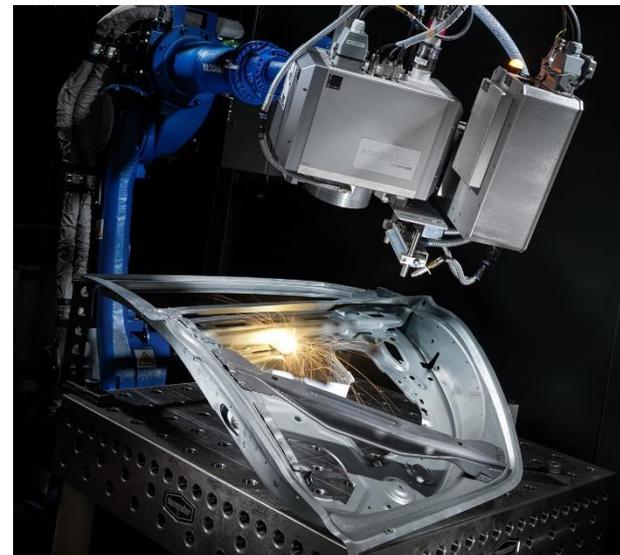
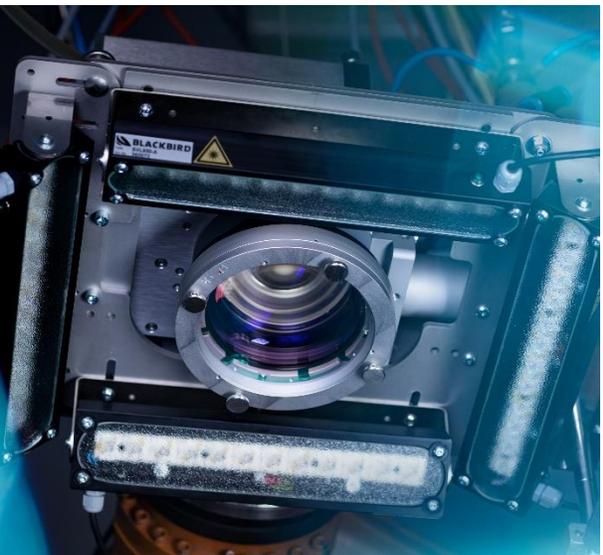




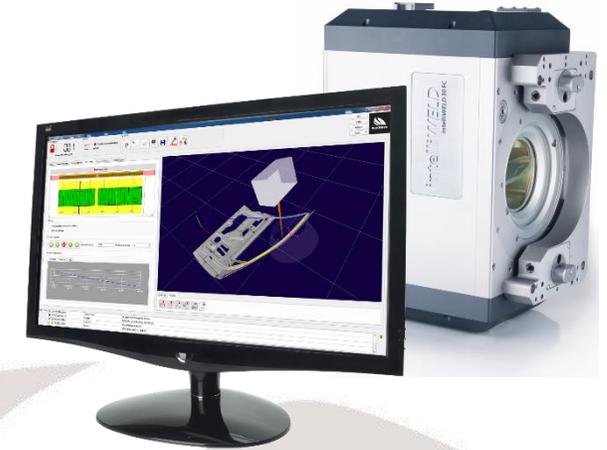
# Laser welding with Blackbird

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Blackbird laser welding tools



- **Leading supplier** for pre-integrated remote laser welding scanner systems
- **Proven experience** in the development of user-friendly and powerful software tools for industrial use.
- **Perfectly fitted** system solutions to the needs of our customers



## TecInvest Holding AG



- ✓ **Foundation:** 2008 in Munich
- ✓ **Systems installed:** 800 and counting
- ✓ **Employees:** 40



- ✓ **Foundation:** 1990
- ✓ **Annual systems:** 35.000
- ✓ **Employees:** 350



- ✓ **Foundation:** 1989
- ✓ **Annual systems:** 10.000
- ✓ **Employees:** 30

...



## **Blackbird Robotersysteme GmbH**

Garching, Munich (Headquarters)

