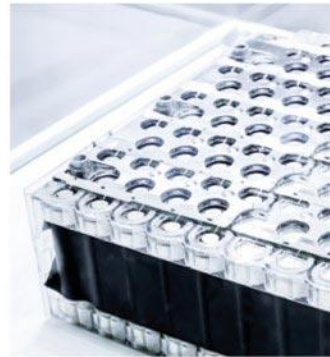


ENGINEERING  
TOMORROW'S  
PRODUCTION



## FUTURE BATTERY TECHNOLOGIES: MANZ APPROACH

10<sup>TH</sup> – 11<sup>TH</sup> MARCH 2022 - BI-REX COMPETENCE CENTER – BOLOGNA

GIORGIO BALUGANI - MANZ



## OUR VISION

As a high-tech equipment manufacturer, our **innovative solutions** for selected growth markets create the foundation for a **future worth living.**

# GLOBAL PRESENCE

## Facts & Figures

### HEADQUARTERS

- » Germany

### R&D AND PROTOTYPING

- » Germany
- » Italy
- » Taiwan

### PRODUCTION

- » Slovakia
- » Hungary
- » China

### SALES & SERVICE

- » Asia
- » Europe
- » USA



1,400



55,000 m<sup>2</sup>



€ 237 million

1987

# FUTURE BATTERY TECHNOLOGIES

Our focus is on **fully automated cell and module assembly** for all cell formats such as round cells, prismatic cells and pouch cells.

- ✓ Reduction of energy consumption in production
- ✓ Digitalization of the factory (Industry 4.0)
- ✓ Continuously automated process optimization through the use of artificial intelligence (AI)
- ✓ Fast product and format change
- ✓ Reduced footprint
- ✓ Reduction of the total cost of ownership (CoO)

With our Lithium Ion Battery Factory of the Future (LBF) project, we are developing highly efficient machines and processes for the **fully automated production** of next-generation lithium ion batteries

# OUR APPROACH



# AUTOMOTIVE & ELECTROMOBILITY

We bundle our experience in automation, assembly, **laser processes** and integrated inspection systems into production solutions for the **automotive industry**. We continuously develop these further - and thus make a significant contribution to the success of our customers.

- ✓ Battery cells and modules (Lithium-ion battery production)
- ✓ Cell contacting systems
- ✓ Battery management systems & inverters
- ✓ Displays
- ✓ Electronic components and control units
- ✓ Sensors and cameras for assistance systems

As a competent **technology and process expert** for the automotive industry, we combine competencies from all areas and are a development partner and **trailblazer for electromobility**

# INDUSTRIES



# BATTERY PRODUCTION

Manz is one of the leading suppliers of production equipment for **lithium-ion battery cells and modules** as well as **capacitors** for electromobility, stationary energy storage and **electronic products**. We have been setting standards worldwide in this field for over 30 years.

- ✓ Production solutions for **cylindrical, prismatic** or **pouch** battery cells
- ✓ Single machines, for example for laboratory production, systems for pilot and small series production as well as **complete assembly lines** and turnkey solutions for battery production
- ✓ For **electronic** products, battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), hybrid electric vehicles (HEVs), and stationary storage systems
- ✓ With our process know-how we support you in the development and optimization of **processes**

Reduction of **energy consumption** in production - **digitalization** of the factory (Industry 4.0) - continuously automated process optimization through the use of **artificial intelligence (AI)**

# INDUSTRIES

## LASER PROCESSING

Development of the latest technologies and methods for laser processing to significantly increase the **efficiency** of production processes

- » Micromachining laser processes for numerous applications such as cutting, drilling, scribing or **welding** of different materials, ablation of layers and thermal laser activation of adhesive elements
- » Extensive expertise in the design of **optical systems** for beam shaping, splitting and guiding

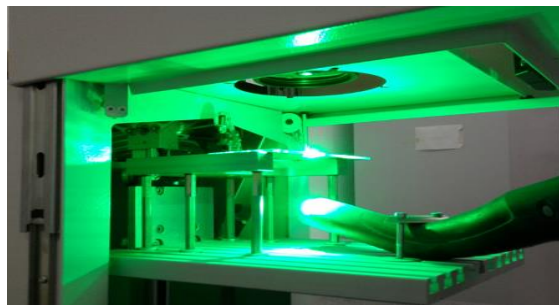
Increase in productivity thanks to **maximum flexibility** and **machine uptime**

