Your Partner for Leading-Edge Scan Solutions

SCANLAB
innovators for industry

SCANLAB GmbH is the leading OEM manufacturer of scan solutions for deflecting and positioning laser beams.

- 35,000+ scan systems shipped annually to 38 countries worldwide
- Developed and manufactured in Germany
- Highest quality standards
- Application-specific custom solutions
- Proactive creation of new laser applications through collaborative research

At Home in the Global Market

R&D Expertise for Your Laser Application

SCANLAB GmbH has been developing and manufacturing galvanometer scanners and scan solutions since its 1990 founding. Our highly qualified and motivated team of more than 400 employees possesses extensive market and application experience. SCANLAB's headquarters in Germany currently manufactures and globally sells more than 35,000 scan solutions annually. As market leader, we have the largest installed base in the world.

The main development and production site is located in Puchheim near Munich. Due to the continuous growth, the company's own building has already been expanded with a third construction phase in 2017 and a fourth phase is planned for 2022/23.

SCANLAB places great importance on expertise and diversity. Our staff hails from 36 countries and the proportion of women is approx. 39%.

International Locations and Partnerships

SCANLAB employs industry and application experts worldwide, to ensure that the most comprehensive and local support is possible. In the US, SCANLAB is represented by SCANLAB America, Inc. in Saint Charles (near Chicago), Illinois. In the Asian markets local distributors support the international sales team. In Belgium, Evergem near Gent, the development team for Polygon scanners is located.

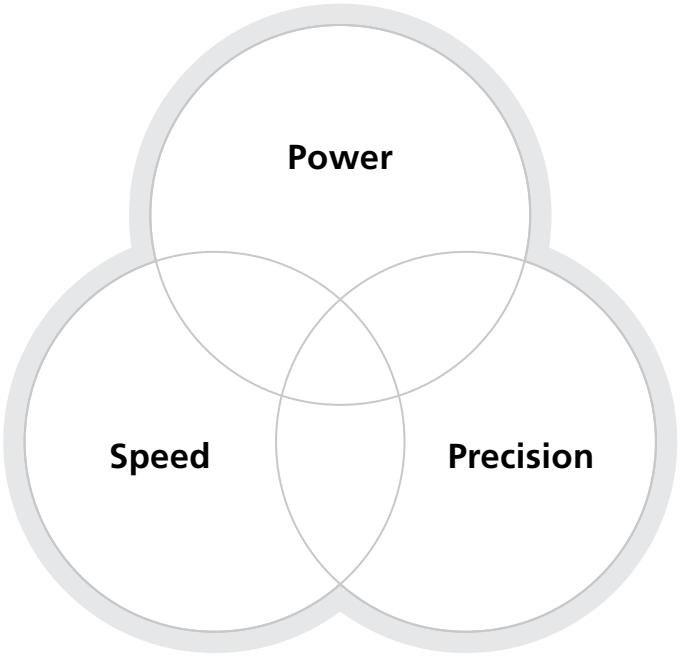
The sister company Blackbird Robotersysteme GmbH, a specialist for innovative robot-assisted laser welding, is headquartered in Garching near Munich. Sales and customer support for Asia is handled by the subsidiary Blackbird Robotics Co. Ltd. in Shanghai, China.

The sister company HOLO/OR, expert for diffractive optical elements (DOE) for industrial applications, is located in Ness Ziona, Israel.

Quality Made in Germany

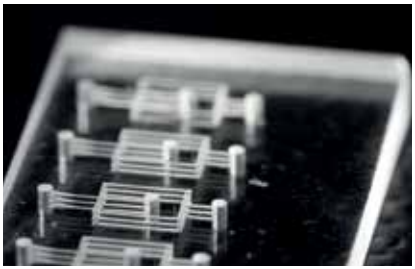
SCANLAB is committed to product-quality excellence, comprehensive expert advice and dependable deliveries. Its highly stable manufacturing processes are based on precisely-defined fabrication sequences.

