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Creative Solutions for E-Mobility Housing Using Sand Core in Low-Pressure Casting

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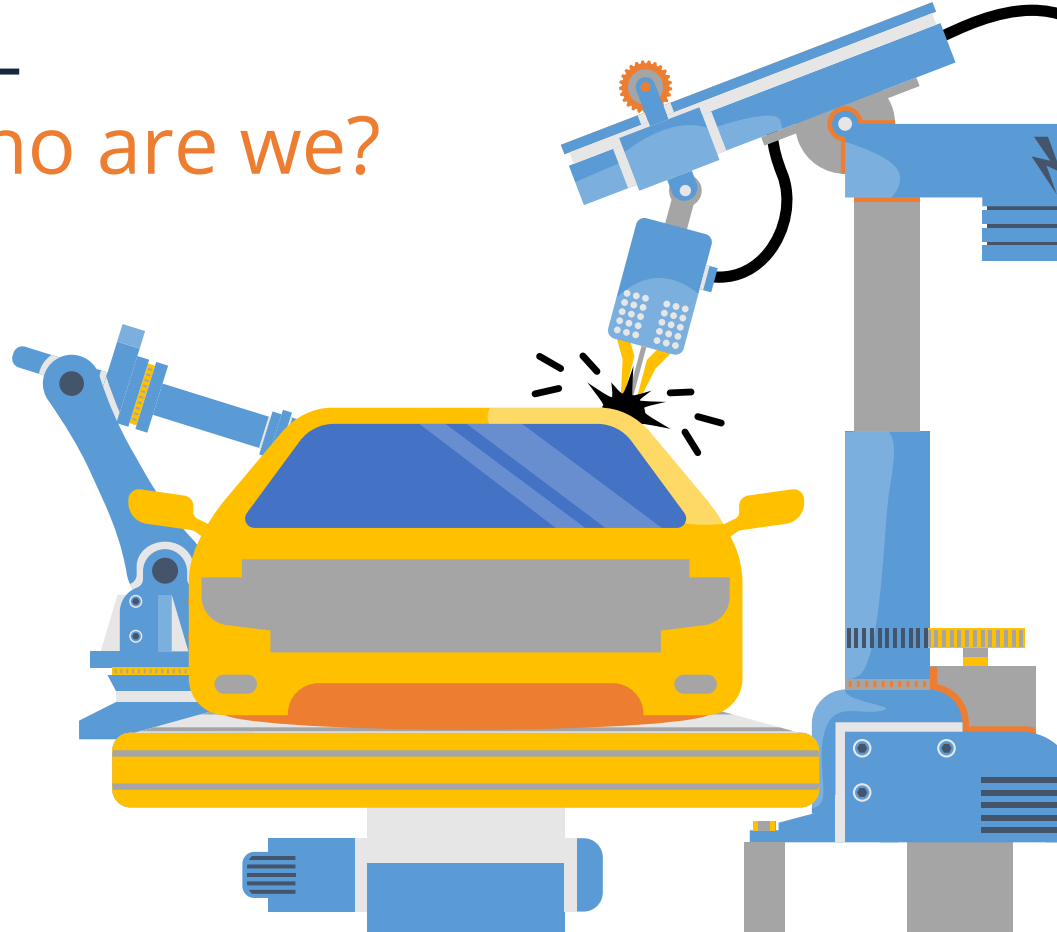
04

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05

Results & Discussion

01
Who are we?



Güriş Holding

CONSTRUCTION

Güriş Construction

INDUSTRY

Parsan
Omtaş
Döktaş
Asil Çelik
Güriş
Construction
Mac. Ind. Co. Inc.

ENERGY

Mogan Energy

TOURISM

Mirage Park
Resort

MINING

Santral Mining

The History of Döktas



Orhangazi facility, established in 1973, specializes in gray iron and nodular cast iron, as well as machining operations
.....



The Manisa facilities are engaged in high and low-pressure casting operations, as well as the production of aluminum wheels
.....



Orhangazi Foundry, Turkey's leading iron casting facility
.....

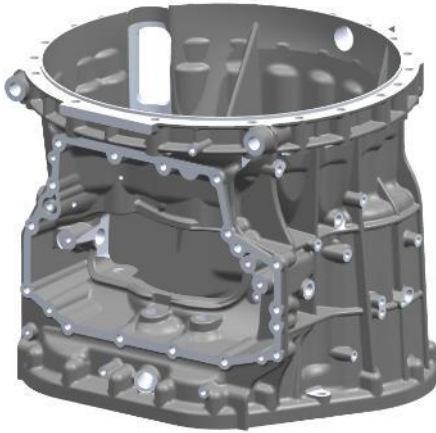


Manisa Aluminum Casting Facility, one of the largest aluminum casting facilities serving the automotive sector in Turkey
.....



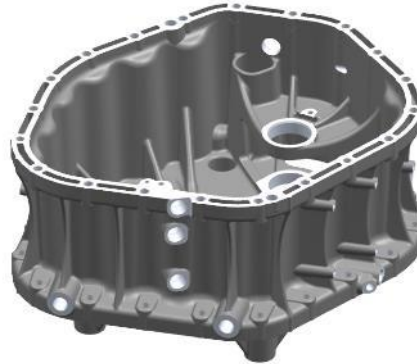
Manisa Wheel Casting Facility, one of the largest aluminum wheel production plants in Turkey
.....

02 Products



Main Case

32,5 kg; machined



Center Case

20,7 kg; machined



Rear Case

22,5 kg; machined



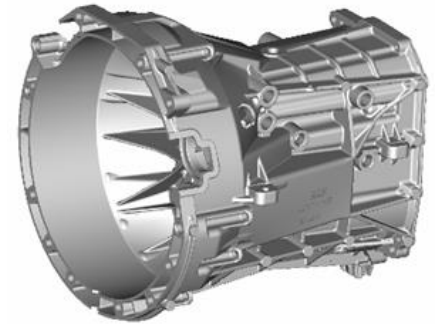
Transmission Housing

5,27 kg; raw



Clutch Housing

7,04 kg; raw



Transmission Housing

10,7 kg; machined



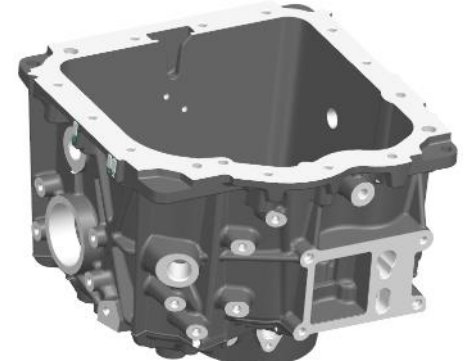
Extension Housing

15,6 kg; machined



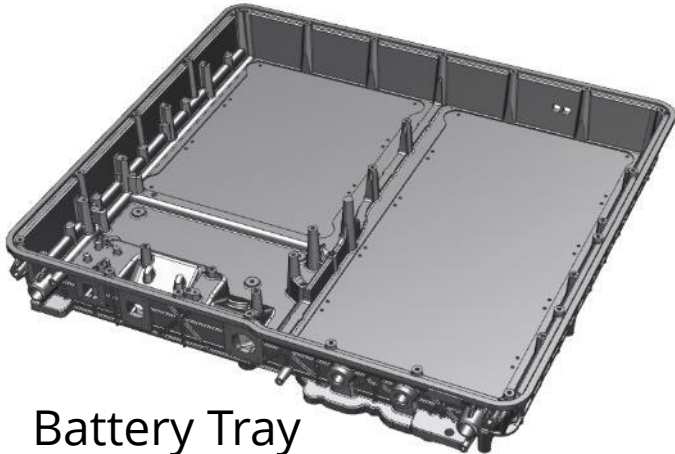
Intermediate Housing

19,2 kg; machined



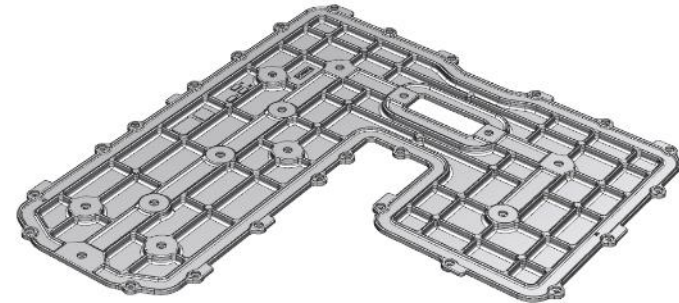
Transmission Housing

17,7 kg; machined



Battery Tray

26,25 kg; machined



Coolant Cover

7,65 kg; machined



Front Knuckle

4,65 kg; machined & assembled



Rear Knuckle

4,95 kg; machined



Spring Arm

6,60 kg; machined



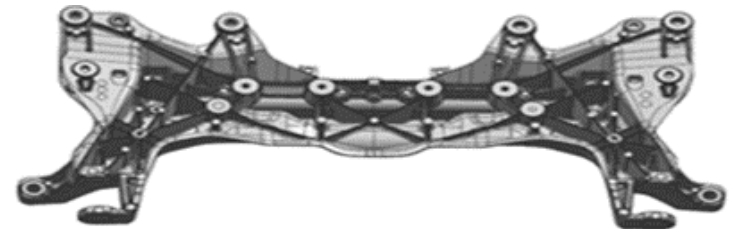
Steering Housing

3,1 kg; raw



Rear Cross Member

3,32 kg; machined



Front Cross Member

10,1 kg; machined



TOFAŞ TÜRK OTOMOBİL FABRİKASI A.Ş.

TürkTraktör



CLAAS



EATON



GRÜNER
systemtechnik



anvis
SUMITOMO RIKO GROUP

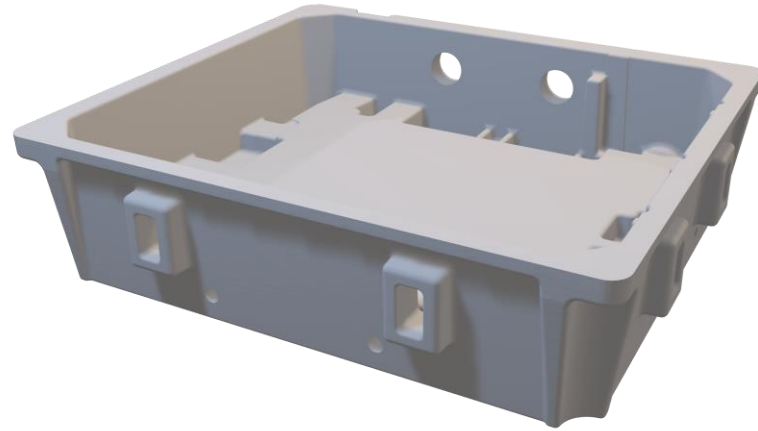


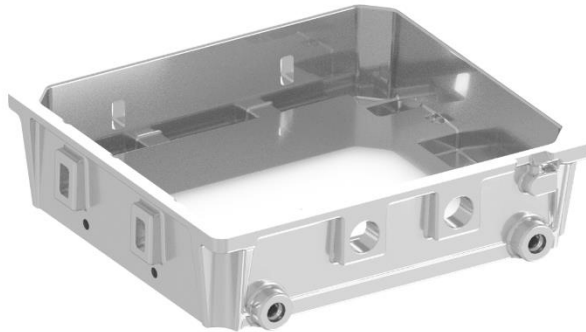
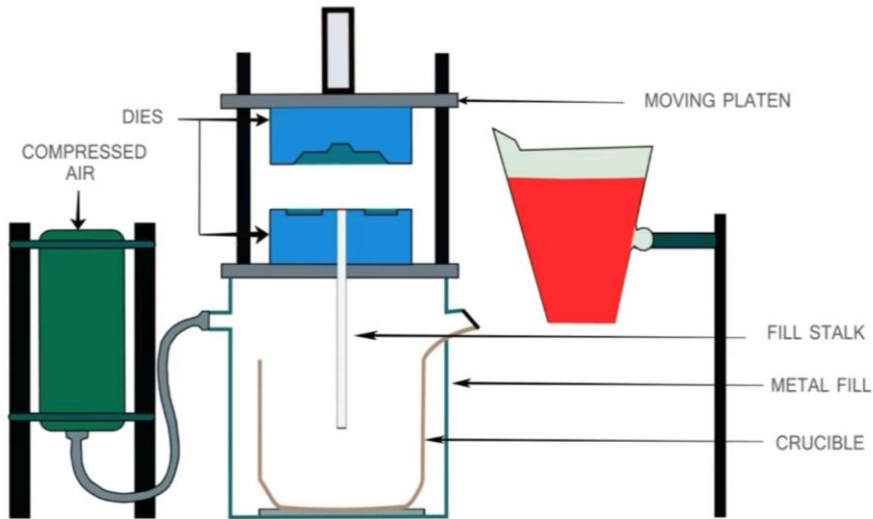
TOGG
Türkiye'nin Otomobili Girişim Grubu



