Industrial image processing with Artificial Intelligence

11.4.2024

Roland Bott, Sascha Schäfer, TRsystems GmbH Division unidor

5th WORKSHOP Forming and Punching

The history of TRsystems GmbH Division unidor

A long road to success

- **1948 Establishment of Kiefer KG, Uhren- und Metallwarenfabrik, Pforzheim**

  Formation of the brand name **„UNiDOR“.** (watches, watch bands, bracelets, pens) In-house development of die protection systems (1976) in the stamping department due to enormous down time and production loss because of die smashes (Series UN)as well as optical Sensors for mis-feed detection
- **1971 Sold to Thurn und Taxis**

  Development of more sophisticated control systems, tonnage monitoring systems and OEM solutions. Foundation of an own business division within the Thurn & Taxis group: UNIDOR Industrial electronics. Formation of a multi-functional process monitoring system: APS series: Die-protection, tonnage monitoring, control cams, automatic adjustments.
- **1990 Takeover by Prym Group**

  After the Prince of Thurn & Taxis died, his wife Gloria resolved the industrial companies UNIDOR and DODUCO to the Prym group (5000 employees) First PC based control unit were developped at UNIDOR (series Aplus).
- **1996 Takeover by TR Group**

  Development of more complex and ccustomized controls for the **stamping industry** and OEM solutions. In 2000 start of the compactPRESS aerea as a universal, modular and modern designed process control, In-Die quality inspection and press control system.
- **2012 Integration into the TRsystems GmbH**

Head office is Pforzheim Freiburger Straße 3

TRsystems GmbH Division unidor

Part of TRelectronic in Trossingen

Trossingen - near to Lake Constanze / Black Forest – Our

TRelectronic

Representation in the Czech Republic

DEL®

Headquarters

del@del.cz

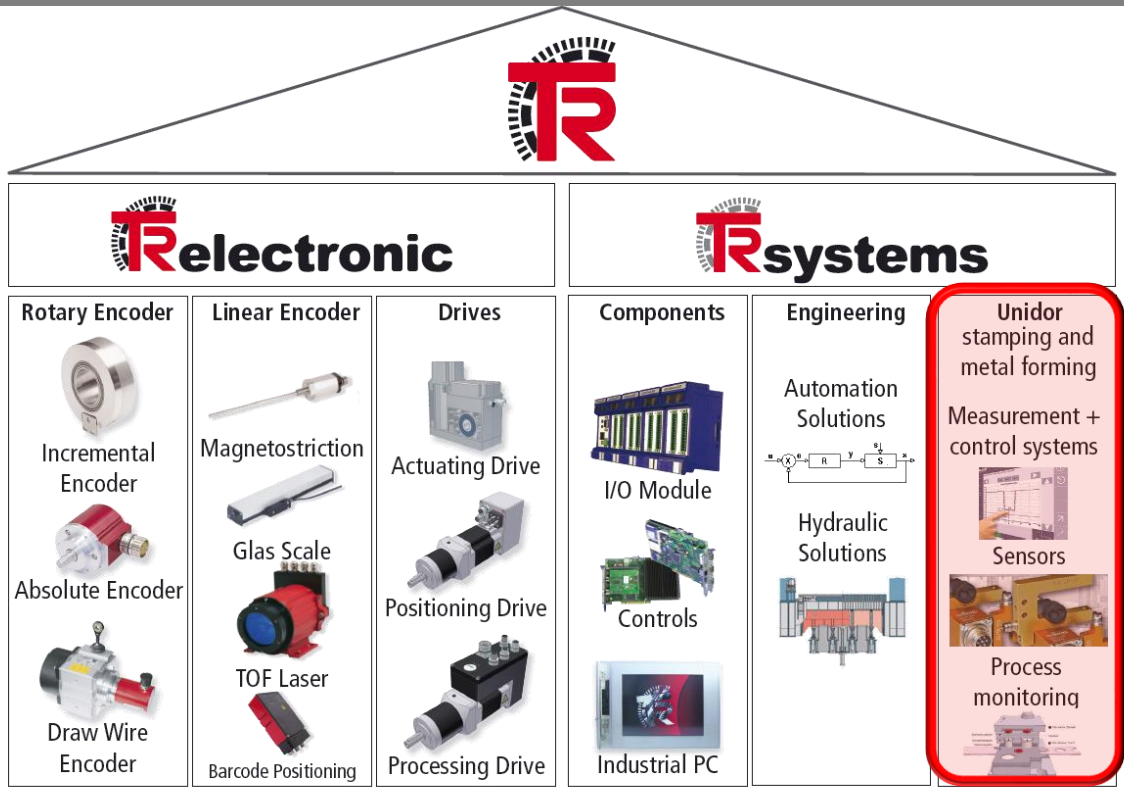
+420 566 657 100

DEL a.s.
IN: 089 62 669
TAX IN: CZ 089 62 669

Biskupský dvůr 1146/7
110 00 Prague 1
Czech Republic

The TR Group

Part of TRelectronic



Industrial image processing with Artificial Intelligence

The challenges

The quality requirements are getting higher and higher

- No scratches
- No marks
- No cracks
- No streaks

Artificial Intelligence

- The parts must be 100% measured
  - Even for parts that fall
- The economic efficiency
  - Costs must be reduced
  - 100 % documentation

Customised monitoring

Industrial image processing with Artificial Intelligence

AI models

- **Recognition of samples**
- Anomaly detection with optical measurement systems
- Advantages: General monitoring
- Disadvantages: The system has to be permanently relearned.
- The evaluation is not certain.

