



JETLASER Integration

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Dr. Jan Flohre
Product Manager JETLASER M + I Series



Judith Schmitz
Sales Manager JETLASER

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4JET Company Introduction

Laser Process and Advantages

JETLASER Integration

- What is JETLASER Integration
- Versions of the JETLASER Integration system

JETLASER Applications

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JETLASER Applications

The 4JET Group – Innovative Laser Solutions for Tomorrow's Production

- Headquartered in Alsdorf, Germany • Subsidiaries in Atlanta and Shanghai • 160 employees, incl. 60 R&D engineers
- Unique know-how in laser processing • High-end R&D laboratory • > 20 patent families
- more than 400 systems installed worldwide • Global service network • Blue-chip company customers • 26 M€ revenue pa

Tire Manufacturing

Laser Cleaning and
Surface Preparation

Marking, Traceability &
Quality Inspection



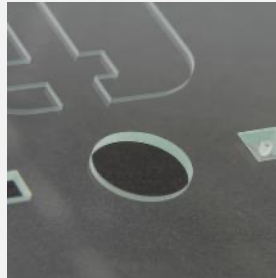
Automotive and General Industry

Laser Cleaning and
Surface Preparation



Glass and Thin-Film Photovoltaics

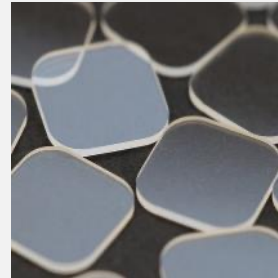
Laser Cutting & Drilling
Laser Patterning



Micromachining Job Shop Services

Laser Cutting, Drilling
& Patterning

Laser Cleaning and
Surface Preparation



New Business

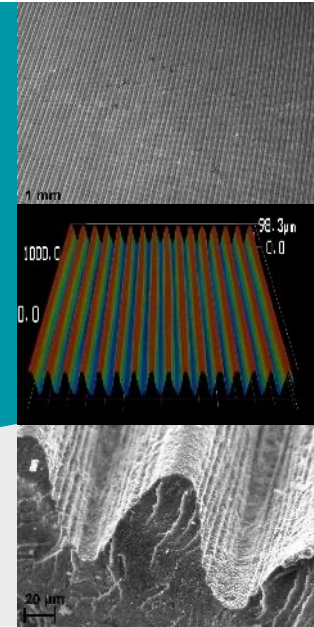
Surface
Functionalisation



4JET's strong IP is based on extensive R&D activities supported by a high-end lab for laser material processing and metrology



- 12% R&D ratio
- > 20 patent families
- Metrology lab with SEM/EDX, laser scanning microscope, 4P bending test
- Technical centre with demo-systems for key products
- Multiple applications' lab with cw, ns, ps, fs laser sources



Serving a global customer base with regional sales and service hubs

Alsdorf (DE)

HQ, R+D,
Production



Eschweiler (DE)

Production



Prutting (DE)

Job Shop



Atlanta (USA)

Sales + Service



Shanghai (China)

Sales + Service

DE: 120 FTE
US: 5 FTE
China: 6 FTE

A dedicated service department supports 24/7 operations of our global customer base

- Technical experts on 3 continents in Europe, USA and Asia
- Repair and maintenance
- 24/7 phone and VPN support
- Upgrades and refurbishments
- Spare part management
- Trainings



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Laser Ablation – How Does it Work?

- Laser ablation is a process to remove material from a surface by using pulsed laser systems.
- Due to high absorption and short pulse duration (nanoseconds) of the laser light, the material to be removed, is heated but not the part itself.
 - It either vaporizes or sublimates (transitions from a solid to a gas).
- This is why laser ablation is categorized as a “Cold” process and or a “Touchless” process.

1

Laser beam contacts the coated surface



2

The laser activates with the material / coating, but not the part itself



3

The surface is cleaned due to vaporization or sublimation



JETLASER Advantages



Touchless

No substrate damage

Sustainable

No water, chemical, or blasting medium required

Selective

Clean only where & what needs cleaning

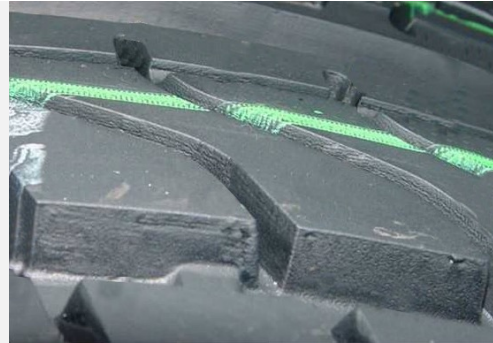
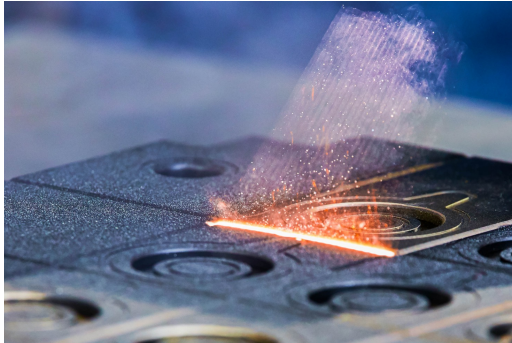
Flexible

No application specific medium or process required

Safe

Easy to operate, non-toxic & quiet

Touchless: Laser Cleaning Does Not Damage Expensive Tooling and Enhances the Product Appearance of Finished Molded Goods

