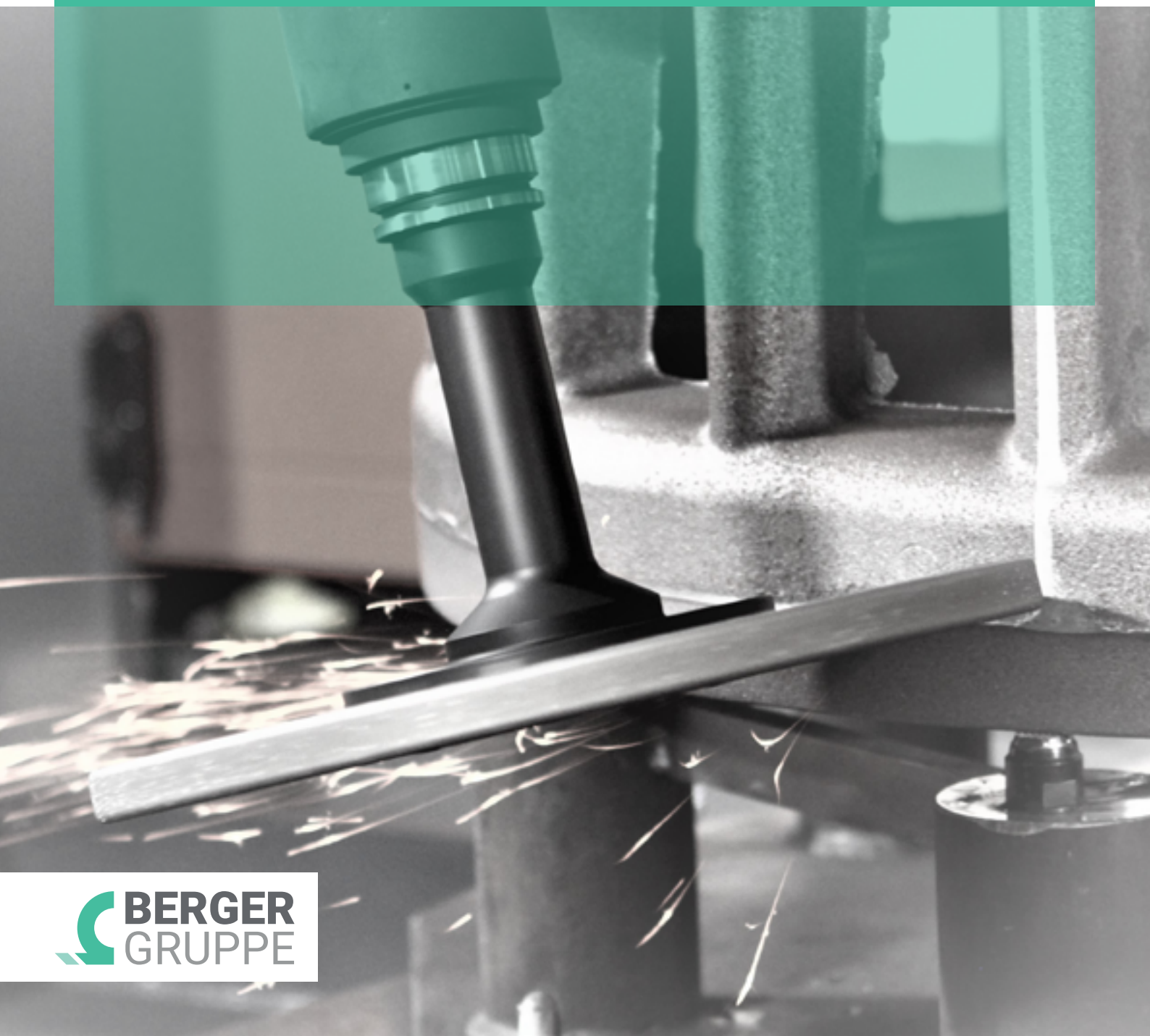
CAST AND FORGED PARTS

ROBOTIC CELLS FOR

fettling | deburring | milling | grinding



BERGER GRUPPE

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ROBOTIC CELLS

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FETTLING

WITH ROBOTIC DEBURRING TECHNOLOGY

GRINDING AND DEBURRING WITH ROBOTIC TECHNIQUE

Process reliability

Manual deburring and fettling as a non-value-adding activity represents a large amount of time, even in a highly automated production of castings and forgings, and leads to a high risk of reworking and rejects due to a lack of process reliability, often only at the end of the process chain.

The Berger Gruppe presents solutions for robotic deburring and fettling of castings and forgings. The focus is on partly standardized robot deburring cells with different conceptual approaches.

Depending on the nature of the cast or forged part, the robotic cell is equipped with different processing stations. Either the workpiece or the tool is guided by the robot.

Robot-guided tool

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.

The deburring robot is equipped with a tool changing system so that it can be equipped with various tools such as grinding wheels, grinding belts, milling tools, files, brushes or polishing wheels.

Berger multi tool head

The Berger multi tool head as a tool changing system enables tool changing times between 0.5 and 1s.

A 3D measuring system integrated in the tool head measures complete workpieces or individual contour elements for programming and checking the workpiece position in the process.

Deburring of contours with large dimensional variation

By using tools specially developed for robot deburring of undefined contours, blank tolerances can be compensated and defined chamfers or radii can be applied seamlessly, reliably and at very high feed rates.

Force-torque sensors

When fettling raw parts, the Berger Gruppe relies on force-torque sensor technology, which enables almost seamless machining of mould divisions and contour progressions (for fire cracks, etc.) and thus replaces time-consuming manual fettling operations.

