POWDER INJECTION MOULDING

Exceptional metal and ceramic products

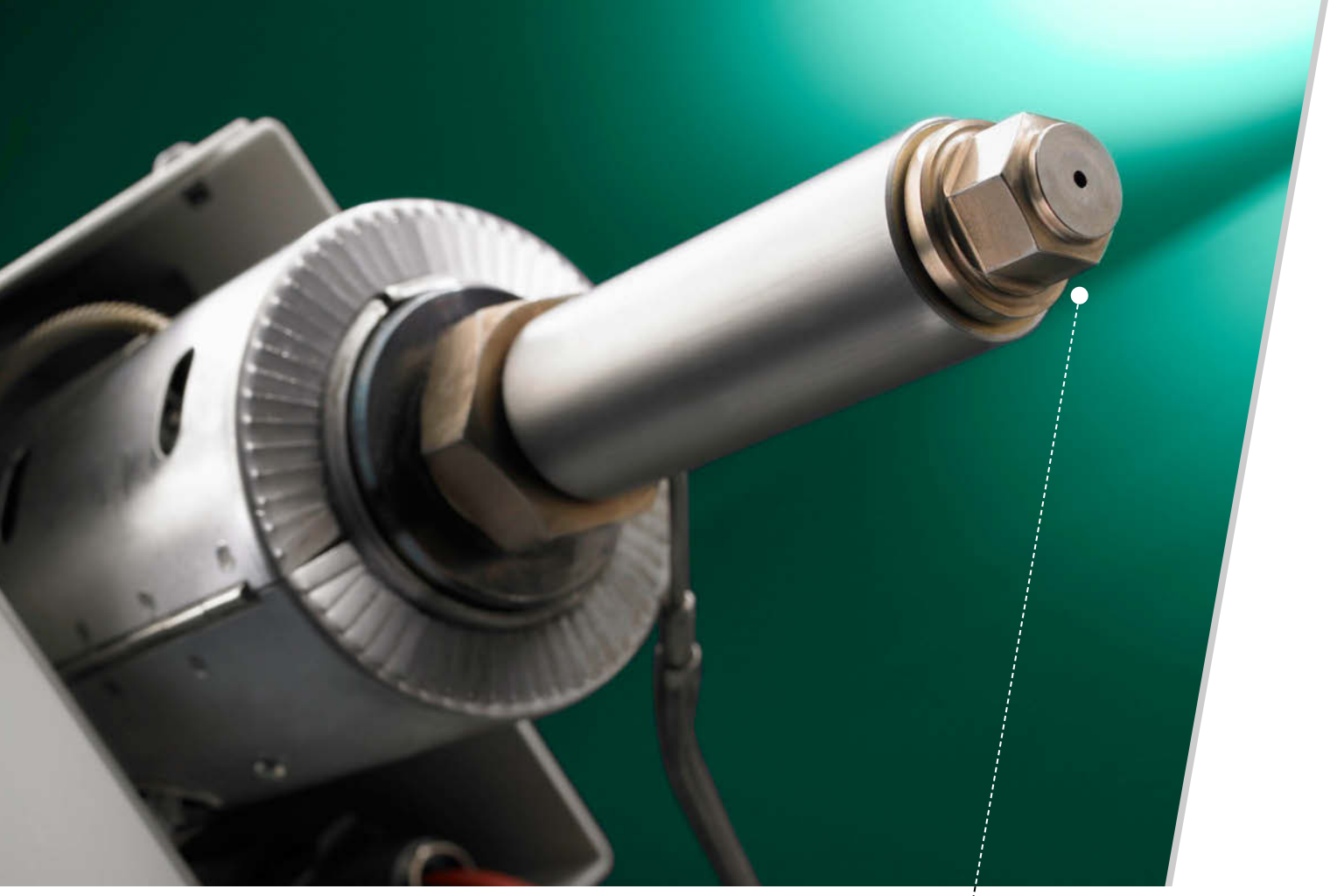
ARBURG

FREE YOUR MIND

When anything becomes possible:
Powder injection moulding with ARBURG.

