presentation of an innovation
RoBoC = Roll Bond Core

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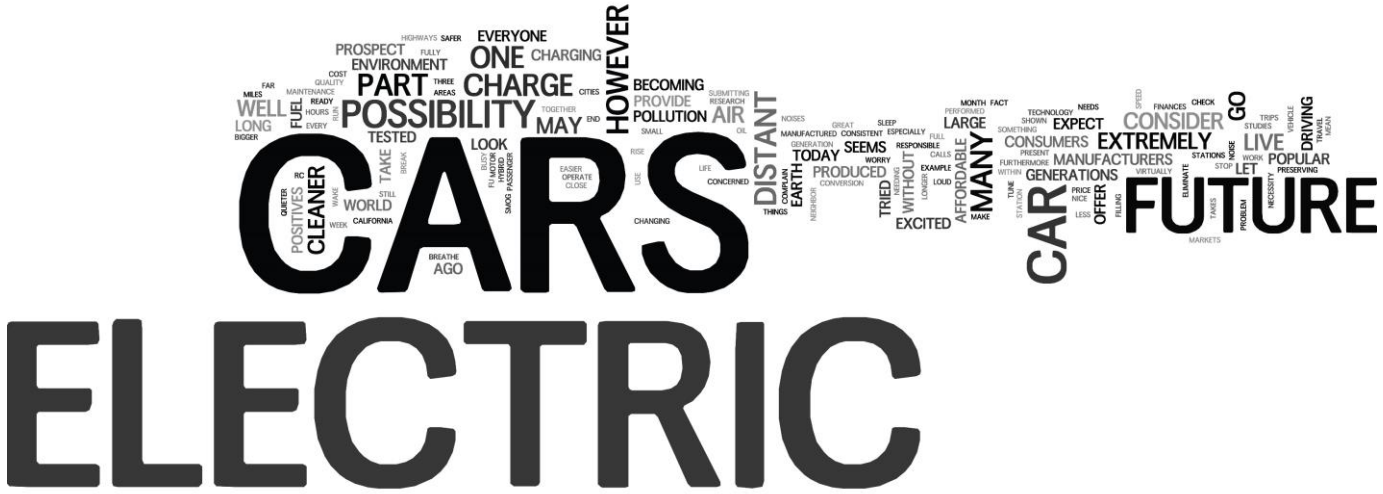

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Introduction of company AionaCast

Established in

2010

AionaCast is located in the South of Germany.

Vaihingen an der Enz

The enterprise is split in 3 sections

Development

Licenses

Production RoBoC

Among these activities AionaCast is busy in the fields of:

Consulting

Engineering

Sales

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E-motor housings

today's most popular production methods for e-motor housings

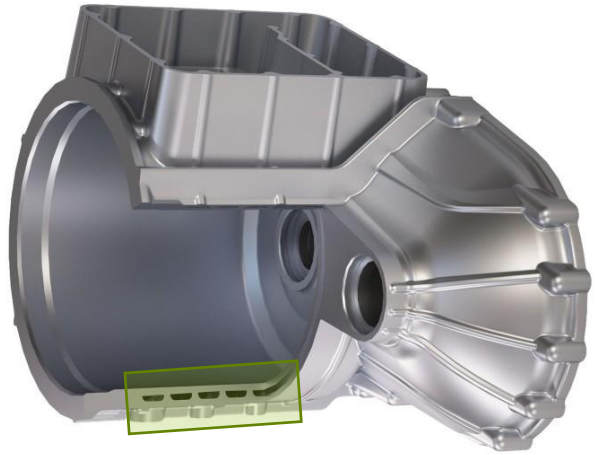
All new traction electric motor housings for electric driven passenger cars and trucks are liquid cooled, even it is not the only one per motor concept.

example for a 2-shell concept in HPDC

inner shell

outer shell

example for SC or GDC or LPDC with sand core



casting

Cooling channel formed from sand core

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Our idea, patent is already granted

PCT/EP2017/000304
and more

We insert a light metal sheet package, which already includes all cooling channels and connectors, in a die for gravity or low pressure die casting and we recast it with aluminum.

What makes this innovation really stand out, is the **perfect combination of a standard casting process with the common Roll-Bonding production method** used for the light metal sheet package!

Hence the innovation is named

RoBoC

(**Ro**ll **Bo**nd **C**ore)

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Realization

1. **Manufacturing of a Roll-Bond Core (RoBoC), ready to be inserted**

2. **Inserting the light metal sheet package in the die**

3. **Closing of the die**

4. **Filling the die with molten metal and <u>cooling of the RoBoC from inside during casting</u>**

