Suitable Production of thin walled Aluminum Prototype and Small Series Castings for Body in White Applications

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Company Information
Grunewald

Founded 1963
Employees 225
Production Sites 6
Locations 5

Main Business Units
- Casting Production
- Tooling (Automotive, Aerospace)
- NC-Machining
- Assembly

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Company Profile

Casting

NC-Processing

Aerospace Tooling and Assembly

Automotive Tooling

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Starting Point - Requirements
Body in White Concept

Daimler AG, SL-Class: Percentage of Materials
Body in White Concept

• 34 Vacuum High Pressure Die Castings
• 2 Low Pressure Die Castings

Total weight of Castings: 110kg

Daimler AG, SL-Class: Castings

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Body in White Concept

Mercedes-Benz AMG, SLS
Starting Point - Requirements

Protoype and Pre-Series Casting Production

1. High Pressure Die Casting Geometry
2. Specified Wall Thicknesses and Tolerances according to Reference Point System (RPS)
3. Mechanical Properties equivalent to Series
4. Economical and in Time Production
Contents

Integrated Casting Product and Process Development
CAE - Development

process parameter

mechanical properties

thermal properties

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CAE - Numerical Casting Simulation

Low Pressure Sand Casting

High Pressure Die Casting
Process Tolerances

Process Flow and Dependencies

Machining → Post processing → Heat treatment → Foundry → Pattern shop

Quality control

Mechanical properties

RPS System

Dimensional tolerances

Product

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Moulding and Casting Process
• Rapid Prototyping, Qualified Master Casting (QMC)
• Low Pressure Sand Casting
Rapid Prototyping and QMC

Selective Laser Sintering of a Polystyrene “lost Model”

Principle of Qualified Master Casting (QMC)

Polystyrene Model → Gating + Feeding System → Moulding → Casting
Rapid Prototyping and QMC

Metrology of Polystyrene Model
Qualified Master Casting - QMC

Metrology of Raw Casting
Pattern Design

CAD-Design of the Pattern, Example C-Pillar
Pattern Making

Manual Finishing after NC-Processing
Foto: xxx

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Mould Production

Moulding

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Low Pressure Sand Casting

Low Pressure Casting Technique
- Crucible Volume 300 kg Al, 2 changeable Crucibles
- Dynamic Pressure Control
- Core Block - Sand Casting
Heat Treatment

Heat Treatment and Quenching
Water and Air
Accuracy +/- 1K

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Blasting Cabin
NC – Machines (examples)

1.800 x 2.100 x 1.250 mm

1000 x 800 x 500 mm

NC – finished Part Processing
Assembly of e.g. Helicoils and Add-On Parts
Pre-Series Casting

Mercedes-Benz AMG, SLS – Roof Component

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Pre-Series Casting

Mercedes-Benz AMG, SLS – Door Component
Pre-Series Casting

Daimler AG, SL – Roof Component
Pre-Series Casting

Daimler AG, SL – C-Pillar

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Pre-Series Casting

Daimler AG, SL – Window Frame

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Pre-Series Casting

Daimler AG, SL – Crossbeam

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Prototype Casting

Body In White Joint, E-Car Application
Contents

Summary and Perspectives
Components: A-, B-, C-Pillars, Window Frames, Roof Components, Joint Components, Doors, Tail Gates, others

Part Dimensions: up to ca. 1500mm x 1200mm x 400mm

Geometrical Accuracy: +/- 0,8mm (Raw Part)

Wall Dimensions: > 2mm (+0,4mm/-0,2mm)

Casting Techniques: Sand Casting, Low Pressure Sand Casting, QMC Prototype Casting on Basis of Laser sintered Rapid Prototyping Polystyrene Models or Sand printed Moulds

Melting Capacity: ca. 300kg – 1000kg, Prototype Volumes are possible

Moulding Material: Cold-Box, Pep-Set, Furan Resin Sand, others

Surface Finish: correspondent to Moulding Material

Surface Treatment: Passivation, KTL, Ni-Plating, others

Tool Life Time: Plastic Tools 1 – 30000 (Material dependend, incl. Maintenance), Metal Tools x – 100.000 (Material dependend, incl. Maintenance)

Production Capacity: 1 - ca. 5000 Castings per Year
Cost Effectiveness

Low Pressure Sand Casting (LPSC) / High Pressure Die Casting (HPDC)
Thank you for your Attention.

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