wieland

Wieland´s rotor technologies for optimized induction motors

March 2024

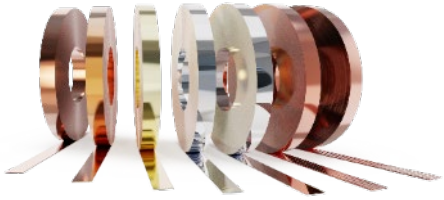
Founded 1820 – more than 200 years ago

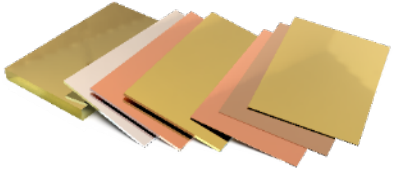
Since its foundation in 1820, Wieland has been a family-owned company with a long-term shareholder focus. Our company has evolved from an art and bell foundry to a leading global supplier of high quality copper alloy products and innovative solutions.

200 JAHRE wieland

Broad product portfolio to meet diverse customer needs

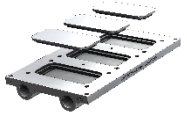
Strip & sheet



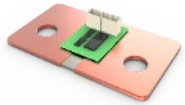


Rods, wires & tubes

High performance tubes & heat transfer solutions



Slide bearings & system components



Powerful eMobility solutions

The electrification of the drivetrain is gathering speed all over the world.

Wieland – as co-engineer and one stop shop partner for automotive and industry sectors – the eMobility team assists customers and looks for solutions with manufacturing and assembly of technically advanced components for EV, electrical and other applications.

Motor Components

Cu Rotors and Rotor Components

For high performance and high-speed induction motors

Cu & Al Die-Cast Rotors

Zero Porosity Rotors (ZPR®) for induction motors

Connector Rings for Stators

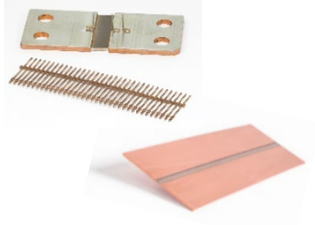
For the connection between e-motor and power electronics

High Voltage Parts for Inverters

For customized synchronous motors

Battery Components

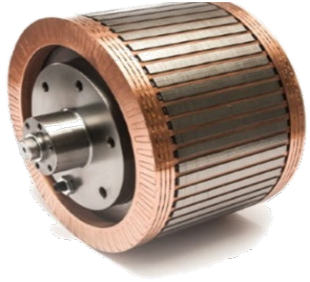
Precision Shunts & Electron Beam Welded Strip

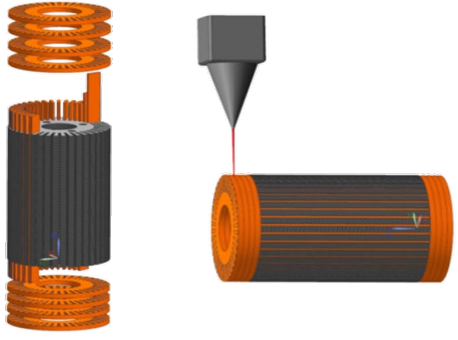


For IBS, BMS and Smart Meters

Fabricated Copper Rotors

- Higher efficiency compared to Al rotors
- Highest temperature and rotation speed possible due to usage of different alloys
- Economical and flexible low- and medium-volume production
- No pore risk due to fabricated rotor design





Performance

- Much better electrical and thermal conductivity of Cu compared to Al
- Usage of high strength copper alloys possible
- Reduced temperature influence of laser / ebeam welding process

Benefits

- Different material combinations in rotor bars and end rings possible
- Very flexible rotor design and welding technology
- Reduced operating temperature due to air gap insulation

