

Laser machines

Machine technology for industrial
laser micromachining - from individual
parts to series production

PULSAR
PHOTONICS

a schunk company

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Basic Machines



Basic Machines - Laser machine manufacturing



Innovative laser machines for the highest demands

Our basic laser systems combine mature technology with high process reliability and flexibility. Our RDX machine platform exists since 2016.

Based on modular machine platforms, they are suited for a wide range of processing tasks such as structuring, drilling and cutting.

With scalable configurations and straightforward integration, they offer an efficient entry point into industrial laser micromachining. All our systems meet the highest safety standards for the user.



RDX500

Compact allround machine for laser micromachining

- USP laser up to 80 W average power, typ. 30 W
- Wavelength: 1030/1064 nm, 515/532 nm or 343/355 nm
- 2D or 3D galvanometer scanner
- Travel range of the axes:
typ. 300 mm x 300 mm x 300 mm
- Installation area: typ. 2500 mm x 2000 mm
- Machine weight: < 2500 kg
- Optional: 1D measuring system for determining the focus position
- System camera for workpiece positioning



- Compact USP system: ideal for limited space
- Flexible allround system for laser drilling, laser structuring, laser fine cutting & more
- Various equipment variants
- User-friendly machine control software Photonics Elements

Application examples



„The RDX500 is a compact yet fully-fledged machine for professional micromachining with ultrashort pulse lasers. It is ideal for the R&D sector, for developers and for newcomers to USP processing.“ **Louisa Draack, Technical Sales**

Laser fine cutting of polymers



Laser drilling of glass vials



Surface functionalization by laser structuring



Laser ablation of precision tools



Laser processing of hydrogen electrolyzers



Large aspect ratio microdrilling of nozzles



RDX800

The flexible laser processing center

dual-micro

- USP laser up to 200 W average power, ns laser > 200 W
 - Fiber laser or free beam, up to 2 sources
 - Wavelength: 1030/1064 nm, 515/532 nm or 343/355 nm
-
- 2D or 3D galvanometer scanner
 - Travel range of the axes:
1000 mm x 400 mm XY, 2 x 400 mm Z1 Z2
 - Installation area: typ. 5000 mm x 4000 mm
-
- Machine weight: < 4500 kg
 - Optional:
1D measuring system for determining the focus position
 - System camera for workpiece positioning



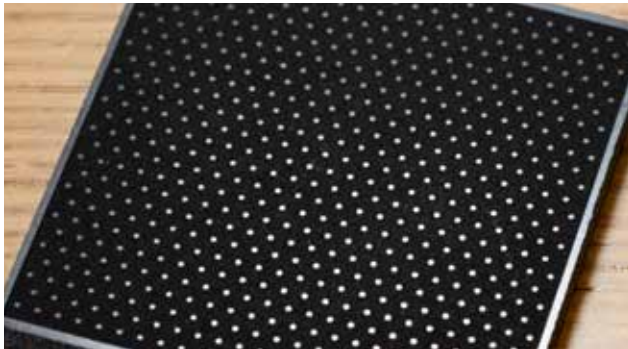
- Combined laser processes (e.g. drilling + cutting) incl. extensive measurement technology
- Automation in the cell can be increased by a roll-to-roll or robot system
- Second Z-axis enables multi-machining with two process heads or the integration of additional measuring technology for component testing

Application examples



„The standard processes of cutting, drilling, and functionalizing make the RDX800 a versatile all-rounder across numerous industries and applications. The machine tool addresses demanding users from the industrial single-part and small-batch production.“
Dr. Stephan Eifel, Managing Director.

Laser structuring of wafer chucks in SiC and Zerodur for production of pin-structures



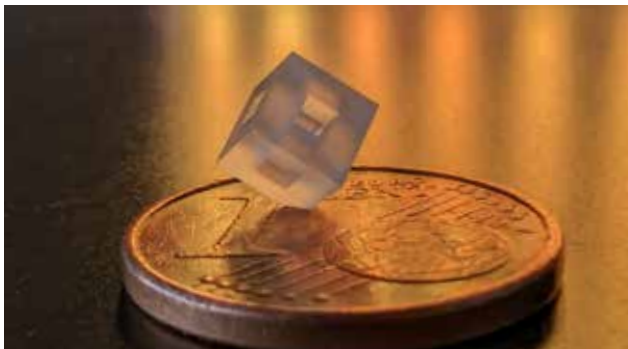
Structures for changing adhesion properties



Laser drilling of microsieves for nebulizers & sprayers



**3D laser ablation in glass:
Processing brittle-hard materials**



Laser turning of ceramic components



Precision-manufactured shafts with a heringbone structure using USP lasers



RDX2Fiber

Machine for combined fiber laser processing

- Combined processing with two laser sources
E.g. laser welding and laser structuring
- User-friendly machine control software Photonic Elements
- Modularly customizable

- CW/QCW/ns fiber laser
- Wavelength: 1030/1064 nm, 1030/1064 nm, 515/532 nm
- 2D galvanometer scanner / fixed optics

- Travel range of the axes: 400 mm x 400 mm x 400 mm
- Installation area: typ. 2000 mm x 3000 mm
- Machine weight: < 3500 kg
- Switch cabinet with machine control

- Operator terminal (stand-alone or attached on machine arm)
- System camera for workpiece positioning
- Optional:
1D measuring system for determining the focus position



Application examples



„The RDX2Fiber combines precise laser production with pragmatic sample handling and ensures high process stability. Partial automation and unrestricted accessibility to the machine complete the profile of the RDX2Fiber.“ Dr. Michael Leers, Head of plant engineering.