- **Artificial Intelligence with neural networks**
- Teaching in issues
- Detecting scratches
- Detecting cracks
- Detecting marks

  Detecting rust….

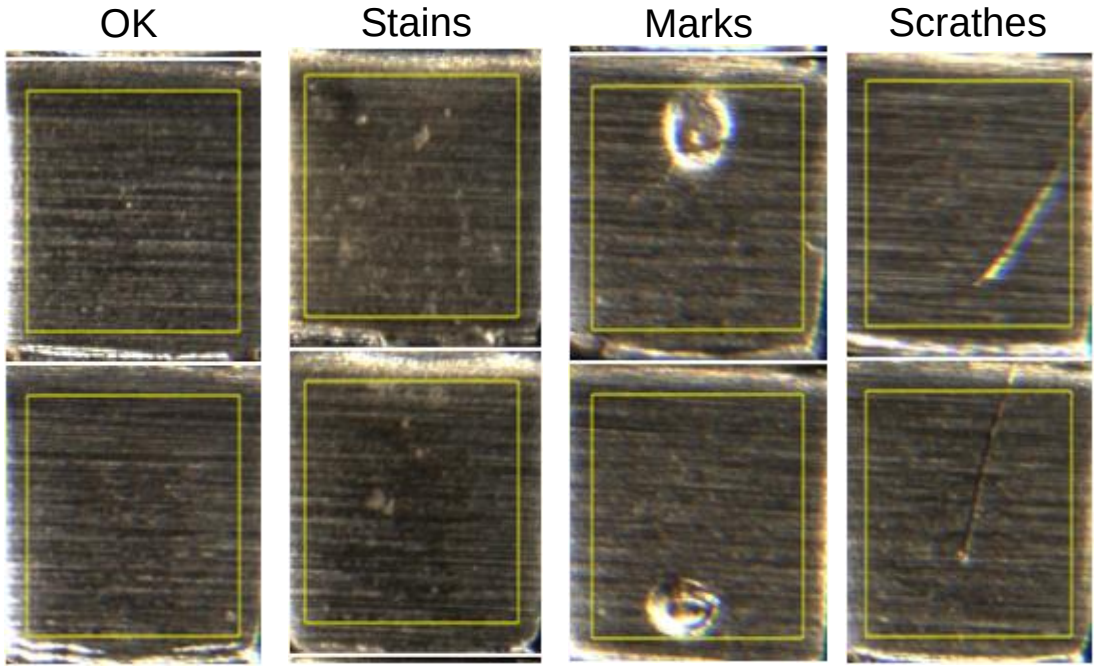
Industrial image processing with Artificial Intelligence

Train on issues

Fehler trainieren - Getriebeplatte

Industrial image processing with Artificial Intelligence

Evaluation of bond surfaces



Industrial image processing with Artificial Intelligence

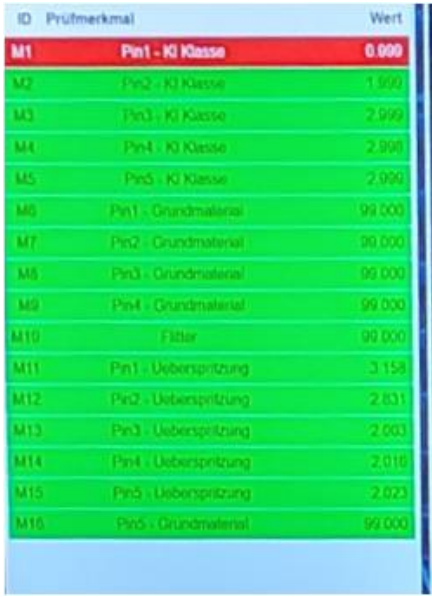
Evaluation of bond surfaces

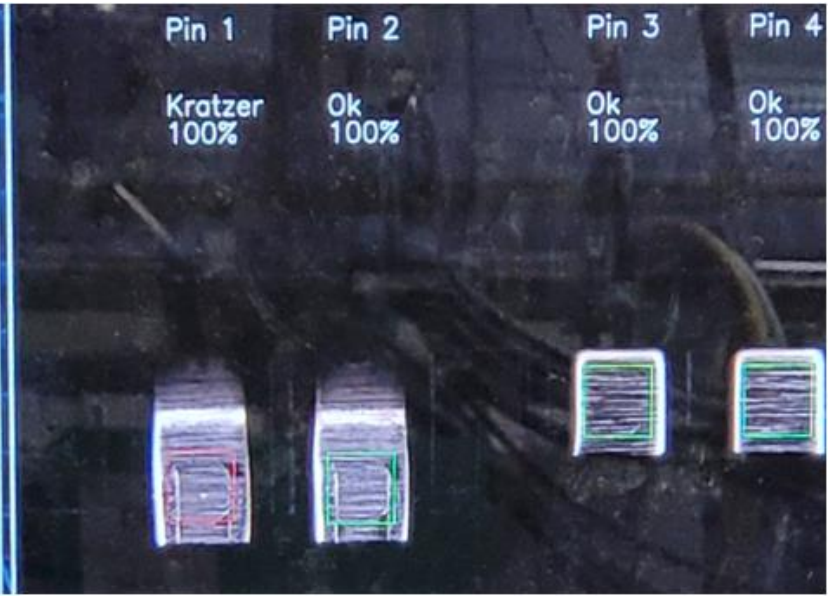
Image	Marks	Stains	Scrathes	OK	Prediction	Result	Filename
	16.7	45.2	21.5	16.7	Stains		Stains1
	17.5	47.2	17.8	17.4	Stains		Stains2

