Continental
The Future in Motion

Evolution in Production

Continental Engineering Services
Additives Design and Manufacturing (ADaM)

www.conti-engineering.com

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Engineering
Services

What is Additive Manufacturing?

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Wikipedia:

3D printing, also known as **additive manufacturing (AM)**, refers to processes used to create a **three-dimensional object** in which layers of material are formed under computer control to create an object.

Objects can be of almost **any shape or geometry** …
… 3D printing or AM builds a three-dimensional object from computer-aided design (CAD) model … by successively **adding material layer by layer**.

CES as part of Continental,
we are familiar with technologies of four divisions

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Continental Engineering Services **Competence Center ADaM**

Chassis & Safety

› Vehicle Dynamics
› Hydraulic Brake Systems
› Passive Safety & Sensory
› Advanced Driver Assistance Systems (ADAS)

Interior

› Instrumentation & Driver HMI
› Infotainment & Connectivity
› Body & Security
› Commercial Vehicles & Aftermarket
› Intelligent Transportation Systems

Powertrain

› Engine Systems
› Transmission
› Hybrid Electric Vehicle
› Sensors & Actuators
› Fuel Supply

Automotive Group

ContiTech

› Air Spring Systems
› Benecke-Kaliko Group
› Compounding Technology
› Conveyor Belt Group
› Elastomer Coatings
› Fluid Technology Power
› Transmission Group
› Vibration Control

Tires

› PLT, Original Equipment
› PLT, Repl. Business, EMEA
› PLT, Repl. Business, The Americas
› PLT, Repl. Business, Asia Pacific
› Commercial Vehicle Tires
› Two Wheel Tires

Rubber Group

Continental

CES – Product Solutions
Service Portfolio

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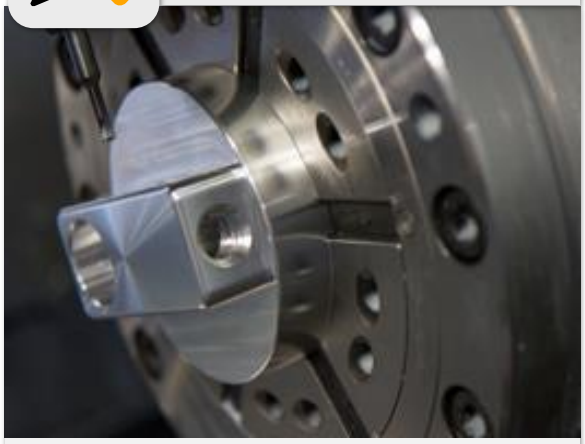
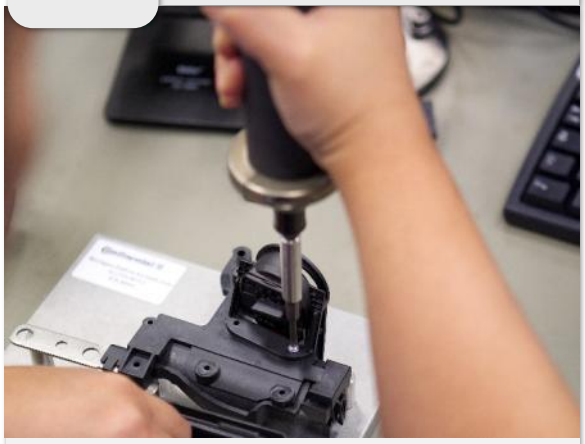
Samples & Parts



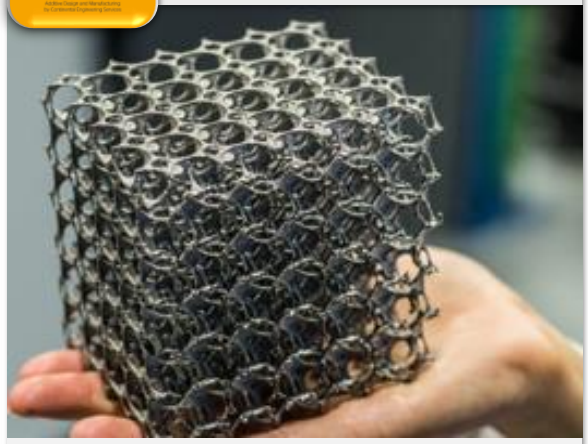
- A/B/C-Samples
- Production of parts
- Technology consulting
- Fairs & Events service

