LASER PROCESSES & SYSTEMS FOR MANUFACTURING MEDICAL IMPLANTS

January 23, 2023

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COHERENT

30+ YEARS OF INNOVATION AND PARTNERSHIP IN MEDICAL DEVICE MANUFACTURING

II-VI + COHERENT rofin LASAG → COHERENT

Medical Device Manufacturing

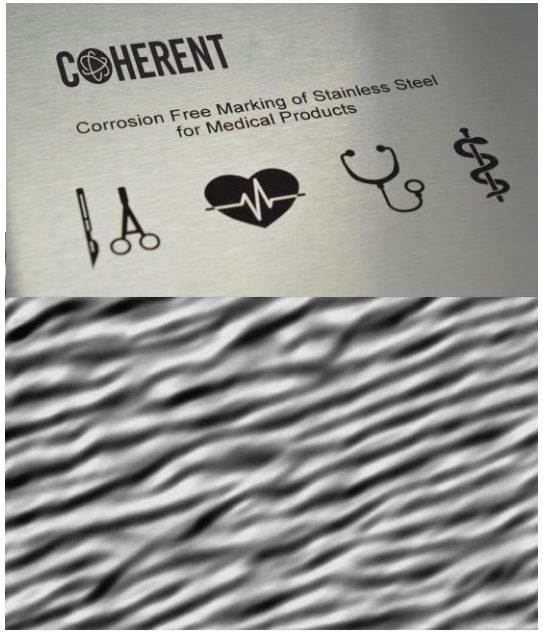
Market Aligned Solutions

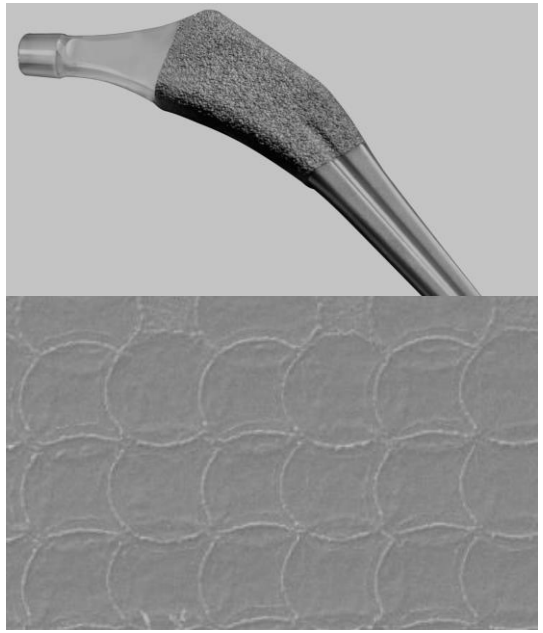
Laser, System & Process Innovation

Application Knowledge & Production Experience
from > 6000 Systems in MDM

Global Support; 21 Applications Labs, 700+ Service Staff
18 Global Logistics Warehouses (GLS)

LASER APPLICATIONS FOR MANUFACTURING MEDICAL IMPLANTS





Cutting

Welding

Marking

Surface texturing

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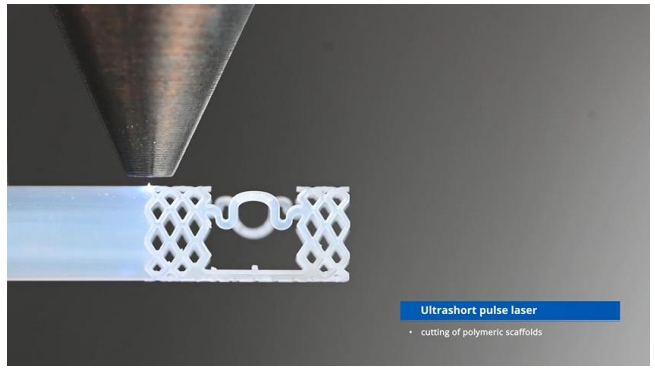
MICRO CUTTING LASERS AND APPLICATIONS

