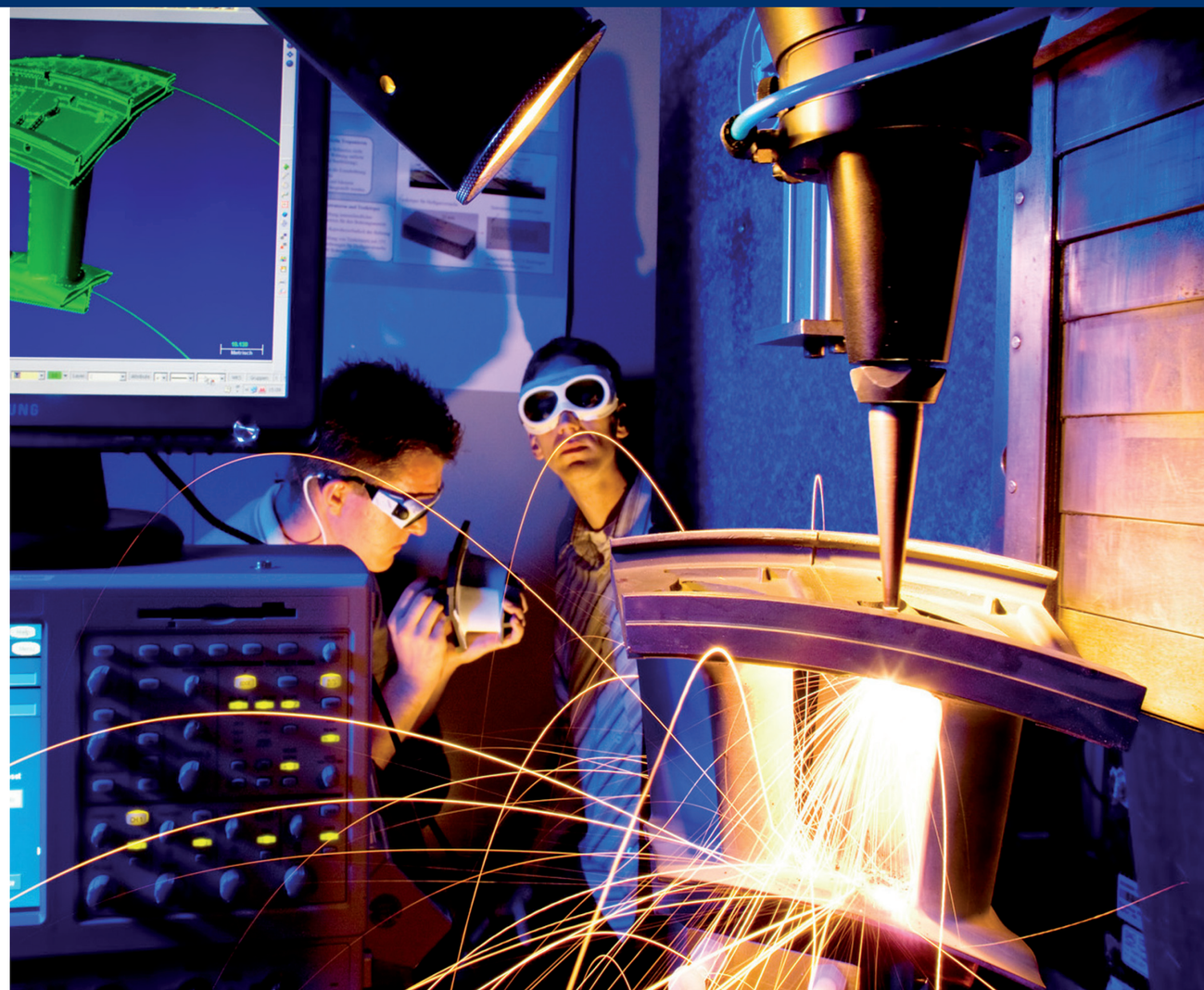
Fraunhofer
ILT

FRAUNHOFER INSTITUTE FOR LASER TECHNOLOGY ILT

SYSTEM TECHNOLOGY FOR LASER MATERIAL PROCESSING



DQS certified by
DIN EN ISO 9001:2015
Reg.-No. 069572 QM15

Fraunhofer Institute for Laser Technology ILT

Director
Prof. Constantin Häfner

Steinbachstraße 15
52074 Aachen, Germany
Telephone +49 241 8906-0
Fax +49 241 8906-121

info@ilt.fraunhofer.de
www.ilt.fraunhofer.de

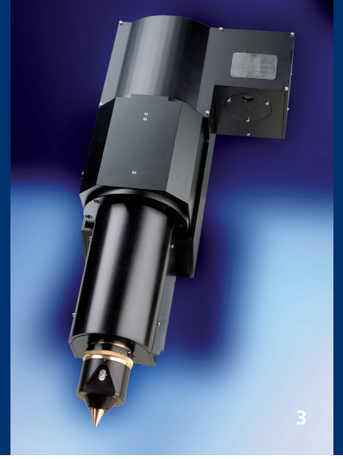
Fraunhofer Institute for Laser Technology ILT

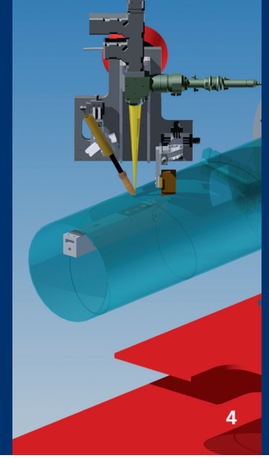
The Fraunhofer Institute for Laser Technology ILT is one of the most important development and contract research institutes in laser development and application worldwide. Its activities encompass a wide range of areas such as developing new laser beam sources and components, laser-based metrology, testing technology and industrial laser processes. This includes laser cutting, ablation, drilling, welding and soldering as well as surface treatment, micro processing and additive manufacturing. Furthermore, Fraunhofer ILT develops photonic components and beam sources for quantum technology.

