

## **Company profile & key references**

Defence & Aerospace

2024

**15+ years**  
**OF HISTORY**

**800 m<sup>2</sup>**  
**AREA**

**40**  
**EMPLOYEES**

**50+**  
**INSTALLATIONS**

## TEAM

- From graduated optics specialists, through optics and automation designers, electrical engineers, PLC and VISION programmers, to electrical engineers.

## AREA

- 800 m<sup>2</sup> of production and laboratory environment in a modern facility in Prague, Horní Počernice.

## FACILITIES

- Workstations for assembly, programming and testing of the machines.
- Complete metalworking workshop: cutting laser, 3-axis CNC centre, milling machines, lathes...
- CAD software: Creo + WindChill, CreoSimulate, Zemax.

## CERTIFICATION

- We are certified in ISO 9001 QMS and ISO 14001.
- Certificate of process cleanliness in the food and medical industry.

## LABORATORIES

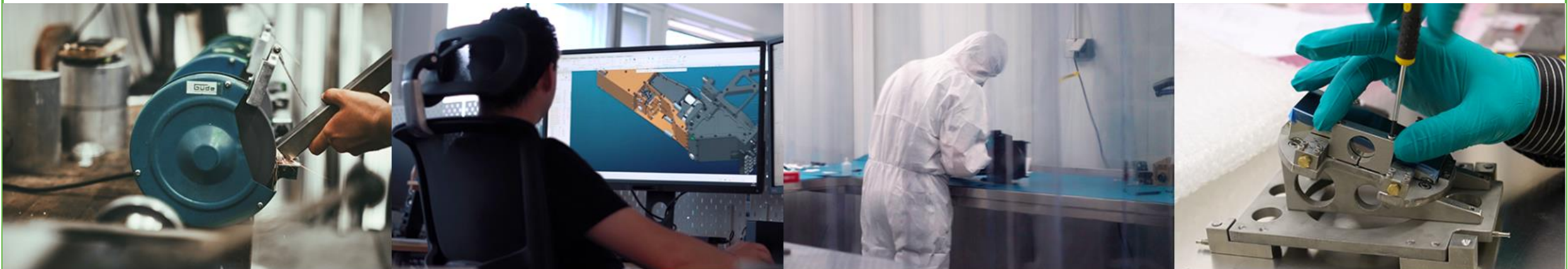
- Laser applications
- Flowbox (ISO 7)
- Dark room
- CCD camera for testing optics for synchrotrons
- Telecentric lenses (ø 140 mm)
- Collimators (ø 250 mm)
- Optical table
- Helium-Neon laser
- Wavefront detectors

## INTRODUCTION

We specialize in development of **Optical systems for defence and space** and **AI optical systems for industry**.

We have capabilities to develop, simulate, produce and program complete technology.

**We pride ourself being one of few producers of Head up display for aircrafts, being part of space projects with ESA and being able to supply AI based system for optical analysis for industry or deliver complete high-power laser systems.**







## AI & Vision systems

This field involves optical measurements and database management, including optical quality control and product identification. We use AI for advanced automation, testing systems, custom 3D cameras and tracking.



## Defence & Aerospace

Design and produce advanced devices for aviation, space, and defense, including displays, test systems and optical components. Based on our own research and development, we create complex solutions combining the latest software and hardware.



## R&D, Design & Automation

We specialize in the design and simulation of mechanical, optomechanical and optoelectronic devices, including optical systems for visible and X-ray wavelengths. Our expertise also extends to high-power laser systems for industrial processes.

# References - excerpt



## AI & VISION SYSTEMS

### Industrial solutions / projects

- AI based visual inspection systems
- AI based automatic volume measurement systems for cars with load of timber
- Traceability cameras connected to cloud database / application for logistics

## DEFENCE & AEROSPACE

### Design and production of devices for aviation and space

- HUD display development (Aero L-39 and Aero L-39NG)
- Dedicated test stands of HUD displays for 100% quality control and calibration
- Development of piezo mechanisms for satellites
- Development of deployable optics for satellites
- Digital photogun replacements

## R&D, DESIGN & AUTOMATION

### Design and production of custom-made scientific instruments

- X-ray microscopes for European laboratories / synchrotrons
- AltAz mounts for ceilometers / autonomous astronomical laboratories
- Domes for robotic telescopes
- Laser welding / cutting / deburring / cleaning industrial units (custom designs)
- Portable laser cleaning machines (development and production of a standard product)

Defence  
Aerospace  
Science

# Head-up display for defence aircrafts

We develop cutting-edge modular optical systems for head-up displays that perform excellently even under the most demanding conditions. In addition, we can customize and use the system in any desired size while maintaining the same level of quality.

