



# eMobility

## Pioneering Solutions from High-Performance Ceramics

# High-performance ceramics: the material for innovative eMobility solutions

The development towards electrification and eMobility presents growing challenges for automotive manufacturers, suppliers, energy producers, infrastructure partners and the manufacturing industry. The further development of alternative drive technologies and new systems for production, storage, transmission and distribution of energy has to be pursued at full speed. The electrical infrastructure for mobile and stationary applications has to be created. These complex tasks require materials which meet extreme requirements. Innovative high-performance ceramics from CeramTec provide a crucial contribution to progress:

required. In all types of bearings, our solutions play out their strengths in the long term. Our materials exhibit immense resistance in the handling of aggressive media. Whether innovative design solutions, lightweight design concepts and miniaturisation, material reinforcement, applications in sound management or efficient production processes – the unique range of properties of high-performance ceramics from CeramTec offers crucial added value and benefits in all these areas.

- Together with customers, we develop technical ceramics solutions which have unique functionalities and a customised characteristics profile to allow visionary concepts.
- They are superior where conventional materials such as metal and plastic reach their limits.
- They support more environmental protection, economic efficiency, safety, durability and user comfort.
- They provide more efficiency and productivity in manufacturing processes.
- They are hard to replace in many applications, such as electrified transport vehicles, charging stations, energy generation, energy storage and energy distribution.
- Solutions from CeramTec cover the entire range of eMobility applications: from cars, eBikes, Segways and eMotorcycles to aeroplanes and other electrically driven mobility solutions – on land, on water and in the air.

### Fields of application for high-performance ceramics

Technical ceramics from CeramTec are used in numerous areas of application: In sensor systems, our sensor components capture and process a variety of values with high precision. In power electronics, ceramic high-performance materials and solutions meet a variety of requirements with a high level of reliability, even under immense demands. For temperature management, high-performance ceramics from CeramTec ensure optimum thermal dissipation and insulation. For fluid and gas regulation, ceramic components from CeramTec help to ensure a high level of reliability. Our technical ceramics play a key role wherever electrical insulation is