Artificial Intelligence calculates the probability of issues in per cent %

Industrial image processing with Artificial Intelligence

The handling





Industrial image processing with Artificial Intelligence

A further example – Latch housin - Check thread passage for cracks

Datum : 03.11.2021
Seite : 13/28

Prüfanweisung

15	Gewindetülle M6-6H (MP1-MP3)	A	ohne

Prüfmitteltyp: Sichtprüfung - Sichtprüfung
Merkmalsklasse: Merkmal ohne besondere Bedeutung
Fehlerklasse: Haupt

Prüffrequenz: 1 / 1 Stunden

Check thread passage for cracks

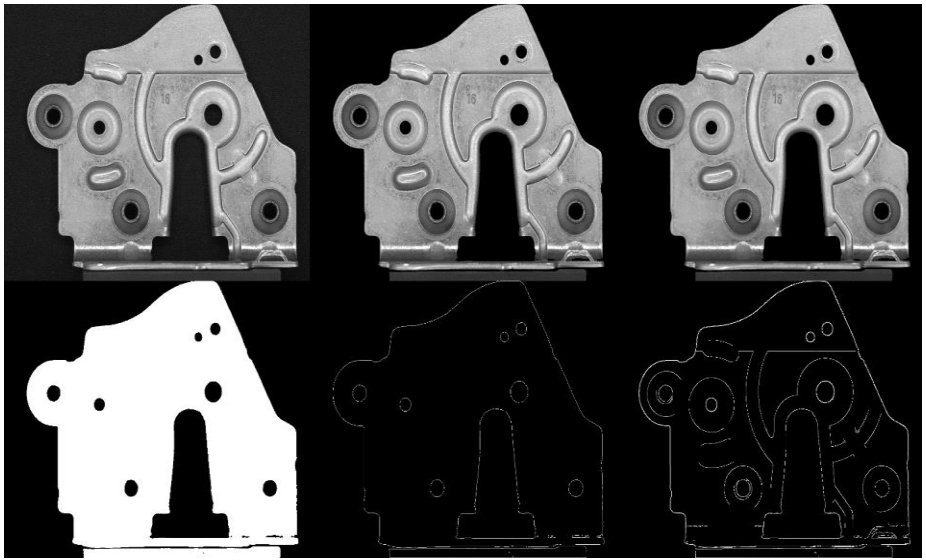
- before Visual inspection
- currently Artificial Intelligence

Latch housing – side door latch

Industrial image processing with Artificial Intelligence

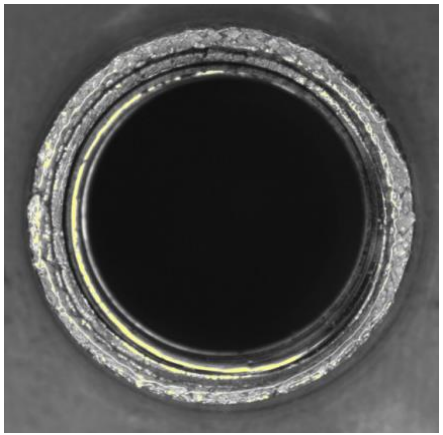
A further example – Latch housin - Check thread passage for cracks