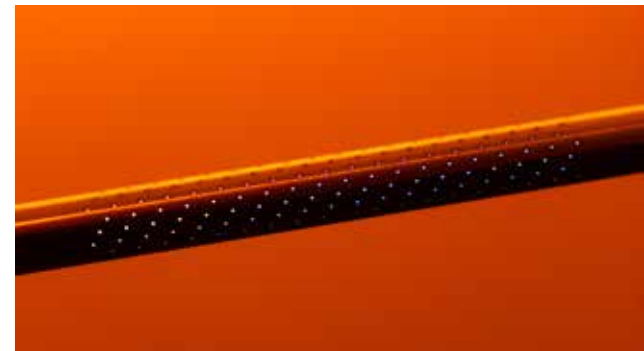
Laser welding of carbon brushes



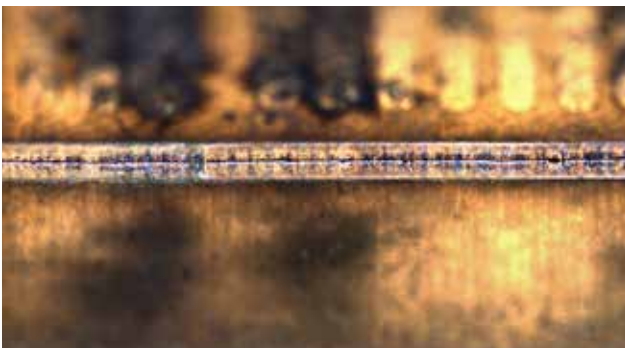
Metal-plastic joining



**Laser drilling of stainless steel tubes
(Ø 250µm)**



Welding of copper-copper connections



**Melt-dominant drilling processes for high
material thicknesses & high drilling rates**



Interior view of the Pulsar RDX2Fiber



Pulsar.One

Precise labeling and marking

- Marking and engraving system with IR nanosecond laser for various materials such as metals, e.g. steel, aluminum, copper and many types of polymers
- Single part processing with individual labeling
- Small and compact housing



- Processing area depending on scan field
 - Focal length between $f = 160$ mm and 420 mm
 - Nanosecond laser with typ. up to 100 W
-
- Installation area: 800 mm x 1100 mm x 1900 mm
 - Weight of the machine: 250 kg
 - Z-axis, optional X-axis and rotary axis

Application examples



„The Pulsar.One is suitable for cost-effective, precise and long-lasting marking of various materials. The non-contact and digital processing enables fast and flexible adaptation of texts and codes.“ **Louisa Draack, Technical Sales.**

Laser Annealing: Coloring of stainless steel surfaces



Marking cylindrical or ring-shaped objects



Labeling of serial numbers, images, logos, QR and barcodes



Pulsar.One: Outside view of the compact labeling system



Resistant markings in steel surfaces



High-contrast & colored marking



Industrial Production Machines



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Customized - single part & series production

Special system engineering - customized solutions for complex requirements

In special machine engineering, we realize individual technical systems that are precisely tailored to the specific requirements of our customers.

Whether highly automated production systems, complex test benches or special solutions for particular industries - our interdisciplinary team combines innovative strength with many years of experience.

From the initial idea to the turnkey handover, we accompany every project with the utmost precision and a clear focus on quality, efficiency and future-proofing.



RDX1000 LWJ

Waterjet-guided laser for material processing



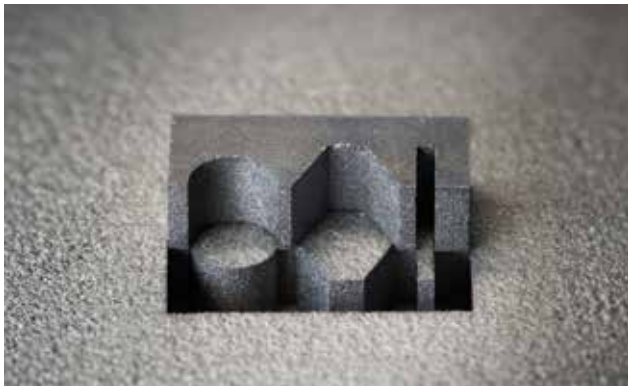
- Two processing stations for combined manufacturing: waterjet-guided laser processing & dry processing station
- Machining of brittle-hard materials: metals & hard metals, technical ceramics, silicon carbide SiC / SiSiC, diamonds, composite materials
- Intuitive and user-friendly software for generation of CAM-paths
- Process head: Synova S.A.

- High aspect ratio laser cutting
- Processing of brittle-hard materials with thicknesses up to 20 mm
- Combined processing with additional conventional processing head

Application examples



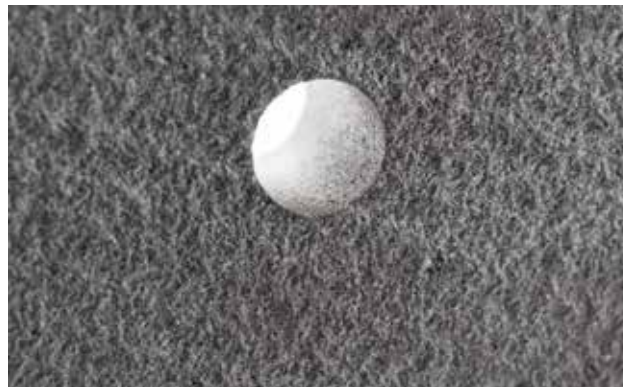
The demand for processes that enable fine structures with maximum precision and quality has increased, particularly in ceramic processing. The combination of laser and waterjet now opens up completely new possibilities in precision machining.
Dr. Stephan Eifel, Managing Director.



Cutting of free-form contours in technical ceramics such as SiC

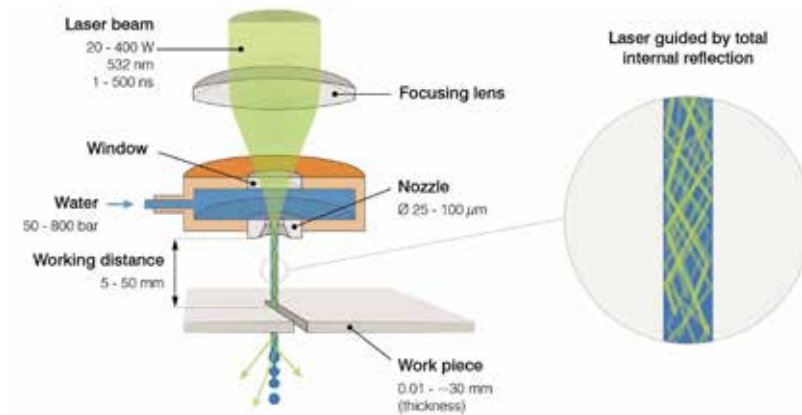


Deep hole drilling in technical ceramics with a material thickness of up to 20 mm



Waterjet-guided laser cutting

Waterjet guided laser cutting (LWJ) is a special type of laser cutting technology especially useful for materials which are difficult to machine and use-cases in which a precise laser cut is needed while minimizing heat input.