ROBOTIC CELLS

WITH ROBOT-GUIDED TOOL

ROBOT PROCESSING WITH MULTI-TOOL-HEAD

If the workpiece is too large or difficult to move, the robot cells are designed so that the workpiece is fixed or fixed on a rotary table with CNC axis and machined with one or more robot-guided tools.

Deburring and milling of aluminium gravity die casting

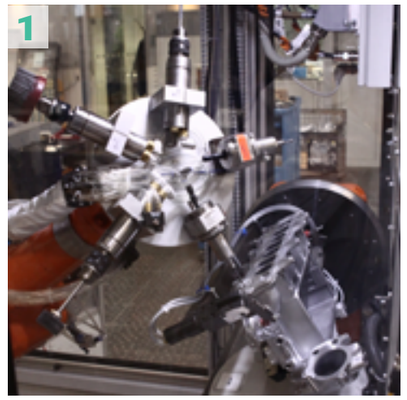
The standard robot cell shown here is designed for the machining of gravity die castings.

The workpieces supplied by the customer are picked up via a CNC rotary table with a machining position and a loading and unloading position. Loading, unloading and machining can thus be carried out in parallel.

An additional rotary axis integrated into the robot control repositions the workpiece during machining (picture p.6).

Five tools are mounted on a multi-tool head and are selected depending on the machining operation.

Programming is done offline, e.g. using RobotStudio. Measurement of the workpiece is integrated into the system.



The robotic cell of the series RSP/5F/3R shown here is composed of:

- 2 robots for loading and unloading
- Positioning of the workpieces by a processing robot via CNC rotary table
- Multi-tool head for holding five tools equipped with five pneumatically driven precision spindles (picture 1)

ROBOTIC CELL
WITH ROBOT-GUIDED TOOL

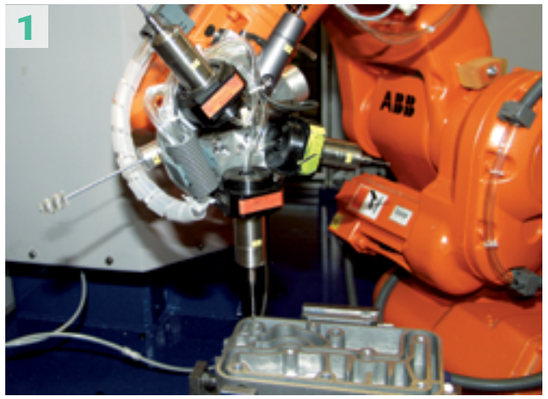
Deburring of aluminium-die casting

The robot deburring of aluminium castings can be realized with the help of various tools. The main tools used are rotationally driven tools such as milling and grinding pins, abrasive flap discs or brushes.

The selection of the tools depends on the accuracy requirements, the material, the surface and the amount of material to be removed. During machining, either the tool or the workpiece can be guided.

- Mounting of different tools in three pneumatically driven milling spindles and one brushing spindle via tool turret head
- Tool changing time: 0,4 s
- Execution of programmed curves in geometric order
- Shortest machining paths
- Integration of up to four tools
- Calibration of complete workpieces or individual contour elements for programming and checking the workpiece position in the process via integrated 3D measuring probes
- Increased tool life and improved surface finish during deburring by wetting with liquid from a spray can attached to the tool turret

1



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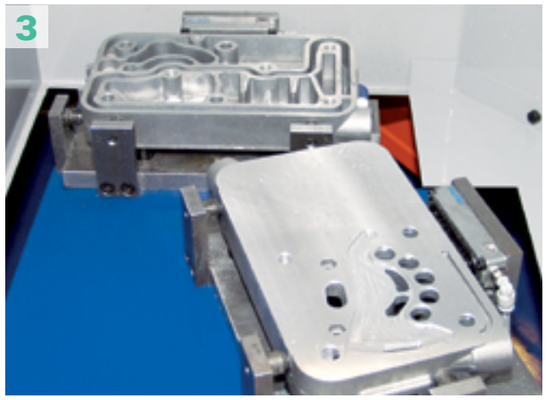
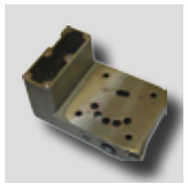




When machining die-cast cylinder heads, for example, precise, defined and secondary burr-free deburring is crucial.

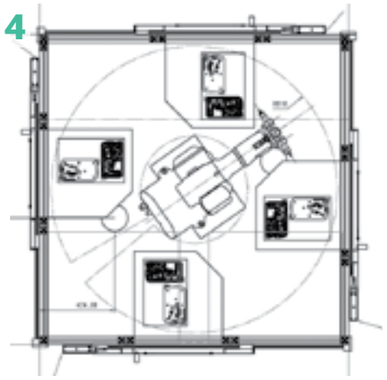
The deburred edges should be 0.2 to 0.4 mm wide to ensure maximum size of the sealing surfaces.

Special milling tools have been developed to reliably produce these uniform and narrow deburring edges for aluminium. The milling tools guarantee a long service life and are designed to limit penetration into the workpiece.

Offline software is supplied for programming the robot, with which drawing data is tapped and the curves to be deburred are assembled as radius and line elements.