Small Series Manufacture



- Manual and semi-automated assembly of:
  - Automotive and industrial (niche) products
  - Temporary ramp up support and spare parts

Additive Design & Manufacturing



- Additive Design & Engineering
- Production and Testing
- Consulting

Competence Center ADaM Karben

Competences from Development up to Series

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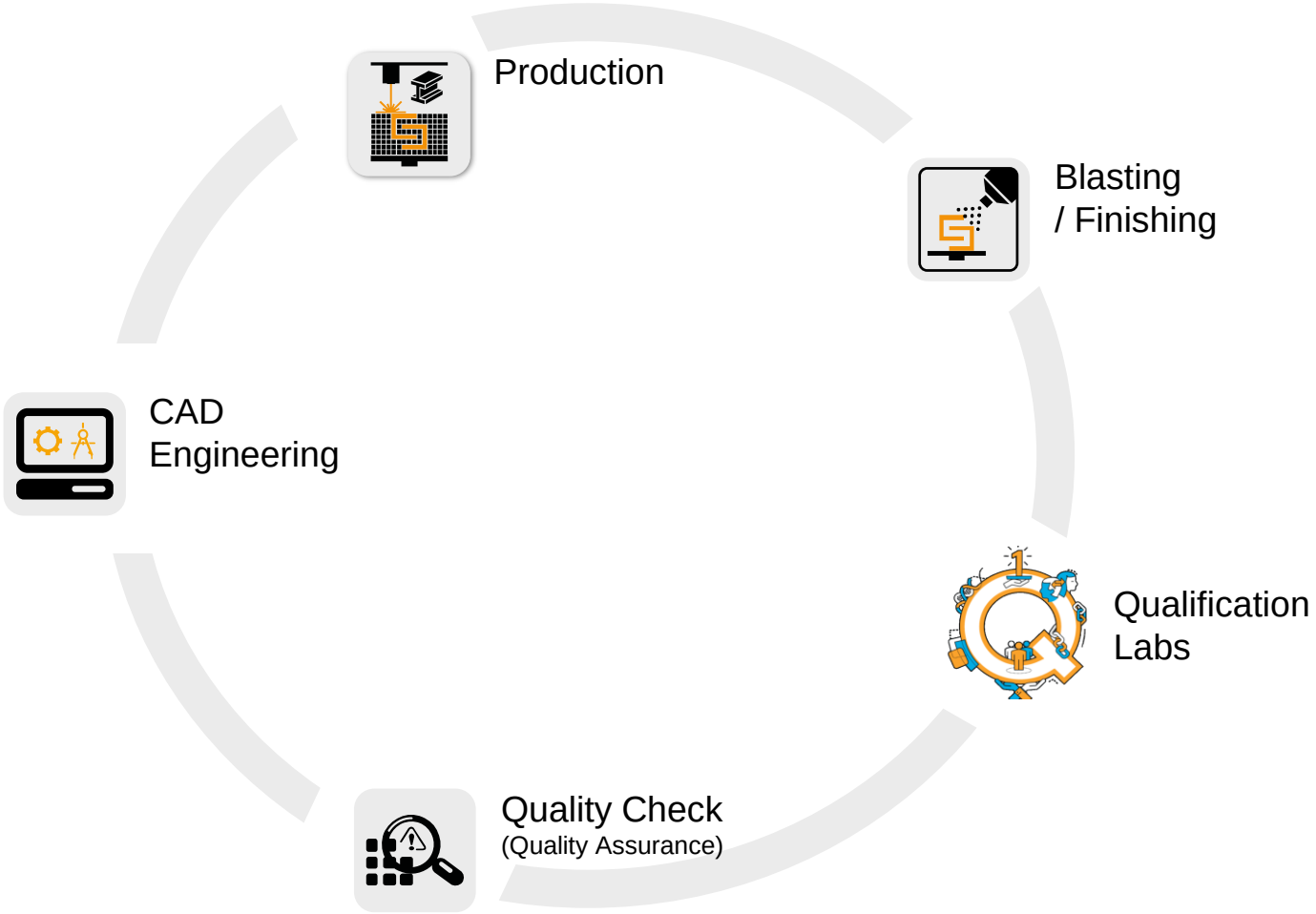

