LASER CLEANING AND APPLICATIONS FOR THE BAKING INDUSTRY

FOR BAKING INDUSTRY

Clean-Lasersysteme GmbH

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CONTENT OF THIS PRESENTATION

- Clean-Lasersysteme GmbH - Introduction
- Current Technology Overview
- Functional principle and laser parameter
- Basic Integration and automation requirements
- Application Examples
- Latest developments
- Running costs /costs of ownership

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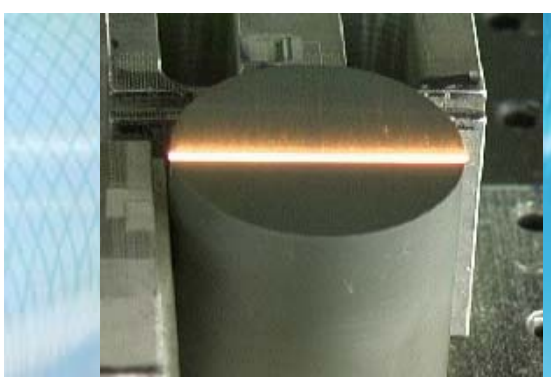
Clean-Lasersysteme GmbH OVERVIEW INTRODUCTION

WE PROVIDE SOLUTIONS

- Founded 1997
- Location: Herzogenrath (near Cologne), Germany
- Certification: DIN EN ISO 9001:2000
- Optical production in **white room** environment
- Own laser **systems** development department
- Own laser **process** development department
- 2 owners (acting as CEO's)
- Approx. 200 devices & systems in field
- Turnover 2009: 3.2 M€ (+10%), Expected 2010: (+25%) -> ~4.0 M€
- ~30 employees, 40% engineers and PhD's

OUR AREAS OF SERVICE FOR YOU

WE PROVIDE SOLUTIONS



ENGINEERING & APPLICATION

- Feasibility studies
- Technical design
- Laser (system) development
- Laser process development

MANUFACTURING

- Laser cleaning and de-coating systems
- System integration
- Corresponding automation technology

SERVICE & SUPPORT

- Assistance with proto-types and pre-serial production
- Instructional courses
- Worldwide technical service

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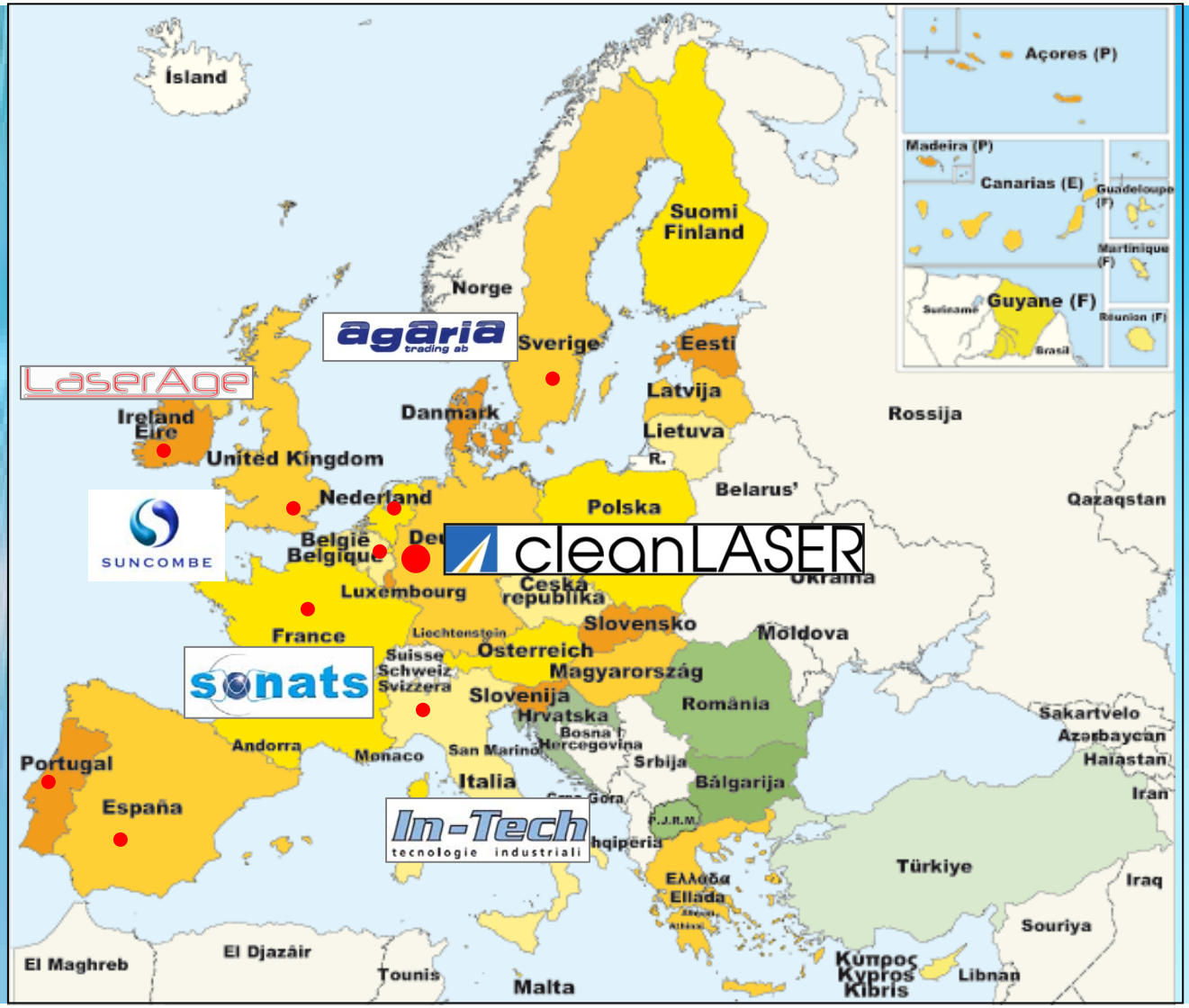
MAJOR GLOBAL DISTRIBUTORS

EUROPEEN DISTRIBUTORS



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LIST OF REFERENCE (SYSTEM USER) INDUSTRIAL APPLICATIONS

EXTRACT

AIRBUS

EADS

Fraunhofer ILT Institut Lasertechnik

U.S. AIR FORCE

Audi

BOSCH

HENNIGES Automotive

Germany, the US & China

Fehrer

Anteon

BRAUN

gomet

Continental TEMIC

CLAAS

Joy CONE CO.