- Tool turret head with 3 pneumatically driven milling spindles, pneumatically driven brush spindle and 3D measuring probe (picture p. 8)

4



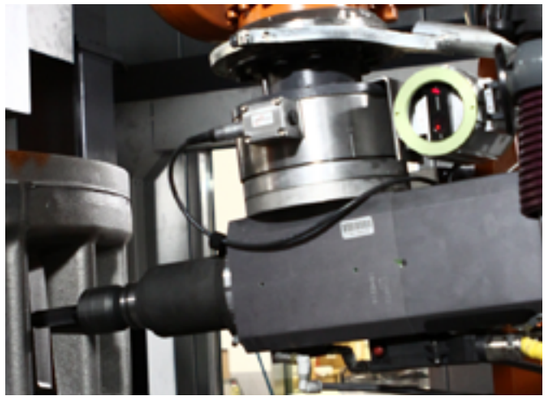
- Machining of die cast parts with tool turret (picture 1)
- Interchangeable workpiece holder (fixture) with defined reference points (picture 3)
- RSP/5F robotic cell for processing die-cast parts (picture 2)
- Layout plan of the robotic cell RSP/5F (drawing 4)

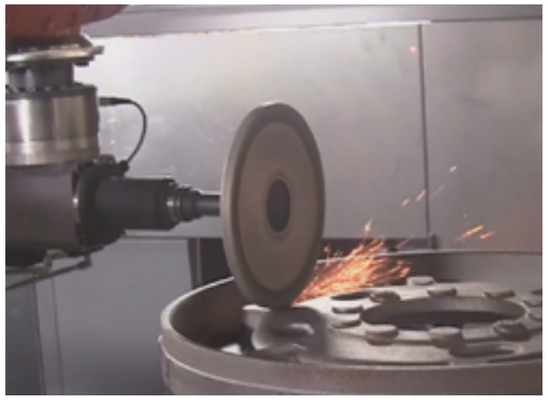
ROBOTIC CELL
WITH ROBOT-GUIDED TOOL

Deburring of grey cast iron

The fully automated robot cell is designed for deburring large-volume workpieces.

The feeding is carried out by the customer via a loading and unloading position. From then on, the workpiece is machined fully automatically.





The workpiece is positioned on a CNC rotary table for machining within the production center. The rotary table axis is fully integrated into the robot control system.

The workpiece is machined with various rotating tools such as grinding wheels or milling cutters.

Depending on the machining task, a tool change is carried out and takes place from a change magazine.

The machining is prepared by means of offline programming – e.g. via RobotStudio.

The robot is equipped with a force-torque sensor, so that an almost seamless machining of contours is possible.

Thanks to additional measurement technology, this robot cell can be offered as a turn-key solution.