*Laboratory, Research & Development, Sales & Service*

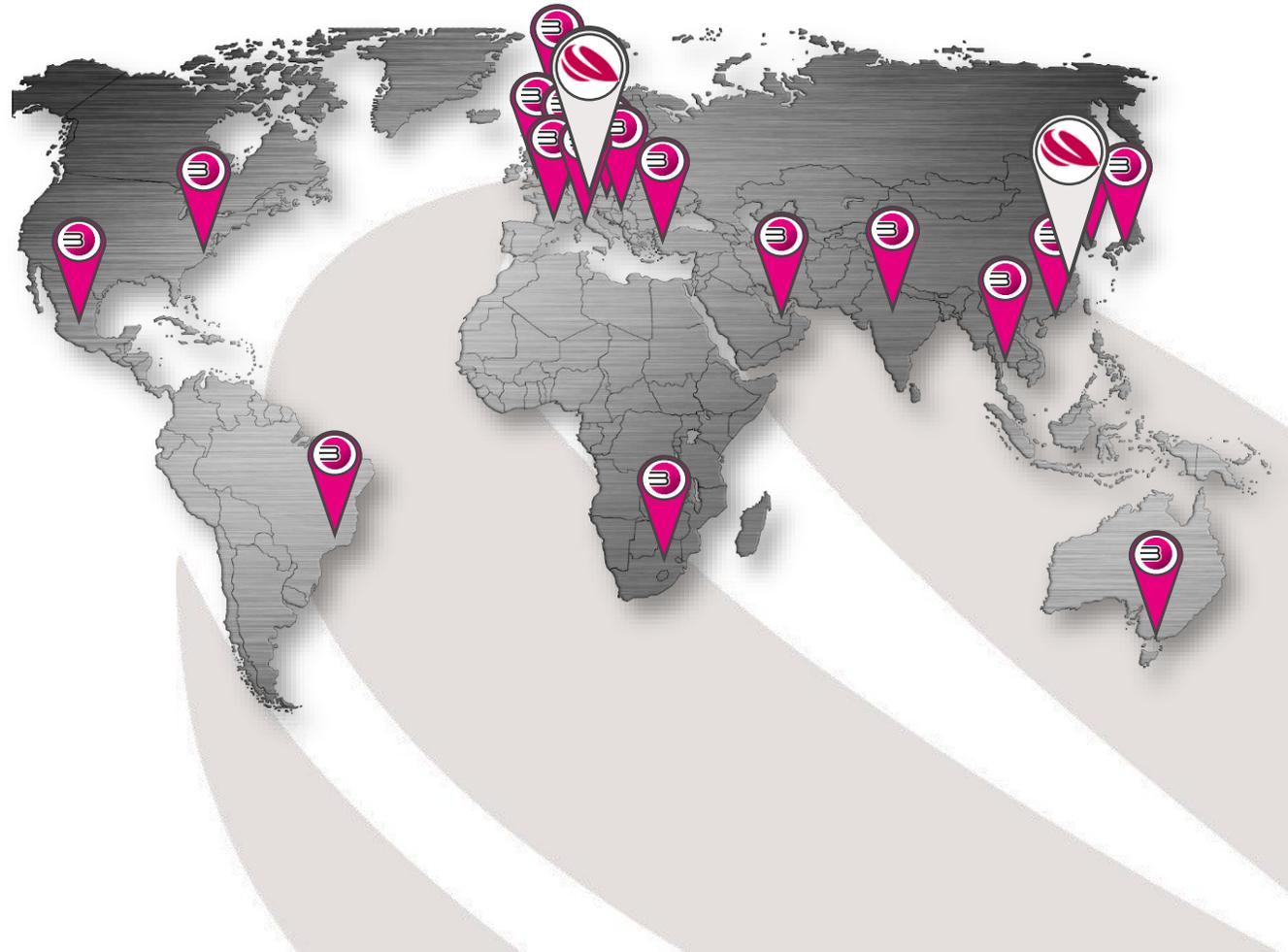


## **Blackbird Robotics Co., Ltd.**

Shanghai (Subsidiary)

*Laboratory, Spare Parts, Sales & Service*

Our sales & service partner :



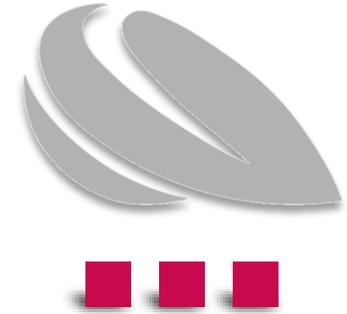
**Hang-on  
Parts**



**Electric  
Vehicles**



**Many  
more**



**Seating  
Parts**



**Housing  
Parts**



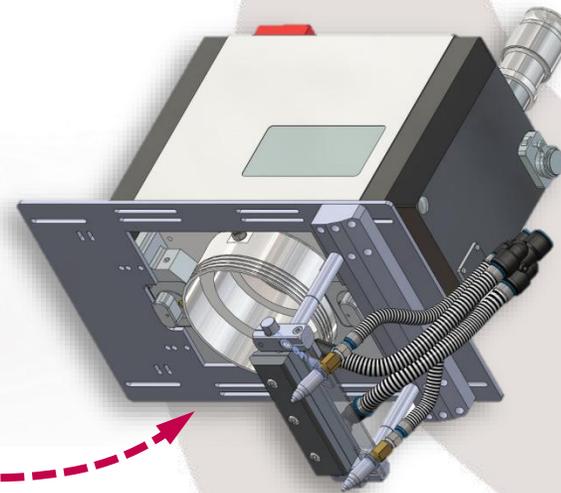
## ScanControlUnit (SCU)