NISSEI

Weforma Dämpfungstechnik GmbH

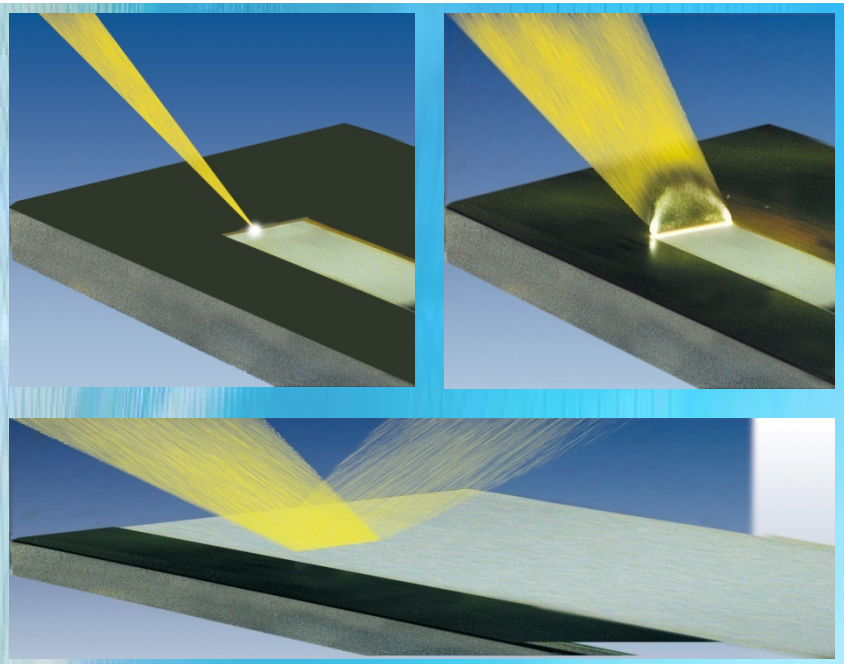
PHILIPS

Honeywell

PROGELCONE

FUNCTIONAL PRINCIPLES OF REMOVING COATING LAYERS

BY LASER RADIATION



Two physical effects:

- Coating layer is vaporised (ablation by sublimation)
- Ablation by thermally induced pressure

ABLATION PRINCIPLE

- Coating layer is removed by absorbing the focused laser spot
- Very powerful but short laser pulses cause very little thermal influence on the base material
- Blank base material reflects laser radiation, ablation process stops
- Metal can not be damaged or destroyed while using the “correct” laser parameter and wavelength
- Higher Intensity can lead to modifications on Metal if required

ADVANTAGE CLEAN-LASER

OUR **PATENTED** ABLATION STRATEGY – SCAN AND MOVE

Courtesy AUDI AG

ABLATION PRINCIPLE

- Up to 50.000 very short pulses per second
- Line-shaped beam deflection
- Very short impact times due to scanned laser-beam
- Exclusive licensed Patent Pending for manual decoating with scanned beam

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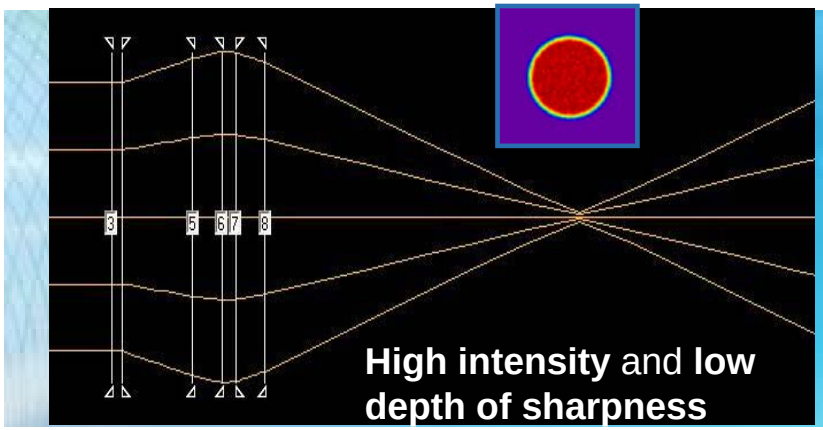
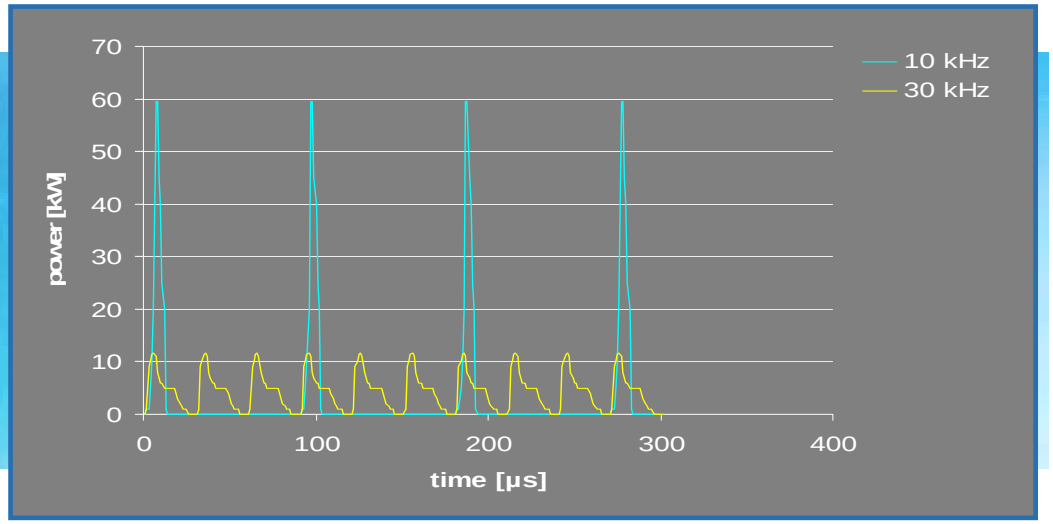
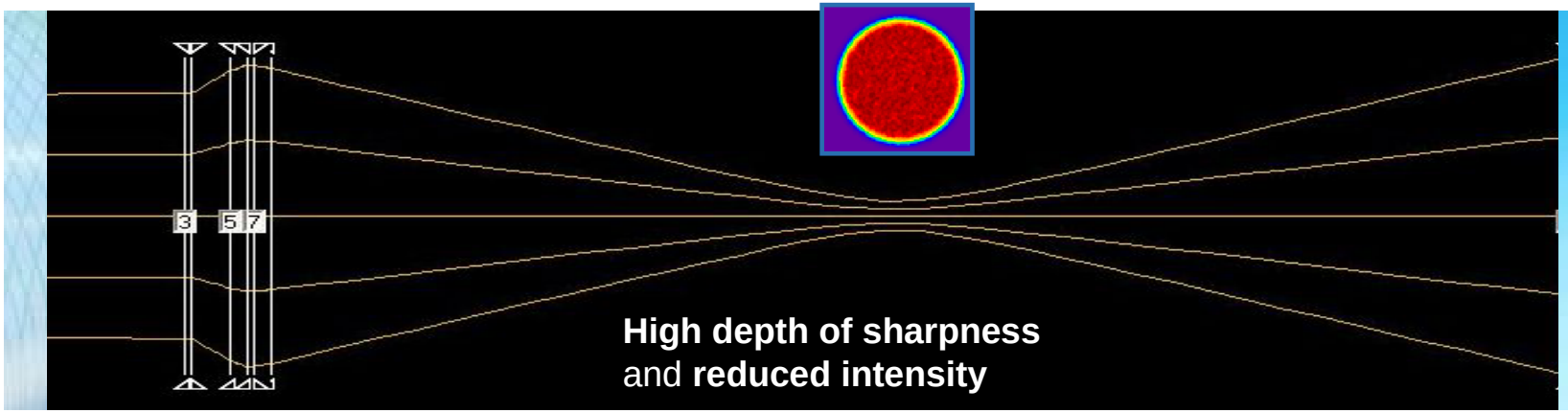
INTENSITY DETERMINED BY FOCAL DIAMETER AND PULSE-POWER