→ Avoiding fuse of the RoBoC

5. **Solidification**

6. **Taking out the casting of the die**

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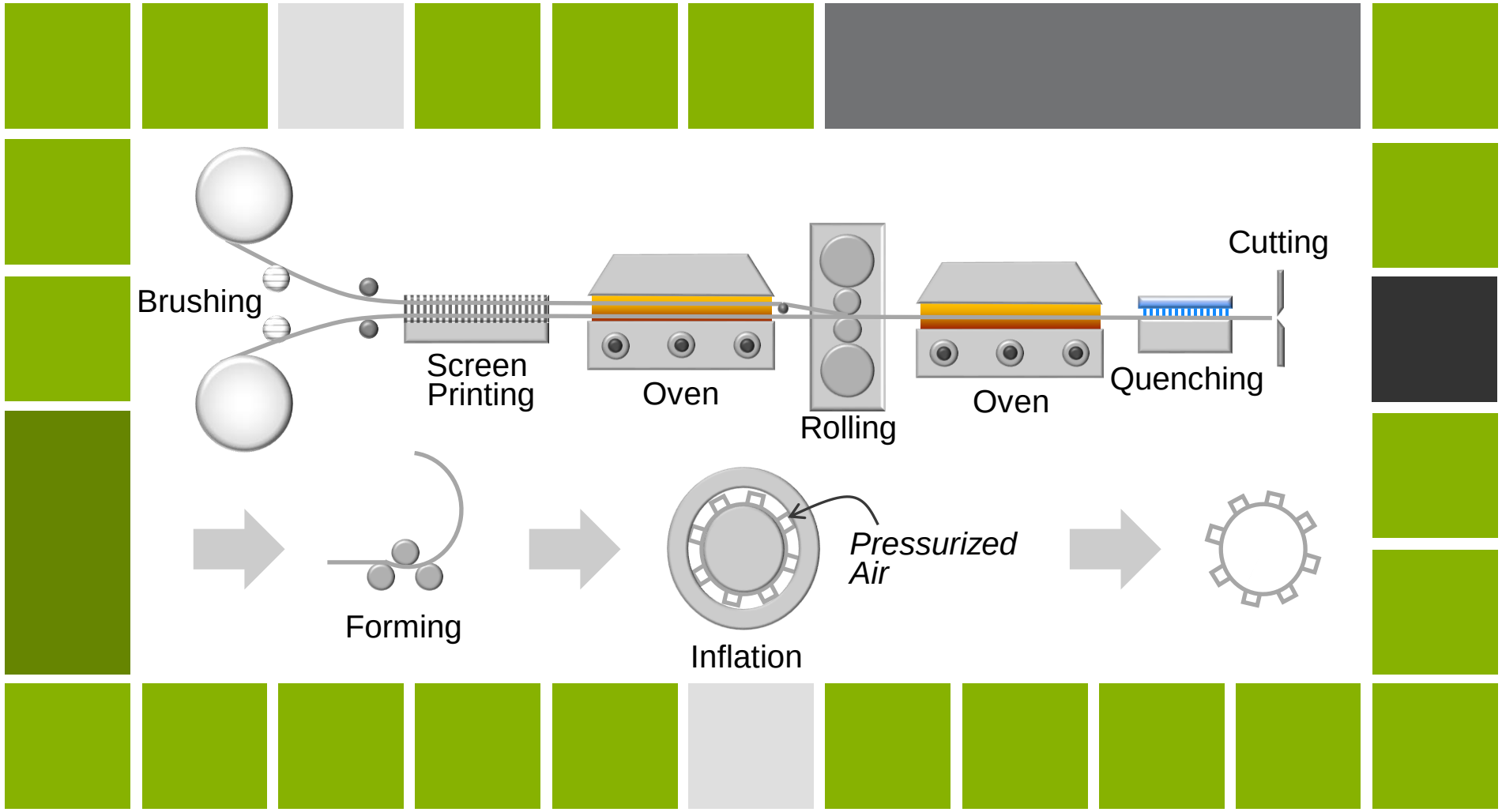
Roll-Bond Core manufacturing



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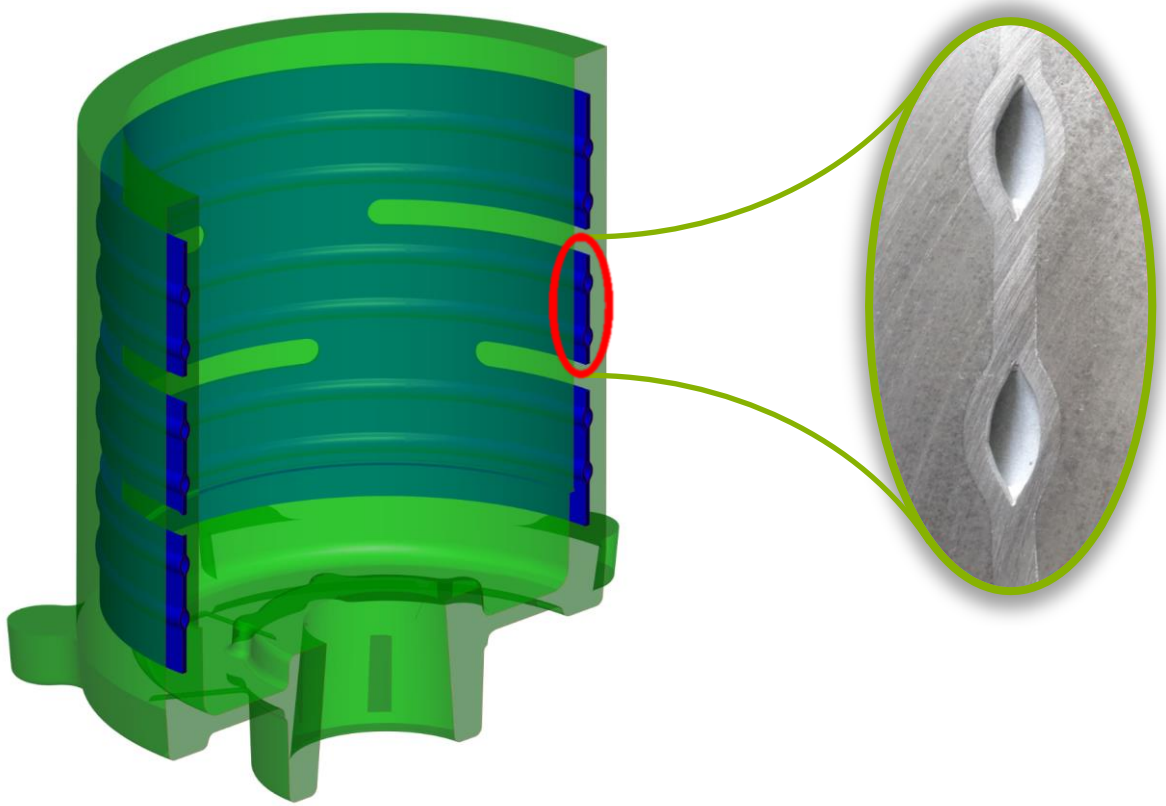
Result

