

# LASER CLEANING SYSTEMS

Non-abrasive | Ultimate precision | Eco-friendly



## ABOUT LASER CLEANING

### How it works

Laser cleaning is an industrial process used to remove unwanted coatings or deposits with highly concentrated laser light from various surfaces. No chemicals or abrasives are used in this process.

The technology is ultimately precise and removes only desired coated area without any damage on base material. Laser cleaning can remove deep or thin layers of paint, oil, rust and other coatings without any affect for substrate.

Laser cleaning is more effective, economical and sustainable solution compared to conventional technologies such as sand blasting, dry ice or chemical cleaning. No chemicals or abrasives are used in this process which makes this technology user and environment friendly.

### Purpose

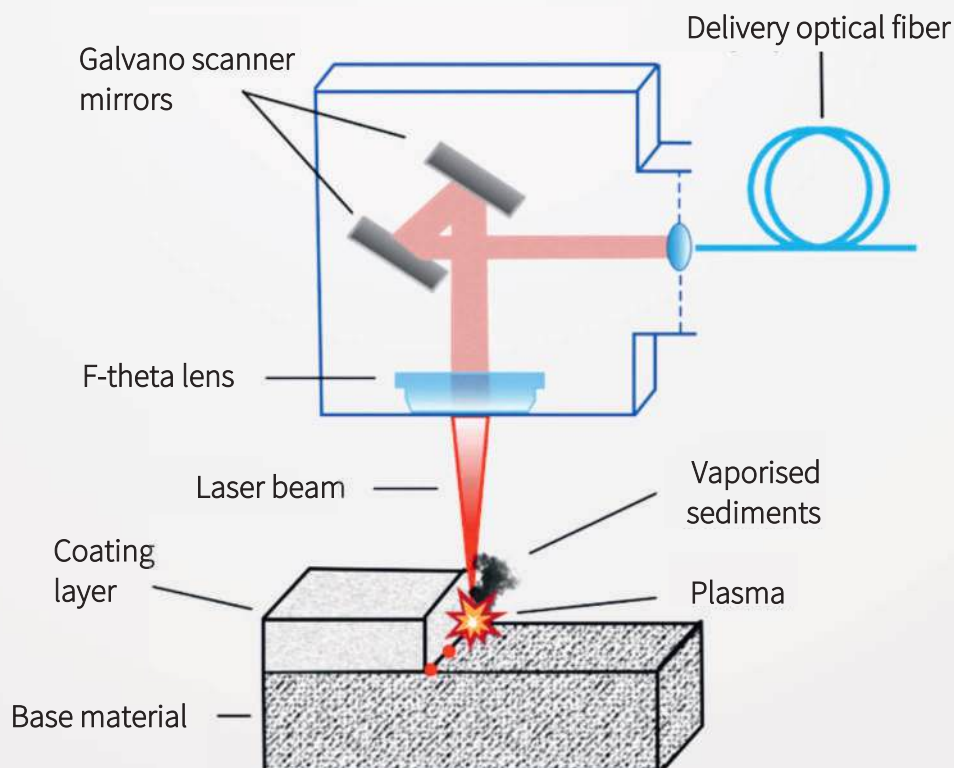
Laser cleaning is very effective in cleaning machinery parts, restoration, weld processing, material texturing, paint removal and etc.

### Speed

Laser cleaning speed is up to 10 sq.m/h depending on the cleaned material.