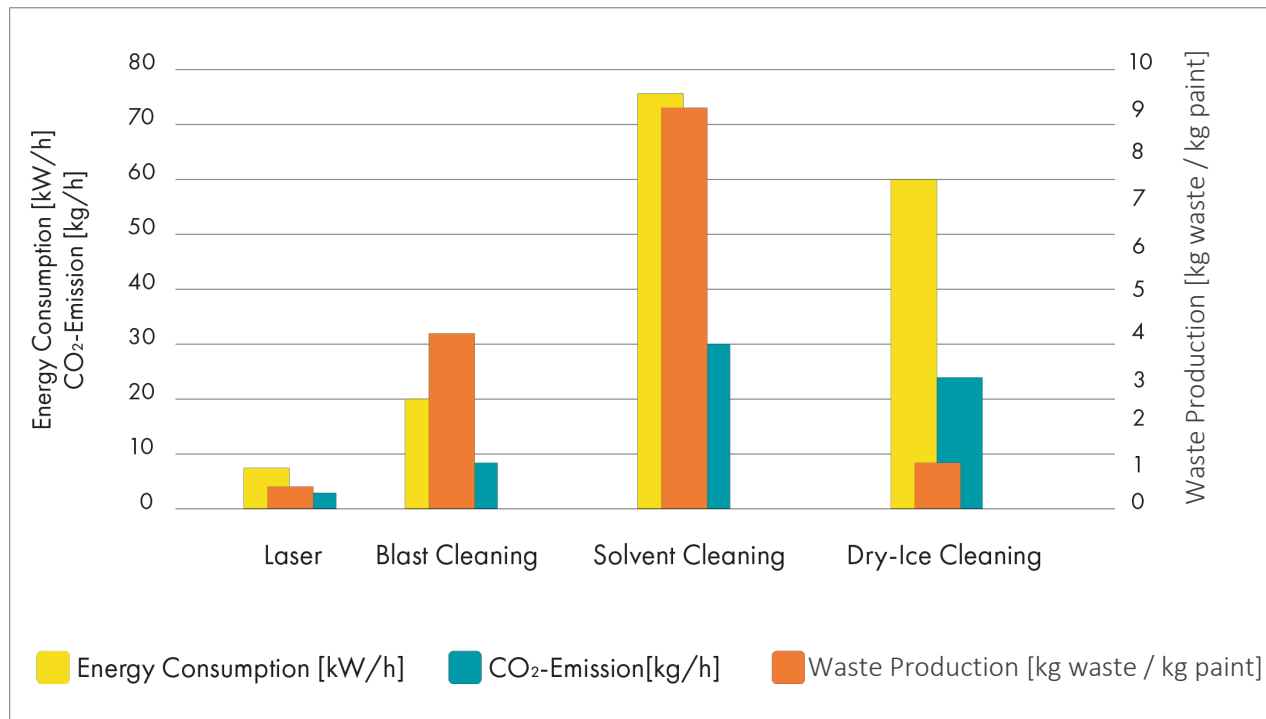


Tire produced in blast cleaned mold



Tire produced in laser cleaned mold

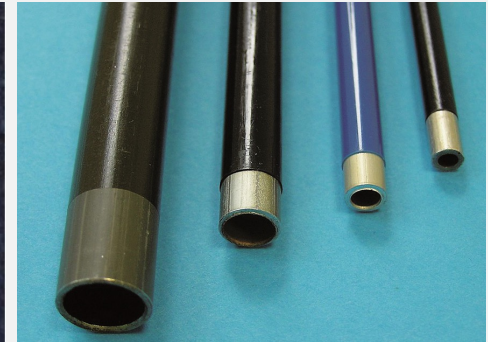
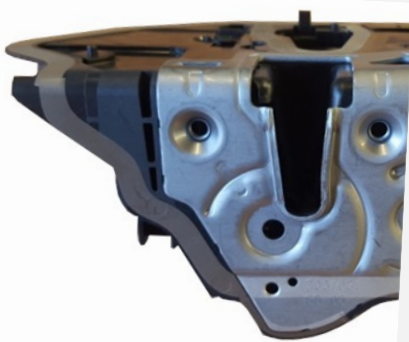
Sustainable: Laser Cleaning Creates Less Emissions and Waste



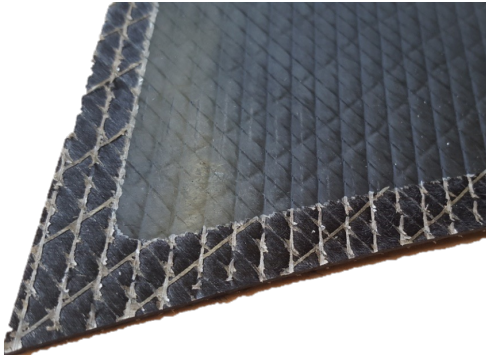
Data for removal of 0.5 kg paint with different technologies



Selective: Laser Cleaning is Carried Out at Essential Positions to Prevent Damages of Expansive Tools and to Save Time and Energy



Flexible: Laser Cleaning Enables Versatile Applications without Using Specific Media or Tooling



Pre-treatment of CFRP for adhesive bonding



Shoe mold cleaning

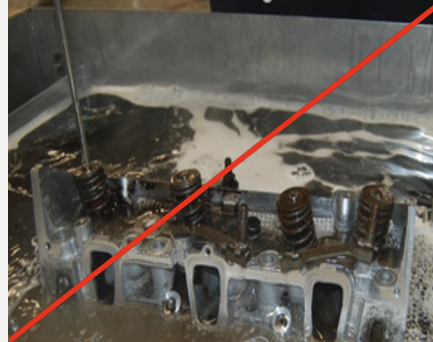


Oxide removal

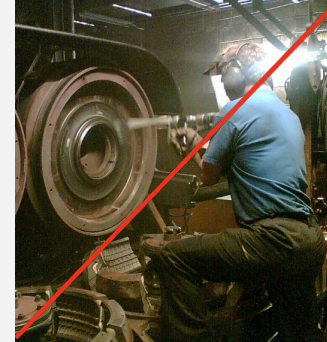
Safe: Laser Cleaning Eliminates the Use of Messy and Dangerous Blasting Dust, Chemicals or Noisy Pressure Cleaning



No more
sandblasting dust



No more
chemicals



No noisy
ice cleaning

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Laser Process and Advantages

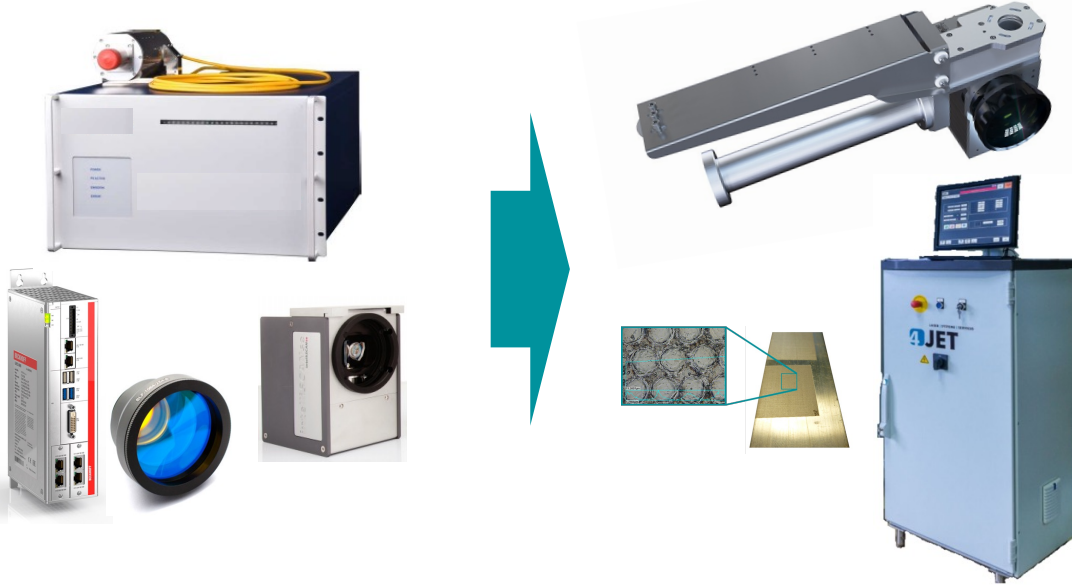
JETLASER Integration

- What is JETLASER Integration
- Versions of the JETLASER Integration system

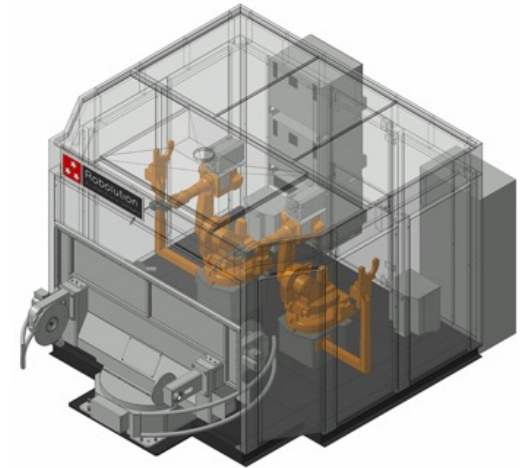
JETLASER Applications

What is JETLASER Integration?