Overall, Fraunhofer ILT is active in the fields of laser plant technology, digitalization, process monitoring and control, simulation and modeling, AI in laser technology and in the entire system technology. We offer feasibility studies, process qualification and laser integration in customized manufacturing lines. The institute focuses on research and development for industrial and societal challenges in the areas of health, safety, communication, production, mobility, energy and environment. Fraunhofer ILT is integrated into the Fraunhofer-Gesellschaft.

1

2


3


4


5


6

SYSTEM TECHNOLOGY FOR LASER MATERIAL PROCESSING

Implementing innovative laser manufacturing technologies creates competitive advantages. Fraunhofer ILT's specialists from the fields of optics, mechanical engineering, electrical engineering, mechatronics, physics and computer science develop individual laser manufacturing systems for the respective application.

Tailor-made Laser Manufacturing Technology

In close contact with its customers, the Fraunhofer Institute for Laser Technology ILT implements new methods in laser material processing as customer specific, system technological solutions. All developments focus on stable productivity of the manufacturing systems and quality of the products. After the processes are successfully implemented in the laboratory, our facilities allow production runs at sample volume for validation. We support our partners during implementation, production ramp-up and in series production.

Foundation for this is a system technology portfolio which fully exploits the potential of laser materials processing methods with regard to speed, precision and flexibility. Fraunhofer ILT supports its customers in a direct dialogue during development and testing of laser processing methods as well as during the design and production of machinery and equipment.

Based on the specific requirements of various laser technologies and components, we design and produce with our partners special machinery which can be integrated into existing production environments seamlessly. For special tasks we have our own design and production facilities with which, for example, special optical systems and equipment can be manufactured on demand for integration into existing systems.

Optical System Solutions for Laser Material Processing

Highly productive and precise laser processes require optical system solutions with which the potential of new technologies becomes exploitable with thermal and temporal stability. Thanks to an experienced optical development unit using a comprehensive simulation of the optical transmission function, we develop high-performance processing optics for a multitude of different laser processes. The spectrum ranges from processing optics which combine laser processes, such as welding and cutting, via systems for extreme power densities, to special solutions for laser drilling where high precision holes with a high aspect ratio can be drilled by rapidly moving the laser beam on a helical path. All processing optics developed by Fraunhofer ILT can be equipped with systems for visual work piece monitoring and process control.

1 System for the remote laser cutting of sheet metal.
2 VarioClad laser metal deposition with variable track width.
3 Helical-drilling optic for making high-precision microholes.

System Technology for High-Speed Processing

Efficient use of laser sources with high output power and high beam quality requires delivery systems which focus the processing radiation in the required dynamic manner onto the processing location. Here, Fraunhofer ILT's activities complement each other in the field of manufacturing technologies and requirements in mechanical engineering. In cooperation with research partners, the institute creates system concepts and system solutions for individual manufacturing tasks where speed and efficiency play a major role. Moreover, the Fraunhofer ILT develops system solutions where special sensor systems allow correction of the tool path for motion systems which jointly use robots and scanners for beam delivery.
In surface treatment with ultra short pulse lasers, optical scanning-systems based on polygon scanners and acousto-optical deflectors provide feed rates of more than 100 m/s. The application of such innovative scanning systems allows the industrial use of new processing methods and the up-scaling of existing methods to large areas.

Our Range of Services

Our services include the development and integration of systems and components such as processing heads, special optics, ultra high speed scanner systems and process monitoring systems into existing systems through to the development of new laser manufacturing systems.

- Processing systems
  - Special optics for laser processing
  - Product-specific laser processing equipment
- Control technology
  - Sensor integration in existing facilities
  - Real-time control of additional components (sensors, actuators)
  - High-precision position recognition, position control,
  - Work piece position recognition
- Process-adapted human machine interfaces
  - Ergonomic user support
  - Adaptive machine control
- High-speed machine technology
  - Rapid optical and mechanical laser scanning technology
  - Rapid high-precision laser position control
  - Synchronous/coupled axis systems

At Fraunhofer ILT, users can test their own ideas in feasibility studies and, in case of success, transform them into concrete systems, processes and applications. As an independent institute, we individually assist in selecting the most suitable suppliers and components from the current market and blend them into solutions tailored to the customer.

Our range of services is supplemented by individual training and development seminars as well as practical training workshops. Within the projects, our customers have access to numerous lasers and robots as well as to the institute's precision engineering and electronics workshops. Fraunhofer ILT is certified according to DIN EN ISO 9001. All projects are therefore conducted according to the guidelines of our quality management system.

Contact

Dipl.-Ing. Peter Abels
Telephone +49 241 8906-428
peter.abels@ilt.fraunhofer.de

4 CAD modeling of a system for laser hybrid welding with integrated sensor technology.
5 System for laser hybrid welding.
6 Laser cutting and welding using a combi-head.