THE OPTICAL SYSTEM & FREQUENCY







I = P/A

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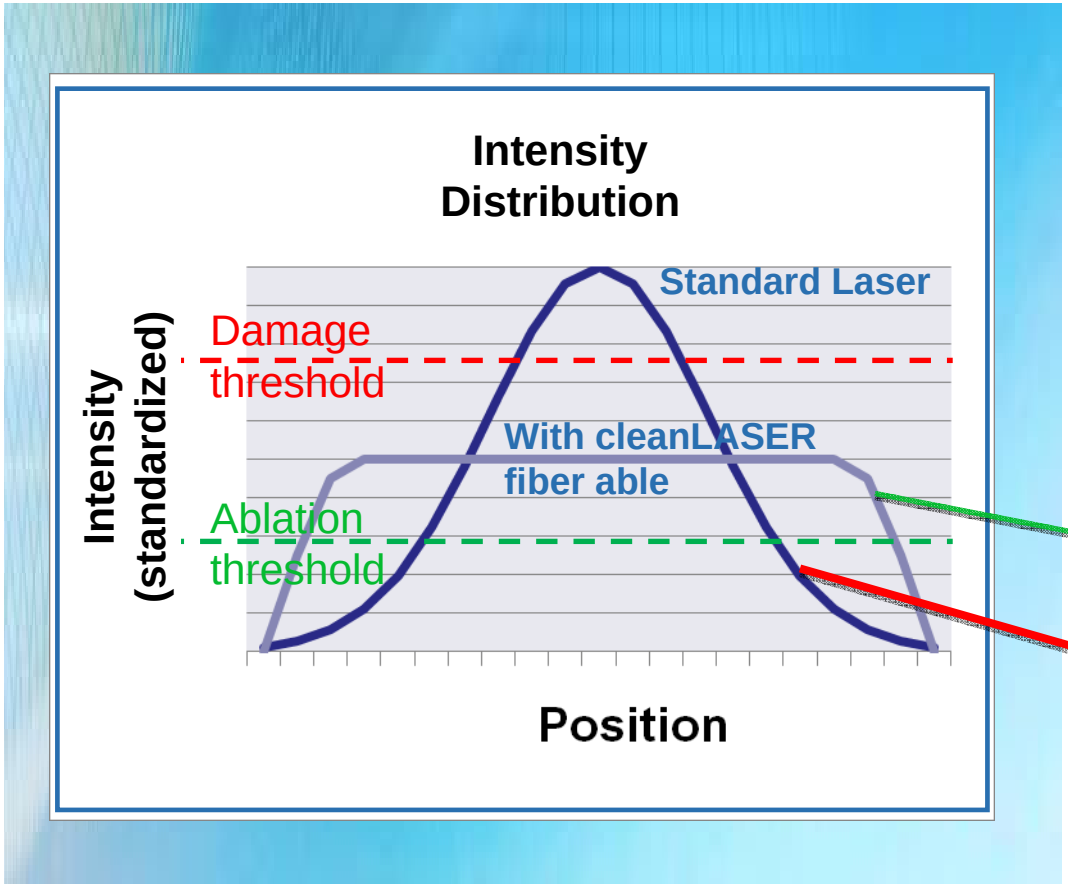
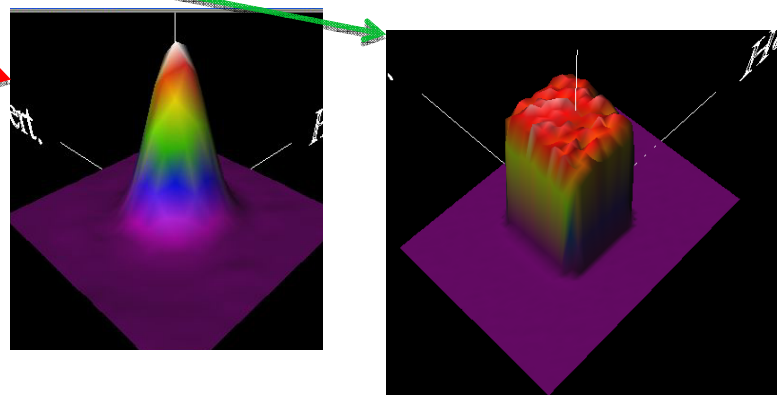
BEAM HOMOGENIZATION BY FIBRE CABLE – Beam shaping



- Laser source emits „gaussian“ beam profile
- cleanLASER fiber-cable homogenizes the laser beam
- Constant intensity within the complete focal area
- De-coating/cleaning of sensitive parts possible
- **Undamaged substrate**



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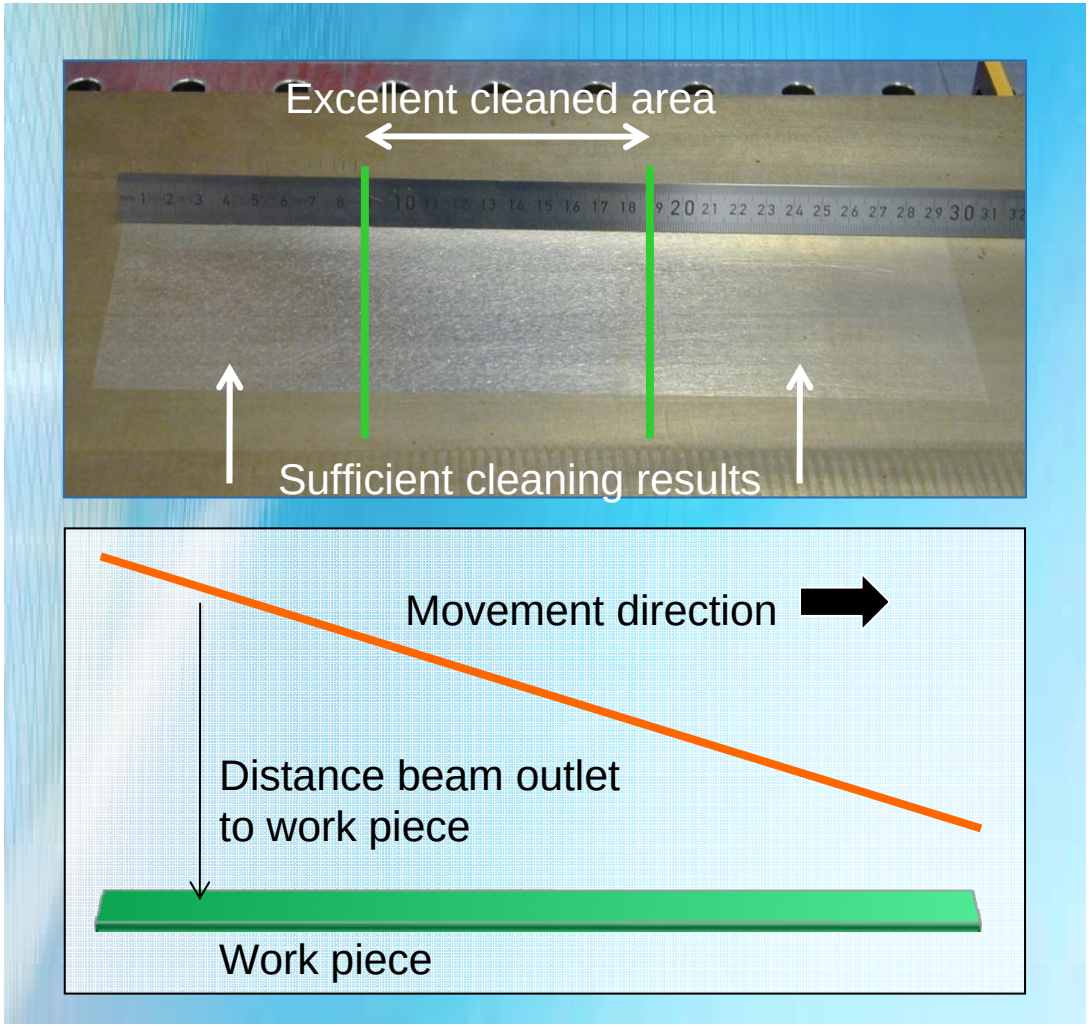
DEFOCUSSING TEST (ON A REAL MOULD)