The result is a smooth embedded metal sheet with the shapes for the cooling channels integrated in the casting.



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Implementation (proof of concept)

Cut electric motor housing

At that time, little attention was paid to the size of the cross sections for the cooling medium and weight reduction

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Implementation (proof of concept)

Casted electric engine housing with connectors

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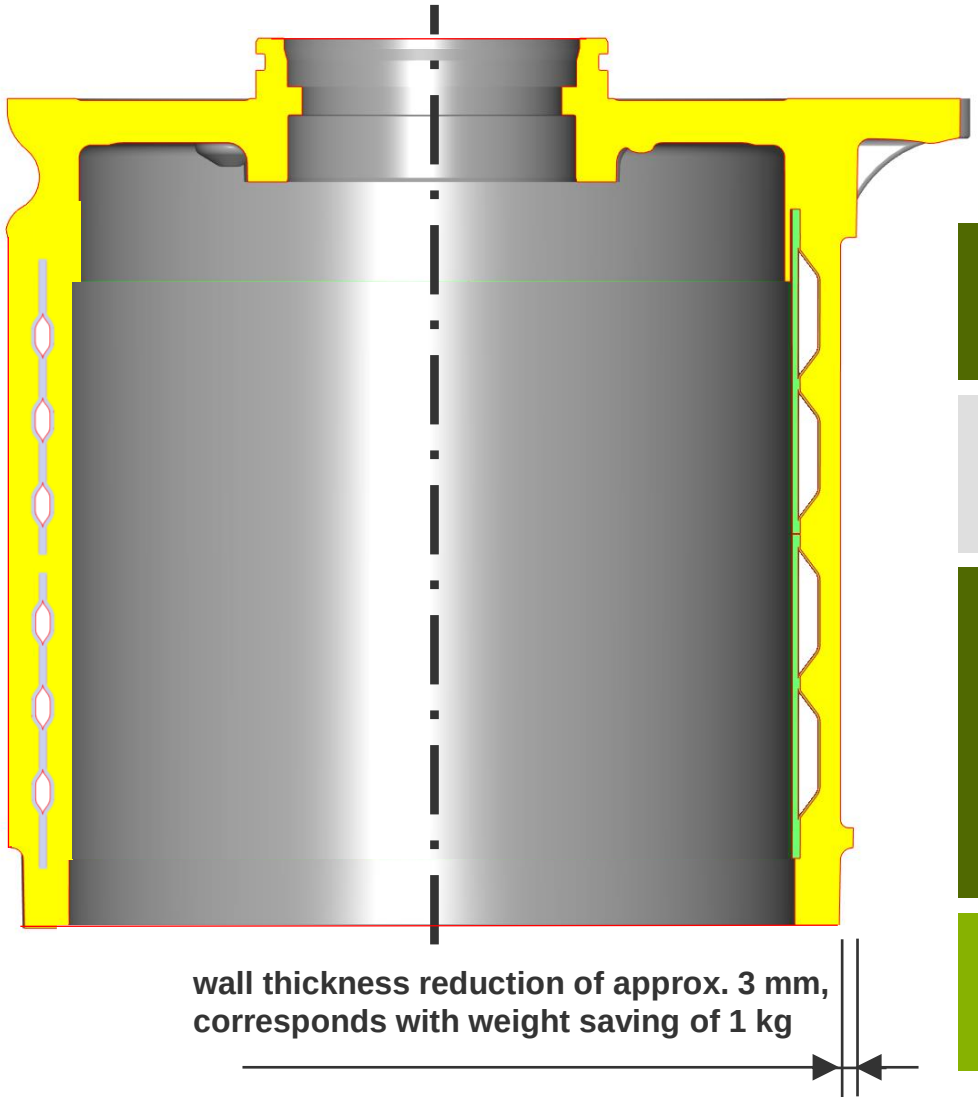
Implementation, Generation 2

