



AUTOMATION

ROBOTIC PROCESS TECHNOLOGY

Handling technology | Process integration



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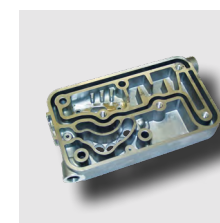
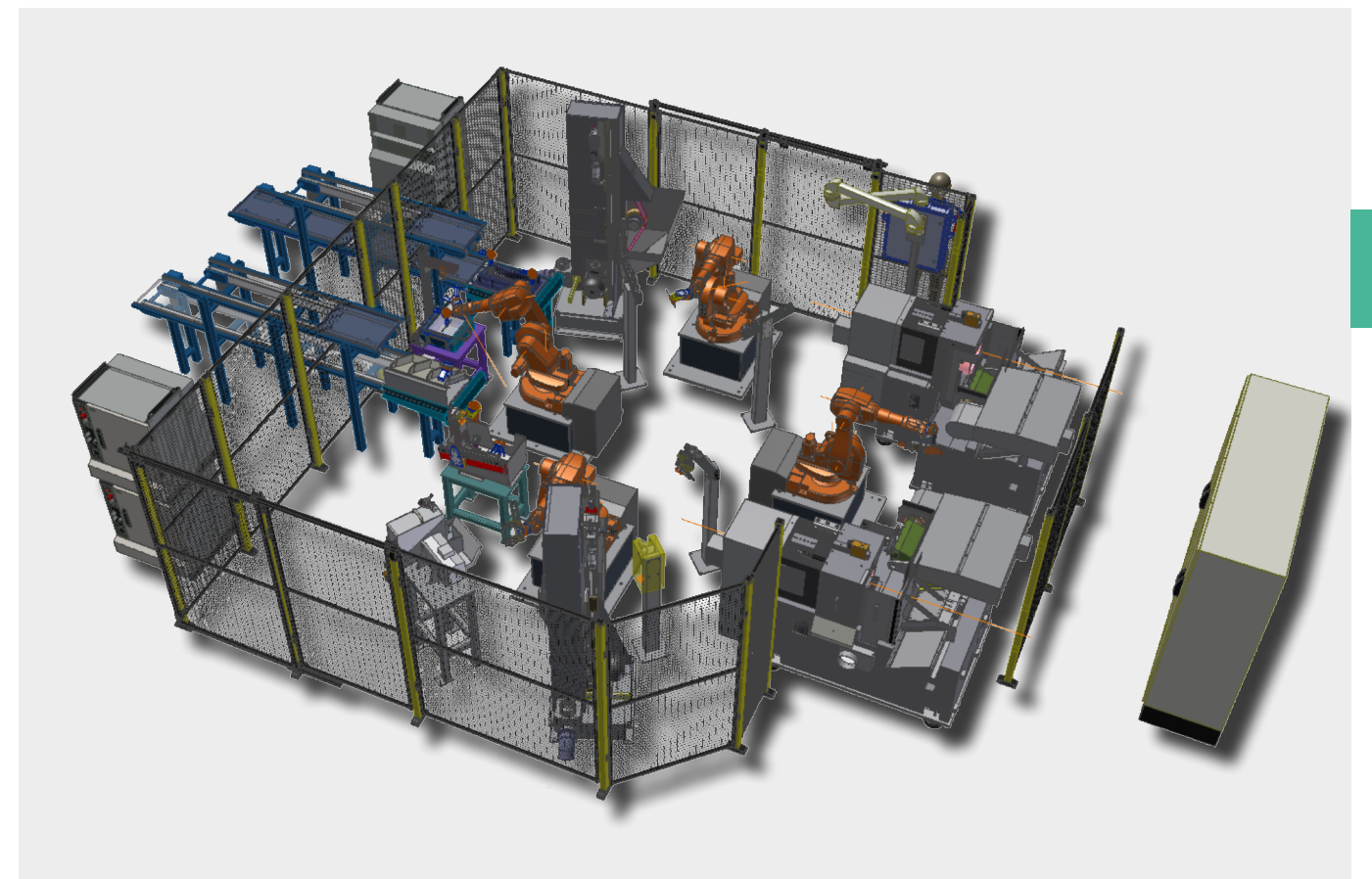
ROBOTIC

GRINDING AND POLISHING SYSTEMS

GRINDING AND POLISHING WITH ROBOTIC TECHNOLOGY

The Berger Gruppe offers solutions for the robotic machining of workpieces of a wide variety of sizes and geometries.

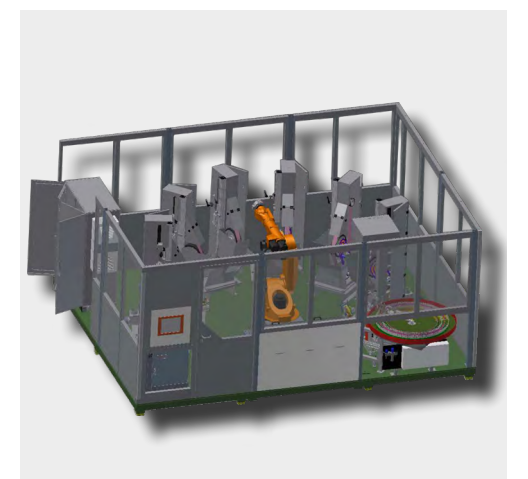
The focus is partly on standardised robot cells based on different design approaches.



Depending on the nature of the workpiece, the robot cell is equipped with different machining stations. In this context, either the workpiece or the tool can be guided by the robot.

If the tool is robot-guided, the workpiece can be positioned using a rotary table. Additional axes are integrated into the system, enabling all-round machining without any additional changeover time.

- Robotic grinding and polishing stations can either be integrated into existing production lines or set up as separate cells
- Standard interfaces to all major robot manufacturers, such as ABB, KUKA, Stäubli and Fanuc
- Offline programming via a CAD/CAM interface
- Integration of measuring systems to compensate for workpiece tolerances in position and dimensions



- Various machining stations with different tools (e.g. grinding belts, grinding wheels, polishing discs) available

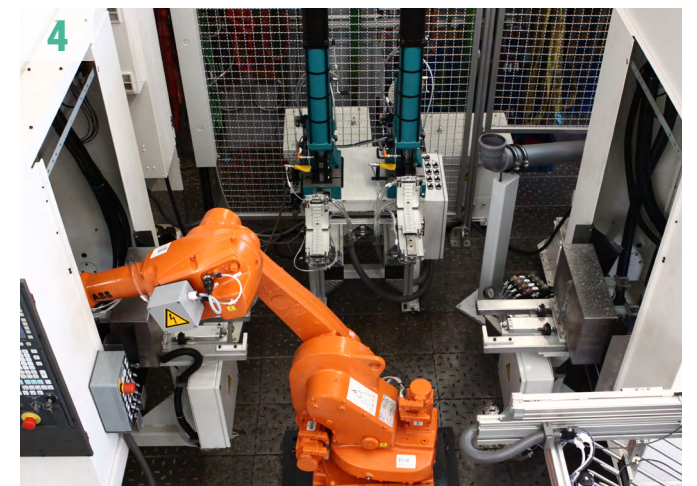
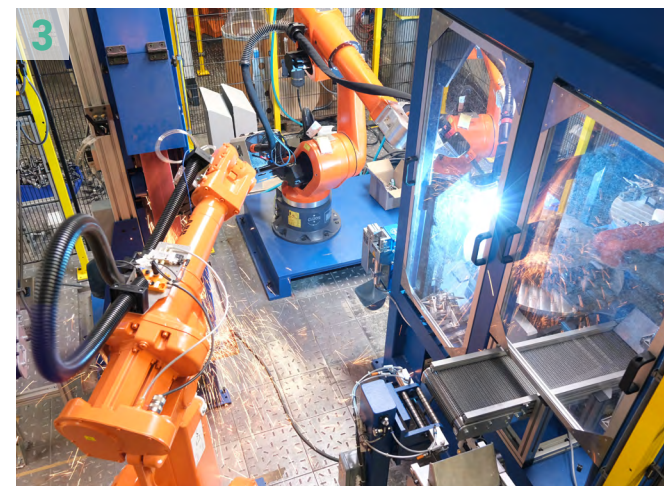
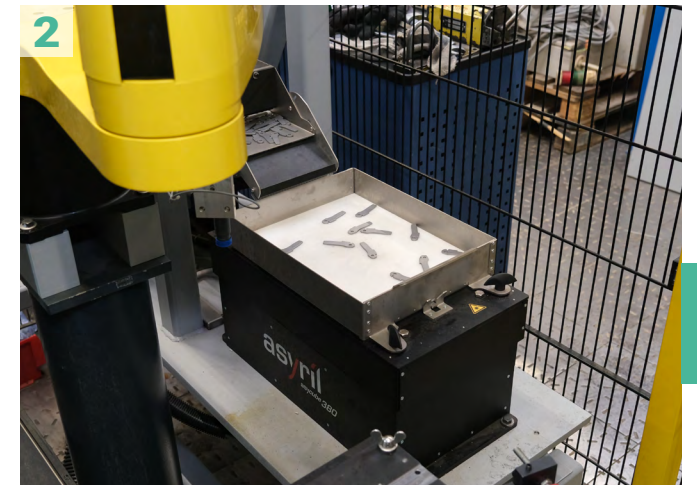
INTEGRATION OF PRODUCTION PROCESSES

