OPENHYBRID

Process Tool Development

Overview

SMART Powder Cladding Head

Wire Cladding Head

Scanning Head

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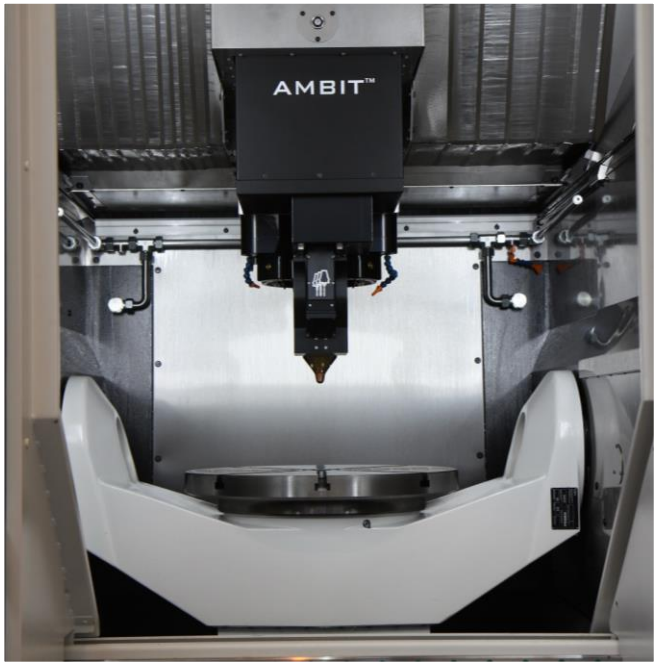
SMART Powder Cladding Head

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



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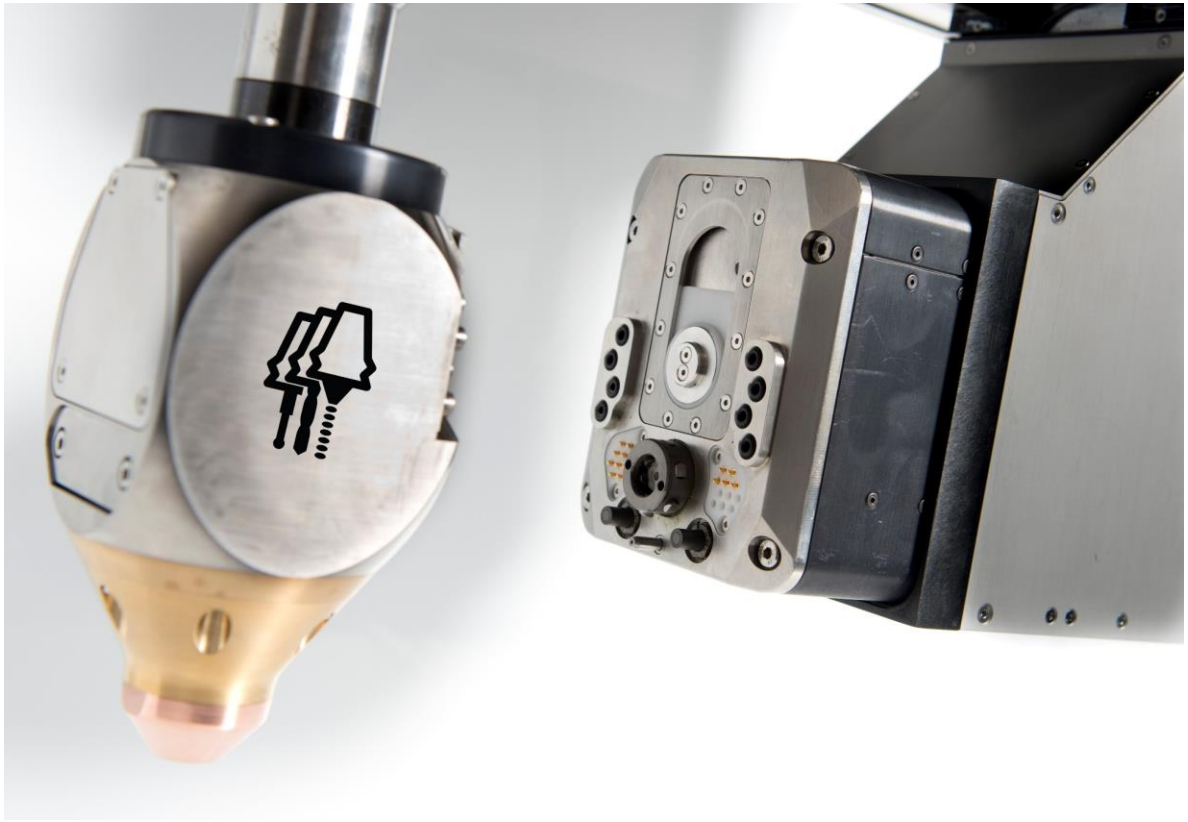
SMART Powder Cladding Head

- 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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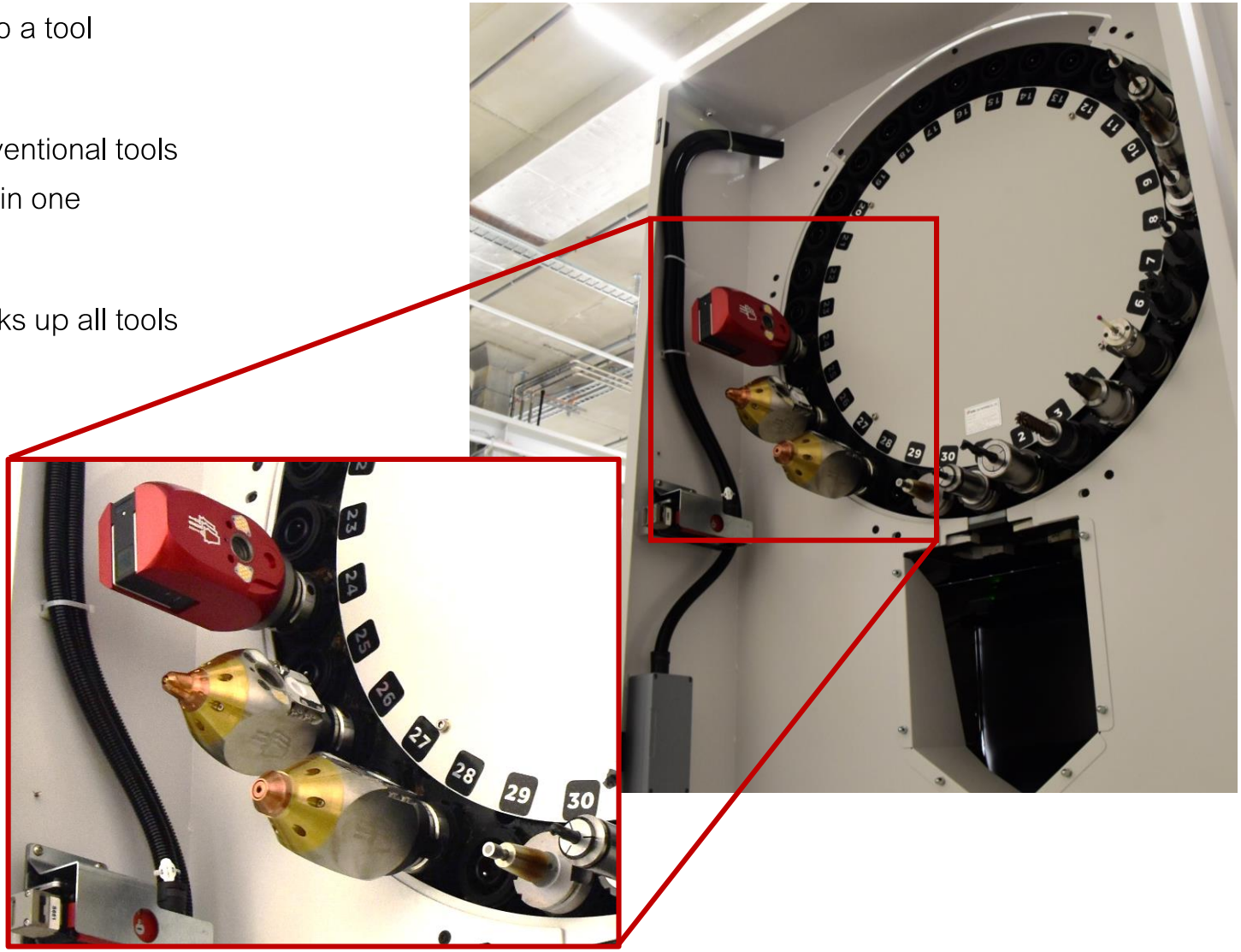
SMART Powder Cladding Head