Generation 1

Clear responsibility allocation for mechanical stability and tightness

cost advantage



Generation 2

1 kg less weight

distance from water to stator reduced by approx 75 %

much faster cooling

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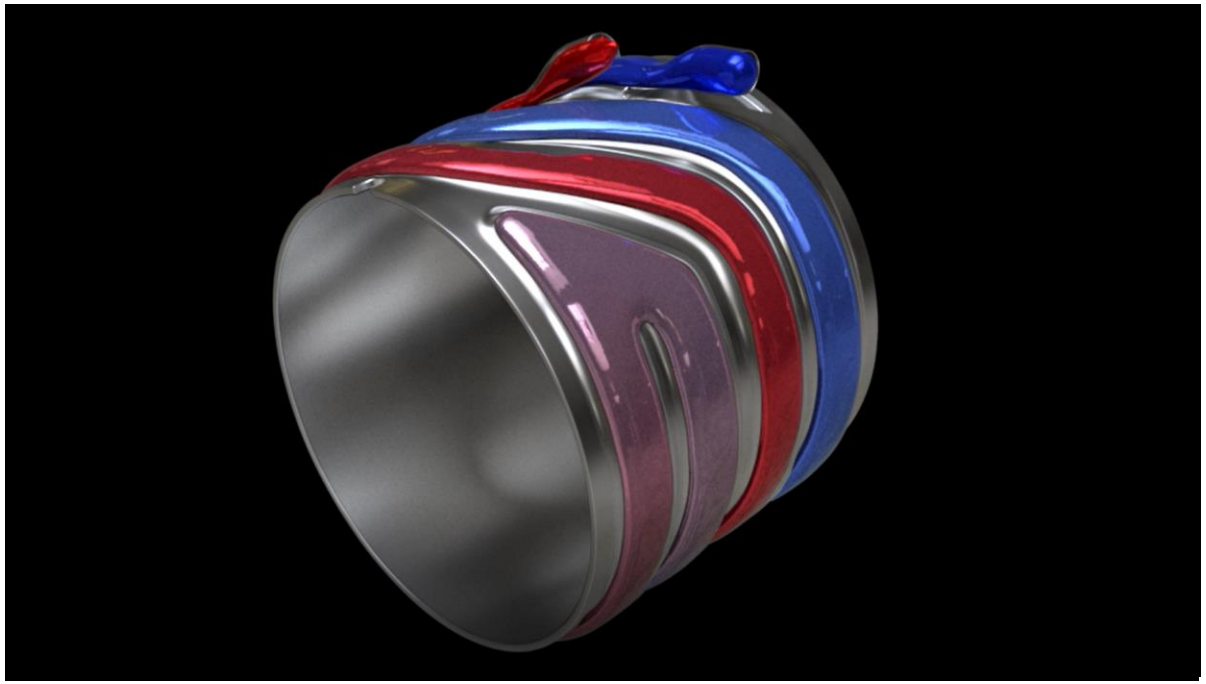
Implementation, Generation 2

Helix cooling layout with the principle of countervailing influence, here the hottest channel is sandwiched between the coldest and the 2nd coldest



The Roll Bond Core touches the stator, no casted material in between

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Implementation

Generation 1

Generation 2

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Implementation, Roll-Bond Core Generation 2

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Generation 2 in partly machined condition

Electric Motor with
Roll Bond Core Gen2

Roll-Bond survived with the correct thermal settings and cooling the Roll-Bond Core from inside during casting