Sorting units

The sorting units in the SE series store workpieces from bulk material or feed them into a magazine.

The workpieces are separated from a hopper and fed via a conveyor belt.

The position of the workpiece is detected by a camera. The position data is transmitted to a robot controller. The robot grips the workpiece and places it in the correct orientation for storage.



Integration of production processes

- Contract welding
- Bending presses
- Drilling/countersinking
- Hardening plants
- Paint shops
- Packaging machines

Application examples (pictures)

1. Integration of a marking laser into a robotic grinding cell (Picture 1)
2. Asyrl feeder integrated into a robotic machining cell (Picture 2)
3. Laser welding system integrated into a robotic machining cell for machine knives (Picture 3)

Integration /Automation of CNC milling centres

- Preparation of workpieces for subsequent grinding
- Special fixture for CNC milling centres for centring, drilling, thread cutting and milling the carbide recesses of surgical instruments
- Fixture construction and development
- Robotic automation and process integration with grinding or bending stations

Application examples (pictures)

4. Integration of two milling centres, two bending presses and a BG1-CNC grinding machine in conjunction with an indexing vertical rotary table magazine (Picture 4)



PROCESS AUTOMATION

HANDLING TECHNOLOGY

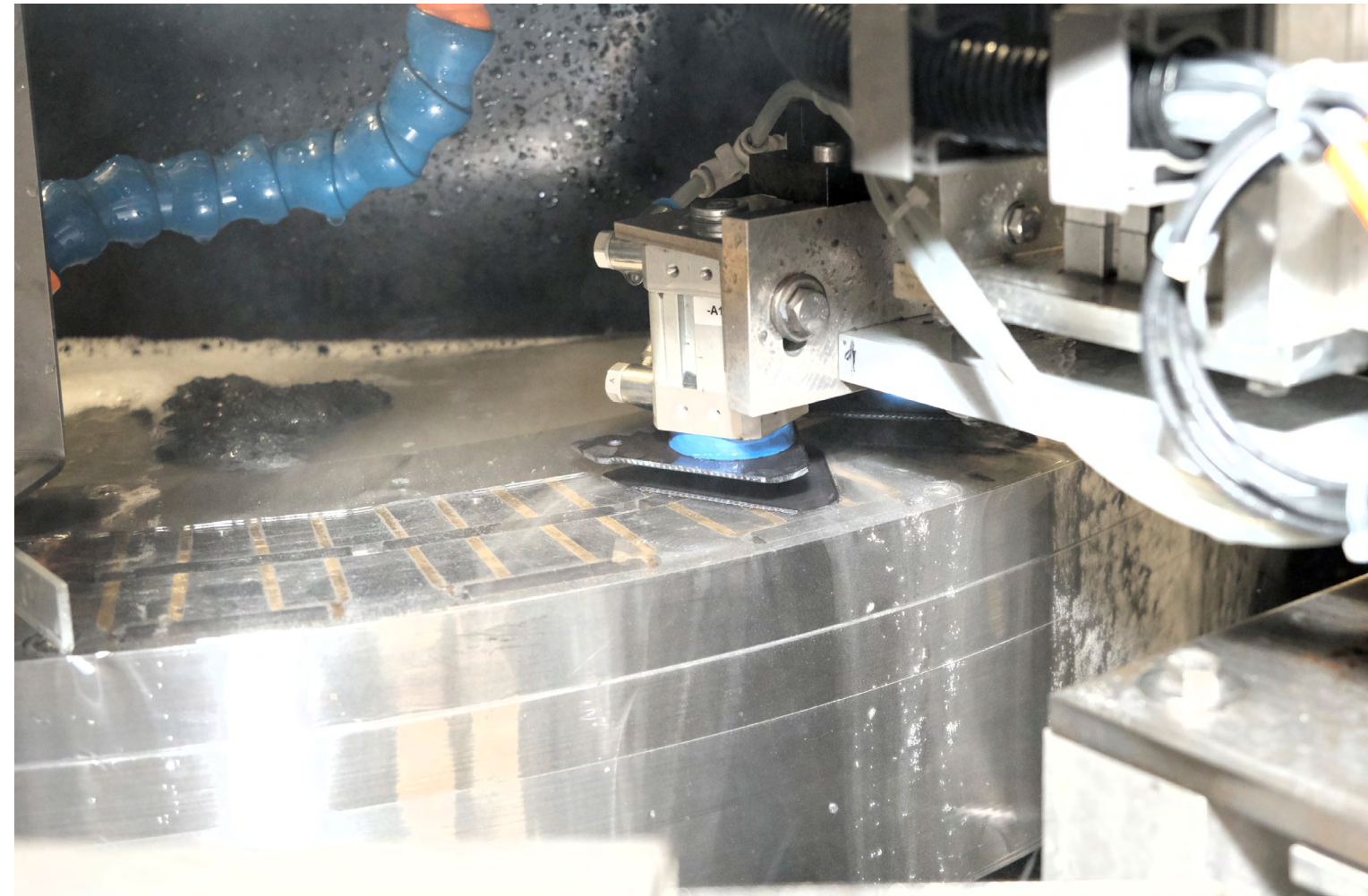
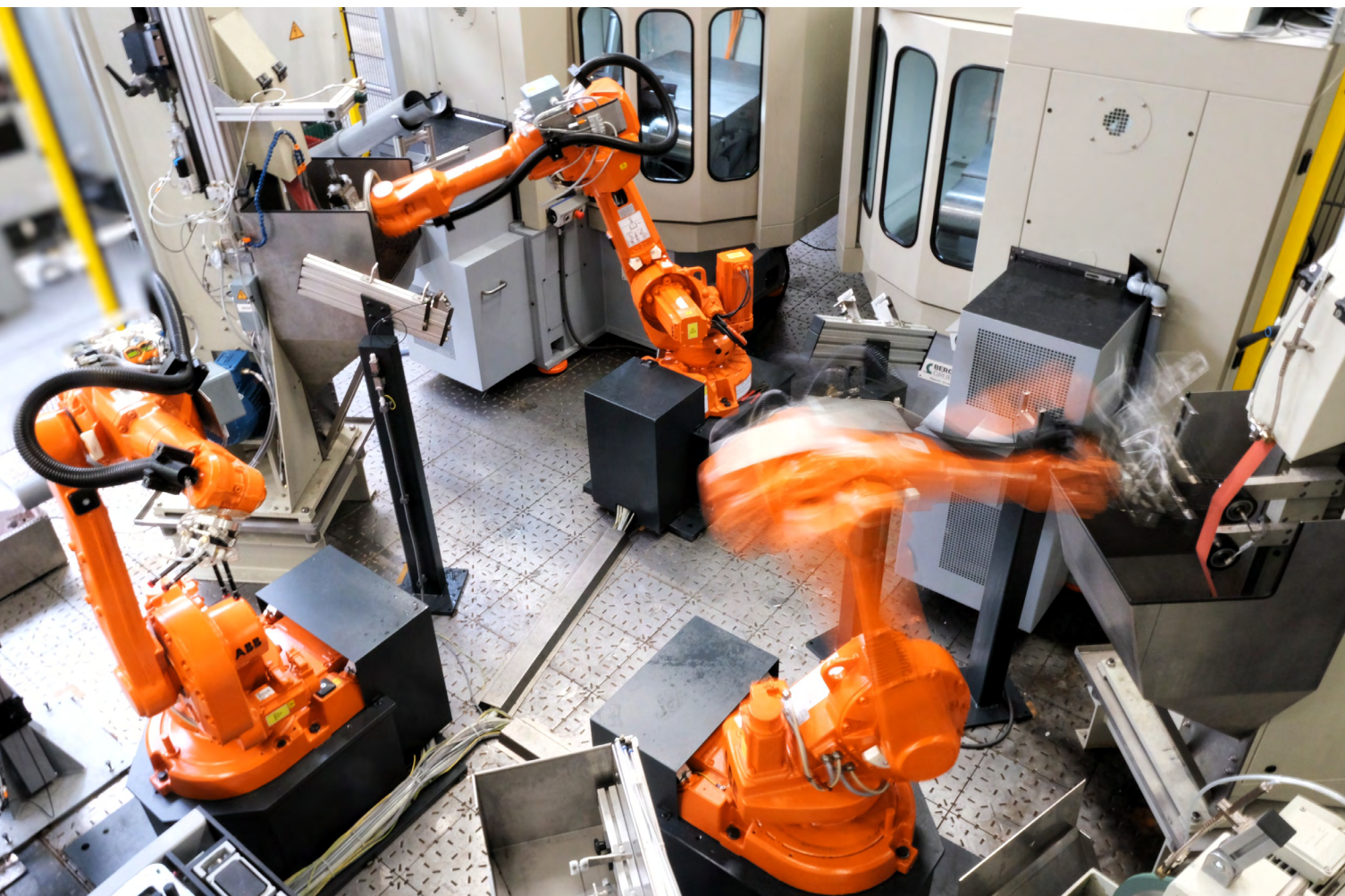
Robotics for loading and unloading