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



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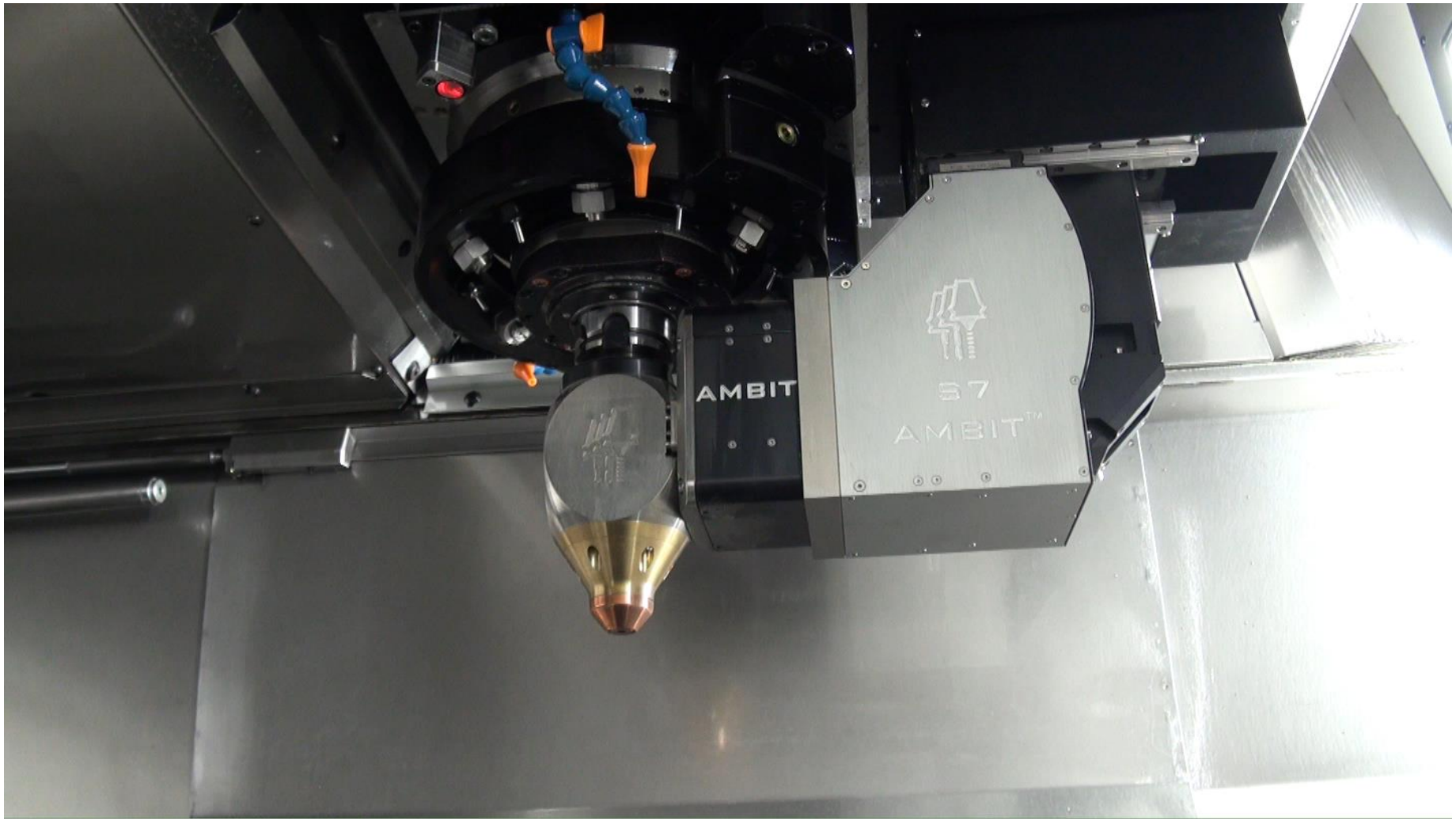
SMART Powder Cladding Head



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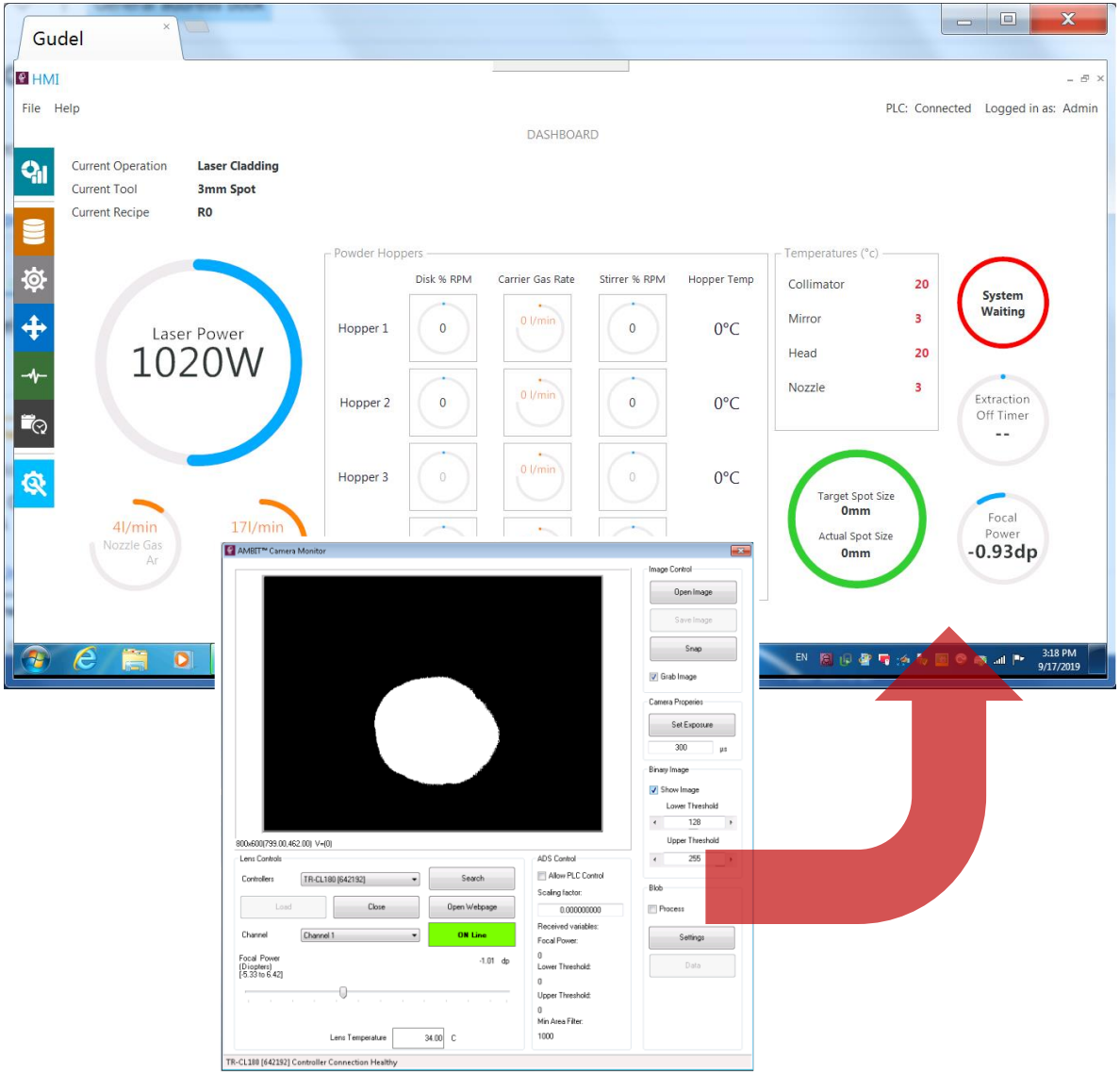
SMART Powder Cladding Head

