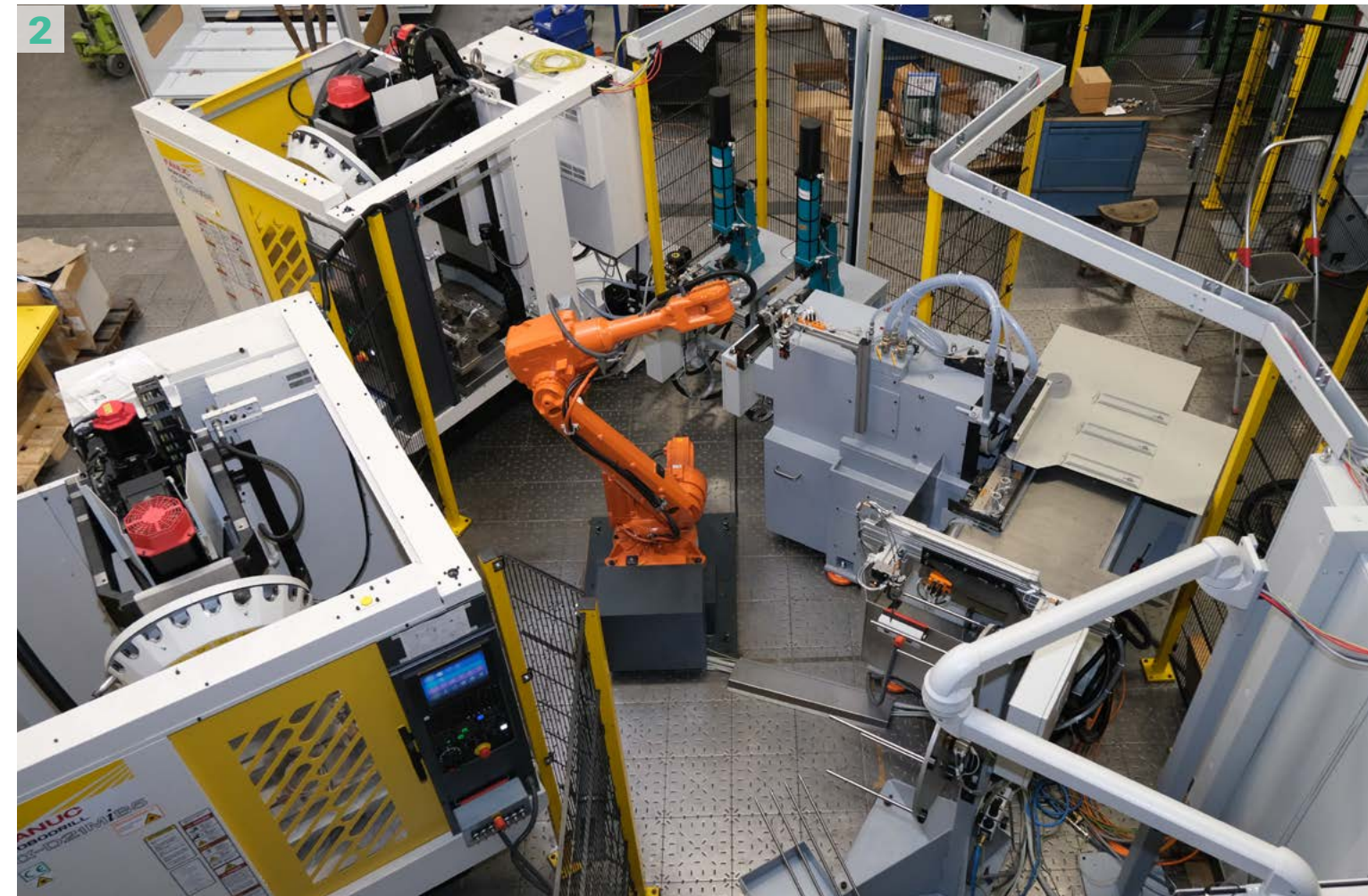