### Materials

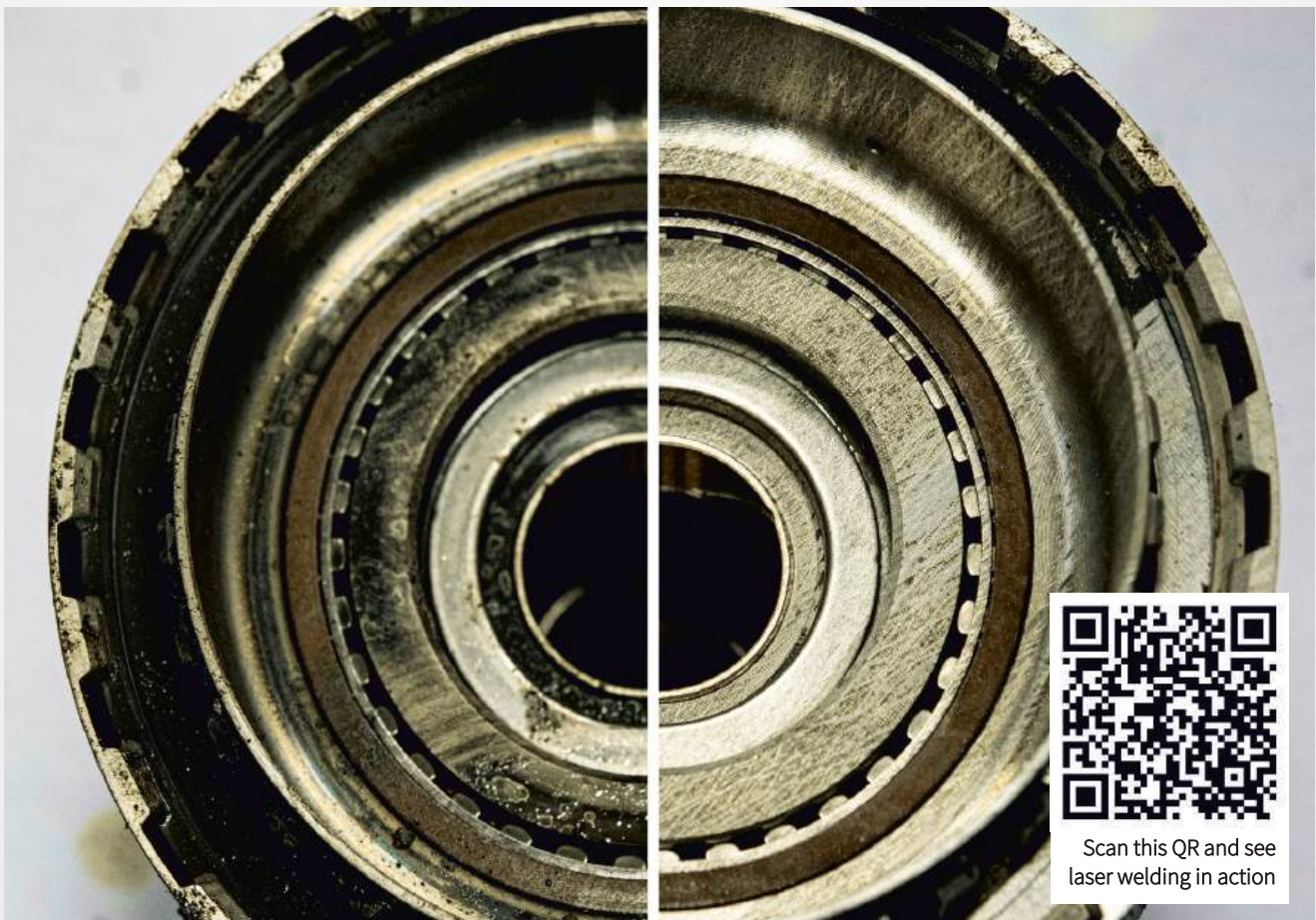
A wide range of materials can be worked with in this process: metals (stainless-steel, copper, gold, silver, aluminium and etc.), plastic and rubber, wood, stone, compounds and more.