- 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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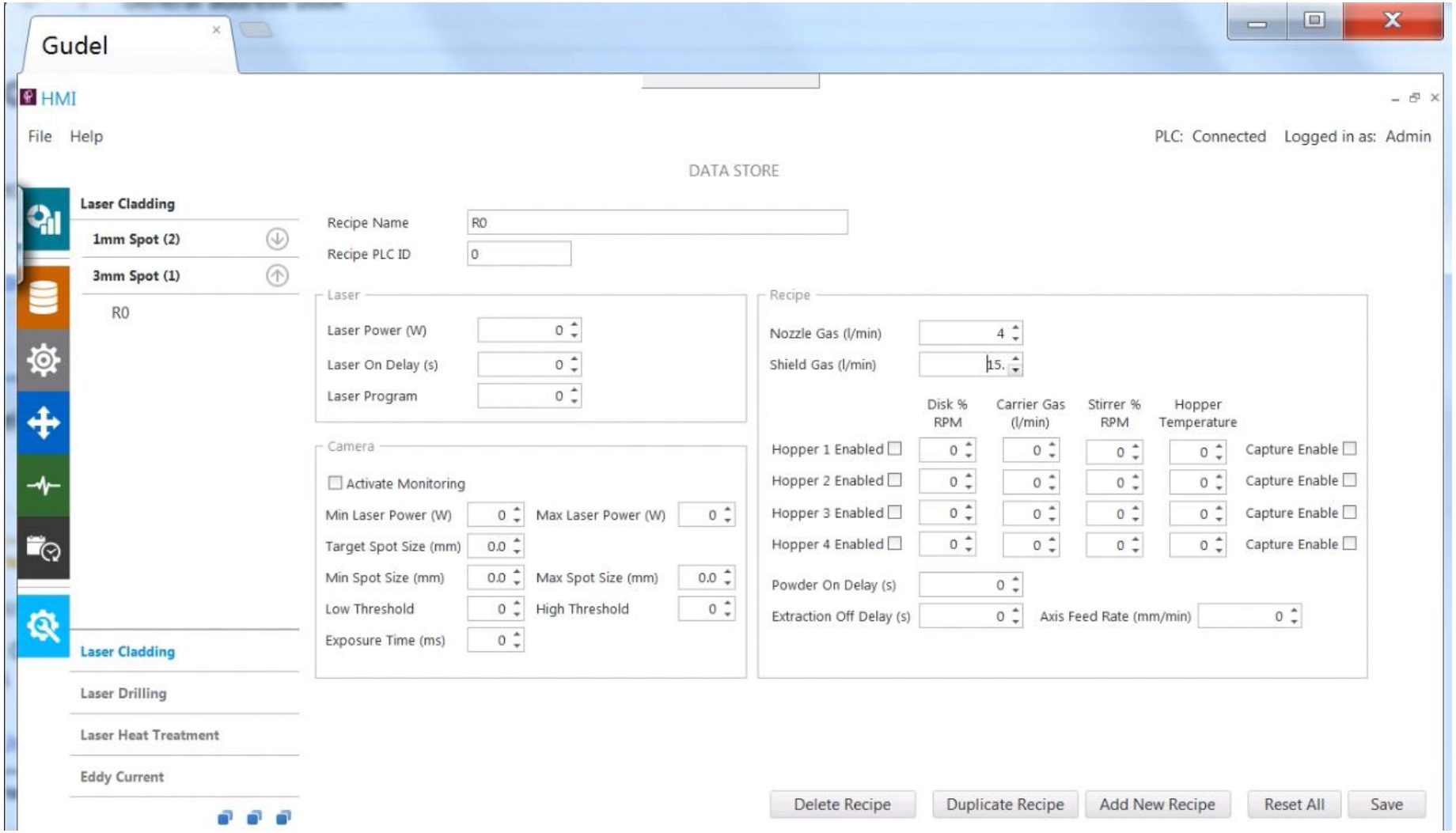
SMART Powder Cladding Head



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Overview

SMART Powder Cladding Head	
Wire Cladding Head	
Scanning Head	

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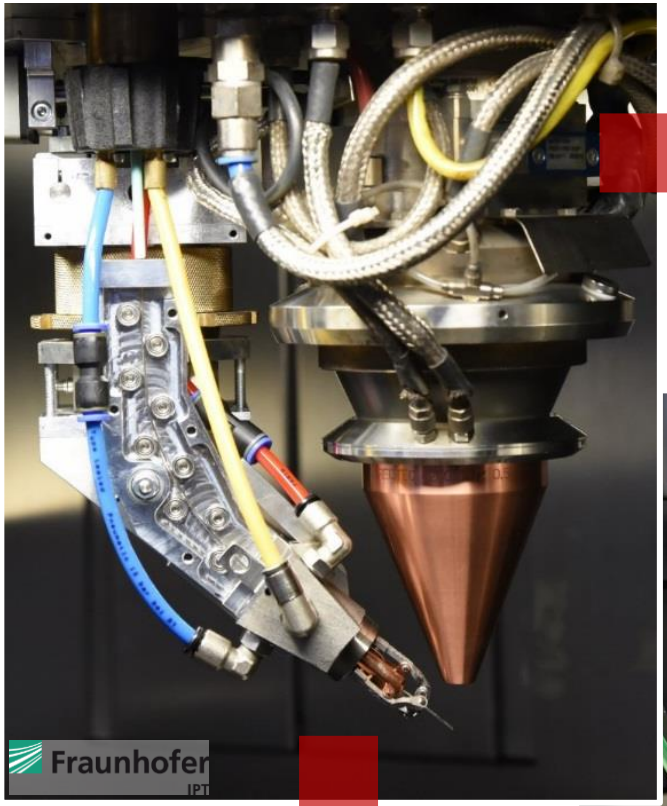
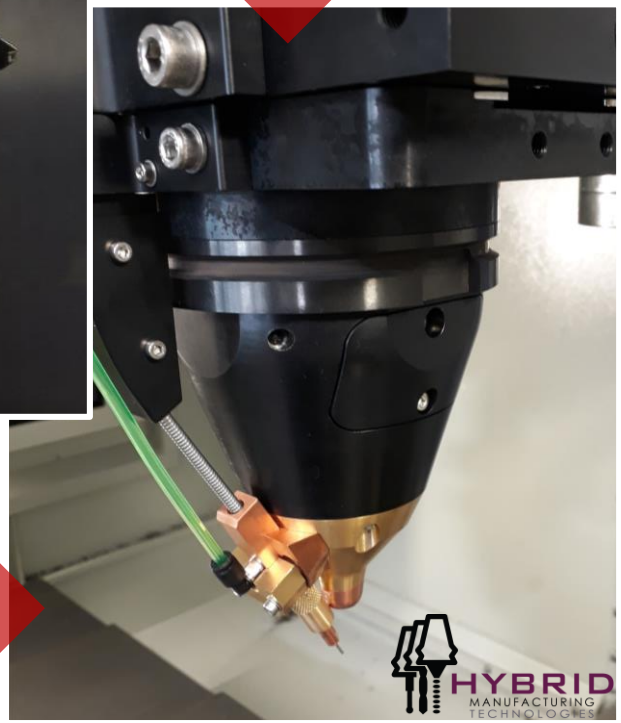
Wire Cladding Head

- 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





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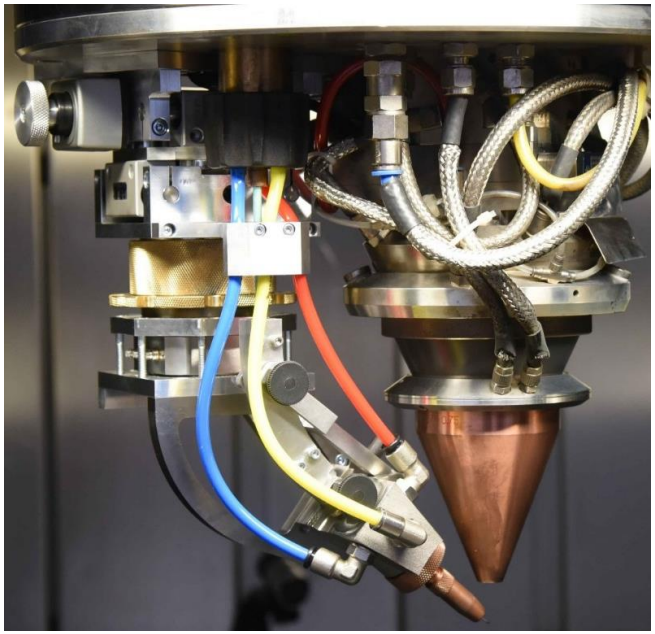
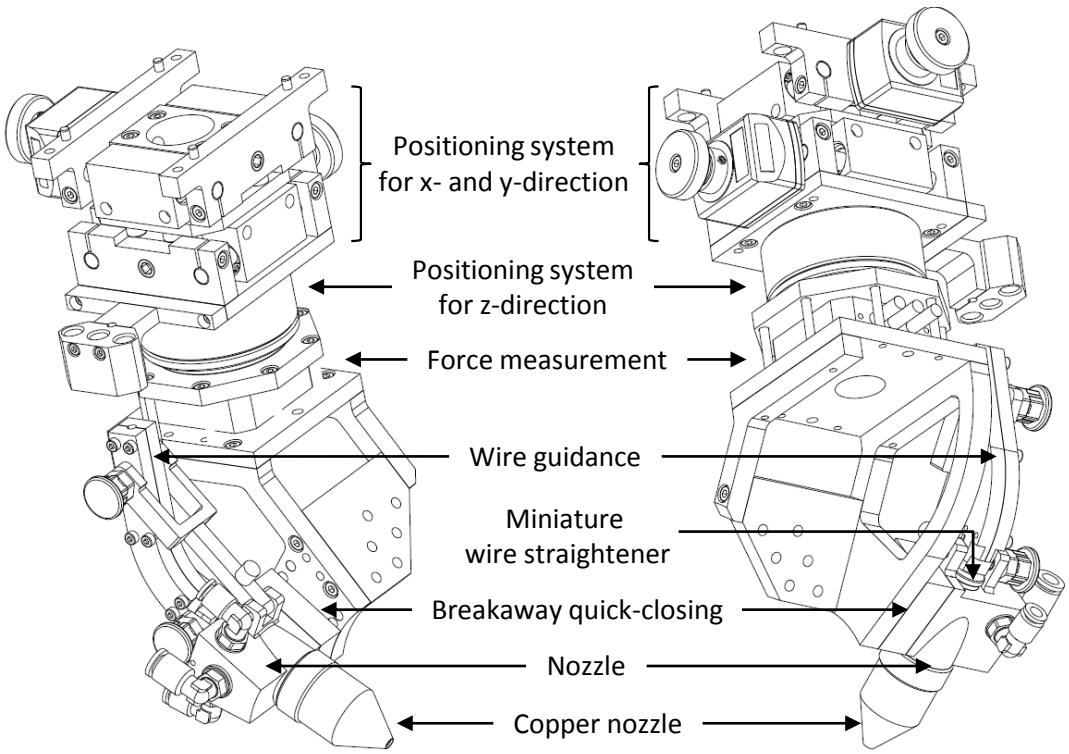
Wire Cladding Head