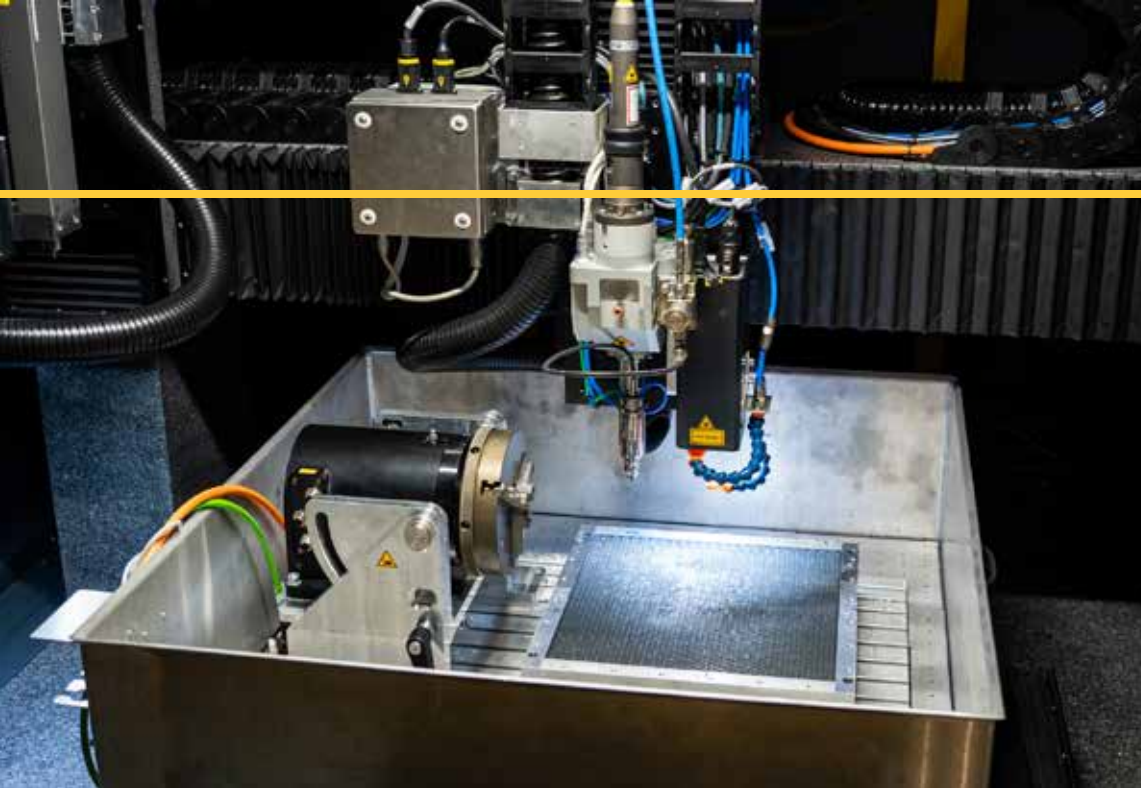
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RDX1000 LWJ

Waterjet-guided laser for material processing



Machine details



Ceramic processing 2.0: When water complements the laser

Our machines of the type RDX1000 LWJ utilize the patented MicroJet® technology by Synova S.A. and combine a modern and user-friendly machine control interface with high-performance laser-cutting optics. The machine is equipped with two processing stations: one for waterjet-guided machining and one for dry laser machining.

Advantages

- Material thicknesses 1 - 20 mm
- Aspect ratios: up to 1:100
- Cutting kerf widths: 80 - 200 μm
- Combined machining, stacked components
- Machining of brittle-hard materials
- Without thermal damage or mechanical wear to the workpiece

Industry

- Ceramics industry
- Semiconductors



RDX2Drill

Laser drilling machine

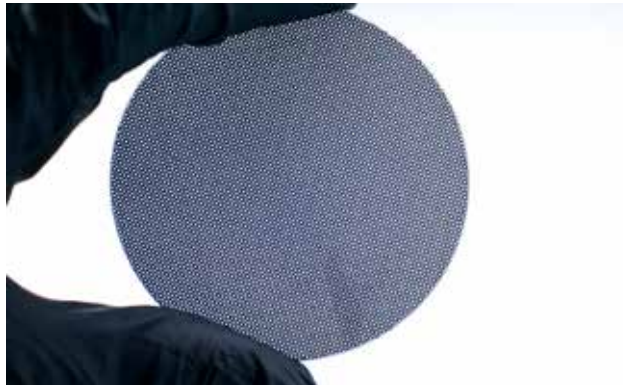
- Drilling system for single-pulse drilling with high-power QCW fiber lasers
- Wavelength from 1060 - 1080 nm (IR)
- Processing area up to 400 mm x 400 mm x 400 mm
- Drilling rates: up to 80 Hz
- Integrated extraction unit for removing melt particles