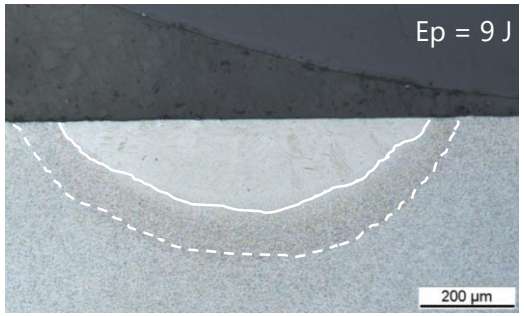
- **Two laser processes available:**
  - Fiber laser fusion cutting (µs, modulated cw)
    - Standard solution for metals (stainless steel, CoCr)
    - Typically providing higher processing speed
  - Ultra-short-pulsed laser cutting (fs)
    - The only solution for bioresorbable polymers and magnesium, preferred for Nitinol
    - Reduced heat affected zones, offering smaller strut widths
    - Less post-processing effort
    - Growing share of femto vs. modulated-cw fiber laser
  - Option: both processes in one machine
    - StarCut Tube Hybrid tube cutting system
    - Dry or wet cutting option
    - Auto tube loading

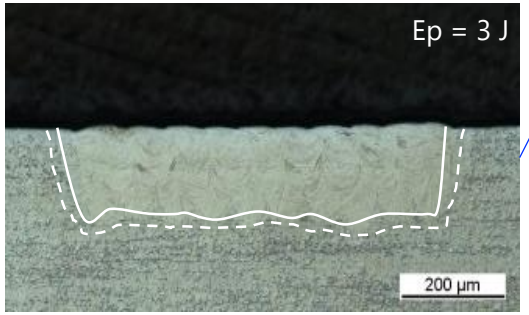
Tube cutting for stents and heart valves



MICRO WELDING SMARTWELD+ PROCESS OPTIMIZATION

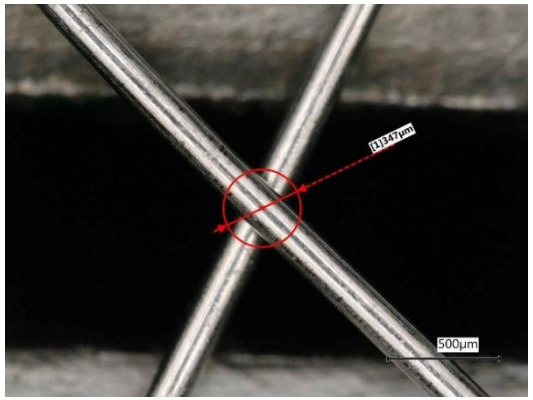
Cross section:
conventional pulsed laser metal weld, spot size ~ 800µm

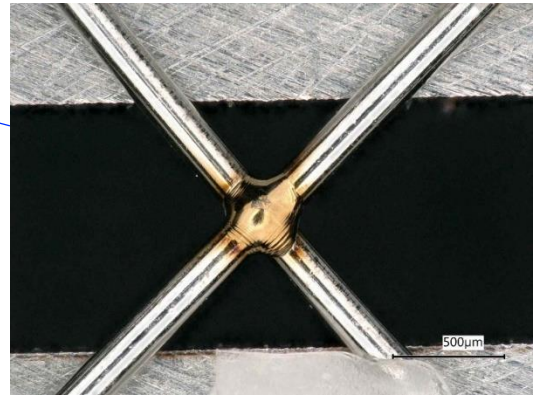




Cross section:
SmartWeld+ metal weld with single mode laser, spot size ~30µm

Welding of stainless steel wire mesh,
Wire diameter 200 µm
Laser spot size 30 µm





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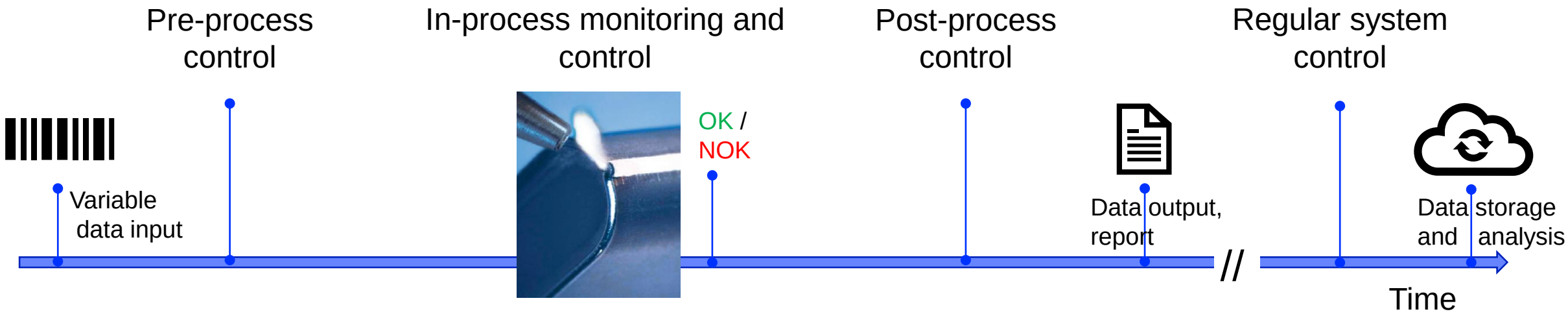
CONTROL THE LASER PROCESS AT VARIOUS STAGES