03

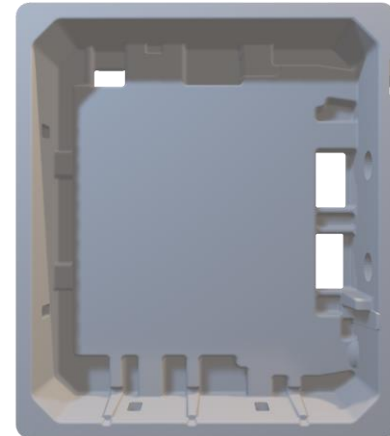
Project Review





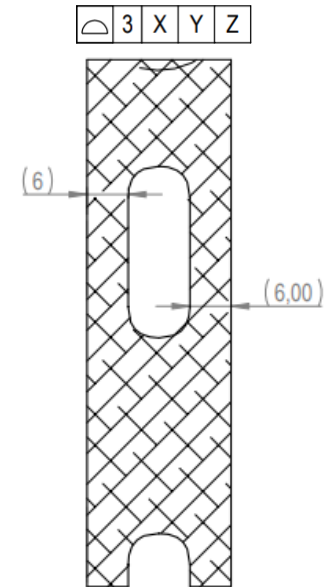
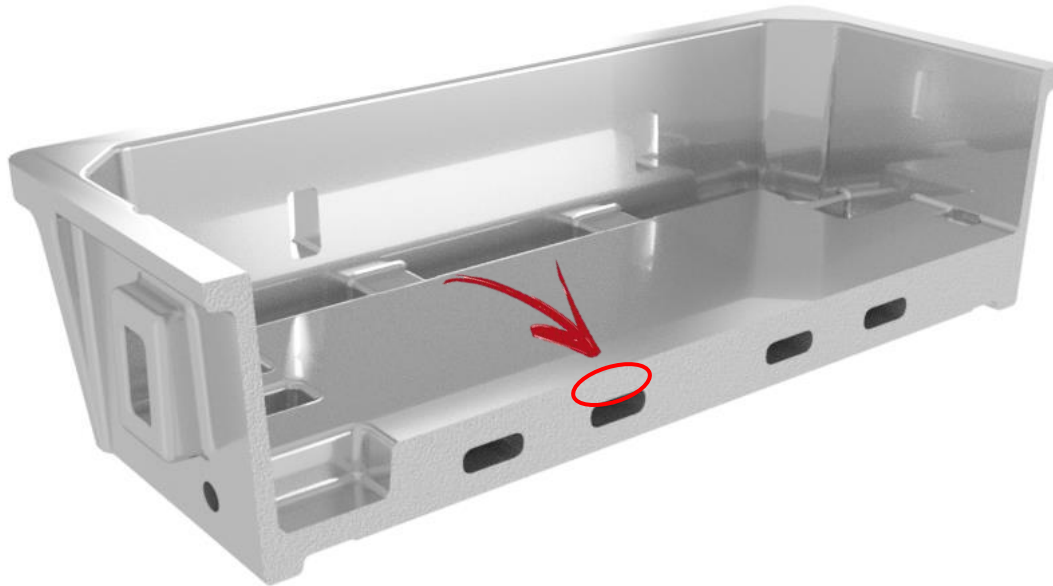
Connector Housing

Weight : 7,6 kg (machined)
Dimensions : 390 x 350 x 130 mm
Material : EN AC 43300 (AlSi10Mg)
Process : LPDC + T5 + Machining
+ Leakage + Assembly





- The wall thickness around the water channels should be 6 mm, within a tolerance of ± 1.5 mm.





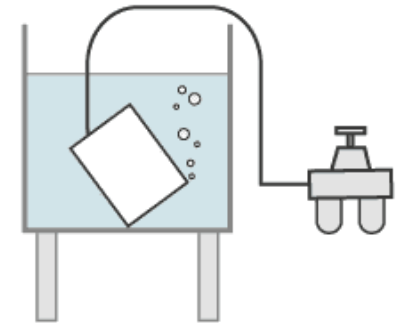
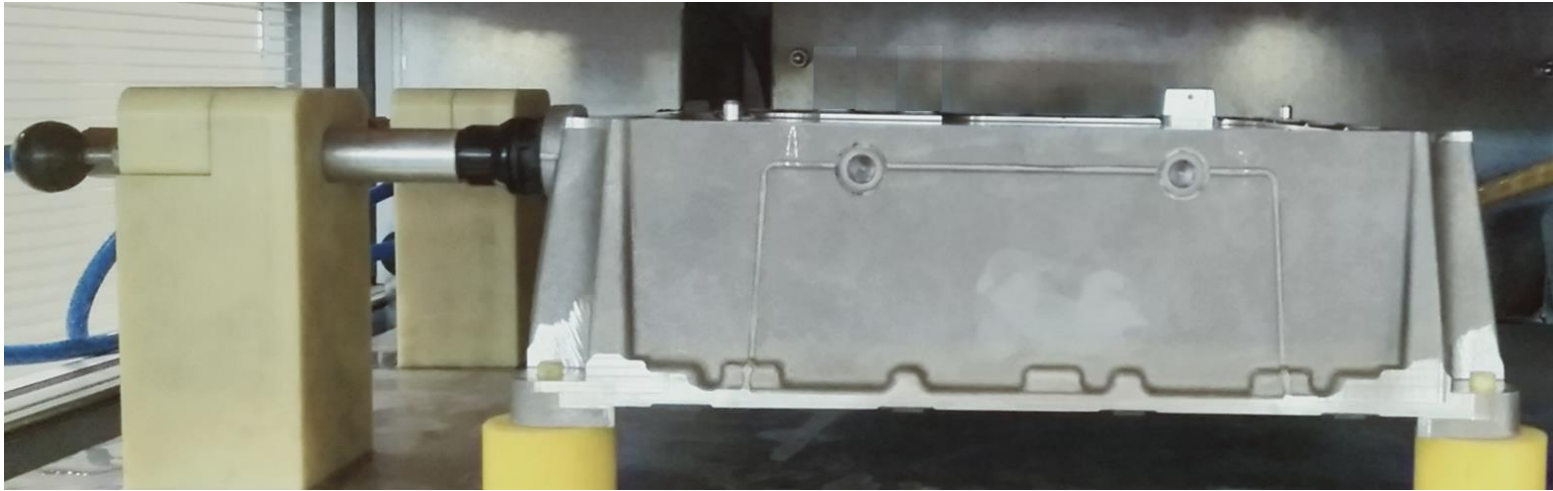
- Maximum defect 1mm, minimum space between two defects 5 mm (<0,3mm).

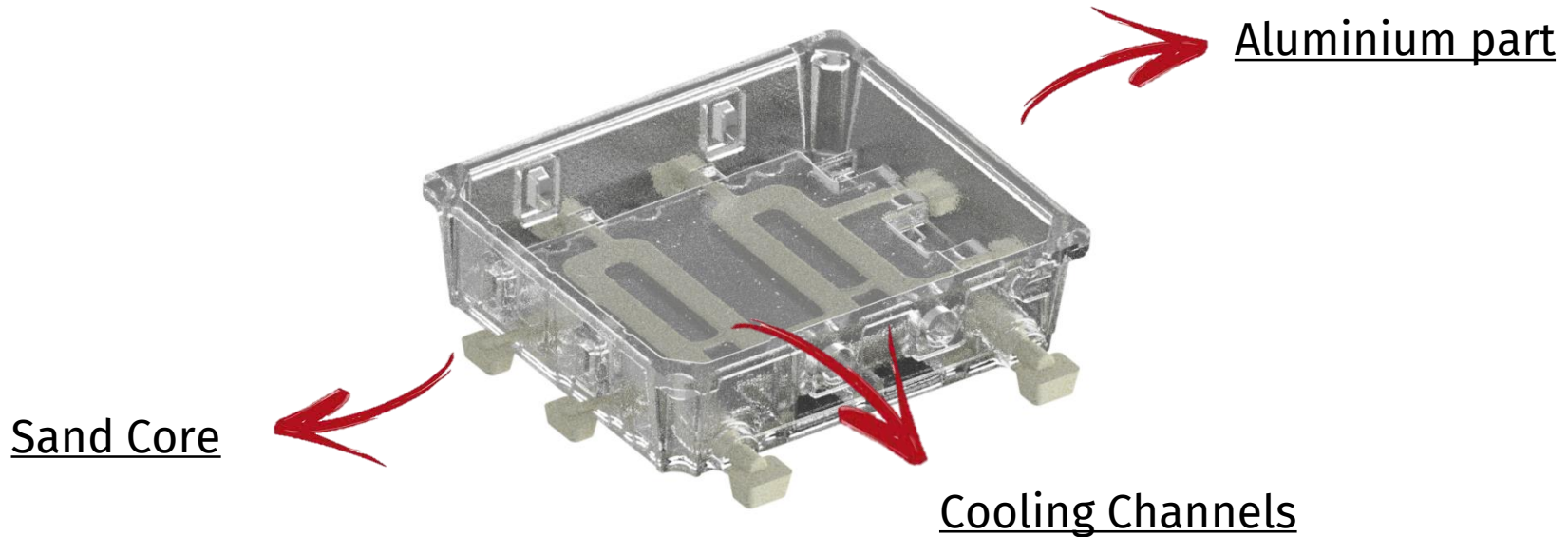
Castings shall not exceed the following radiographic quality levels, as defined in ASTM E155.

	Permanent Mould	
Section Thickness	19mm	6mm
Gas Holes Quality Level	3	3
Gas Porosity (round) Quality Level	3	3
Foreign Material (less dense) Quality Level	3	3
Shrinkage (sponge) Quality Level	4	4
Shrinkage (cavity) Quality Level	4	4
Gas Porosity Elongated Quality Level	3	3
Foreign Material (more dense) Quality Level	3	3



- Leakage test at 3 bar pressure for 60 seconds – No bubbles should appear underwater.