- 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

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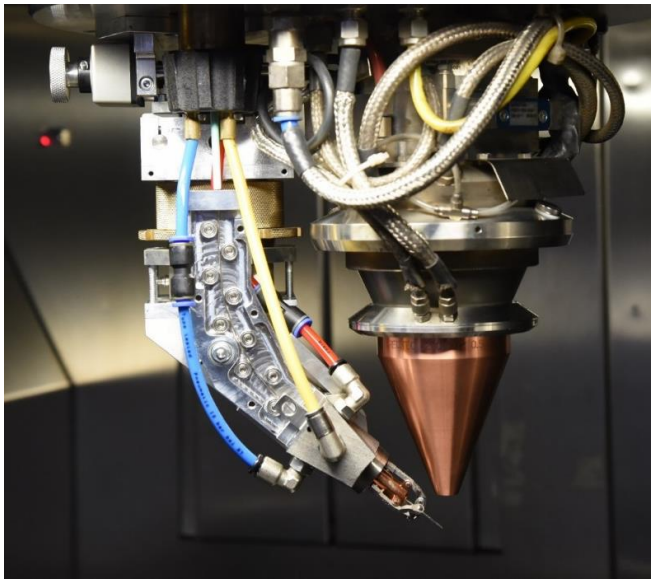
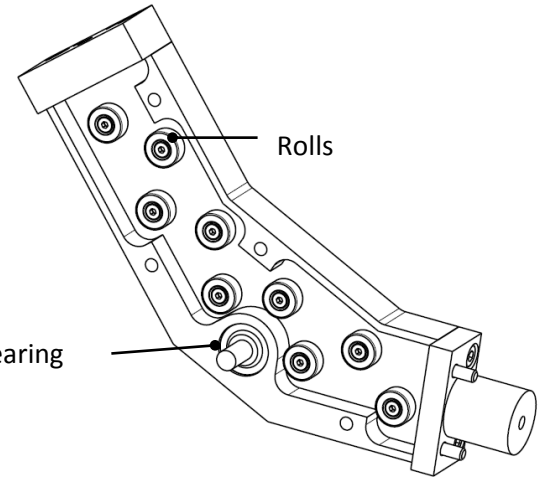
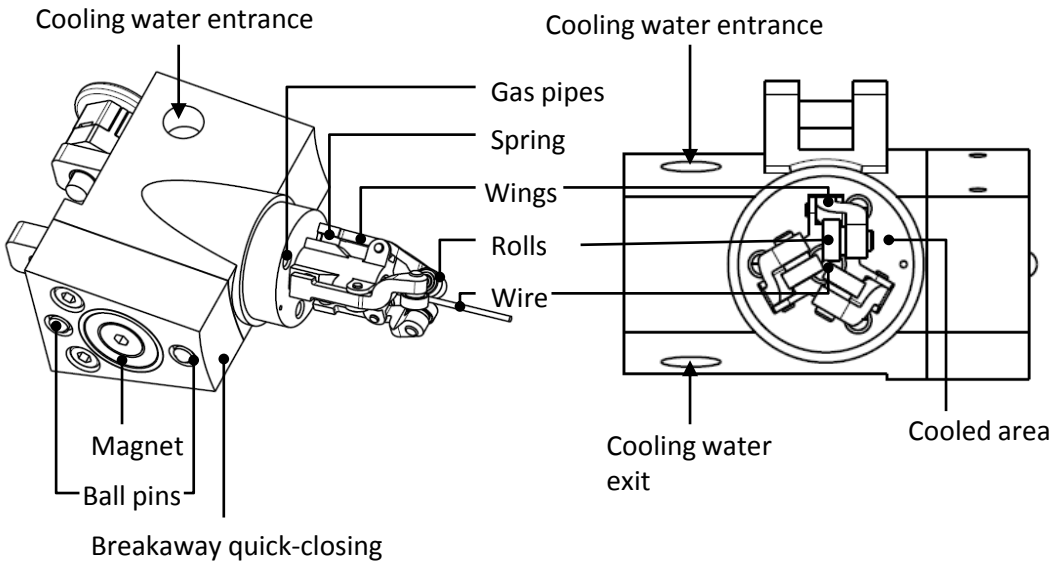
Wire Cladding Head



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





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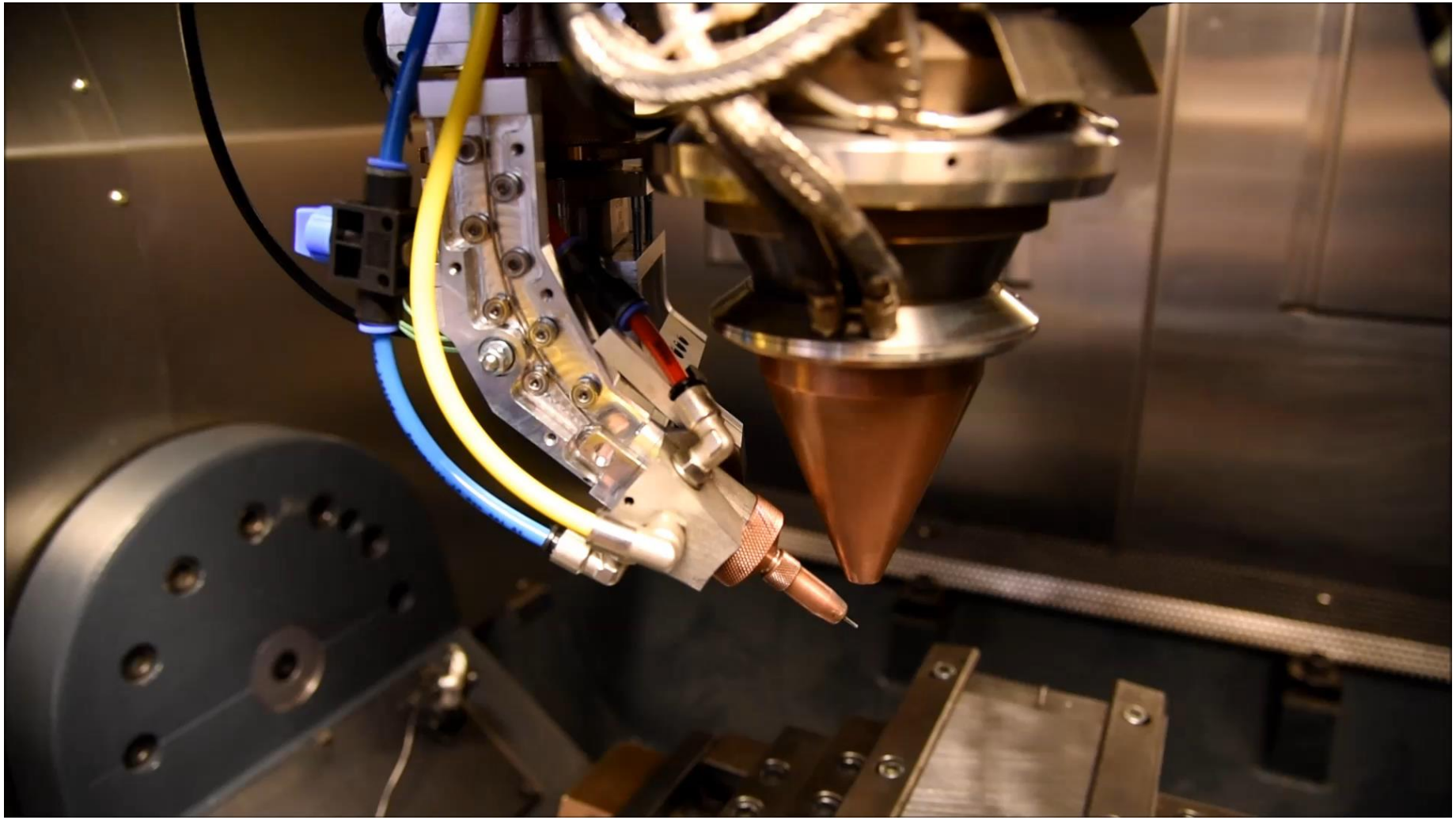

