



**MATERIALS THAT MATTER**

# **Laser Welding Solutions for Battery and EV Manufacturing**

**OPTICS & PHOTONICS International Exhibition**  
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# II-VI at a Glance as of June 30, 2021



**22,000+**

Employees

Engineering & Technology

**3,800+**

Employees

Core Competency

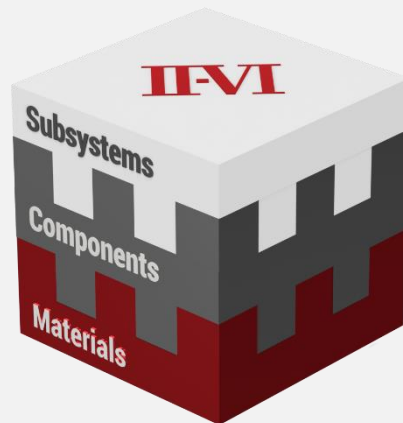
**Engineered Materials**



**2,200+**

Patents

**Vertically Integrated  
Model**



**1971**

Year Founded



**73**

Locations



**18**

Countries

FY21 Revenue

**\$3.1B**

Cash & Equivalents

**\$1.6B**

FY21 Free Cash Flow <sup>(1)</sup>

**\$428M**

*(1) Free cash flow is defined as cash flow from operations of \$574M less capital expenditures of \$146M for the twelve months ended June 30, 2021.*

# II-VI HIGHYAG

- Part of the Laser & Systems Business Unit
- Laser Processing Heads & Beam Delivery Systems



II-VI HIGHYAG near Berlin



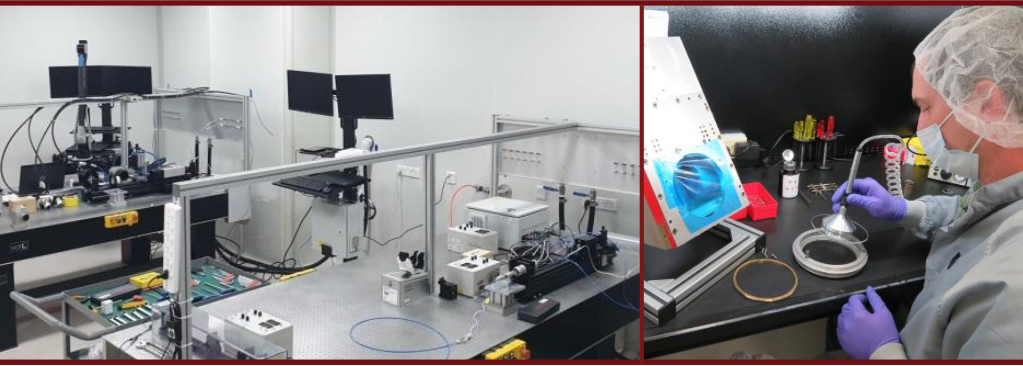
- Leader in tools for laser materials processing with 200+ employees
- R&D and manufacturing near Berlin, Germany
- Worldwide sales offices
- Service locations in Germany, USA and China
- Applications Labs in Germany, USA and China