The part has been designed to allow the cooling channels to be produced using the sand core method. In this project, which is extremely complex both in terms of design and manufacturing from a casting process perspective, the challenges encountered during production are as follows:

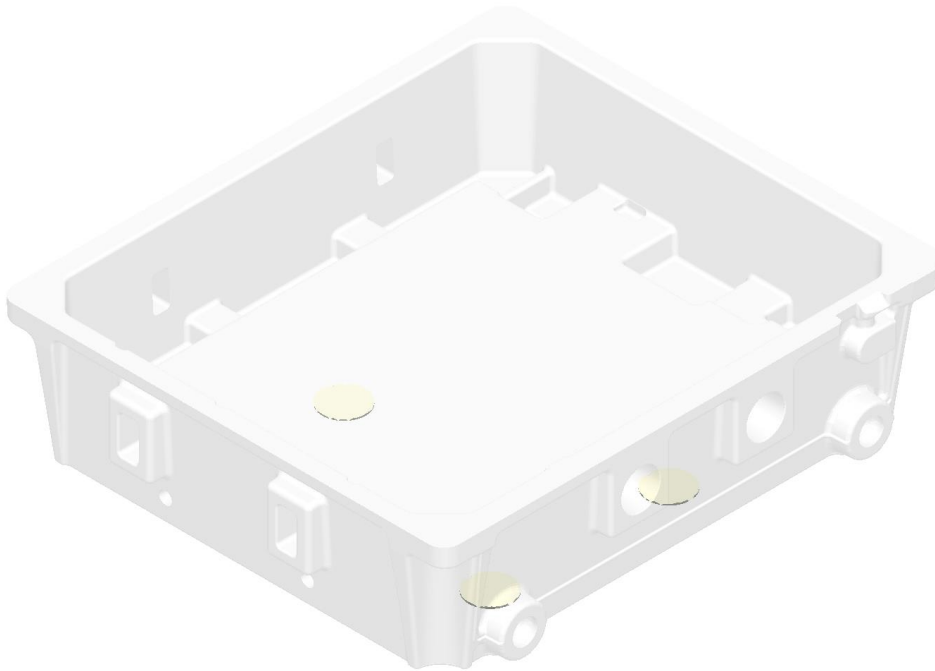
- Inability to fix the sand core during the filling process,
- Deformation of the sand core at high temperatures due to the design,
- Formation of porosity.

04

Challenges & Solutions

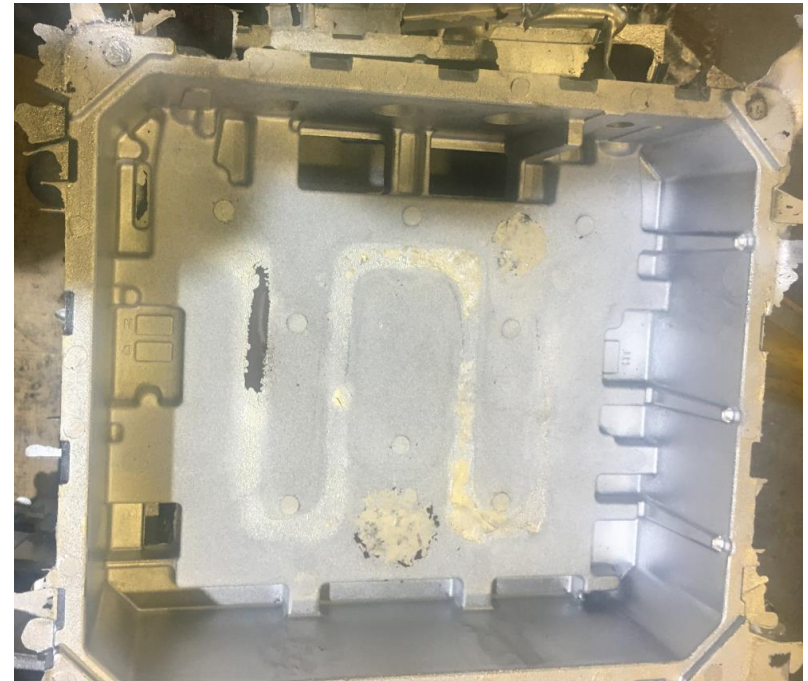


- Due to the sand core's density being less than the density of molten aluminum, the problem of the sand core floating occurred.



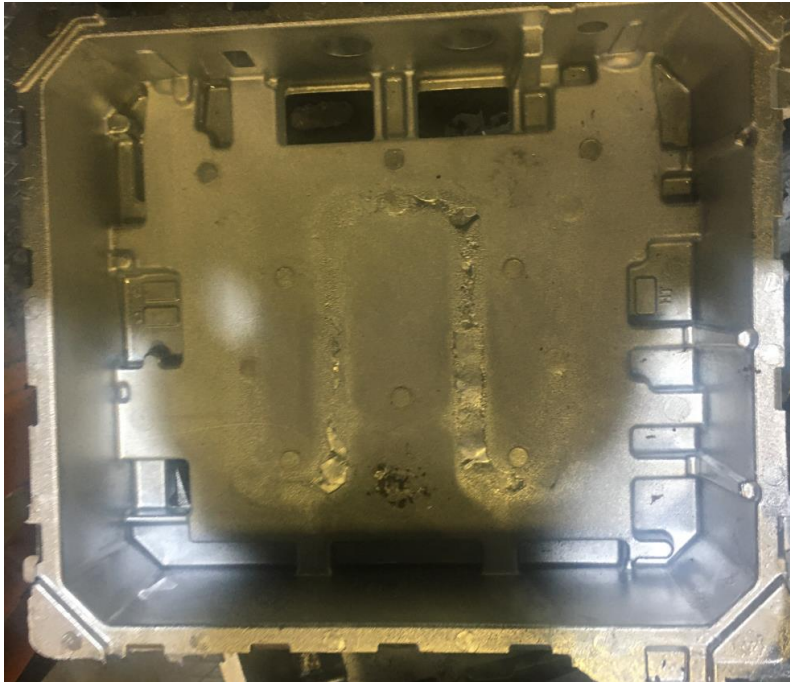


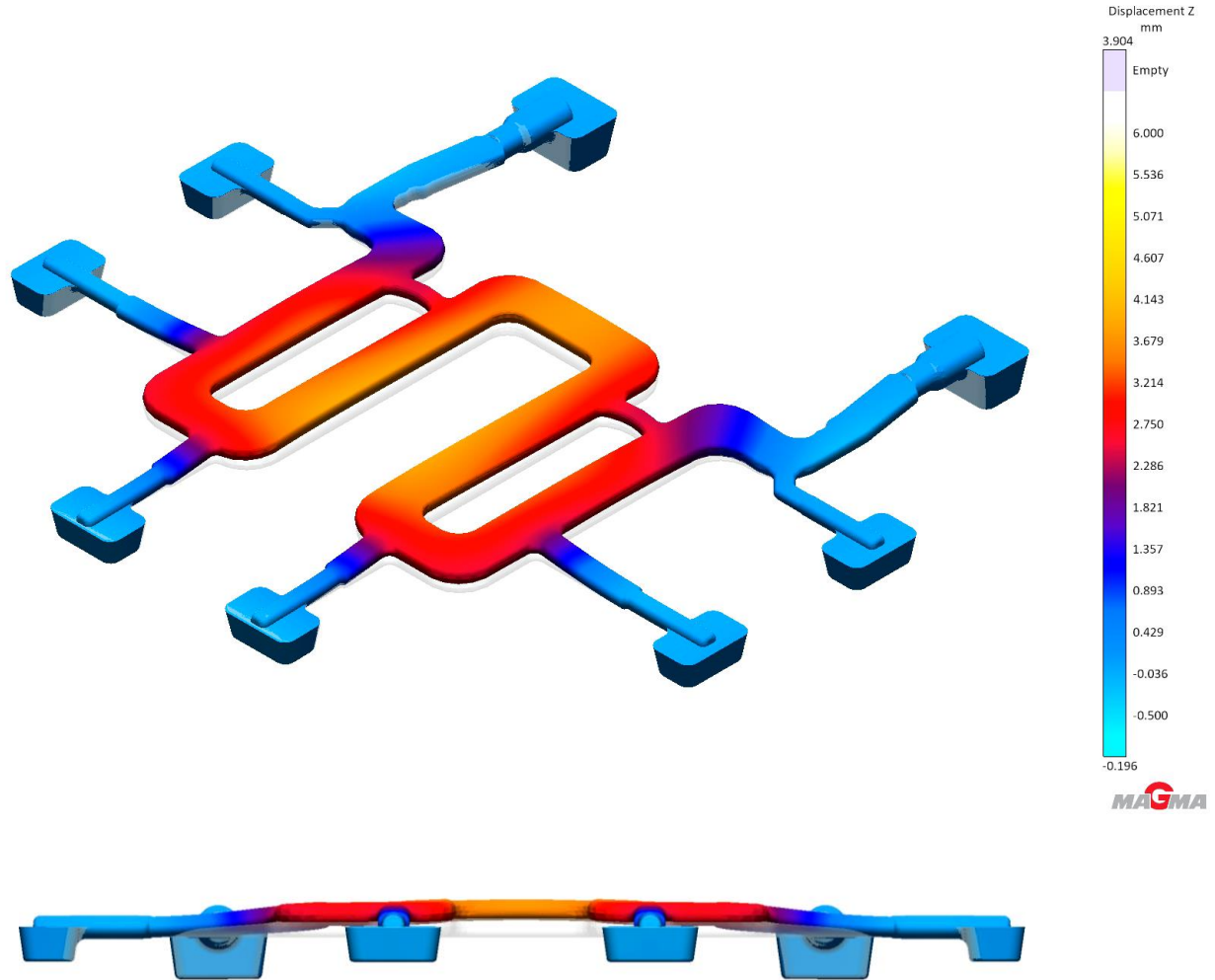
- Due to the sand core's density being less than the density of molten aluminum, a floating issue with the sand core has emerged.