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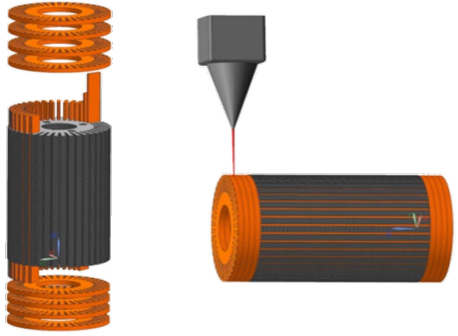
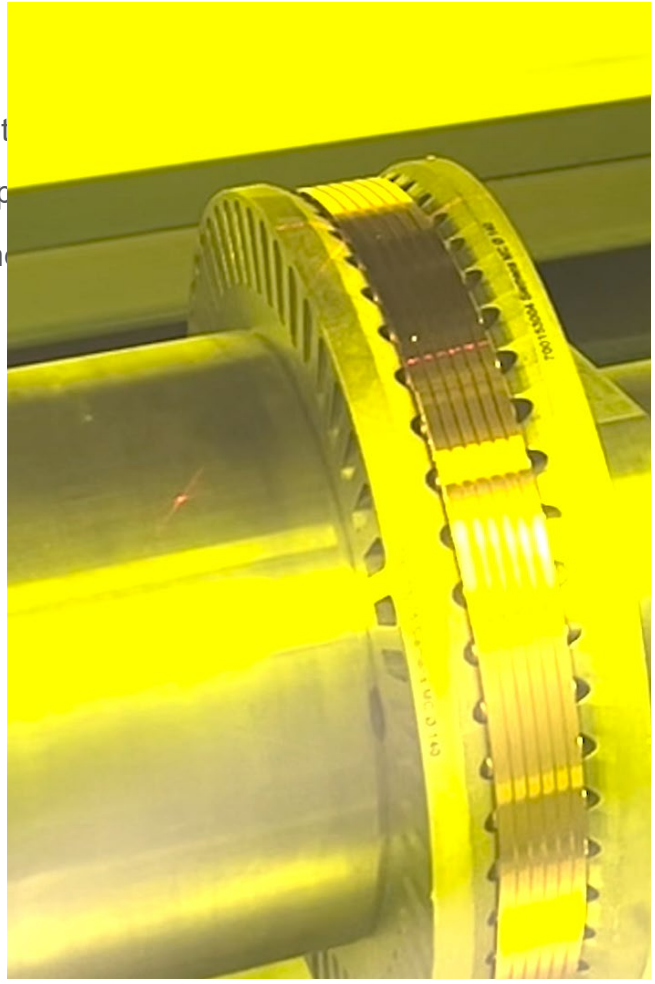
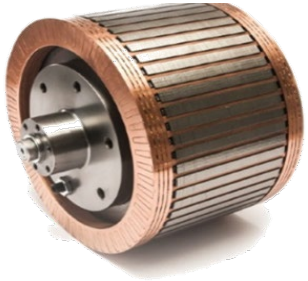




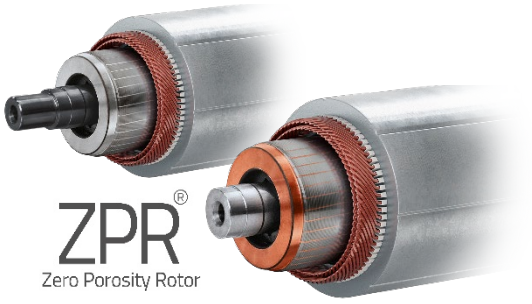


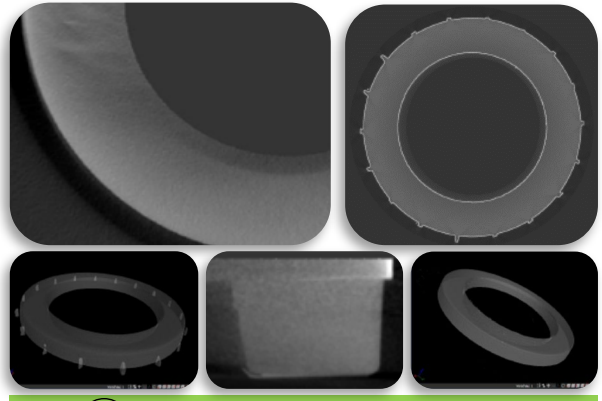
Benefits

- Different material combinations in rotor bars and end rings possible
- Very flexible rotor design and welding technology
- Reduced operating temperature due to air gap insulation

Cu & Al Die-Cast Zero Porosity Rotors (ZPR®)

- Unique casting process (Laminar Squeeze Casting) leads to zero porosity and maximum design flexibility
- Freedom in slot design
- High electrical conductivity
- Sustainable product (100% recyclable)