- ✓ Control cabinet
- ✓ Connects all components
- ✓ Individually built



## RobotSyncUnit (RSU)

- ✓ Blackbird user software
- ✓ Intuitive programming
- ✓ All Blackbird packages



## 2D- / 3D-Scanner

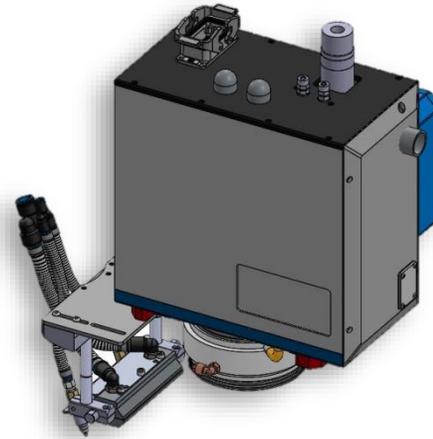
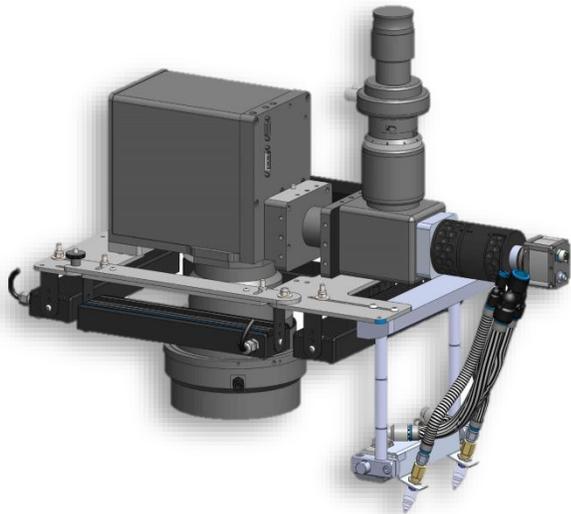
- ✓ High quality products
- ✓ Reliable and efficient
- ✓ Future-proof



## **intelliSCAN FT**

2D-Scanner for all upcoming challenges of E-Mobility and ready for the mass-production

**The new industrial standard**



**The intelligent working horse**

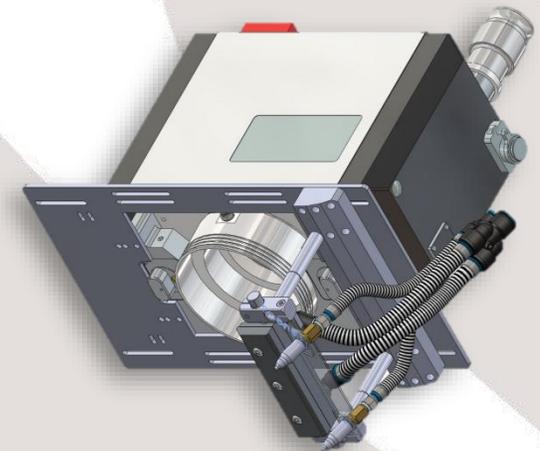
## **intelliWELD II FT**

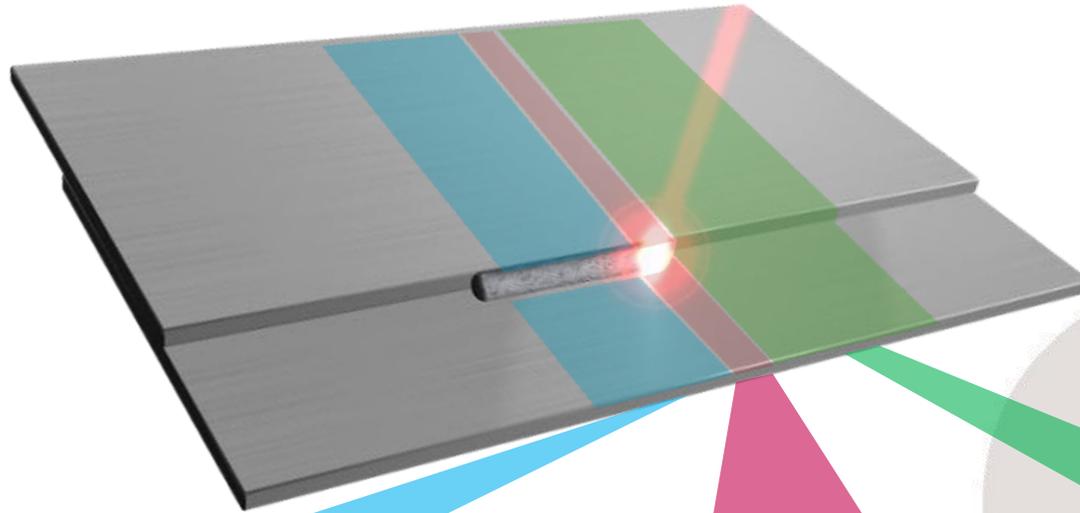
Robust and intelligent 3D-Scanner for high-power multimode laser applications

## **intelliWELD II PR**

3D-Scanner perfected for laser welding with seam tracking, single-mode laser applications and larger workpieces

**The high-tech scanner**





## Post processing zone

- seam position and width
- undercut
- underfill
- surface pore
- ...