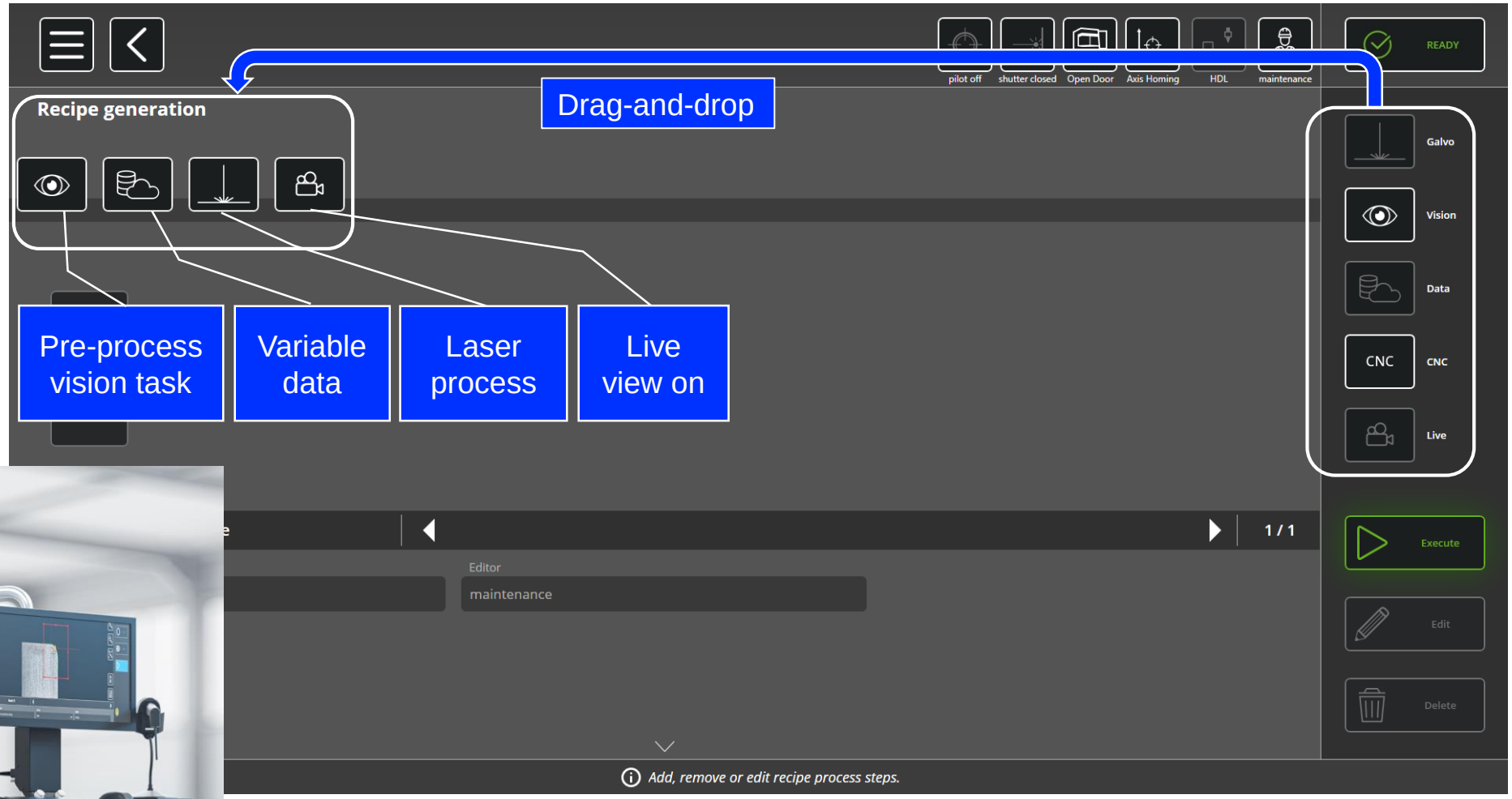
- Visual sensing:
  - Part fit
  - Weld gap detection
  - Part position
  - Correct parts?
  - Part geometry
- Fixture sensing
- …