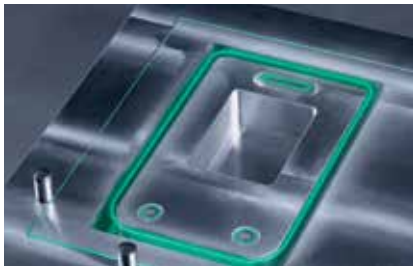
We design our own test procedures to ensure exceptionally high quality standards and reliable products. Each scan system is subject to numerous tests both during and after manufacturing, including optical verification of the beam position. Our products only receive the *SCAN*check quality seal after passing the final test.



	Welding	Cutting	Perforating	Engraving	Additive Manufacturing	Marking	On-The-Fly Applications	Scribing	Drilling	Precession Drilling	Micro Material Processing / Structuring	Soldering	Heat Treatment	Medical Treatments	Eye Surgery	Biomedical Imaging
Power	●	●	●	•	●	•	●	•	•	•	•	●	●	•		
Speed	•	●	●	•	●	●	●	●	●	•	●	•	•	●	●	●
Precision	•	•	•	●	●	●	•	●	●	●	●			•	●	●





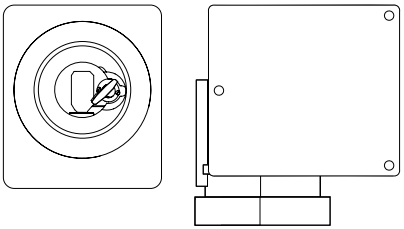



Scan systems are used for laser processing in numerous industries:

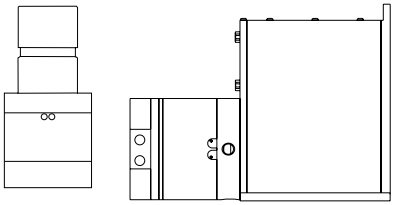
- Automotive
- Electronics & communications
- Packaging & food sector
- Lightweight construction
- Electromobility (E-Mobility)
- Machine tool and metalworking industry
- Medical technology
- Photovoltaics
- Textiles
- Time pieces, jewelry & lifestyle

The high-performance components meet diverse speed, precision and laser-power requirements for optimal flexibility in laser processing, treatment and imaging.

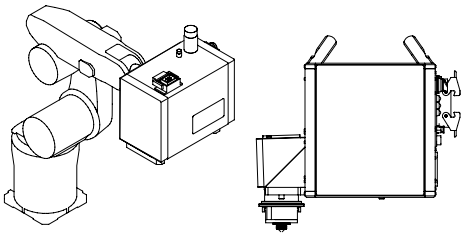
SCANLAB Product Range



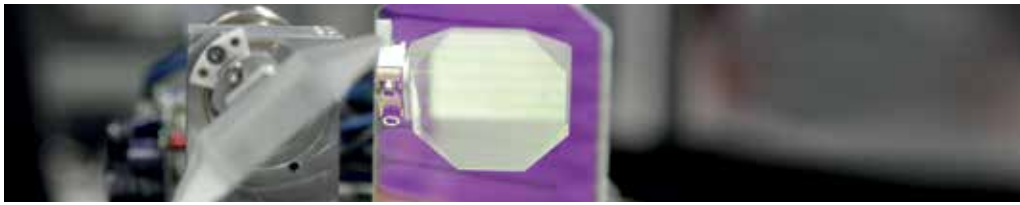
Scan Systems
2 and 3-axis systems

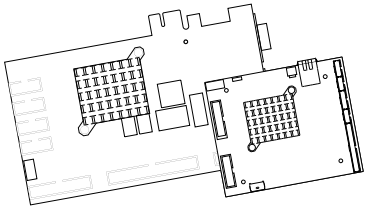


Z Axes & 3D Extensions
Dynamic focusing units and z axes



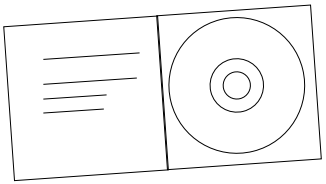
Advanced Scan Solutions
Integrated application-specific systems