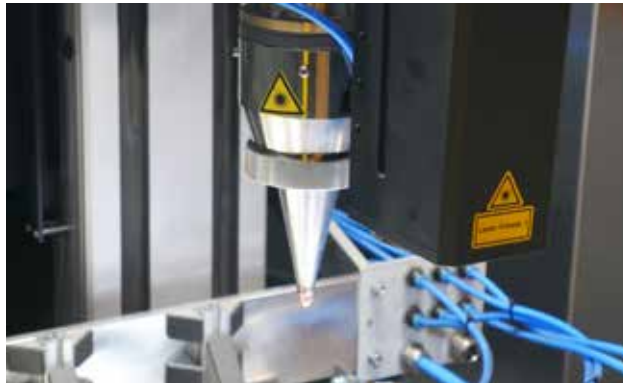
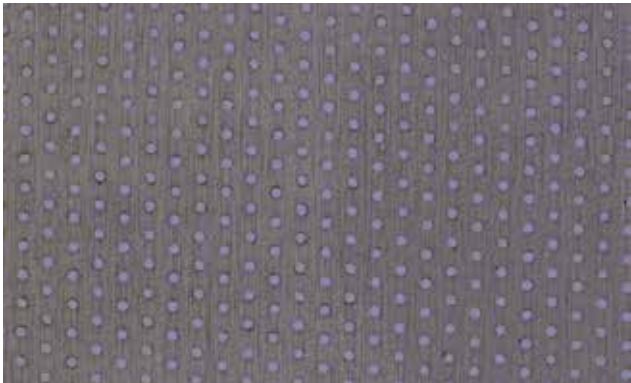
Application examples



„A specially developed control software enables the RDX2Drill series to laser drill thick sheets of metal sieves and filters efficiently. The digital process chain makes it easy to map product variants.“ **Philip Oster, Head of Laser Application Center.**



Production of metallic sieves for filter applications



Microsieves for filter applications

The RDX2Drill is a configuration of the RDX2Fiber machine series and is designed for the production of metallic sieves and filters using melt-dominant laser drilling.

A fiber laser, a drilling process head (fixed optics) and a fast XYZ axis system for positioning workpieces under the process head ensure highly productive drilling processes.

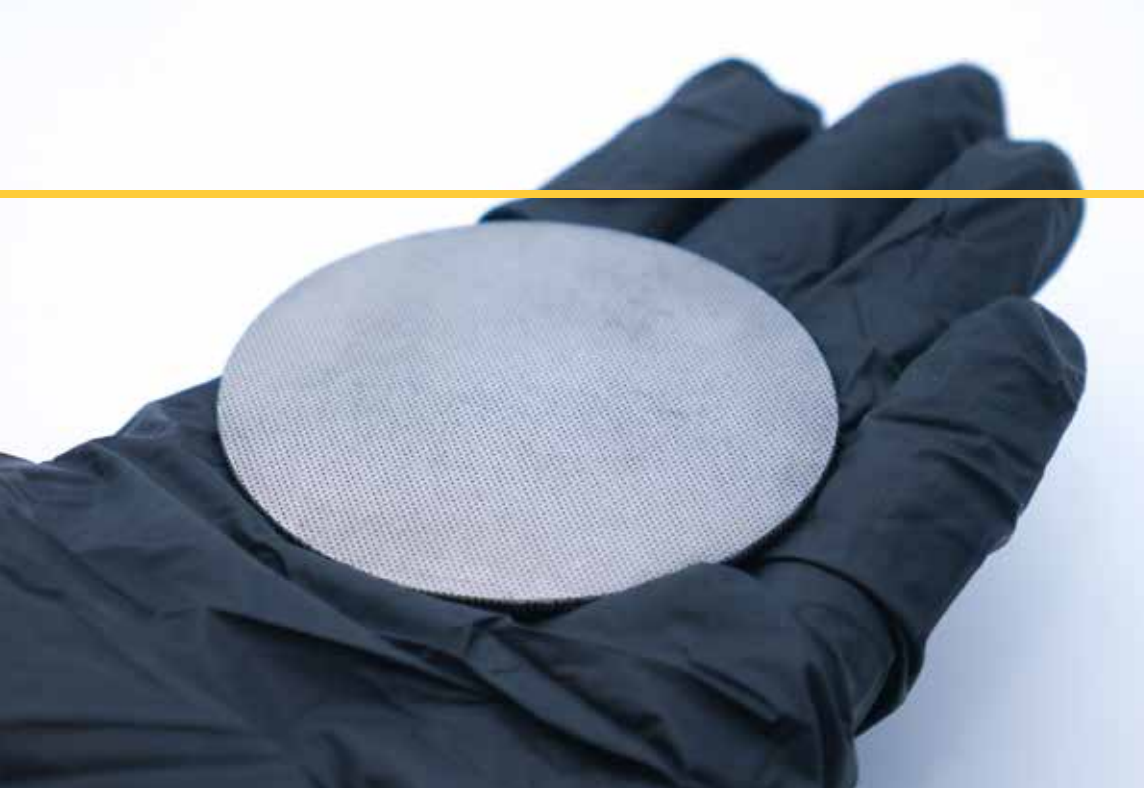
This technology is particularly suitable for the production of filter applications in the field of sustainable manufacturing. Thanks to the software-based control, almost any drilling pattern can be realized.

RDX2Drill

Laser drilling machine



Machine details



Machine for laser drilling of metallic sieves and filters

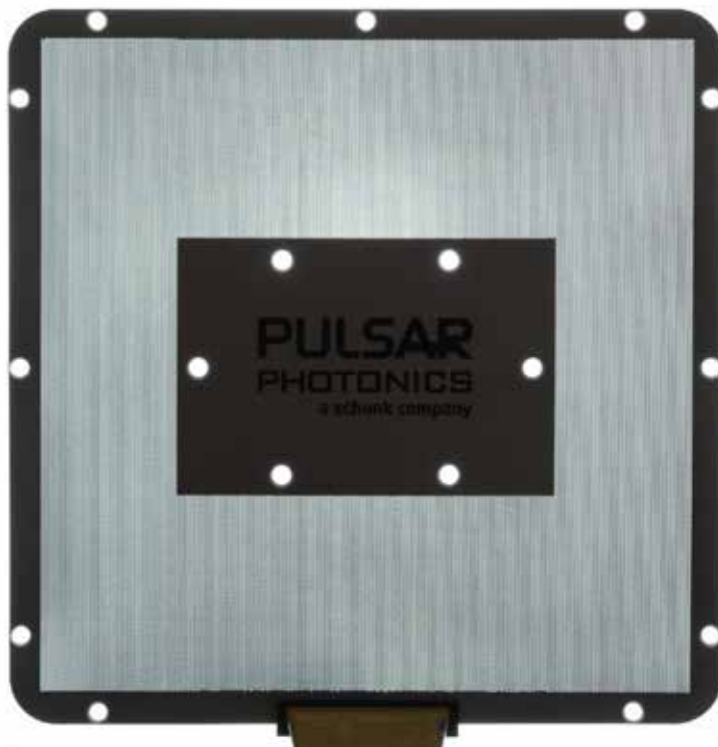
QCW lasers are generally used for laser drilling. These have a peak pulse power in the multi-kW range, while the pulse durations are in the order of a few microseconds or often even milliseconds. The pulses have such a high pulse energy that they are suitable for single-pulse drilling. This means that drilling rates up to 80 Hz can be achieved even with thicker sheets.