For over 20 years, the Berger Gruppe has been using robots to load and unload conventional and CNC-controlled machines.

Depending on the requirements, there are a wide range of options available, e.g. loading a single machine, multiple machines or integrating a grinding machine into a production cell.

We utilise MITSUBISHI, FANUC, ESPON, KUKA, ABB, DENSO, STÄUBLI and other robot types and models.

ROBOTICS AND CNC FEEDING SYSTEMS FOR LOADING AND UNLOADING



Examples of robot loading applications:

- Surgical scissors with a circular magazine
- Tools, secateurs or circular blades with a vertical stacking magazine
- Pocket knife blades with a step conveyor

Examples of robotic applications

- Sharpening and/or deburring knife blades from a magazine using SM-CNC series sharpening machines

CNC feeding systems for loading and unloading

- CNC control of the horizontal and vertical transfer and loading axes
- High-precision positioning via brushless AC servo drives
- Simple programming of paths and positions using the workpiece program
- Freely programmable approach speed of up to 100 m/min
- Robust, low-wear and low-maintenance axes with toothed belts or ball screws
- High loading capacity for non-stop production lasting several hours
- Space-saving, clearly laid-out design with unobstructed access to the machines from all sides
- Magazine tower, chain magazine, stack magazine, rotary indexing table and step conveyor available
- Interlinking of different machine types
- 180° NC servo axes with electromagnetic gripper, e.g. for loading RTS2/3 rotary table grinding machines (picture above)
- Short changeover times by recalling programmed positions and paths

PROCESS AUTOMATION / HANDLING TECHNOLOGY

Berger Automation Cube (BAC)

The Berger Automation Cube (BAC) is a flexible automation solution for production facilities. It can load and unload production machines or, as a processing robot, guide workpieces during machining.

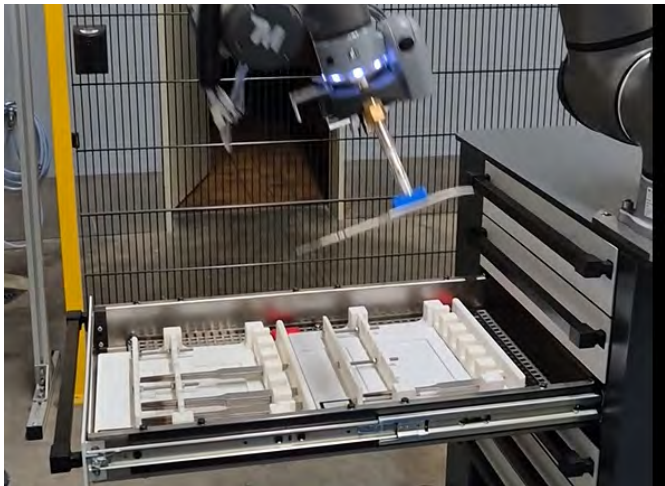
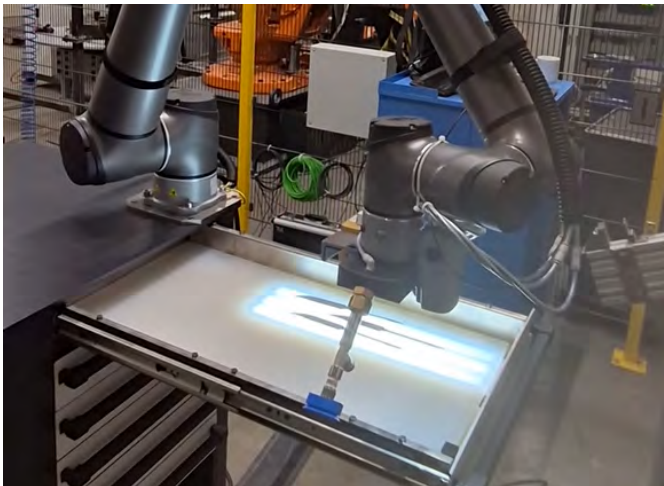
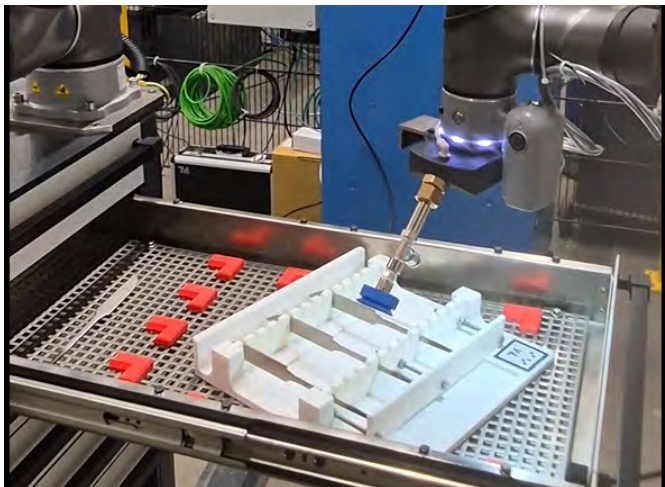
The Cube can be flexibly deployed across different machining cells and can also be retrofitted

into existing production cells.