PARAMETER OVERVIEW

- CL 500
- high beam Quality M^2~20
- Optics OSA 70
- Removal of release agent
- Movement in y-direction 300mm
- Movement in z-direction 60mm
- Excellent cleaning results in a z-range of: +/-10mm
- Sufficient cleaning results in a z-range of: +/-25 mm
- **Suitable range for efficient automation and handheld use with compact optics**

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cleanLASER TECHNOLOGIE

SUITABLE SYSTEMS FOR DIFFERENT SPEED DEMANDS

MOBILE LASER FOR FLEXIBLE USE

LOW POWER
Backpack / CL 20 / CL 50

MID POWER LASER
CL 150 / CL 300 / CL 500

HIGH POWER LASER
CL 1000

WORKSTATIONS & SYSTEMS FOR AUTOMATED USE

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CL 20 / BACKPACK

FEATURES AND OPTIONS

- Pulsed laser
- Large operating distance up to 250 mm
- CW laser power up to 20W
- Desktop or plug free (Backpack) version
- Several optics available - suitable for robot use
- Water cooled optics for high temperature enviroment available
- With 2D optic excellent marking results (Backpack also)
- Laser class 4 product

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MID POWER SERIES CL 150 – CL 500 LASER

TECHNICAL DETAILS

FEATURES AND OPTIONS

- Reliable diode pumped solid state laser (Nd:YAG)
- Integrated on-line resonator power meter for permanent quality-control
- Field bus (optional)
- Telediagnostic & Data Logging/ remote access (optional)
- Simplified user interface
- Available with beamswitch e.g. for manual and automated cleaning with one laser unit

OUR LASER OPTICS FOR CLEANING

EXAMPLES – SOLUTIONS FOR (ALMOST) EVERY APPLICATION

Automated Optics

- OSA 20
- OSA 70
- Stylus

2D Optics (manual or automated use)

- Stamp 10
- Stamp 14

Handheld Optics

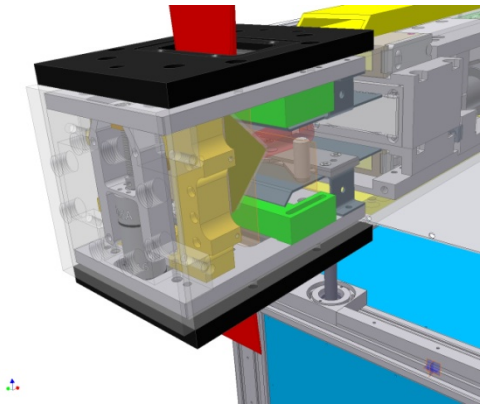
- Stylus
- OSH 20
- OSH50
- OSH80

CUSTOMIZED LASER MACHINE

“MOULD WIPER” FOR MOBILE IN-LINE CLEANING

FINAL CONCEPT:

- 80 watts short pulse unit
- Top located automation system
- Gun style automation system
- Fiber coupled laser unit
- Fully air cooled system
- Integrated suction hose/channel system for attachment of an external suction unit



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CUSTOMIZED LASER MACHINE

DEVELOPMENT PHASE – CONCEPTIONAL DESIGN EXAMPLE

CONCEPT:

- 3 Axis Gantry
- Complete design by cleanLASER
- CIP
- Hot Moulds

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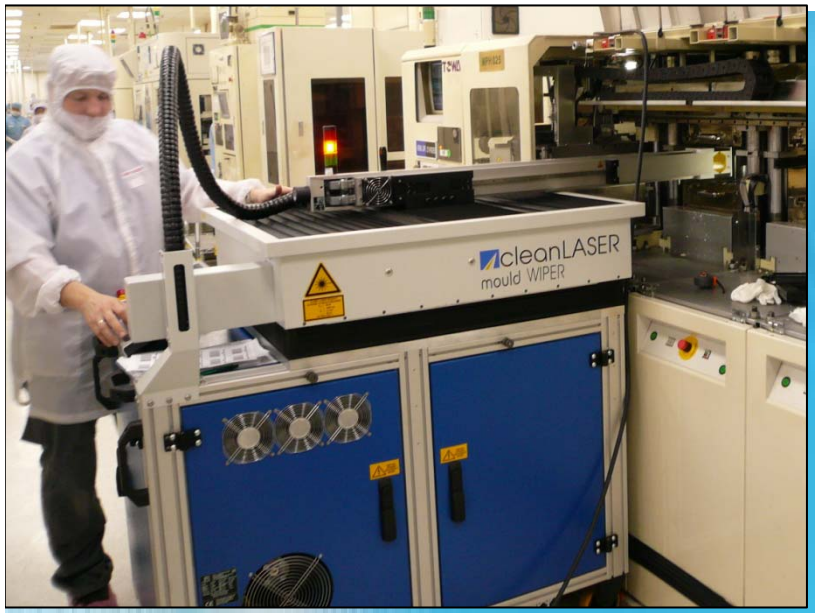
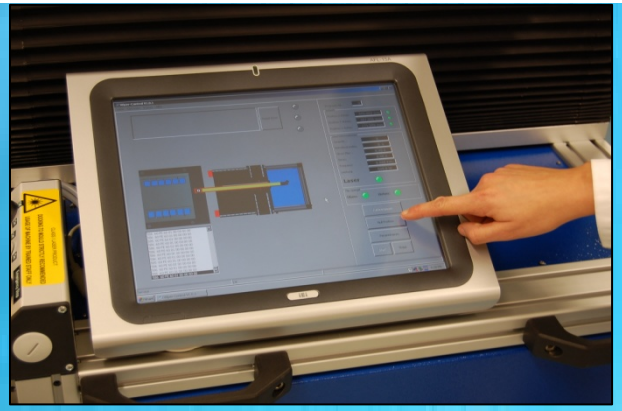
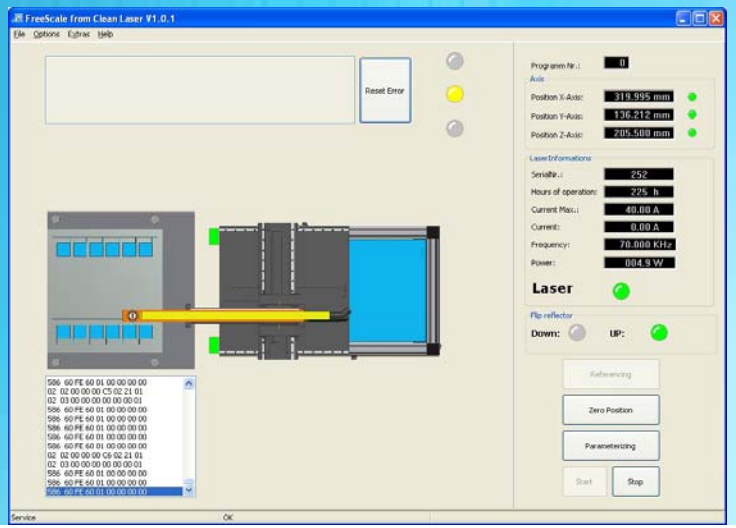
CUSTOMIZED LASER MACHINE

DEVELOPMENT PHASE – PROGRAMMING AND INTERFACE EXAMPLE







Software and Control:

- PC based control and programming
- Touch screen
- Graphics based visualisation

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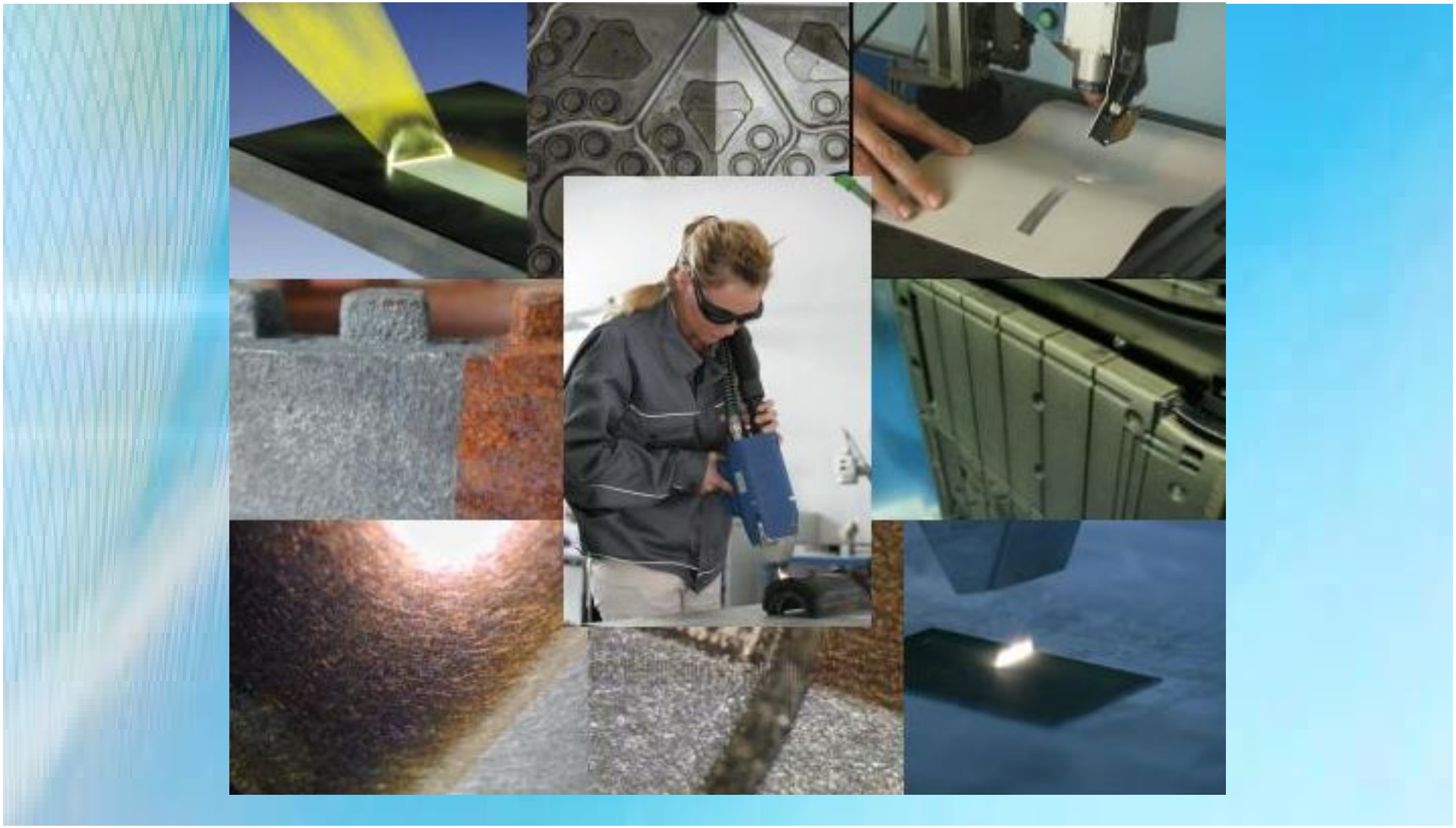
cleanLASER APPLICATION IMPRESSIONS



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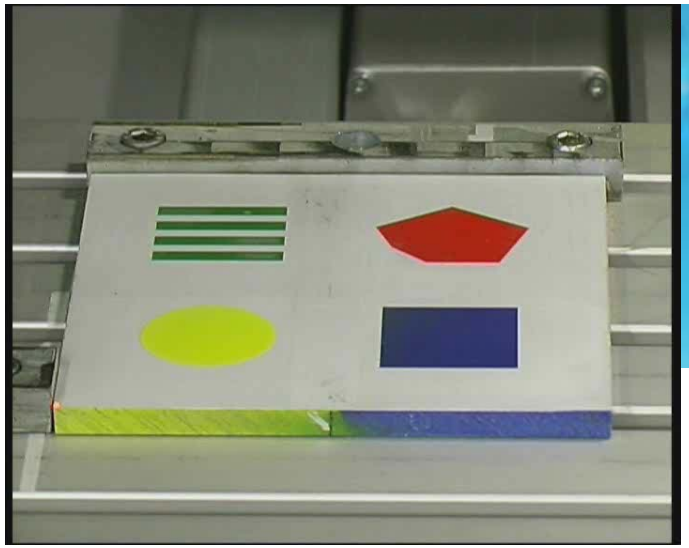
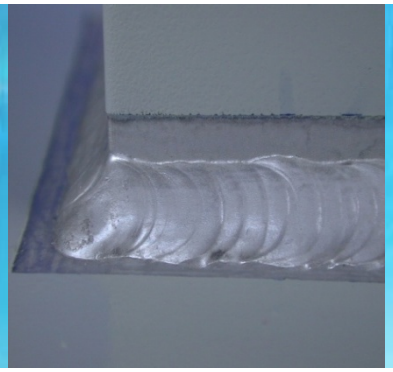
PAINT-STRIPPING FOR MAINTENANCE



Camera based colour recognition



APPLICATION: damage free coating removal for maintenance and inspection

ADVANTAGE: „zero-emission“, dry and flexible de-coating technology, no residues, no damage to surrounding areas

SAVINGS: short set-up and de-coating time for smaller areas

Current Status: More then 15 units in use (mainly US armed forces)