Achievable qualities

- **Materials:** Stainless steels, aluminum, titanium
- **Material thickness:** 0,5 - 1,5 mm
- **Bore diameter:** 100 - 400 μm
- **Drilling rates:** up to 80 Hz

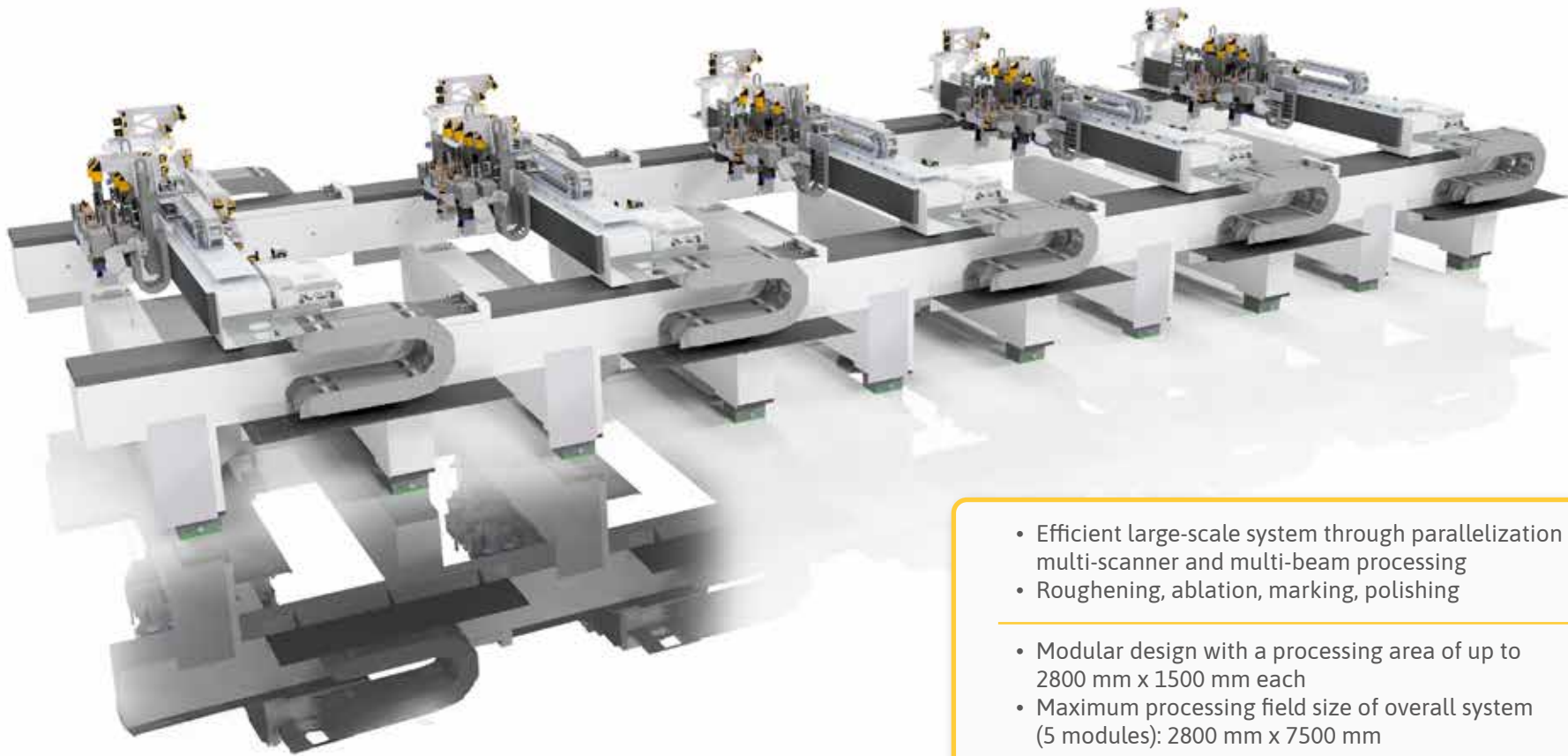
Industry

- Filter technology
- Process engineering (e.g. chemicals, pharmaceuticals)
- Recycling



RDX2800

Large-scale laser micromachining



- Efficient large-scale system through parallelization with multi-scanner and multi-beam processing
- Roughening, ablation, marking, polishing
- Modular design with a processing area of up to 2800 mm x 1500 mm each
- Maximum processing field size of overall system (5 modules): 2800 mm x 7500 mm
- Scalability to full-surface laser micromachining of > 10 m² in size

Application examples



„Real-time online monitoring allows us to continuously track how and when the machine is working with specific files. It is an indispensable part of our system, as it enables us to monitor all operating statuses seamlessly.“ **Dr. Joachim Ryll, Managing Director.**

Precise structuring of areas larger > 10 m² with USP laser & up to 100 partial beams



Full-service laser processing of large flat components



Scaling through parallelization with multi-beam technology

Motivated by environmental requirements and regulations restricting the use of chemicals or paints, more and more companies are faced with the task of converting their production processes to more environmentally friendly and/or less energy-intensive manufacturing methods.

Large-area laser micromachining offers a way to replace existing manufacturing processes or to improve coating and cleaning processes.

