



Selektives Laserschnelzen von Metallen auf dem Weg om Prototypen zur Serienfertigung Neueste Entwicklungen und

technisches Update

Präser tiert von Stefan Ritt Export, Sales und Marketing Manager SLM Solutions GmbH 6. Merseburger Rapid Prototyping Forum















Privately owned German Ltd. (GmbH)
500.000 Euro listed min. capital
13 Mio. Euro turnover in 2011

- 3.100 sqm floor space
- **50+ employees**
- Average time in comp. > 10 years
- 25+ machines anual production
- 100+ tons anual consumables sales
- 55 years of market experience





2007-

2009-

2011-

2012-









Manufacturing Solutions GmbH Science Life -Invention of "the root SLM process" by Krupp, Essen 1994-1997 Basic Research F&S, Trumpf and 1995-1998 Fraunhofer ILT 1998-2002 &S Resea rch leading to IP &S / MCP partner to develop, produce and market the SLM Technology to industrial needs and requirements 2003-Launch of Fibre Laser technology with the MCP SLM 250 2006 -Launch of SLM 100

Launch of the 400 Watt technology

Launch of SLM 250^{HL}

Launch of SLM 125^{HL} and SLM 280^{HL} Launch of SLM 500^{HL}

Launch of (semi) automated handling devices











Features

- Standard:
- Heated platform with cool down procedure
- 125 x 125 x 125 mm
- 250 x 250 x 250(350)mm
- 280 x 280 x 350 mm
- Build envelope reduction:
- 50x50 mm
- 100x100 mm

Advantage:

•Usage of smaller powder volumes (e.g. precious metals)
•Simple substrate plates

Build Platform











- Science Life Manufacturing Solutions GmbH
- Build Envelope 125x125x 75 (125)mm
- Build Envelope reduction 50x50x50 mm
- Device requires a small foot print
- Dimensions 1800x1000x800mm
- 100-200 Watts
- Optimized powder handling for smaller heights









Overview SLM 250^{HL}

- Build volume 250 x 250 x 250 (350) [mm]
- Fibre laser (100 W), 200 W oder 400 W
- Focal point 60 µm 300 µ
- Layerthickness 20 μm 100 μm
- Building speed 25 cm³/h
- Platform / eating ~200°C
- Inert gas, Argon 4.6, 5 bar, max. 3 l/min
- Laser ptics cooled with water and pressured air
- Automatic fire extinguishing device
- Closed-loop powder cycle
- Layer by Layer control system (LCS)
- User-friendly system control













Features

- **Closed-loop powder cycle for reactive** materials
- Manual filling of the recoater possible
- Safe powder handling



Prozess Chamber Door with Protective Gloves











Features

- Large powder storage for building processes up to 350mm
 - iert gas atmosphere
 - **Dustfree filling**
- Closed-loop powder handling
- Manual / automatic dispensing of powder into the recoater tank

Main Powder Tank









- Recyclable filtration inlets
 - Rinsing station (Optional with sink unit and vacuum device)
 - Changing of filtration units during the building process





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- Silicone wiper blade
 - Possibility of none supported
 - sophisticated structures
 - Easy calibration / reduced setuptimes
 - Minimum wear costs
 - **Double loader principle**
 - Recoating in two directions
 - Recoating "on the fly"
- Automatic powder handling
- Display and recording of filling levels
 Unique Recoating
 System













Advantage of the use of Bi-Directional Recoating

One direction recoating

Building time: ~5h Man. Costs: ~750€





Marine propelling screw AlSi12 / 350Watts / 50µm Layerthickness X/Y: 100mm, Z: 70mm

Two direction recoating

Building time: ~**3,5h** Man. Costs: ~**600€**

Science - Life -	Manufacturing Solution SLM125HL	SLM250HL
Capacity	100 ~ 115 units / 30 μm	400 ~ 460 units / 30 μm
Build time	4,75 h (19 h / 460 units)	15,9 h
Hourly rate	~ 55,€	~ 75, €
Material cost per unit	~ 0,50 €	~ 0,50 €
Production cost per unit	~ 2,80 €	~ 3,10 €
	e use of Brecoating	<image/>

















Ref.- Point Clamping System (e.g. EWORA ITS, R3)



Sa









Mounting of four prefabricated cores on **building platform Precise individual** positioning of layer data to mounted cores via LCS+ **Economic hybrid** manufacturing **Interface between Rapid Manufacturing / Conventional Tooling**

Hybrid manufacturing









Science -

Life -



SI



Latest SLM 280HL

Buildvolume 280 x 280 x 350 [mm]
400 W AND 1000 W Fibrelaser
Increased productivity
Laserfocus 100 µm / 700 µm
New 3 D optics without F-Theta lens
no thermal shift
Layer thickness 20 µm – 100 µm

All "250"-options available

Details











Part 20x20x20mm Scan distance savings 800m 1600 seconds time saving compared with single laser Approx. 3 times conv. Speed, up to 5 times productivity









by the end of 2012





Ti (cp), TiAl6Nb7, TiAl6V4, CoCrMo, H13 tool steel, stainless steel, aluminum, Inconell ...



- Protection of in-house material know-how
- Widest flexibility of material usage and supply chanals
- Featuring quality as a f(x) of tensile strength, density, surface finish
- Reduction of time of individual alloys, developments and parameter optimisation SLM AutoFab – Material Development Modul













Material: H13 / 1.2344 tool steel **Smart Structures**

density gain by improved melting strategy, D>99.9%

- helium leak test fulfilled up to 6x10⁻¹⁰ mbar
- UHV compatible
- simultaneous growth of dense and porous regions







Manufacturing Solutions Gmb-Life -**Science**



- **Re-designed aircraft** bracket
- Height 342mm
- Material: Al and Ti
- 41:23h

lightweight parts substitution of solid mass to boost production **Engineered** materials



Build time for two parts: Smart (internal) Original design **Structures and Designs**







- Re-designed automotive part
- Height 320mm
- Material: Al
- Build time: 88:16h



SLM

Large Structures and Designs

























Now what do you think?

Can SLM-Technology fulfill your expectations?