## In processing zone

- penetration depth of the keyhole
- collapse of the keyhole

## Pre processing zone

- position of the edge or any other feature
- edge quality
- gap between sheets

## 3D-scanner with pre-focus optics

- ✓ Optimized for quality assurance devices
- ✓ Optical magnification:

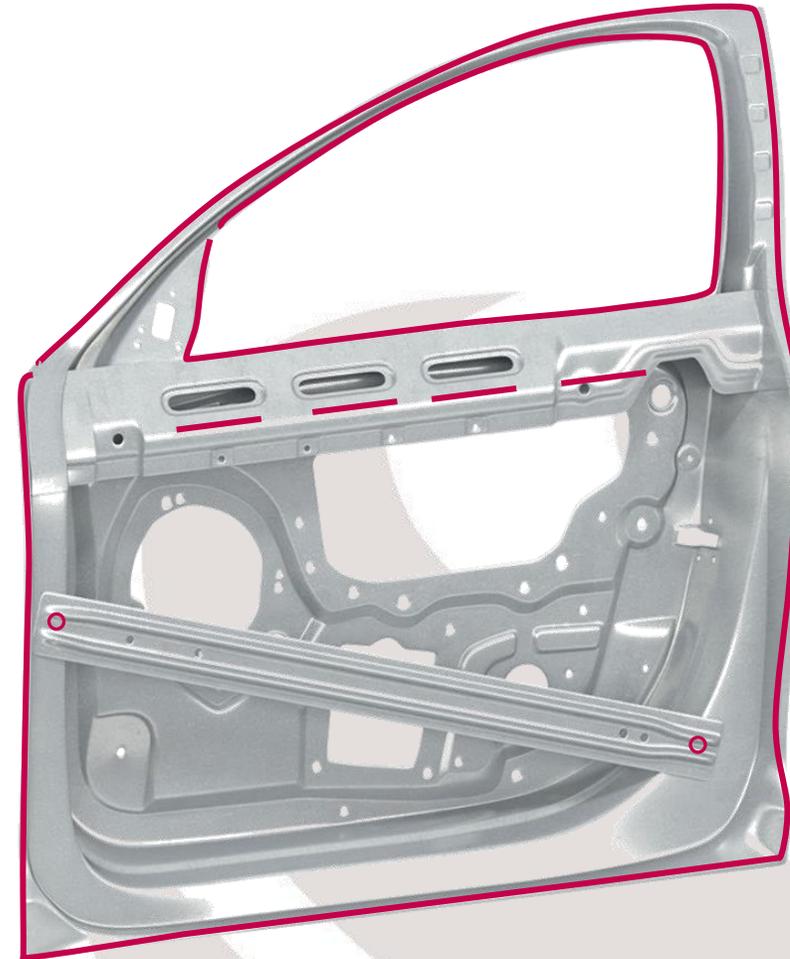
Multi-Mode	4,9 to 6
Single-Mode	2,64 to 4

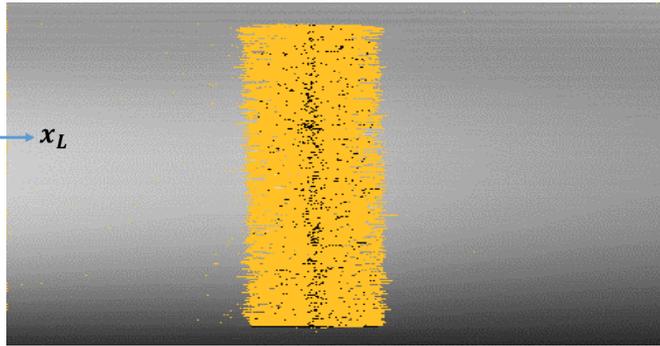
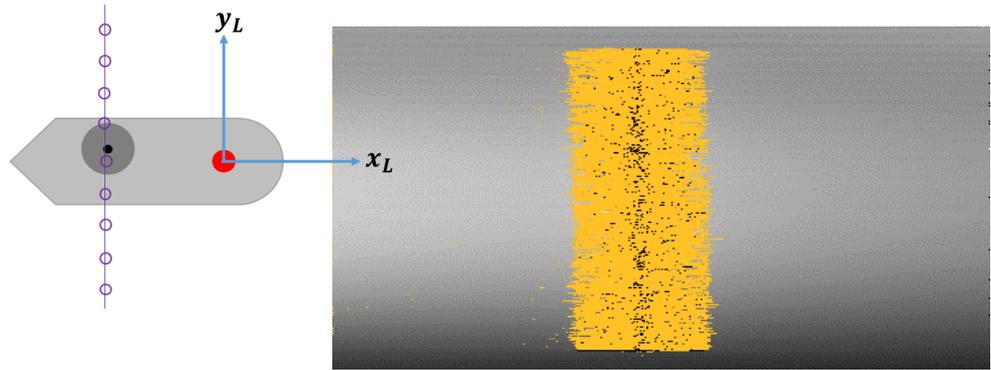
## OCT-scanner

- ✓ Most dynamic OCT scanner available
- ✓ Oscillation compensation up to 1 kHz
- ✓ 100% of scan field can be used