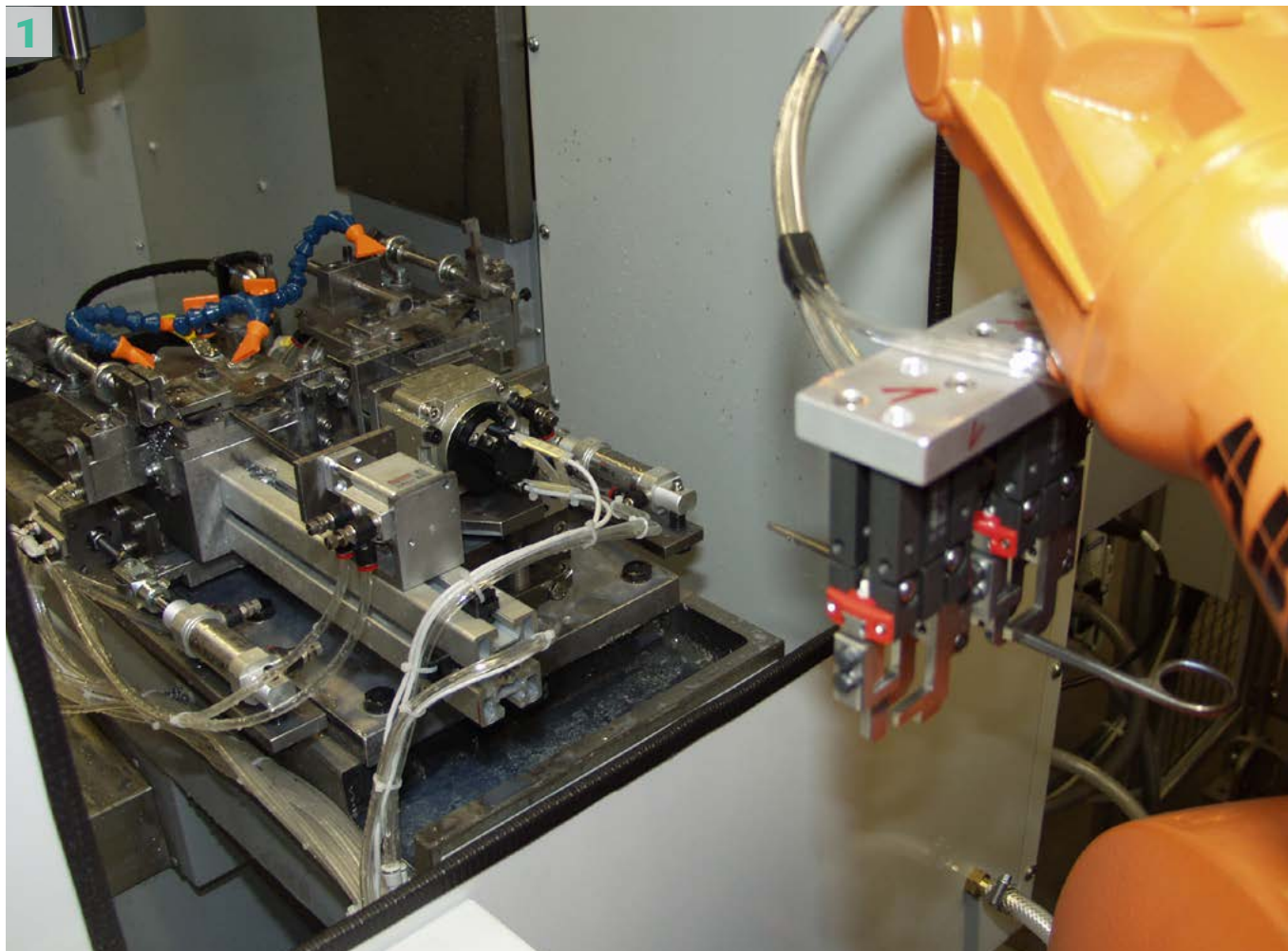




