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_Company presentation

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_Locations

Key figures of PVS Group:

- 78 Mio € turnover
  (financial year 2023/2024)
- 480 employees

126 injection molding machines

(Update: 2024/09)

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_PVS Germany

Location: Niedernhall

Founding: 1976

Number of employees: 265

53 injection molding machines
from 35 to 1.600 tons

Production area: 15.000 sq m / 162,000 sq ft

IATF 16949
ISO 9001
Environmental Management System ISO 14001
Energy Management System ISO 50001

(Update: 2024/09)

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_PVS Hungary

Location: Celldoemoelk

Founding: 1999

Number of employees: 121

32 Injection molding machines
from 15 to 500 tons

Production area: 4.800 sq m / 52,000 sq ft

IATF 16949

(Update: 2024/04)

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_PVS USA | Huber Heights

Location: Huber Heights, Ohio

Founding: 2004

Number of employees: 65

21 injection molding machines
from 60 to 1.600 tons

Production area: 7.000 sq m / 75,300 sq ft

IATF 16949

Environmental Management System ISO 14001

(Update: 2024/04)

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_PVS USA | Johnson City

Location: Johnson City, Tennessee

Founding: 2023

Number of employees: 3

4 injection molding machines
from 180 to 340 tons

Production area: 5.000 sq m / 54,500 sq ft

(Update: 2024/04)

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_PVS China

Location: Taicang

Founding: 2011, since 2018 at Taicang

Number of employees: 26

16 injection molding machines
from 40 to 600 tons

Production area: 4.200 sq m / 45,200 sq ft

IATF 16949

(Update: 2024/04)

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_Our Business Strategy

OUR VISION

Co-Creating
high technology
for sustainable and eco-friendly
solutions in plastics
worldwide.

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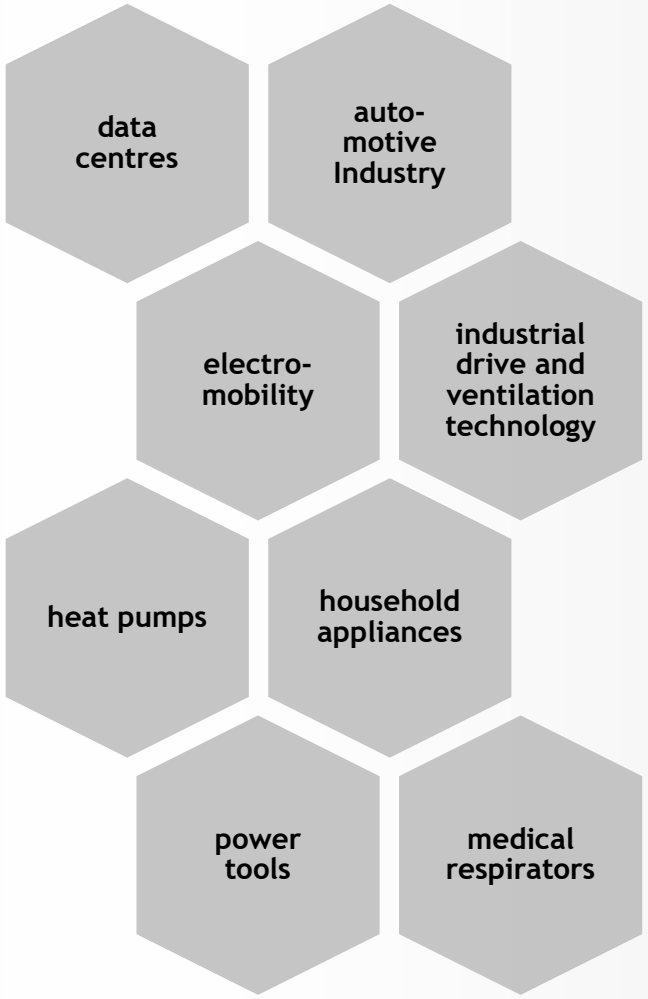
_Applications



Every year, the PVS Group produces around 100 million plastic parts that help to make electric motors and blowers more energy-efficient, lighter and quieter.

