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European Commission

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Project Duration: 36 months

Project Coordination: Unimetrik S.A.
Project cost: 4.201.510 €
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Type of Programme and Action:
H2020: Research & Innovation Action

About ADALAM Project

ADALAM aims to develop a sensor based adaptive micromachining system using ultrashort pulsed lasers for zero failure manufacturing. The technology developed will generate completely new solutions for manufacturing of high-quality and innovative products, enabled by the ability of adaptive laser micromachining.

The Concept

Miniaturization, advanced high performance materials and functional surface structures are all drivers behind key enabling technologies in high added value production. It is in such areas that ultrashort pulse lasers have enabled completely new machining concepts, where the big advantages of laser machining are combined with a quasi non-thermal and therefore mild process, which can be used to machine any material with high precision.

However, an important obstacle that hinders the full exploitation of the unique process characteristics is the lack of a smart/adaptive machining technology. The laser process in principle is very accurate, but small deviations - e.g. in the materials to be processed - can compromise the accuracy to a very large extend. Therefore feedback systems are needed in order to keep the process accurate.

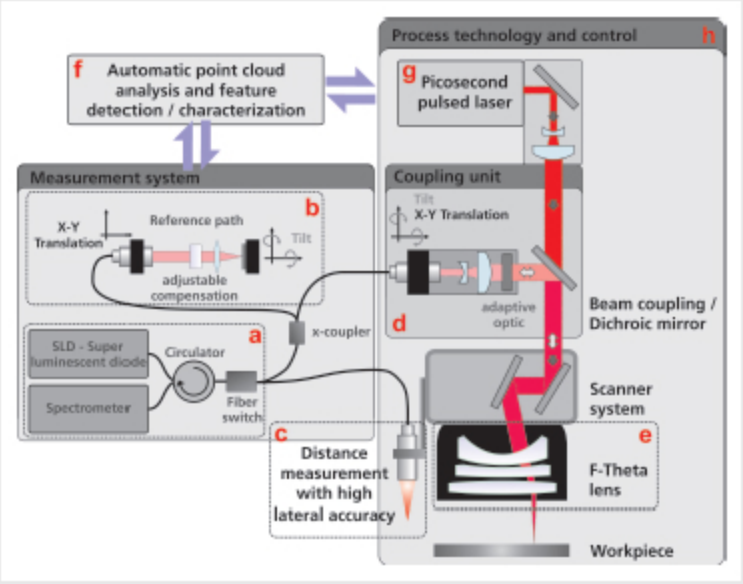
Objectives

The main goal of ADALAM is to develop an adaptive laser micromachining system, based on ultrashort pulsed laser ablation and a novel depth measurement sensor, together with advanced data analysis software and automated system calibration routines.

The adaptive laser micromachining system will be usable for a large variety of applications, each requiring a special adaptation of the control software. The system will therefore be developed in a modular approach, enabling a straightforward development of future new applications.

Finalising the project scope, the developed solution will be specifically optimized for **three industrial end-user applications** representing three different uses of the system:

- Adapting a micromachining process to process deviations.
- Adapting a micromachining process to defect detection and removal present on a workpiece.
- Steering and adapting a texturing process regarding deviations in shape and position of complex 3D shapes.



The key components depicted in the figure are listed as follows:

- **a.** In-line topography measurement system
- **b.** Automatically adjustable reference path system
- **c.** External distance measurement sensing head with high lateral accuracy
- **d.** Active alignment unit for beam coupling and sensor integration based on adaptive optics
- **e.** Optimized scanning objective with enhanced numerical aperture and lateral accuracy
- **f.** Software for an automatic point cloud analysis and feature detection / characterization

  High Power Picosecond Laser Source – Switchable Pulse Length / Synchronization
- **h.** Integrated adaptive laser micromachining system
- **i.** System Calibration, Traceability and Certification

The Impact

The project consortium comprehends partners in every aspect of the development chain for execution of an adaptive ultrashort pulse laser micro manufacturing asset. Based on this fact, the potential for a subsequent exploitation of project results and developments is extremely strong. These results will be employed and transformed into competitive advantages.

ADALAM project is designed to deliver convincing evidence to SMEs of the benefits of the use of adaptive ultrashort pulsed laser based manufacturing systems and its monitoring and control with in-line dimensional metrology as well as final quality assurance for a considerably enhancement of the exploitation and usage of material and resources and the consequent generation of high quality final products.

The Team

The project team includes stakeholders from the entire value chain, with a strong industrial leadership of mainly SMEs. The partners represent:

- Suppliers of optical equipment and lasers
- Research institutions
- System developers (optical, mechanical, mechatronic)
- Laser systems integrator and process developer
- End users of laser based equipment
- Business Models

Project Coordinator

UNIMETRIK
METROLOGY AND CALIBRATION

Project Partners

carsa · DATAPIXEL · DEMCON · focal · Fraunhofer IPT · JDSU · lightmotif · SANDVIK · SIL · XYCARB CERAMICS

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