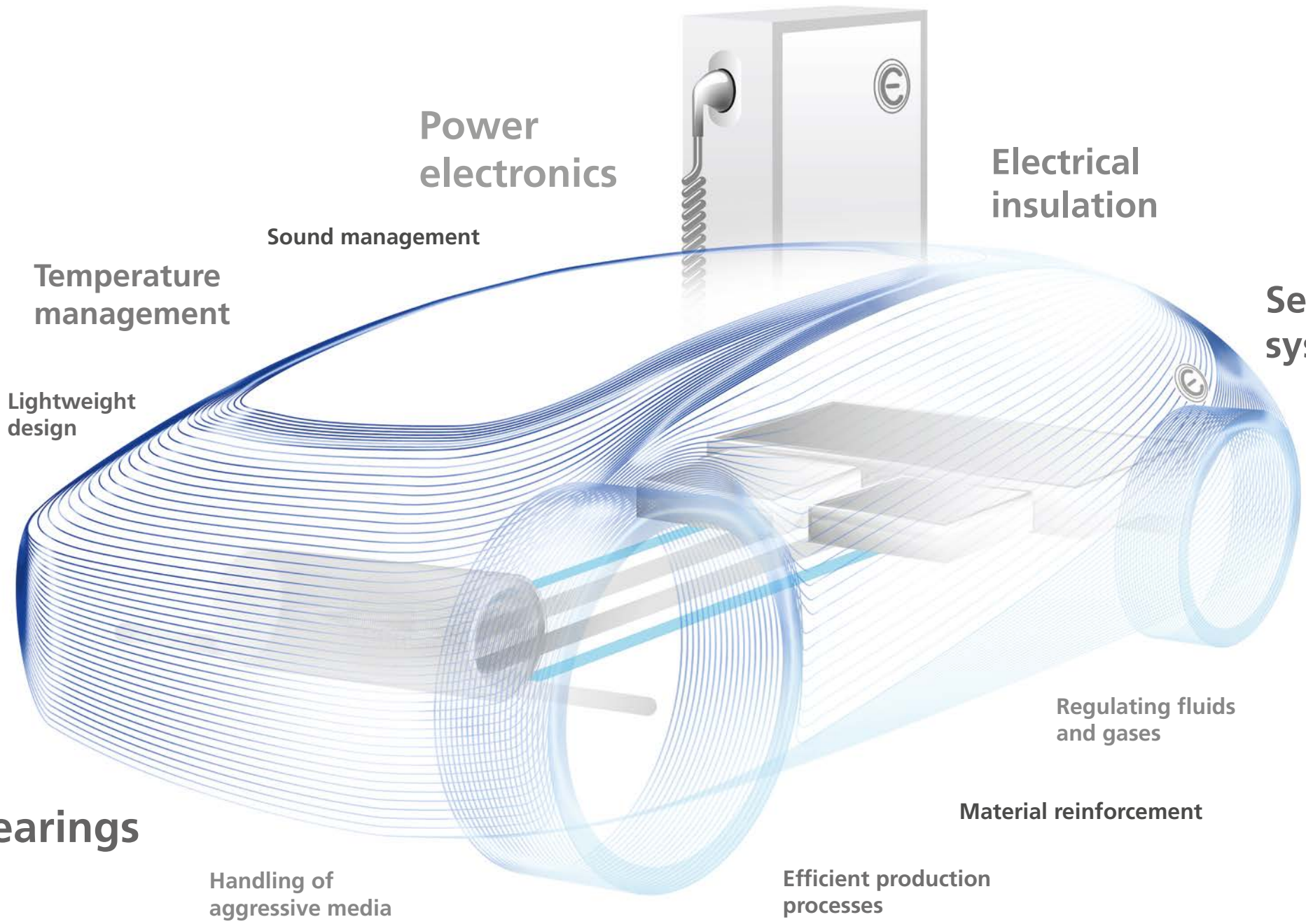
### HIGH-PERFORMANCE CERAMICS\*: POWERFUL FOR EMOBILITY

- Electrical insulation
- High dielectric strength
- Electromagnetic compatibility (EMC)
- Freedom from partial discharge
- High thermal conductivity
- Corrosion resistance
- Thermal insulation
- High heat resistance
- Low friction
- Chemical resistance
- Impact resistance
- Wear resistance
- Low weight
- UV resistance
- Resistance to temperature shock

\* Depending on the material, advanced ceramics have different properties

# CeramTec – competence in eMobility

- Piezo-ceramic discensing elements** used within ultrasonic parking assistance systems
- Cyrol® ceramic bearing roller elements** for wear-resistant, electrically insulating bearings and preventing electro-pitting
- Integrated membranes** for pressure sensors in brake control systems, gearbox controls and other sensor applications
- Preforms** for material reinforcement and for lightweight design
- Switching spark gap** for xenon lights
- Piezo-ceramic sensors** for flow rate and fill level detection
- Ceramic bearings** for control valves
- Substrates** as hybrid circuit for control devices, e.g. gearbox control
- Electrical insulation components** in PTC high voltage heaters for interior heating or fluid heating
- SOEC fuel cell components** for producing CO<sub>2</sub>-neutral fuels
- Ceramic elements** for regulating and dosing fluids
- Ceramic bearing elements** for durability and wear resistance under rough conditions
- Piezo-ceramic sensor components** for flow rate and fill level detection in fluids to airbag detection systems
- Resistor cores** for resistors in electronic circuits
- Inductor Cores** for Inductors in electronic circuits



- Ceramic circuit carriers** for xenon, LED and laser light technology
- Protective ceramic plates** for vehicle armoring
- Insulation rings** for thermal management in brake callipers
- HTCC and LTCC ceramic tape CeramTape®** for manufacturing hybrid and electronic control elements
- Face seals** in coolant pumps
- Socket and insulation tubes** for electrical insulation in halogen and xenon lights and for vehicle-independent heaters
- CeramCool®** heating elements for thermal management in batteries
- CeramCool®** heat sinks for potential transformers, battery cooling, drive control and brake energy recovery
- Components** for electrical insulation in electric and electronic systems
- Hermetically sealed assemblies** for sensor applications, connectors and conduits for electrical systems
- Manufacturing: Casting cores** for complex cast components with undercuts, channels, etc.
- Manufacturing: Welding centring pins and gas nozzles** for MAG welding in car body making
- Manufacturing: Risers and nozzles** for casting engine and suspension components and aluminium rims
- Manufacturing: Tool systems and cutting materials SPK®** for turning and milling cast iron and hardened steel components
- Manufacturing: Porous cells** for chrome plating
- Manufacturing: Setter plates** for MIM components

The objective is to ensure mobility through environmentally friendly, sustainable and yet economically efficient technologies. As a partner of the international automotive industry, CeramTec actively drives eMobility developments and uses its comprehensive automotive competence in the field of technical ceramics to offer innovative solutions for all types of drive concepts – from optimising combustion engines and hybridisation, to pure electromobility and providing the required infrastructure. Innovations need creative minds, new thinking and extremely powerful, exceptional materials: high-performance ceramics from CeramTec. Pointing the way to the future.



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