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_Our Core Competences

ca. 29 Mio. units produced per year

ca. 24 Mio. units produced per year

ca. 47 Mio. units produced per year

- Stators and Rotors
- Blower Wheels
- Technical Components

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_Overmolding Technology

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_Stator segment with overmolded plastic insulation

Length: currently up to 200 mm is possible

Application:

Industrial engines, hybrid automobile technology, wheel hub drives

Advantages:

- High coil density
- Compensation of stack tolerances from 0.8 mm before the insulation to 0.05 mm after insulation
- Ensuring the air gaps and creepage distances in the joint area of the individual segments

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_Stator segment: overmolded, wound, encapsulated

stack height = installation height = 105 mm
(stator composed of 30 segments / Ø 290 mm)

Application:
Hybrid drive passenger car (Plug-In),
power: 80 kW

Advantages:

- Stack, overmolding, winding and encapsulation from one supplier
- High coil packing density with small dimensions
- Contour for placing the winding wire is integrated in the part
- Sealing of the winding wire without damage of isolation
- Additional fixing of the winding by encapsulation

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_Skewed external rotor stator with overmolded plastic insulation

Diameter: 150 mm

Installation height: up to 85 mm

Helix angle: 6°

Application:

Powerful industrial engines

Advantages:

- Reduction of the detent torque
- Use of loose laminations
- Stacks need no welding
- Reduction of noise
- Insulation displacement contacting integrated in the geometry

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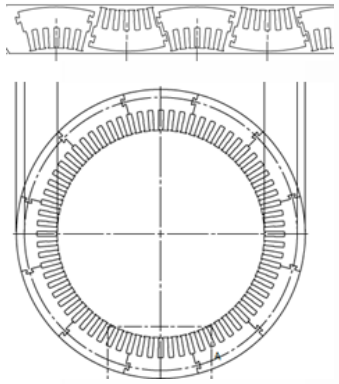
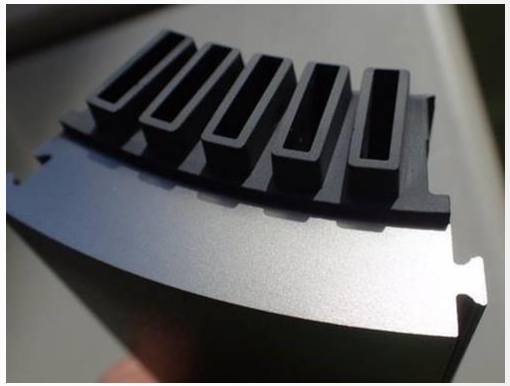
_Segmented EV stator | protoype





Outer Ø: 220 mm
Inner Ø: 157 mm
Height: 160 mm

Key facts:

- Tailor made material selection for punching
  eg. Stator material: NO30-16
  Rotor material: M800-50A
- Maximum material utilization
- Insulation thickness 0,3 mm
- Improved thermal conductivity
- One-Piece insulation by overmolding

→ improved creep-distance
in comparison to end cap designs

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_Overmolded stator and rotor

Diameter of stator: 120 mm

Diameter of rotor: 84 mm

Installation height: 14,5 mm

Application:

Fan for engine cooling consisting of overmolded stator and overmolded rotor with magnetized and preassembled magnets

Advantages:

- Weight and space savings
- High temperature applications
- Subsequent magnetization not necessary

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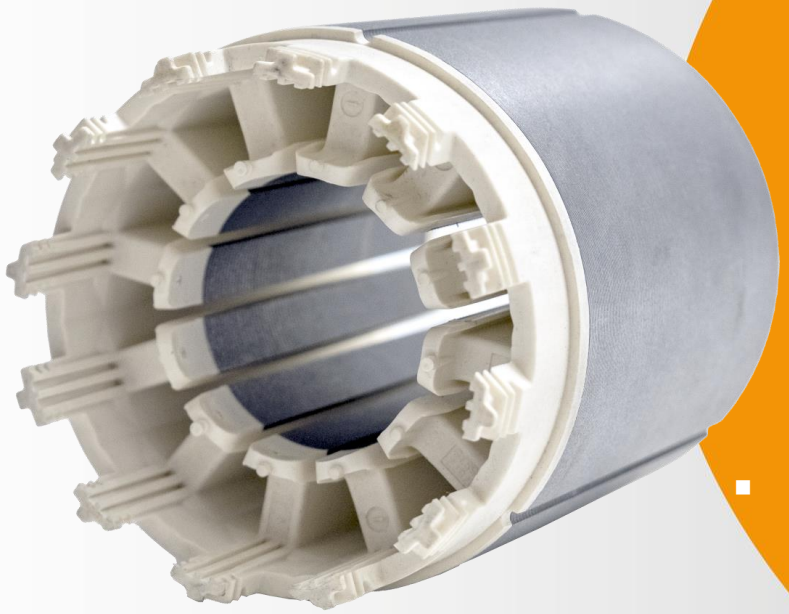
Stator with overmolded plastic insulation