High-quality parts with detail down to the micrometer range. Unusual geometries that cannot be produced in series with such precision using conventional methods. This is what processing of metal and ceramic powders on injection moulding machines means. The process offers you enormous freedom of design. Near-final-contour part production, including internal threads, difficult undercuts, gearings and free-form surfaces – with our technology and know-how it's easy.
It is worth getting on board!

WIR SIND DA.



Cost-saving: Extended nozzles keep sprues short and make the best possible use of expensive powder materials.

AT A GLANCE

// Powder Injection Moulding (PIM) gives you access to technology that offers you great freedom in designing highly complex metal (MIM) or ceramic (CIM) parts. The process technology does not differ significantly from the processing of filled plastics. This is especially true for a reproducible, qualitatively faultless production process. With us as partners, PIM users are always on the safe side. \\

Highlights

- All machine types can be used for powder processing
- Expertise across the entire process chain
- Versatile team of PIM specialists

Exploit injection moulding potential

PIM allows you to manufacture complex components with precision and economically in large quantities. The process can be highly automated and quickly converted for other products. Here's what our injection moulding technology offers:

- A wide selection of machine series, sizes and injection units
- Numerous equipment and configuration options, as with e.g. multi-component technology
- Powder-specific adaptation of plastification

Achieve reliable quality

Our machine control system easily integrates process-specific peripherals equipment. Thanks to process programming with real-time plausibility check, even complex processes can be set up with ease. Numerous functions for process optimisation, monitoring and documentation ensure top quality moulded part production. This includes, for example, evacuating the cavities or injection embossing.

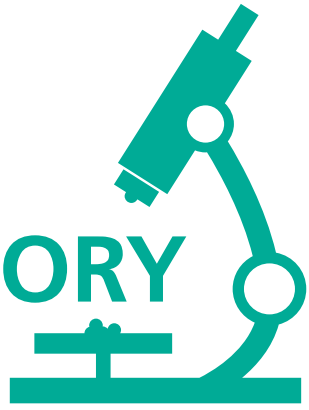
Benefit from unique advice

Our PIM specialists will support you all the way. Including everything from material selection and preparation, component design suitable for moulded parts, and up to individual machine and mould configuration or for debinding and sintering processes. At our company headquarters in Lossburg, Germany, you can make use of a perfectly equipped PIM laboratory. Our lab offers you an opportunity to easily carry out material tests, produce sample parts, look into process optimisations or test moulds.

70 m²

PIM LABORATORY

ARBURG experts can test applications and materials for you



PIM PACKAGE

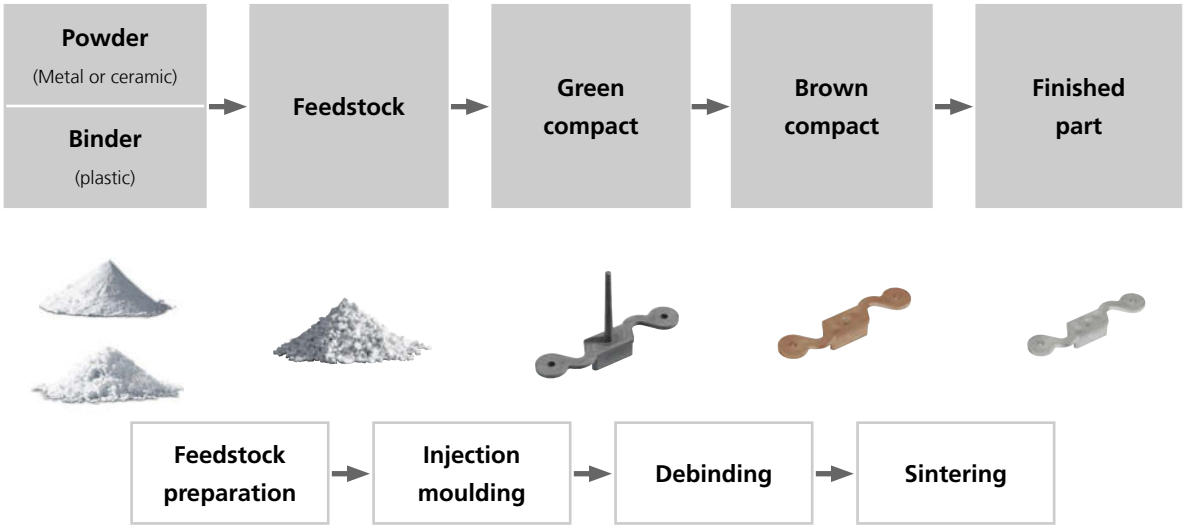
■ Highly wear resistant MIM or CIM cylinder module with specific configuration of non-return valve	■ Reproducible injection with aXw Control ScrewPilot (servo-electric or hydraulic)
■ Extended PIM nozzle length with additional heating circuit	■ Control functions such as evacuation
■ Interfaces for vacuum devices	☐ Vacuum devices