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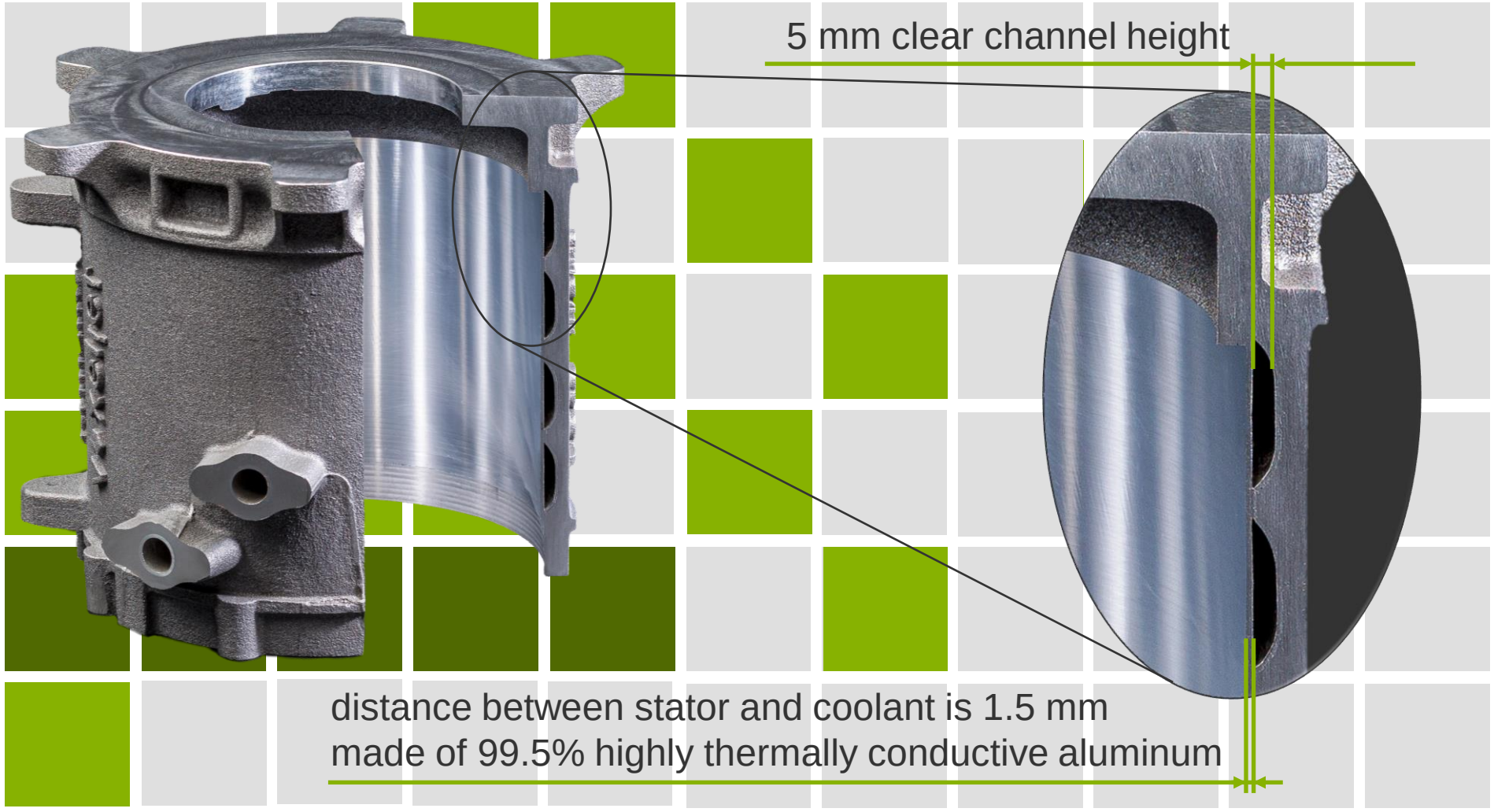
Generation 2 in partly machined condition



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Technical advantages

approx. 1 kg weight saving and less required installation space

Cooling of the channels during pouring and solidification of the molten metal, means better mechanical properties of the casting

distance from the stator to the cooling channel approx. 1,5 mm ⇨ extremely fast cooling

Helix-Cooling design could reduce the size of the total engine in reason of higher cooling efficiency

no risk for leakage and residual dirt

parallel channels are possible

Clear responsibility allocation for mechanical stability and tightness

The process is also suitable for battery housings, power unit housings, junction boxes and other similar applications

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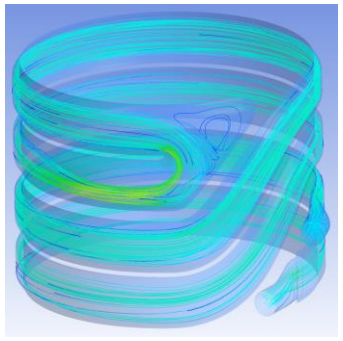
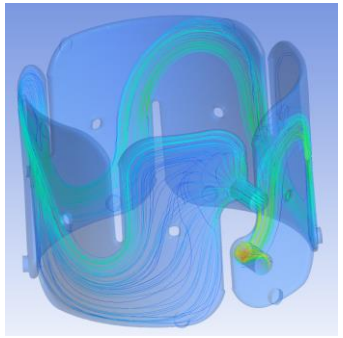
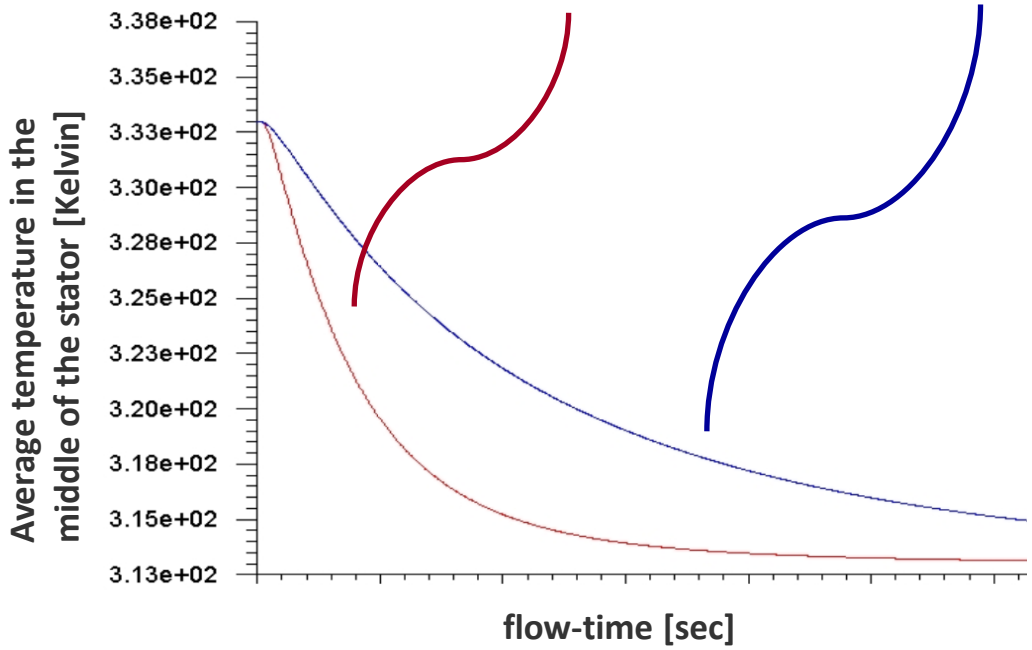
Technical advantages