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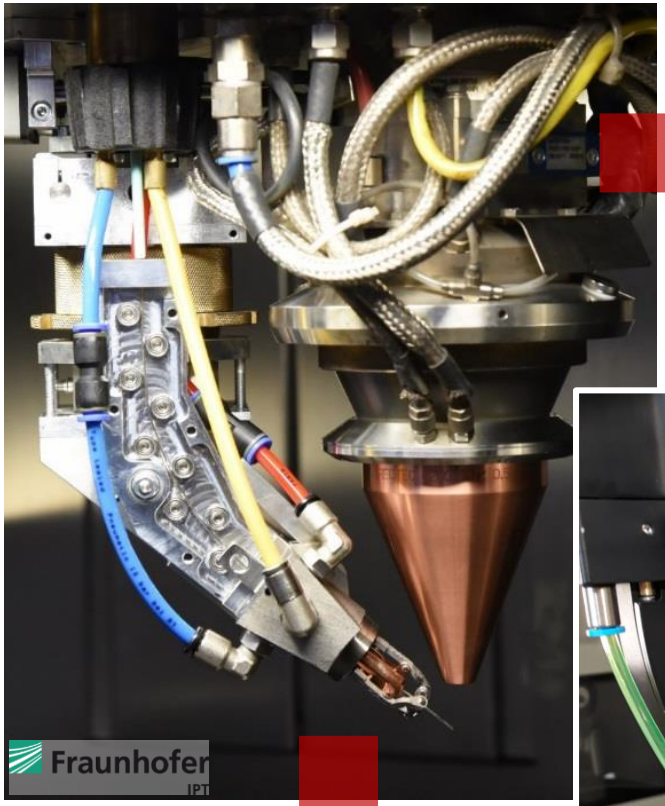
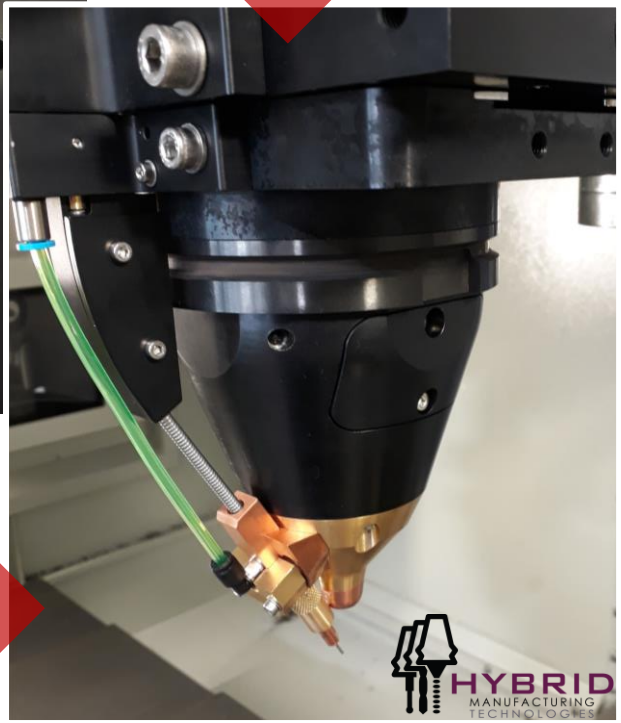
Wire Cladding Head

- The wire arm IPT-Mk2 allows detailed process investigations, but is not dock-able
- 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





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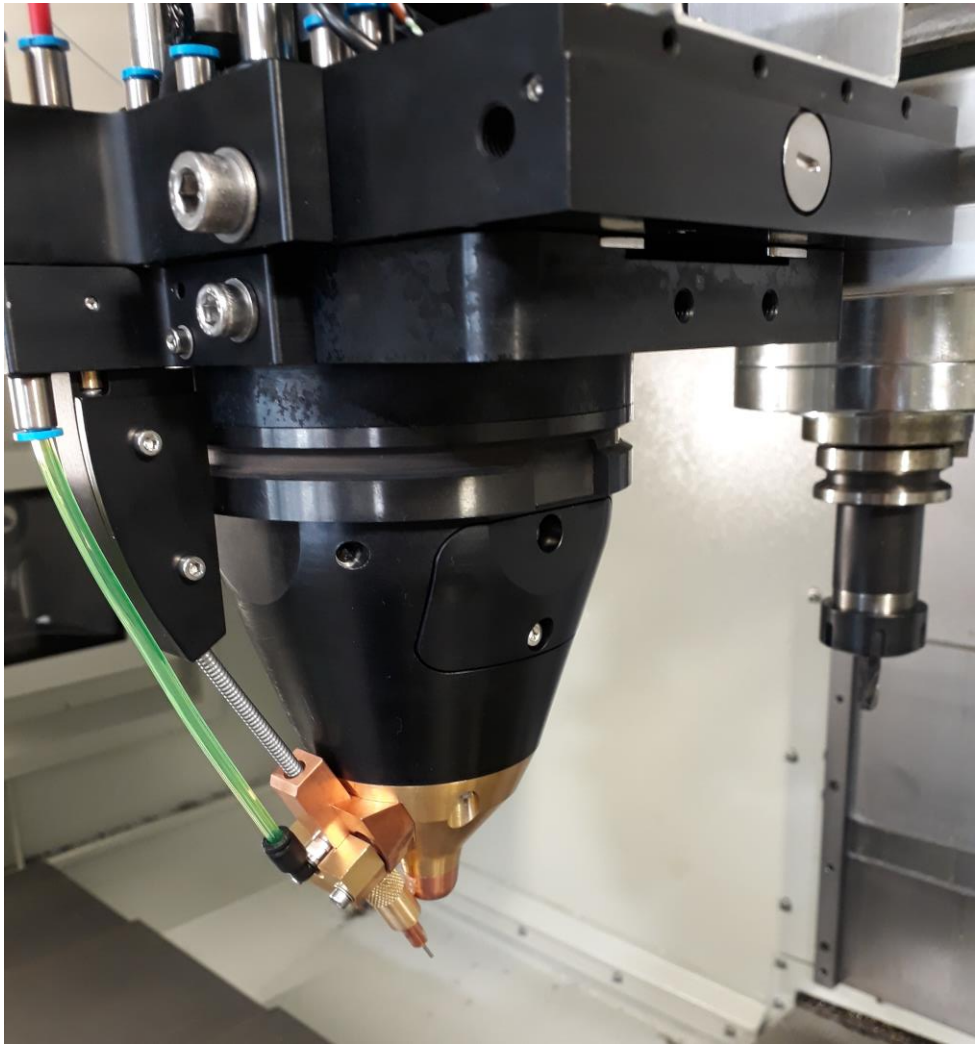
Wire Cladding Head

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



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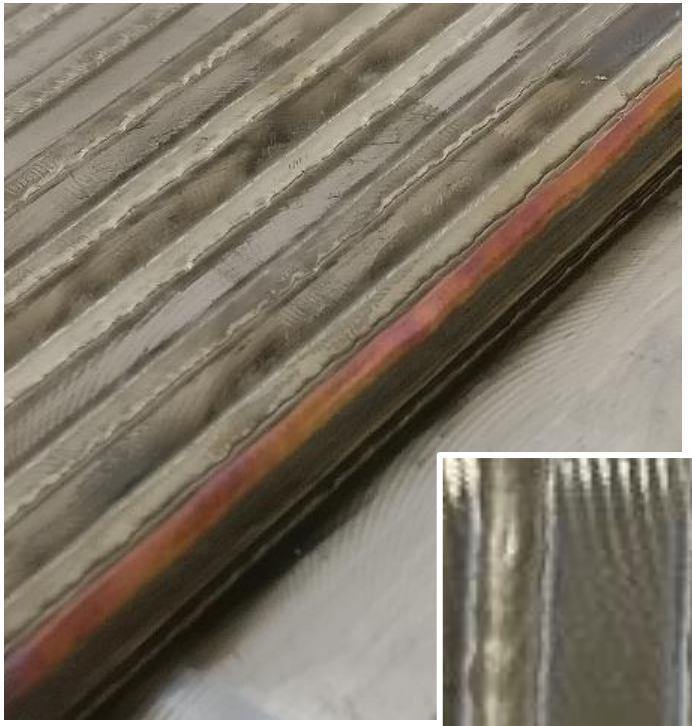
Wire Cladding Head