Dimension / shape / position tolerance X Y

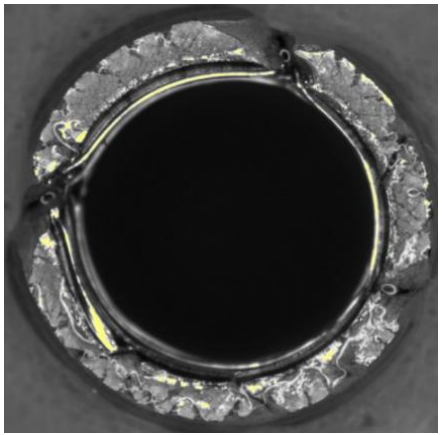


Classification

OK

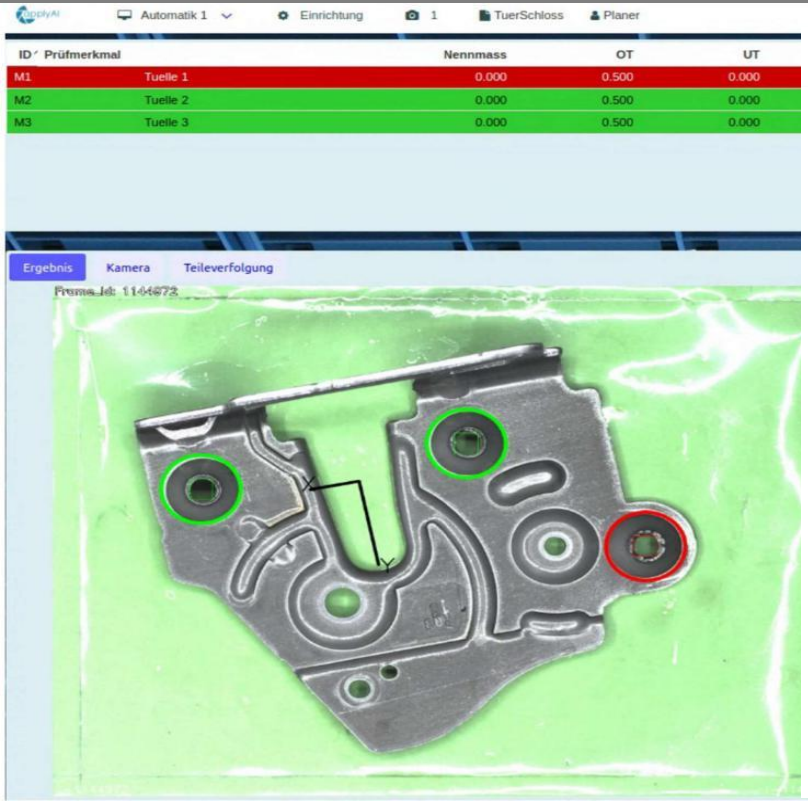


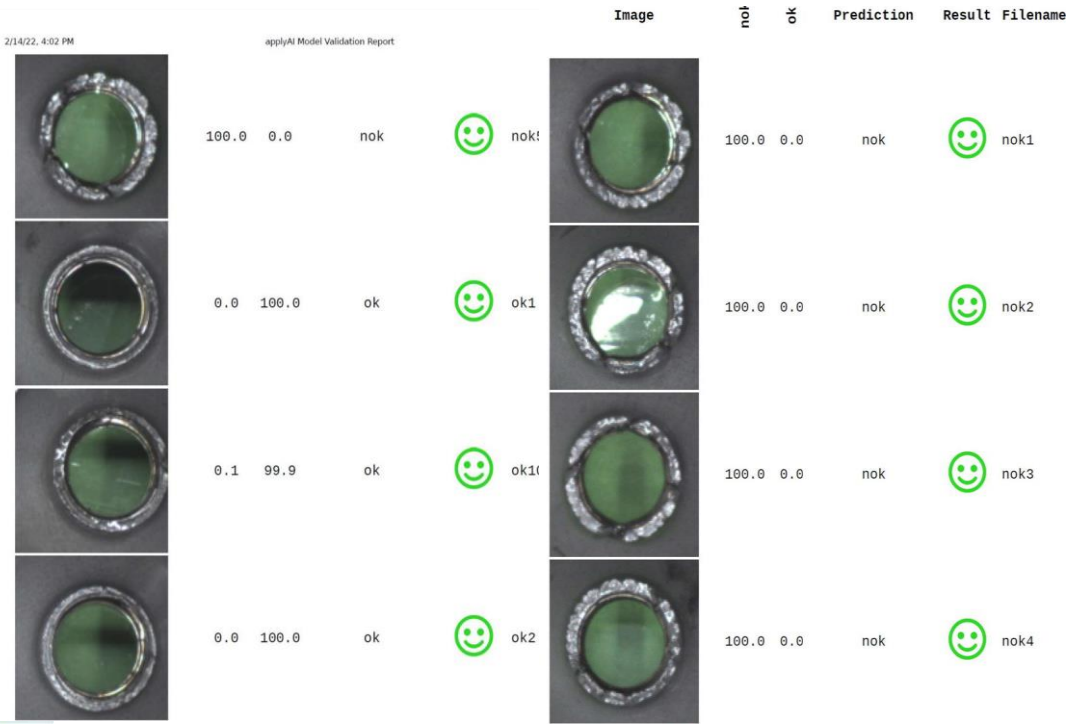
NOK



Industrial image processing with Artificial Intelligence

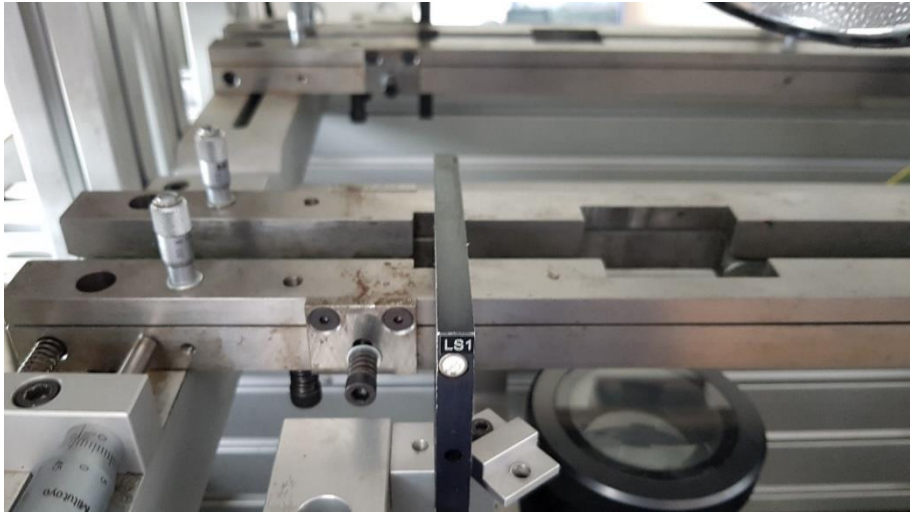
A further example – Latch housin - Check thread passage for cracks