RoBoC Gen2 Design





serial production design



3 times faster from 60 to 40°C

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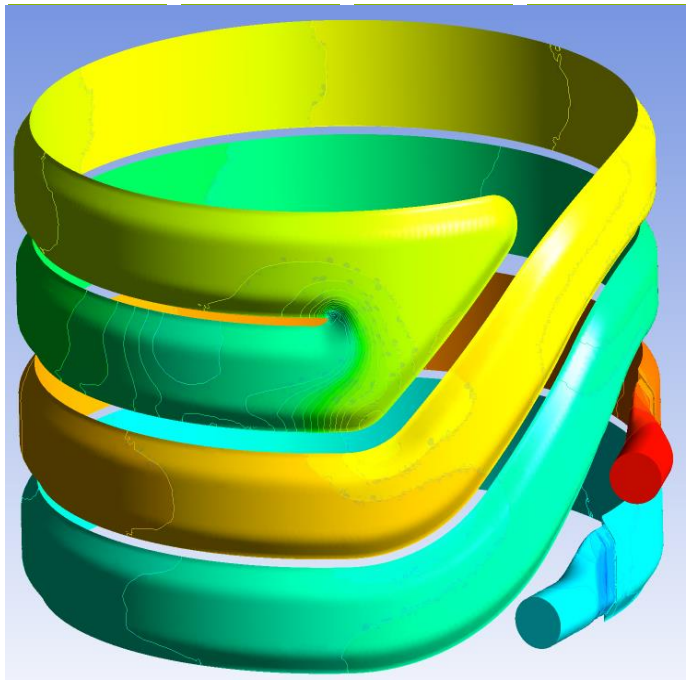
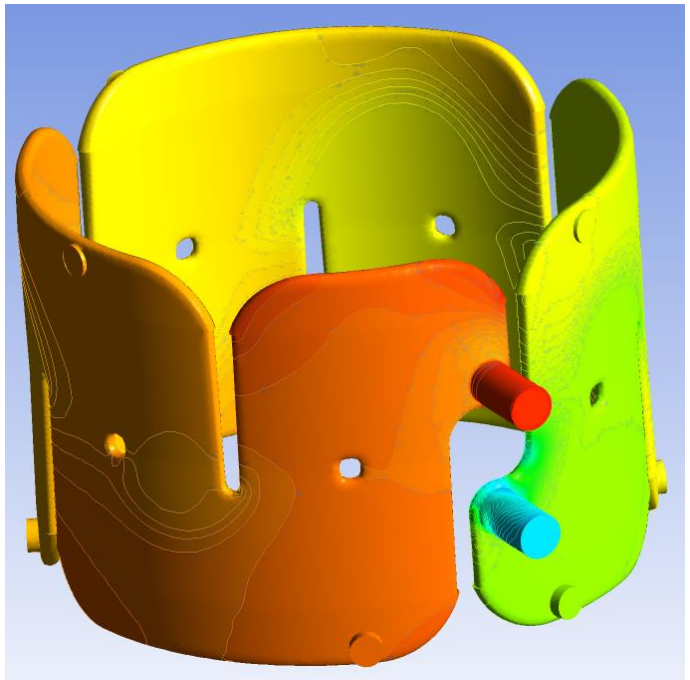
Technical advantages

70 % increase of the heat transfer coefficient at the interface between housing and stator with the RoBoC Gen2 design

RoBoC Gen2 design | very similar pressure drop | serial production design





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Cost advantages

One piece of casting, no additional machinery or assembly process necessary - means **simplification of the process**

BUY

Elimination of non value-added operations

highly complex sand core production

necessity to remove the sand core

machining and associated closing of the core prints

Much less CNC machining

Shorter cycle times for the casting process in reason of cooling from inside during casting