Developed entirely in the Czech Republic, the Head-Up Display (HUD) for aircraft represents over 10 years of dedicated engineering and has been installed in more than 30 aircraft. The system is built to withstand shock, vibration, humidity, and extreme temperatures, and it is fully compatible with Night Vision Goggles (NVG).

- GEN 1: PDU39
  - HD resolution
  - Resolution 0.6 mrad / pix
  - Accuracy < 3 mrad (TFOV)
  - TFOV 23 deg
- GEN 2: PDU39NG
  - FullHD resolution
  - Resolution 0.45 mrad / pix
  - Accuracy < 1.5 mrad (TFOV)
  - TFOV > 25 deg



## Elya head-up display (HUD)



10+ years of  
R&D



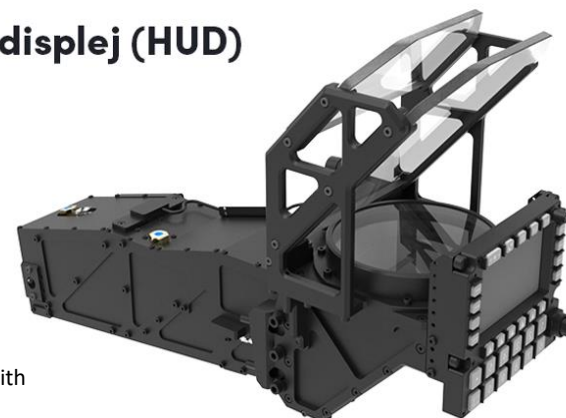
Scalable



Compact  
display



Lighting system with  
LED and DMD  
technologies



Serial production  
for L-39

2021

Lower  
consumption,  
longer service life



High resolution  
and brightness



Minimized  
dimensions

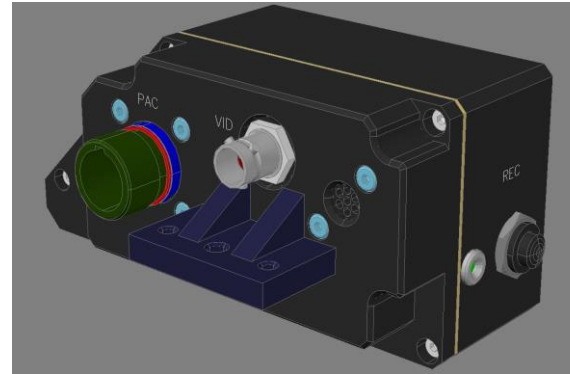


# Digital replacement of analog photoguns for airplanes

## Digital Photogun

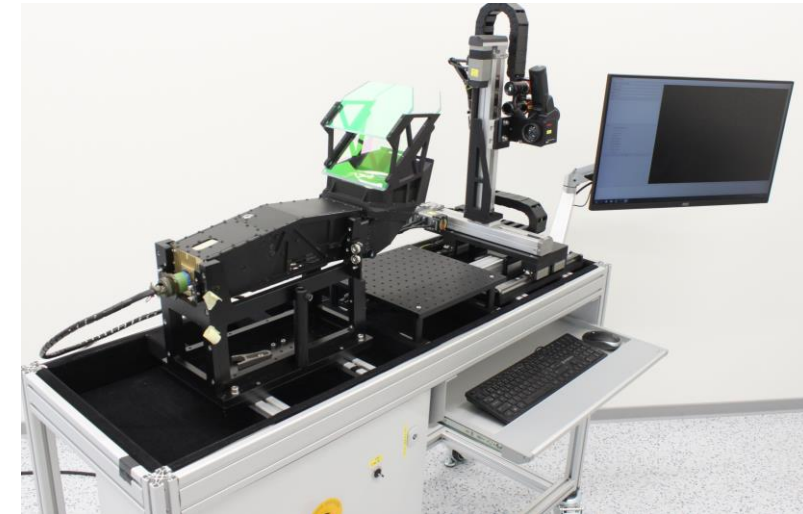
Core idea – **retrofit** existing airplanes **with** modern **digital** avionics.