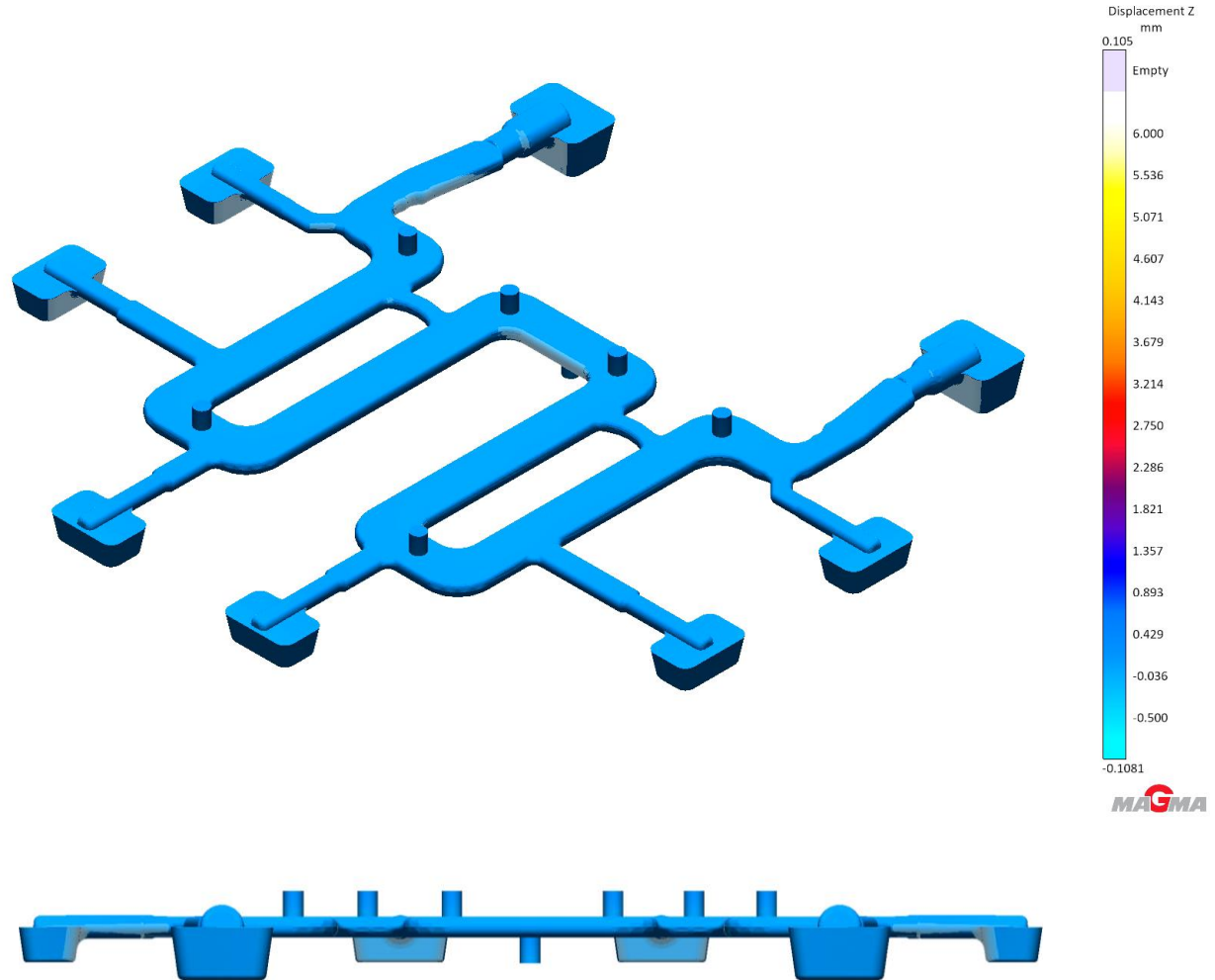


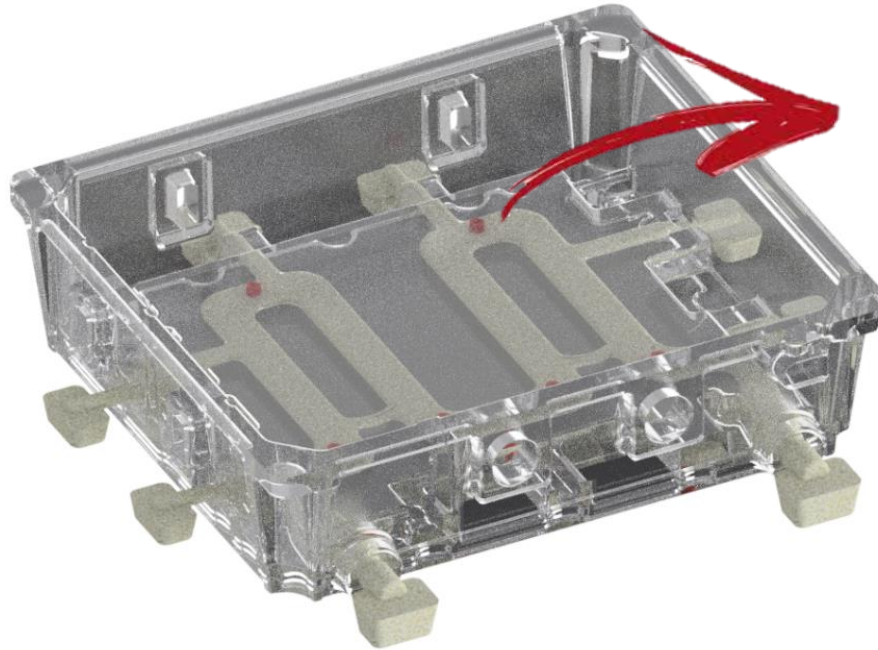
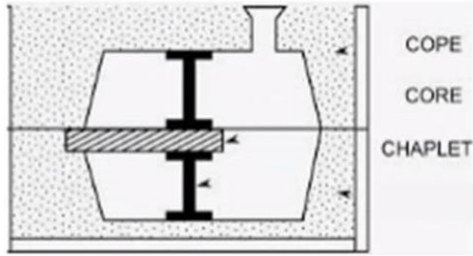


- During the filling process, the sand core is bending due to the high temperature.

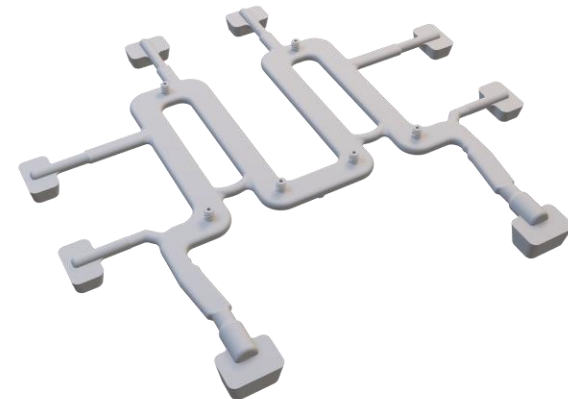
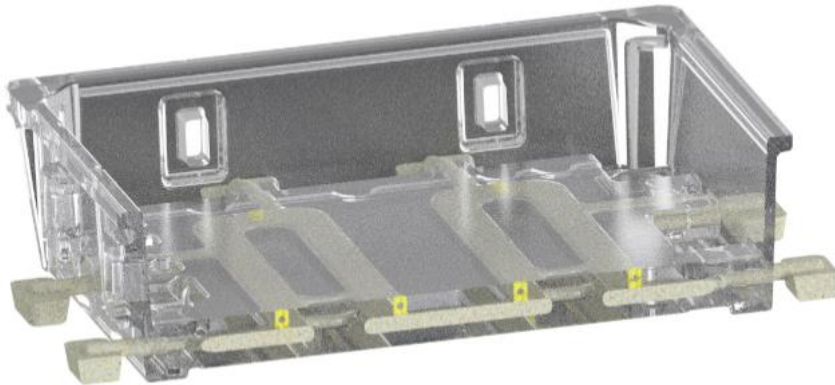


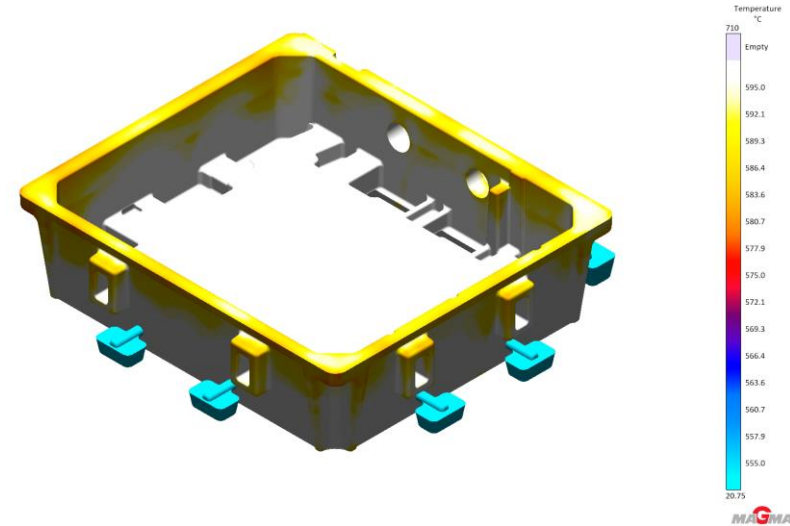
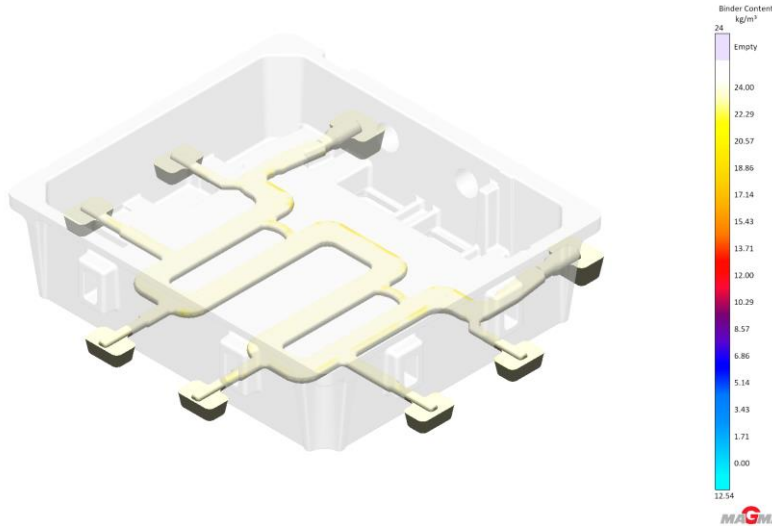






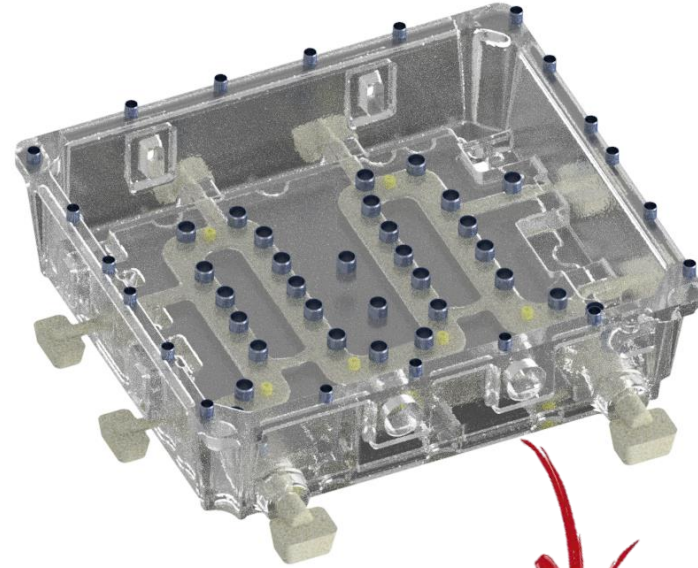
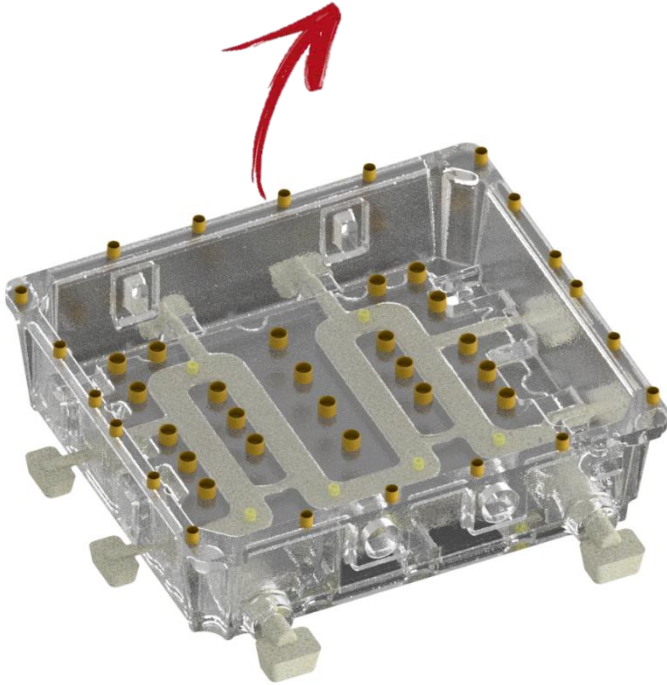
Sand Core
Fixing Part






- Since the sand core is placed on the thickest and last solidifying part of the component, the sand core gas causes porosity in these areas. Therefore, filter inserts were added to these regions to facilitate the easier removal of sand core gas.