# World Wide Service Centers and Application Labs

**Berlin Area, Germany (Headquarter)**



**Suzhou, China (Repair and Application Lab)**



**Saxonburg, USA (Repair Lab)**



**Detroit Area, USA (Application Lab)**

# II-VI HIGHYAG Product Portfolio

## Laser Processing Heads

### Brazing



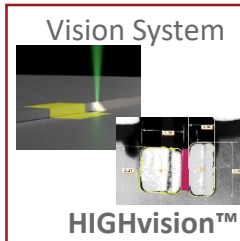
### Welding



### Cutting



### Beam Delivery



# Systems Overview

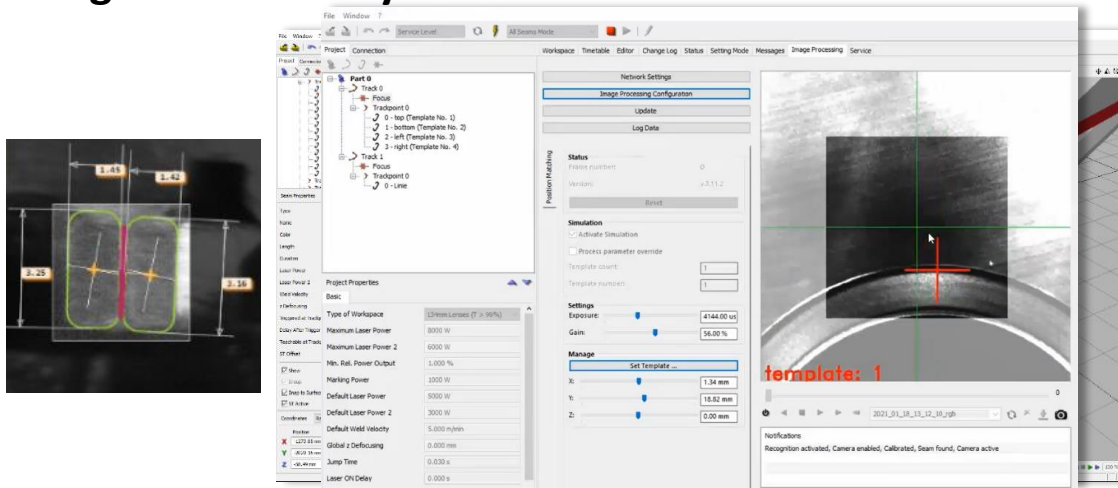
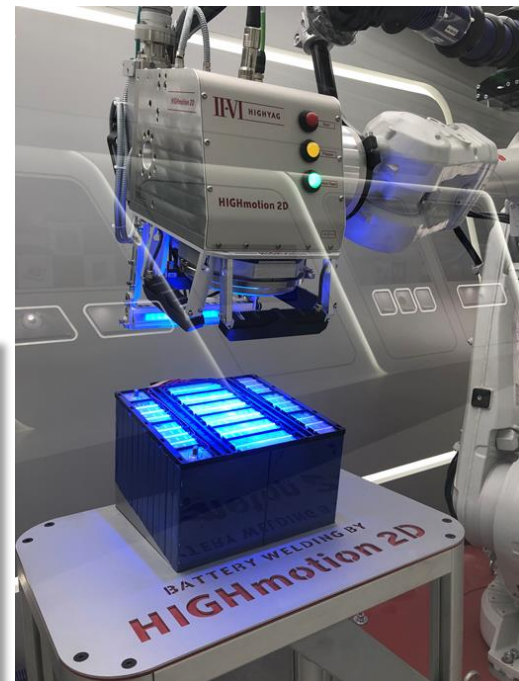




# II-VI Remote Welding Systems

## Powerful Software Platform and Intelligent Vision System

- In situ **position control** thanks to II-VI self developed high performance image recognition system **HIGHvision™**
  - **Control of the laser position on the part on a  $\mu\text{m}$ -scale!**
- **Easy to operate and feature packed software solution with fully integrated vision system controls**



# II-VI Tactile Guided Joining & Brazing Systems

**HIGHtactile™:**

**Best fit for battery tray welding!**

- For welding edge welds in aluminum and steel with/ without wire assistance
- Integrated tactile seam tracking



**Main benefits and features**

- Rated for 8kW Laser Power at 100% duty cycle
- Zero Force Calibration in Full Operating Range
- Process & Collimation Protective Window
- Software Suite with Digital Cross Hair Generator