Quality processes according to Continental standard

CES Product Solutions
In Numbers

Production Space
8.000 m²

More than
200 Projects
per year with
30.000 Samples
20 Small Series

200
Employees

5 Locations:

40 years of
Experience

1996
First SLA Machine

ISO TS 16949: 2009
Certification

ADaM Fab
Plant Karben

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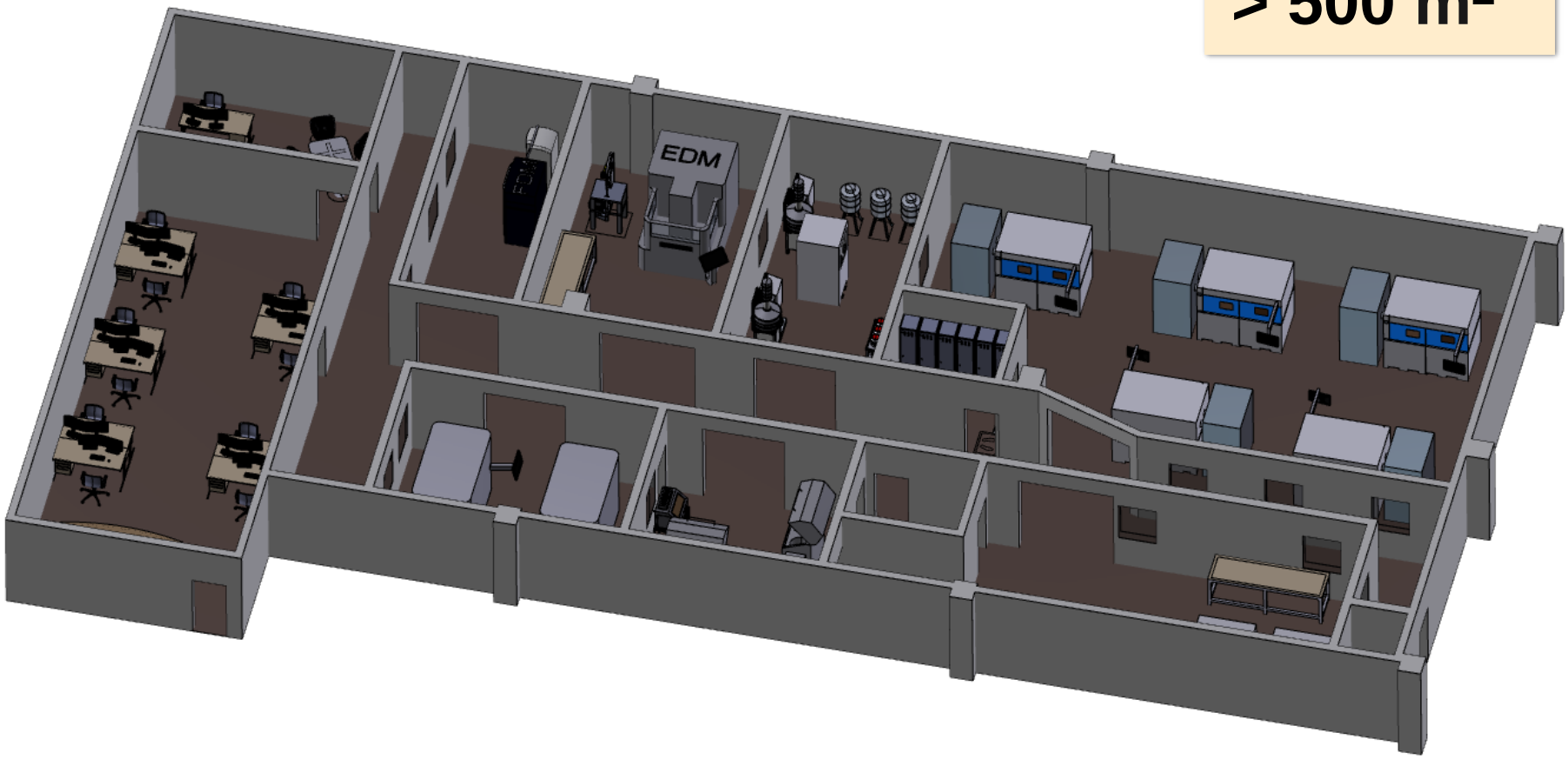
Reconstruction of
> 500 m²



