





OPENHYBRID

SMART Powder Cladding Head

Wire Cladding Head

Scanning Head





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SMART Powder Cladding Head

Wire Cladding Head



Scanning Head







- SMART powder cladding head used into the Mikron Mill P 800 U DED
- All required media are supplied by the S7 Ambit







- The interface between head and the dock includes:
 - Optical port
 - Powder ports
 - Gripper
 - Water cooling
 - High pressure gas ports (up to 20 bar)
 - Low pressure gas ports (up to 10 bar)
 - Electrical connectors
 - Tool detection
 - Mechanical alignment
 - Shutter to cover optical port



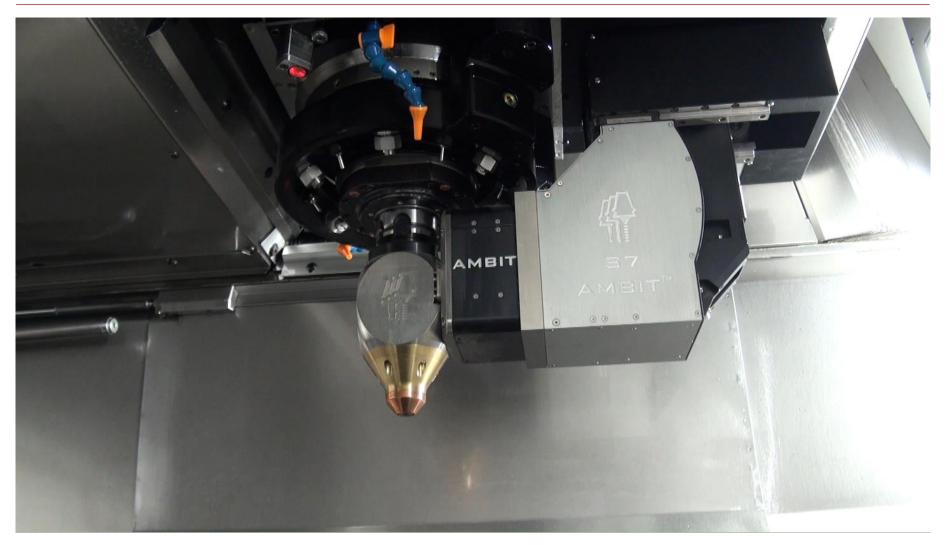


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- HMT heads fits into a tool carousel
- Availability of conventional tools and additive tools in one machine setup
- Milling spindle picks up all tools



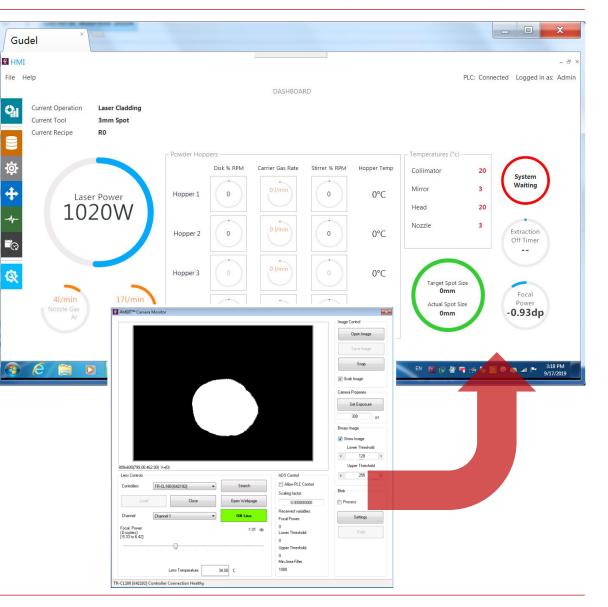






Live Monitoring of

- laser power
- nozzle gas flow
- shield gas flow
- powder hopper data
- temperatures of the cladding head and optical train
- status of cladding head
- size of melt pool
- Data can be seen on mobile device
- System is ready for Industry 4.0