Diameter of stator: 69 mm

Diameter of rotor: 35 mm

Installation heigt: 75 mm

Application:

Brushless, linear server motor for transport systems

Advantages:

- Weight and installation space savings
- Plug pockets for insulation displacement technology are molded in
- Separate channels for wire guidance are molded
- Compact design

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_Ventilation Technology

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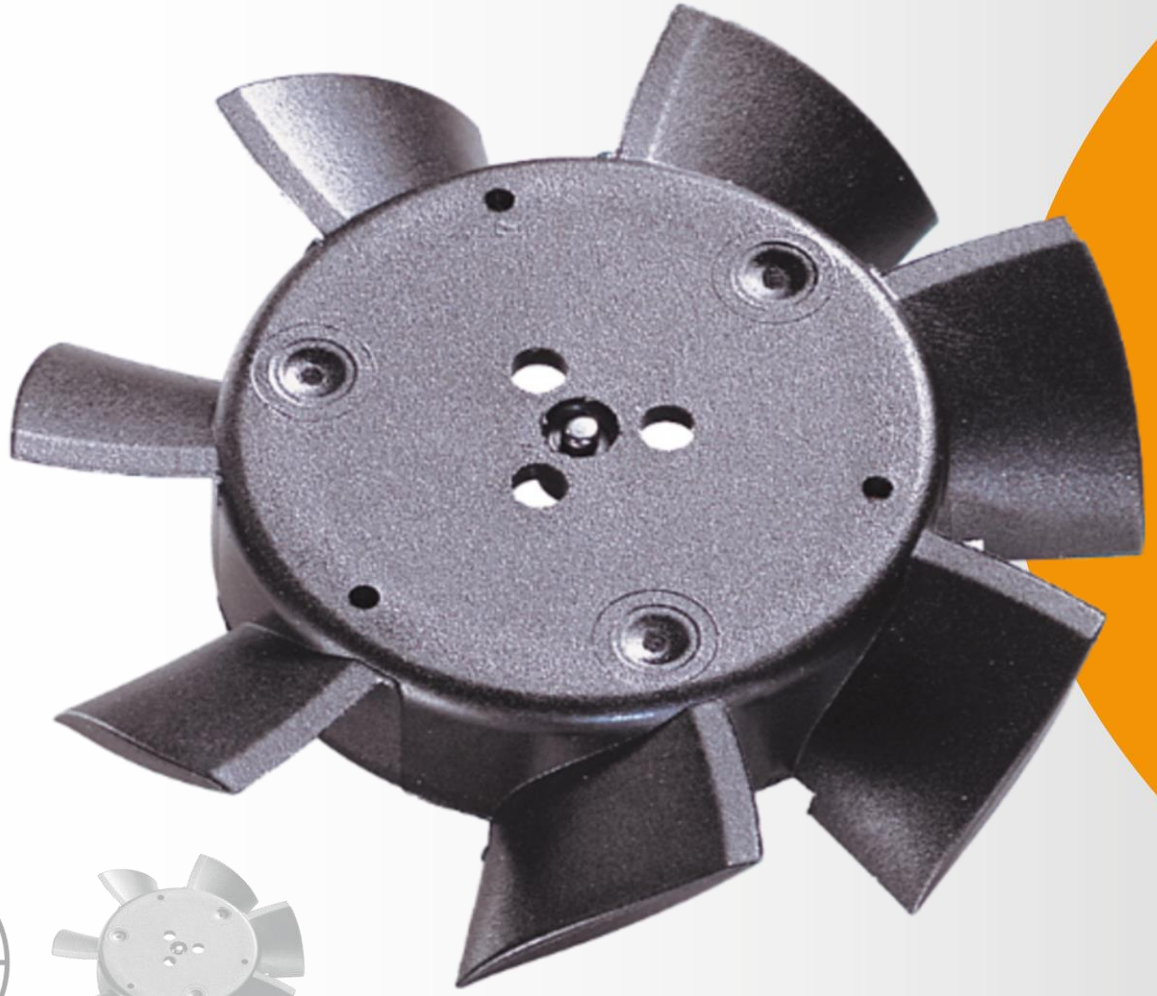
_mini axial impeller