- Identical interfaces, easy replacement.
- Optical and optomechanical engine of the digital replacement for analogue photoguns used in some Czech military airplanes.
- Minimized dimensions.
- Preserving the interfaces.
- Collaboration with other Czech avionics suppliers.
- Military certification.

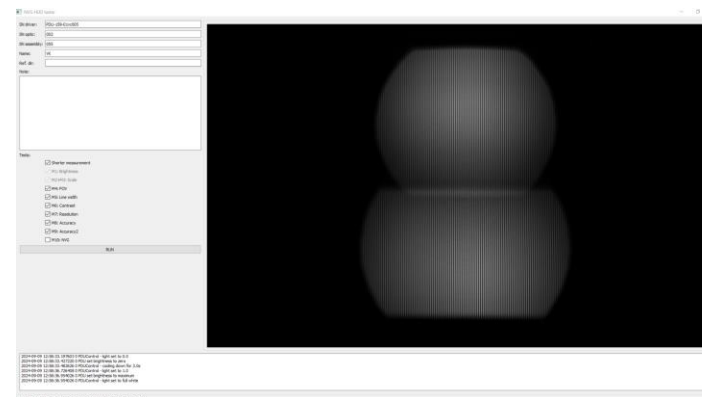




- Automated measuring and testing stand using AI.
- Mechanical, optical design and production, SW development.
- Number of tools developed:
  - Automated analysis generating full test report of vision parts and parameters:
    - Resolution
    - Brightness
    - Field of View
    - Calibration coefficients (offset, scaling...)
    - Accuracy
    - ...
  - SW tool for Manual pointing tool calibration.
  - SW tool for adjustment of combiners.
  - SW tool for focusing.
- Dedicated test stand for each HUD generation.



Calibration stand with HUD installed.



Automatic test, line-pairs for resolution currently analyzed



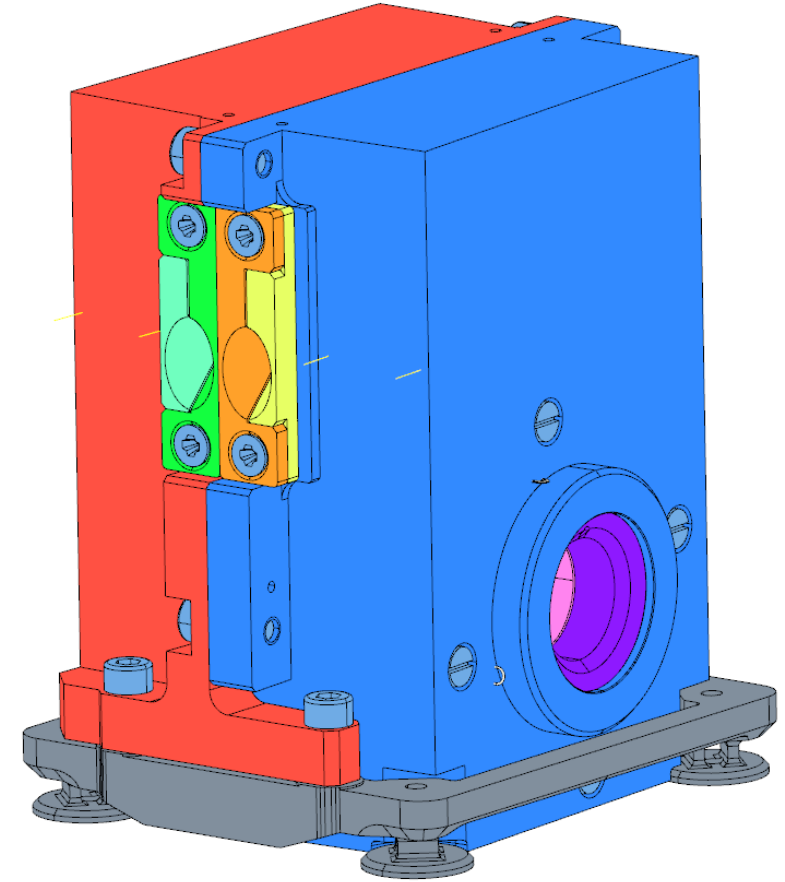
# Test report

[illegible]