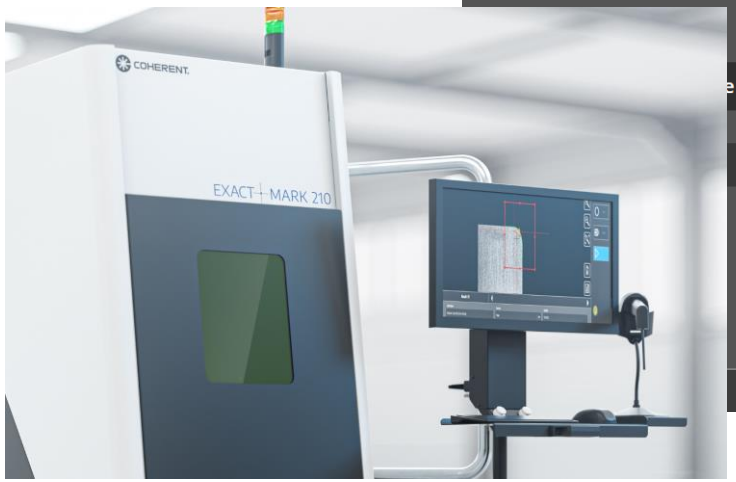
- Weld depth monitoring (OCT)
- Diode-based monitoring
- Acoustic monitoring
- Pyrometer-based laser power control
- Thermal imaging
- Height sensing
- Path deviations
- …

- Weld geometry and alignment
- Marking code verification
- Visual process quality (w/ or w/o AI and machine learning)
- Thermography of the cool-down process
- Acoustic emissions
- …

- Laser power validation and regulation
- Beam quality check
- System utilization
- System-to-system equalization
- …

LASER FRAMEWORK SOFTWARE: PROCESS WORKFLOW - RECIPE





Exact2xx series

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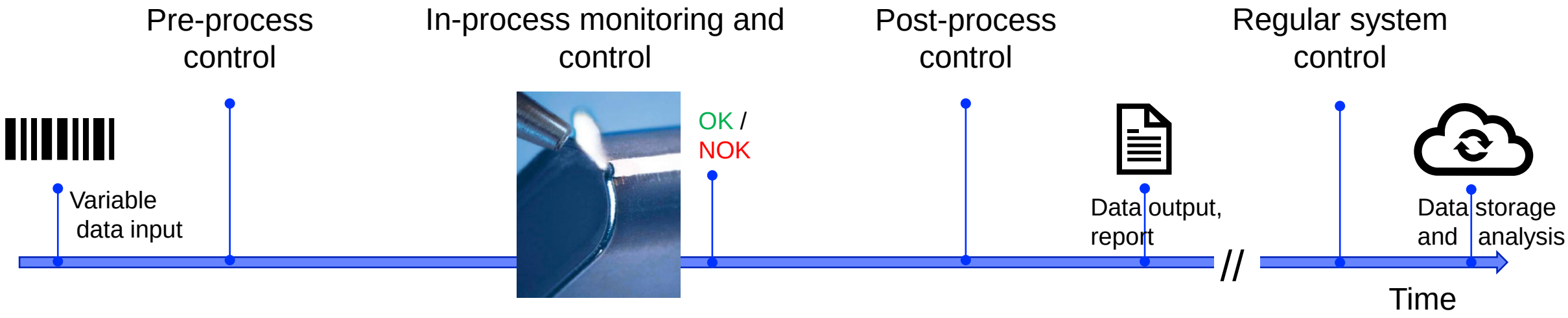
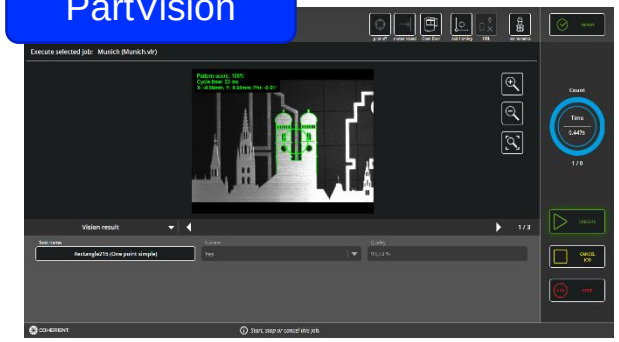


PartVision



SmartSense+

PartVision

BeamInspect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