Elimination of the flow rate and leak pressure test after casting / assembly

Less casting scrap

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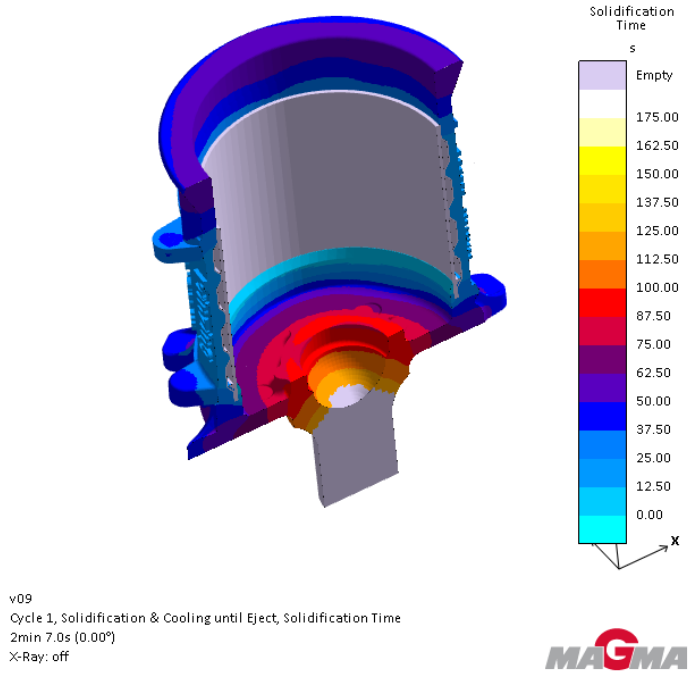
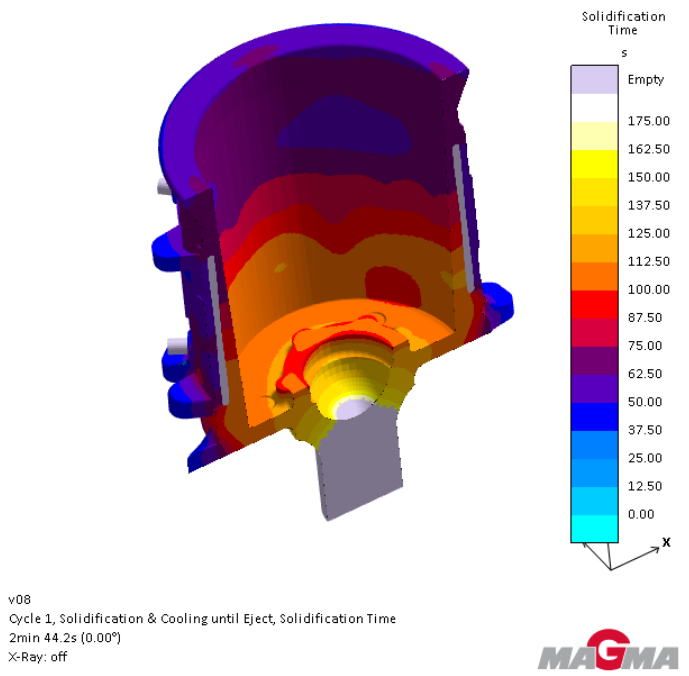
Speed of Soldification