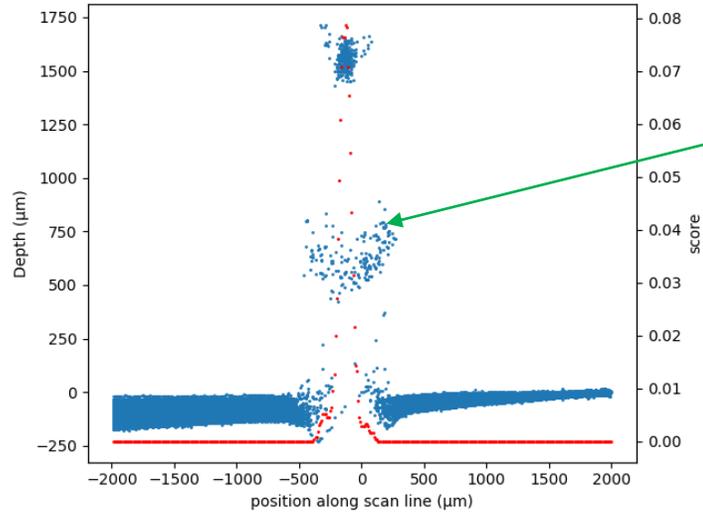


- Main challenges:
  - Fillet and overlap welds
  - Beam oscillation (Aluminum)
  - Complex weld geometry (3D welds, inclined surfaces)
  - Varying gap widths (fillet welds)
  - On-the-fly welding
- OCT applications:
  - Seam tracking
  - Keyhole depth monitoring
  - Seam inspection

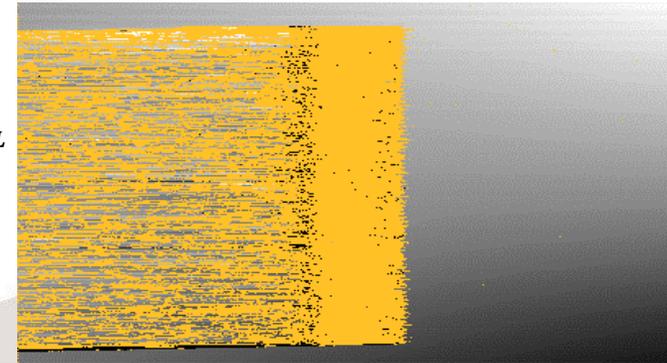
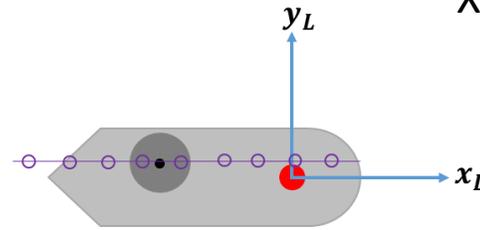