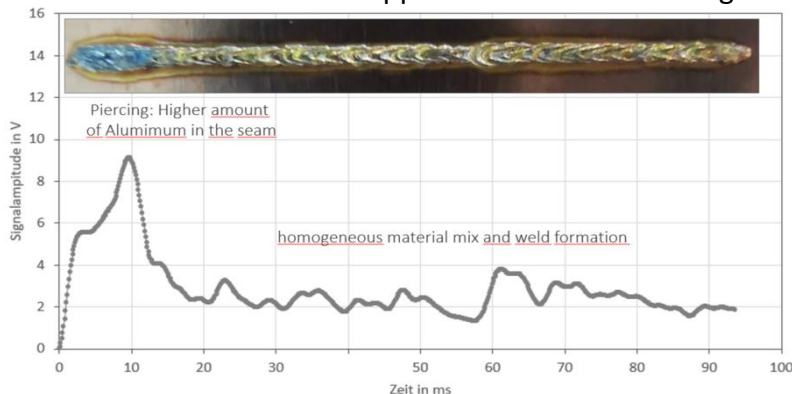




# Process Observation and QA Tools

- Several Logging Features already integrated in II-VI Software Solution
- In addition: Compatible with all common Quality Assurance Tools
  - Ensure maximum safety and monitor part quality
  - Seam failure detection
  - Weld penetration depth measurement

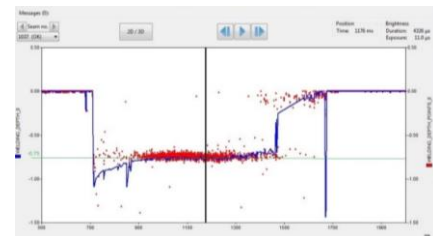
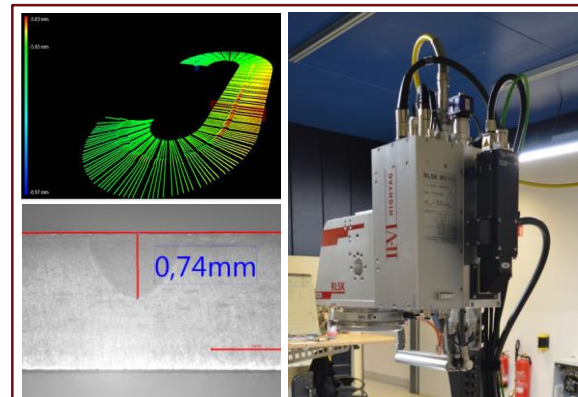
Copper to Aluminum Welding



Tests conducted with 4D



Upper Sheet: Cu 0.3 mm  
Lower Sheet: Al 1.0 mm  
Power: 5800 W  
Speed: 18 m/ min



Tests conducted with lessmüller Lasertechnik

## Application Examples

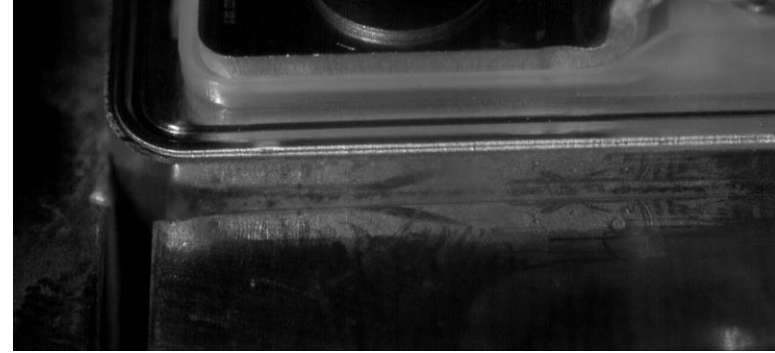
# Application Examples – Can to Cap Welding


## Setup

- Optics: II-VI RLSK (M=3x) + external vision system
- Laser: Coherent HighLight™ FL-ARM Laser 100/290

## RLSK Benefits

- Process speed >350 mm/s
- Large scan field =  
Even large sized prismatic cells accessible without repositioning
- Fine power tuning =  
Full penetration depth control even at higher angles of incidence
- Highest optical performance = Stable and reproducible part quality
- Precise positioning = Safer process
- Low spatter behavior thanks to the ARM Laser



Test conducted with  COHERENT.