Additive Manufacturing Technology Park
Available Technologies – our ADaM Family

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3D Printing	+	SLA	+	FDM
Since 2006		**Since 2014**		**Since 2016**

Additive Manufacturing Technology Park

Available Technologies – our ADaM Family

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2 x

SLM (Metal)

1 x

FDM

1 x

SLS

New in 2017

Technologies for Professional Additive Manufacturing

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Laser Melting (SLM)

Production of metal parts

out of metal powder

Possible materials:

- Aluminum (e.g. AlSi10Mg)
- Maraging Steel
- Stainless Steel
- Nickel Alloy
- Cobalt Chrome
- Titanium

Laser Sintering (SLS)

Production of plastic parts

out of plastic powder

Possible materials:

With or w/o e.g. GF, different colors:

- PA 6
- PA 11 / PA 12
- Polystyrol
- PEEK

Stereolithography (SLA)

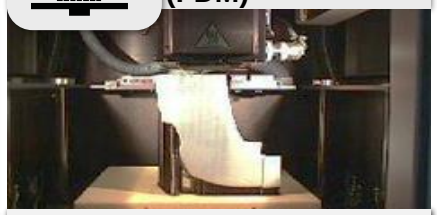
Production of plastic parts

out of photopolymerization

Possible materials:

- Photopolymer
- Synthetic resin
- Epoxy resin

Fused Deposition Modeling (FDM)



Production of plastic parts

out of filament

Possible materials:

- ABS
- ABS-ESD
- ULTEM
- ASA
- PC
- Nylon

Technologies for Professional Additive Manufacturing

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Laser Melting (SLM)

Advantages:

- Mechanical properties original
- Complex design possible
- No additional cost for tooling
- Fast and flexible
- internal Structures (like cooling channels) possible to implement
- Series intend, fully functional

- **Support domes**
- **Surface might be rough**

Laser Sintering (SLS)

Advantages:

- Mechanical properties original
- Complex design possible
- No additional cost for tooling
- Fast and flexible
- Series intend, fully functional

- **Surface might be rough**

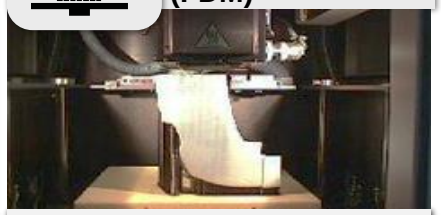
Stereolithography (SLA)

Advantages:

- Excellent surface
- Excellent geometric properties
- Fast and flexible
- Basis for vacuum casting

- **Support domes**
- **UV sensitive**
- **Not series intend**

Fused Deposition Modeling (FDM)



Advantages:

- ESD compatible
- High performance plastics
- Easy to handle
- No supports

- **Conjunction between layers**
- **Surface might be rough**

Possible Applications

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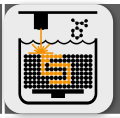
	 SLM	 SLS	 SLA	 FDM
Master form for Vacuum casting			✓	✓
A – Samples / Prototypes	✓	✓	✓	✓
B - Samples	✓	✓		✓
C – Samples / Series parts	✓	✓		✓
Production- and Testequipment	✓	✓		✓
Tools	✓			✓
Spare Parts	✓	✓		✓

Additive Design and Manufacturing @ Product Solutions

Combination between Additive and other technologies

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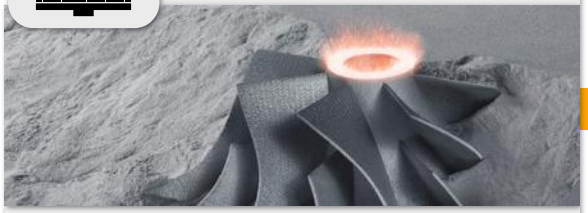
Laser Melting (SLM)



Production of metal parts

out of metal powder

Possible materials:

- Aluminum (e.g. AlSi10Mg)
- Maraging Steel
- Stainless Steel
- Nickel Alloy
- Cobalt Chrome
- Titanium

Technology examples

CNC Turning

CNC Milling

Laser Welding

- Best production technology for each individual part
- Combination of different technologies to optimize: Quality, cost, timing