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Recipe PLC ID 0 Both Laser Recipe R0 Laser Program 0 \$ Laser Program 0 \$ Laser Camera Disk % Carrier Gas Stirrer % Hopper R0M Camera 0 \$ <	1mm Spot (2)									
R0 Laser Power (W) 0 ‡ Laser On Delay (s) 0 ‡ Laser Program 0 ‡ Laser Program 0 ‡ Camera Disk % Activate Monitoring 0 ‡ Min Laser Power (W) 0 ‡ Min Laser Power (W) 0 ‡ Min Spot Size (mm) 00 ‡ Min Spot Size (mm) 00 ‡ Low Threshold 0 ‡ Laser Cladding Laser Drilling		Recipe PLC ID	0							
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Laser Cladding Laser Drilling		Min Spot Size (mm)	0.0 🔹 Max Spot Size (mm)		Powder On Delay (s)	0	÷			
Laser Drilling		Low Threshold		0 ‡	Extraction Off Delay (s)	0	‡ Axis F	aed Rate (mr	m/min)	0 ‡
	Laser Cladding	Exposure Time (ms)	0 ‡							
Laser Heat Treatment	Laser Drilling									
	Laser Heat Treatment									



Wire Cladding Head

Scanning Head

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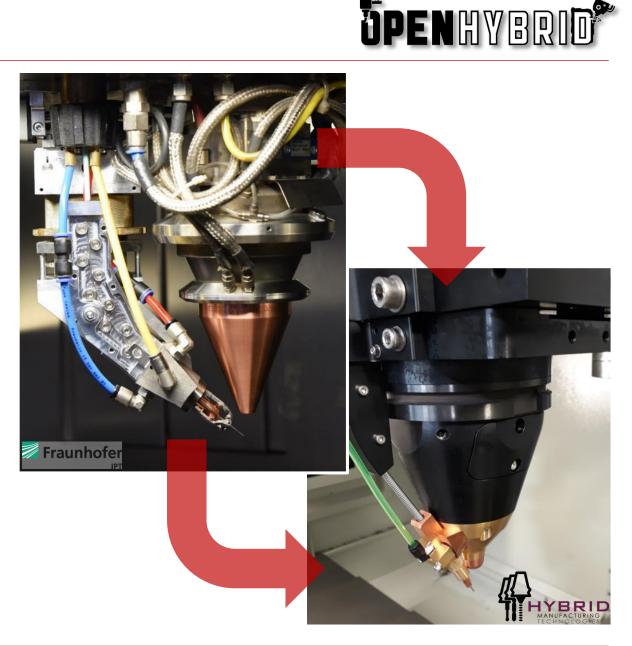








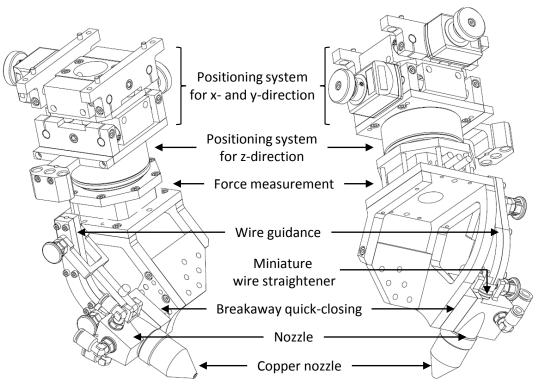
- How to get the wire precisely from spool to the melt pool?
- Investigation on
 - wire straightening
 - forces during feeding
 - bending curves and behavior of the wire
 - friction in the guidance
 - positioning in relation to the melt pool