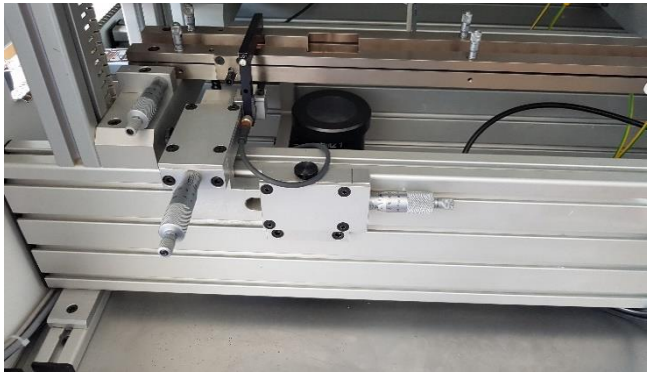
Industrial image processing with Artificial Intelligence

Cost-effective monitoring "From old to new" retrofit



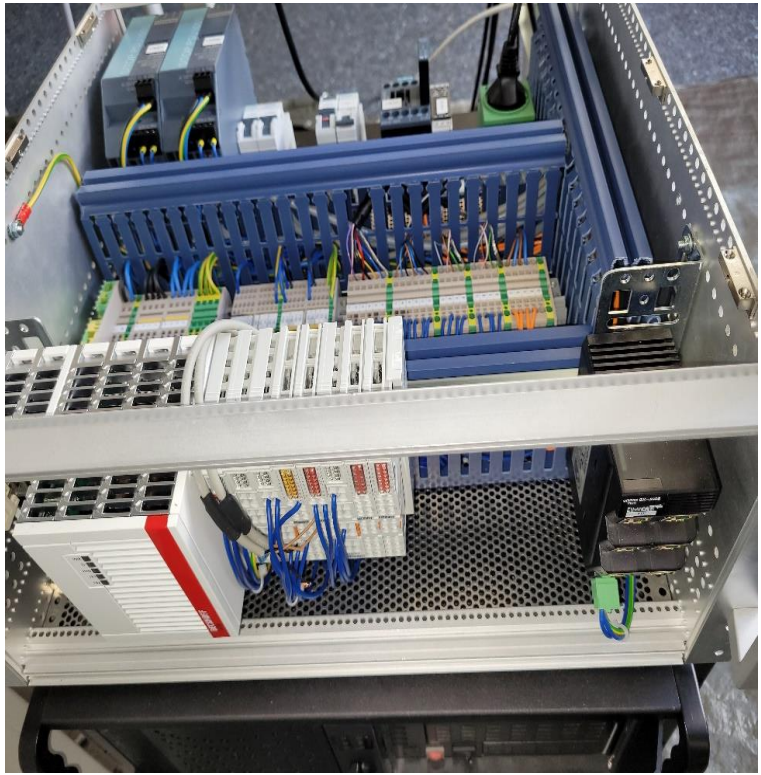
Industrielle Bildverarbeitung mit künstlicher Intelligenz