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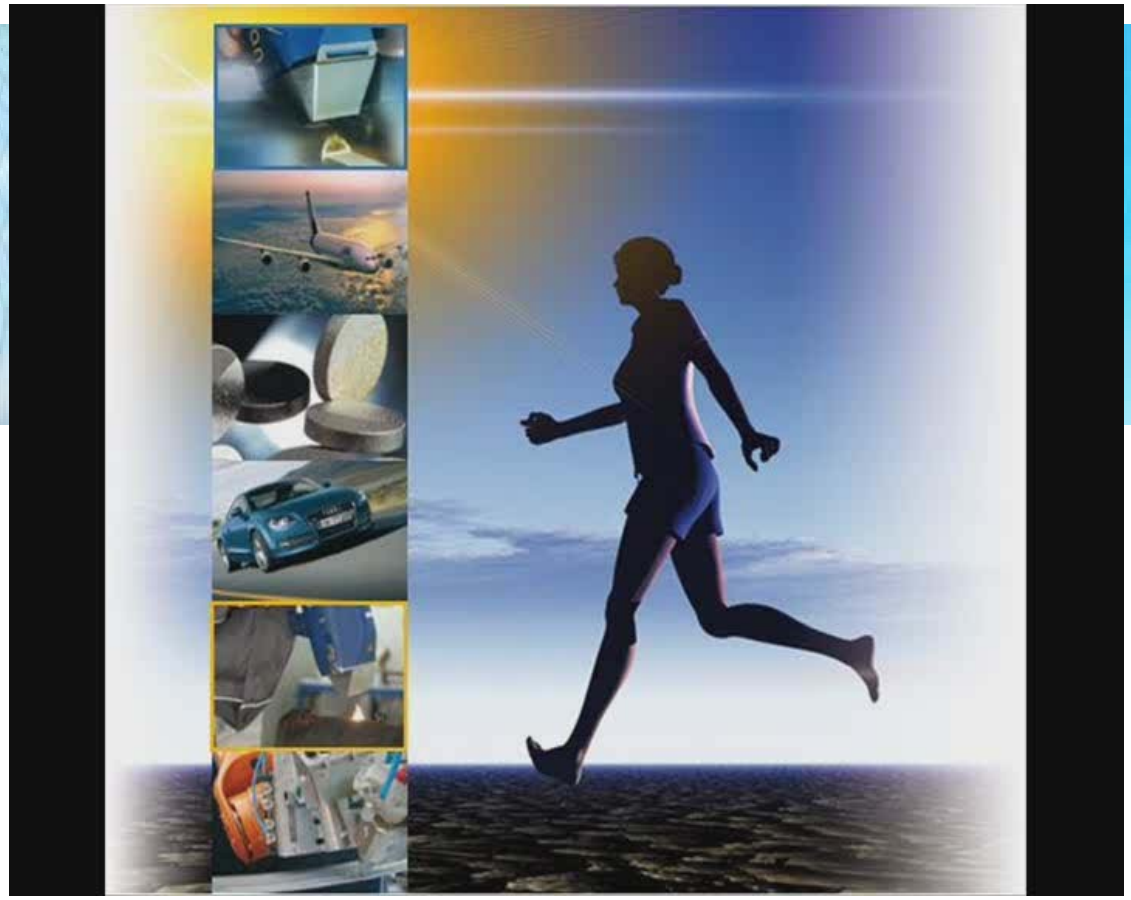
AL-WELDING PRE-TREATMENT WITH CLEAN LASER TECHNOLOGY

AL- BASED CARS

- Treatment with CL500 / CL300 Laser
- Removal of oxidation and grease layers
- Pre-treatment for electric beam- and laser welding of Al 6016 sheet metal
- Constant surface quality
- Comparable to chemical cleaning results
- Local area cleaning with up to 4m/min
- Status: in serial production at AUDI for TT and Q5 models

COMPOSITE MOLD CLEANING



- **In use at several Aircraft makers!**

Work piece after 100 treatments (500 W) without any dirt layer – no abrasion

- Removal of process residuals
- Economical cleaning of large segments with a beam width of up to 100mm and more
- Sensitive structures of aluminium, invar and steel will not be damaged
- Homogeneous cleaning results
- Cleaning speed of more than 15 m²/hr (depending on layer thickness and laser power)

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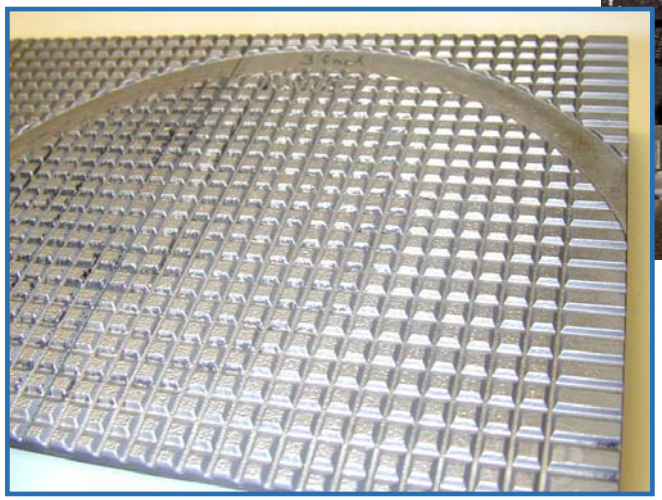
AUTOMATED IN-LINE CLEANING

BAKING INDUSTRY

Cleaning speed up to
10cm²/s @CL150

In-line cleaning possible



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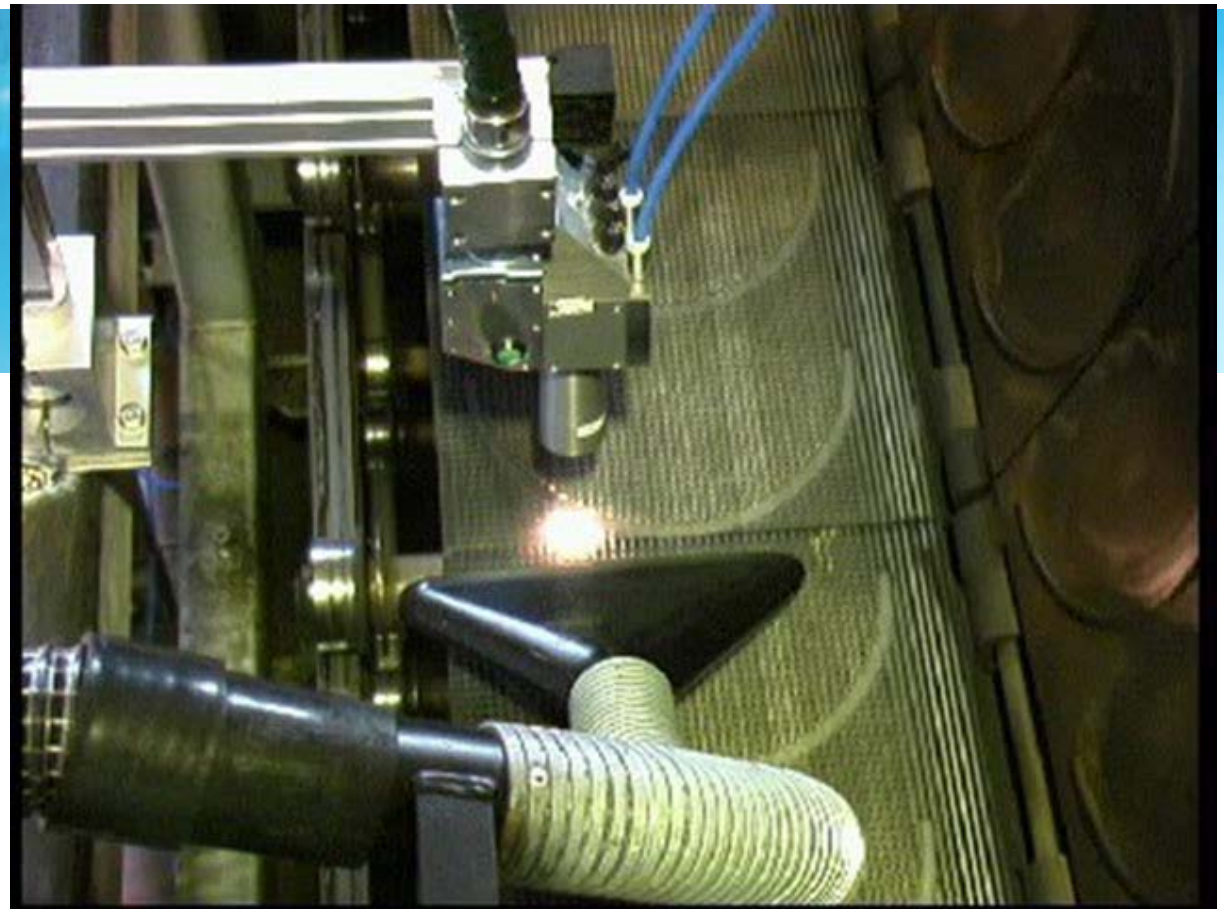
AUTOMATED IN-LINE CLEANING

