ALL IN 1: Laser Deposition Welding & Milling

Additive Manufacturing in Milling quality
SAUER LASERTEC, a member of the DMG MORI SEIKI AG, integrates for the first time the additive manufacturing into a high-tech 5-axis milling machine. This innovative hybrid-solution combines the flexibility of the laser deposition welding with the precision of milling in one machine.

The process uses the metal deposition by powder nozzle, which allows the complete machining of nearly all materials without process-chamber and up to 20-times faster than the generation in the powder bed. In addition overhanging contours are feasible without the need of a backing geometry.

This opens up totally new applications and geometries. Especially large workpieces are now possible to be machined in an economical way. The flexible change between laser and milling operation allows the direct finishing machining of sections which are not reachable anymore at the finished part.
**Working principle – Laser-Deposition-Welding**

The metal powder is welded to the basic material in layers (non-porous and crack-free melting). Thereby the metal powder is joining up with the surface in a high strength connection. A coaxial shielding-gas protects against oxidation during the build-up process. After cooling the metal layers can be machined mechanically.

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### Highlights

- The flexibility of the generative manufacturing via laser powder nozzle is combined with the precision of the cutting technology (milling)
- The workpiece can be built up in several steps; intermediate milling operations are possible
- Laser deposition welding with powder nozzle: 20-times faster vs. powder-bed-process
- Machining of complete, also large workpieces
- 3D-geometries with undercuts realizable
- Repair of turbine and mould components, generation of wear resistant coatings

### Materials

- Stainless steel
- Tool steel
- Aluminum and aluminium alloys
- Chrome-Cobalt-Molybdenum alloys
- Brass alloys
- Noble metal alloys
- Nickel-base alloys
- Copper alloys
- Stellite
The most important target market segments

Additive Manufacturing in Milling quality for Production, Repair, Coating.

**Machining of complete parts**
- Prototypes
- Small series
- Large workpieces
- Integral parts
- Lightweight-components
- Complex parts with undercuts

**Repair**
- Repair of Die & Mould components
- Repair of turbine components made from Inconel, e.g. blade tips, casings

**Coatings**
Partial or complete coatings (technical and wear resistant):
1) Mould Making
2) Off Shore
3) Engineering
4) Medical

**Highlights LASERTEC 65 Additive Manufacturing**
- MILL + LASER: Full 5-axis milling machine from DECKEL MAHO in stable monoBLOCK®-design; flexible integration of a laser head by HSK-interface
- Complete machining with fully automated change between milling and laser operation
- Large working room for workpieces up to ø 650 mm, 360 mm height and max. 1.000 kg
- Accessibility and ergonomics: Doorway 1.430 mm, optimal accessibility from the front
- Lowest space requirement with 7,5 m² footprint
Additive Manufacturing with powder nozzle // Benefits

+ Complete machining without process-chamber (realizable with most materials) up to 20 times faster than the generation in the powder bed
+ Wall thickness from 0.1 mm to 5 mm possible (depending on laser and nozzle geometry)
+ Feasibility of 3D-contours without backing geometry: e.g. machining of a flange, cone
+ The flexible change between laser and milling operation allows the direct finishing of sections which are not reachable anymore at the finished part

The complete generation of a 3D-part:

1: Basic set-up of the cylindric ring
2: 90° swivel: Generation of the flange
3: 90° swivel: Milling of the plane surface and the outer contour
4: Drilling of the flange
5: Continuation of the cylinder generation
6: Build-up of the crossover section
7: Laser construction of the conical funnel
8: Generation of the second flange
9: Manufacturing of the 12 connectors
10: Milling of the connectors
11: Milling of the flange and the inner contour
12: Milling of the inner circular pockets

Turbine housing
Material: Stainless steel
Laser Deposition Welding: 230 min.
Milling: 76 min.
Unique hybride solution with USP’s.

Highly dynamic machine
- Full 5-axis milling machine in stable monoBLOCK®-design
- Large working room for workpieces up to ø 650 mm, 360 mm height and max. 1.000 kg
- Doorway 1.430 mm, optimal accessibility from the front
- Only 7,5 m² footprint

3D-Laser Deposition Welding
- Integration of the laser head via HSK-interface into the spindle
- Integrated changer mechanism inside the working room
- Laser source: 2 kW diode laser in the standard (selectable according to application)
- Automatic change between laser and milling machining

5-Axis-Milling
- Possibility of milling between the alternating laser build-up process
- Best possible surface qualities and part accuracies
- Manufacturing of parts in milling quality

Exhibition performance in 2014:
18. 02. – 22. 02. 2014: DMG MORI SEIKI OPEN HOUSE, Pfronten
11. 03. – 15. 03. 2014: METAV, Düsseldorf
08. 09. – 13. 09. 2014: IMTS, Chicago
30. 10. – 04. 11. 2014: JIMTOF, Tokyo
25. 11. – 28. 11. 2014: EUROMOLD, Frankfurt

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