Diameter: 15 to 36 mm

Balancing value: 0.12 gmm

Axial runout: 0.1 mm

Radial runout: 0.05 mm

Application:

Car seat ventilation, IT

Advantages:

- No subsequent balancing necessary
- Very smooth running
- No reworking steps
- Metal parts – shaft and flux ring – are inserted into the injection mold and overmolded, thus very high concentricity

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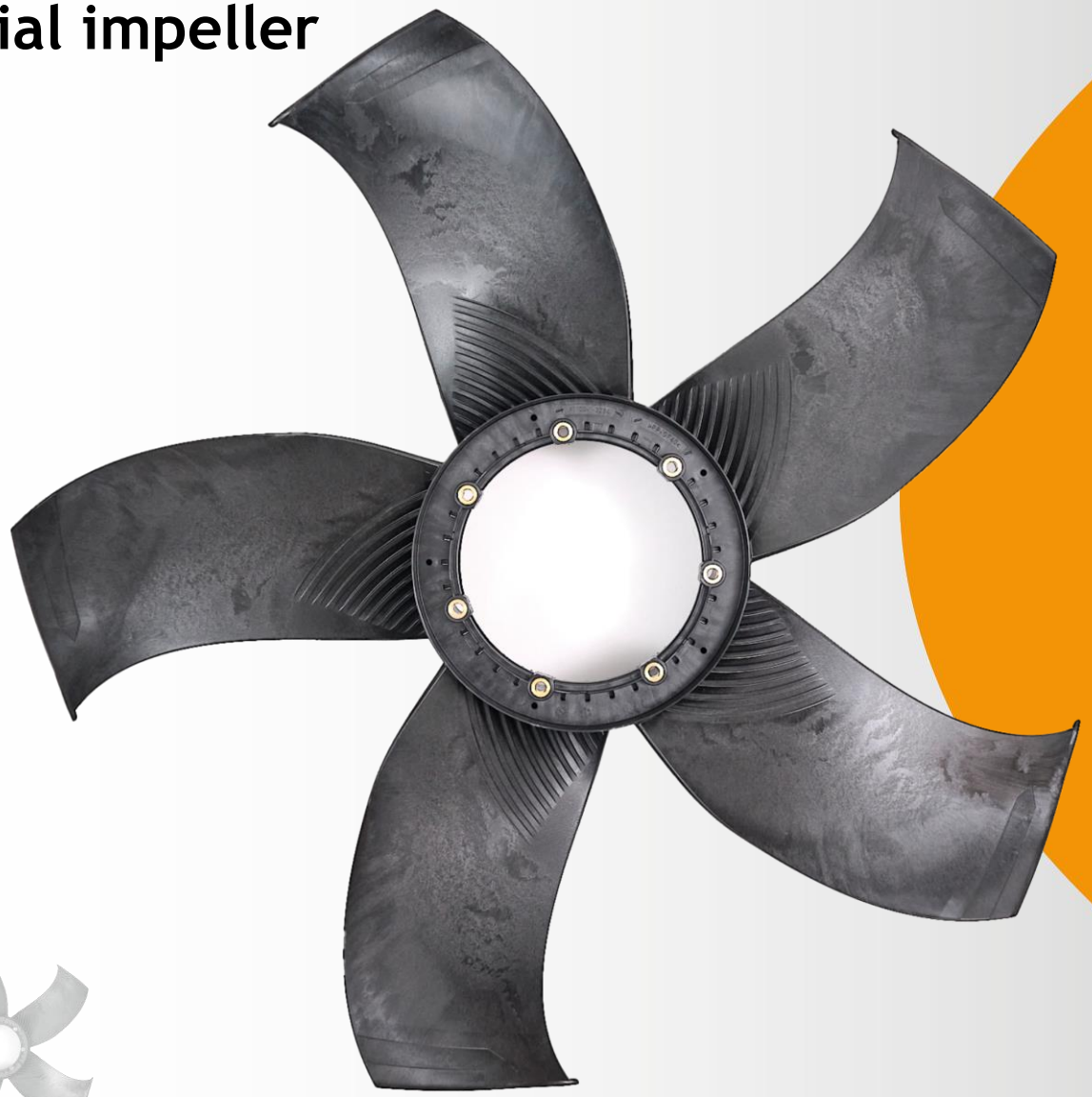
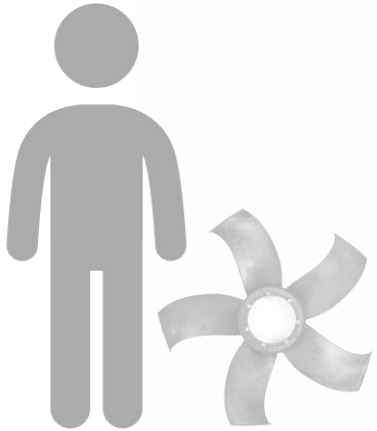
_maxi axial impeller