The integrated sensor system, in the form of a laser scanner, scans the cobot's predefined working area to provide an additional safety function. Thanks to this system, unlike industrial robots, the cobot can be operated without protective enclosures.



Picture generated by AI



Depending on requirements, the system can be used either as a pick-and-place unit or as a solution for supplying raw parts. When operating as a stand-alone machine, the BAC can also deburr or sharpen workpieces. To this end, raw parts can be placed in the storage compartments/drawers and processed individually

The integration of the camera, both in terms of hardware and software, enables the use of native vision tasks on the robot controller. So-called landmarks (orientation markers) allow the robot to reference its environment seamlessly. For example, when loading or unloading a machine, the position of a fixture or magazine can be determined by recognising a landmark, ensuring the task is carried out reliably.

This simplifies the operator's work with the BAC. In addition to landmark detection, many other vision algorithms can be utilised. Pattern recognition, for example, can be used to identify recurring patterns.

AI algorithms, such as those for detecting misaligned parts using transmitted light, can also be programmed and utilised directly on the controller.

Advantages

- ➔ Simple programming
- ➔ Flexible automation thanks to a mobile base
- ➔ Enhanced safety through detection of the danger zone
- ➔ Easy integration (230 V & Profinet communication)

Application examples, e. g.:

- Machine feeding for unmanned third shifts
- Offsetting staff absences due to illness through flexible automation
- Automation of deburring and sharpening processes
- Cost-effective automation even for small batch sizes

PROCESS AUTOMATION / HANDLING TECHNOLOGY

Berger Feeding System

The Berger Feeding System automates the flow of materials in robotic cells and ensures a precise, uninterrupted supply of workpieces or components.

It increases productivity, reduces downtime and minimises the need for manual intervention in the production process.



Picture generated by AI



Advantages

- Future-proof: New product variants can be easily programmed via software
- 2D contour detection
- Defective part sorting: Detect and sort out damaged parts
- Position detection
- Mixed-mode operation possible

The robot cell shown here consists of:

- Machining station SS1 with a cutting disc, Ø 600 mm
- Single-sided grinding station SS1 with a peripheral grinding wheel, grinding wheel Ø 600 mm
- Single-sided grinding station P/T with a peripheral grinding wheel, Ø 80–100 mm
- Milling spindle with finger milling cutter, Ø 20 mm
- CNC rotary table for holding the grinding wheels and milling cutters
- Machining robot with gripper changeover system
- Feeding system for loading and unloading workpieces
- Integration of a 3D measuring station at the loading position to detect the position of workpieces on the feed conveyor
- Laser distance sensor for aligning workpieces in the robot gripper prior to machining
- Swarf conveyor

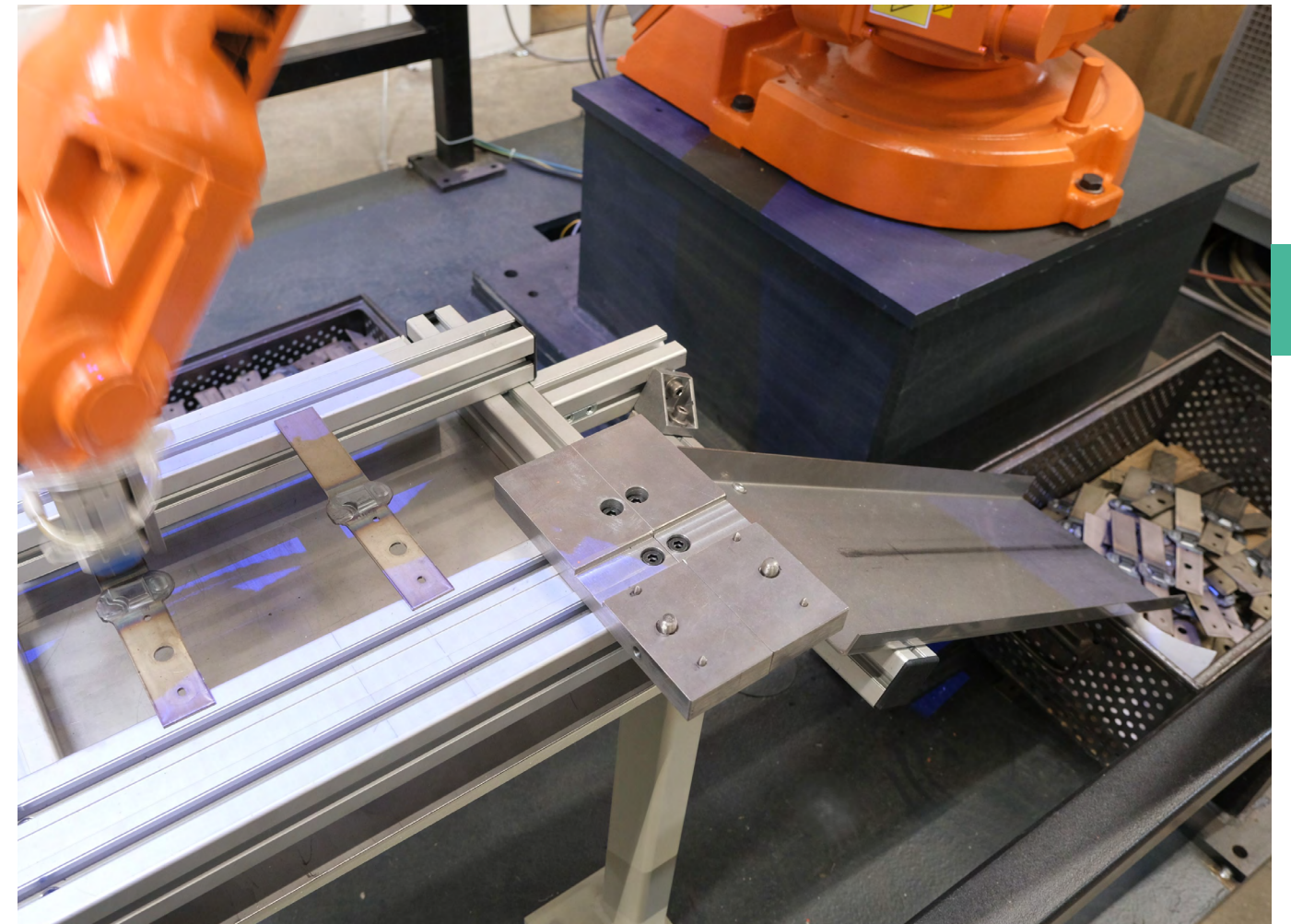
PROCESS AUTOMATION / HANDLING TECHNOLOGY

BIN PICKING – Reaching into the crate

A camera system comprising high-resolution cameras – in this case from Keyence – detects the position of the workpieces, which are scattered randomly in a mesh box or Schäfer crate, and transmits this information to the handling robot.