# ADVANTAGES OF LASER CLEANING

**Laser cleaning can be very effective in most industries and offers these benefits:**

- **Non-Abrasive** - laser cleaning is a contactless technology with no chemical or mechanical abrasives. It preserves the integrity of the underlying material;
- **High Precision** - the technology allows for highly precise cleaning, targeting specific areas with various power and size settings and without affecting adjacent surfaces;
- **Compact and Portable** - Diodela laser cleaning systems are compact and portable (with 4 wheels), making it easy for the user to move and change work locations;
- **Eco-Friendly** - laser cleaning is an environmentally friendly process, producing minimal waste and eliminating the need for harmful chemicals;
- **Easy to Learn** - with Diodela laser cleaning systems, it takes only 5 minutes to start working;
- **Low Operational Costs** - during the process, only the electric power is consumed;
- **Reliable** - expected laser cleaning system lifetime >90 000 hours (10 years);
- **Quick Return on Investment** - our clients have proven the return on investment within 1 year;
- **Automation Compatibility** - can be integrated with robotic systems for automated processes via 2-channel logic.





## DIODELA LASER CLEANING SYSTEMS



Diodela laser cleaning systems are based on fiber laser technology developed in Center for Physical Sciences and Technology (FTMC) for Diodela.

Laser cleaning system prices starts **from 12 000 Eur.**

Expected laser cleaning system **lifetime >90 000 hours (10 years).**

All Diodela systems are provided with **24 months warranty and user trainings.**

### **How to choose a suitable system?**

The easiest way is to send us samples for cleaning (~ 10x10cm preferably). We will be able to specify cleaning speed and effect of desired system on specific material. After testing, we will advise the most efficient system for your specific needs.

### **All systems are equipped with accessories necessary to operate:**

With standard (5 m) fiber cable, power cable (2m long – can be modified) accessory kit (2pcs eye protection, 2pcs respirators, IR detector and etc.)

### **Important notes:**

- I.** Power is not the only parameter to measure the effectiveness of the laser system. Contact Diodela team and discuss how laser cleaning can serve to your applications in most efficient way;
- II.** All systems have 2-year warranty and possibility to extend warranty up to 3 years;
- III.** All systems include professional class 4 laser safety and exploitation training;
- IV.** This process can be used in both hand-held precise and large-scale automated workshops, allowing cleaning speed of 1-10 sq.m/h.



## SPECIFICATIONS OF DIODELA SYSTEMS

Model	FCS-50	FCS-100-300	FCS-500-1000
Average power (Nom.)	50W	100W up to 300W	500W up to 1000W
Output power stability	3%	3%	3%
Pulse energy	2 mJ	4 mJ up to 12 mJ	20 mJ up to 40mJ
Repetition rate	25-250 kHz		
Pulse duration (FWHM)	10-500 ns		
Spectrum width (FWHM)	<5 nm		
Operating voltage (220)	210-230 AC	210-230 AC	380 V
Maximum current consumption (Pout=Pnom)	6 A	8 A	16 A
Operating ambient temperature	0°C- +40°C		
Storage temperature	-10°C- +60°C		
Cooling method	Air Cooling	Air Cooling	Water Cooling
Warm up time (operation)	Up to 1 min		
Warm up time (specified laser parameters)	5 min		
Relative humidity (At +40°C)	10-90% (At 40°C temp.)		
Dimensions	L-635 x D-580 x H-680 mm	L-635 x D-580 x H-680 mm	L-1030 x D-585 x H-1120 mm
Weight of laser system	65 kg	90 kg	140 kg (portable with 4 wheels)

*Table of specifications for Diodela laser cleaning systems*

### OPTIONAL:

- Laser diode sources;
- Fume extraction unit;
- Automatization solutions;
- Expanded warranty.

## APPLICATION FIELDS

Laser cleaning is a versatile and efficient process applicable to a wide range of surfaces. Its precision and ability to remove contaminants without damaging the underlying material make it ideal for various industries.

### **Machinery**

Laser cleaning effectively removes oil, scale, and other deposits from engine parts such as pistons, cylinder heads, and intake manifolds.

### **Restoration**

Restoration of historical artifacts (paintings, sculptures, furniture) and buildings, removing dirt, grime, and pollutants without harming the original material.