Diameter: 950 mm

Application:

Supply air, exhaust air, refrigeration and air conditioning technology in industrial buildings

Advantages:

- Lighter than metal wheels
- Little or no rework required
- Very low impact values with constant quality

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_Fanblade

Diameter: 360 mm

Balancing value: 10 gmm

Axial runout: 1.5 mm

Radial runout: 1.5 mm

Application:

Automobil engine cooling

Advantages:

- Economical production due to a 2-cavity mold
- Variable balancing, thus little to no subsequent balancing processes at the customer´s location

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_Radial blower wheel

Diameter: 147 mm

Balancing value: 4.0 gmm

Axial runout: 0.5 mm

Radial runout: 0.5 mm

Application:

Automotive air conditioning

Advantages:

- Variable balancing, thus little to no subsequent balancing processes at the customer´s location

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_Double side radial blower wheel

Diameter: 97 mm

Balancing value: 2 gmm

Axial runout: 0.4 mm

Radial runout: 0.4 mm

Application:

Air-conditioning and ventilation systems in automobiles and home appliances

Advantages:

- Pressing on „smooth“ hub shaft
- No rebalancing required at the customer´s location

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_Compact blower wheel

Diameter: 133 to 630 mm

Optimized balancing values

Low axial and radial runouts

Application:

Ventilation and air conditioning technology

Advantages:

- One-piece blower wheel
- No assembly or welding work necessary
- Lowest noise emissions
- Aerodynamically optimized design
- Improved fluidic degree of efficiency
- Automated balancing possible due to modified plastic geometry

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_Diagonal impeller

Diameter: 116 mm

Axial runout: 0.2 mm

Radial runout: 0.3 mm

Application:

Automotive and IT ventilation

Advantages:

- Low-noise optimized impeller design by using a special tool technology
- Automated balancing possible due to the plastic geometry
- No rework required

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_Turbine

Diameter: 72 mm

Balancing values: less than 3 gmm

Axial runout: 0.2 mm

Radial runout: 0.2 mm

Application:

Powertools

Advantages:

- Realization of complex blade geometries in plastic, rework-free
- Lowest imbalance values for speeds up to 30,000 rpm
- Variable balancing

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_Complete fan frame

Application:

Cooling Fan Module

Information:

- Production of the axial wheels and the frame
- Assembly and balancing of the module by PVS
- Production according to demand and delivery to an OEM

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_Steam condenser with blower

Application:

Dishwasher

Information:

- Development and patent of the heat exchanger unit by PVS
- Design of the blower unit in cooperation with the motor supplier
- Tailored production and assembly of components and the blower at PVS

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_2-Component air intake

Application:

Automotive air intakes

Information:

- Integration of a flexible seal in a component made of polyamide
- Made on a 2-component machine with rotary disk

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_Wall ring

Application:

Touch protection for external rotor motors

Information:

- Integrated engine mount
- Interchangeable inserts for different engine versions

_Intellectual Property (IP)

„The value of an idea
lies in the using of it.“
Thomas Alva Edison

PVS property right:

- **EP3871323**
  Stator/rotor device for electric motors
  and a method for producing a plastic coating
  of a stator/rotor device

- Further utility model applications
  are in the approval phase

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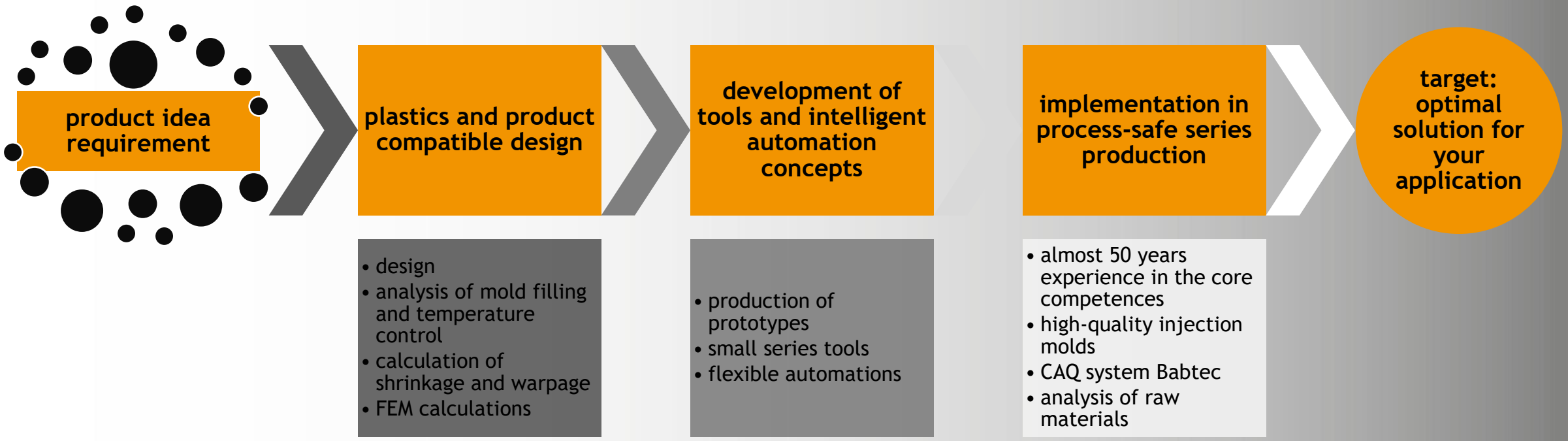
_Development of product and process



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_Tool making

- 40 % of our injection molds are manufactured in our own tool shop.
- In particular molds required for overmolding stators and rotors.

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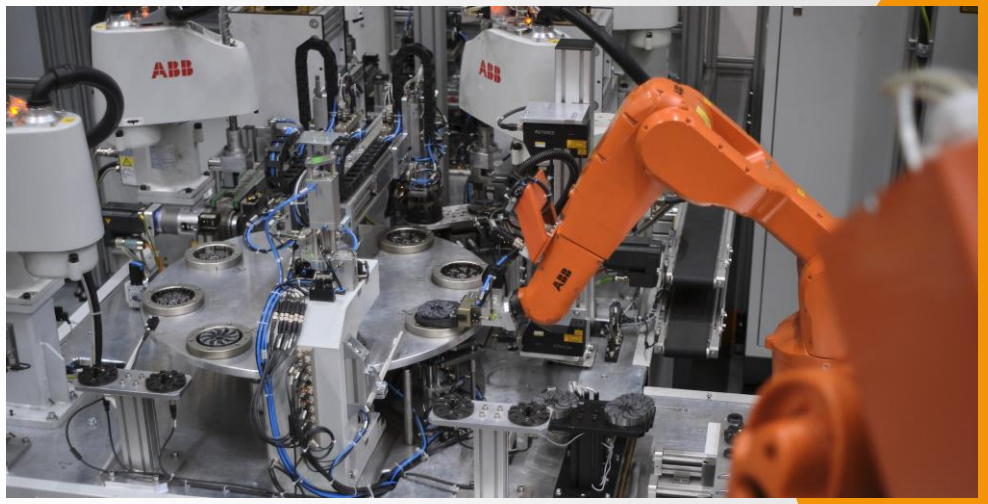
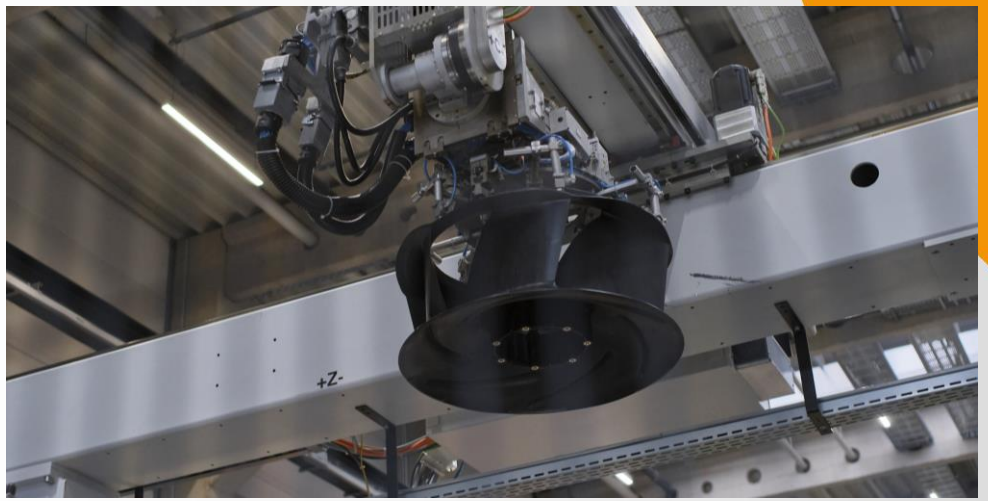
_Automation technology