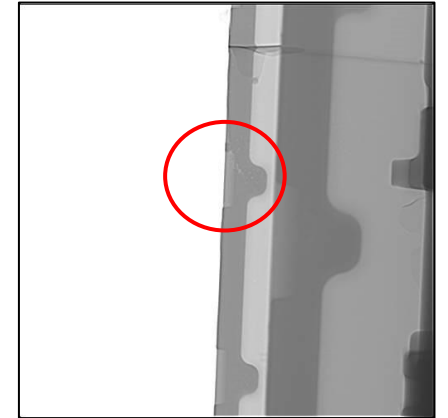
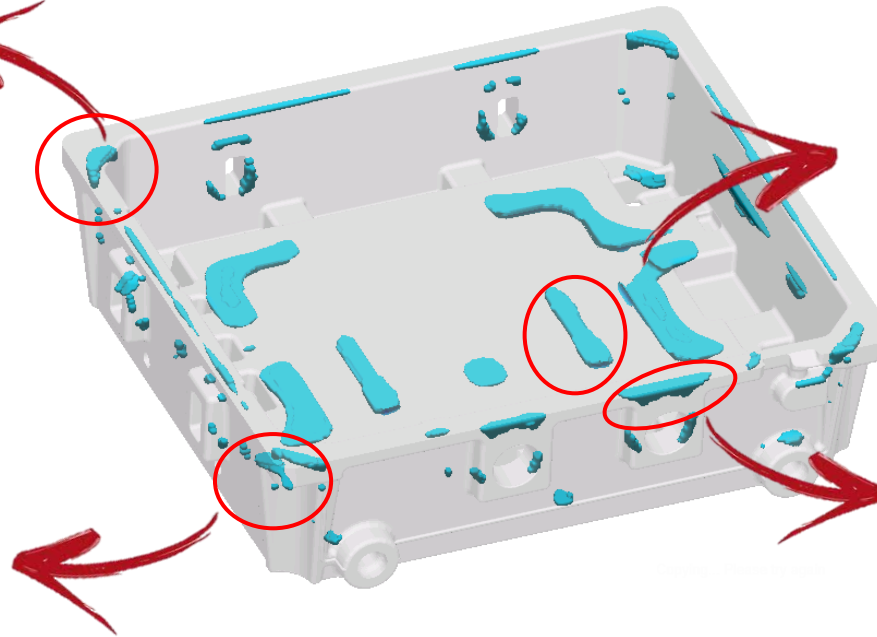
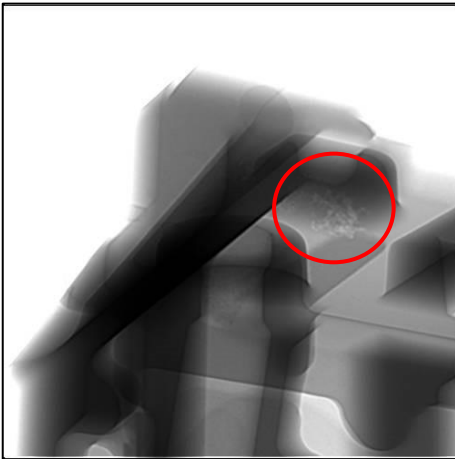
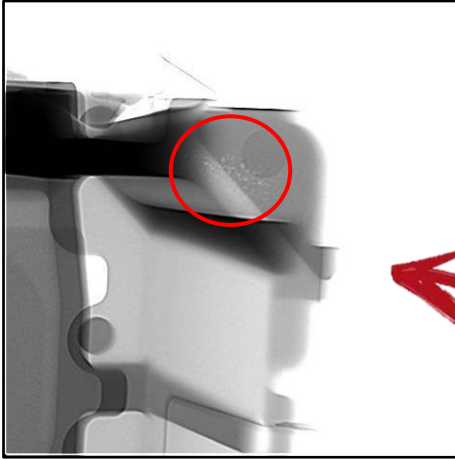
Initial Filter Design



Improved Filter Design



Multiple trial productions were carried out regarding the number and placement of filters. The areas where core gas was observed in the simulation were confirmed by X-Ray. The number of filters was increased.



The analysis results have been compared with the actual X-ray results of the cast part.

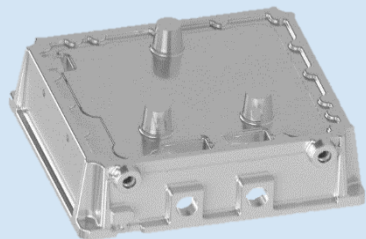


05

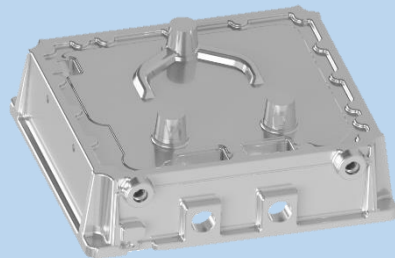
Results & Discussions

Gate Design Improvements

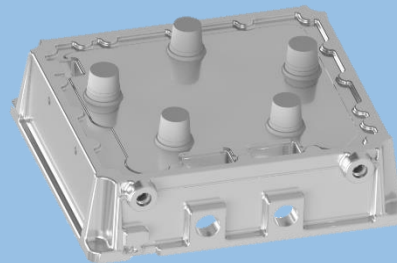
3 Gates



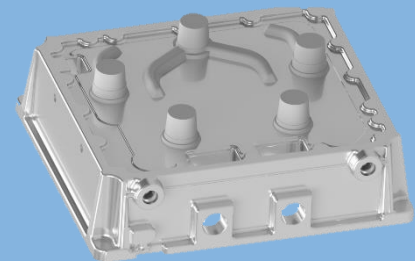
**3 Gates
Oriented**



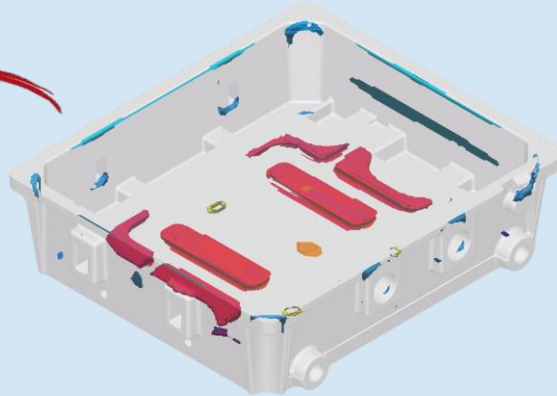
5 Gates



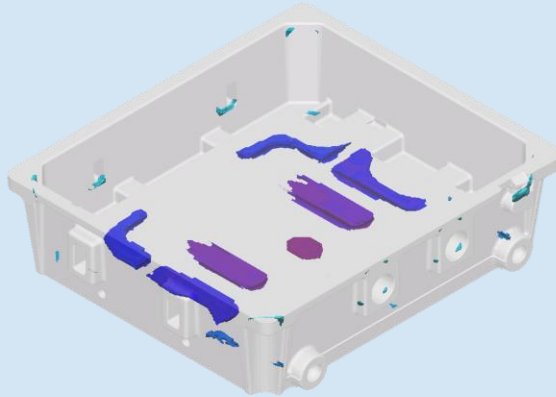
**5 Gates
Oriented**



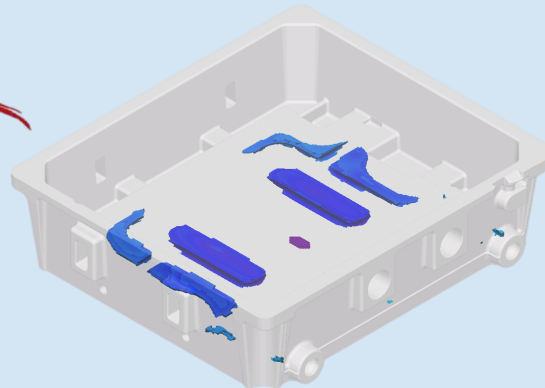
First initial
trials of casting



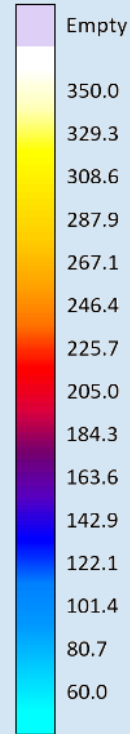
HTC
parameters
improved



Cooling
parameters
improved

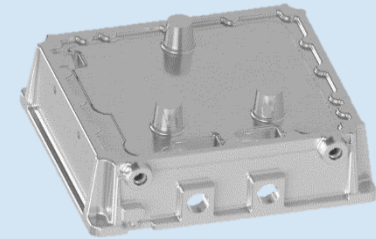


Hot Spot FSTime
s



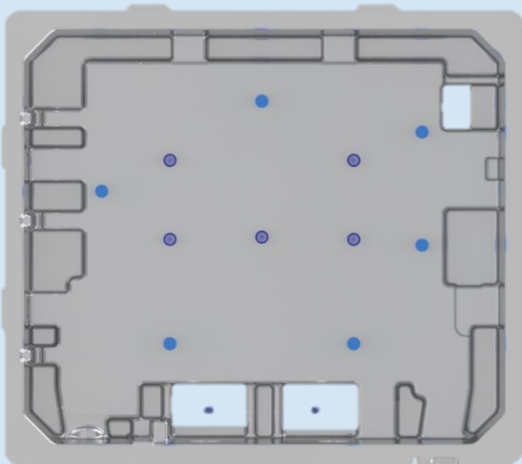
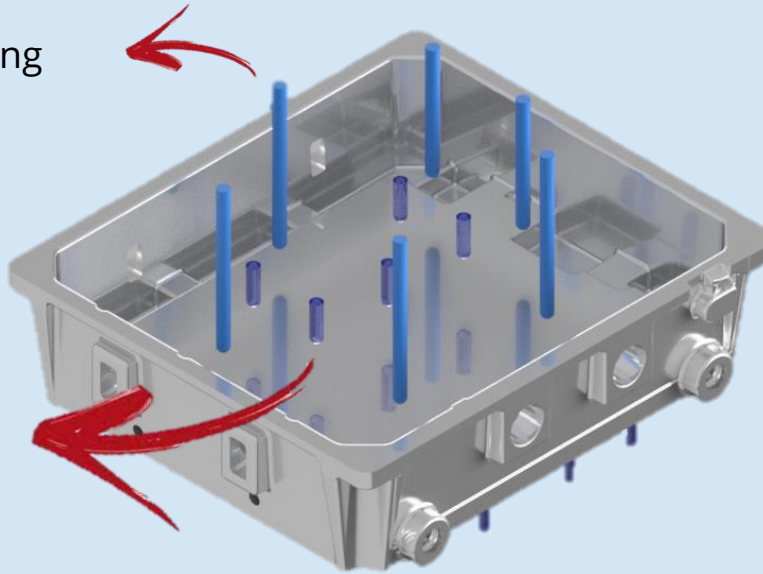
MAGMA