Porosity: 0.01 %

Performance

- Superior mechanical characteristics due to high performance alloys
- Cutting edge quality compared to industry standard

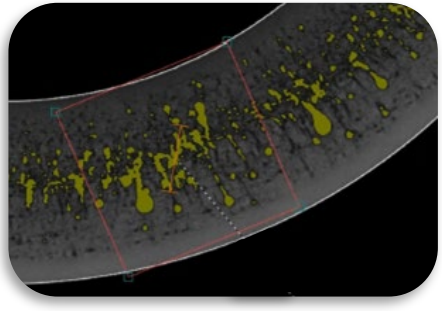
Benefits

- Free of rare earths
- Economical high-volume production due to casting process
- Maximum process stability

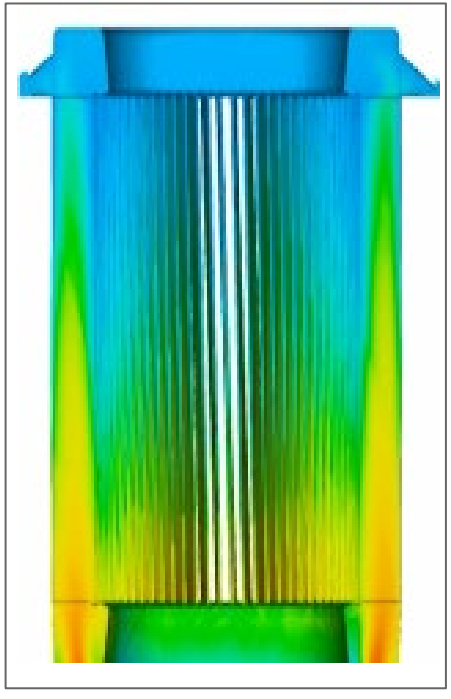
Comparison of Casting Technologies

Industry Standard

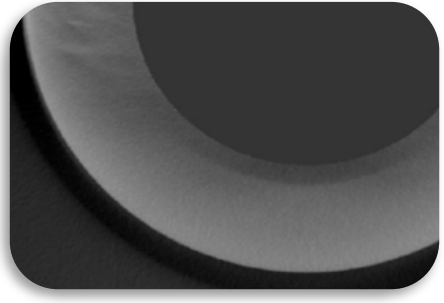
Area	[mm²]	381.366
Porosity	[%]	10.1323
Tol (max)	[%]	5.0000