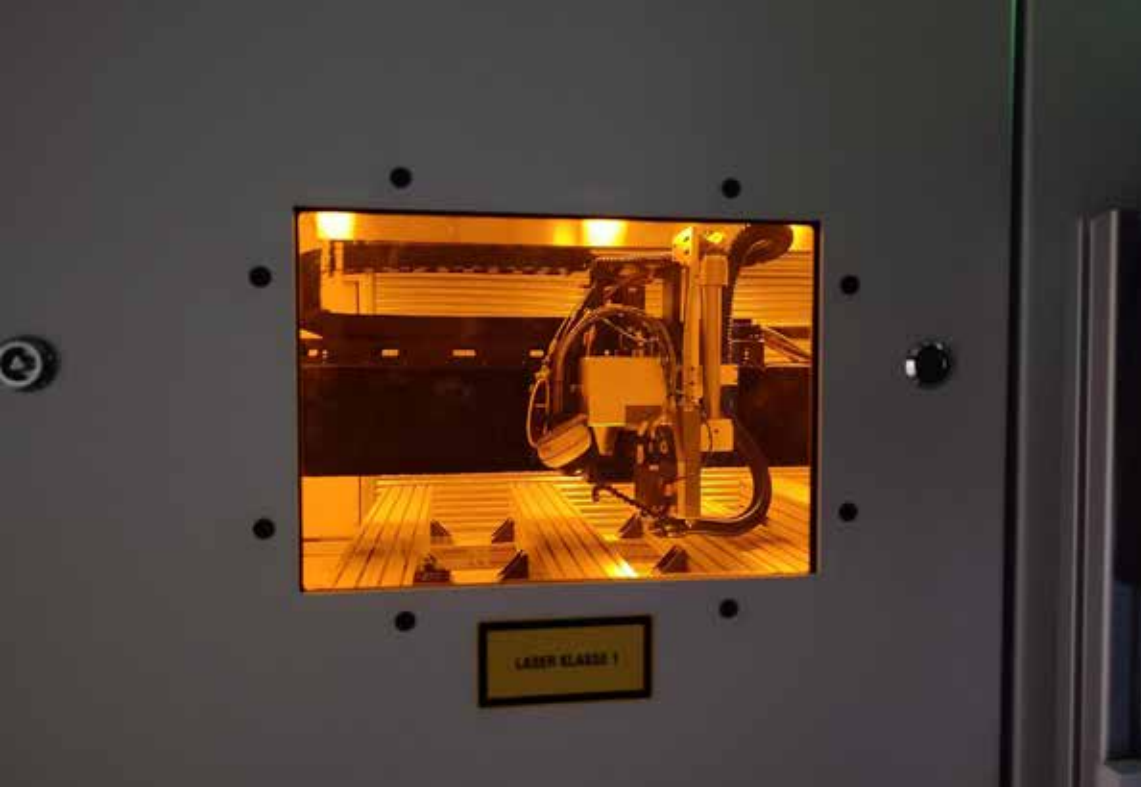
The laser-based manufacturing process also opens up scope for new product features and market differentiation thanks to the digital process chain and the combinability of laser processes.

RDX2800

Large-scale laser micromachining



Machine details



Micromachining goes macro: Laser micromachining of workpieces in the square meter range

Advantages

- Replacing etching processes with hard chrome plating (environmentally friendly, sustainable production processes)
- Component size up to 2800 mm x 7500 mm
- Option for flexible processing with each machining optic
- Full-digital process chain from CAM to processed workpiece
- Interface to higher-level systems
- Asynchronous process preparation
- Processing of large area CAM-data
- Parallelization & process scaling

Industry

- Large-format flat components in tool technology



RDX800 automatic

Roll-to-sheet laser manufacturing



- Roll-to-roll + roll-to-sheet
- Process sequences - various (laser) processes in succession
- Double-sided processing
- Measurement technology & individual component tracking
- 100% component verification & audit trail
- Individualized software solutions (production UI)

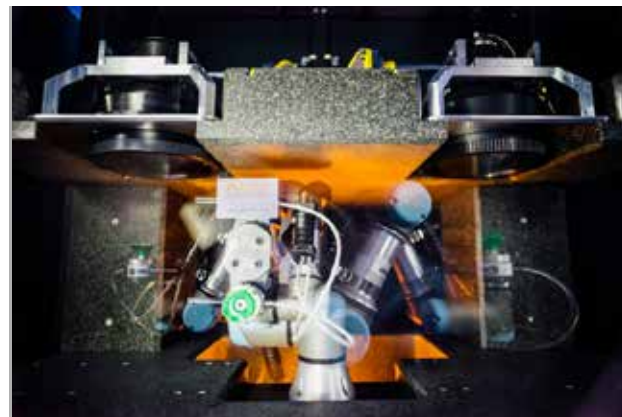
Application examples



„The system combines many process steps and also offers far-reaching advantages in comprehensive component handling. The Pulsar Photonics machine concept enables 100% component inspection with complete traceability of each individual part. Robot integration eliminates any manual transfer between the individual process steps.“ **Dr. Joachim Ryll, Managing Director.**



A wide range of automation modules: Production and monitoring are fully automated from the moment the roll is inserted



Fully automated series production of electronic components for medical technology

The RDX800automatic is a highly automated laser machine based on the existing RDX system concept and has been supplemented by an extended automation module.

With an integrated **roller system, robot handling** and options for **various laser sources** (UV, green, IR), it enables fully automated production processes - from material feed to final processing.

The system combines numerous processing steps (e.g. **drilling, cutting, structuring**) and offers maximum precision and traceability thanks to functions such as **register mark detection**, a **z-axis measuring probe** and **reject detection**. With its modular expandability, it can be used flexibly and achieves high quantities at low cost thanks to automated processes.