### **Material texturing**

Manufacturers use laser cleaning to prepare surfaces by removing oxides, lubricants, and other residues before further processing. This enhances adhesion and overall product quality.

### **Weld processing**

Laser cleaning degreases materials before welding and removes oxidation after the welding process, ensuring clean and strong welds.

### **Paint removal**

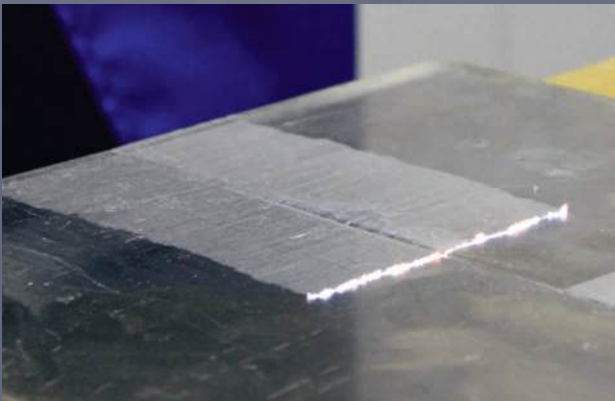
Laser cleaning allows for the precise removal of paint from various surfaces without damaging the base material. This process removes paint layer by layer (probing) to achieve the desired result.



# MATERIALS

## Wide range of materials can be worked with laser cleaning process:

- Metals (stainless-steel, copper, gold, silver and aluminium etc.);
- Plastic and rubber;
- Wood, stone, compounds and more;



CONTACTLESS TECHNOLOGY – NO THERMAL  
DAMAGE FOR THE BASE MATERIAL



ECO-FRIENDLY WITHOUT ANY CHEMICALS  
AND ONLY ENERGY CONSUMPTION



HIGH PRECISION ON DESIRED AREA  
WITH VARIOUS POWER AND SIZE SETTINGS



COMPACT AND PORTABLE

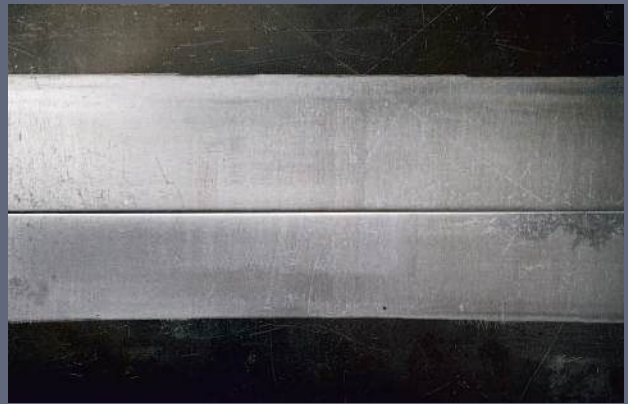


## LASER CLEANING IS MOST EFFECTIVE FOR:

- Oxide removal;
- Oil and grease removal;
- Paint or dye removal;
- Welding pre/post-treatment;
- Mold cleaning;
- Removal of various coatings;
- Metal surface texturing;
- Restoration of sculptures, paintings where precision is necessary;