Zero Porosity Rotor – ZPR®



Area	[mm²]	262.5746
Porosity	[%]	0.01
Tol (max)	[%]	5.0000



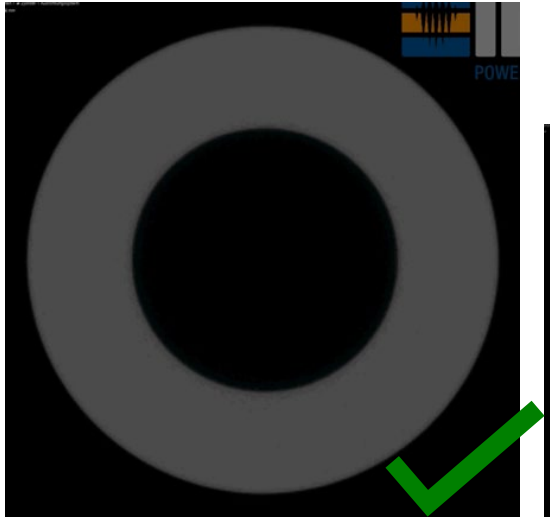
ZPR®
Zero Porosity Rotor

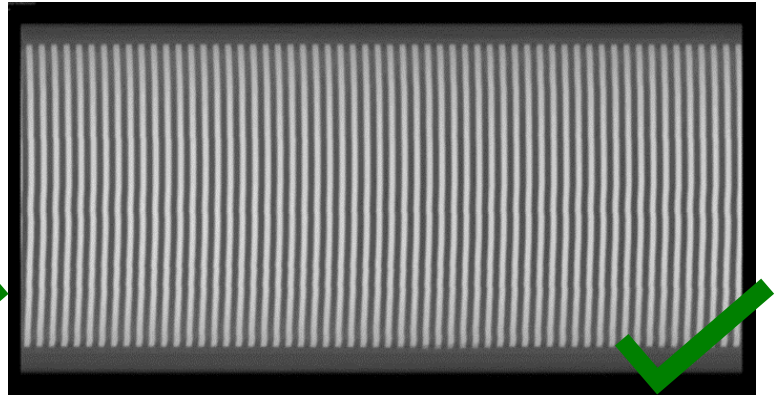
Comparison of Casting Technologies

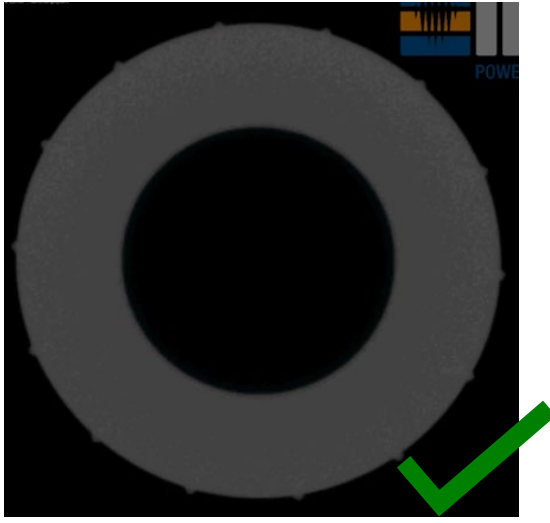
ZPR® Zero Porosity Rotor

IMS POWERED BY PEOPLE

Lower short circuit ring	Slots	Upper short circuit ring



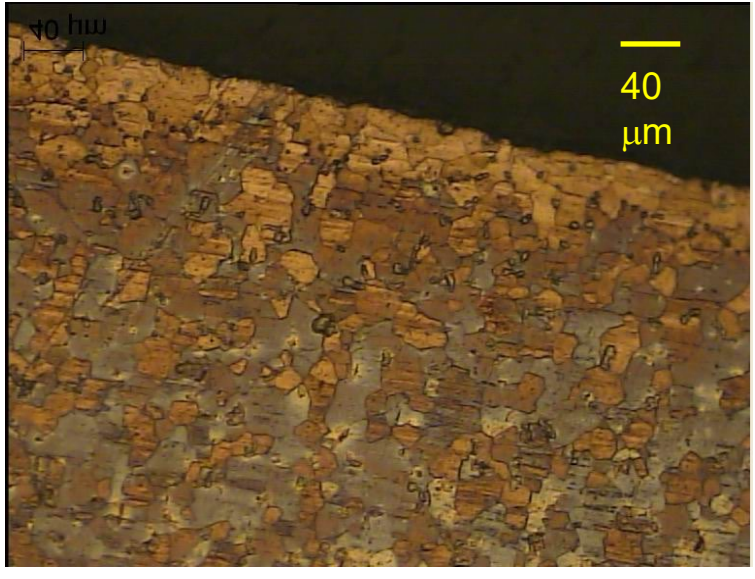