Picture generated by AI



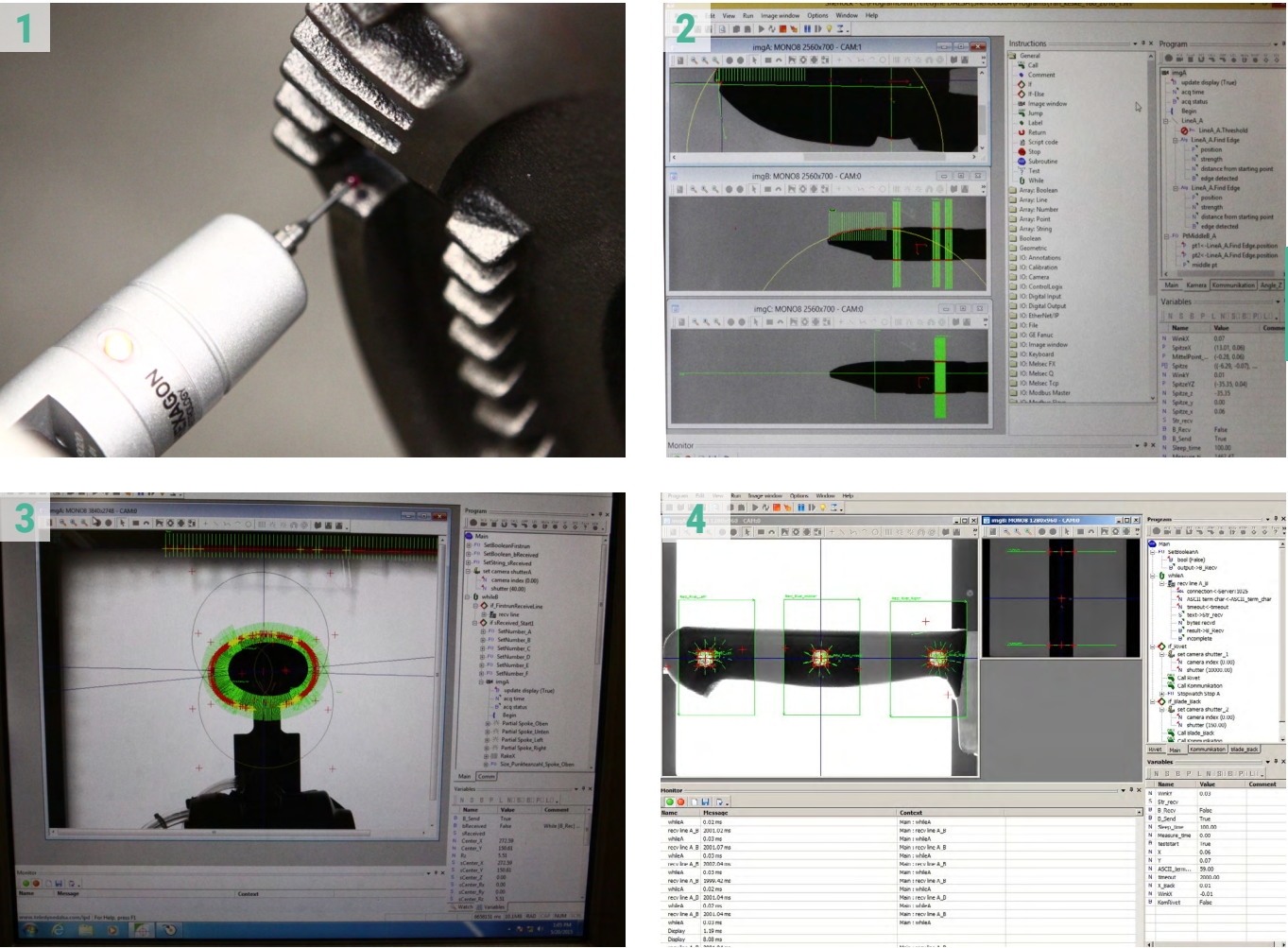
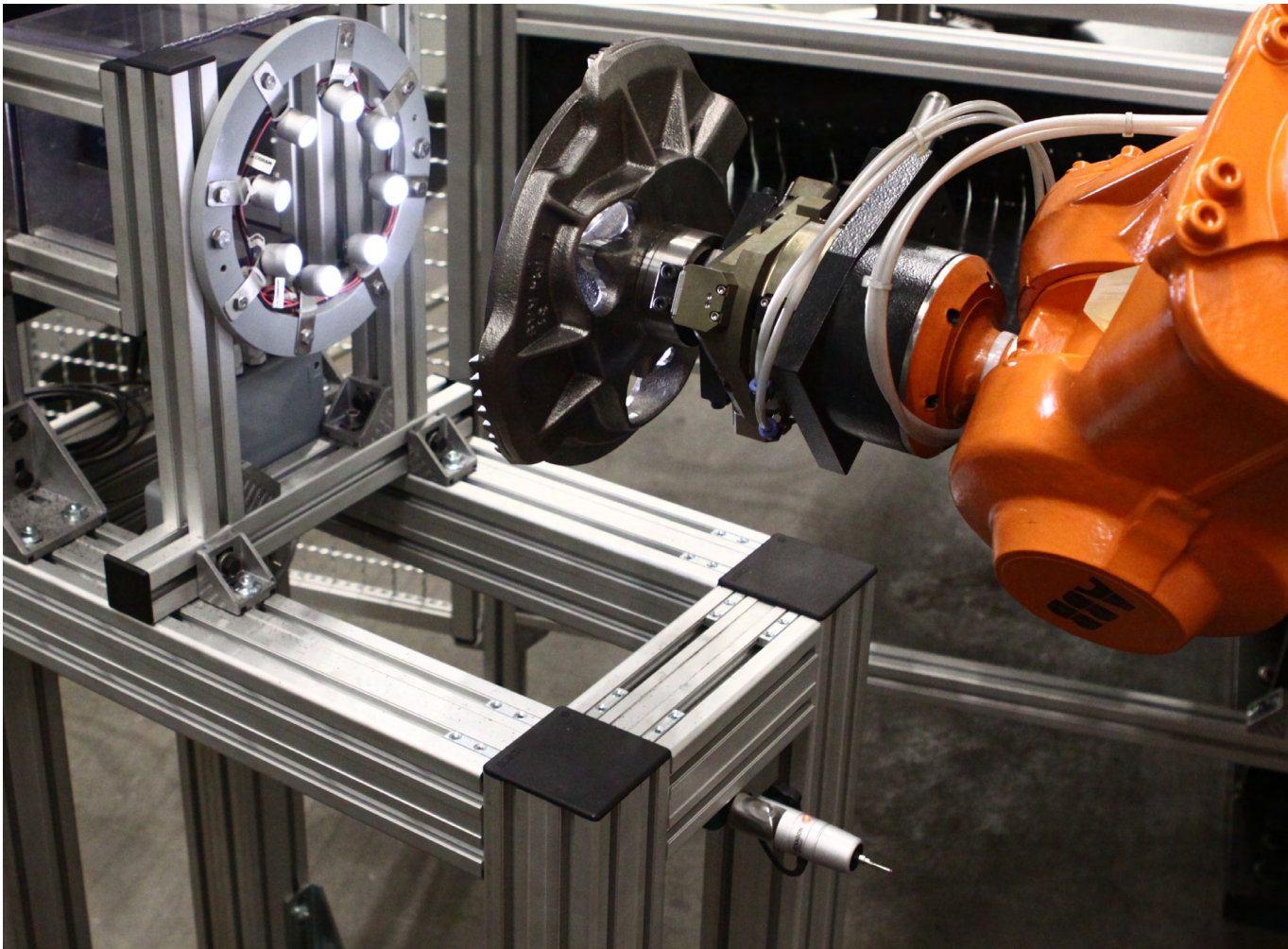
- Feeding and handling of unorganised workpieces using bin-picking from KLT boxes
- Docking stations for KLT containers with repeatable positioning via stops
- Bin-picking robot
- 3D robot vision
- Camera-controlled turning and centring station
- 3D position detection via a camera-based measurement system with high-resolution cameras
- Automatic calculation of the optimal robot trajectory
- Specialised robot gripper tailored to the workpiece



CAMERA, LASER AND MECHANICAL PROBE

Measuring workpieces using camera and laser measurement technology

With the aid of cameras, lasers or mechanical probes, workpieces can be measured before or after machining, thereby influencing the machining program.