■ Standard ☐ Option

PRODUCTION PROCESS: MULTI-STAGE

// Machining or pressing technology no longer allows you to implement your product ideas cost-effectively in high unit volumes? Injection moulding of powder materials (PIM) is the alternative! It offers great freedom of product design, access to a wide range of materials, and the ability to work with a high degree of automation and largely without waste. At the same time you will achieve near-final-contour parts with high dimensional stability and surface quality – with no need for re-working. This makes high-volume production of sophisticated metal and ceramic components highly economical. \\

EXPERT CONSULTING THROUGHOUT THE ENTIRE PROCESS CHAIN



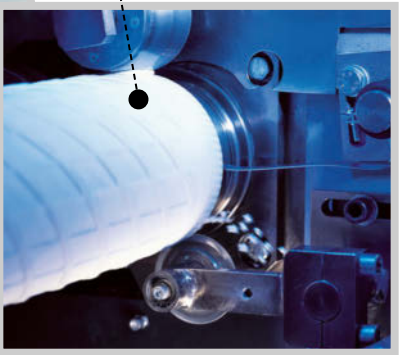
Feedstock preparation

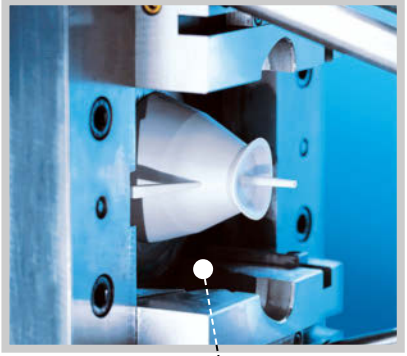
The injection-mouldable feedstock is processed from a fine-grained, sinterable powder and a suitable plastic-based binder to form a homogeneous mass. The availability of powder materials is constantly growing: In addition to oxide ceramics and steels, hard and precious metals as well as cermets or magnetic variants are available. You also benefit from the option of having individual feedstocks developed and produced.

Injection moulding

The technology is similar to plastic processing. The binder content of the feedstock is melted in the plasticising unit through heat before being injected into the mould. A robotic system gently removes the hardened moulded part, known as the „green compact". In addition to automated series production, fast material and mould changes also make just-in-time production possible.

Individually processed: Powder properties are decisive for process and component.





Precise contours: Injection moulding is key to part quality.

Debinding

The polymer component is removed from the green compact by catalytic processes, dissolving (e.g. with water or acetone) or thermal decomposition. This process can be effectively supported through suitable process control measures. When the binder is removed, the moulded part becomes what is known as a "brown compact". In this condition, the parts are porous, fragile and relatively unstable.

Sintering

In order to firmly bond the particles in the brown compact, it is sintered in a furnace under an adapted atmosphere observing precise temperature-time profiles. By means of this heat treatment just below the melting point, the component is homogeneously compressed by 15 to 25 percent and in the process attains its material properties. Fine powders ensure outstanding surface qualities and minimal tolerances.