4JET



Integrator

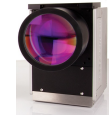


Qualified Industrial Components for JETLASER Integration

- Laser



- Scanner



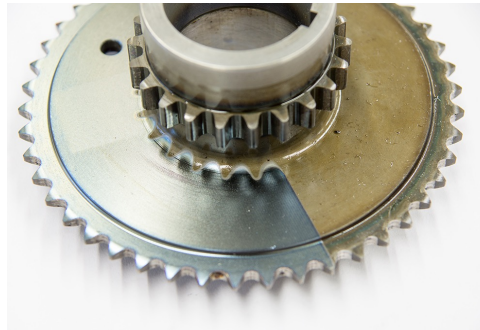
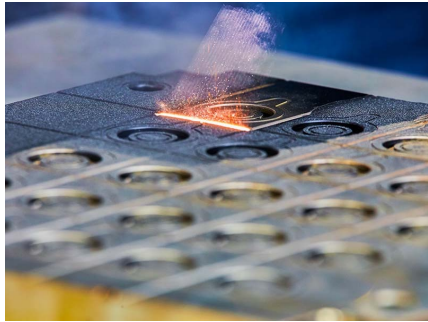
- Optic



- 4JET selects qualified components and combines just appropriate components

For which Market is JETLASER Integration?

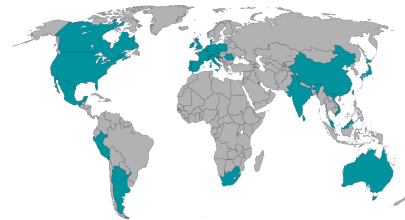
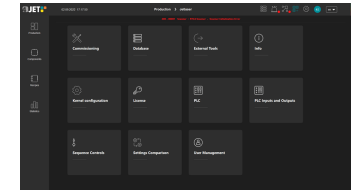
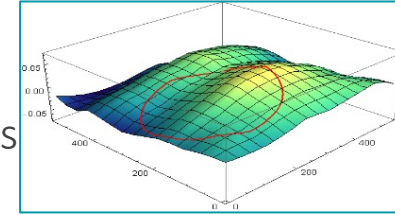
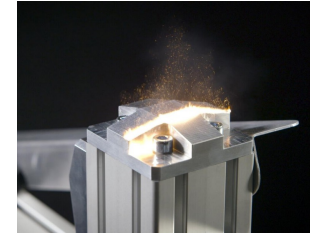
- Automotive
- General Industry
- Service Contractor



- Mold Cleaning
- Selective Paint Stripping
- Pre Treatment
- Post Treatment

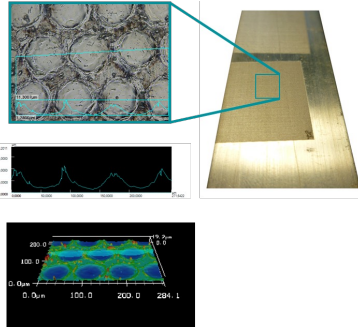
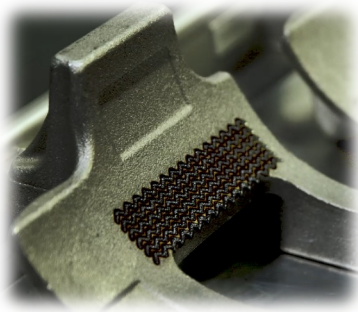
Why is 4JET the best choice?

- 4JET has process know-how and experience with complex laser processes
- An excellently equipped analytic lab enables profound detailed studies
- The 4JET software provides versatility to control the laser process
- 4JET has a world wide acting service



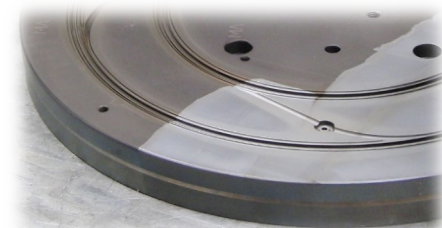
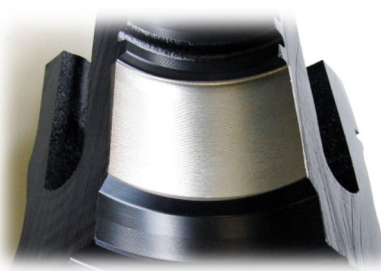
Different Laser Systems for different Applications

Laser Structuring



- Pattern a defined structure to the surface
- Change surface morphology and chemical composition
- Increased surface energy

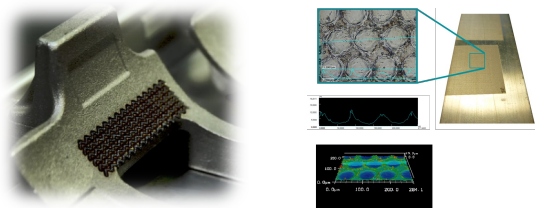
Laser Cleaning



- No change of surface morphology
- Clean surface without contaminations
- Increased surface energy

Which Systems are Available?