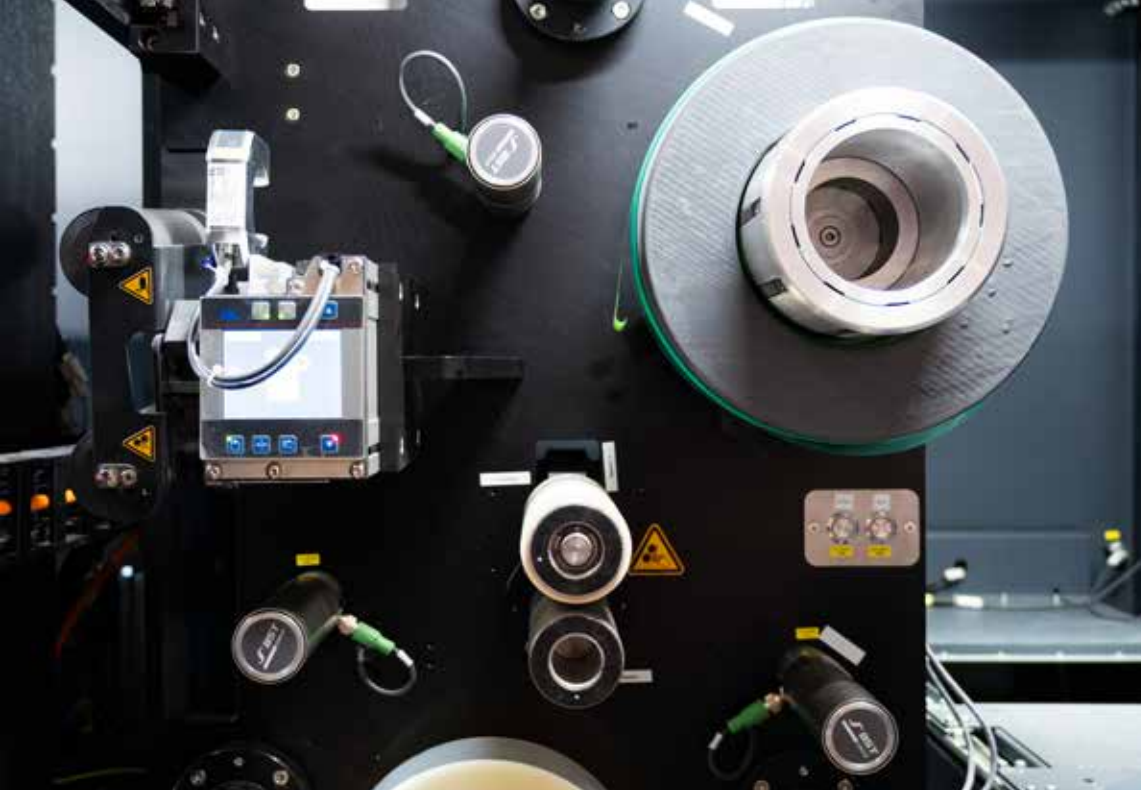
The machine exemplifies the combination of laser micromachining and intelligent automation.

RDX800 automatic

Roll-to-sheet laser manufacturing



Machine details



Highly automated laser micromachining system with integrated robot and roller system

Advantages

- Roll-to-roll & roll-to-sheet
- Process sequences - various (laser) processes in succession
- Double-sided processing
- Measuring technology & individual component tracking
- 100 % component verification & audit trail
- Individualized production
- Individualized software solutions
- Separate sorting of rejects