Position=-130.0  
Depth=1551.88764  
Score=0.07873



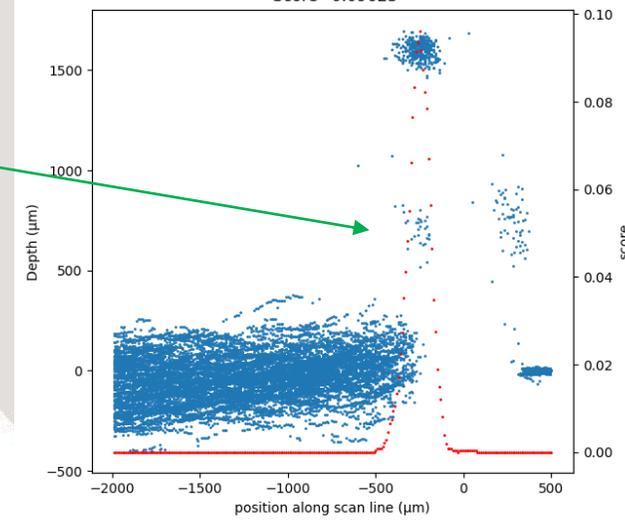
Y-Offset = -130μm



X-Search : scan lines parallel to polyline

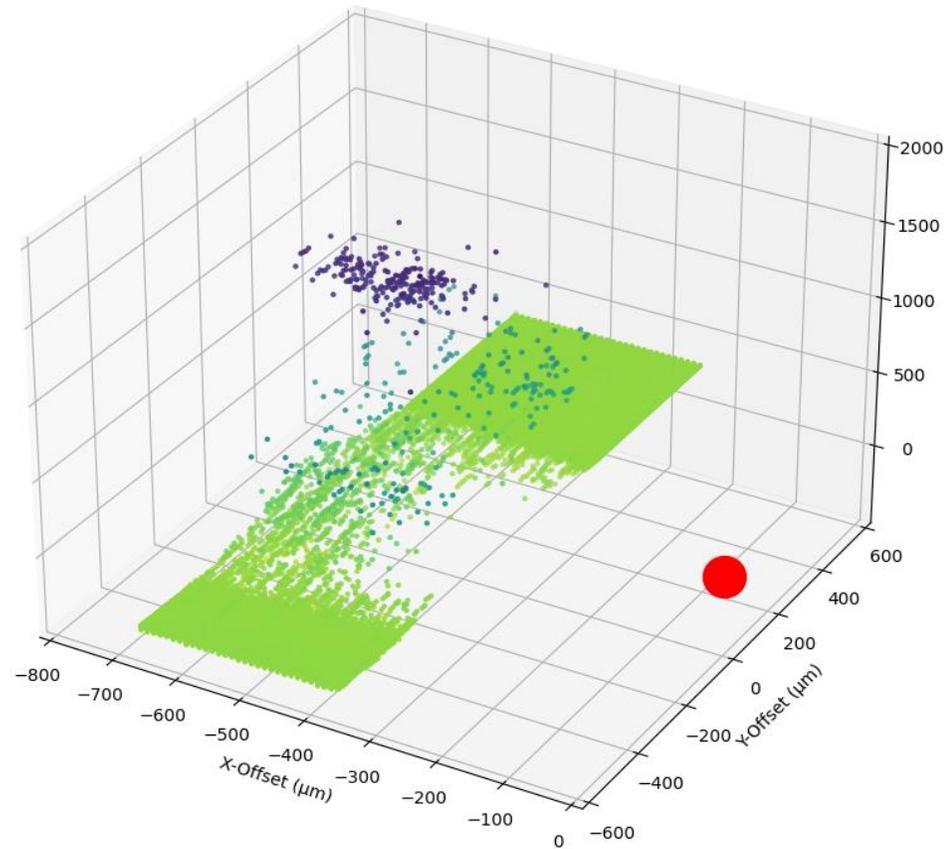
Point distance = 10 μm

Position=-250.0  
Depth=1641.98936  
Score=0.09623



X-Offset = -250μm

Other reflections  
Depth ~ 750 μm



Naht-Eigenschaften von Polylinie\*

Allgemein Geometrie Geschwindigkeit Leistung Pulsen Oszillation Defokussierung Spotgröße Zusatzaufgabe

OCT

Measurement mode  Linie  Point  Line (relative to the welding spot)  Multiple Runner (relative to the welding spot)