Kostengünstige Überwachung „Aus Alt mach Neu“ Retrofit



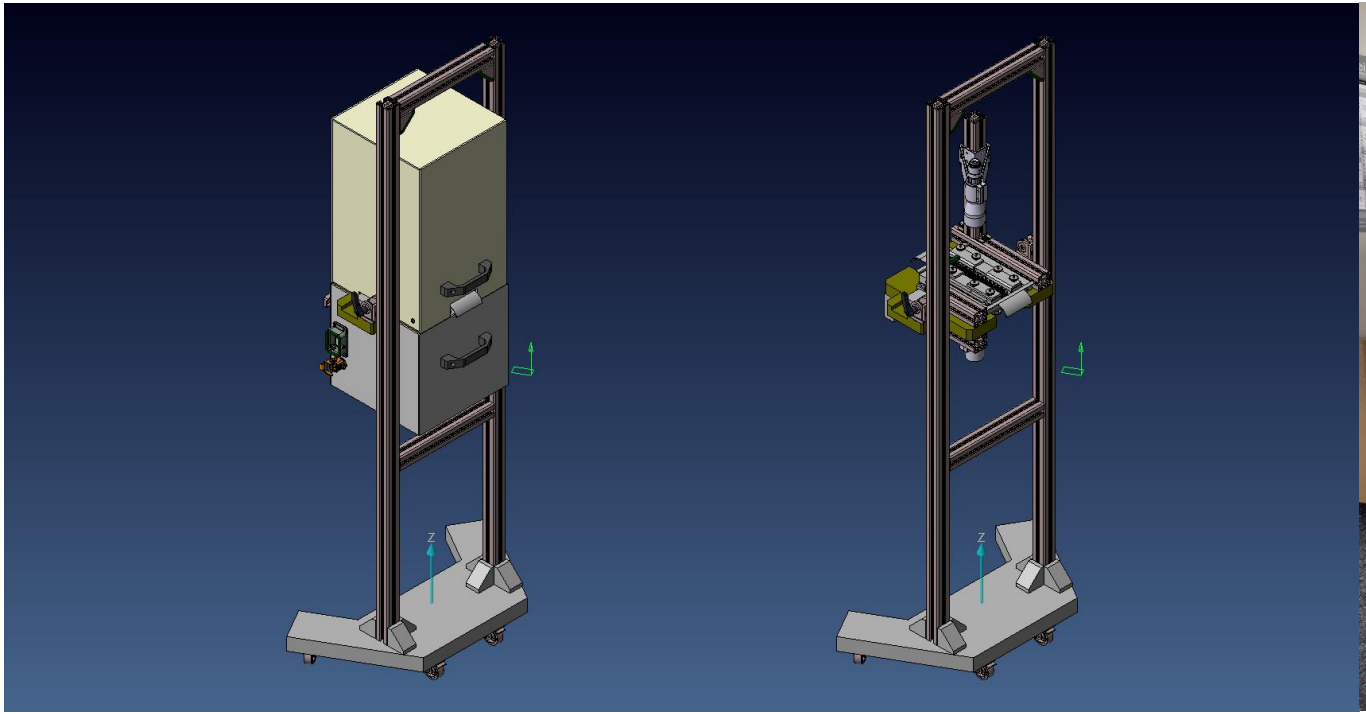
Industrial image processing with Artificial Intelligence