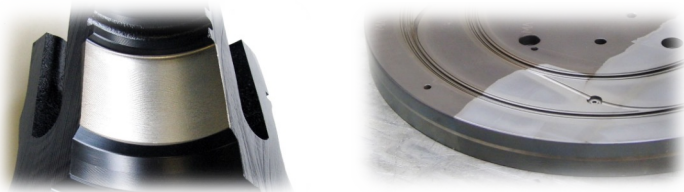
Laser Structuring



Available Power Levels

100 WAir cooled
5m fibre**200 W**Air cooled
8m fibre**300 W**Air cooled
8m fibre

Laser Cleaning



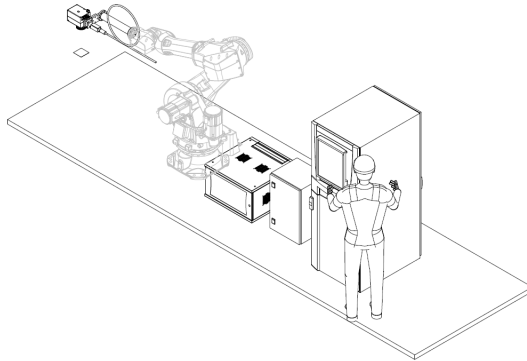
Available Power Levels

100 WAir cooled
5m fibre**200 W**Water cooled
10m fibre**500 W**Water cooled
15m fibre**1000 W****2000 W**

JETLASER Integration 3 Different Platforms

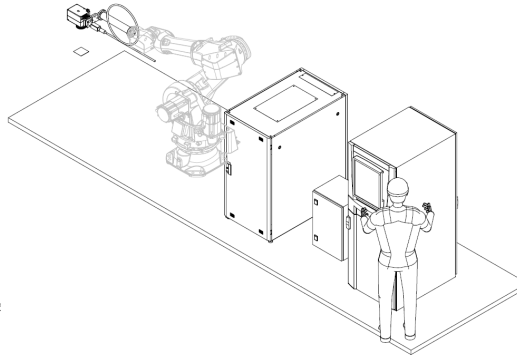
**Laser
Structuring**

100 - 300 W



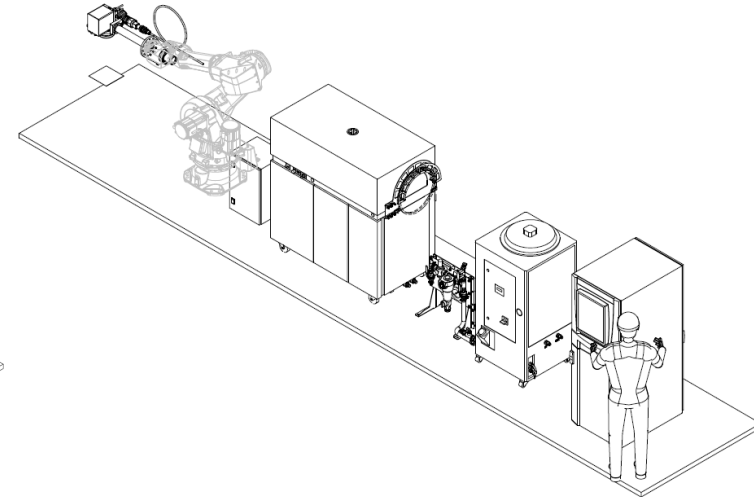
Laser Cleaning