Scan-Profil Höhenprofil Focus Profil Aufgabenprofil

Frequency 66000 Hz

Start position [Y] 750 µm

End position [Y] -750 µm

Offset [X] -300 µm

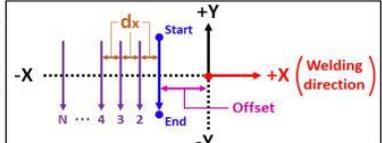
Point distance 10 µm

Line distance [dx] 10 µm

Number of lines [N] 81

Attack angle (max) 0°

Adjust measurement reference dynamically

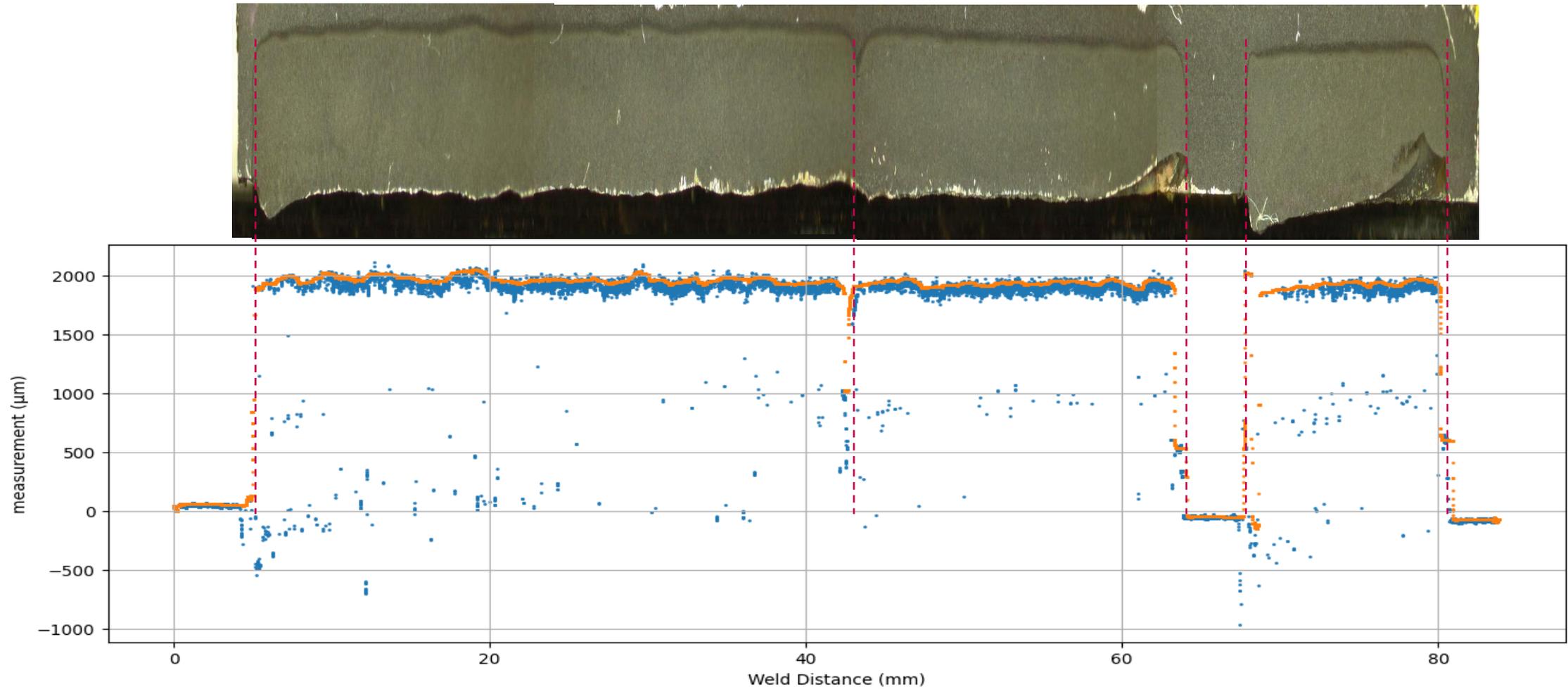


Scan Area [µm] = 300 Last line position [µm] = -600

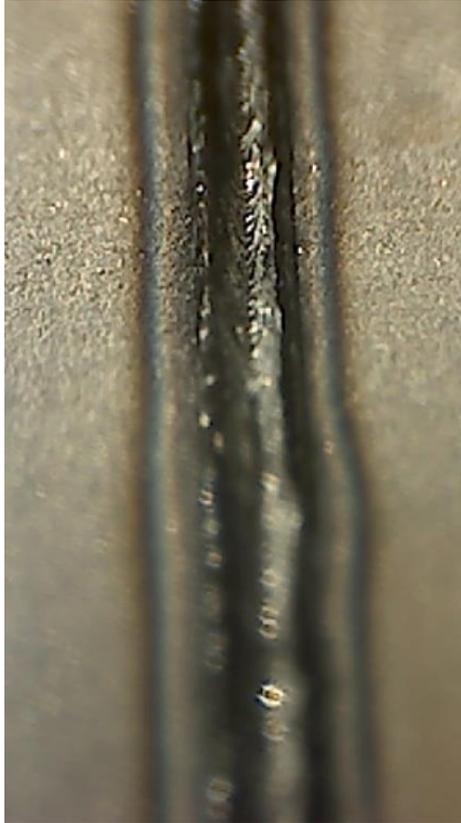
Statistics (for Development)

Number of points per line = 150	Covered distance [µm] = 114.000
Total number of lines = 512	Rotation angle [°] = 4.346
Desired line length [µm] = 1500	Scan speed [m/s] = 0.660
Real line length [µm] = 1504.326	Scan time [µs] = 2280
Real point distance [µm] = 9.997	Cycle time [µs] = 120800

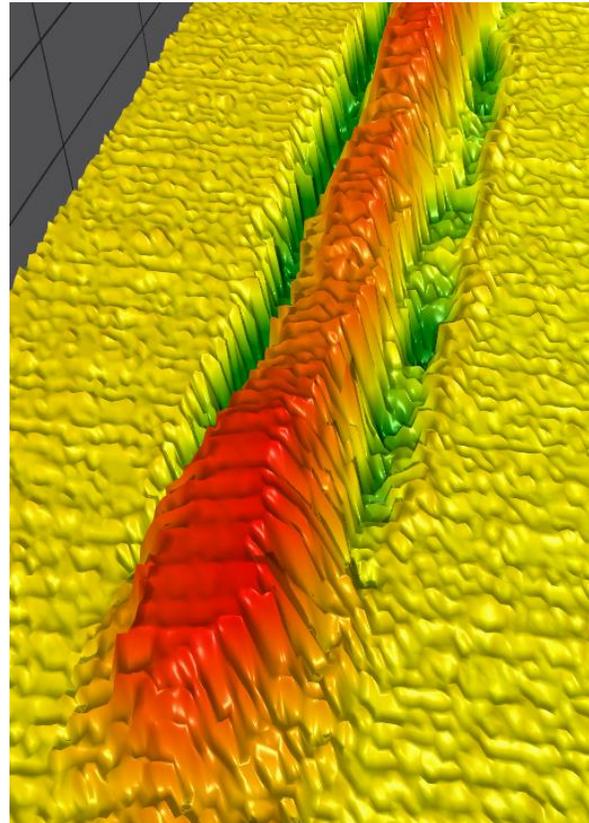
OK Abbrechen Anwenden



**Seam appearance**



**High-res OCT**



**Low-res OCT**



Post-process seam visualization (overlap weld of steel, low-res measurement done online)

## OTF - The most efficient process

- ✓ Simultaneous welding and movement of the part / scanner
- ✓ Increase your laser-on time through welding OTF