Cost-effective monitoring "From old to new" retrofit



Industrial image processing with Artificial Intelligence

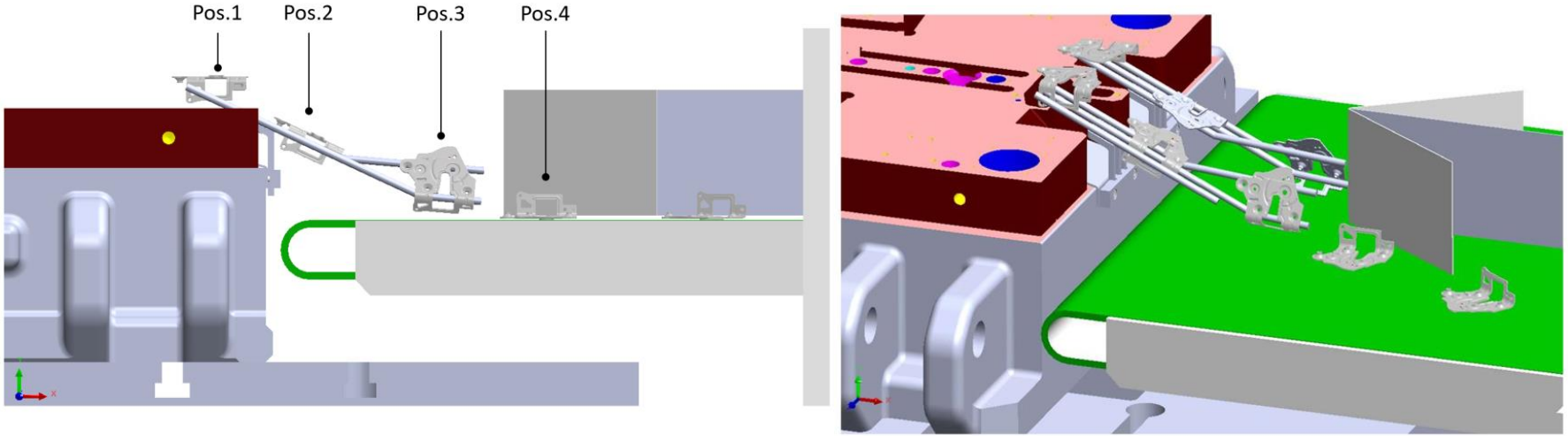
Also available as a modular system



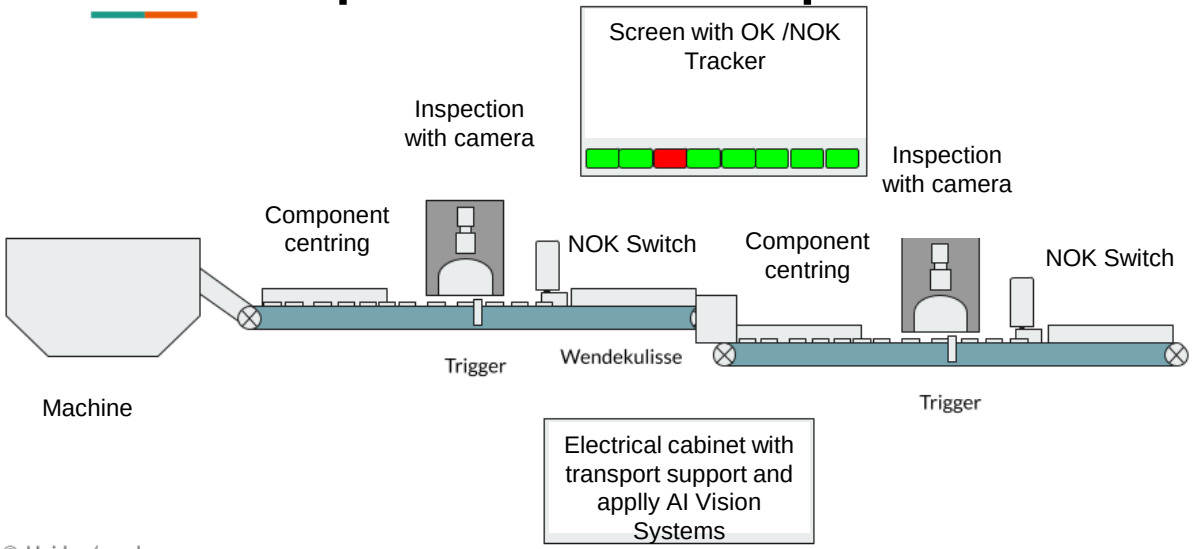
Industrial image processing with Artificial Intelligence