### INTEGRATION AND AUTOMATION OF MILLING CENTERS

#### Integration of production processes

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

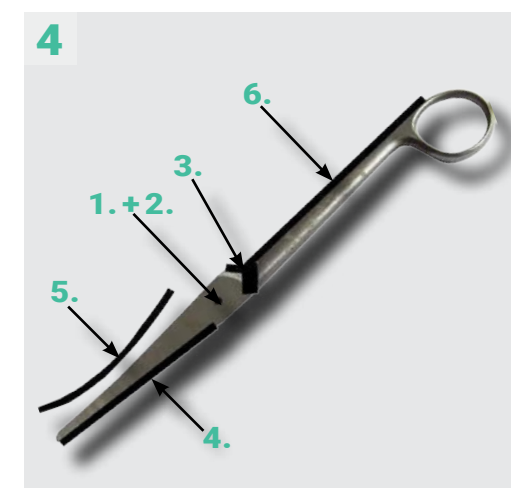


#### Centering, drilling, milling

- preparation of workpieces for subsequent grinding processing
- fixture construction and development

#### Examples of use (pictures)

1. Special device for CNC milling centers for centering, drilling, thread cutting and milling the carbide recess of surgical instruments (picture 1)
2. Robot automation and process connection with grinding or bending station (picture 2)
3. Automation milling center and press for bending surgical scissors (picture 3)
4. All-around machining of surgical scissors (picture 4)
- 1.-4. Drilling and milling work in conjunction with machining center and specially designed clamping device
5. Bending press, press to achieve the bending up
6. Grinding machine BG1/ZA/NT, three-axle CNC grinding machine designed for processing the shank/inside