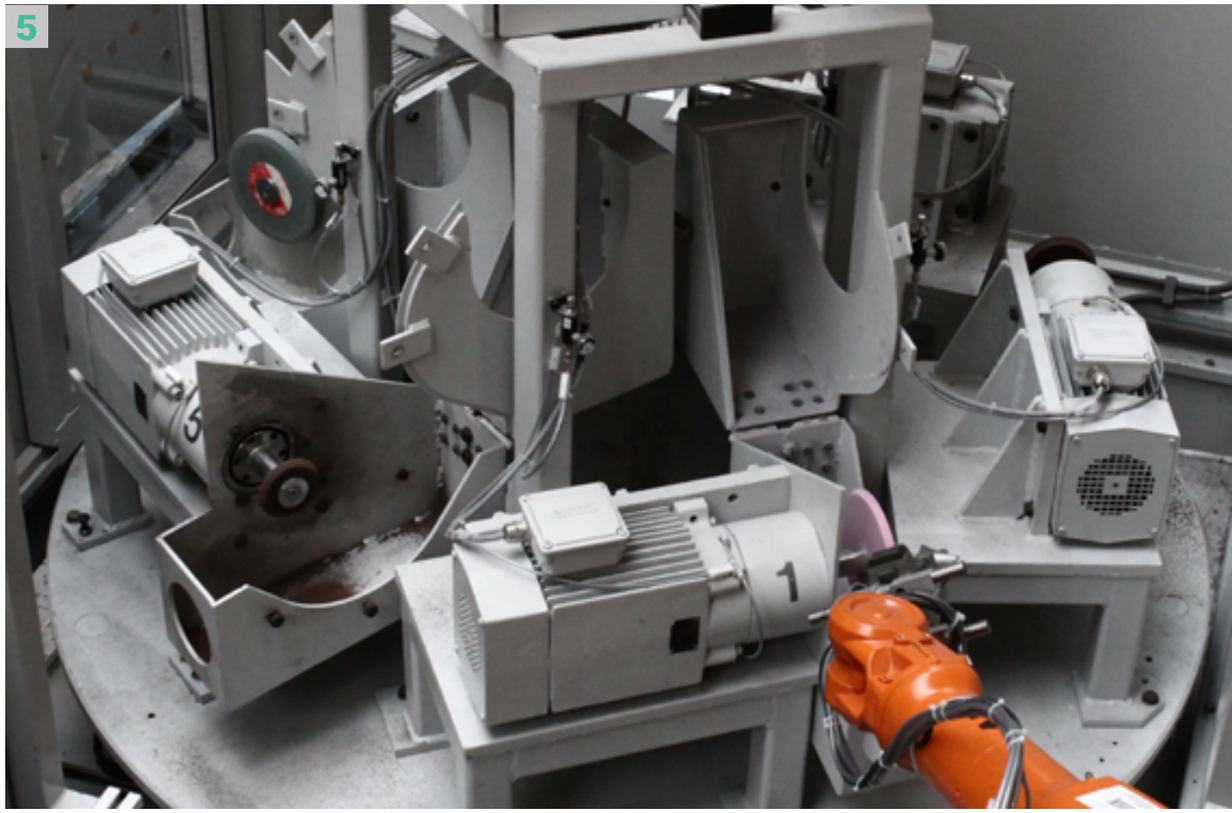
ROBOTIC CELLS

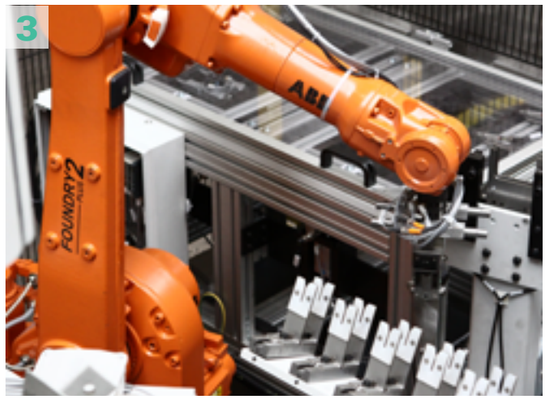
WITH ROBOT-GUIDED WORKPIECE

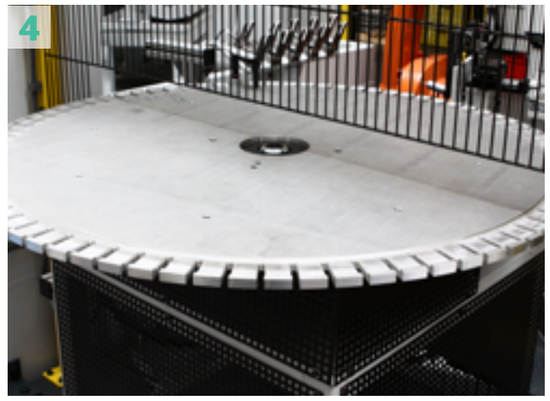
ROBOT PROCESSING WITH CNC ROTARY TABLE

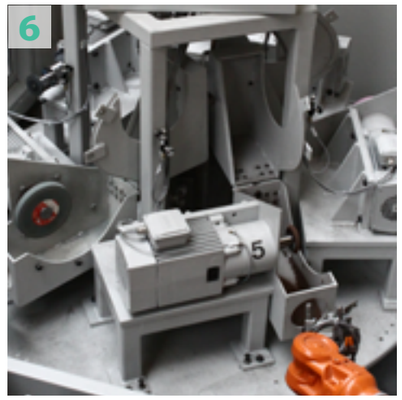
Grinding and deburring of cast steel

The robot cell is equipped with five processing stations mounted on a rotary table. The workpiece is guided by the robot.









The machining cell is designed for all-round machining of workpieces.

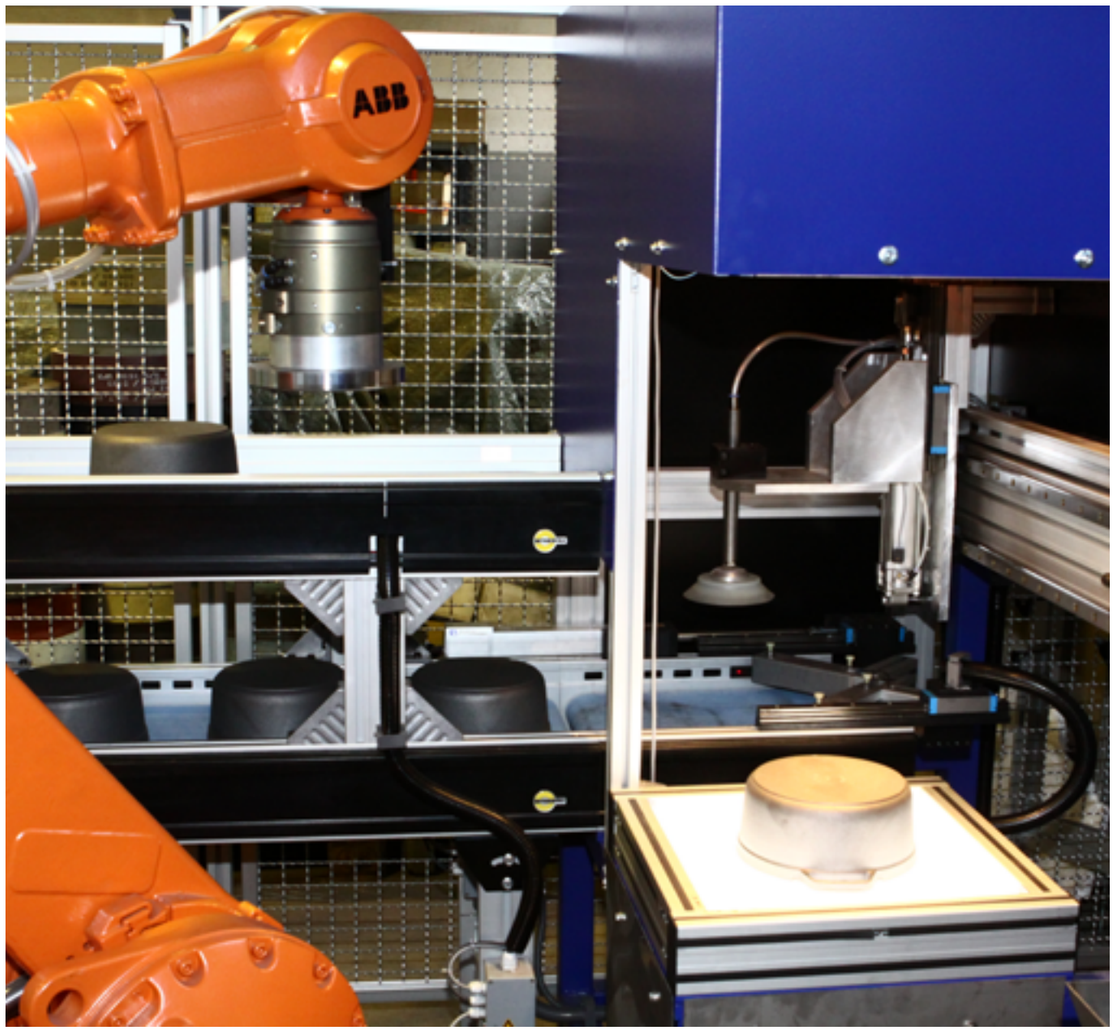
- CNC rotary table for 5 processing stations (pictures 5, 6 and 7)
- 5 single-sided grinding machines of the P3 series, equipped for wet grinding with nozzles for intensive cooling (picture 1)
- CNC dresser with two CNC axes
- Measuring station for measuring the workpieces, consisting of 2 iron-on lasers, a double laser distance sensor and a tactile Tesa probe (picture 2)
- Turning and centering station (picture 3)
- 180° loading table (picture 4)
- Robot with gripper changing system Interchangeable gripper for machining the other side of the workpiece