0.05 mm

SMALL TOLERANCES

can be achieved with the PIM method

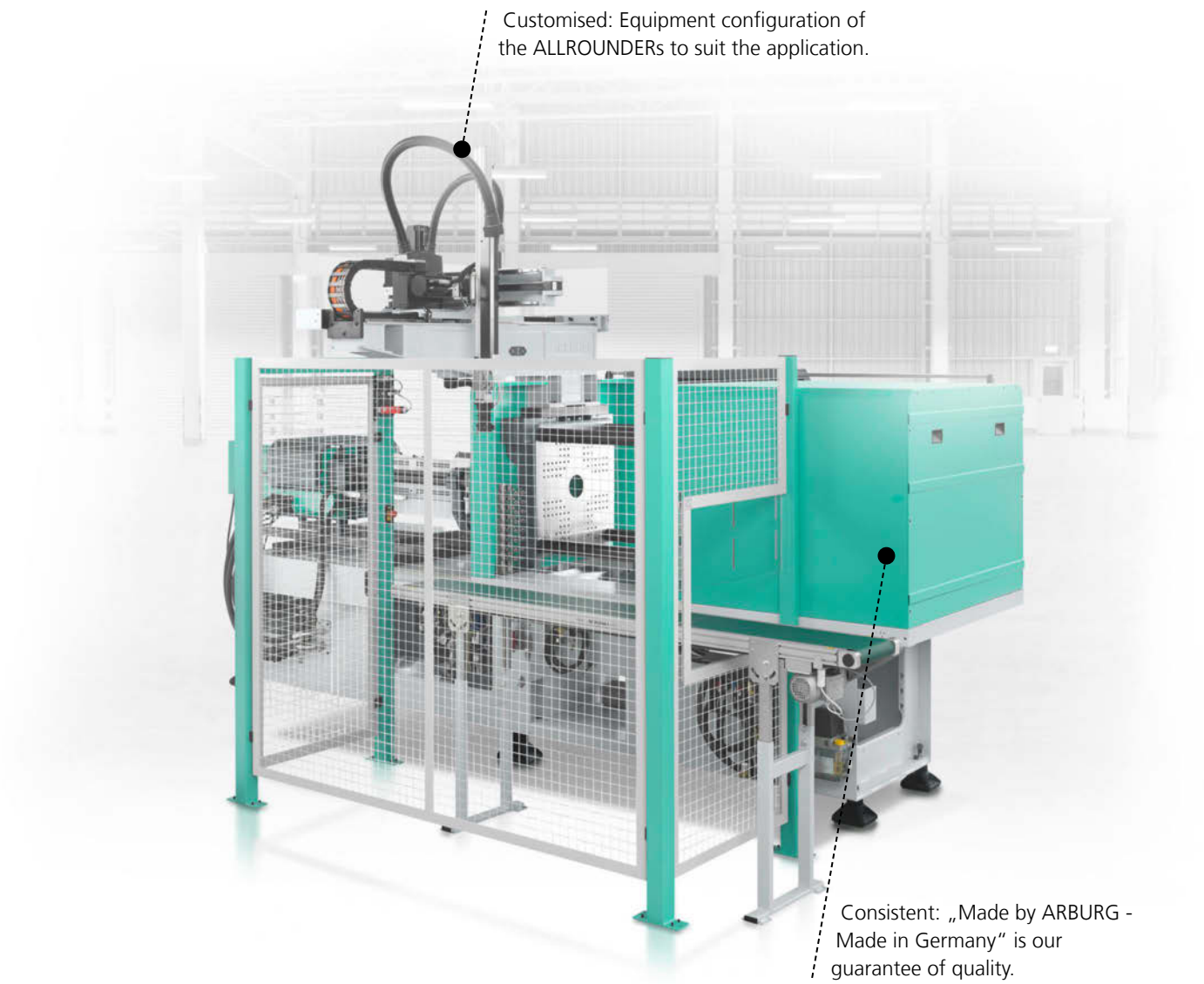
High-quality sintering: Moulded parts shrink equally in all directions (isotropically).