# Development of the FSUA mechanism of ESA LISA mission

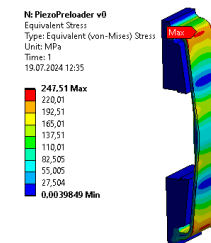
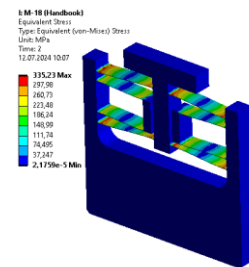
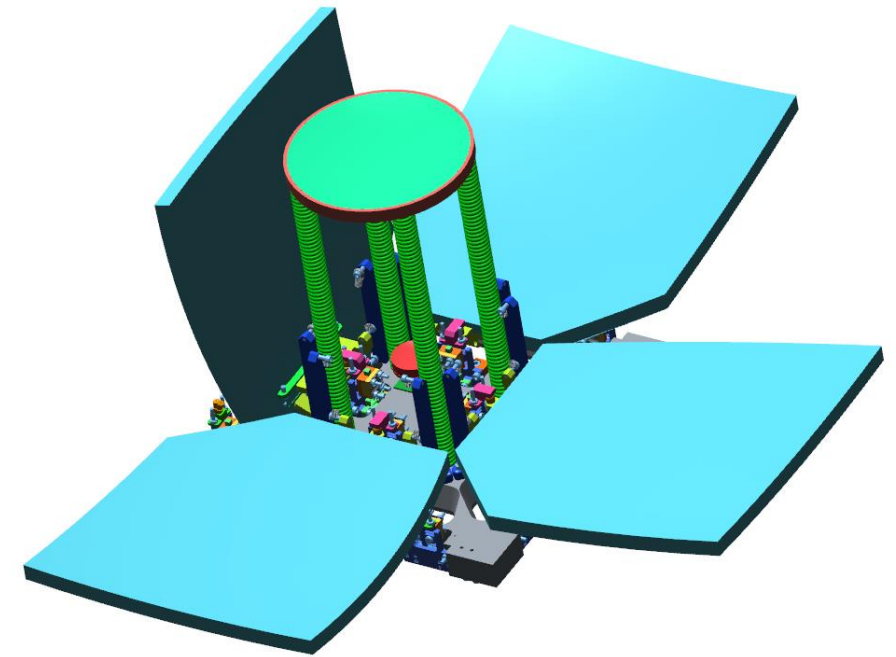
## Fibre Switch Unit Mechanism

- Miniature (57x47x65 mm) mechanism rotating the optical elements in the future ESA (European Space Agency) mission detecting gravity waves (LISA).
- Cooperation with FZU, ASU, UFA, IT (institutes of the Czech Academy of Sciences).
- Support the institutes with mechanical design of the FSUA mechanism.
- Support the institutes with mechanical design of the dedicated GSE (test stands, transport containers, calibration setups etc.).
- Piezo based, non-magnetic, redundant system.
- Technology highlights:
  - Materials: Titanium based, Inconel screws, special versions of PEEK.
  - Processes: Piezo stick-slip actuator, custom design.
  - Space constraints.



# Deployable & active telescope for small satellites and cubesats

- Development project in cooperation of Elya and TOPTEC.
- **European Space Agency** funded project.
- **Technology highlights:**
  - Piezo actuators for moving the mirror segments.
  - Shape memory alloys for unlocking / deployment.
  - In-flight mirror adjustment methods.
- **Use case:**
  - Satellite is launched in folded state => minimizing the dimensions.
  - Mirror petals are deployed in-orbit (both primary and secondary mirror) – maximizing telescope performance.
  - Selected petals are adjustable in orbit within submicron steps => correcting mechanics imperfections and thermoelastic deformations.



# Laser ceilometer with Alt-Az mount

Measuring cloud altitude with lasers

- Collaboration with FZU, Czech Republic.
- **Robotized mount** for rapidly pointing ceilometer into arbitrary position in the sky.
- **Laser** ranging ceilometer normally used at airports for detection of cloud level.
- Here it is used to detect cloud level at arbitrary direction to support automatic / robotic telescopes at remote locations.
- Remotely controlled.
- Full safety for remote operations.
- Image on the right show tests on the FZU roof during development.
- Installation sites: Chile, Canary Islands etc.