Cameras on conveyor belts

One camera system for several machines

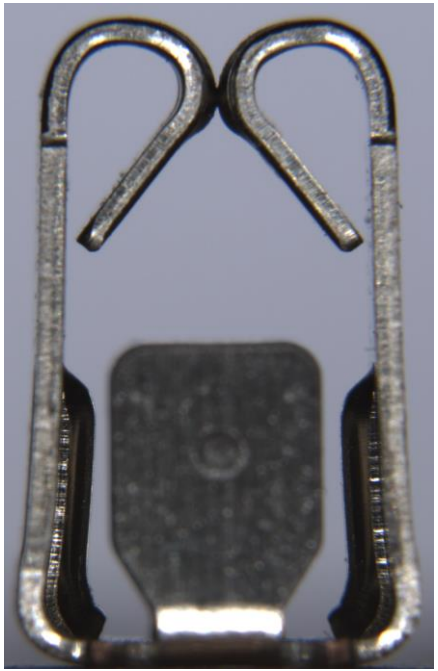


The concept - a further example



Industrial image processing with Artificial Intelligence

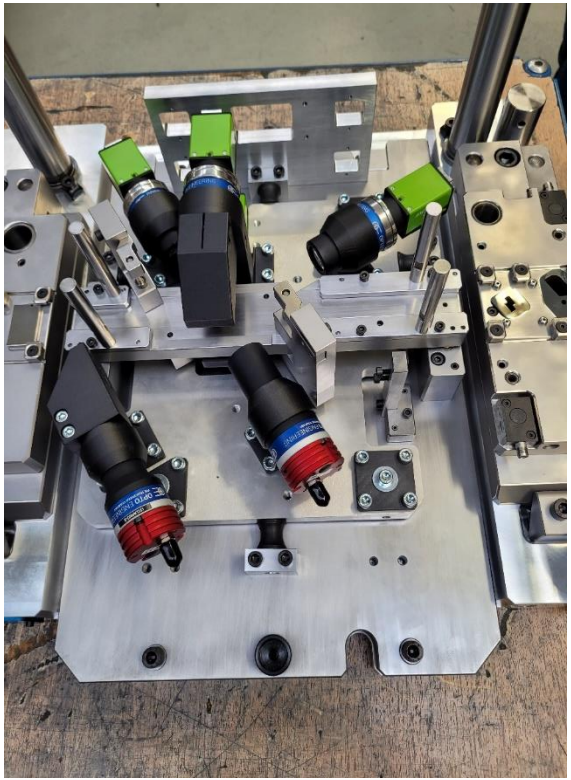
Cameras in the tool

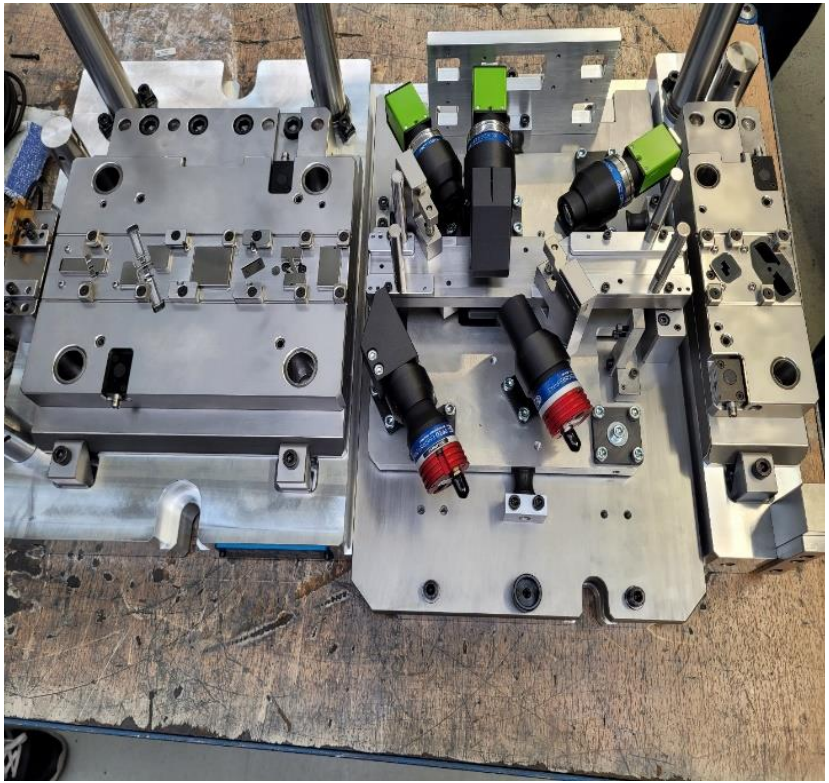


- Task:
- Measurement of a contact.
- 12 dimensions must be monitored during production.
- The parts are punched out at the end of the tool.
- Stroke rate: 400 rpm

Industrial image processing with Artificial Intelligence

Lighting and cameras in the tool





Industrial image processing with Artificial Intelligence

Tool space monitoring

Monitoring bar with 4 cameras

Advantages:

- One camera system for all tools

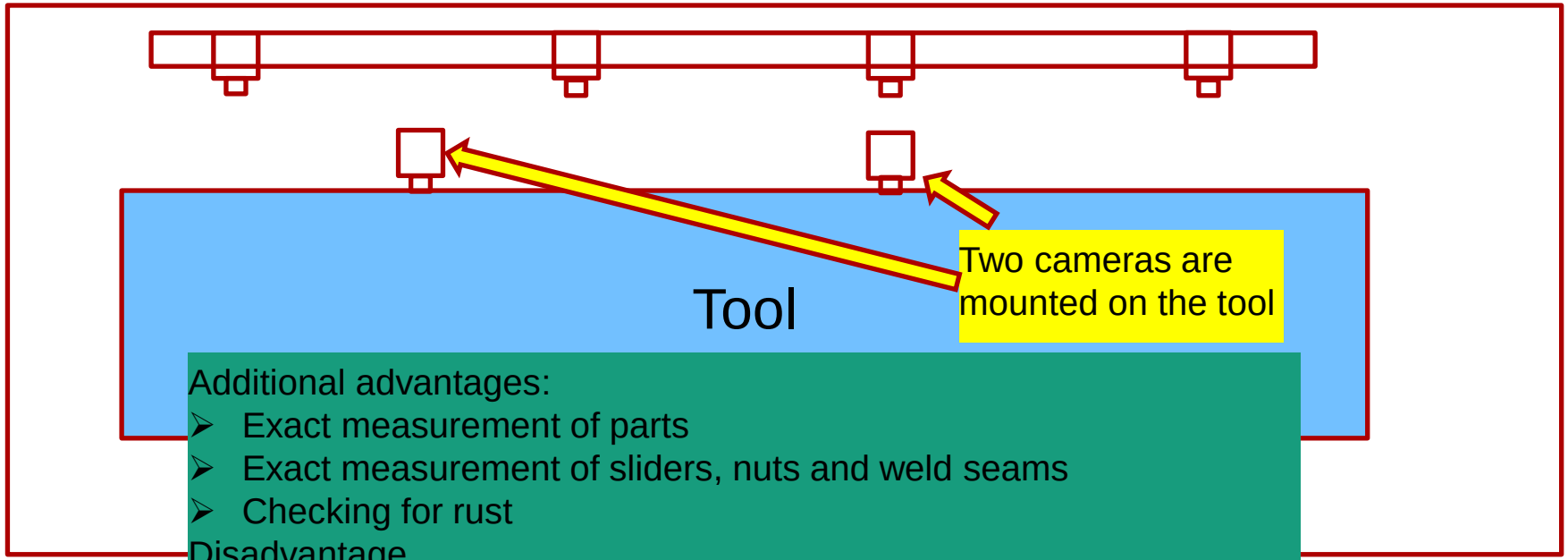
Monitoring of the tool space:

- Foreign object (after installation)
- Torn parts e.g. stamps, springs, standard parts, ...
- Monitoring the strip
- Creation of a (film) in stamping

Industrial image processing with Artificial Intelligence

Tool space monitoring

Monitoring bar with 4 cameras



Additional advantages:

- Exact measurement of parts
- Exact measurement of sliders, nuts and weld seams
- Checking for rust

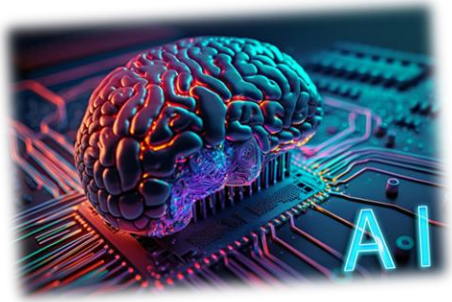
Disadvantage

- The tools require a camera holder

Summary

Why should you buy a camera system from Trsystems unidor?

- We are the specialist for AI!
- All systems can be retrofitted with AI!
- We are able to offer customised systems!
- We have a low-cost system with high-end evaluation!
- We come from the pressing & stamping sector



Industrial image processing with Artificial Intelligence

We look forward to your questions

Interest in the lecture?