Reliably debinded: In suitable atmosphere, dependent on binder and moulded part.

PIM LABORATORY: UNIQUE

// You can test the process steps of powder processing in practice at our headquarters in Lossburg/Germany: From the feedstock mixture and testing, through to preparation and injection moulding, up to and including debinding and sintering of the moulded parts. In-depth consulting by experienced specialists is also available – on suitable powder/binder mixtures, for example. We also enable you to produce sample parts using your own moulds. Top service for you: Typical ARBURG! \\


Practical support: Testing of all debinding and sintering processes on the market.
Complete: The equipment on around 70 m² leaves nothing to be desired.



MACHINE TECHNOLOGY: HIGH QUALITY

// Perfect part quality is particularly important for powder injection moulding as defects in the moulded part can no longer be eliminated by downstream debinding and sintering. This is why we attach great importance to a reproducible manufacturing process. Only in this way can you be on the safe side – and your series production too! \\

i Further information:
Products and services brochure

Reproducible basis

Protective mould use and highly precise moulding without burr formation: with our ALLROUNDERs, we achieve this, for example, through proven three-platen technology with four tie-bar guidance for even force application. The unique aXw Control ScrewPilot ensures reproducible mould filling and excellent moulded part quality.

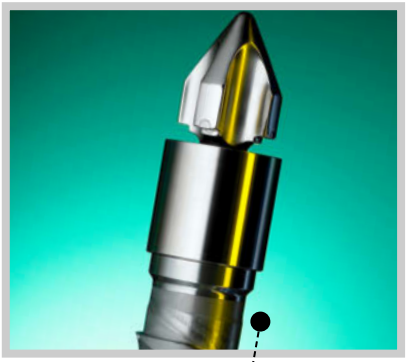
Variety of expansions

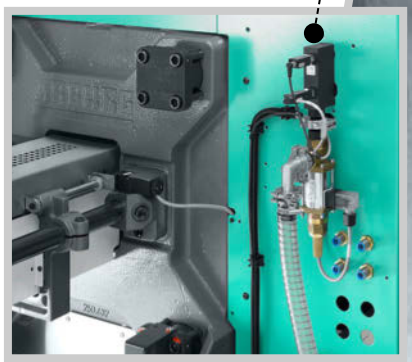
All ALLROUNDER machines are also suitable for powder processing. This _applies equally to both hydraulic and electric models, whether with large or small clamping forces and injection units. From multi-component processing and dynamic mould temperature control to complete solutions with integrated peripheral equipment and automation. Our technology can be individually tailored to your requirements.

Adapted plasticising

To ensure high process stability, we set the non-return valve to the relevant grain size of the powder. To prevent feedstocks from overheating and decomposing, our PIM screws have low compression. An extended PIM nozzle ensures short sprues and perfectly compressed moulded parts. To protect against the abrasive powder-binder melt, the plasticising components are designed to be highly wear resistant.

Application-specific: Mould venting with modular vacuum technology.





Material-specific: Design of the genuine plasticising components from ARBURG.

Nothing is impossible: Versatile functions for special processes, with which special sequences become standard for you.

CONTROL SYSTEM: SMART

// Maintaining control over machine, mould, robotic and peripheral technology requires a suitably powerful central control system. This calls for smart technology that offers extensive data integration options, monitors and adaptively controls your processes, and supports you in every operating situation. All the features of our SELOGICA and GESTICA control systems are designed for a fast, secure and comfortable set-up and operating process. This enables you to get the best out of all your applications. \\

Highlights

- SELOGICA and GESTICA – fully compatible
- Graphic sequence programming
- Real-time plausibility check
- Assistance packages and connectivity modules "Ready for Digitalisation"
- Central control system for complete production cells

i Further information:
SELOGICA and GESTICA brochure

Reliable evacuation

Avoiding air inclusions, flow-line issues or binder migration: Evacuation of the mould prior to injection is important for smooth powder processing. Evacuation can be implemented very flexibly via dedicated symbols. You can use the signals from the vacuum units for process and quality control purposes. This ultimately results in the transparent control and documentation of the entire evacuation process.