100 - 1000 W



Laser Cleaning

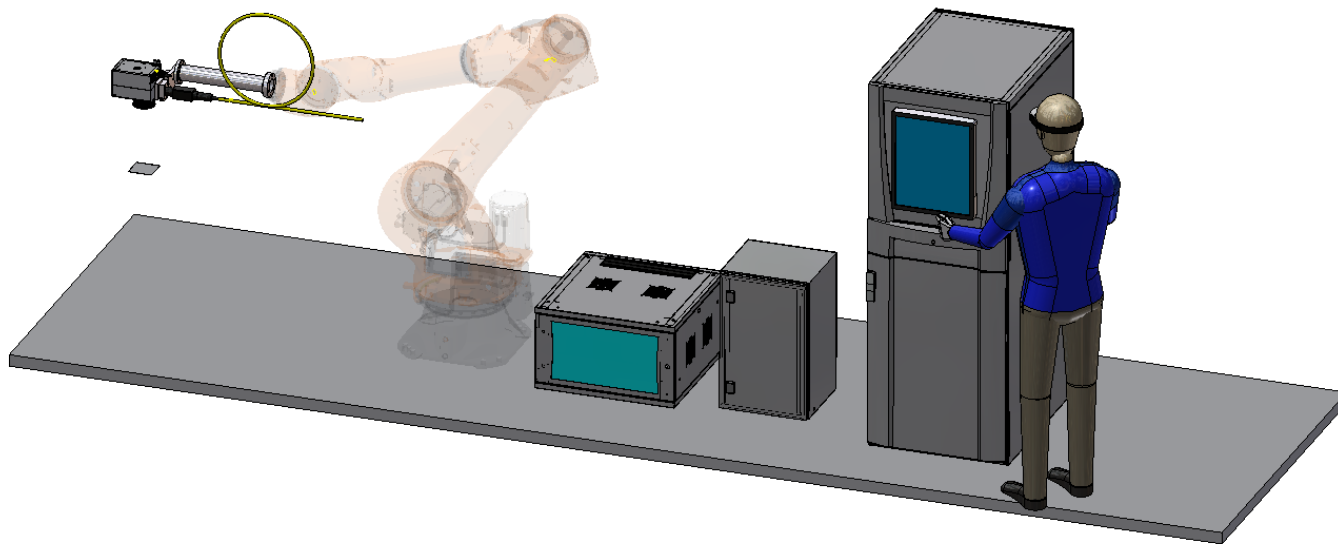
1 - 2 kW



JETLASER Integration Technical Data

Laser
Structuring

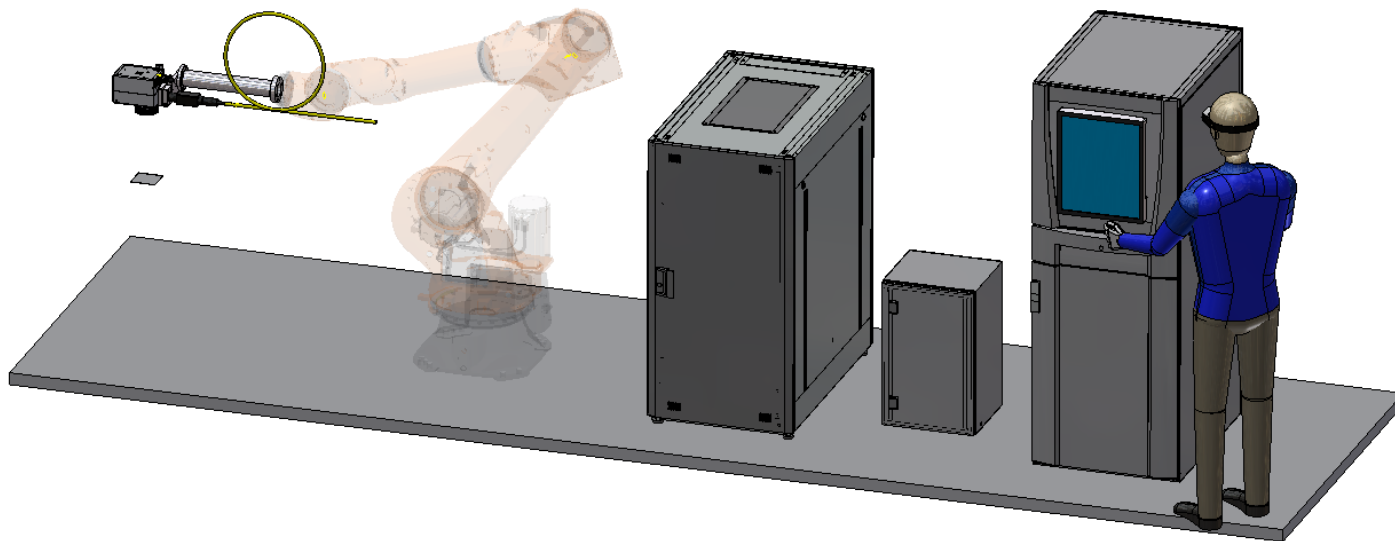
100 - 300 W



JETLASER Integration Technical Data

Laser Cleaning

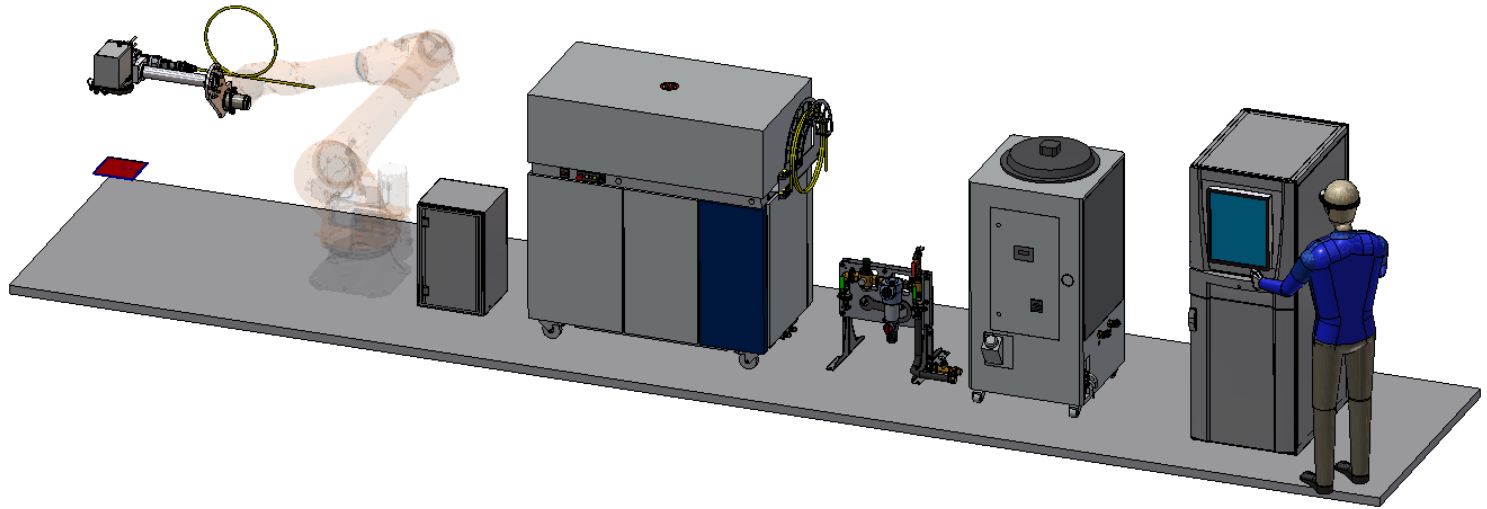
100 - 1000 W



JETLASER Integration Technical Data

Laser Cleaning

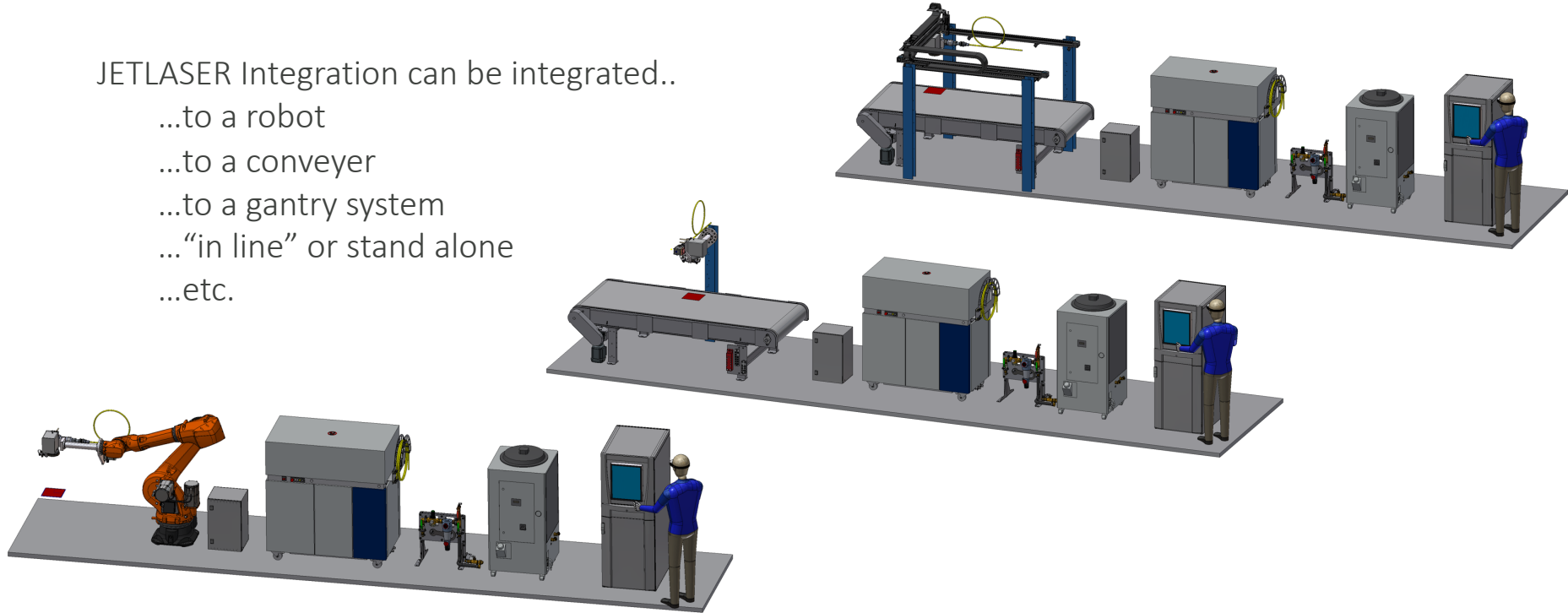
1 - 2 kW



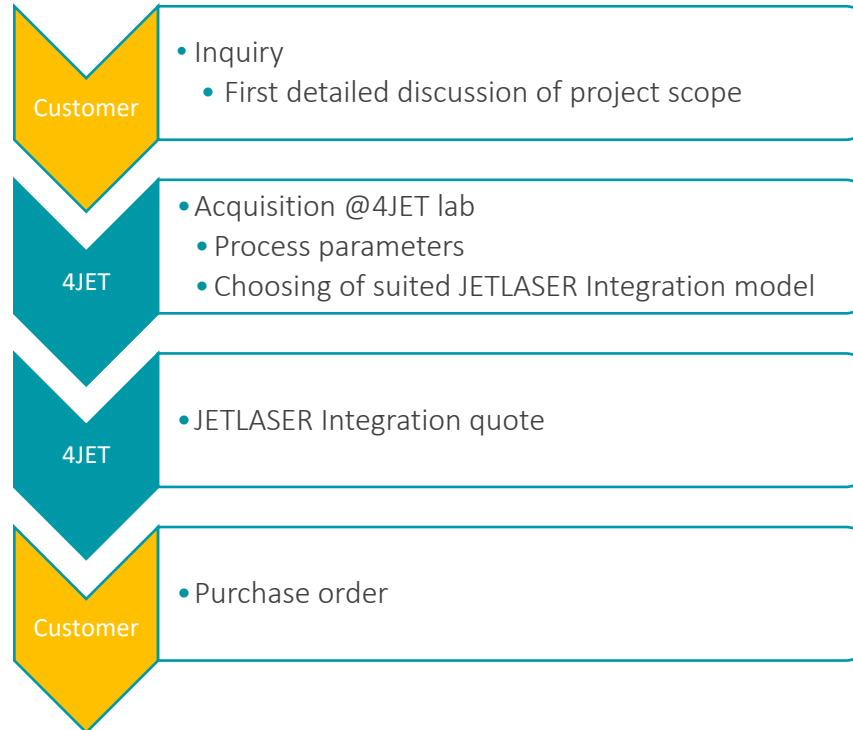
Versatile Ways to Integrate JETLASER Integration

JETLASER Integration can be integrated..