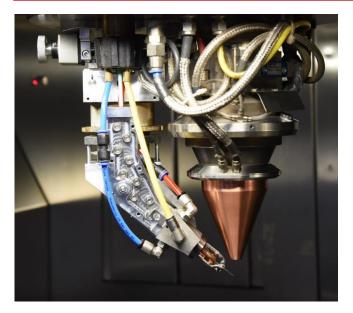




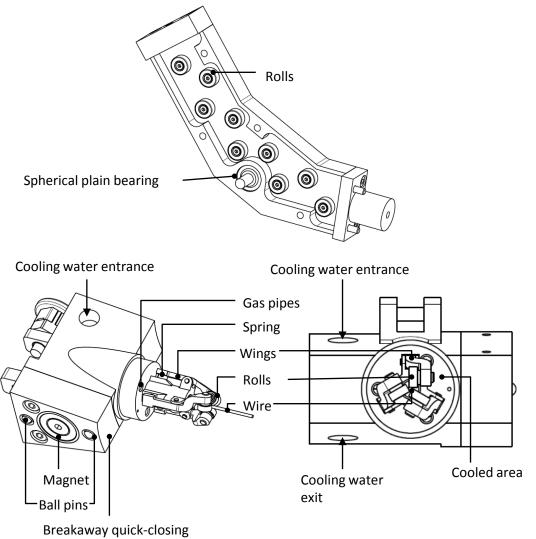
- Development of wire feeding system and wire arm IPT-Mk1
- High accurate positioning in three directions
- Force measurement system integrated
- Breakaway quick-closing to avoid damages and conventional wire guidance





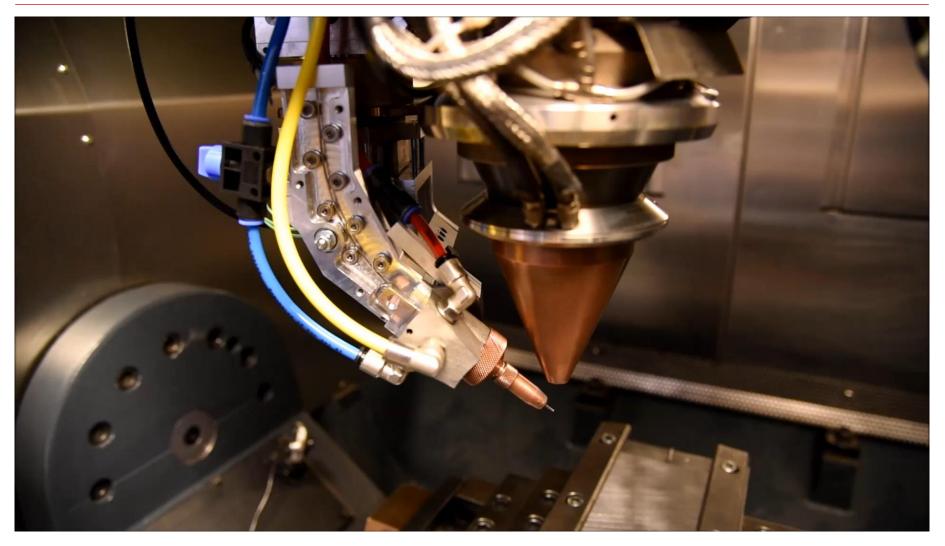


- Development of wire arm IPT-Mk2
- Improvement of wire guidance with roll-guidance
- Improvement of wear behavior at the wire nozzle