Application examples (Pictures)

- 1. 3D measurement using a probe (Picture 1)
- 2. Compensation for workpiece tolerances using a camera-based measurement system (Picture 2)
- 3. 3D measurement using a camera (Picture 3)
- 4. Camera-based measurement system with a graphical interface for part measurement (Picture 4)

MEASUREMENT TECHNOLOGY

Position detection and correction

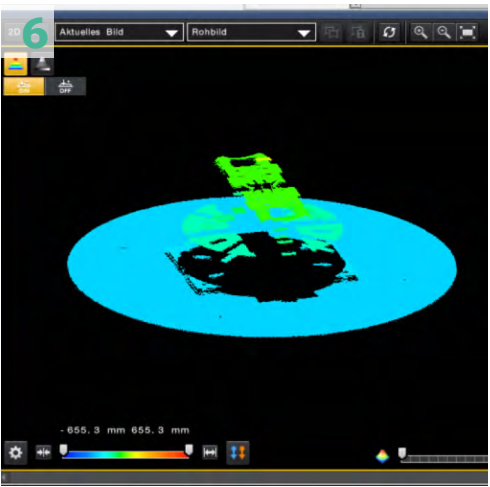
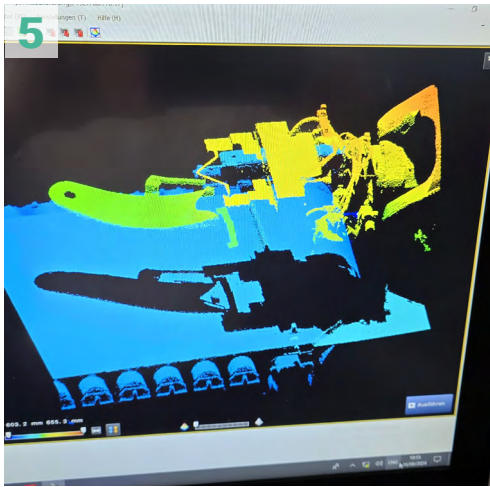
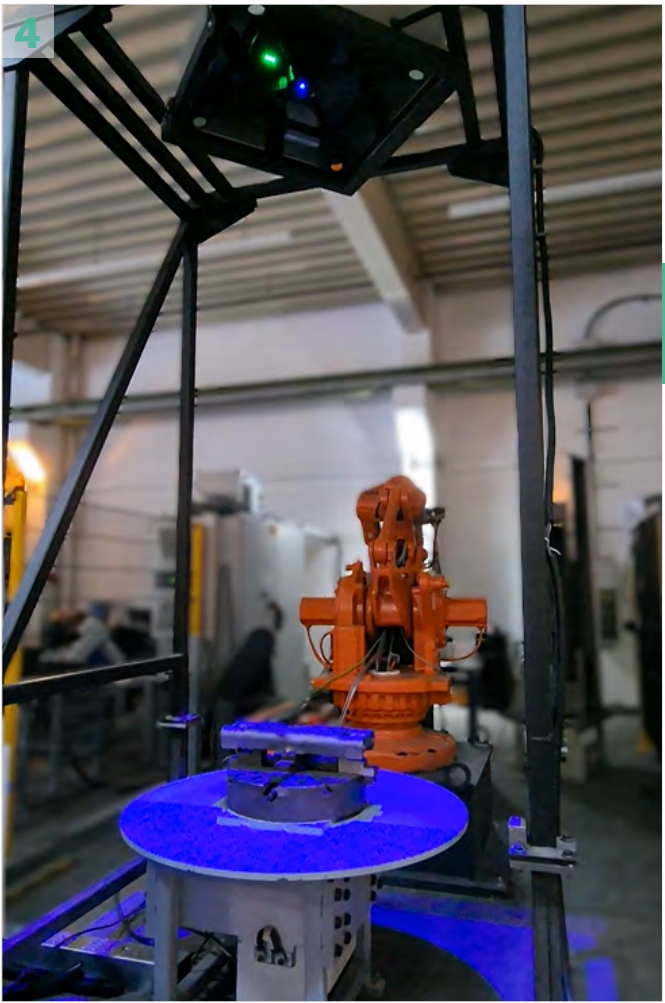
The position of the workpiece is measured using 3D cameras or distance lasers fitted to the robot:

- In robot cells with a robot-guided workpiece: here, the workpiece is guided by the robot and measured using 3D cameras.
- In robot cells with a robot-guided tool: the clamped workpiece is measured and the data is transmitted in a closed-loop control system to the real-world environment to adjust the robot programme.

- In robot cells with a robot-guided workpiece, a distance laser can be integrated into the robot arm to measure the position of the stationary workpiece.

Pictures

1. + 2. Measuring the clamped workpiece using a distance laser during machining with force-torque sensor technology (Pictures 1 + 2)



Pictures

3. + 5. Position detection of the workpiece in the robot using a 3D camera, followed by correction of the workpiece's position in the gripper; used in robot cells with a robot-guided workpiece (Pictures 3 + 5)

4. + 6. Detection of the clamped workpiece using a 3D camera and transmission of the position to the robot controller, used in robot cells with robot-guided tools (Pictures 4 and 6)