Projects examples

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Brake caliper

Technology : SLM
Material : AlSi10Mg
Post Processing : sand blasting

→ Reduction of prototypes manufacturing time and cost

Projects examples

Powertrain Housing

Technology : SLM
Material : AlSi10Mg
Post Processing : sand blasting

Reduction of prototypes manufacturing time and cost

Projects examples

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Battery Cooling module

Exhibited at the IAA in 2017

Air flow Control
Technology : SLA
Material : Epoxy resin
Post Processing : polishing & painting

Frame
Technology : SLM
Material : AlSi10Mg
Post Processing : polishing & painting

→ Visual prototype of the definitive design

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Battery Cooling module

Technology : SLM
Material : AlSi10Mg
Post Processing : sand blasting

Integration of the cooling channel
No tooling cost

Projects examples

Pipe pieces

Technology : SLM
Material : 1,4404 / 316L
Post Processing : sand blasting

Serial Production
- small part
- few material
- no tooling cost

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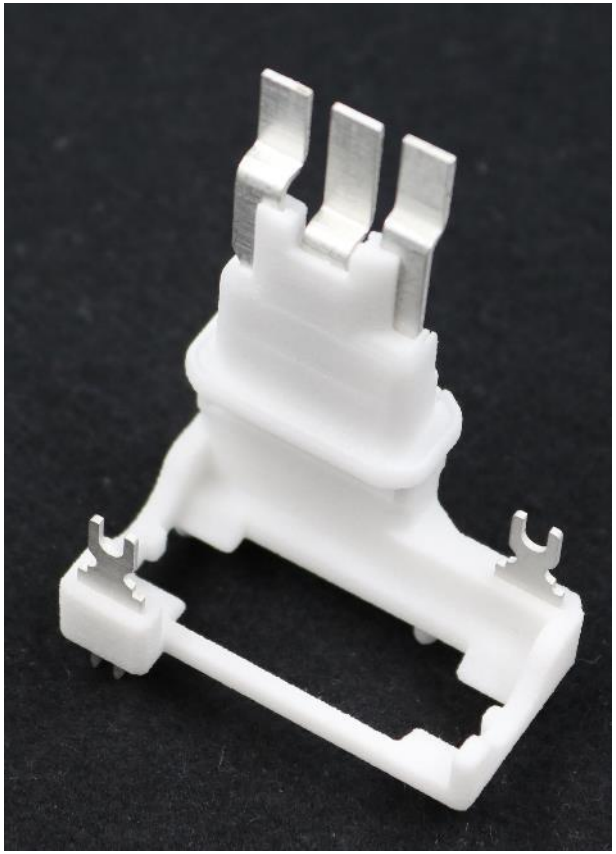
Blister manufacturing

Technology: SLS & Thermo forming
Material: PA 12 & ESD

Blister manufacturing up to 1000 pcs.

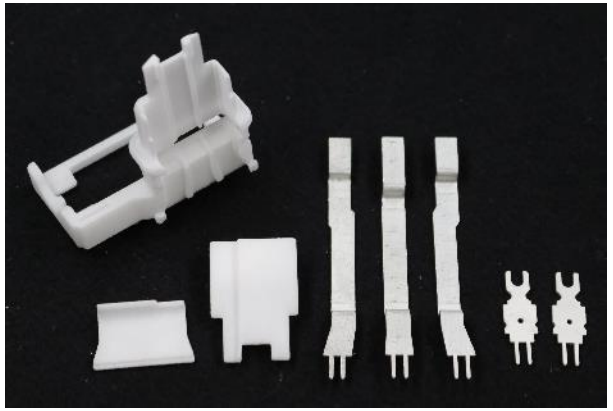
Projects examples

Electrical plug



Technology : SLS
Material : PA 12
Post Processing : gluing

→ Integration of the electrical contacts



ADaM: Summary
What are we doing?

ADaM

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Production Technologies


FDM


Stereo Lithography


SLM


Cutting


Vacuum Casting


SLS


Machining

Service


Blasting / Finishing


Painting / Finishing


CAD Engineering


Reverse Engineering


Quality Check
(Quality Assurance)


Project Management

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Phase II

Additive Manufacturing & Industry 4.0

Contact

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Additive Design and Manufacturing

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