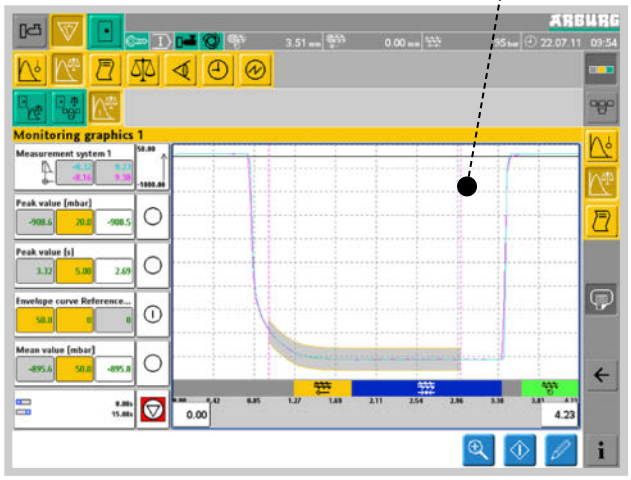
Universal injection compression moulding

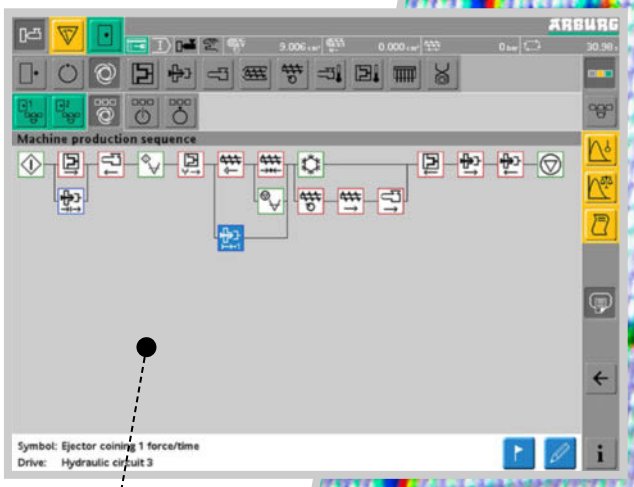
Directed mould filling without the formation of open jets can be achieved by injection compression moulding. Here, the ejector or core pulls are actively moved during injection. The compression sequence is both controlled and freely programmable via our machine controller, for example through individual selection of the starting conditions.

Integrated peripherals

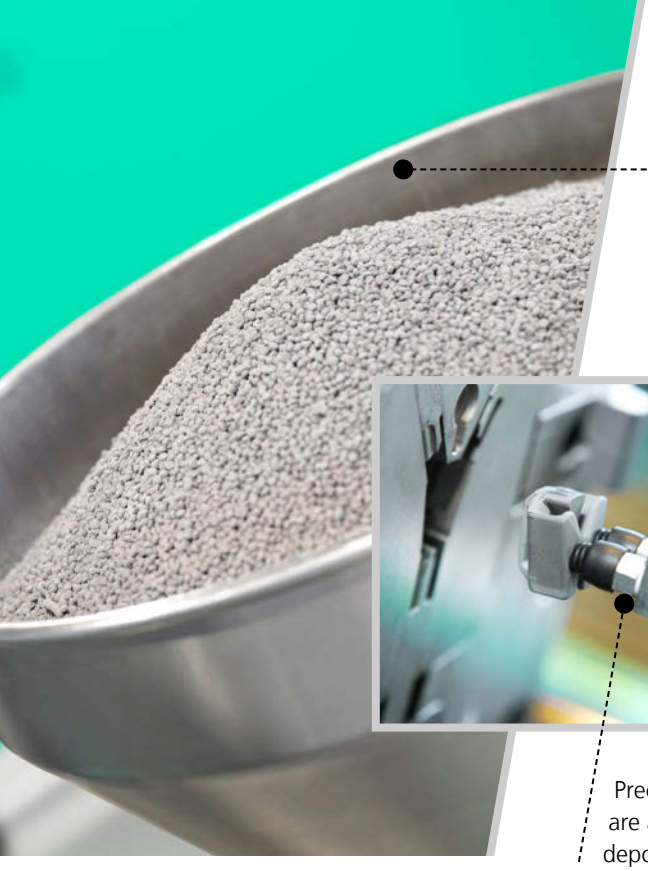
Mould, robot or peripheral equipment functions: All processes can be programmed and centrally monitored, depending on or in synchrony with machine movements.