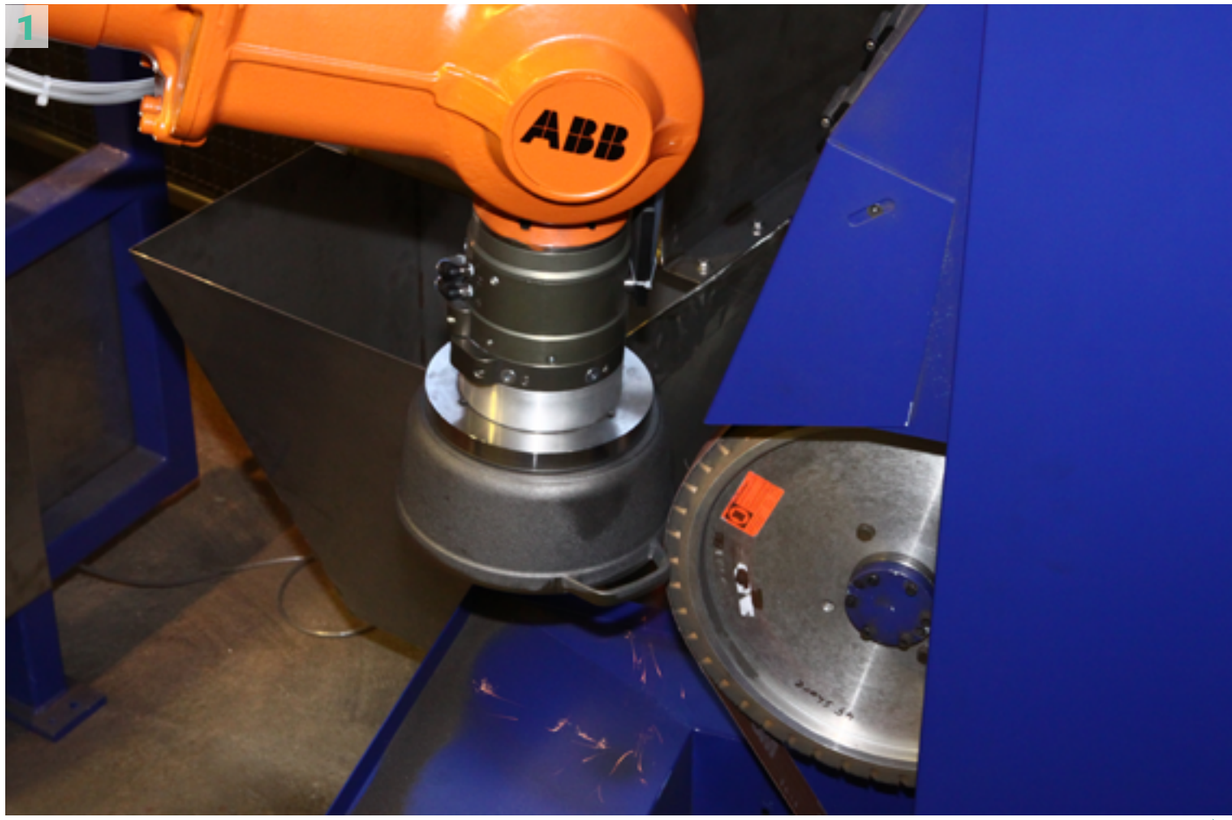
ROBOTIC CELLS
WITH ROBOT-GUIDED WORKPIECE

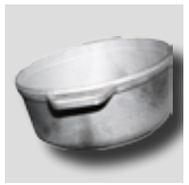
Grinding and deburring of spheroidal graphite iron

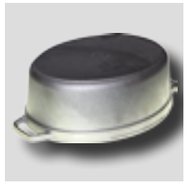
The modular robot cell shown here is designed for machining spheroidal graphite cast iron.

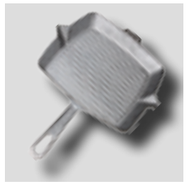
The workpieces are picked up by adapted grippers and guided by robots.