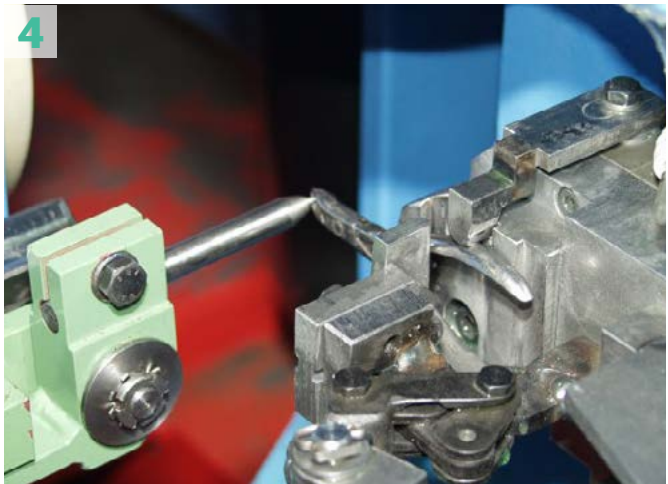
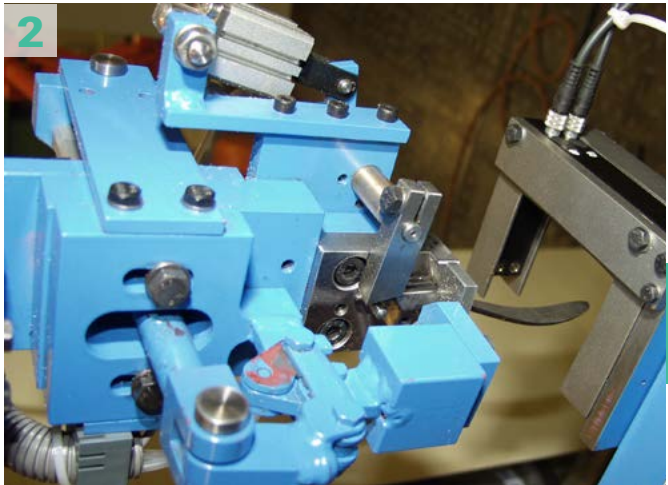
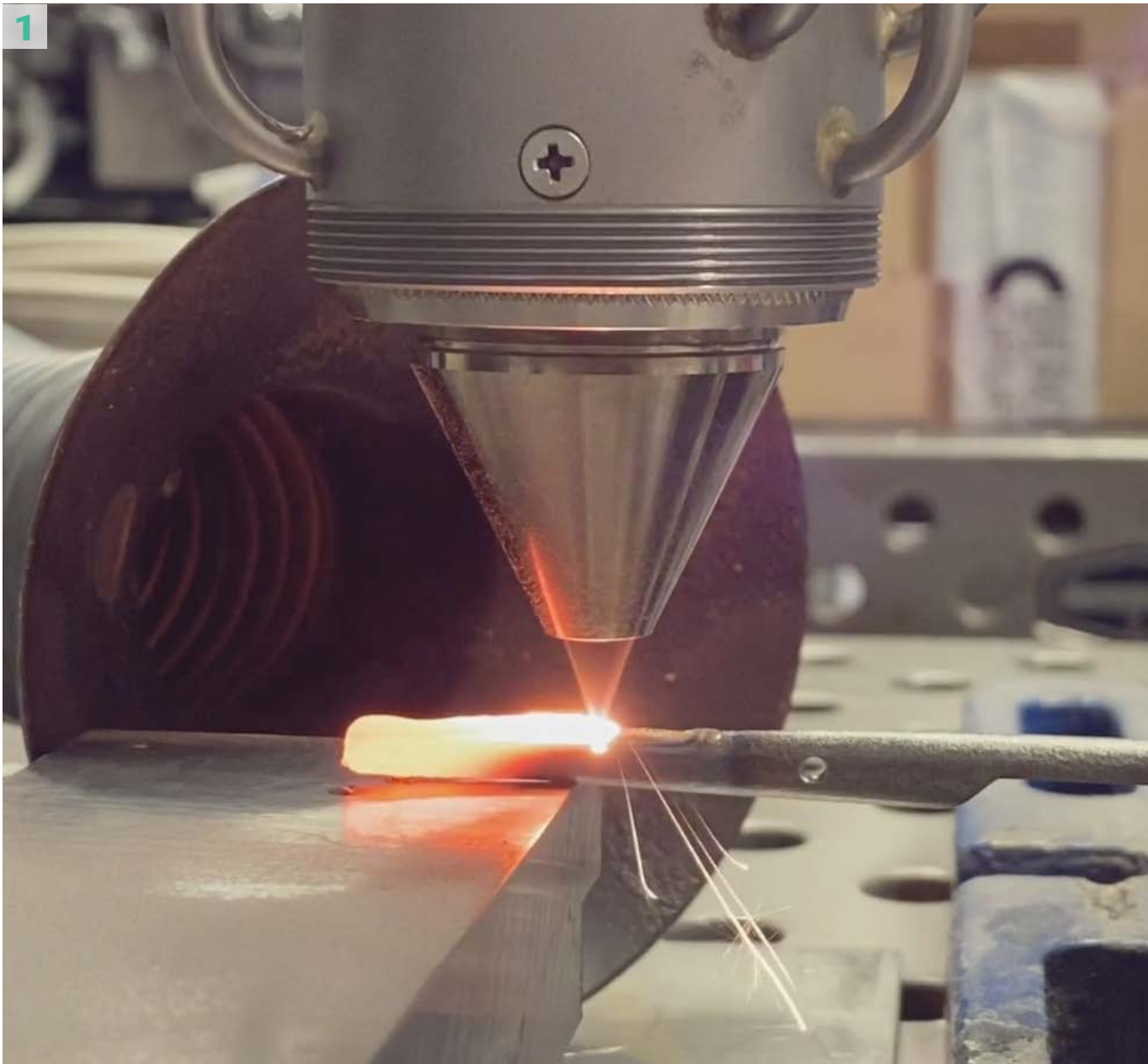




# ROBOTIC PROCESS TECHNOLOGY / AUTOMATION

## Automation of built-up laser welding

Automated cell for laser cladding in combination with a six-axis robot for guiding the laser sources and/or for loading and unloading the fixture.



### Measuring technique

Development of standard measuring systems for various applications for the measurement and compensation of automated dimensions / contours

- measuring systems for automated contour identification and measuring of surgical articles
- compensation of tolerances of forged parts
- suitable for machines of CG1 and BG0/ RV/NT series and various robots
- robot automation and process connection with grinding or bending machines

### Examples of use (pictures)

1. Camera measuring system for measuring surgical scissors (picture 1)
2. Laser measuring system for robotic cell for external measurement of surgical forceps parts (picture 2)
3. Camera measuring system for robot cells for position recognition of tweezers (picture 3)
4. Measuring system for automatic center measurement of surgical forceps with BG grinding machine (picture 4)