- ...to a robot
- ...to a conveyer
- ...to a gantry system
- ...“in line” or stand alone
- ...etc.



Project Workflow



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Mould Cleaning

Use case:

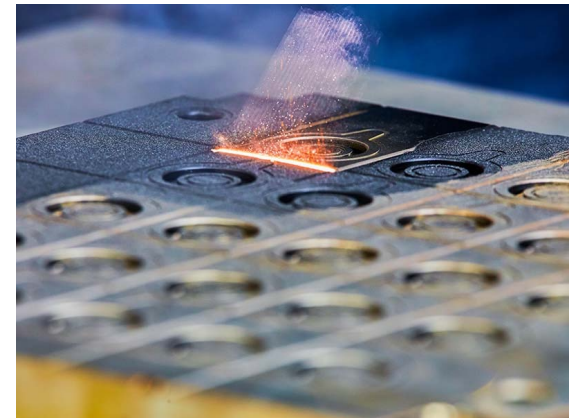
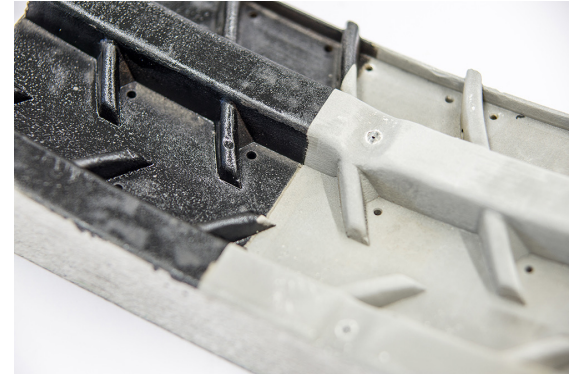
Removal of process residues in tyre, automotive, and general industries

Motivation:

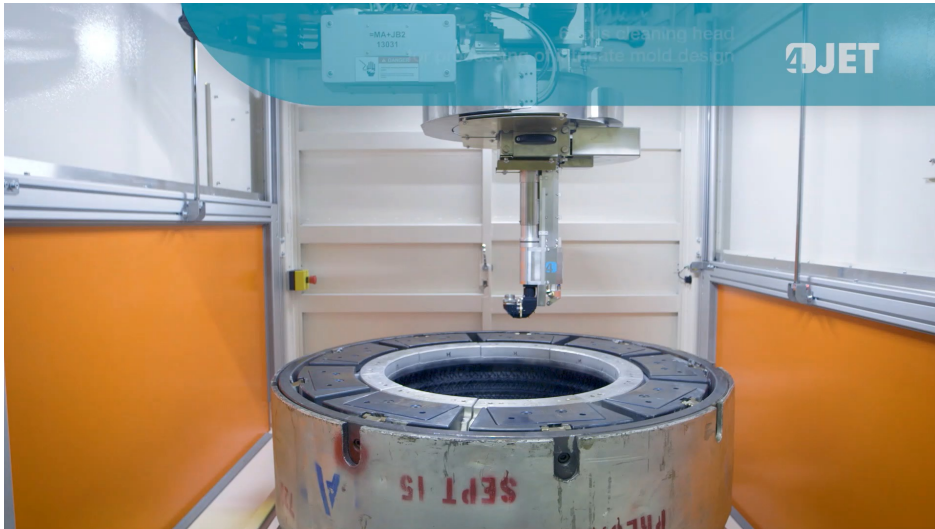
No damage caused by blasting media or aggressive chemicals



Laser Tire Mould Cleaning



Mould Cleaning – Manually and Automatically



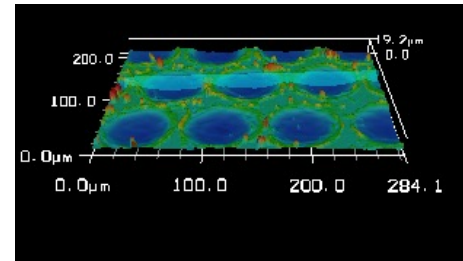
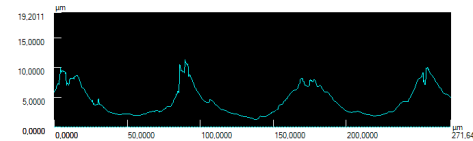
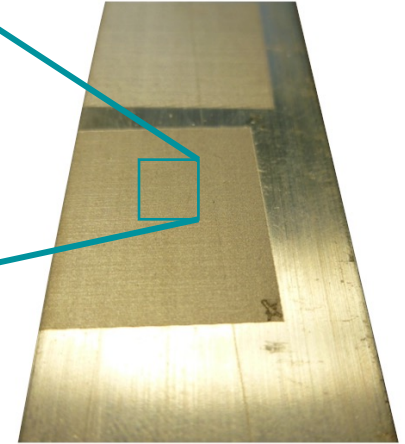
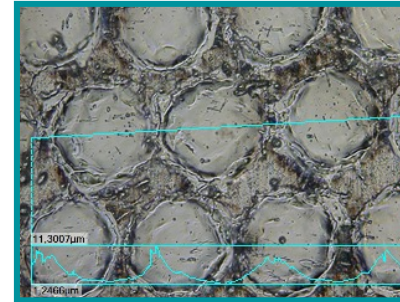
Surface Structuring

Use case:

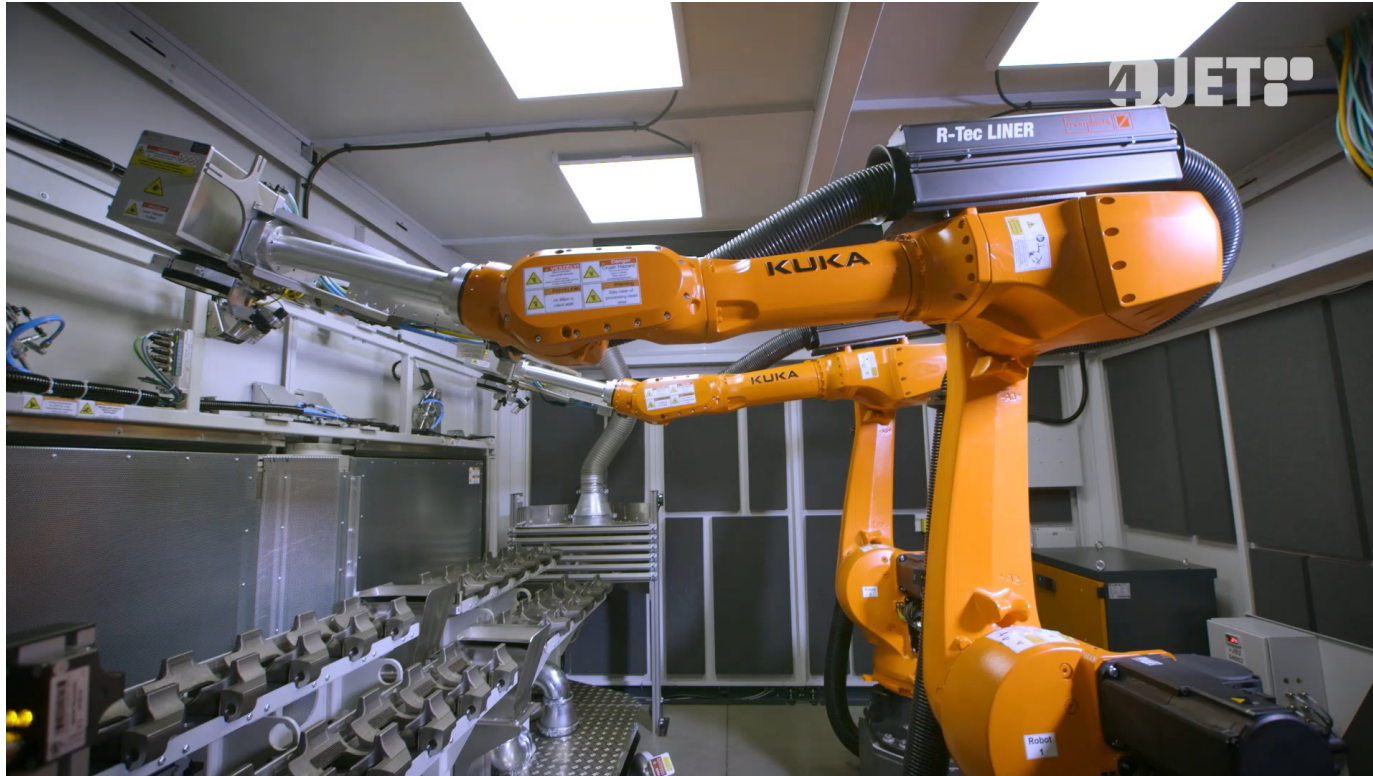
Pre treatment for adhesive bonding and coating

Motivation:

Customization of the surface to the properties of the adhesive (cleaning, oxide removal, surface area enlargement)



Surface Structuring and Hardening



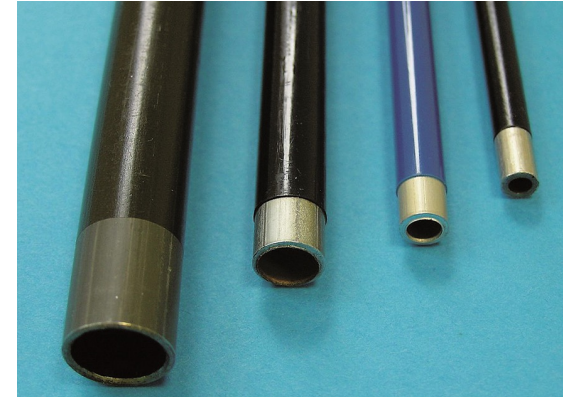
Selective Paint Stripping

Use case:

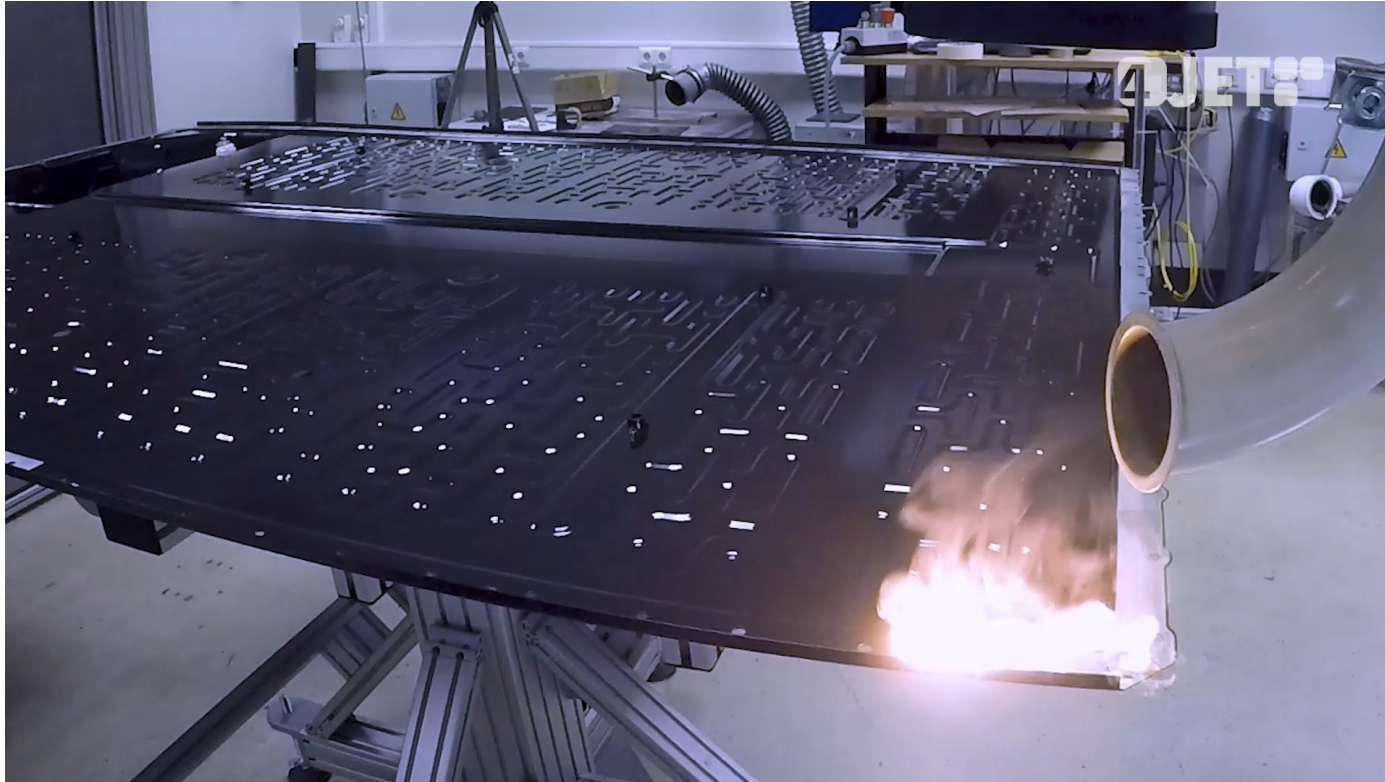
Selective stripping of paint on CDC, wet, or powder coated samples

Motivation:

Expansive masking unnecessary. Selective stripping of certain coating. (anticorrosive-) Protection layers may stay unaffected.