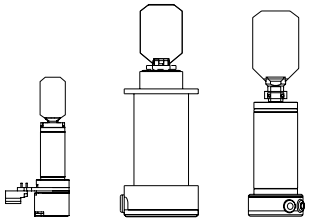
Control Electronics

RTC control for 2D and
3D scan systems



Software & Calibration Solutions

Image analysis, camera systems and software for professional laser materials processing



Galvanometer Scanners

Single-axis modules and servo drive boards

excelli*SCAN*

- The premium scan system
- *SCAN*ahead servo for fullest utilization of scanner dynamics
- Ultimate precision
- Housing innovations

intelli*SCAN*

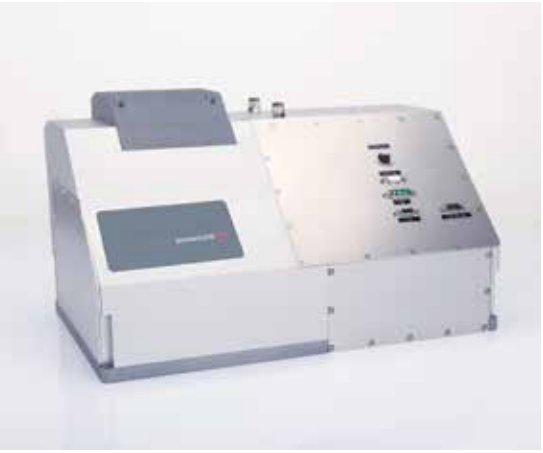
- High-end scan head
- Maximum precision (optionally with digital encoder technology)
- Highest dynamic performance
- Comprehensive diagnostics and monitoring capabilities

*SCAN*cube

- Very compact scan head
- Very good price/performance ratio
- High dynamic performance
- Best-practice marking solution

basiCube

- Very high write speed
- Compact and easy to integrate
- Attractive price/performance ratio



power*SCAN*

- For highest laser powers
- Large image fields and small spots
- Easy replacement of axes and galvanometers

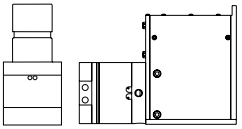
intelli*DRILL*

- Drill system with shortest jump-response times (point & shoot)
- High precision
- Water cooling
- With digital encoder technology

intelli*WELD*

- For remote welding applications
- For highest laser power
- Integrated safety concept for highest process safety

Z Axes & 3D Extensions

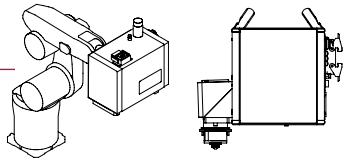


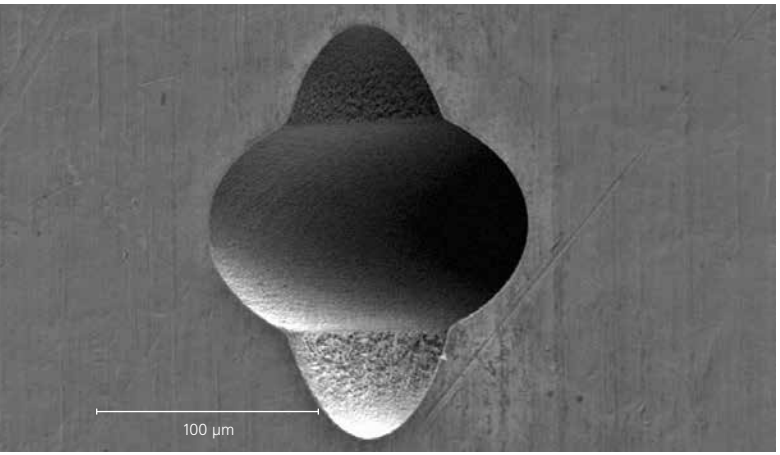
vario*SCAN*

- Extends 2D systems into 3D systems
- Suited for any installation position
- Compact and sophisticated system design
- Large selection of optics configurations for all common laser wavelengths
- Optics configurations for high laser powers

excelli*SHIFT*

- Transforms your 2D scan head into a 3D system
- Dynamics tuned to scan head
- Exceptionally fast scanning with long stroke





5-Axis Micromachining Subsystem

Ultra-short-pulse lasers (USP) are revolutionizing micromachining. Laser pulses in the pico-second and femto-second range allow gentle, precise, high-throughput processing of nearly any material.

