

TOPIC AREA "CASTINGS FOR ELECTRIC DRIVES"



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Mobility through Casting

The topic of electromobility is gaining increasing importance, also in casting technology and the related development of new cast components. Particular attention is being paid to the development and testing of **new casting concepts and design methods** for the components of electric motors. The demands for a later **transferability to series production** are constantly being taken into consideration.

At the forefront lies, for example, the **embedding of tubes or hollow structures** in the housings for electric motors, batteries or power electronics, due to cooling aspects. Furthermore, measures for the **optimization of cast rotors** are being developed. The concept of the **cast coil** opens up completely new possibilities for performance increases compared to conventionally wound wire coils.

Through close interdepartmental cooperation with the Electromobility department, an optimal know-how constellation is being forged that enables a holistic consideration of the manufacturing technological aspects with a casting technological focus, constructive design, and electromagnetic interpretation for the successful **manufacture of components for electric drives**.

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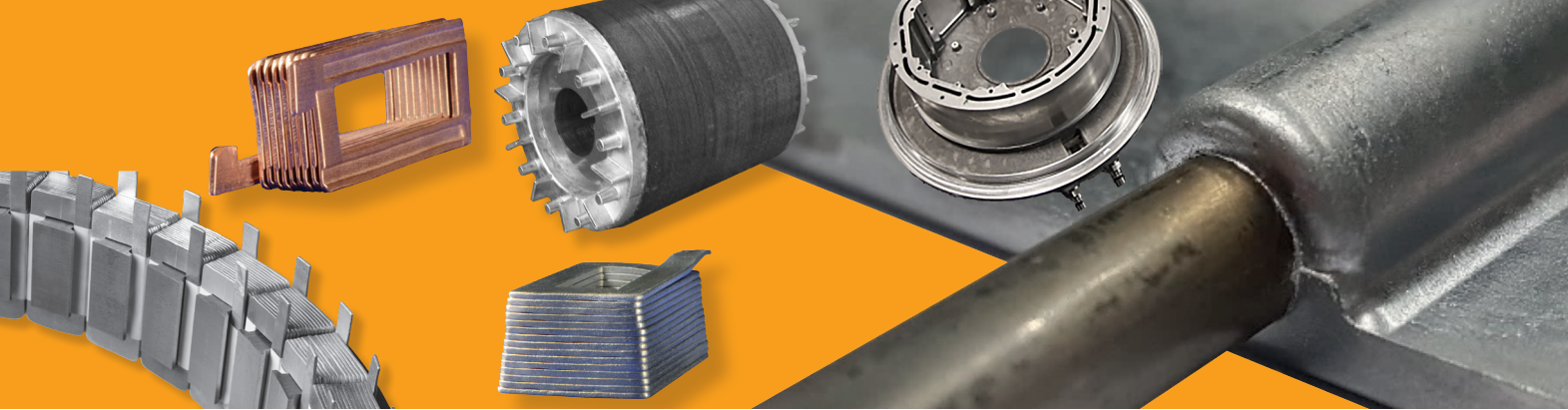
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Focus Points in the Topic Area "Castings for Electric Drives"

Housings for electric drives, batteries, and power electronics

- Housings with integrated cooling structures
- Embedding of tubes and hollow structures during casting

Cast coils

- Cast coils made in high-pressure, low-pressure, and investment casting
- Coils made of aluminum or copper
- A range of dimensions (conductor length from 30 to 700 mm)
- New coil concepts, e.g. with integrated cooling structures
- Coatings for cast coils

Rotors

- Casting of rotors using high-pressure aluminum casting
- Casting of rotors using low-pressure casting
- Cast and gating systems for rotor casting
- Design of lamination stacks and short circuit rings
- Analysis of casting defects

Castings for autonomous driving

- Embedding of sensors for condition monitoring
- Early detection of material fatigue or overloading
- Evidence of misuse loads

From the concept to the product...

With our competencies in Casting Technology, Fraunhofer IFAM accompanies our industrial customers throughout the casting technology implementation of an idea from the concept to the first prototype to the final series-ready product. We have various casting processes and materials ready to address any query.

... in our one-stop shop!

The Casting Technology and Lightweight Construction department can illustrate the entire process chain from the concept phase via the casting design to the tool construction and the casting technological manufacture to the final metallographical and nondestructive testing.

Novel technology combinations

In addition to the conventional casting technological queries we also support our customers when it comes to reaching across technologies into manufacturing and materials technology. For this, project teams from various departments at Fraunhofer IFAM as well as other institutes of the Fraunhofer-Gesellschaft will come together to combine their expertise. Such topics as corrosion, surface treatment, paint and lacquer technology or adhesive bonding technology can be scientifically and practically addressed through our comprehensive network of research and development staff.

An overview of our services

- Technology consulting for the processes of high-pressure die-casting, low-pressure die-casting, lost foam casting and investment casting
- Experimental research and development
- Feasibility studies and market analyses
- Error and process analyses
- Quality testing and analytics

Our research topics

- Complex castings
- Castings for electric drives
- Hybrid casting and fiber integration
- Digitalization of castings through the integration of RFID transponders and sensors

Technological equipment

- HPDC: 660t BÜHLER SC/N 66 + 250t FRECH DAK 250-34
- LPDC: TEGISA I (50 liters melt volume)
- LPDC: TEGISA II (110 liters melt volume)
- Investment casting: INDUTHERM VC 650 + INDUTHERM VC 3000 D
- Wax injection casting: ModTech C20
- Lost foam casting: VULCAN compaction unit Vector-Flo

Analytics

- X-ray and computer tomography: YXLON MU-2000
- Optical measurement system: GOM ATOS 3 TripleScan
- Complete range of metallographical testing at Fraunhofer IFAM