- Innovative automation solutions
- Economically sustainable systems for each application
- Complex production facilities enable a full-automated inserting and overmoldingof metal parts for electronic motor components

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_Lean production

- Modern and partially linked production lines
- Unit weight up to max. 8 kg
- Injection molding machines with clamping forces up to 16,000 kN
- Production of modules
- Continuous improvement processes
- SMED workshops

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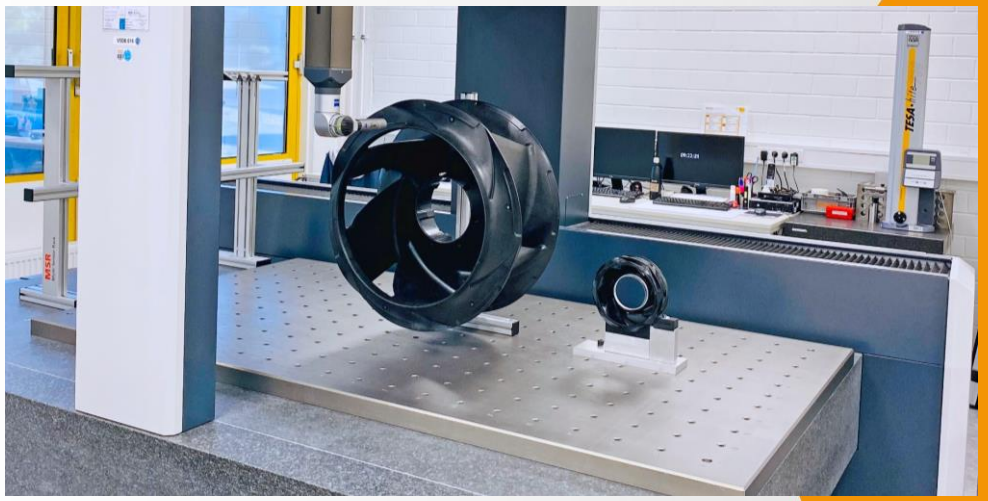
_Production-supporting quality assurance



- Material testing upon arrival and MFR/MVR testing of plastics
- Tactile and non-contact measuring systems from Zeiss
- CAQ System
- 10 balancing machines
- High-voltage testers

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_Quality Management

„ Quality is the fulfilment of expectation.“

Georg-Wilhelm Exler

Quality management means for us:

- The fulfilment of all normative requirements and customer specifications.
- A QM system that is actively practised, with process owners and the endeavour to continuously optimise all processes.
- The use of IT to support process and document control.
- An internal monitoring system as part of our annual audit programme.
- Our Q-Max programme for suggestions for improvement.

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Thank you for taking the time for us.

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