# TECHNOLOGIES



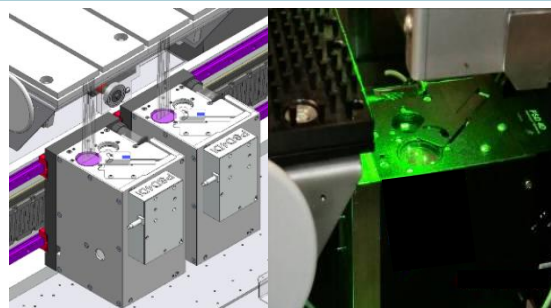
## FIELDS OF ACTIVITY

### Laser processes



- Development of novel laser processes
- Laser process optimization in terms of **quality** and efficiency
- **Customized** process solutions

### Optical devices



- **Simulation** of sophisticated optical systems
- **Design** of optical systems
  - Beam propagation
  - Focussing heads
  - Beam shaping

### Second level support



- Transfer of evaluated laser processes into **machines**
- **Technical support** of customers
- Systematic error analysis
- **Training** of service team

## MANZ product divisions



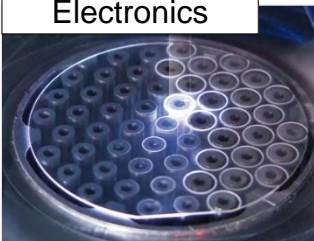
# OVERVIEW – LASER APPLICATIONS

## Ablation

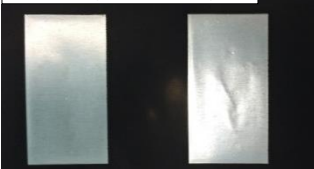
Energy storage



Electronics

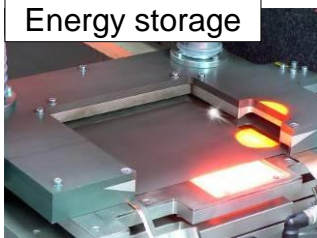


Energy storage

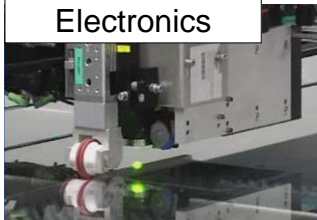


## Cutting

Energy storage



Electronics

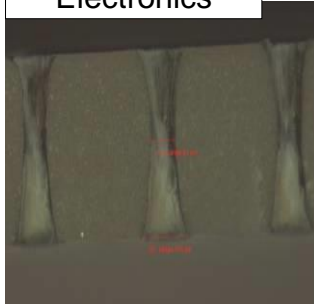


Electronics

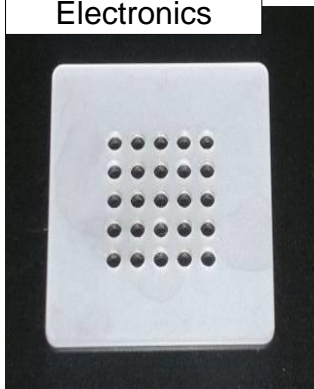


## Drilling

Electronics

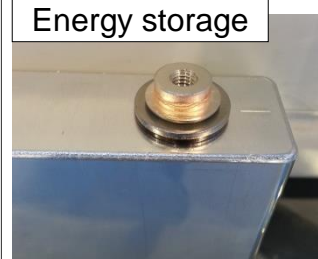


Electronics



## Welding

Energy storage



Energy storage



Energy storage



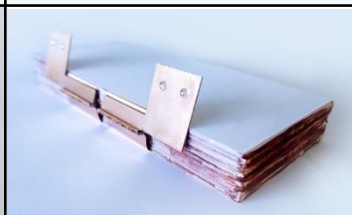
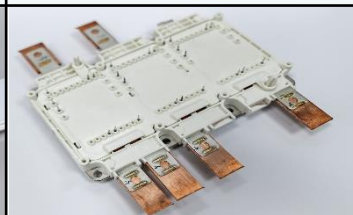
## Novel Processes

Electronics



# FOUR WELDING TECHNOLOGIES FOR A HOLISTIC SOLUTION

	P1-Technology	P2-Technology	P3-Technology	P4-Technology
Feature	Pulsed, High Intensity	Precise, Flexible	High Power	VIS Radiation
Key Facts	10 kW Peak Power Short Pulse Duration	Focus diameter <40µm, Lateral Beam Oscillation	Up to 16kW power, Adjustable Power Distribution	High absorption for copper welding
Field of Application	Welding of Copper Current Collector to Cylindrical Cells	Welding of moderate Material Thicknesses e.g. Pouch cells, Welding of thin Foils, etc.	Welding thick Materials e.g. prismatic cells, Inverters, etc.	Welding of copper, e.g. Cu Foils, Power Electronics, etc.