Reliable production monitoring: Process and quality control dependent on evacuation.





Targeted process optimisation: Universal embossing procedures as key.



Versatile: Processing individual feedstocks according to requirements.

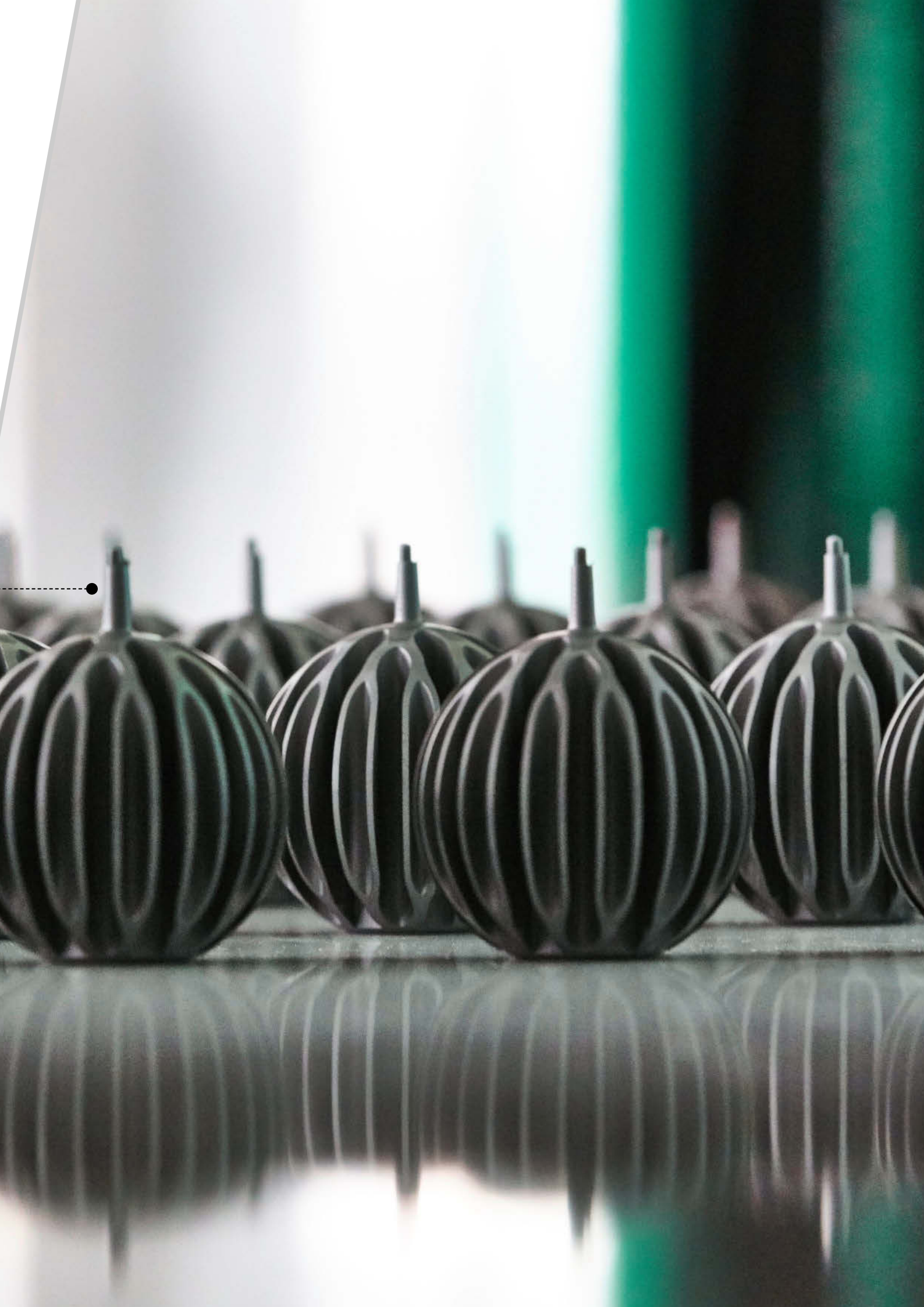
Precise: Sensitive components are automatically removed and deposited for further processing.