FUNCTION AND TECHNOLOGY - BASED ON CL 150 LASER UNIT

Two axis gantry (y-z) (manual or automated)

Line-by-line cleaning (manual or automated)

CIP applicable



AUTOMATED IN-LINE CLEANING BAKING MOLD USING CL 20

IN INDUSTRIAL USE SINCE 2007

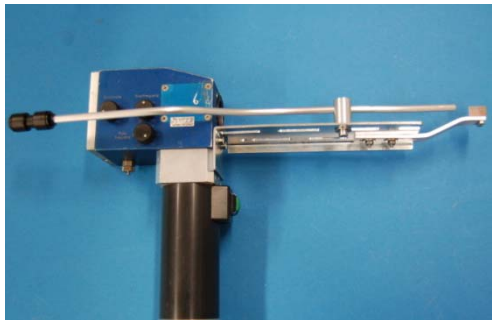
Record: 5.8 Million cones within 15 days (24/7) means >4 cones per second in average

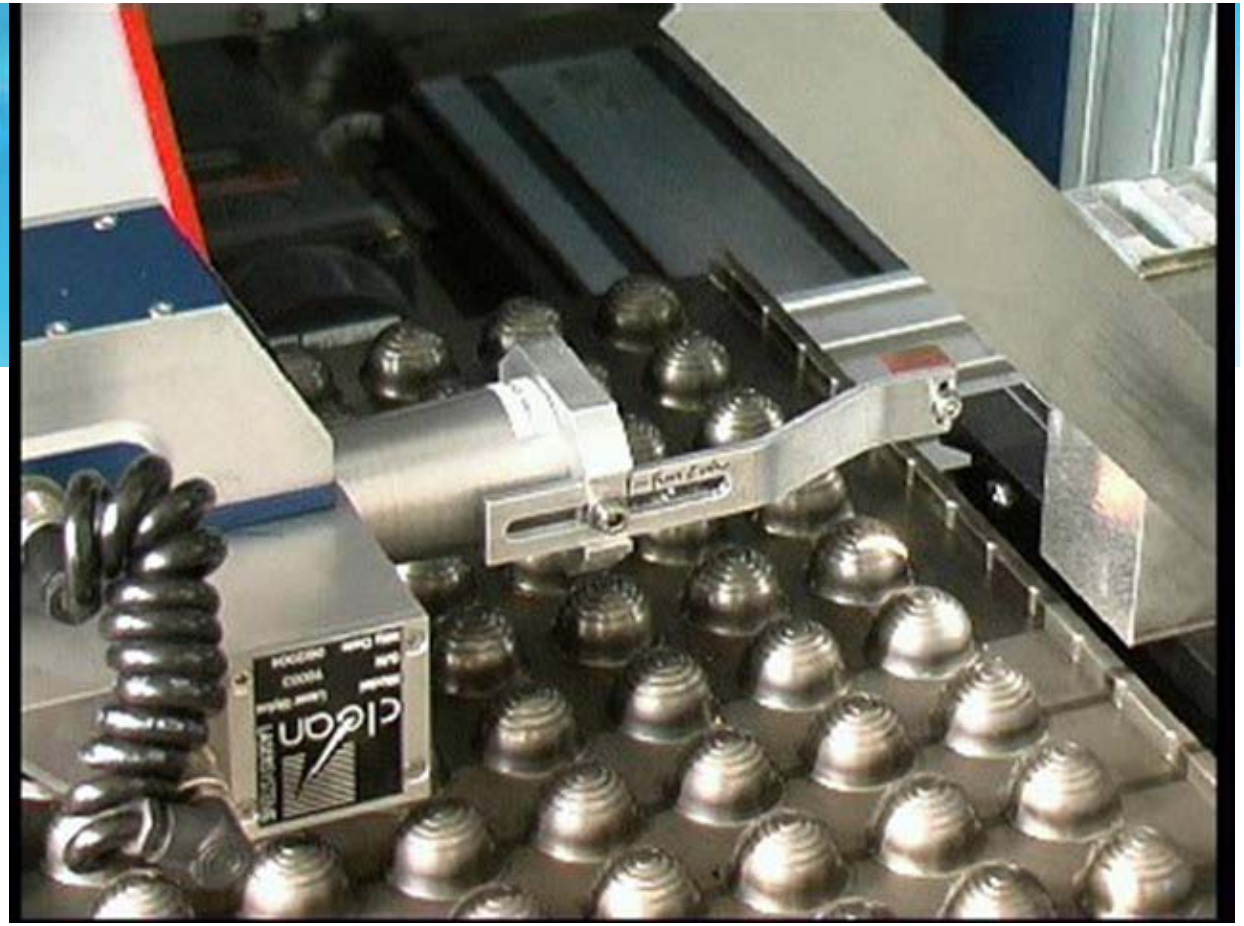
AUTOMATED IN-LINE CLEANING

CLEANING IN LIMITED SPACES

Using a mirror for deflection

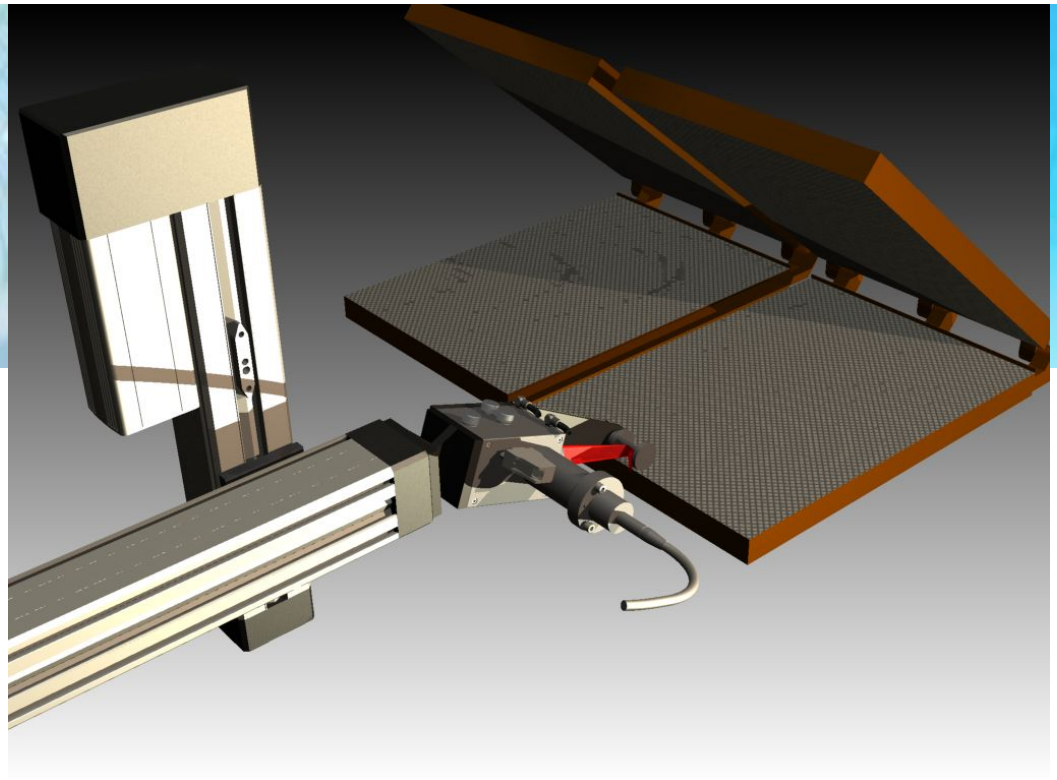
Simulating the access situation

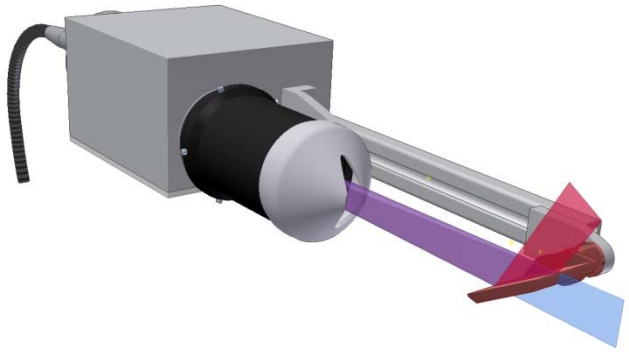


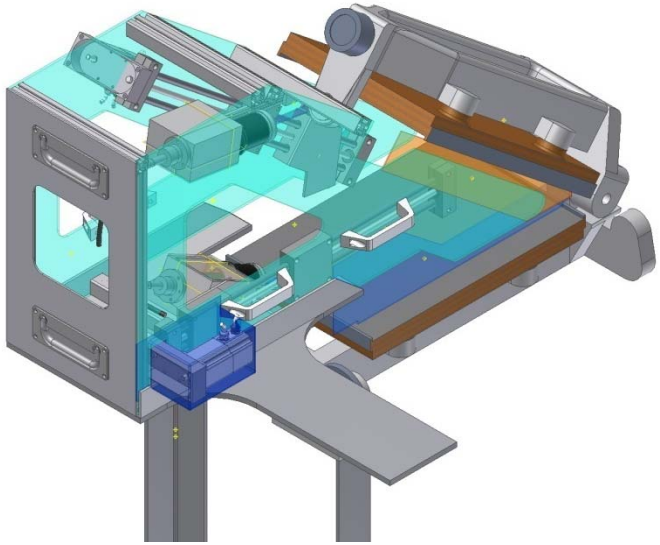


CLEANING OF LIMITED SPACES

TECHNICAL CONCEPT TO SOLUTION







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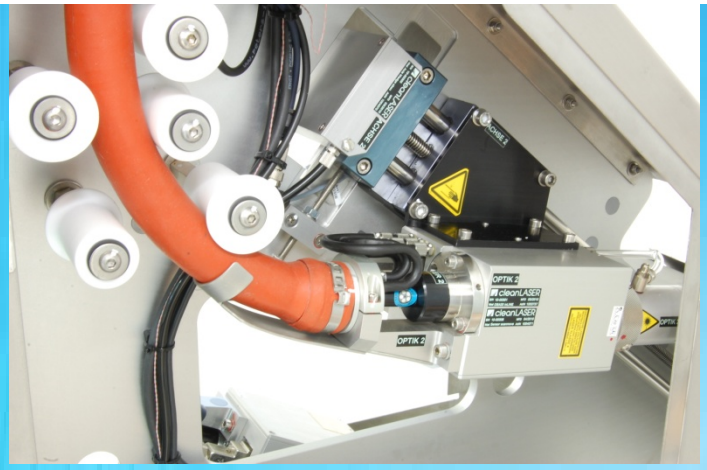
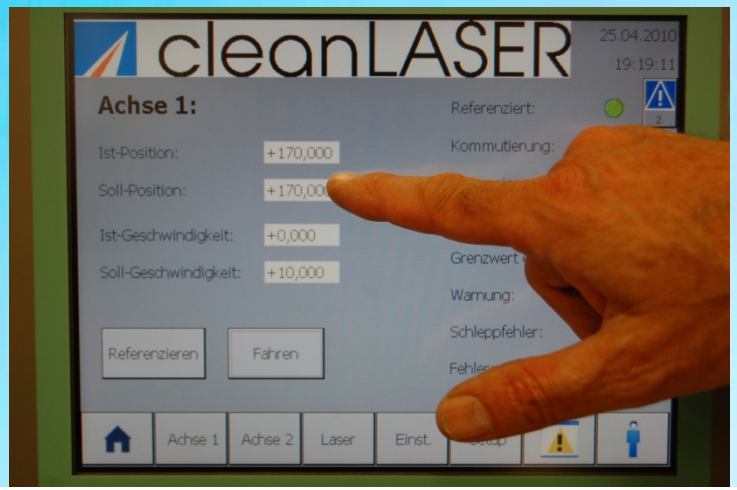
CLEANING OF LIMITED SPACES

THE FINAL CLASS 1 SYSTEM