The precSYS Micromachining Subsystem enables industrial USP laser processing of flexibly-defined geometries with high aspect ratios. Processed bore holes and edges are notably sharp and burr-free, eliminating the need for post-processing.

Featuring the latest high-end scan technology, digital encoders, integrated control, embedded PC and GUI-based software, the precSYS delivers top dynamic performance and precision. Its robust, innovative system design ensures maximum dependability in industrial use.

precSYS's modular, compact construction and its well-designed hardware and software interfaces facilitate straightforward integration in customer-specific laser systems and networked manufacturing environments (internet of things).

These systems are available for USP lasers with wavelengths of 1030 nm, 1064 nm and 515 nm.

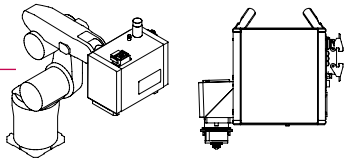
High-Speed Polygon Scanner Systems

Ultra-short-pulse (USP) lasers are ideal for maximum-precision micromachining of diverse materials such as metals, glass, silicon, ceramics and thin film. To achieve industrial-scale productivity, USP lasers are best combined with ultra-fast scanners such as polygon scanner systems.

Polygon scanners are particularly advantageous for line-oriented full-surface processing of workpieces – at fine resolutions and with freely definable patterns and structures. Thanks to their high speed, these systems can considerably slash material processing times.

With the help of these systems, users can better leverage the benefits and potential of ultra-fast lasers. A wide range of polygon scanners (with or without additional galvanometers) is offered, allowing fast customization for optimum efficiency.

These ready-to-use solutions enable exceptional scan performance in demanding applications, through innovative features such as SuperSync Control and TrueRaster Technology.



Robot-Assisted 3D Laser Welding

Remote laser welding – with industrial robots and working distances in the hundreds of millimeters – is widespread in industrial manufacturing.

SCANLAB and its associate company Blackbird Robotersysteme teamed up to develop a well-crafted complete solution – including intelligent monitoring and control of the welding process.

The intelli*WELD* scan system is responsible for precisely guiding the laser beam. This scan head can reposition the laser focus to any location in mere milliseconds and provides concurrent process monitoring when used with a camera.

This scan system's robotics suitability is supported by the ScanControlUnit (RobotSyncUnit), a central operating unit for the entire laser welding system – including robot, laser and peripherals. Easy and intuitive system usage brings efficiency to programming of welding tasks.

www.blackbird-robotics.de

BLACKBIRD
ROBOTERSYSTEME

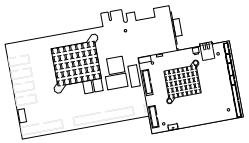
Highest Precision for Large-Surface Micromachining

With the XL SCAN scan solution, a 2D scan head and an XY positioning table with two servo axes are controlled synchronously. The scan concept, including the smart control which was developed jointly by SCANLAB and ACS Motion Control, offers an almost unlimited image field for laser processing.

The XL SCAN is suitable for both large-area micromachining as well as for cutting large foils and drilling circuit boards in electronics manufacturing.

The combination of the tracking error free excelliSCAN scan head with the smart syncAXIS software enables highest precision. The XL SCAN concept also allows a significant increase in throughput; thanks to the optimized control concepts (such as synchronous control and predictive trajectory planning) and the easy configuration of multi-head machines.

