

# ADVANCED MANUFACTURING LABORATORY

High performance manufacturing  
solutions for Industry 4.0

The Advanced Manufacturing Laboratory is equipped with state-of-the-art research facilities with industrial, prototypal, and experimental systems, testing and characterization equipment as well as dedicated software packages. In the laboratory, the complete material transformation phases are represented from process to its qualification to the complete production system. Process feasibility, optimization, and control as well as production systems design and performance enhancements are covered within the research.

## INSTRUMENTS & FACILITIES

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BLM Group Adige Sys LC5 combined laser sheet and tube cutting system with 6 kW fiber laser.

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BLM Group Alfetta flexible robotic laser welding cell with 6 kW fiber laser and wobblers head.

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Lasers for e-mobility cell for remote welding, stripping, cleaning, and ablation solutions with 1 kW single mode fiber, 100 W green, and 50 W ns-pulsed fiber lasers.

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Laser Induced Forward Transfer system for high precision multimaterial additive manufacturing.

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Laser micromachining cell with high power fs, ps, and ns pulsed laser sources.

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Qilin hand-held laser welding system with 3kW fiber laser.

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YASDA YMC 650 + RT20 High precision 5-axis CNC machining centre: 200-40,000 rpm; 7.5 kW @27,000 rpm (S3); 2.7 Nm @27,000 rpm (S3); HSK-E32 (DIN 69893-5); FANUC 31i-B5; resolution: 0.00001 mm & 0.00001°.

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KERN Evo Ultra precision 5-axis (3+2) CNC machining centre: 50,000 rpm; 6 kW @40,000 rpm (S1); 1.5 Nm (S1); HSK 25-E; Heidenhain iTNC 530; resolution: 0.0001 mm; positioning accuracy P: < 2 µm.

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The Digital Twin Lab for physical simulation of production systems.

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Intermac Primus 322 Metal waterjet cutting system with BHDT Ecotron 4037 intensifier pump up to 380 MPa.

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Alicona Infinite Focus micro coordinate measurement system (resolution down to 10 nm).

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Zeiss Prismo 5 VAST MPS HTG coordinate measuring machine (E0, MPE = 2,0 + L/300 µm).

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North Star Imaging NSI X25 micro computed tomography system and VGStudio Max for image reconstruction and material analysis.

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FLIR X690Xsc MWIR high speed thermal camera with acquisition rate up to 20.000 fps.

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Additive manufacturing systems.

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## ACTIVITIES

### THE RESEARCH TOPICS INCLUDE THE FOLLOWING

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Advanced machining and machine tools.

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Deformation of metals with conventional and flexible tools.

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De-manufacturing systems for circular economy.

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Geometric product specification and verification.

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In situ process monitoring and intelligent data analytics.

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MI\_crolab – Micro Machining Laboratory.

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Performance evaluation and optimization of manufacturing systems.

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SITEC - Laboratory for Laser Applications including cutting, welding, microprocessing, cladding, heat treatment.

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Virtual manufacturing and simulations of manufacturing processes.

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WJ\_Lab, for waterjet process improvement and novel solutions.

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PoliMill - A laboratory for the digitalization of chip removal processes.

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Additive manufacturing process improvement, monitoring, control and development of novel solutions.

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