- 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



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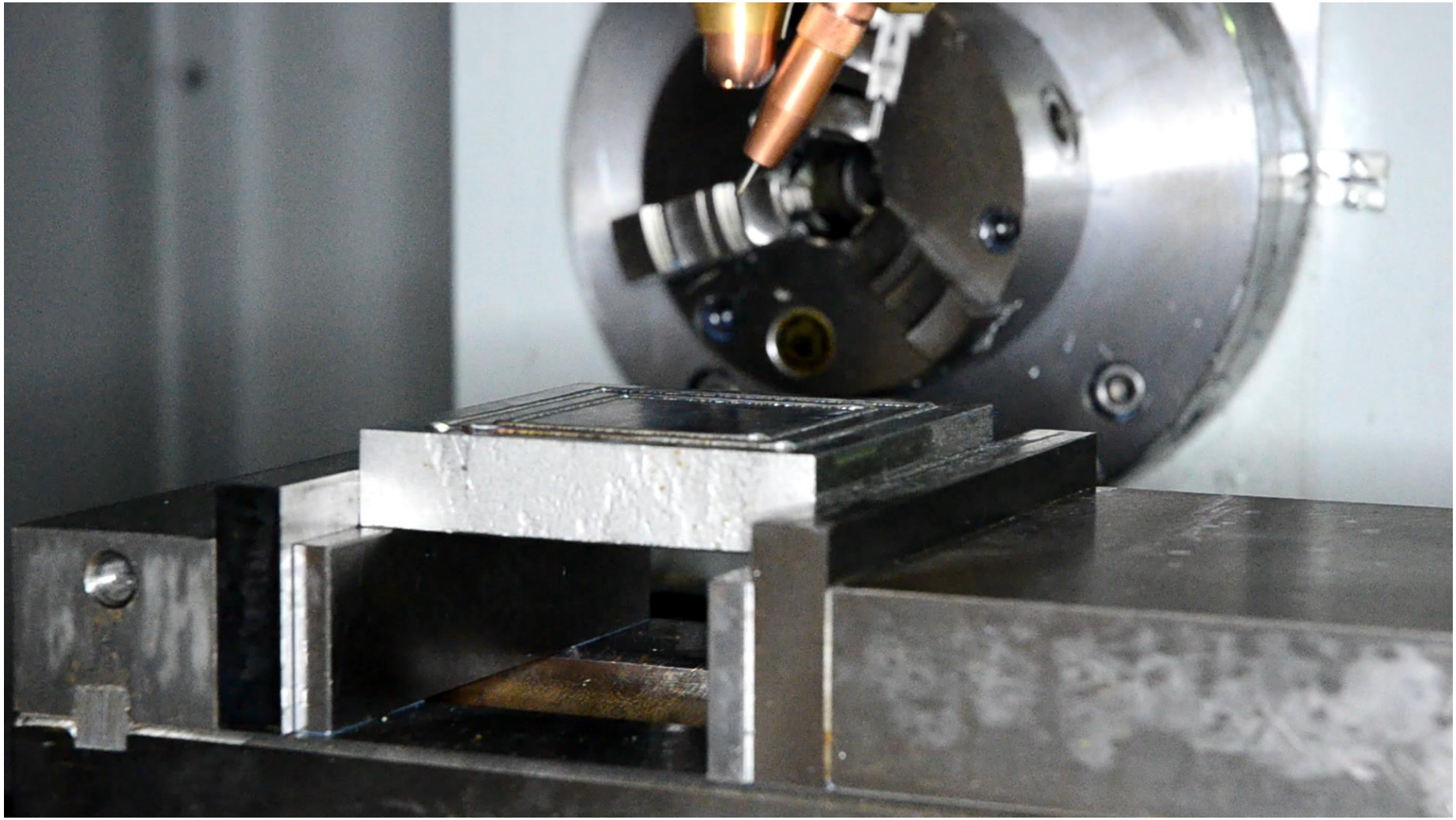

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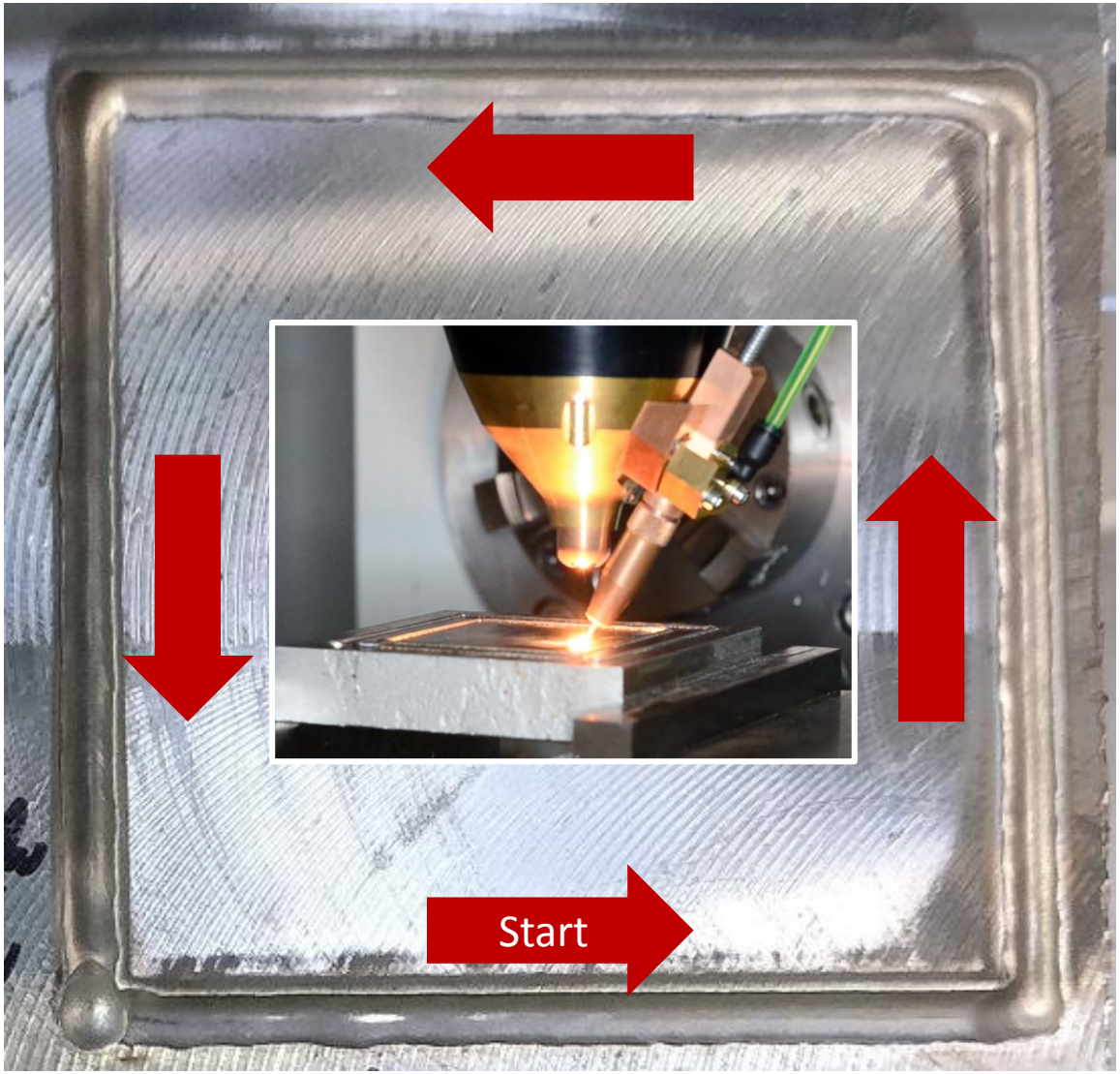
Wire Cladding Head

- 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)