3 Gates



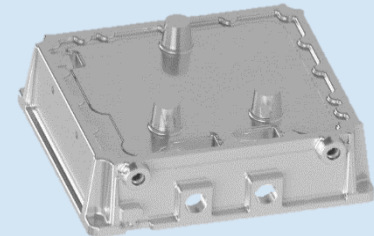
Water cooling
channels

Air cooling
channels

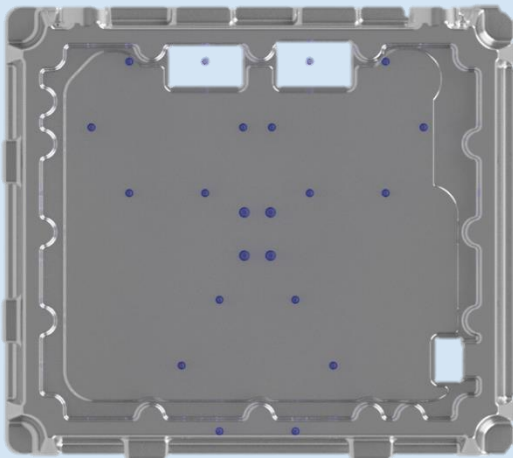
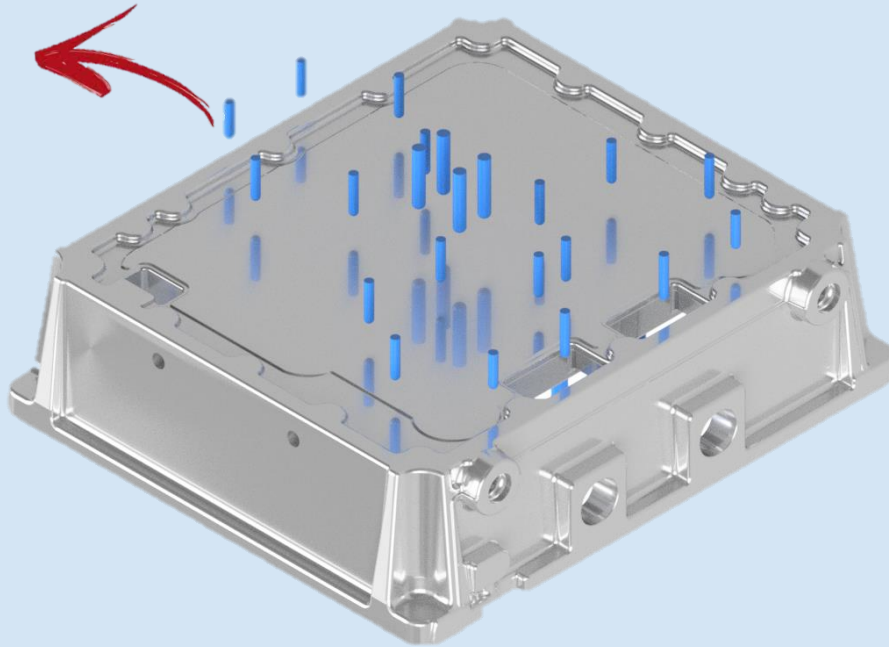


3 Gates

**Top Die
Cooling System**

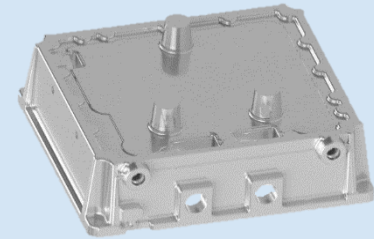


Air cooling
channels

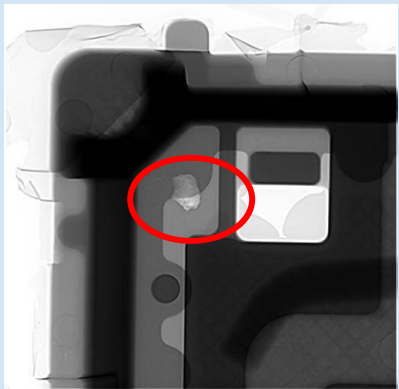
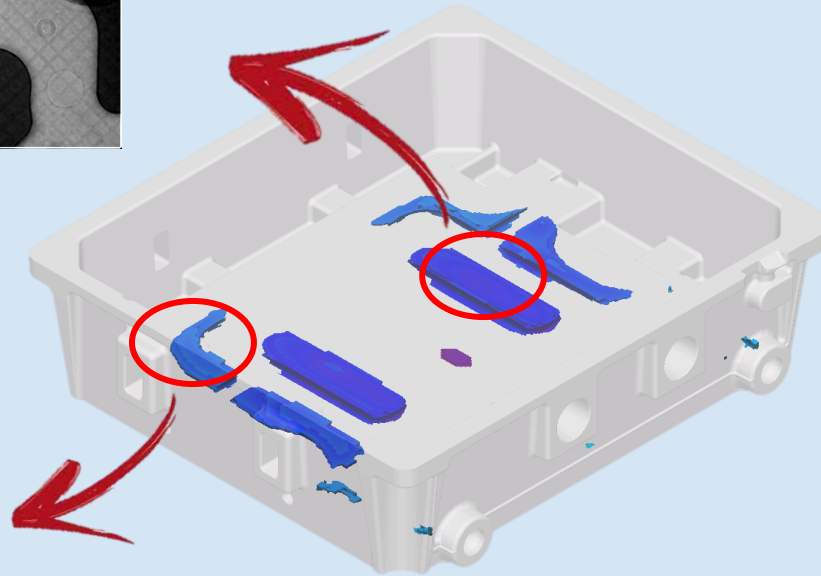
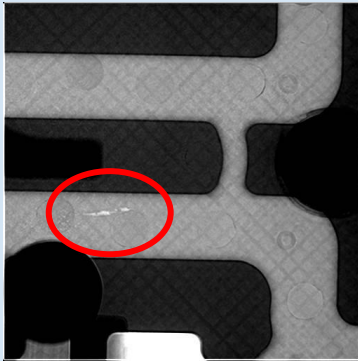


3 Gates

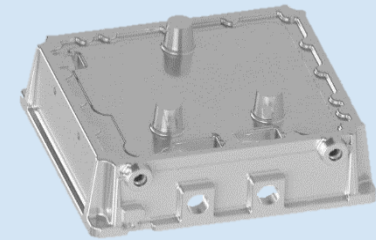
**Bottom Die
Cooling System**



The Hotspot Results seen in the X-Ray



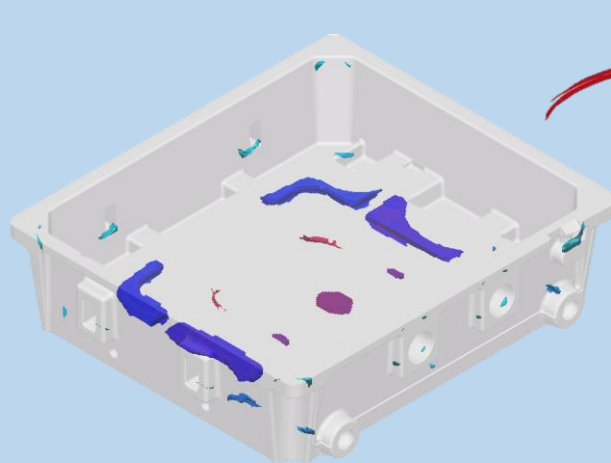
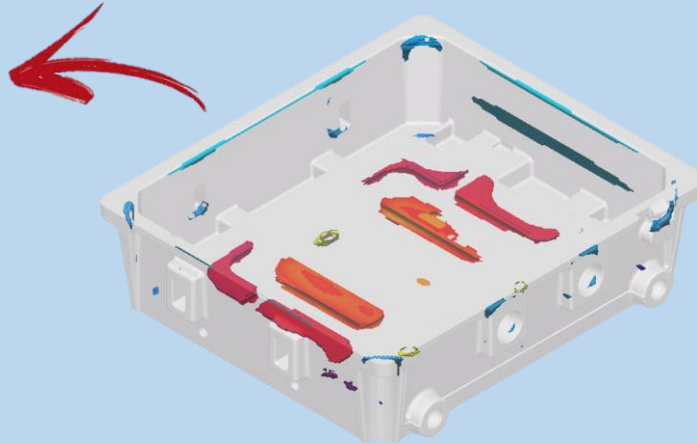
3 Gates



Sufficient
improvement was
not observed in
the result

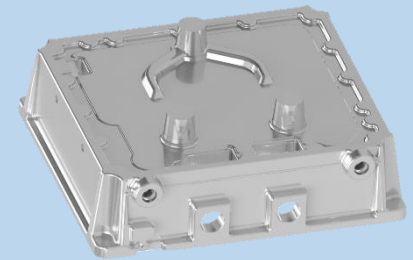
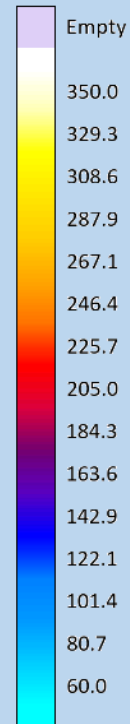
3 Gates Oriented