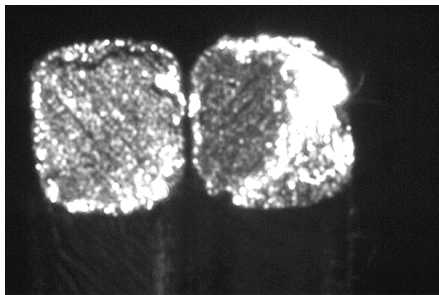
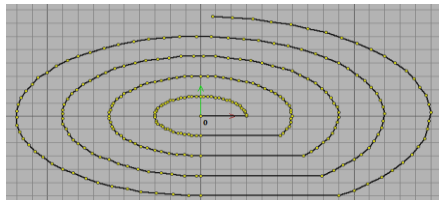
# Application Examples – Copper Welding

## Setup

- Optics: II-VI HIGHmotion™ 2D (M=2.25x) with HIGHvision™
- Laser: Single Mode Laser (left), Coherent HighLight™ FL-ARM Laser 100/290 (right)

### Hair Pin


weld time:  $\ll 150$  ms, detection time:  $< 10$  ms

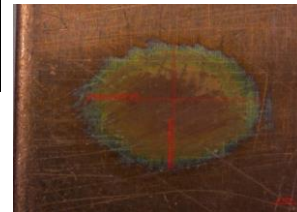
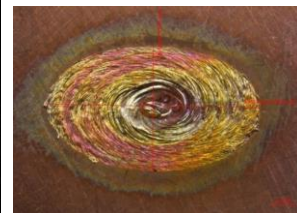
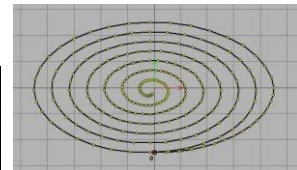


### Sn-Coated Copper (1 to 1 mm)

weld time:  $\approx 400$  ms



Test conducted with  COHERENT.

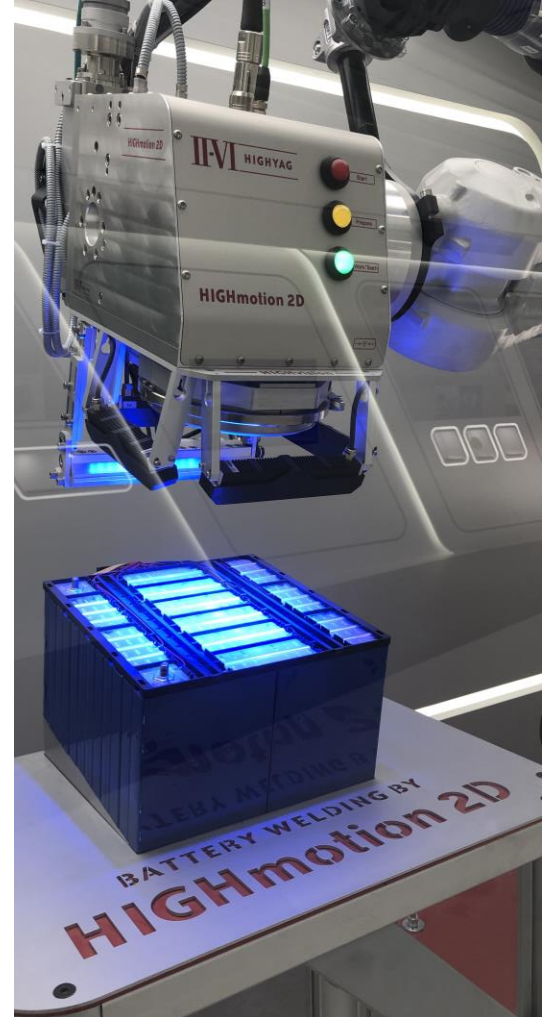


# Conclusion

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## Laser Welding Systems from II-VI

- **II-VI - A reliable partner for our customers**
  - ✓ >20 years track record in high power laser processing
  - ✓ First class application and field support
  - ✓ Open minded to change requests
- **Expertise in all fields of high power laser processing**
  - ✓ Customer tailored laser solutions to fit your production
  - ✓ Integrated process control to push the envelope
  - ✓ Welding Heads and Vision Systems out of one hand





# IMI

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