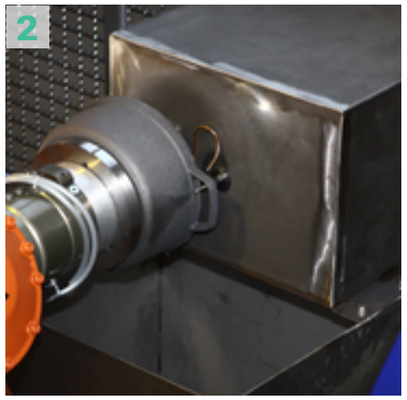


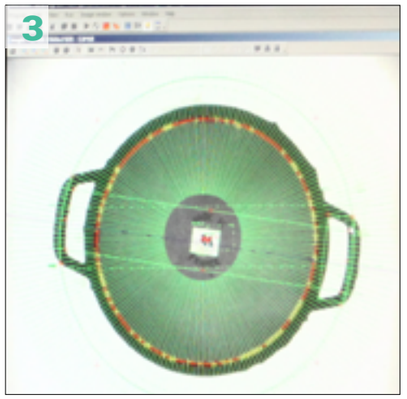












The robotic cell is composed of:

- Feeding via conveyor belt with preparation on camera measuring table (picture p. 14)
- Compensation of workpiece tolerances by camera measuring system (picture 3)
- Deburring of the inside of the handle with high-frequency motor spindle (picture 2)
- Outside cleaning with two belt grinding stations type BSS14 (picture 1)

ROBOTIC CELLS
WITH ROBOT-GUIDED WORKPIECE

Deburring and milling of cast steel

The robot cell of the RSP/5F series shown here is designed for deburring and milling cast and forged parts.

The workpiece positioned on the loading table is gripped by the robot.

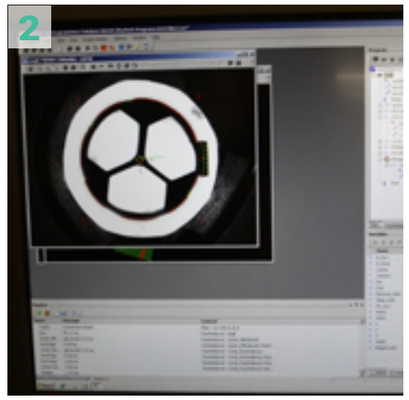
The workpiece is aligned and measured with the aid of a camera measuring station and demo 3D measuring probe.

After that, the workpiece is machined at a milling station with a fixed milling spindle.

(For machining with a fixed milling spindle see also page 15)

1

2



3

The robotic cell consists of:

- Rotary table for loading and unloading workpieces with a diameter of 2,000 mm, holds up to 30 workpieces
- Milling station with pneumatic spindles for the use of burrs (picture p. 16)
- Camera measuring system with illumination and lens (pictures 1 and 2)
- 3D probe (picture 3)