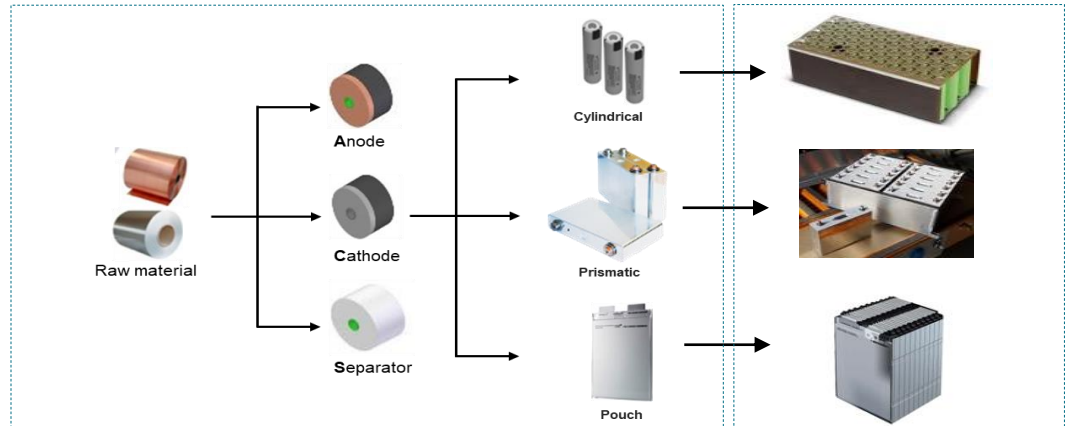
# LI-ION BATTERY PRODUCTION PROCESS

Electrode  
manufacturing

Cell  
Assembly

Cell  
Finishing

Module  
Assembly

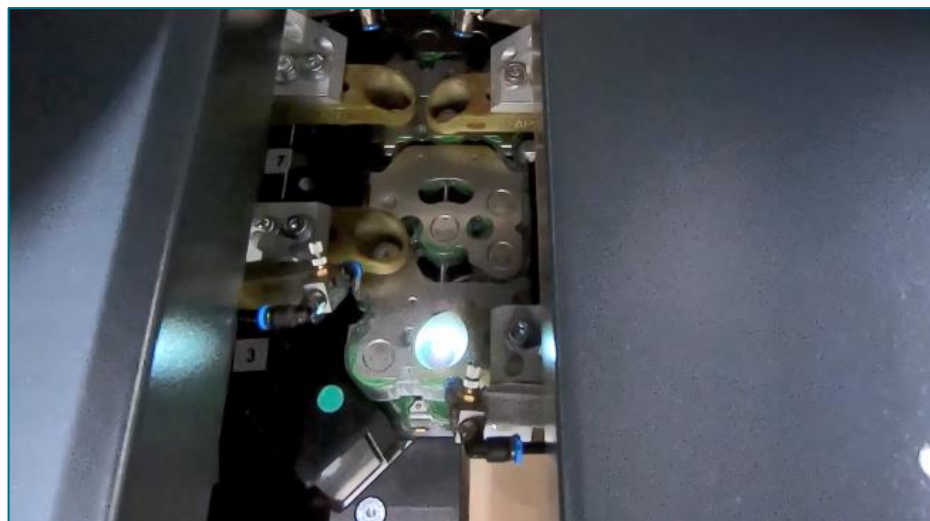
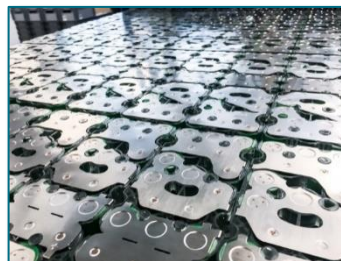


Basically, the production process of Li-Ion Battery can be divided into two main steps:

- Li-Ion Battery **cell** production process
- Li-Ion Battery **module** production process