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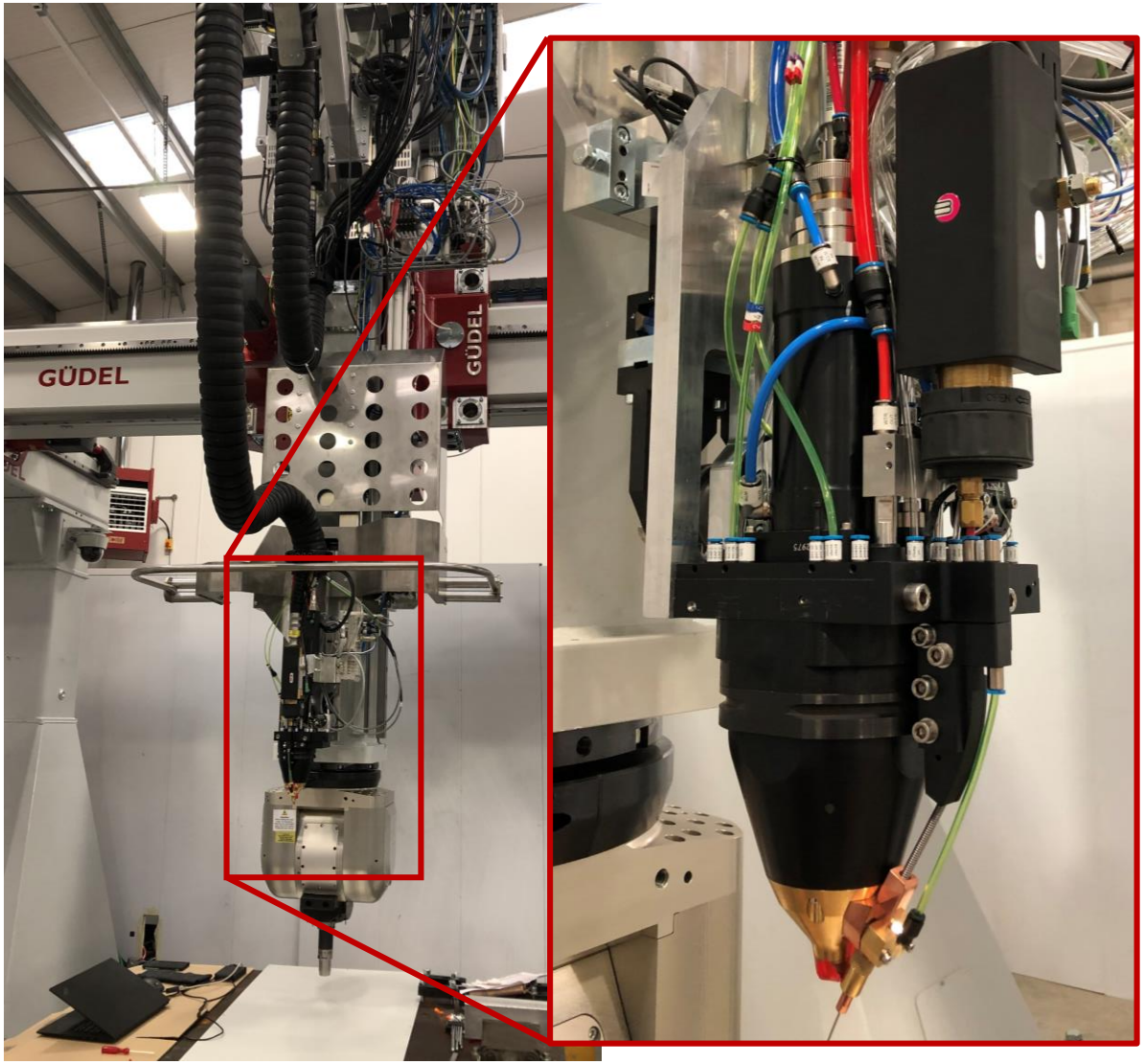
Wire Cladding Head

- 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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Scanning Head

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

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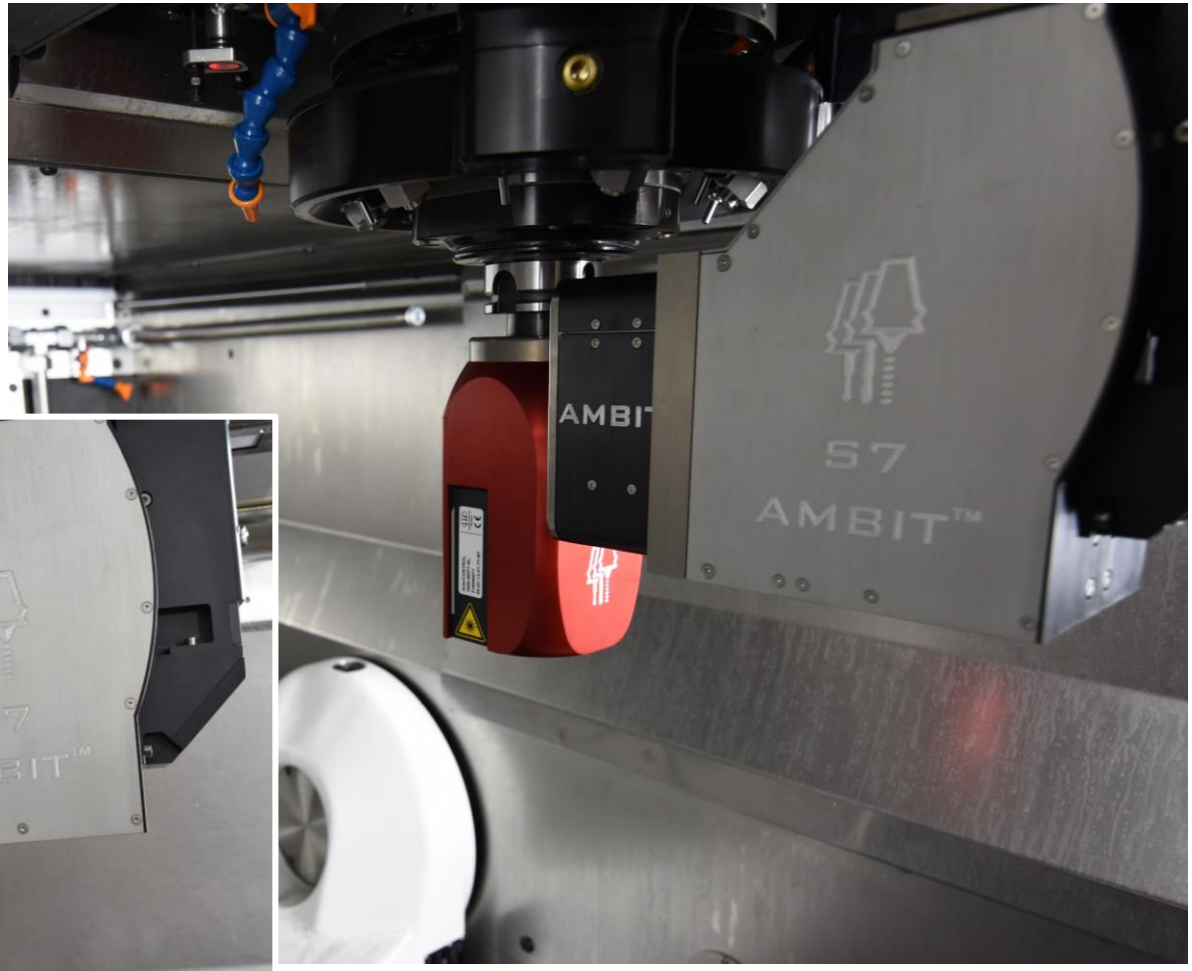
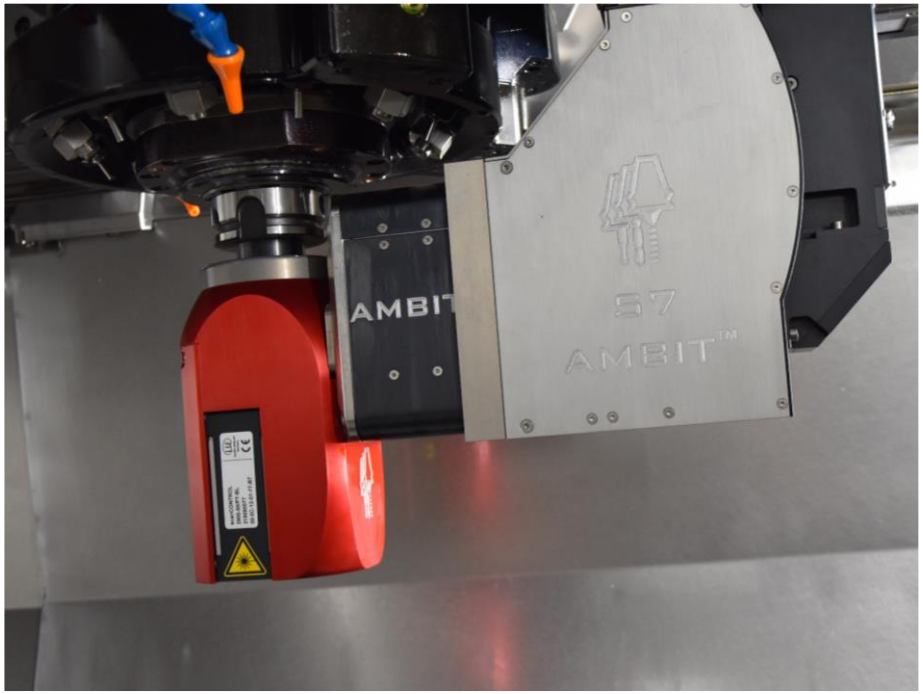
Scanning Head