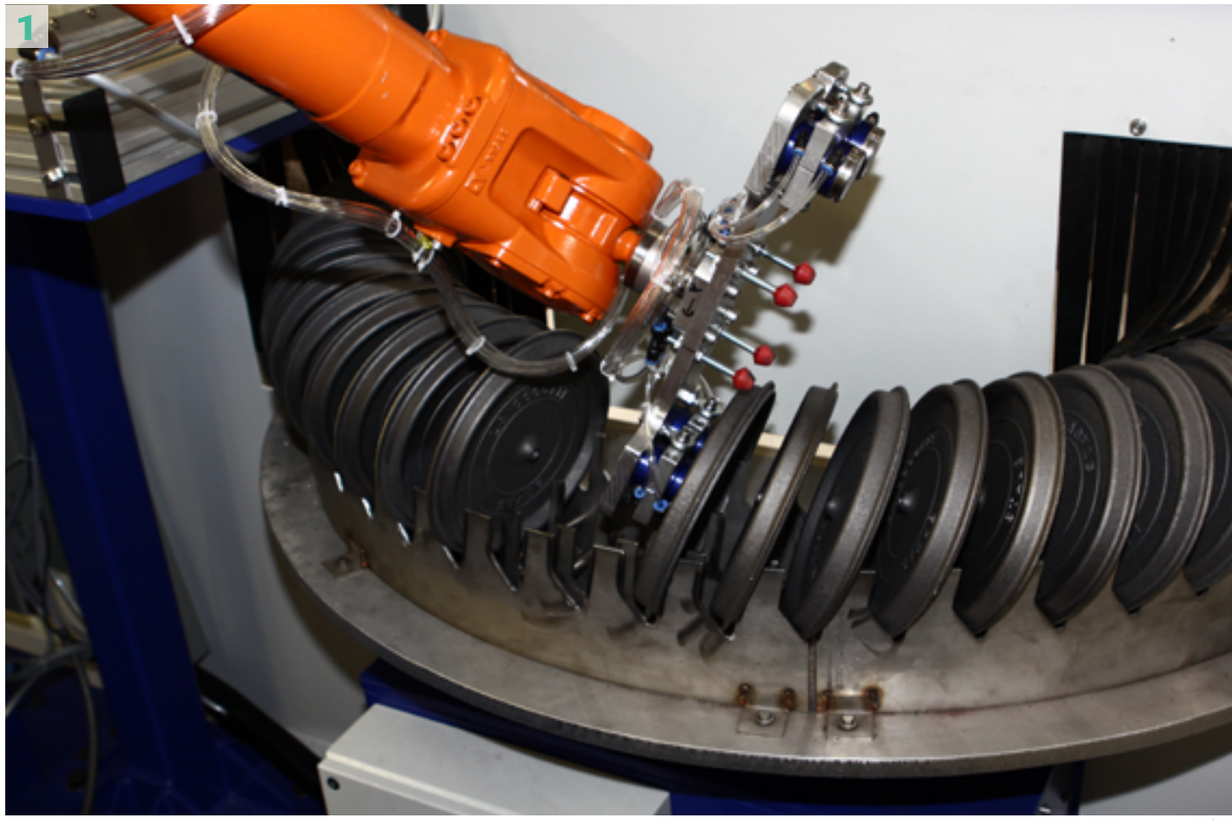
CNC-DEBURRING MACHINES

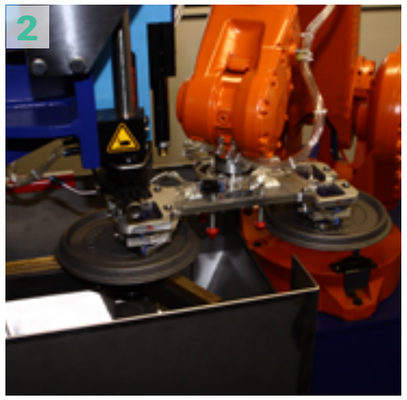
WITH ROBOTIC FEEDING OF THE WORKPIECE

PROCESSING WITH CNC TECHNIQUE

Deburring of spheroidal graphite cast iron

The modular robot cell shown here is designed for machining lids and similar workpieces.





- Robot gripper designed as double gripper for handling two lids including change parts for one pot family (picture 2)
- Belt grinding station BSS10 with pneumatic belt tensioning and belt breakage control
- Polishing station P3 with CNC axis for grooving the grinding belt against the pot lid; design with ball screw, AC servo motor and SERCOS interface

- Frequency converter for infinitely variable regulation of the spindle speed of the station BSS10/P3
- Encapsulation of the grinding machine (picture 3)
- Belt grinding station BSS14 for processing pot lids (picture p. 18)
- Rotary table for holding up to 60 workpieces (picture 1)

FULLY AUTOMATED

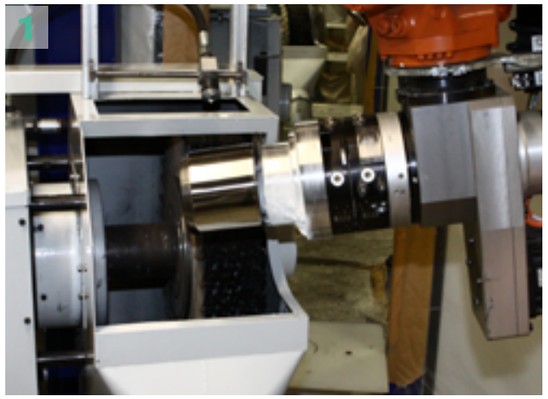
ROBOTIC SYSTEM

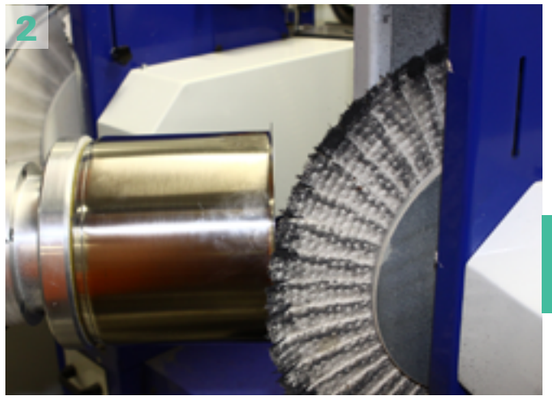
ROBOTICS AWARD 2018

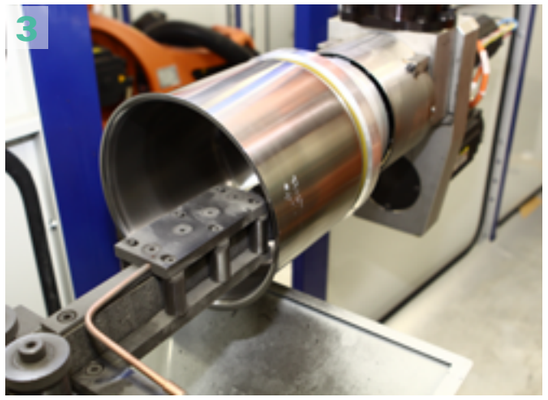
ROBOTIC SYSTEM WITH 33 INTERACTING ROBOTIC CELLS

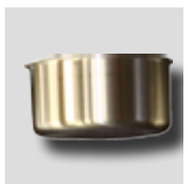
Grinding, Polishing and deburring of stainless steel

Fully automated robotic system for polishing the inside and the outer surface and deburring the rim of hollow goods.









Fully automated robotic system for polishing the inside and the outer surface of hollow goods.

Decentralized, intelligent systems decide on the basis of input signals and sensor technology what kind of actions are to be carried out.

This is achieved both in the area of networked control technology and in the area of intelligent spare parts supply.

The robot system is equipped with 33 interacting robots. The robots communicate with each other, request raw materials or display consumables – each as an independent, intelligent unit.

For spare parts supply and preventive maintenance, the machines communicate worldwide as an independent system with the control center to display the current machine status and the required wear parts.