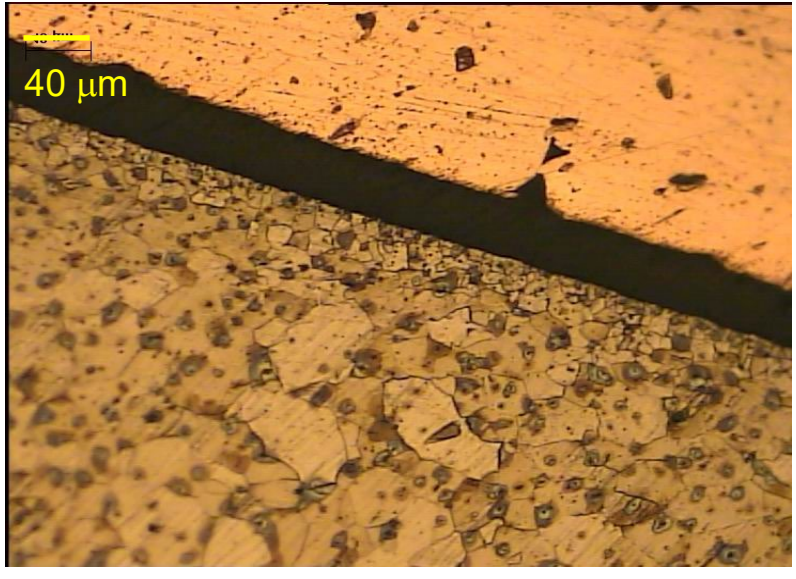
Electrical steel vs. temperature

ZPR®
Zero Porosity Rotor

Before casting



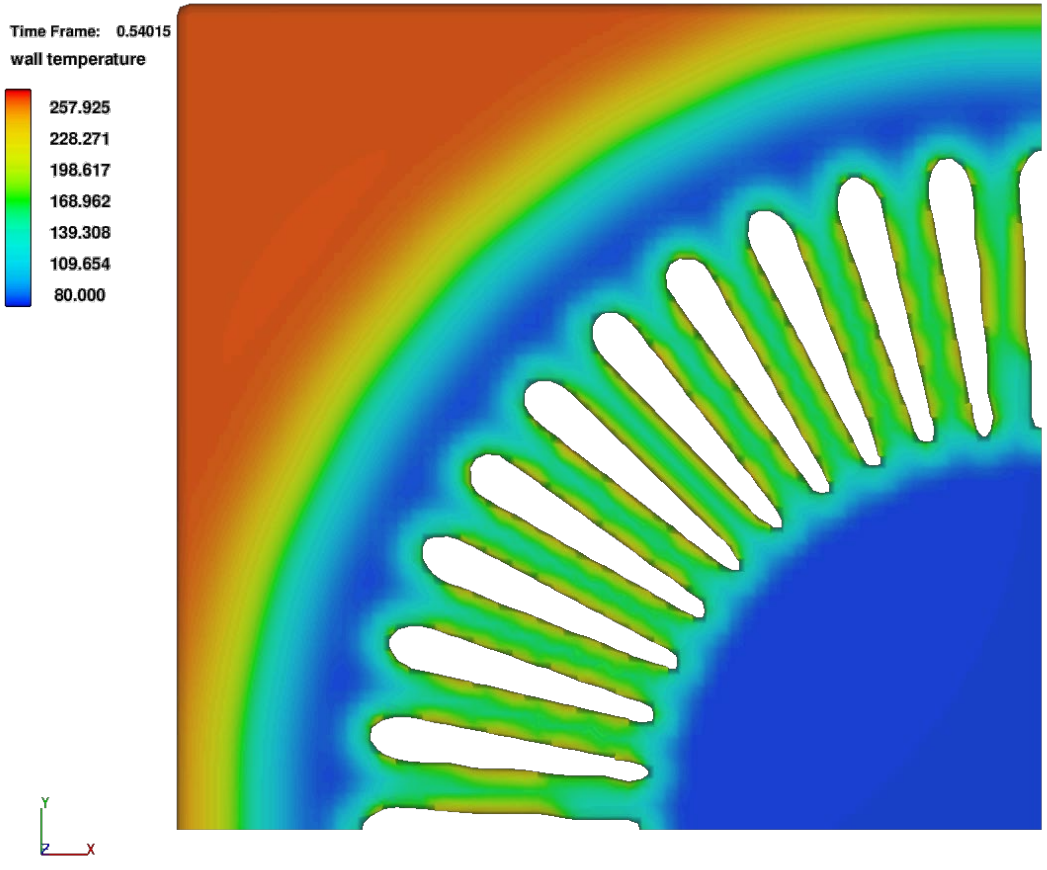
After casting



Electrical steel vs. temperature

ZPR®
Zero Porosity Rotor

Temperature in steel during casting <650°C

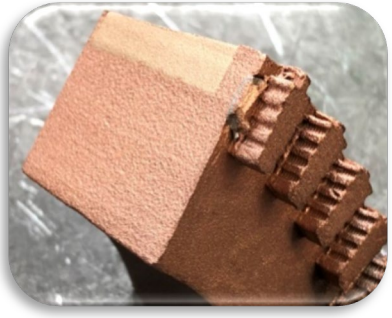


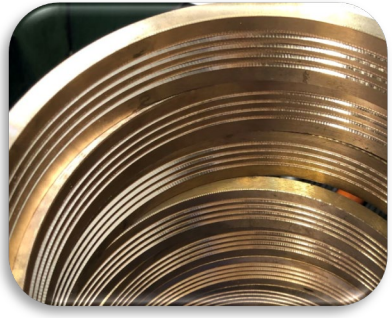
Freedom in Slot Design through Pioneering Innovation