Innovative: Production of bionically optimised heat sinks for LED luminaires.

APPLICATIONS: IN PRACTICE

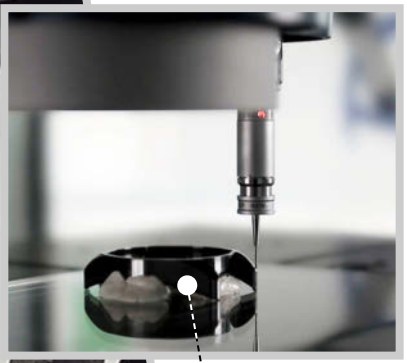
// Freedom of design, wide choice of materials and, above all, cost-effective high-volume production: Powder injection moulding offers you attractive advantages for unique metal or ceramic parts. Furthermore, technologies such as multi-component injection moulding or dynamic mould temperature control extend the range of possible applications. In addition to our premium technology, you can also rely on our extensive expertise. Whenever you need it. An individual approach for efficient solutions. \\

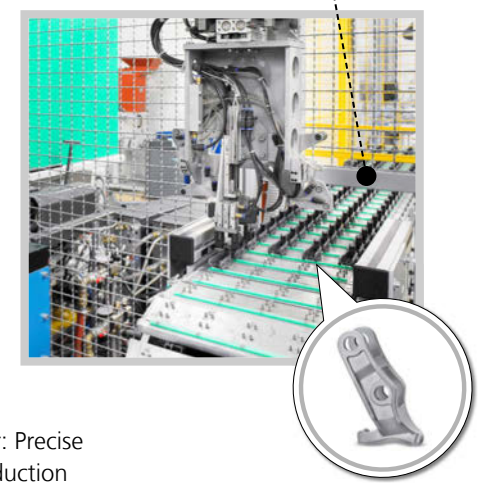
i Further information:
Turnkey projects brochure



Extraordinary: Powder injection moulding offers you enormous freedom of design.

High quality: Zero-fault production (0 ppm) of intermediate levers for valve control of a passenger car engine.

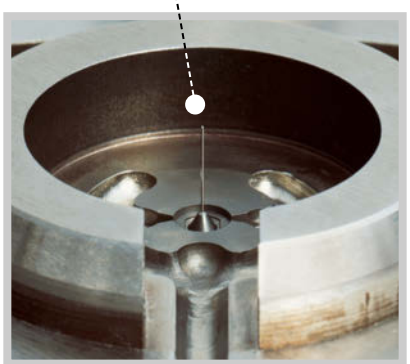




Near-final contour: Precise high-volume production of ceramic watch casings.

Metal housing for smartphone:
Cost-efficiently realisation of high-quality surfaces with new materials.

Utmost precision: Injection moulding of ceramic ferrules with ±10 µm to meet the sharpest of tolerances.



Unlimited: Fully automatic production of hard alloy radius milling cutter with internal thread.

Reliable: Gently remove sophisticated metal housings using integrated automation.

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Media Centre: in-depth,
captivating, entertaining.

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