The robot cell is equipped as follows:

- Feeding via conveyor belt system
- Modular design of the system
- Separate lines for the inside and the outside machining
- Automatic gripper changing system
- Tool changing system
- Control station monitoring the entire plant
- CNC adjustment of the paste gun
- High-gloss polishing of the outer jacket (picture. 1)
- Polishing the pot rim (picture 2)
- When grinding the inner jacket, the robot holds the pot over the vacuum system (picture 3).
- Fully automatic change of polishing discs (picture 4)

ACCESSORIES

FOR ROBOTIC CELLS

MEASURING TECHNIQUE
PROGRAMMING
SYSTEM MONITORING

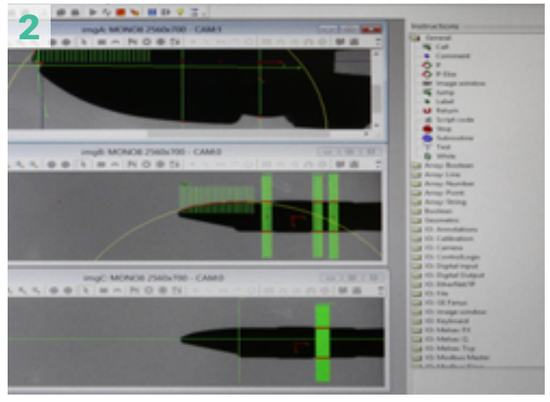
Measuring technique

With the help of cameras or mechanical probes, the workpieces can be measured before or after machining and thus the machining program can be influenced.

Examples of application:

- 3D measuring with probe (picture 1)
- 3D measuring with camera system (picture 2)
- Compensation of workpiece tolerances by camera measuring system (picture 3)
- Camera measuring system with graphic interface for part measurement (picture 4)


1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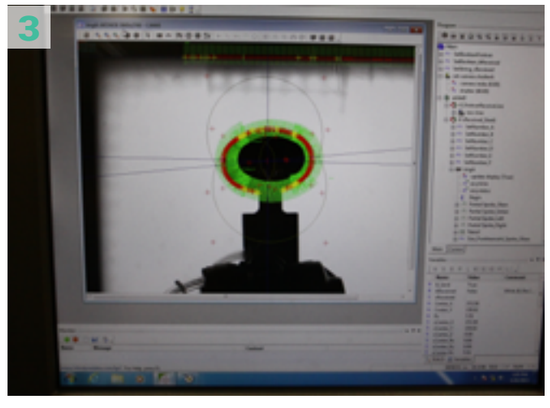
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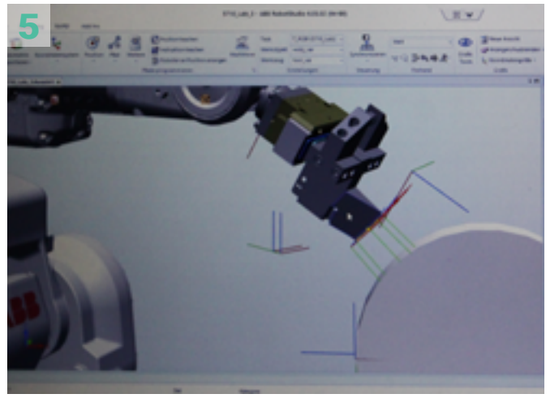
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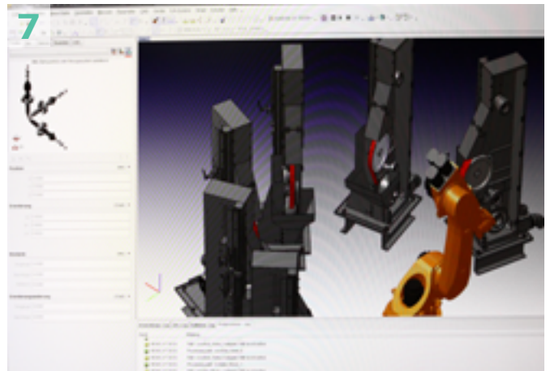
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8

Programming

The program can be created offline with corresponding software – e.g. with RobotStudio (pictures 9 and 10).

The processes can also be simulated and the machining times determined.

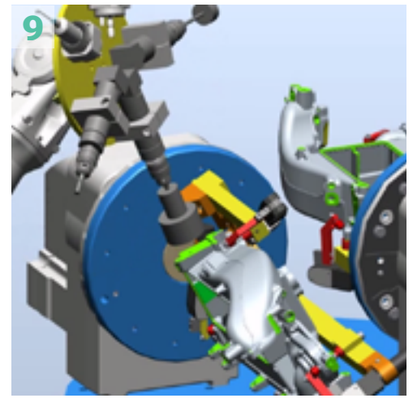
Examples of application:

- Robot program in conjunction with RobotStudio: guiding of the workpiece (picture 5)
- 3D offline programming in conjunction with KUKA robots (picture 7)

System monitoring

The system states can be monitored by means of an app with email notification (picture 8) or in connection with a central PC (picture 6).

Warnings are shown on the display or sent by email.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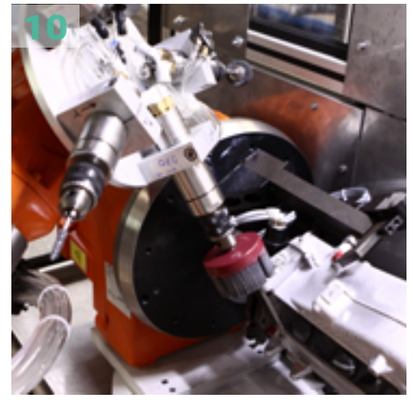
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REQUEST FOR QUOTATION

QUESTIONNAIRE FOR TECHNICAL DATA

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

Please make a quotation for:

	WORKPIECE		
	aluminium die casting		
	aluminium gravity die casting		
	grey cast iron		
	speroidal graphite cast iron		
	cast steel		
	stainless steel		other
	TYPE OF PROCESSING		
	deburring		
	grinding		
	brushing		
	fettling		
	polishing		other
	TECHNICAL DATA		
	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

Please mail the questionnaire to sales@bergergruppe.de.

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