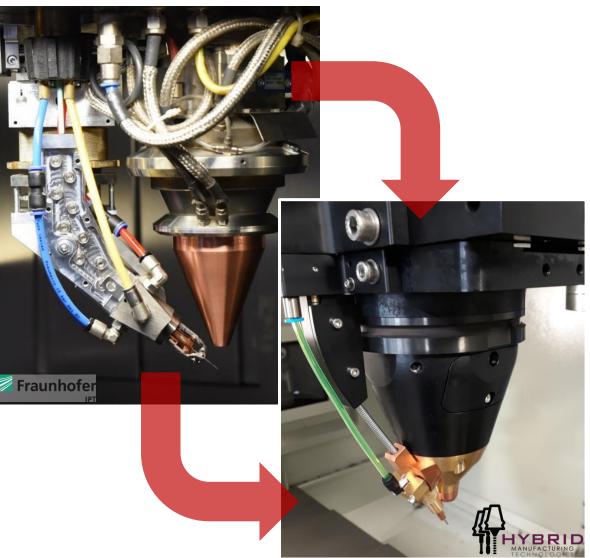






- The wire arm
 IPT-Mk2 allows detailed process
 investigations, but is not dockable
- A dock-able head has
 - to be more compact to fit into a tool changer
 - to combine wire arm and optics
 - to be robust
 - to be operator friendly
 - to be omnidirectional

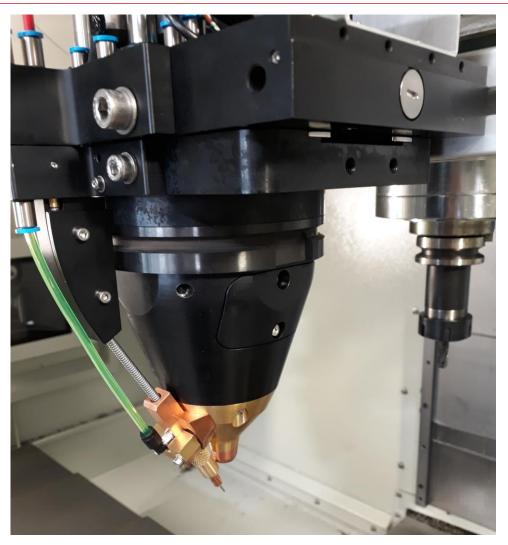






- Compact wire feed head for HMT S8 docking interface
- Integrated side wire arm with shielding gas nozzle
- Additional shielding gas coaxial to optical axis

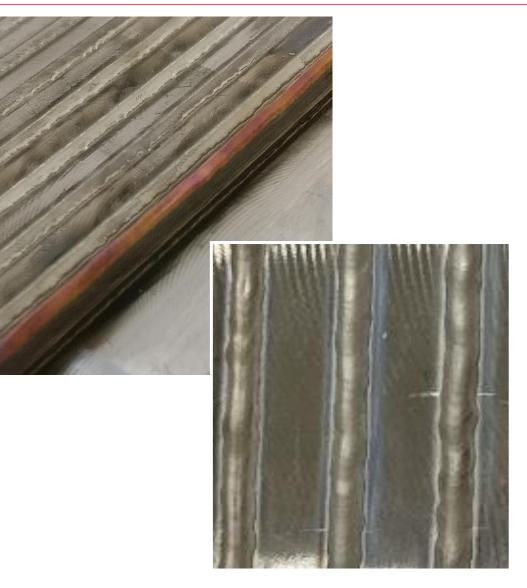






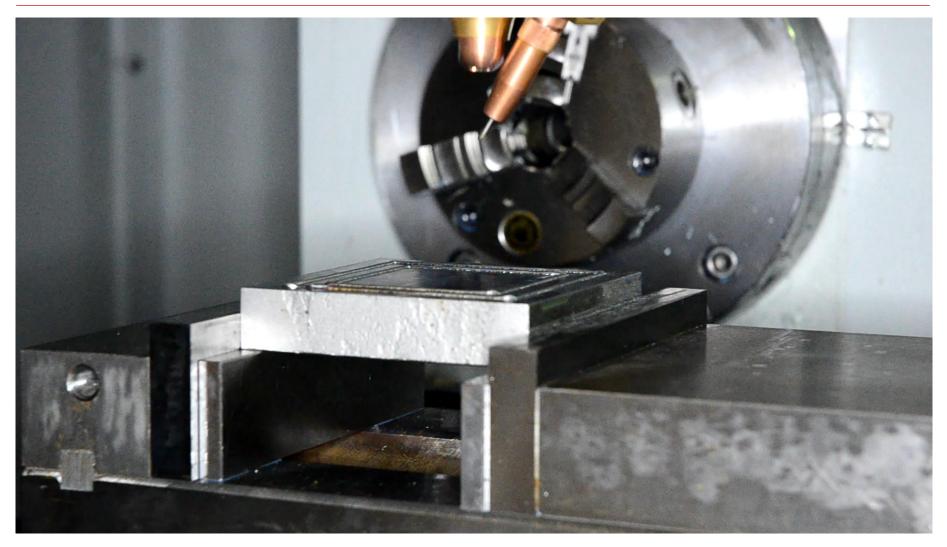
- Clean cladding process due to
 - no overspray
 - no hazardous powder dust
- Stable process
- No porosity
- Thin walled structures are possible
- Up to 100%
 material efficiency