# Industry

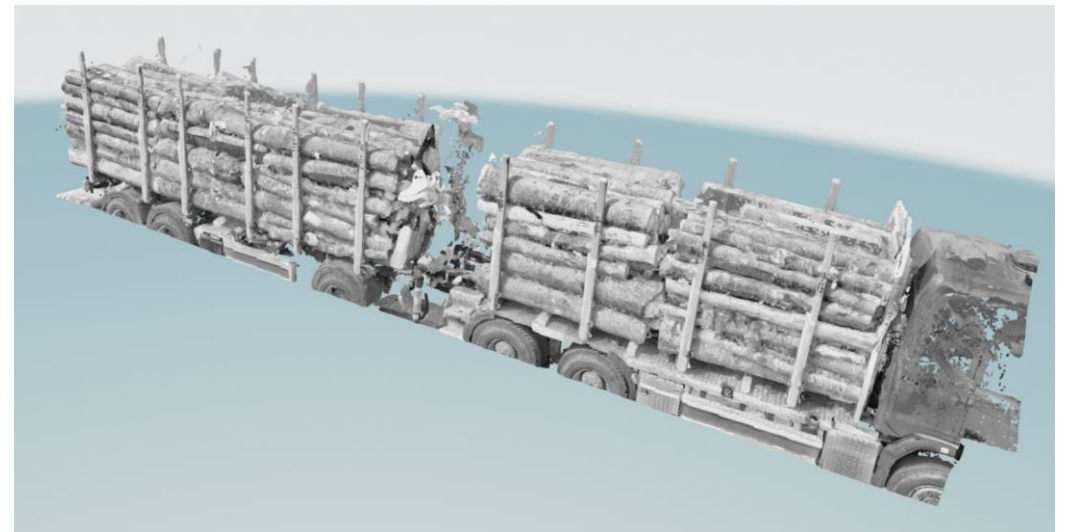


# AI based automated timber volume measurement system

The main goal of the implementation was to achieve full automation of the wood volume measurement process on trucks in remote collection warehouses in the wood wholesale sector. This simultaneously streamlines warehouse operations and increases the traceability of wood loads.

## The project implementation involved several key steps:

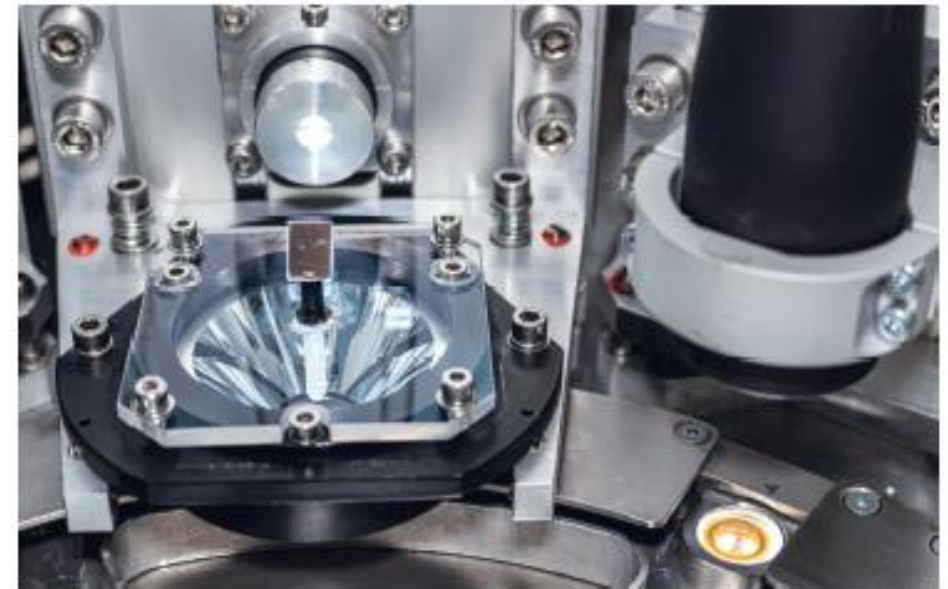
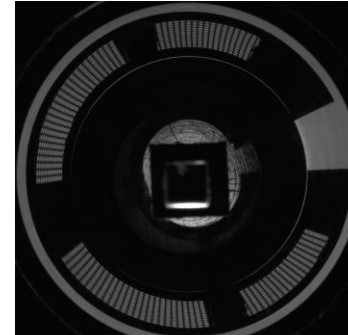
- Development of **custom 3D cameras** that use **deep learning / AI** and operate in harsh outdoor environments.
- **Calibrating** cameras to ensure accurate measurements.
- Tracking truck movements using **deep learning / AI**, **reading license plates** and detecting wood in vehicles using **deep learning / AI**.
- **Video** from both sides.
- Sending measurement results and complete photos/videos of the load with dimensions to **cloud storage**.
- Triggering measurements via **mobile app**.