LASER WELD PROCESSED  
BY LASER CLEANING METHOD



METAL SURFACE TEXTURING

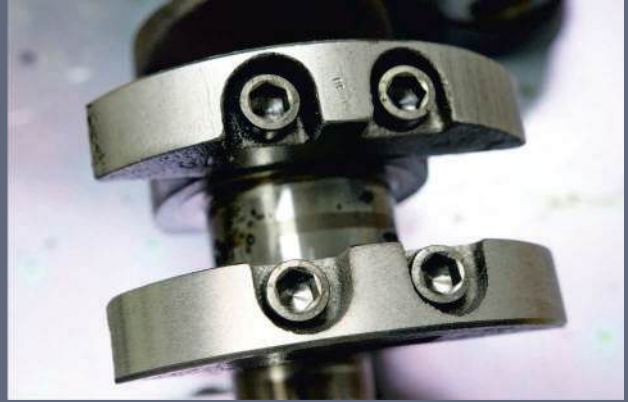


OIL AND GREASE REMOVAL



RUST REMOVAL

## RESULTS OF DIODELA LASER CLEANING



# DIFFERENCES BETWEEN FLAT-TOP AND GAUSSIAN BEAM

Two commonly used laser beam profiles in laser cleaning are the flat-top and Gaussian beams, each offering distinct advantages and limitations. The choice between these beam profiles plays a pivotal role in determining the efficiency and quality of the laser cleaning process at the 1064nm wavelength.

## FLAT-TOP BEAM

A flat-top beam exhibits a uniform intensity distribution across its profile. This uniformity benefits laser cleaning applications, ensuring consistent energy distribution across the treated surface. When using a flat-top beam at 1064nm wavelength for laser cleaning, several advantages become evident:

### Uniform Energy Deposition

The flat-top beam evenly distributes energy over the target area, resulting in a more consistent and controlled cleaning process. This helps prevent over-cleaning or under-cleaning specific spots.

### Reduced Thermal Damage

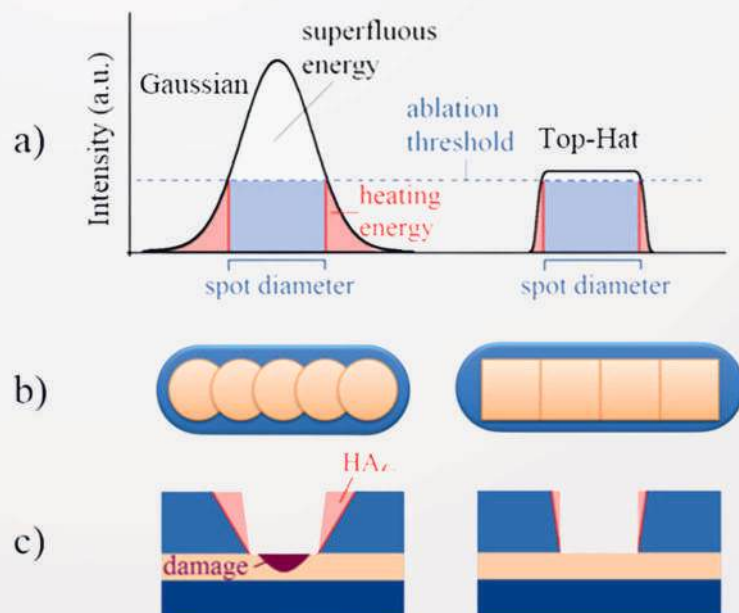
The uniform energy distribution minimizes the likelihood of excessive heating in localized areas, reducing the potential for thermal damage to delicate substrates or materials.

### Enhanced Efficiency

The uniformity of the flat-top beam allows for efficient use of laser energy, maximizing the removal of contaminants or coatings while minimizing wasted energy.

### Reduced Beam Overlap

Compared to Gaussian beams, the need for beam overlap is often reduced with a flat-top beam due to its even energy distribution, potentially speeding up the cleaning process.





## GAUSSIAN BEAM

A Gaussian beam has a characteristic bell-shaped intensity distribution, with the highest energy concentration at the center and tapering off towards the edges. When considering the use of a Gaussian beam at 1064nm for laser cleaning, specific characteristics should be noted:

### Energy Concentration

The Gaussian beam's energy is concentrated at the center, making it effective for focused applications where localized cleaning is required.

### Tapered Energy Distribution

The energy decreases gradually from the center of the beam towards the edges, which may lead to uneven cleaning and potential over-cleaning in the central region.

### Precise Spot Cleaning

Gaussian beams are suitable for spot cleaning, where controlled removal of coatings or contaminants from specific points is necessary.