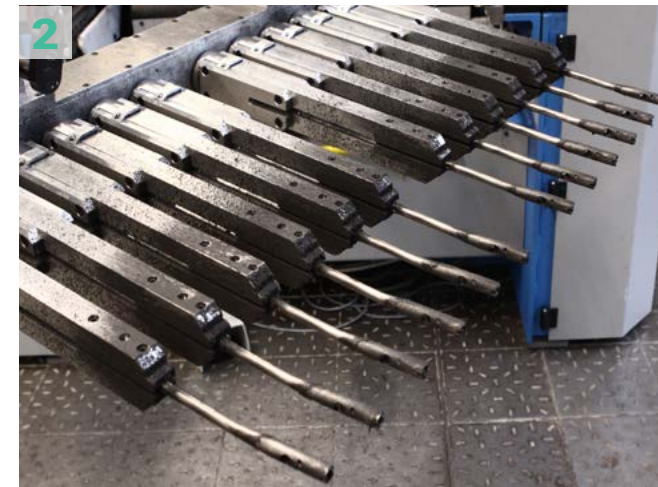


## POLISHING MACHINES

### DOUBLE SHAFT POLISHING MACHINES

**Rough and final polishing of surgical workpieces**

The CNC controlled double shaft polishing machine PS is designed for polishing bone nails, bone plates, scissors and similarly shaped workpieces.



The machine is equipped with a control system in which all process parameters are programmed in a user-friendly manner and stored depending on the workpiece.

Thanks to the short changeover time of only a few minutes, the machine can also produce small batches economically.

- PLC control for setting the machine (paths, distance, speed, etc.)
- max. machining length 1,000 mm
- infinitely variable speed controlled polishing roller drives
- polishing paste shot control
- automatic correction of polishing roller wear
- load-dependent corrected roller contact pressure
- integration of 360° swivel tools for machining rotary workpieces

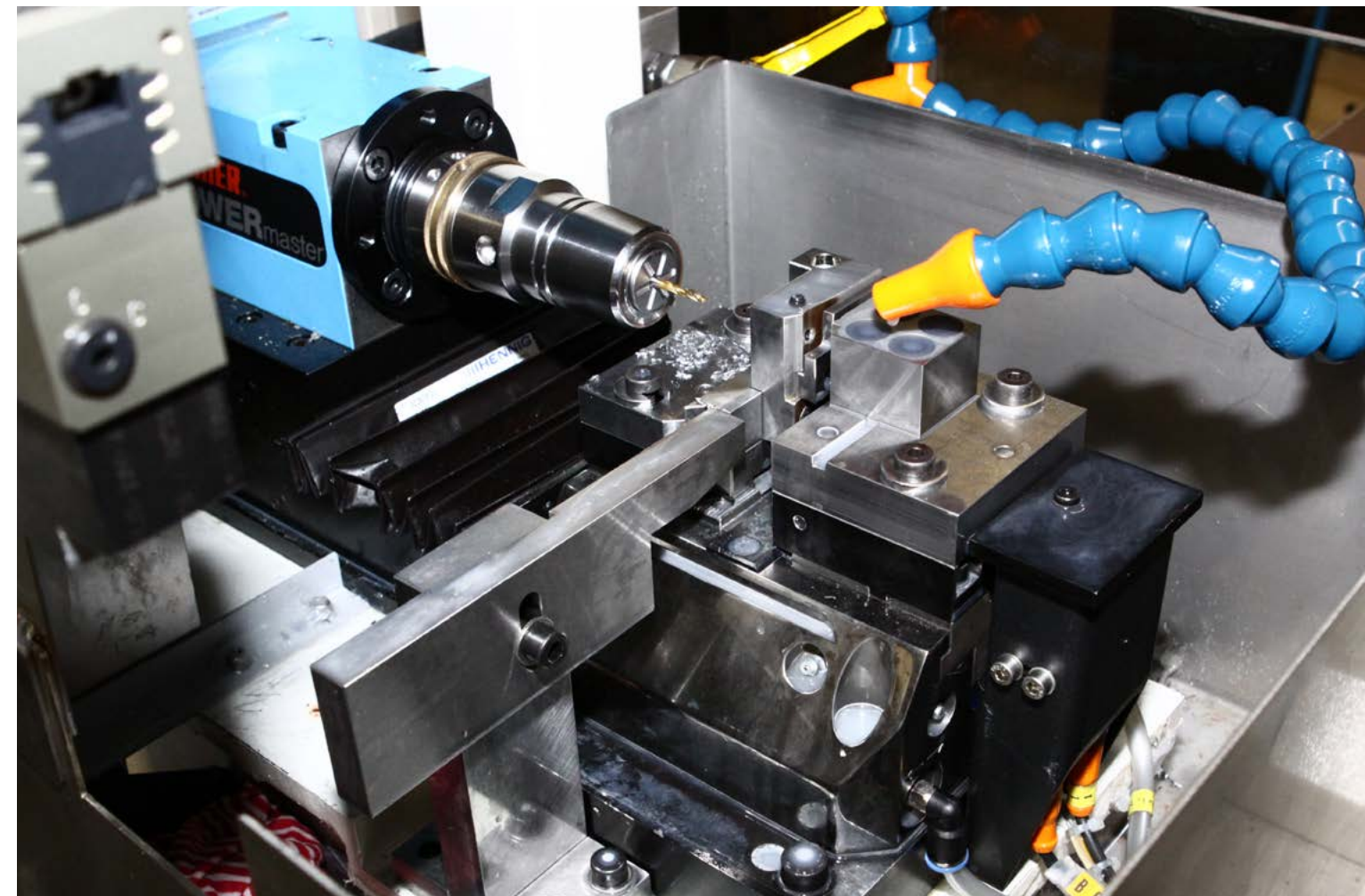
### Examples of use (pictures)