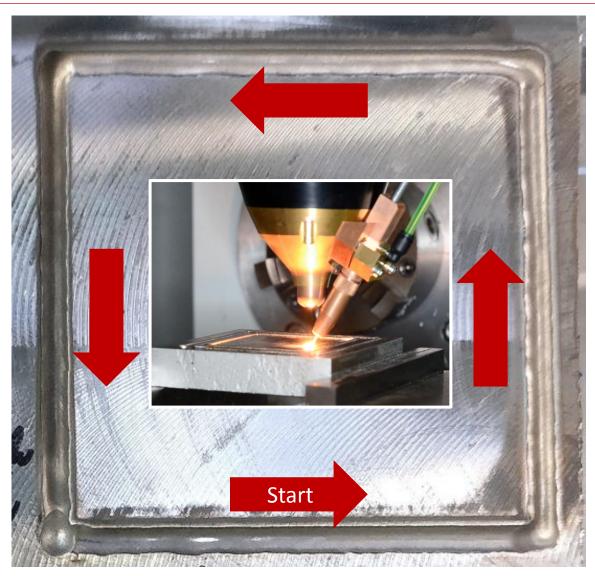






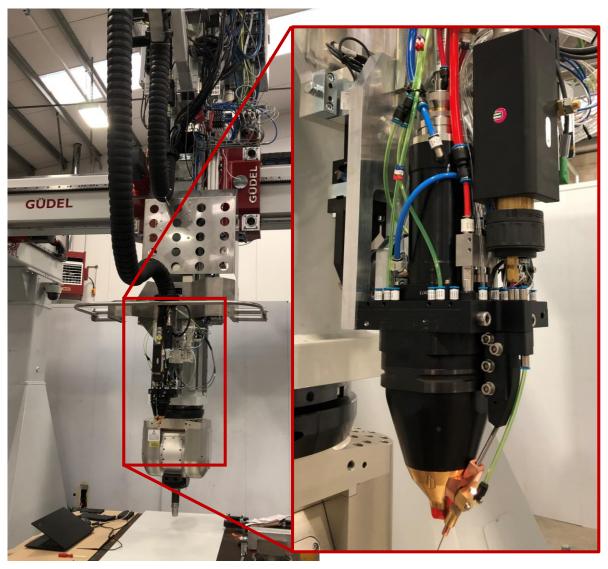
- Steep wire angle of 60° allows omni-directional cladding
- Used process parameters:
 - Material :
 SS316L
 (base plate and wire)
 - Laser power:
 1400 W
 - Wire feed rate:950 mm/min
 - Machine feed rate: 800 mm/min
 - Shielding gas:
 Argon (2 x 15 l/min)







- Integration of HMT S8 docking interface with wire cladding head into Güdel hybrid gantry machine tool
- Automatic change between subtractive and additive machining operations
- Different laser operations possible by automatized change of laser heads



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- Tool-changeable and dock-able scanning head for S7 dock
- Laser line scanner integrated
- Connected to the Siemens 840D sl controller







- Scanning head used into the Mikron Mill P 800 U DED
- All required signals are supplied by the S7 Ambit