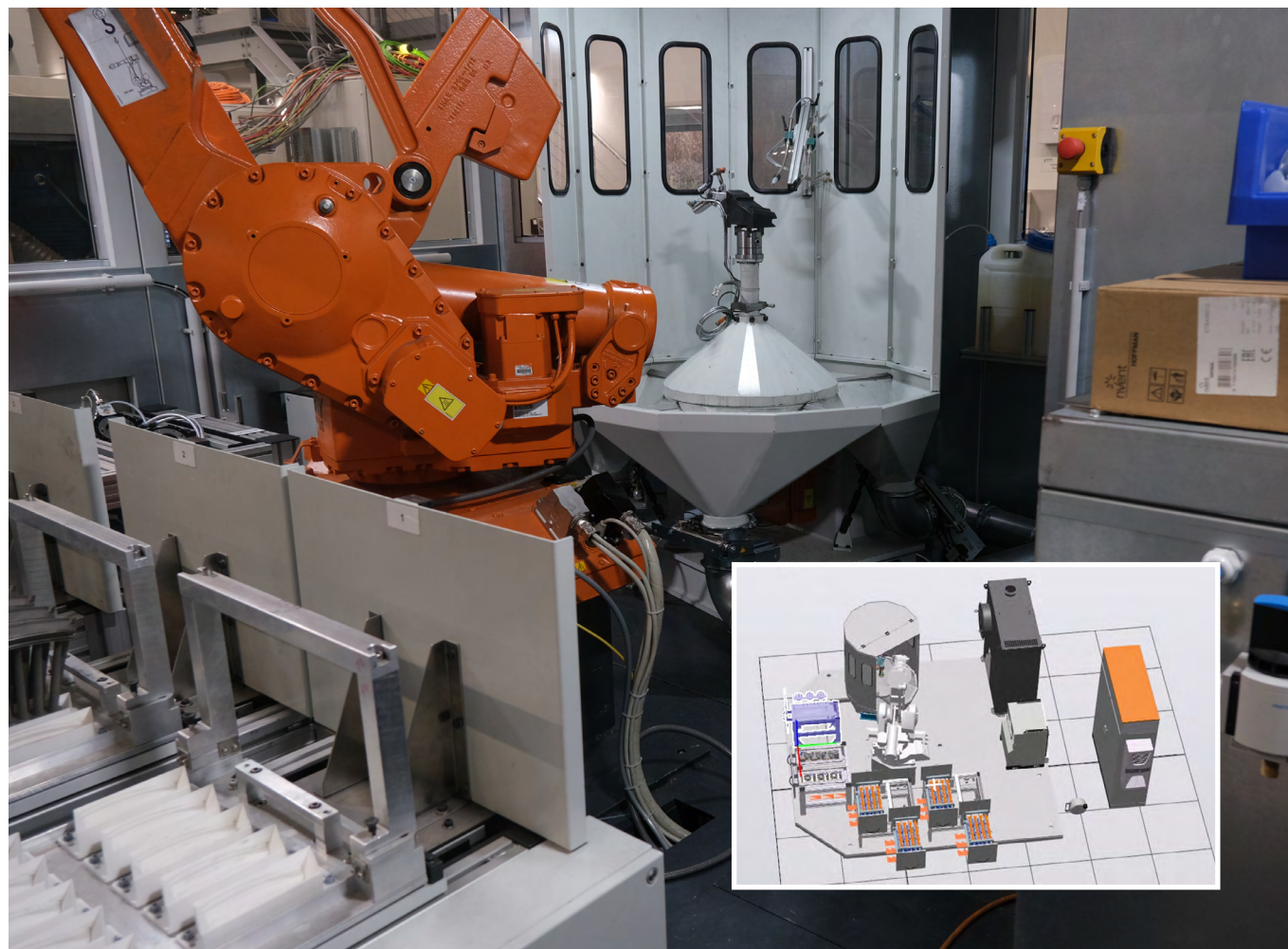
PROGRAMMING FOR ROBOTIC CELLS

Programming with RobotStudio

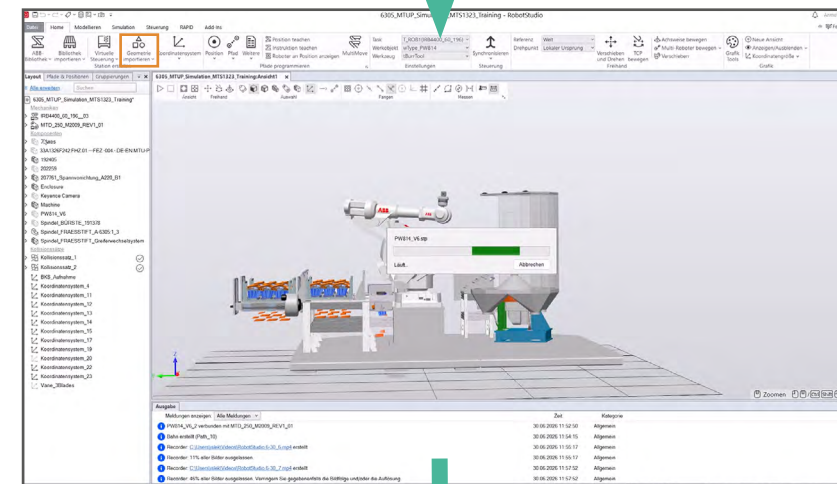
Programmes can be created offline using suitable software – for example, as shown here with RobotStudio.

- Creating the robot programme using RobotStudio in four steps, as illustrated in the figures on the right
- Transferring the program to the ABB robot in a 'live environment'

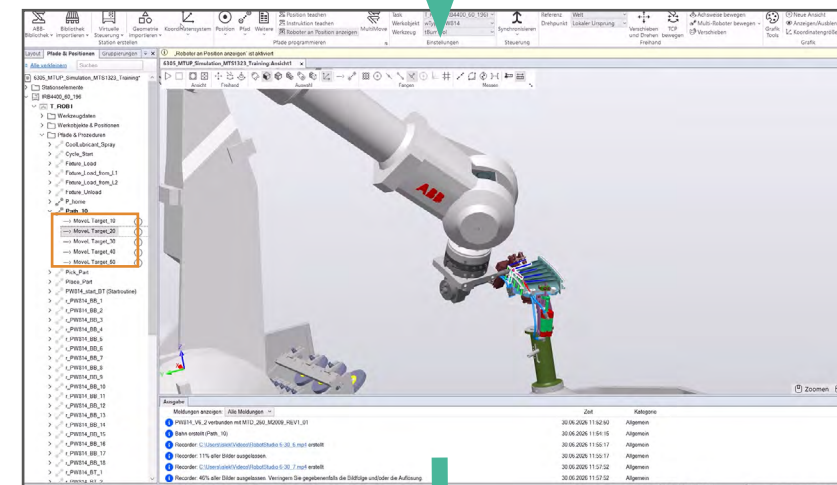
PROGRAMMING IN A VIRTUAL ENVIRONMENT



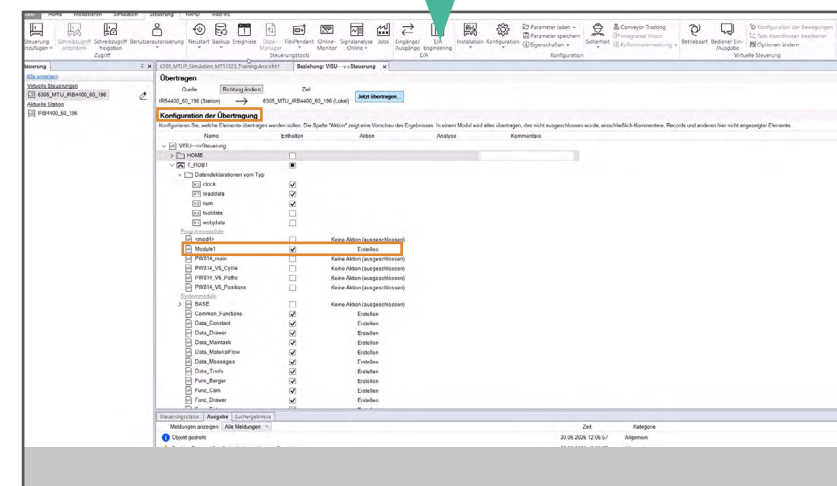
1
Virtual workpiece positioning
using a 3D file