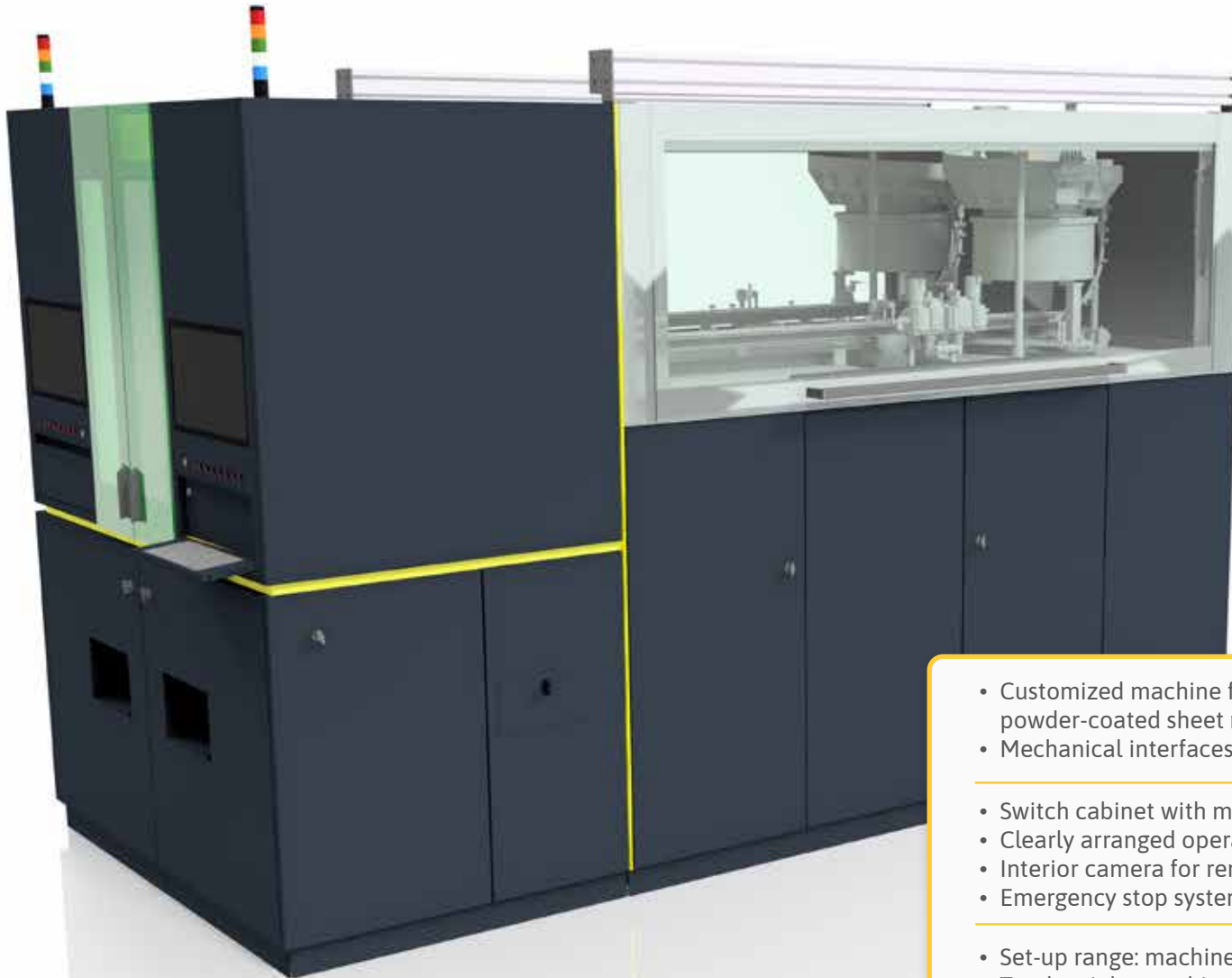
Industry

- Medical technology
- Electronics industry



P1000 automatic

For bulk material manufacturing



- Customized machine frame (machine base frame, powder-coated sheet metal cladding, machine bed)
- Mechanical interfaces for feeding system
- Switch cabinet with machine control
- Clearly arranged operating terminal with limited access rights
- Interior camera for remote support
- Emergency stop system for laser class 1
- Set-up range: machine-specific
- Total weight: machine-specific

Application examples



„This solution significantly increases productivity while enhancing machine reliability. At the same time, direct operating costs—particularly in the area of wear parts—can be substantially reduced. In addition, the digital nature of the laser drilling system enables real-time evaluation of numerous KPIs, effectively supporting production control.“ **Dr. Stephan Eifel, Managing Director.**



The separated design of the laser drilling system allows for one-sided maintenance while the other production station remains in operation, eliminating the need for a complete machine shutdown

Automatic handling and measurement technology with 100% quality assurance

The P1000 automatic is a machine series for the automated laser microprocessing in series applications.

The combination of modular laser processing cells from the RDX series, component-adapted feed systems and high-performance measurement technology creates special machines for the laser-based processing of components and flexible substrates in large quantities. A 100% check of the processing results is included, so that seamless post-processing is guaranteed.

The machine configuration is designed and configured customer-specifically based on the requirements for cycle time and component quality. The start of series production takes place together with the customer, supported by our on-site service.

P1000 automatic

For bulk material manufacturing

Fully automated laser
micromachining for
series production



Machine details



Special machinery for automated micromachining

Advantages

- Up to 300 000 parts per day
- High productivity
- 100% inspection with OK / NOK lock
- Interface to higher-level DCS
- Feeding with bulk material
- Machine interlinking with upstream and downstream processes
- High technical machine availability (24/7)
- Component processing price: less than 1 ct
- < 0.2 % rejects
- Equipped for „summer operation“ (high ambient temperatures, active cooling)
- Various laser processes possible: drilling, marking, roughening, ablation

Industry

- Medical Technology
- Electronics industry
- Defense

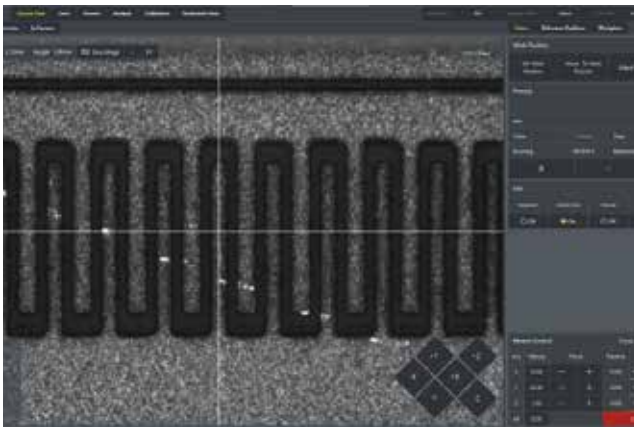


Services around our machines

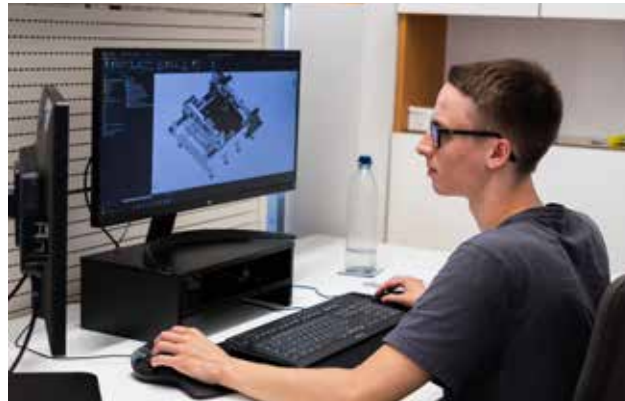
Photonic Elements

Photonic Elements is our **control and operating software** for laser micromachining. The laser software integrates the control of the individual machine components as well as the monitoring of safety-relevant functions. It offers a context-related interface for tasks such as laser machine preparation or the execution of process-related machining strategies.

- Clear and easy to use interface
- Job editor with scripting to create process flows
- Integrated CAD module
- Measurement functions & data visualization
- Modular system for controlling hardware components



Photonic Elements central view.



We work with the latest CAD and CAM tools

Design

To successfully complete your project, we support you in the **development, design, FEM calculation, construction and drawing derivation** in the depth you require. Depending on your needs, we can take care of individual components or entire assemblies and machines. We have the necessary experience from our internal activities as developers of highly complex laser systems.

- Individual advice & design for your projects
- CAD & FEM modeling with Autodesk Inventor
- Optional: Production and assembly with a network of competent and reliable manufacturers

Training & support

We offer a comprehensive range of different services to our customers. In addition to the classic **on-site and remote service**, the program also includes **system upgrades, system maintenance and operator training**. We will be happy to put together an individual service package for you!

Our online learning platform **Pulsar Academy** offers another opportunity to immerse yourself in the world of laser technology.



With the help of our service portal, you can easily forward your inquiries to us

Company facts

Pulsar Photonics GmbH is an innovative high-tech company in the field of laser micromachining. The range of services extends from laser application development and series production to system construction with software development and laser system technology.

Our focus lies on the processes of structuring, drilling, precision cutting and surface functionalization.

Since its foundation in 2013, Pulsar Photonics has been intensively involved in the scaling of laser processes and the development of machine technology for industrial laser production - from single parts to series production.





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13b

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