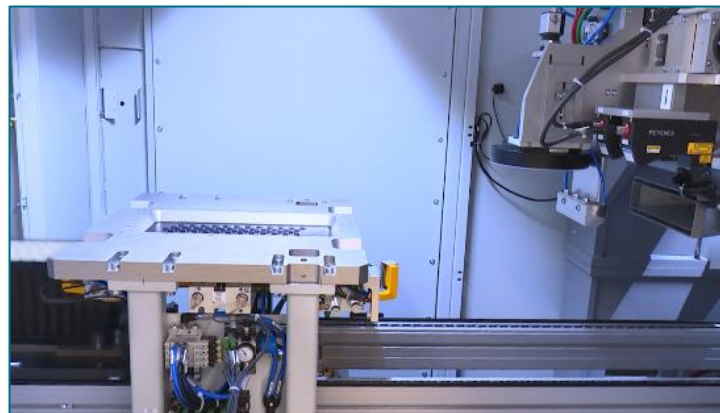
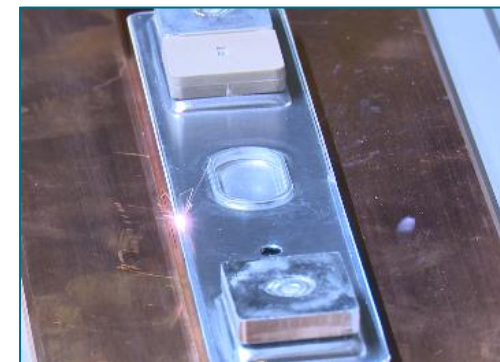
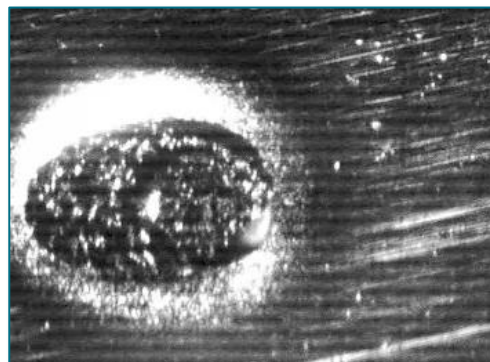
# FOUR WELDING TECHNOLOGIES FOR A HOLISTIC SOLUTION

	P1-Technology
Feature	Pulsed, High Intensity
Key Facts	10 kW Peak Power Short Pulse Duration
Field of Application	Welding of Copper Current Collector to Cylindrical Cells



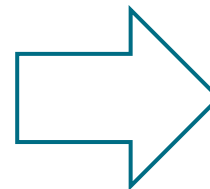
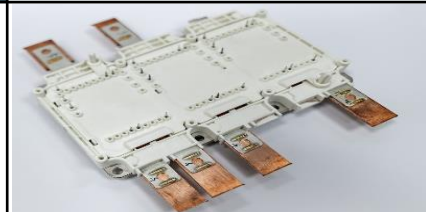
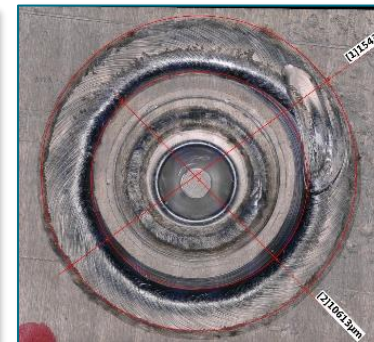
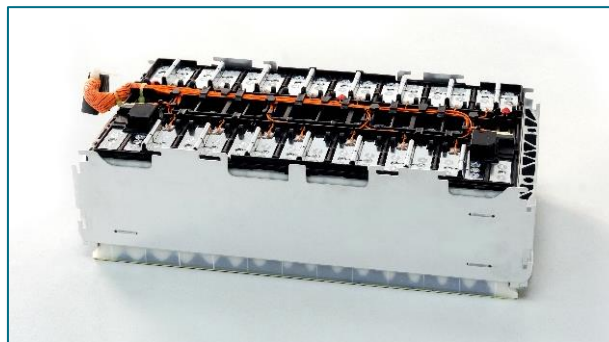
# FOUR WELDING TECHNOLOGIES FOR A HOLISTIC SOLUTION

	<b>P2-Technology</b>
<b>Feature</b>	Precise, Flexible
<b>Key Facts</b>	Focus diameter <math><40\mu\text{m}</math>, Lateral Beam Oscillation
<b>Field of Application</b>	Welding of moderate Material Thicknesses e.g. Pouch cells, Welding of thin Foils, etc.