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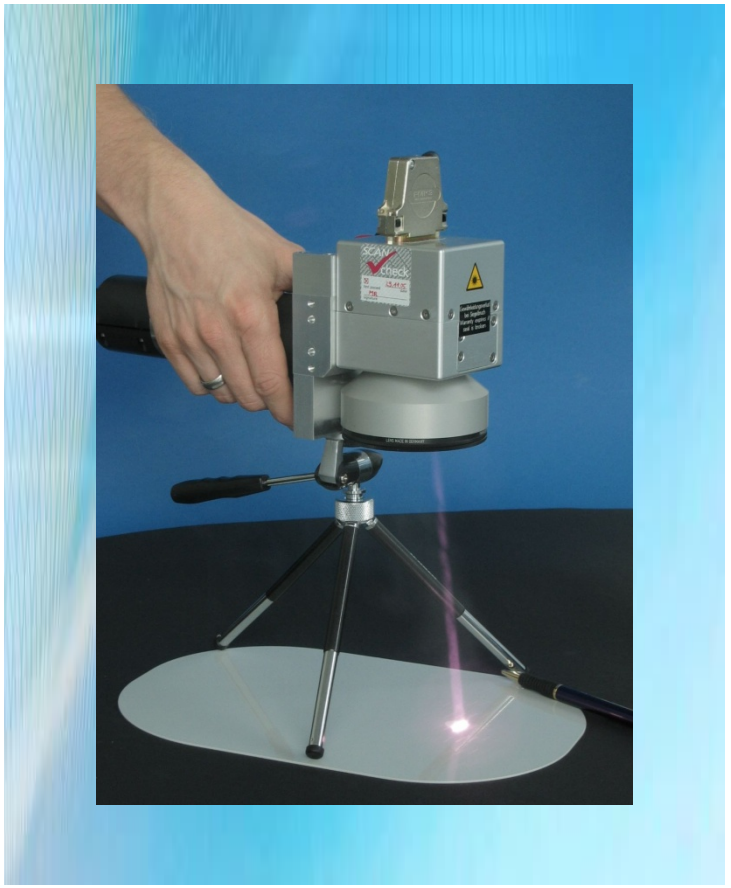
COST & ADVANTAGES OF THE CLEANLASER TECHNOLOGY

- Cleans with the power of focused light
- Flexible use due to fiber optics / Easy integration & automation
- (Almost) maintenance free technology
- High repeatability, sensitive cleaning technology
- Special advantages on Aluminium



ECONOMICAL EFFECTS

- Very small operating Costs 0.5-5€/hr (CL20/CL1000)
- Low costs of ownership due to reliable new diode pumped laser technology
- Affordable Investment/short payback period
- No process downtime

ECOLOMICAL EFFECTS

- No blasting material no chemicals
- No noise emission (“quiet” laser-ablation)
- No waste at all except of the ablation residues

cleanLASER turn down the production costs!

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MERCI BIEN!

THANK YOU!

DANKE!

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