## CHOOSING THE RIGHT BEAM PROFILE

Selecting the appropriate beam profile for 1064nm laser cleaning depends on the nature of the surface, the desired level of uniformity, and the efficiency required for the cleaning process.

**Flat-Top Beam:** Choose a flat-top beam when consistent, uniform cleaning is essential, especially for larger areas or when maintaining material integrity is a concern.

**Gaussian Beam:** Choose a Gaussian beam for precise spot cleaning or applications where localized removal of contaminants is the primary objective.

In conclusion, the choice between flat-top and Gaussian beam profiles for 1064nm laser cleaning hinges on the specific requirements of the cleaning task. The uniformity and controlled energy distribution of flat-top beams offer advantages in broader applications, while Gaussian beams excel in spot-cleaning scenarios that demand precise targeting. Careful consideration of the beam profile is crucial to achieving optimal results in laser cleaning processes.

# SUPPORT, TRAININGS AND MAINTENANCE

## Support

Professional customer support is our priority, thus Diodela's team is doing our best to ensure smooth communication and high-quality service. Our experienced engineers are quick in responding to any questions regarding machines use, maintenance and etc.

As a producer of laser systems, our company is able to quickly perform any repair. Our broad knowledge in the laser field allows us to be flexible and do custom modifications for various clients' needs.

## Trainings

Diodela's laser systems are built for smart and easy use, thus training takes only 1 day. Depending on your preference, training can be organized at your company premises or during the online call.

During the trainings, the user receives safety and maintenance information and training for practical skills. After the training user will be able to ensure a safe work environment, safely operate the laser system, perform all the necessary maintenance for the laser machine and get high-quality cleaning results.

## Maintenance

Diodela laser systems require only minimum maintenance. Technical maintenance of the laser cleaning system includes:

- The system consumes electricity.
- Lens cleaning once a week. The cleaning principle is simple and similar to cleaning glasses. Detailed instruction is provided with the user manual.
- Lens replacement when they wear out. The expected time of the lens is 1 year. It depends on correct maintenance and workload.
- For the systems FCS-500-1000 where the water-cooling method is used, the cooling system requires distilled water (recommended to be changed every 6 months). For other systems, this step is not applicable.

It is highly recommended to handle Diodela systems with general care, read the manual and train the users properly. With the correct and regular maintenance, Diodela's laser cleaning system is expected to operate for around 10 years.



## USER SAFETY

Diodela's FWS laser cleaning machines are classified as a high-power laser system of the 4th category. The system can radiate up to 8kW of momentary power in the IR field (808-1064nm) wavelength range. Laser radiation is not in the range of light visible to the human eye, it can damage the retina irreversibly, thus, safety glasses and face shield must be worn during the entire laser system operation period.

All personnel working near the laser cleaning area must wear safety eyewear and protective clothing. Safety glasses and face shield must be selected according to the length of the laser wave by Diodela. Depending on the materials to be cleaned, it is recommended to wear respirators or use dust suction and filtering systems.



User manual with detailed instructions is provided during laser machine user training. Diodela's laser systems are CE certified.







## ABOUT DIODELA

### Experts in Industrial Laser Manufacturing

Diodela is a European photonics solutions manufacturer for industry, specializing in developing and producing advanced industrial laser systems for welding and cleaning. With a dedicated team of professionals and extensive expertise in photonics, we excel in crafting innovative and precise laser systems that cater to the diverse needs of industrial clients.

### Established by Laser Scientists

Diodela was established in Vilnius, Lithuania by professional laser scientists. The company operates within a city renowned for its rich history in photonics, serving as a hub for numerous esteemed companies within the field.

With full control over our production processes, Diodela ensures the highest quality standards, competitive pricing, swift production turnaround, and dedicated customer support. Our commitment to excellence and continuous improvement has earned us a reputation as a trusted partner in the industry. Diodela lasers are exported to over 20 countries in Europe, North America, and Asia, ensuring high quality, competitive prices, fast production times, and professional customer support.

### Our Partners:





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