ACS MOTION CONTROL



PC Interface Boards

RTC control boards ensure fast, precise, synchronous control and management of scan heads, lasers and peripherals in real time.

RTC boards are available for various interfaces:

- Ethernet
- PCI Express
- PCI

System integrators appreciate the variety of programmable signals available for vector and bitmap output.

Primary functions:

- Communication via such standard protocols as XY2-100 or SL2-100
- Up to 20-bit position resolution
- Status signal evaluation
- Automatic readjustment
- Processing-on-the-fly support
- 2D and 3D field correction
- Application-specific functionality
- Diverse standardized interfaces for system integration and automation
- Multiple RTC boards with master/slave relationship in one PC
- 2nd scan head option

Laser Processing Software

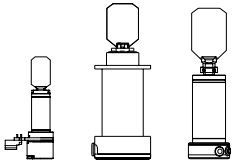
The intuitively structured laserDESK program lets you easily control laser marking and processing operations. It manages your hardware components using SCANLAB's RTC control boards.

laserDESK's graphical user interface streamlines creation and execution of laser jobs, even highly complex ones. You can assign process parameters individually to all marking objects and process steps. Library functions simplify reuse of objects and parameter sets, saving work-time while reducing repetitive effort.

Typical application areas:

- Product qualification
- Process testing
- Sample production
- Development of prototypes and series products

Galvanometer Scanners



Single-Axis Modules, Mirrors and Servo Drive Boards

dyn*AXIS* galvanometer scanners are high-performance rotary motors for precisely positioning laser beams used in surface processing. Mirrors attached to the galvanometers accurately guide the laser for each application.

Galvanometer scanners are available in an assortment of sizes and configurations. SCANLAB produces, integrates and ships more than 60,000 galvo units annually.

Digital vs. Analog Angle Sensors

Core components of these systems are a galvanometer motor (based on moving-magnet technology) and an analog or digital position sensor. Digital position sensors, also called encoders, outperform analog systems due to their enhanced precision and long-term stability.

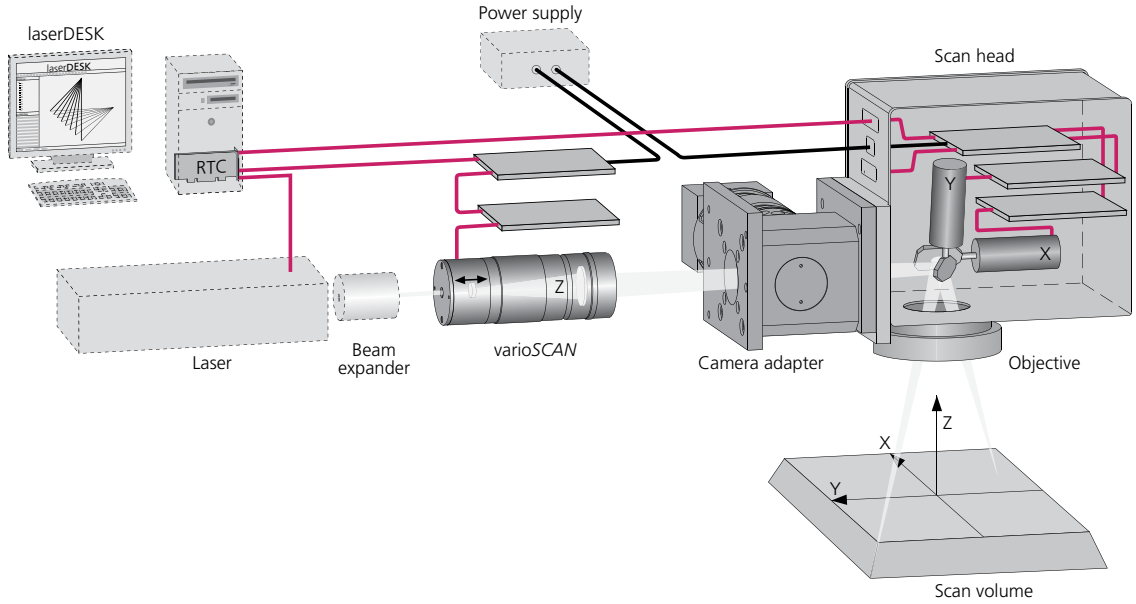
For each dyn*AXIS* scanner, SCANLAB offers suitable mirrors with coatings for all common laser wavelengths and powers. These mirrors have excellent reflective properties, as well as optimized stiffness, flatness and inertial loads.