# AI vision based controlling station for sorting fuel filters

A complete delivery of a single-purpose machine for high-speed sorting of fuel filters was realized for a customer from the automotive industry.

- AI based vision system.
- Checking more than potential 100 defects.
- Advanced electrical and mechanical design.
- Cycle time for evaluation and handling is 1 s/piece.
- Capacity > 40 000 pcs/day.
- Possible extension to various shaped products.
- Check the quality of both the mesh (e.g. dimensions, holes, dirt, number of OK, missing mesh, double mesh) and the plastic (e. g. color, breaks, shape), etc.
- Delivered 10 systems.



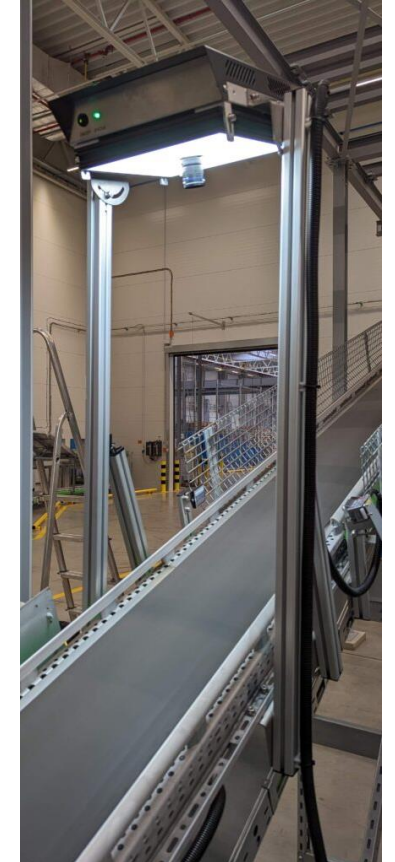
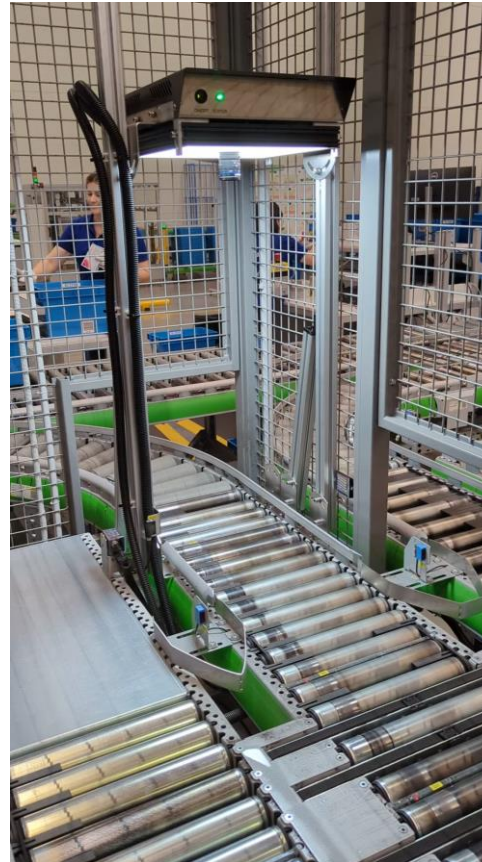
# AI vision system for supporting traceability in logistics

We have implemented an **AI camera system** that has **improved traceability and process control in warehouse logistics, specifically in the area of drug distribution to pharmacies.**

A key feature is the combination of image recording with traceability, which allows access to photographs through serial numbers. These photos are stored in the **cloud**, which is a secure and accessible data repository.

## Benefits:

- Customers now know what's in each box thanks to barcodes.
- They can track what has changed or been added.
- Images stored in cloud – extremely easy to deploy.
- AI based automatic defects detection available.
- System includes photos from 4 cameras and stores data history for 2 months.