RoBoC Gen2



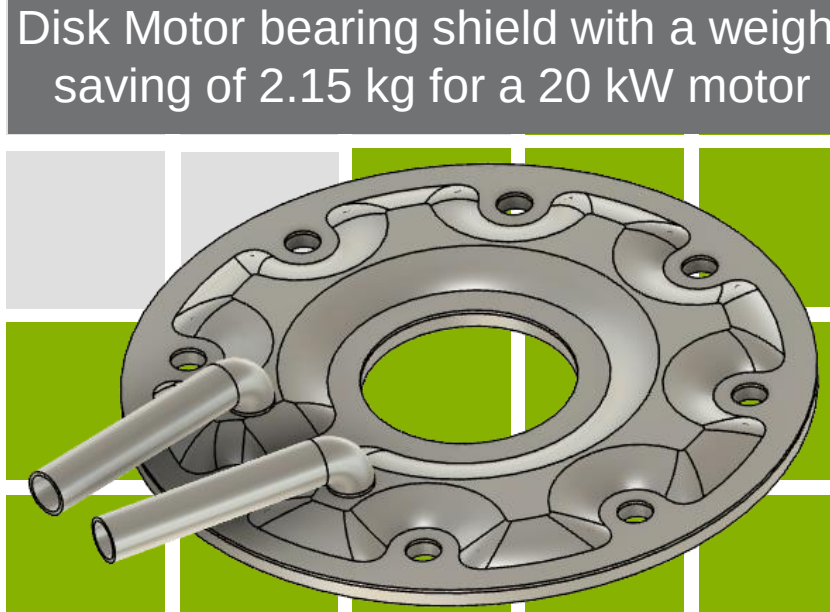
original sand core

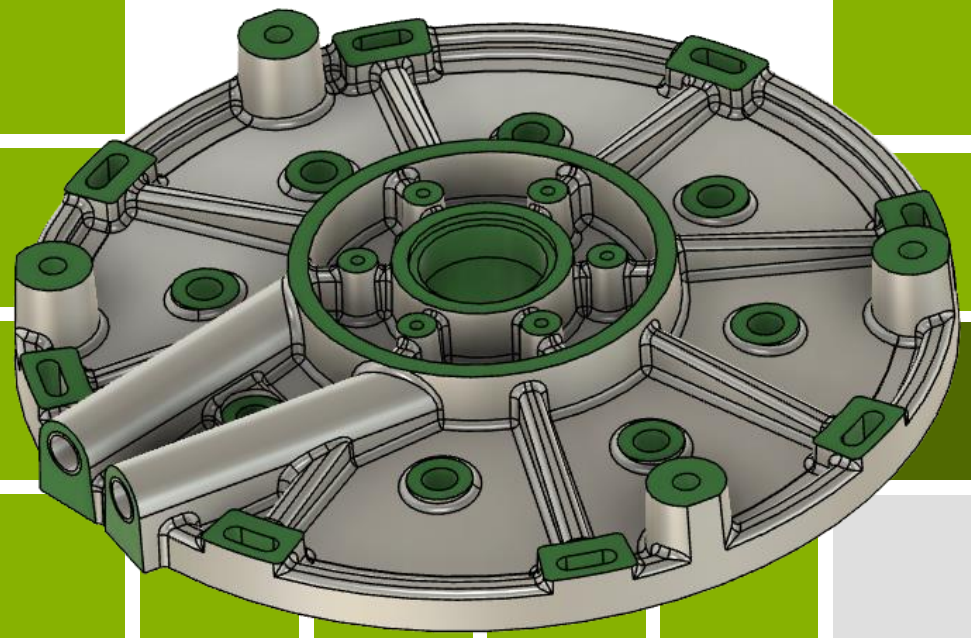


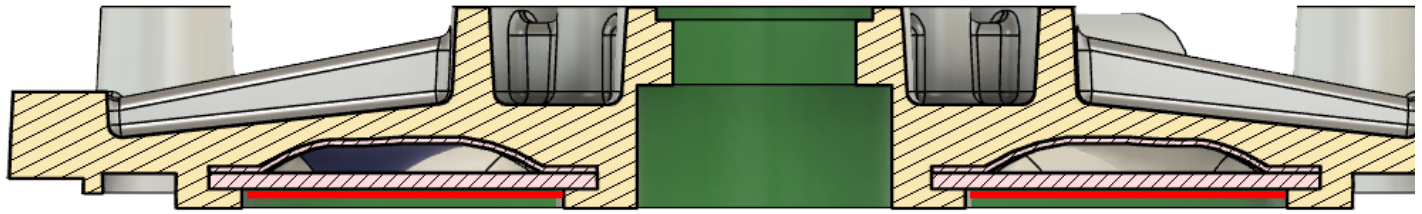
solidification until ejection takes 30% longer with sand-core versus RoBoC

Design study for Axial Flux / Disc Motors

Disk Motor bearing shield with a weight saving of 2.15 kg for a 20 kW motor







contact surface of the stator with the RoBoC

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Offer

We can offer business cases …

a.	licenses with AionaCast Licenses GmbH (mainly for foundries)
b.	delivery of Roll-Bond Cores (RoBoC)
c.	delivery of ready for assembly electric motor housings with our partners or your partners
d.	shares in AionaCast Cooling Systems
	**… get in touch with us!**

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Thank you for your attention!

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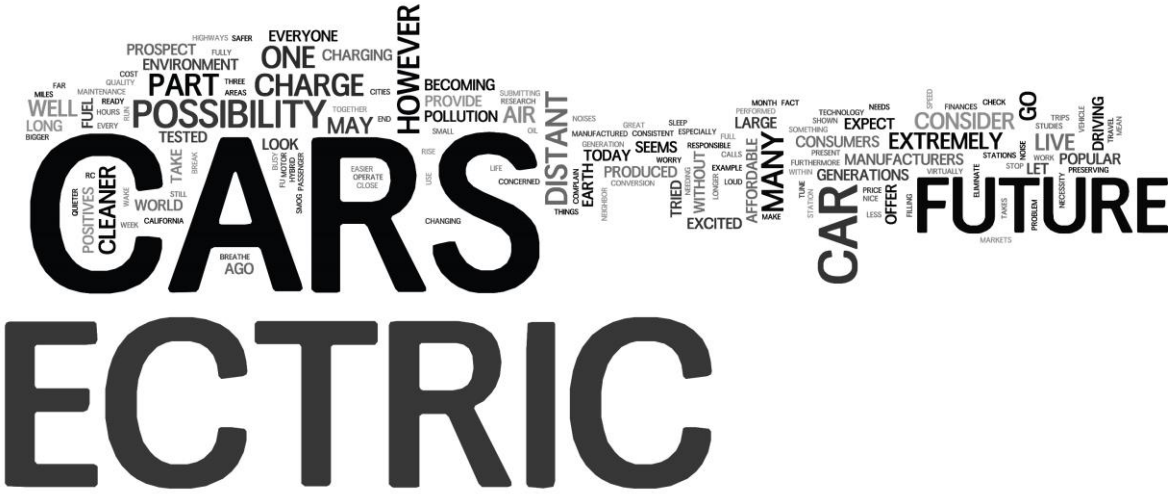

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