ZPR®
Zero Porosity Rotor

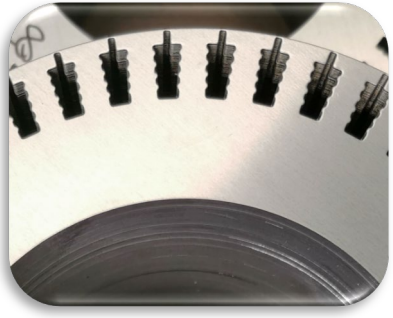
1. Ability to cast designs for high-speed concepts with enhanced rotational speed
2. Reinforcement of endring stability
   - Pine tree slot design
   - Mechanical reinforcement through back cutting
   - Cu-Alloys reinforcement of endring
   - Further advantages such as improvement of magnetic properties through special slot design

Reinforcement of Endrings





Freedom in Slot Design



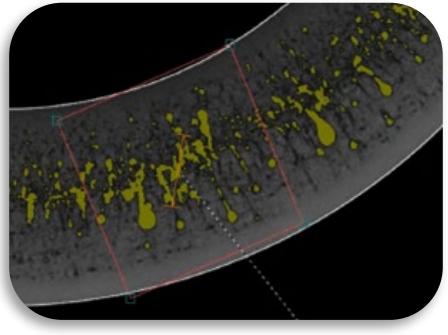
Min. until now R 0,38 mm

Electrical conductivity

ZPR®
Zero Porosity Rotor

Industry Standard

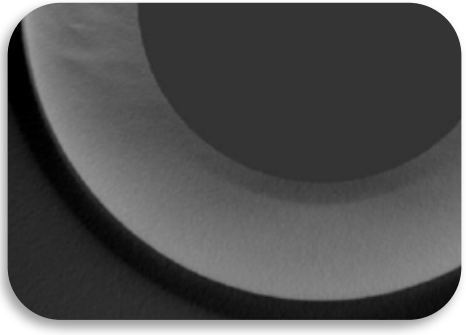
Area	[mm²]	381.366
Porosity	[%]	10.1323
Tol (max)	[%]	5.0000