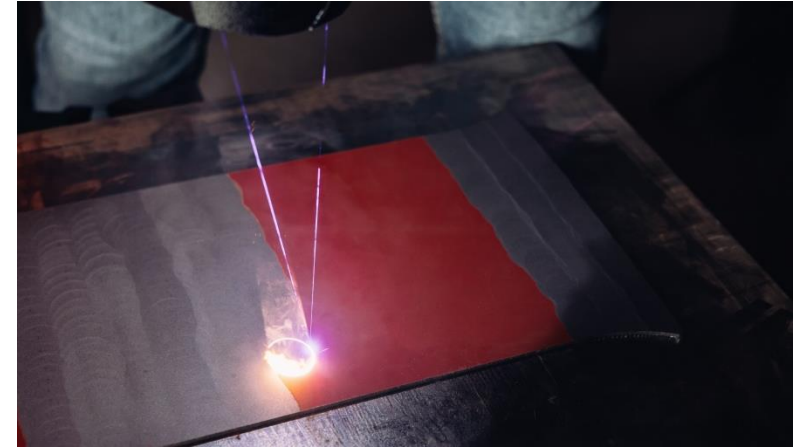
# Laser technology



# Development of 2D laser cleaning head

## CLEANING LASER 2D SCANNING HEAD

- Fully customized 2D laser cleaning head.
- Designed, manufactured, tested.
- Optics + mechanics.
- Light and small design - handheld / portable.
- Capable of utilizing 2D patterns (not just pure lines) where necessary.
- Currently tested up to 2 kW lasers.





# Automated robotic laser system for aluminum car bodies

Laser cleaning before the painting process

The primary objective of the project was to automate the cleaning of automotive chassis surfaces to ensure proper paint adhesion. Our systems efficiently combines both laser cleaning and surface roughening, meeting the customer's specific needs in a single process.

## The project implementation involved several key steps:

- Installation of two laser cleaning systems (combined laser power).
- Construction of a fully automated system equipped with two robots and integrated with conveyor systems.
- Cleaning and roughening the chassis surface in one step to create the required **anchoring profile** for paint.

## Benefits:

- Full automation of the cleaning and roughening process.
- Increased efficiency of the production cycle (cleaning time: 180 seconds per chassis)
- Environmentally friendly with no chemicals involved.
- Lower operational costs and reduced need for manual labor.
- Accurate, contactless process with minimal dust creation.



People  
X  
Equipment

# Special equipment – lens bonding station – optics assembly

## TOOLS AND EQUIPMENT

### Unique device – bonding station OptiCentric 5D.

This enables us to:

- Position the objective lenses precisely into the mechanics in the correct relative position, while compensating the mechanics imperfections.
- Preserve position during the glue curing process.
- Make the objective assembly process stable / repeatable.

### Benefits:

- Used to assemble objectives, lenses glued into correct position.
- 5-axis adjustment of each lens ( $<1\ \mu\text{m}$ ,  $<2\ \text{arcsec}$ ).
- Axis being held in position during curing process.
- Located in a clean room.



# Special equipment – optical 3D scanner – metrology

## TOOLS AND EQUIPMENT

High precision mechanical parts needed for optical, optomechanical and industrial applications in general require precise metrology.

Keyence optical 3D scanner helps us to perform 100% input inspection for HUD production, in development of new devices and for internal production. We have defined a metrology process, which we are using internally, but can be used also for external services.

### Benefits:

- **Metrology digital twin** – any measurement possible on the twin without the need of additional real scans.
- Traceability – storing digital twins for each part for the future use.
- Objects up to 500 mm in diameter, 200 mm in height.
- Fast and accurate measurement.
- 100% metrology control for selected parts and/or projects.



# Our origins



# References

SELECTED CUSTOMERS IN CZECHIA AND SLOVAKIA



# Group slide

Sister companies in our Group



The logo for LASCAM, with "LAS" in red and "CAM" in black.

LASCAM Systems specializes in the development, production, and supply of automated units for laser processing of metals and plastics, as well as optical systems.



Elya Solutions specializes in the development of optical systems for defense and space, as well as AI-powered optical systems for industrial applications.

The logo for AYES, consisting of the word "AYES" in a large, black, sans-serif font.

AYES specializes in the supply of smart glasses and the use of augmented reality in the digitalization of industrial production.



MARK industries specializes in industrial technologies, offering solutions such as laser marking, cutting, welding, and product identification.



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