The Gates were oriented on bottom side

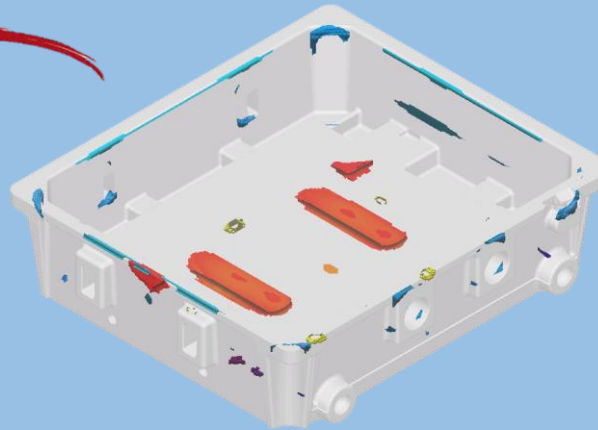


Cooling parameters improved

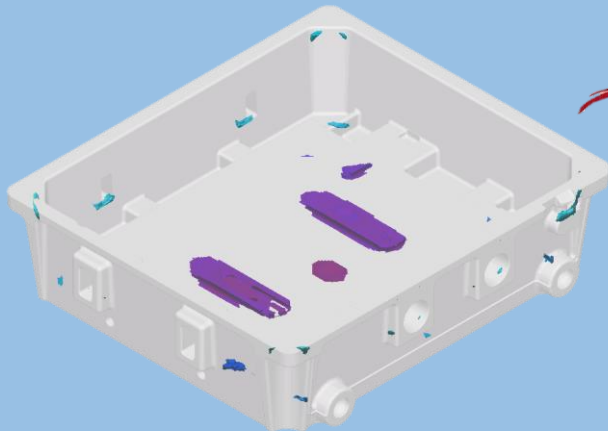
Hot Spot FSTime
s



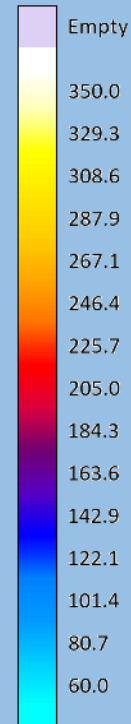
The Gates
number is
increased



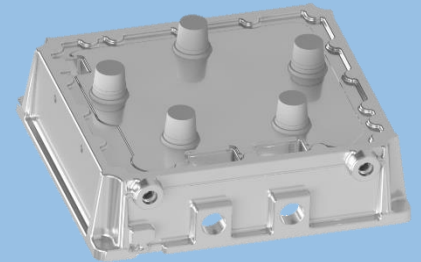
Cooling
parameters
improved



Hot Spot FSTime
s

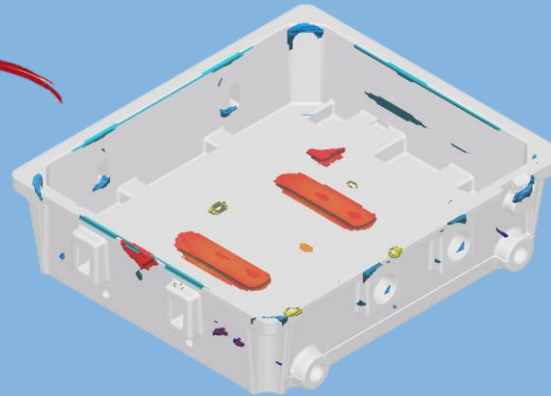


5 Gates

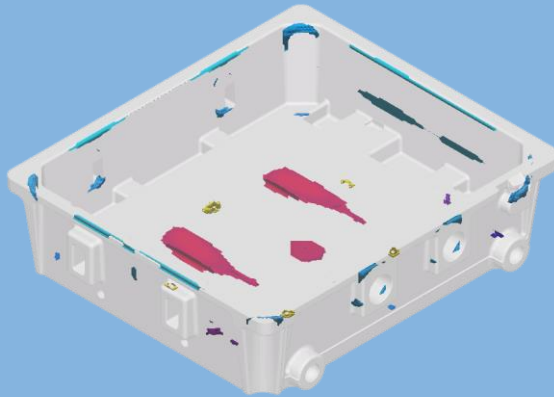


5 Gates Oriented

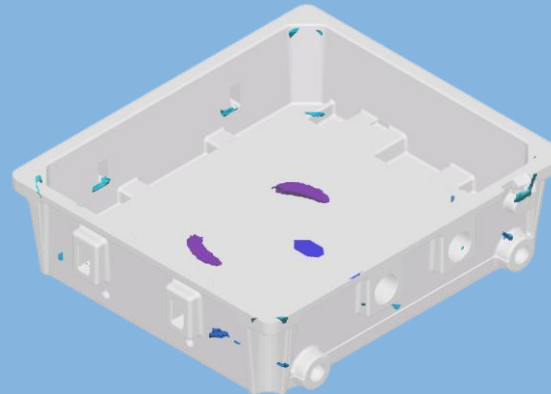
The Gates were oriented on bottom side



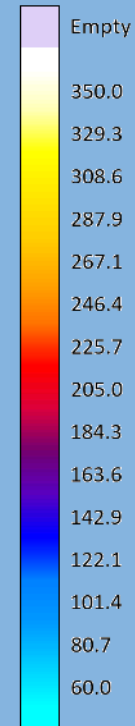
Cooling parameters improved



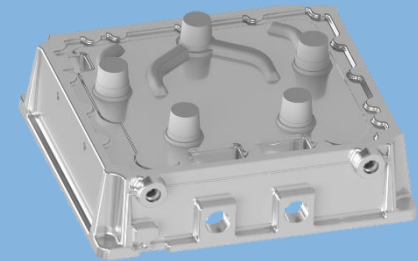
Cooling type improved



Hot Spot FSTime
s

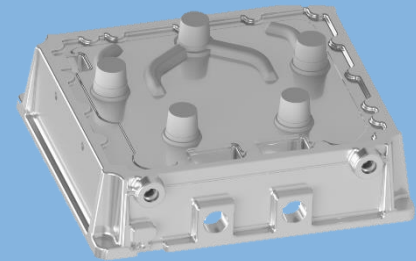


MAGMA



5 Gates Oriented

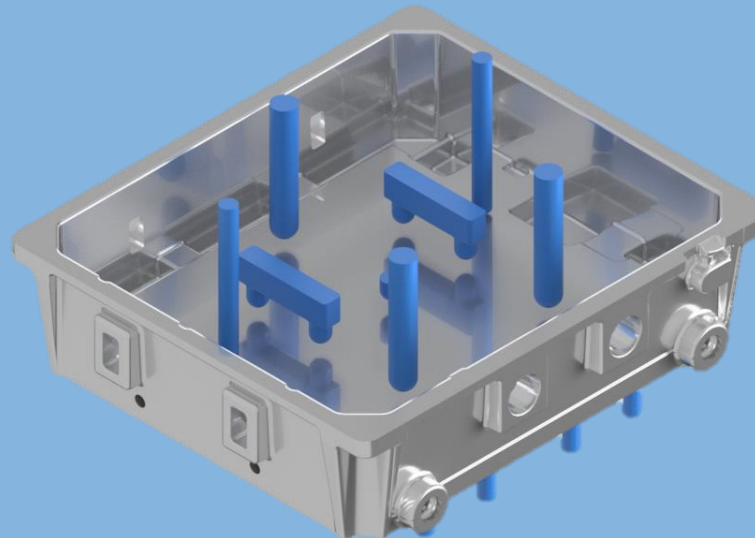
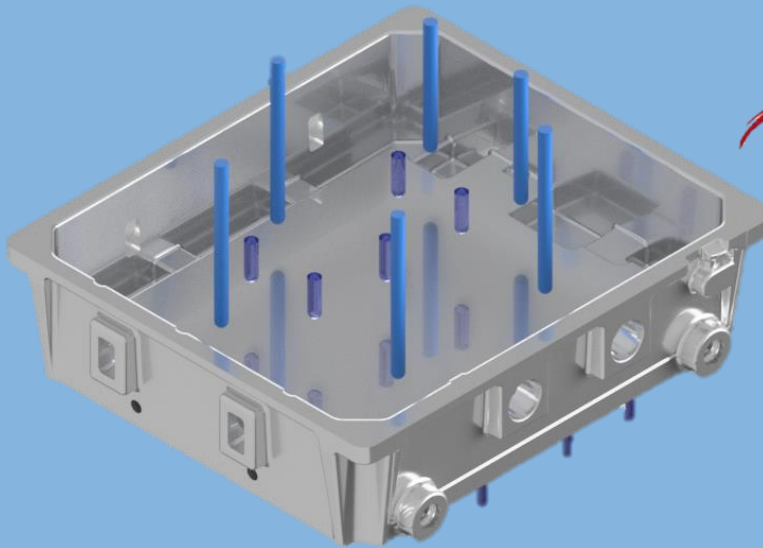
**Top Die
Cooling System**



Old cooling
type



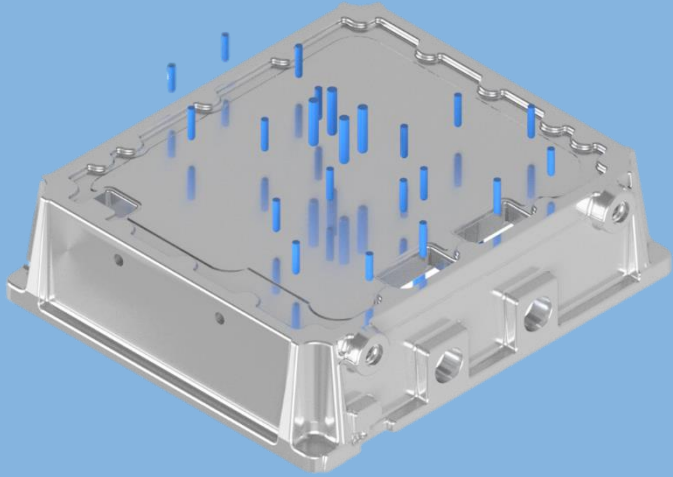
Improved
Cooling type



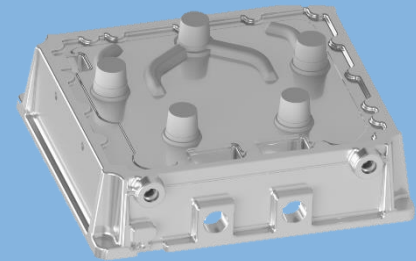
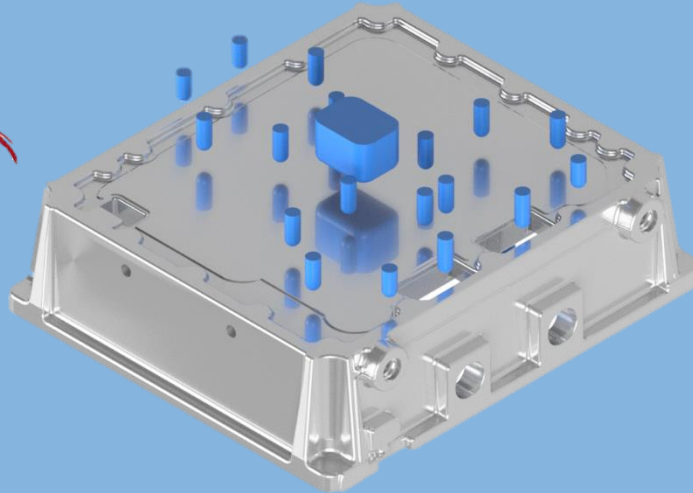
5 Gates Oriented