1. Double shaft polishing machine of the series PS1000 for rough and final polishing of bone plates (picture 1)
2. Collet chuck 360° rotatable with workpieces (picture 2)
3. Collet chuck with polished bone nails (picture 3)
4. Rough and final polishing of bone plates (picture 4)
5. Shining of surgical scissors (picture 5)



## PROFILE GENERATING CENTERS

**PROFILE GENERATING** Polygon generating and serrating  
Profile generating center for polygon generating and serrating of cortical screws, pedicle screws, compression screws and similar workpieces



- universally applicable production machine with stationary workpiece spindle head
- reduction of cycle times due to extremely short cutting and magazine times
- turning and milling technology for polygon generating and serrating by rotary profile generating combined on the profiling center LP110
- combining different work processes on one machine is possible thanks to drilling, turning and milling tools integrated on the tool slide
- freely programmable synchronization between workpiece and tool spindle via electronic gear
- CNC cross slide with hardened flat guides
- reduction of cycle times to a minimum compared to conventional processes
- feeding of cylindrical workpieces through hollow spindle of spindle head
- manual loading for special and small series at any time without conversions possible due to freely accessible working area without interfering contour polygon generating



## REQUEST FOR QUOTATION

### QUESTIONNAIRE FOR TECHNICAL DATA

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

Please make a quotation for:

|                     |   |  |
|---------------------|---|--|
|                     | <b>WORKPIECE</b>                        |  |
|                     | Surgical scissors                       | Artificial hip joint                           |
|                     | Micro scissors                          | Lancet   |
|                     | Surgical forceps                        | Bone nail                                      |
|                     | Tweezers                                | Bone plate                                     |
|                     | Scalpel                                 | Surgical screws                                |
|                     | Gouge Blades                            | Other  |
|                     | <b>TYPE OF PROCESSING</b>               |  |
|                     | Grinding (flat/bevel)                   | Glazing  |
|                     | Contour grinding                        | Polishing                                      |
|                     | Scalloped grinding                      | Milling  |
|                     | Sharpening                              | Profile generating                             |
|                     | Serrating                               | Other  |
|                     |   | <b>TECHNICAL DATA</b>                          |
| N° of pieces        |   |  |
| Lot size            |   |  |
| N° of models        |   |  |
| Type of feeding     |   | manually                      by robot         |
| Type of machining   |   | single pieces                  steel strips    |
| Cooling water plant |   | centralised                      decentralised |
| Exhausting device   |   | yes                                  no        |
| Full enclosure      | yes                                  no |  |