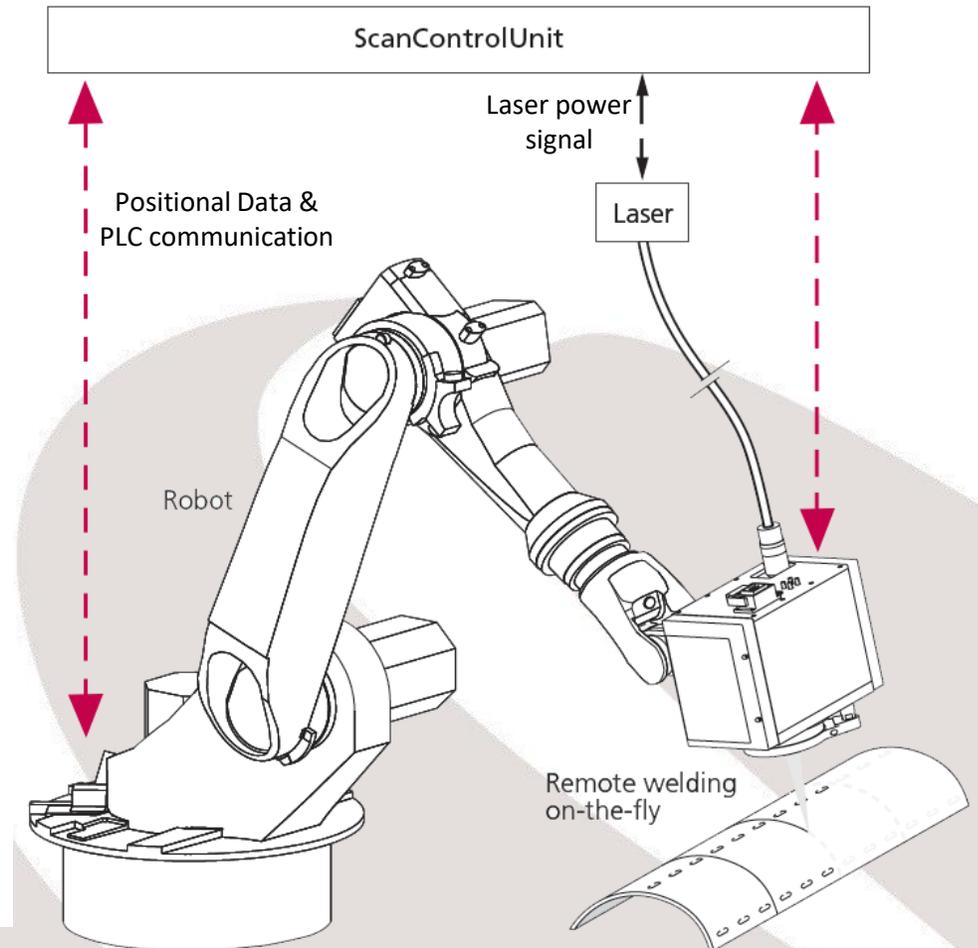
## From early pioneering work to industrial standard

### The most and longest experience

- ✓ First series application of RLW-system with OTF-welding
- ✓ Proven experience with multiple OEMs

### OTF processing with

- ✓ KUKA, Yaskawa, Comau, ABB, Fanuc, Kawasaki
- ✓ 1D- / 2D-linear stages



## Application & Issues

- ✓ Welding of large-scale body sheets
- ✓ Complex part with 3D-geometry and various weld seams
- ✓ Core issue: Managing the complexity while keeping a low cycle time



## The Blackbird Approach

- ✓ OTF-welding with **most intuitive programming** on the market
- ✓ **Compatibility** with third party sensors
- ✓ **Maximal lifetime** due to state of the art air management

## Process Requirements

- ✓ Efficient placement of the weld seams
- ✓ Low maintenance costs
- ✓ Quality assurance



## Our System Configuration

- ✓ **intelliWELD II PR** - 3D-Scanner
- ✓ **SCU-3** - Scan Control Unit
- ✓ **OTF option**
- ✓ **OCT Seam tracking option**



## Applications

- ✓ Static processing of complex weld geometries
- ✓ On-the-fly welding of fillet welds with online gap bridging

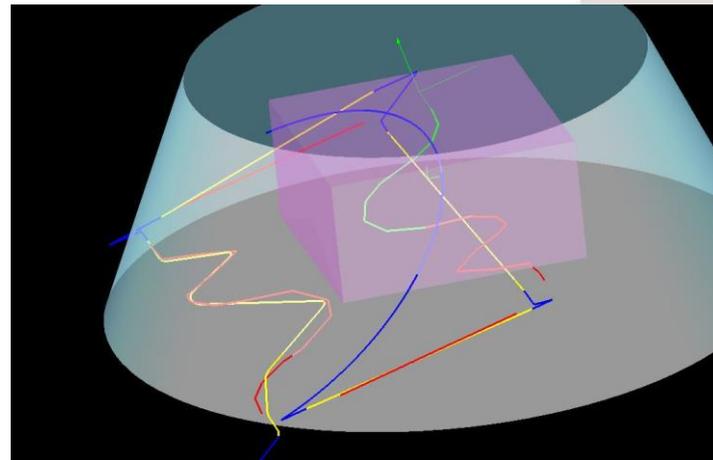


## The Blackbird Approach

- ✓ Highly dynamic OCT beam control and deflection
- ✓ Real-time scanner synchronization

## Features

- ✓ Omni-directional welding
- ✓ Various joint geometries
- ✓ Oscillations up to 1 kHz
- ✓ Continuous gap control
- ✓ 3D seam visualization



## Your Advantages

- ✓ All iW PR-Scanner features usable during fillet welds
- ✓ Optimized duty-cycles
- ✓ Online gap bridging

# Your sales contact

Blackbird Germany Sales  
[sales@blackbird-robotics.de](mailto:sales@blackbird-robotics.de)  
Tel.: +49 89 307 484 710

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Further information at  
[www.blackbird-robotics.de](http://www.blackbird-robotics.de)