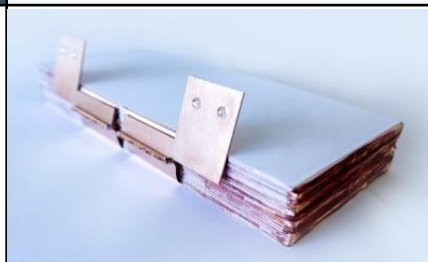
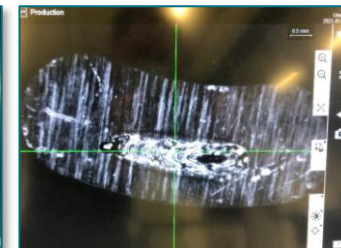
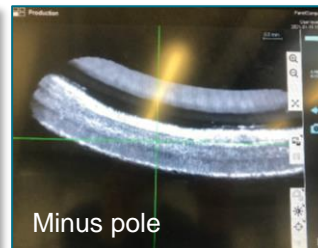
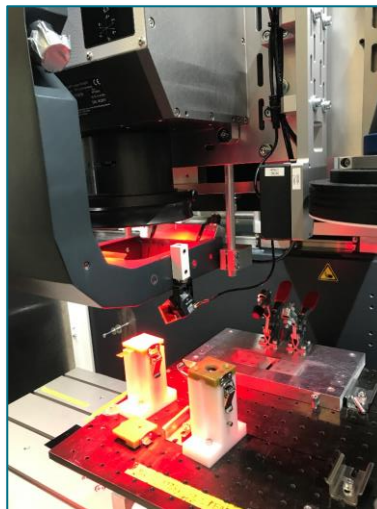
# FOUR WELDING TECHNOLOGIES FOR A HOLISTIC SOLUTION

	<b>P3-Technology</b>
<b>Feature</b>	High Power
<b>Key Facts</b>	Up to 16kW power, Adjustable Power Distribution
<b>Field of Application</b>	Welding thick Materials e.g. prismatic cells, Inverters, etc.

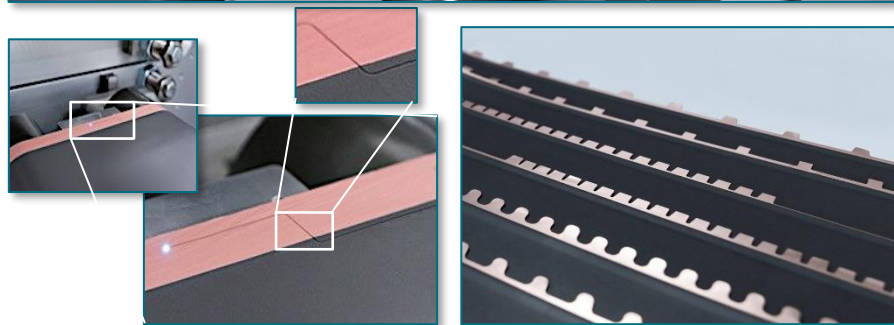
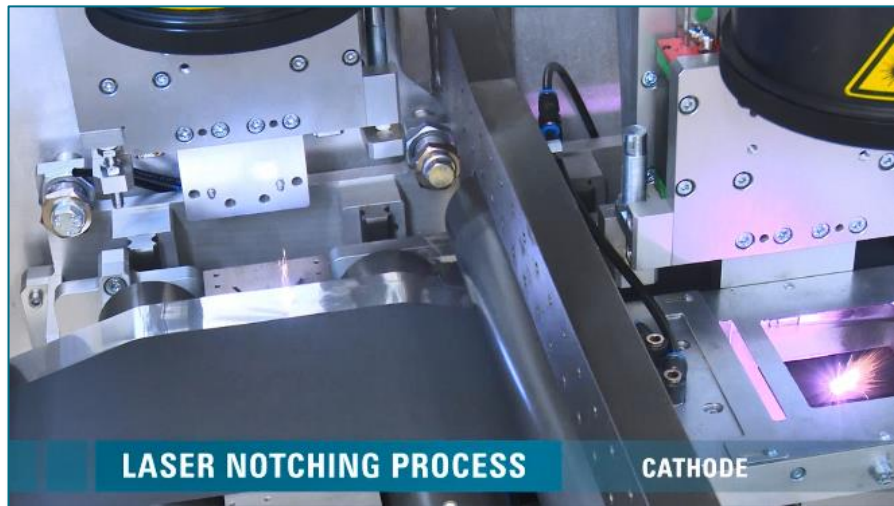


# FOUR WELDING TECHNOLOGIES FOR A HOLISTIC SOLUTION

	<b>P4-Technology</b>
<b>Feature</b>	„Green“ Laser for welding of copper material to cells (e.g., 0,5 mm copper)
<b>Key Facts</b>	High absorption for copper welding
<b>Field of Application</b>	Welding of copper, e.g. Cu Foils, Power Electronics, etc.



## KEY HIGHLIGHTS – ELECTRODE LASER CUTTING (ROLL TO ROLL)



- » Continuous Roll to Roll process
- » Web speed > 1000mm/s
- » Cutting bare foil and coating with the same laser beam
- » Slitting and Notching at the same time
- » High cutting quality during the entire lifetime of the laser source
- » Highest efficiency and flexibility



# CONTACTS



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