Selective Paint Stripping



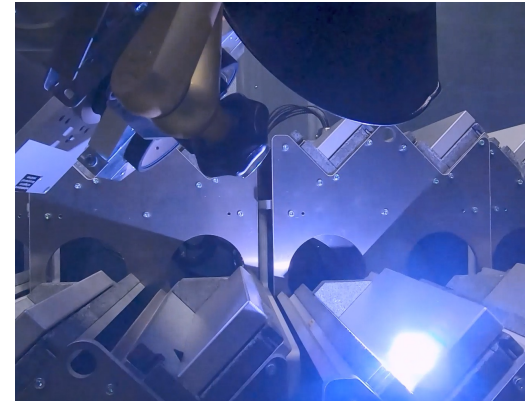
Pre or Post Treatment

Use case:

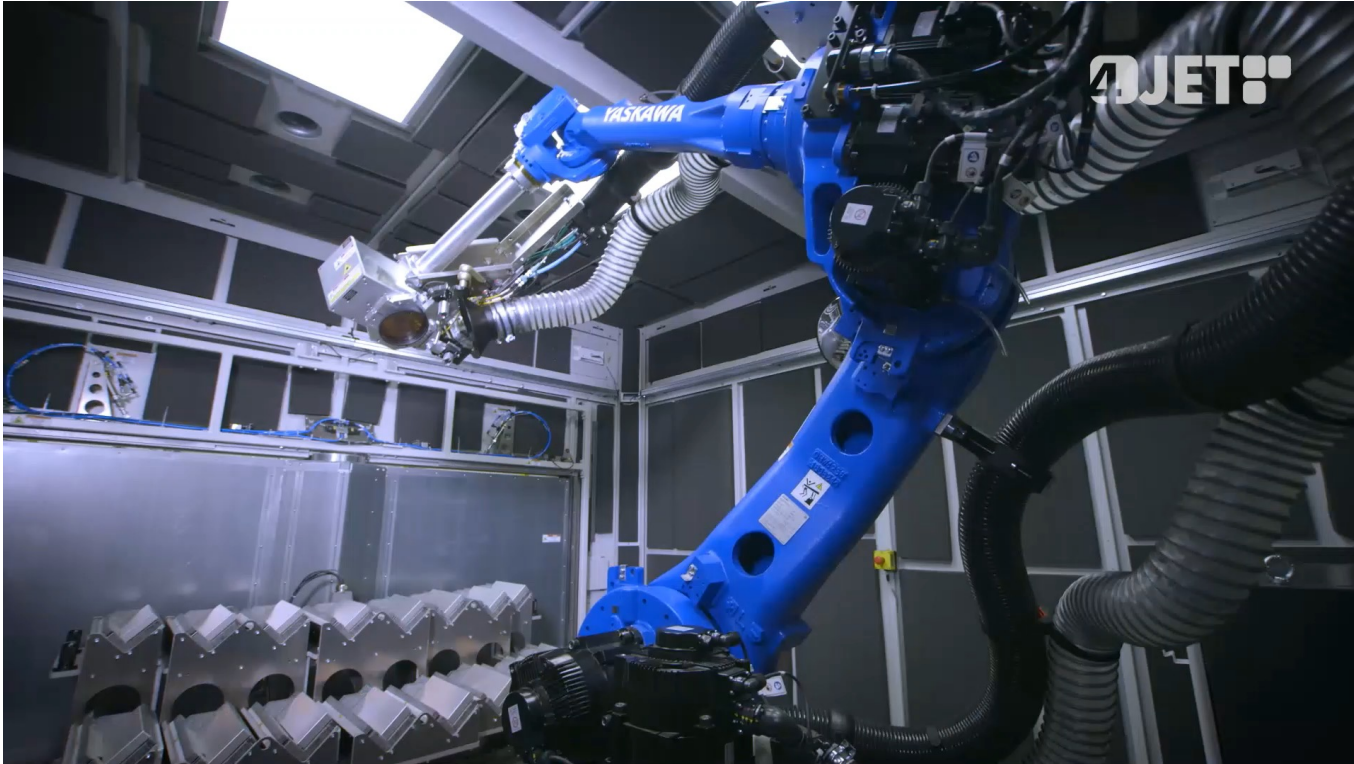
Pre treatment for certain coatings. Post treatment for weld seam cleaning.

Motivation:

Oil, grease and other contaminations can effectively be removed by the laser while the surface energy is increased.



Pre or Post Treatment



Post Treatment of welded parts with the manual JETLASER



Rust Removal

Use case:

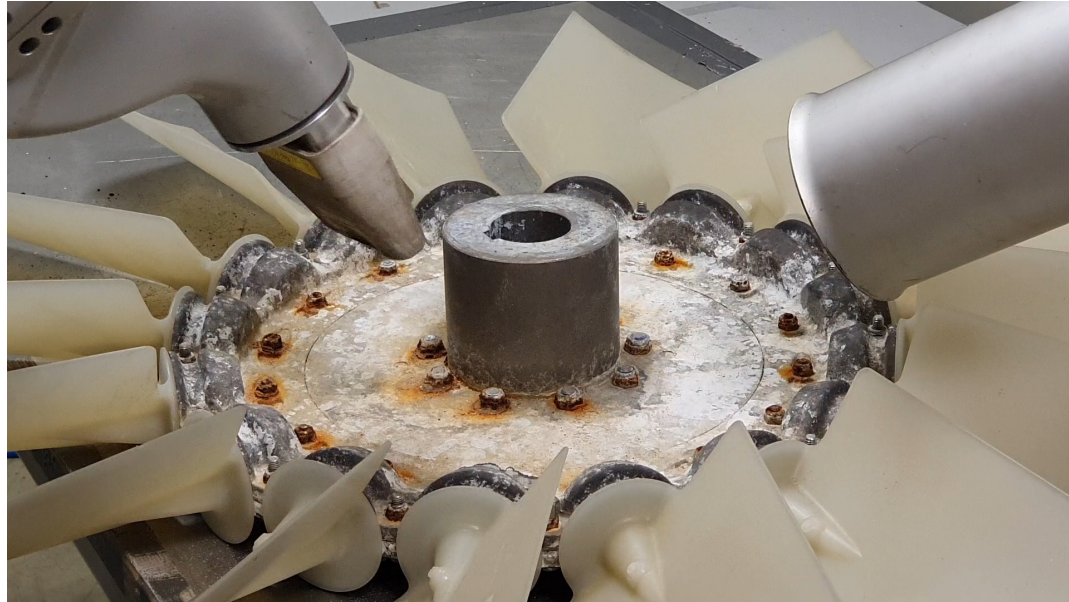
Rust removal from any steel part as a pre treatment (for painting / welding etc.).

Motivation:

Rust can be removed easily with the laser, parts can be reused after exposure to humidity. Surface structure remains unchanged.



Rust Removal with the manual JETLASER



Rust Removal of welded parts with the manual JETLASER



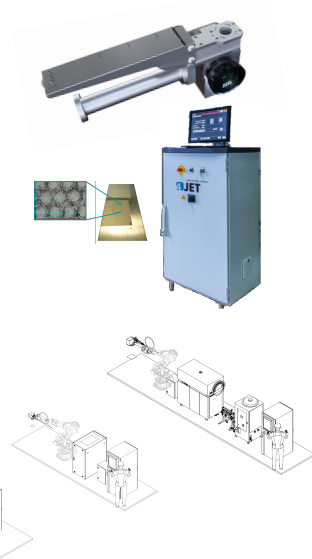
JETLASER Integration in a nutshell...

JETLASER Integration...

... is a laser cleaning module which can be integrated in an automated process.

... allows a variety of combinations to fit for individual applications selected by 4JET specialists.

... is suited for versatile applications: e.g. mold cleaning, structuring, pre-treatment before welding and bonding or rust removal.



Thank you for your attention Any Questions?

Contact JETLASER-Helpdesk@4JET.de