2
Robot-Studio user interface:
Loading a new workpiece



3
Determining trajectories, path
generation and alignment
using sensors



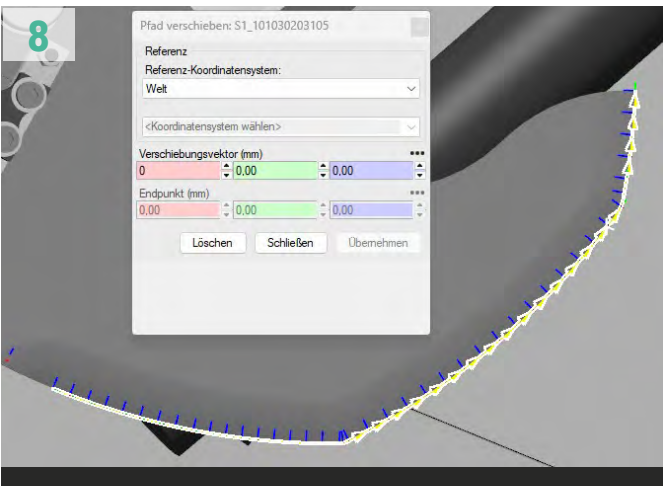
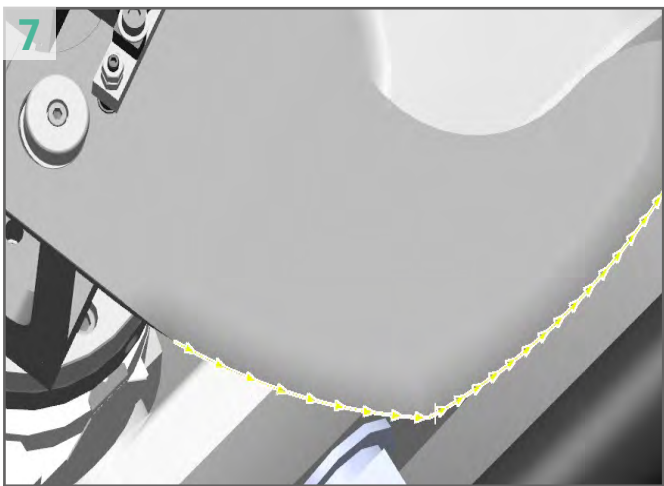
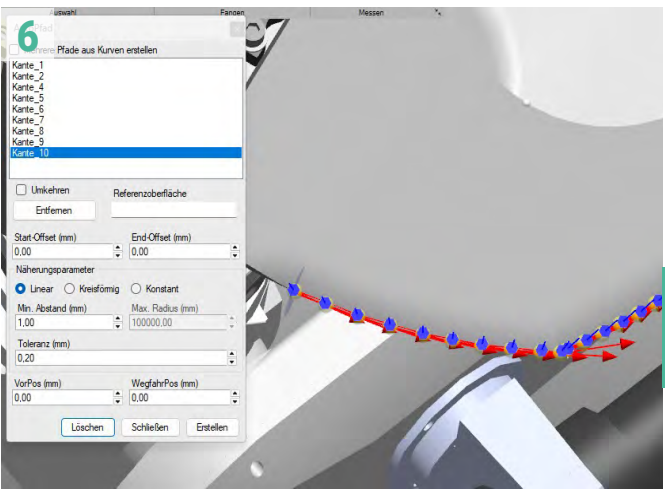
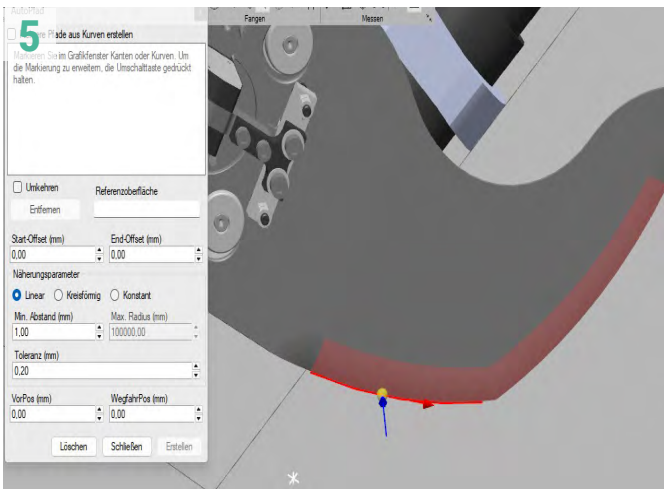
4
Transferred from the path
created to the actual control
system

PROGRAMMING: SHARPENING FOR ROBOTIC CELLS

Adjusting the blade via the robot

The programs for this have been prepared in the robot and a user interface has been set up on the robot panel (BergerGrinder).

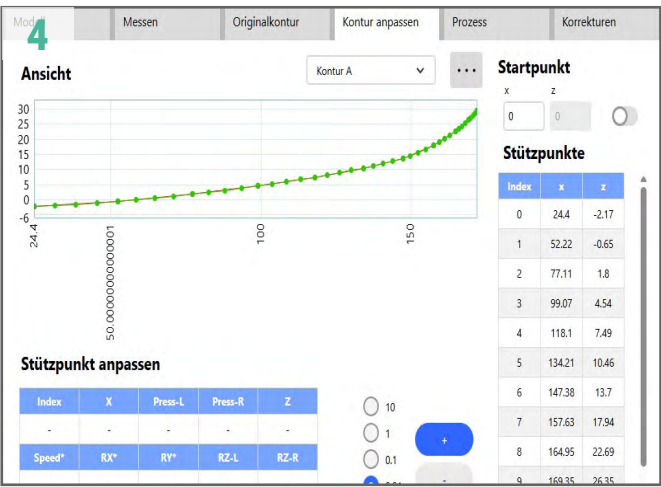
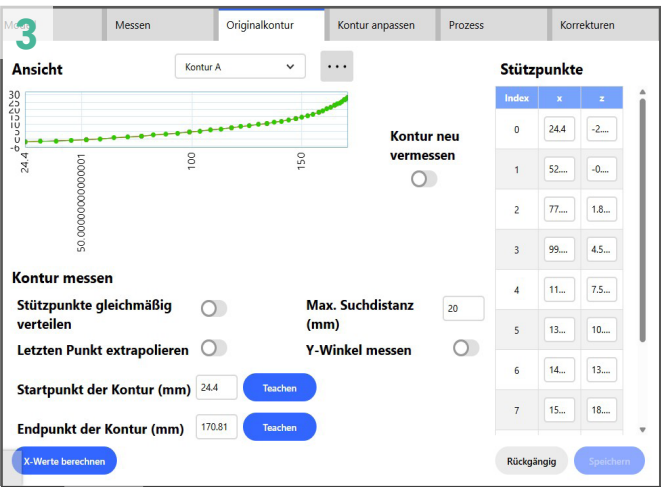
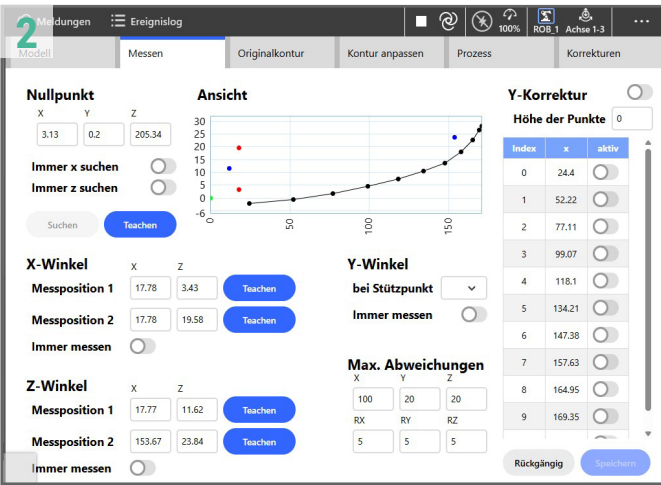
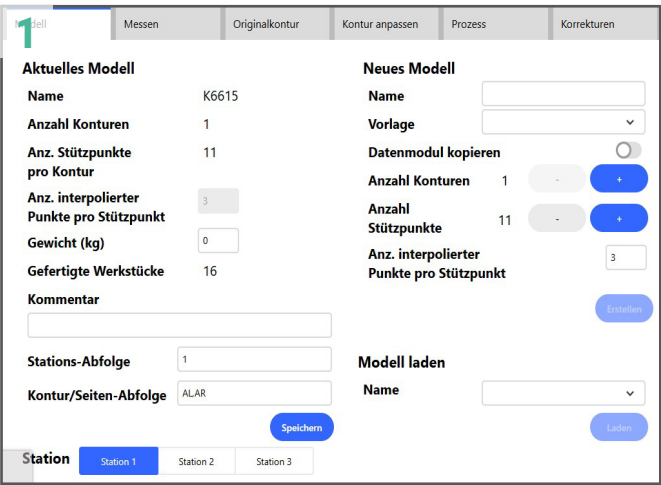
1. Set up a new model in BergerGrinder (Picture 1) and teach the pick-up position in the magazine
2. The robot retrieves the workpiece from the magazine and moves it to the laser
3. Determine the position using the zero point, the cutting corner at the neck, the X-angle and the Z-angle (red, green and blue dots in the picture) (Picture 2)
4. Teaching the start and end points (Picture 3).
- 5 The robot captures the blade contour via the laser station
6. Fine-tuning the contour (Picture 4)



Setting up the blade via RobotStudio

Here, a station must be set up in RobotStudio to create individual programme sections, which must then be linked to the robot programme.

1. Insert the CAD data for the blade into the station (prepared by Berger) and link the station to the robot and the gripper.
2. Create an 'auto-path' along the blade (Pictures 5, 6, 7).
3. The finished path now runs along the width of the edge.
4. Adjust the path in Robot Studio (Picture 8).
5. Generate the programme using Robot Studio and upload the programme to the robot.



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

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

Please send the questionnaire to sales@bergergruppe.de.