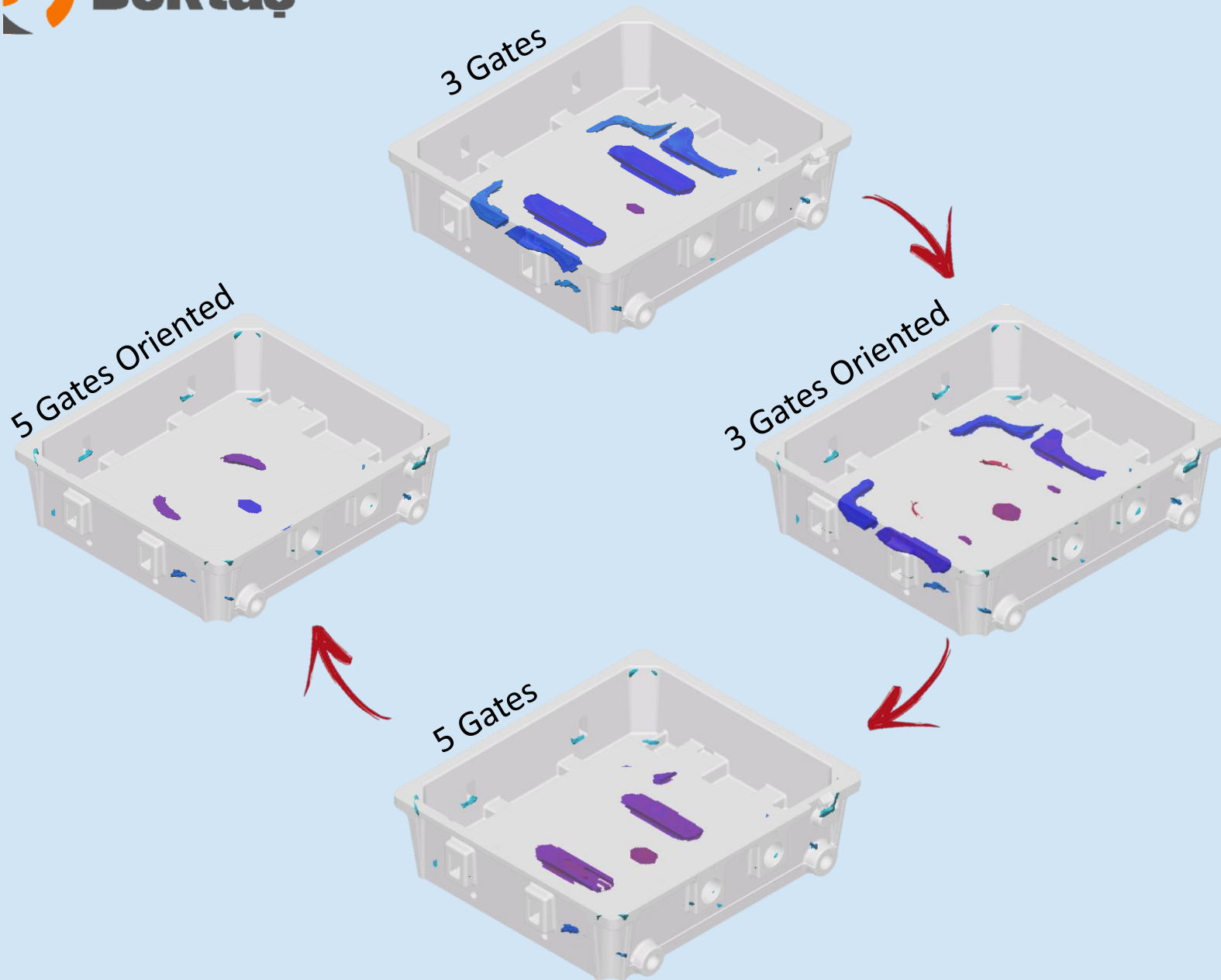
**Bottom Die
Cooling System**

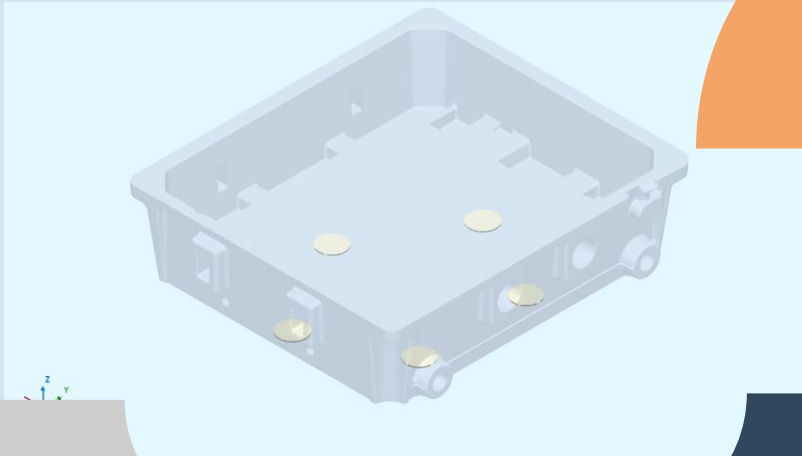
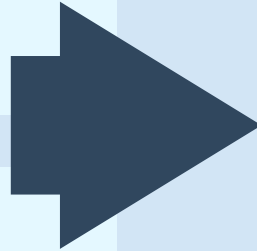
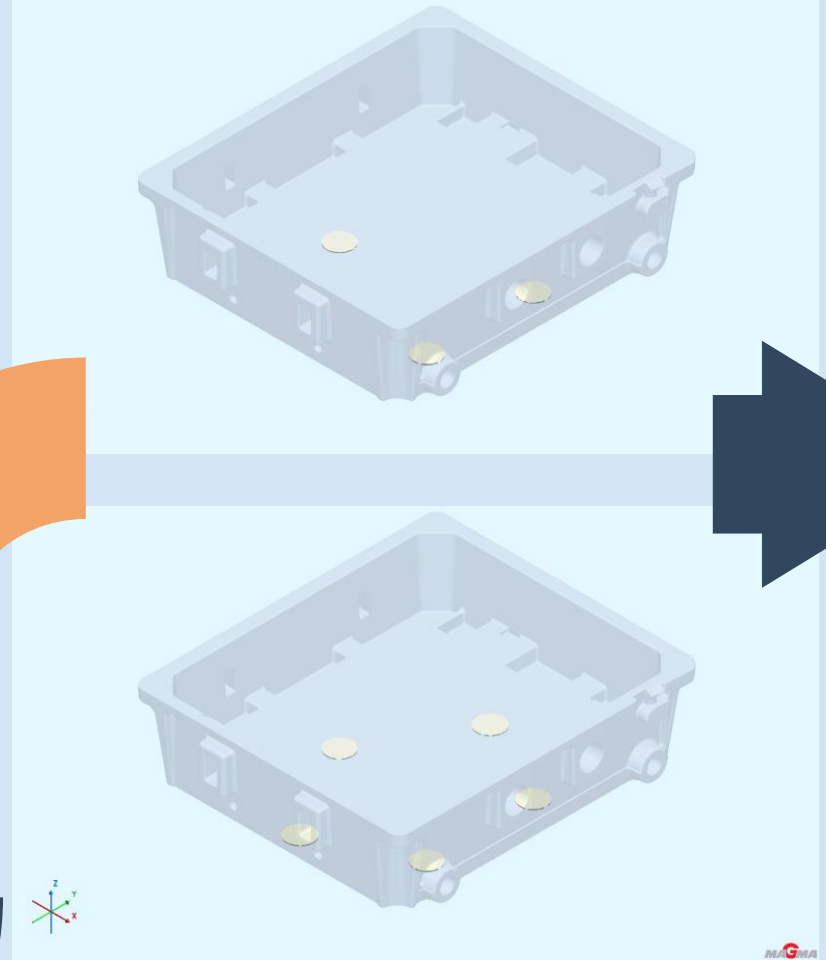
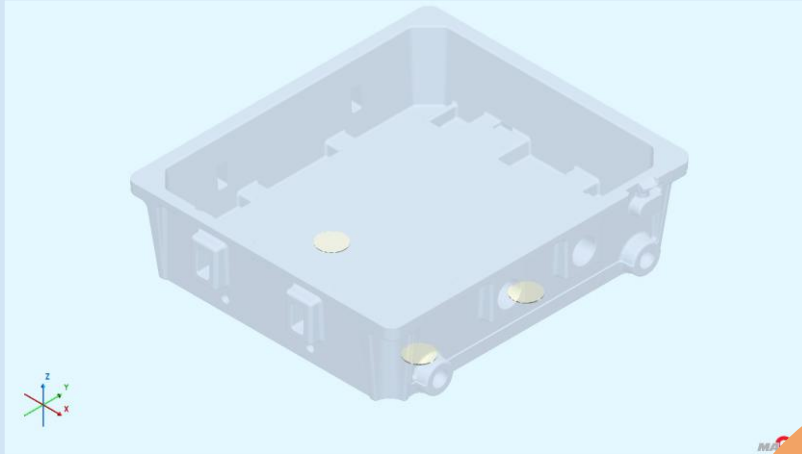
Old cooling
type



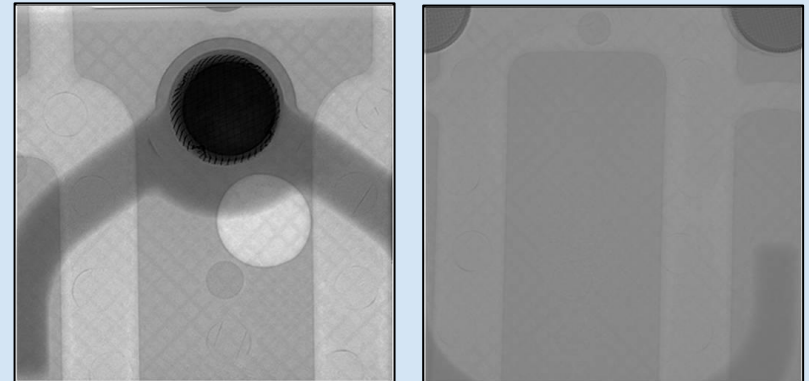
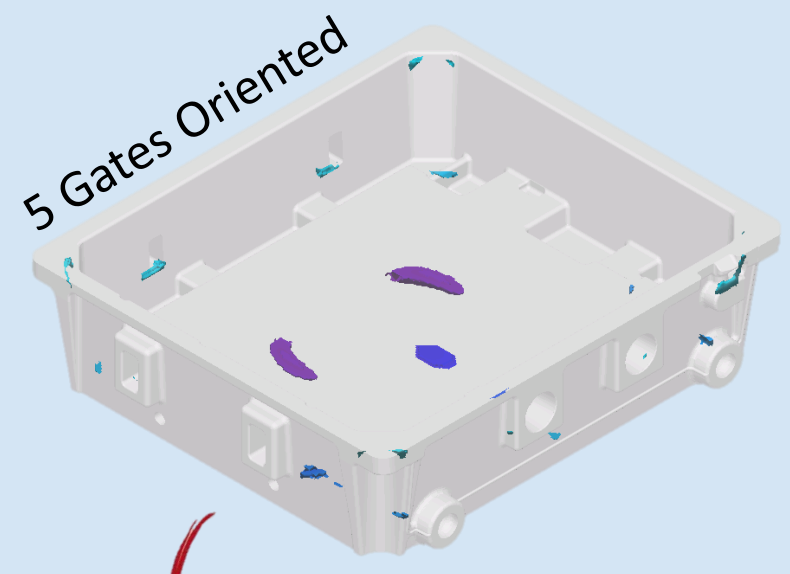
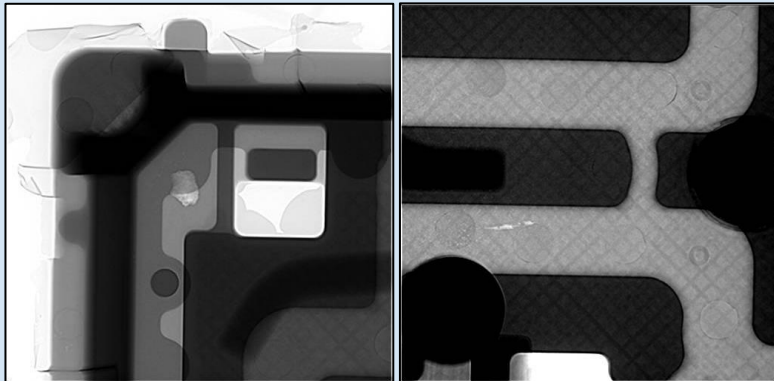
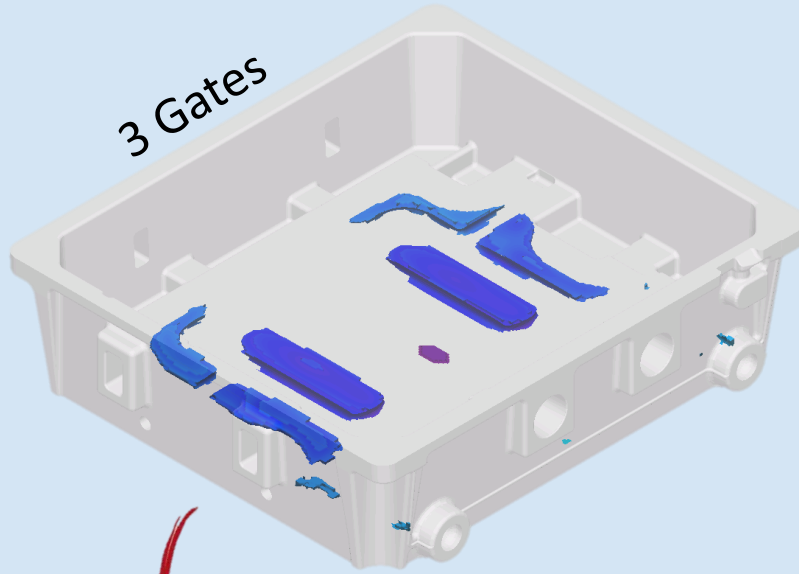
Improved
Cooling type







Filling animation



Thanks for listening...

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