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





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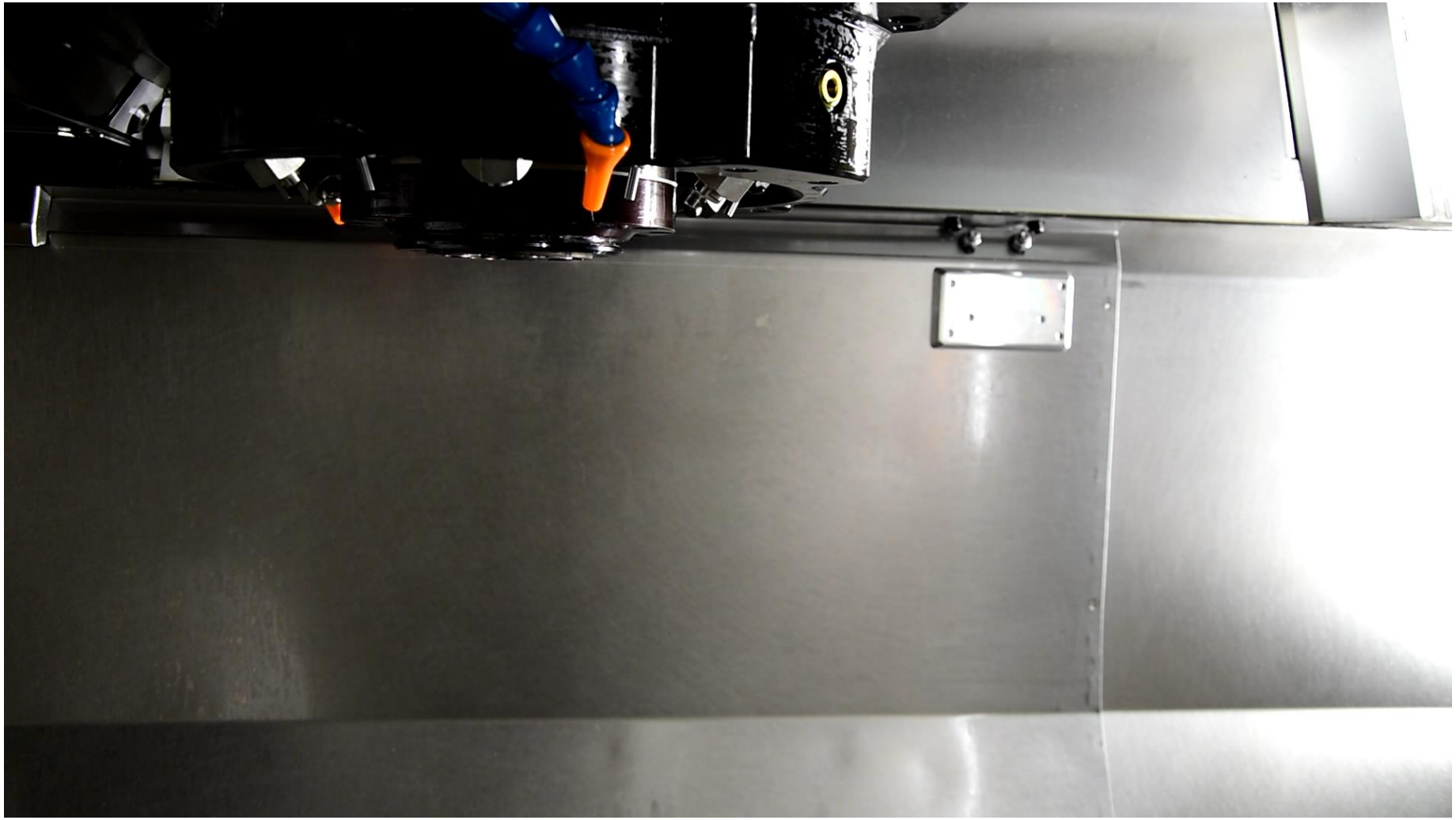

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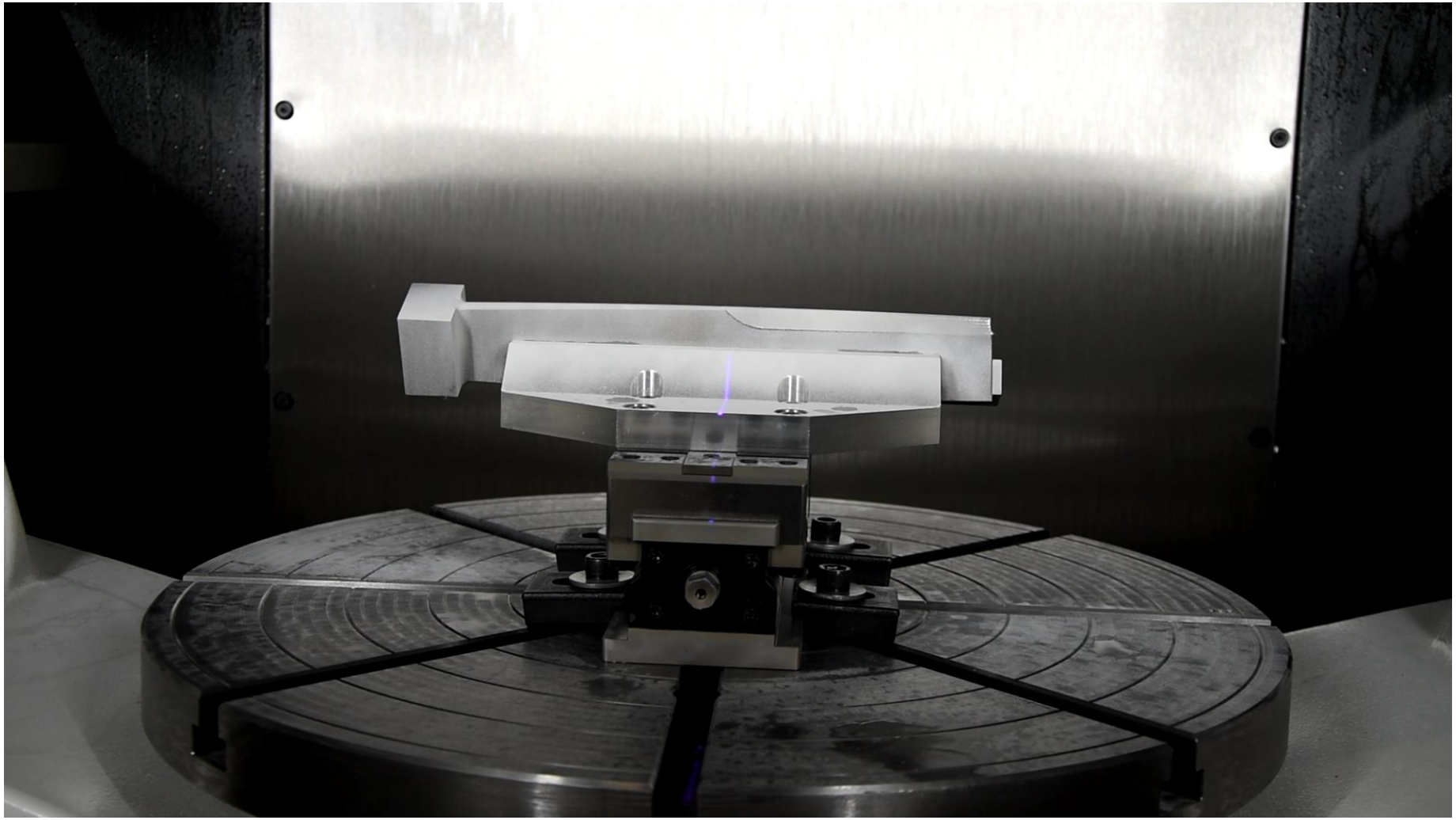

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