Conductivity
AL 25 - 28 MS/m
Cu < 50 MS/m

Zero Porosity Rotor – ZPR®

Area	[mm²]	262.5746
Porosity	[%]	0.01 ✓
Tol (max)	[%]	5.0000



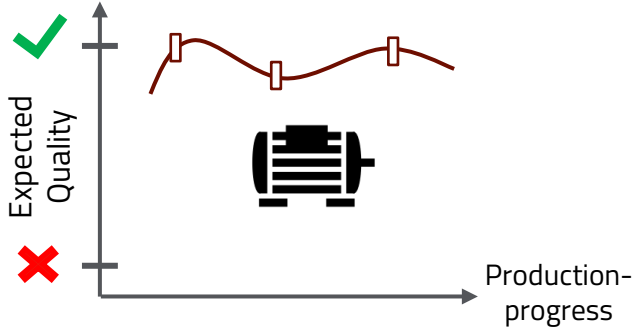
Conductivity
AL 35 MS/m
Cu >57,5 MS/m

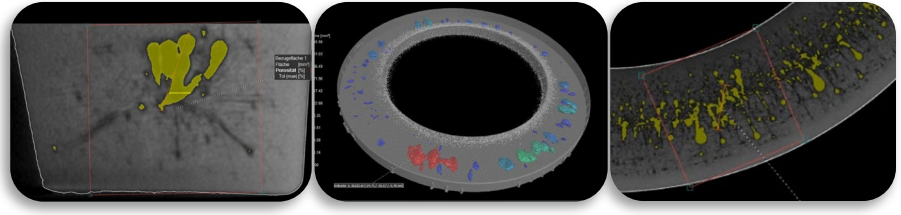
Production stability

ZPR®
Zero Porosity Rotor

Industry Standard

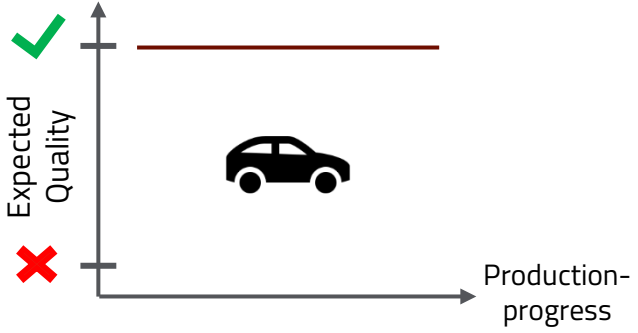
Electric Motor Production

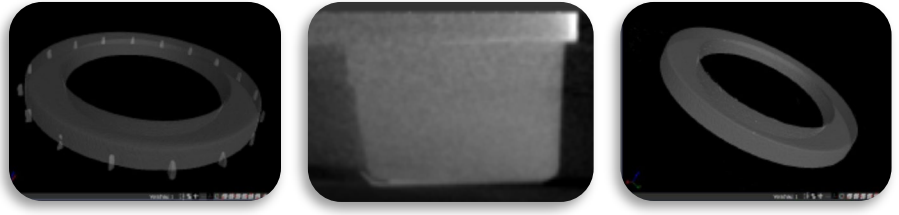




Zero Porosity Rotor – ZPR®

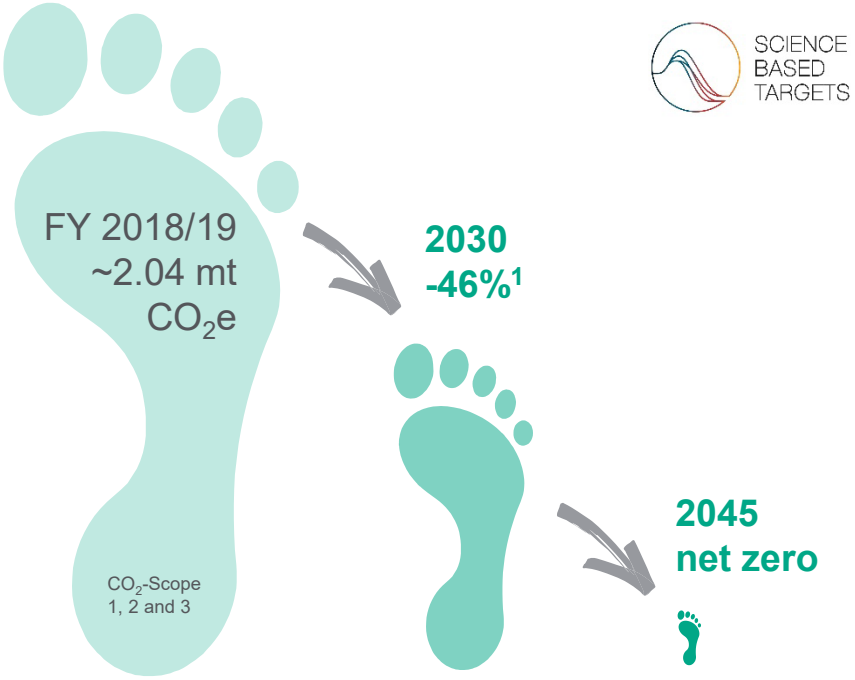
Automotive understanding of Quality





Wieland's ambitious decarbonization roadmap in progress

Wieland's CO_2 footprint



How we achieve net zero

- **100% electrification of all plants** to phase out fossil fuels (Scope 1 = 5%)[2]
- **100% use of renewable energy** through green electricity supply contracts and self generated electricity (Scope 2 = 27%)[2]
- **100% recycled content** through supply of scrap from our global recycling initiative (Scope 3 = 68%)[2]

Capital expenditures of **more than €2 billion** for complete implementation over approx. 25 years[3]

[1] Compared to base year 2018/19 (2.04 million t CO_2e). Verified by Science Based Targets Initiative (SBTi) | [2] Compared to fiscal year 2022/23 | [3] Regarding the current cost level, inflation not considered

wieland

Creating value for generations.

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