Intelligent Servo Drive Boards

SCANLAB galvanometer motors provide optimal performance when combined with our innovative servo drive solutions, available in both single axis and dual axis configurations. We offer the most advanced control features – including analog or digital inputs and status outputs, and analog or digital (PWM) drives with a variety of operating voltages – to efficiently meet dynamic performance requirements without overheating.

The all-digital servo drives enhance performance while enabling features such as multiple tuning parameters, position acknowledge signals for laser triggering, and customer-specific digital features upon request.

Operating Principle of a Scan System



Galvanometer-driven scan heads first transformed laser systems into highly flexible processing tools. Their scope of functionality is closely tied to servo electronics and control concepts that satisfy diverse demands in dynamically positioning the laser beam and system monitoring.

Optical Design

Laser beam deflection is performed via scan mirrors, which are quickly and precisely positioned by galvanometer motors. The scan head integrates all components, including electronics, in a compact, sealed housing. The laser beam is focused by an objective at the scan system's beam exit or by a focusing system at the beam entrance. A camera adapter can be installed to monitor processing.

System Configuration and Design

A scan system's optical and dynamic configuration is based on several factors, including:

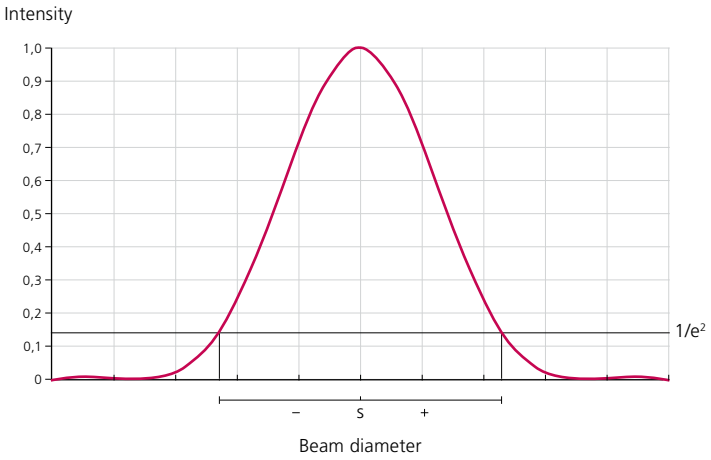
- Spot size
- Working distance
- Image field size or working volume
- Wavelength, laser power and pulse length
- Positioning accuracy
- Dynamic performance

We optimally configure each system to your requirements.

Determining Spot Size

$$s = \lambda \cdot f \cdot M^2 \cdot k / d$$

s	**Focal diameter ($1/e^2$)**
λ	**Wavelength (typically 193 nm – 10.6 µm)**
f	**Focal length (typically 30 mm – 2,000 mm)**
M^2	**Beam quality (laser-dependent ≥1)**
k	**Correction factor (ideally 1.27; more typically between 1.5 and 2.0)**
d	**Beam diameter prior to focusing (typically 6 – 70 mm)**



Wavelength, Laser Power, Pulse Length

Each system is equipped with appropriately coated mirrors and objectives or variable focus units suitable for your laser's wavelength, power and pulse length.

Spot Size

Spot size ($1/e^2$) can be approximated using this formula, and is influenced by the scan system's light source (laser wavelength and coupled beam quality), aperture and focal length.

Working Distance and Image Field Size or Working Volume

The free working distance is essentially governed by focal length and the focus optic's design. Image field size is determined by the scan system's scan angle and focal length, as well as the objective's design.

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