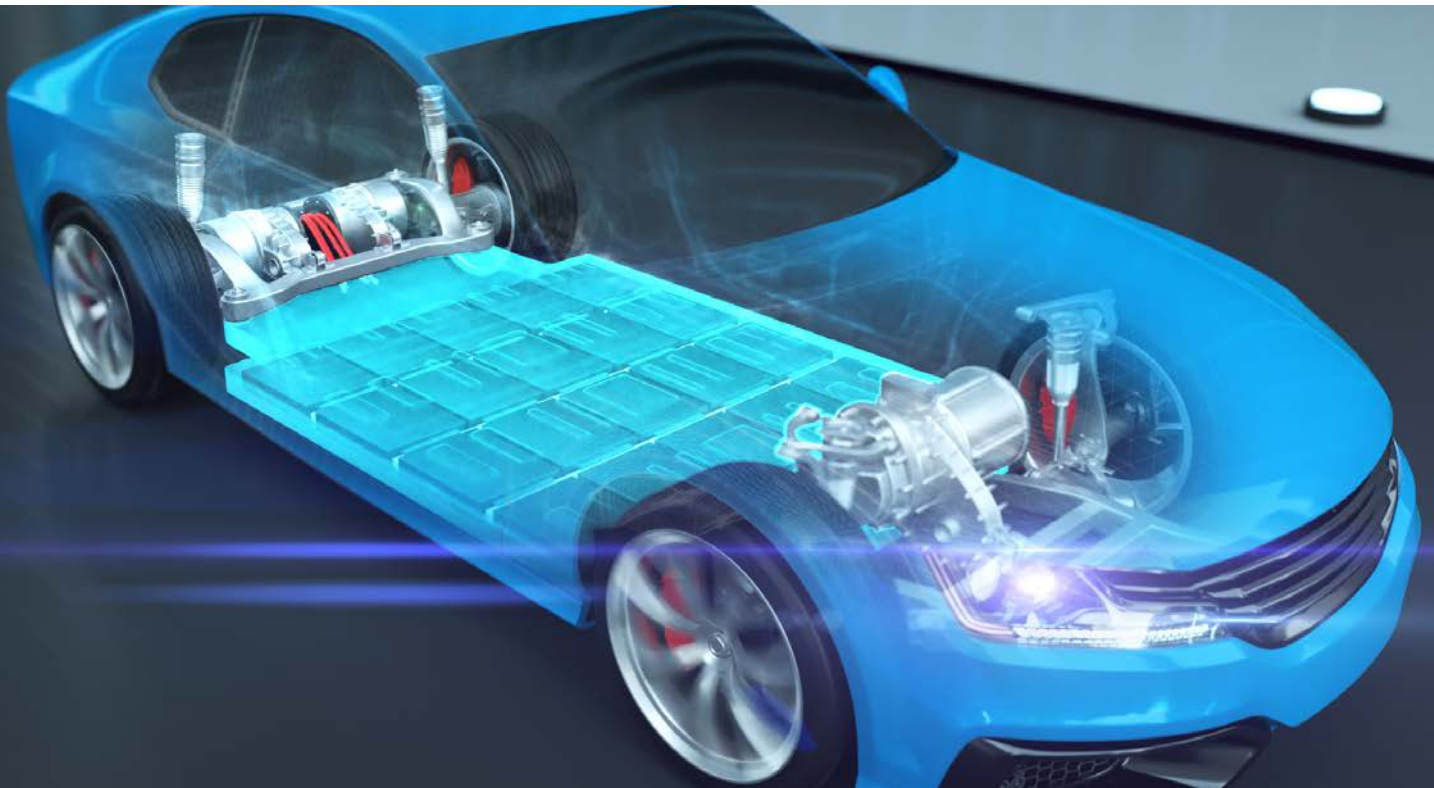


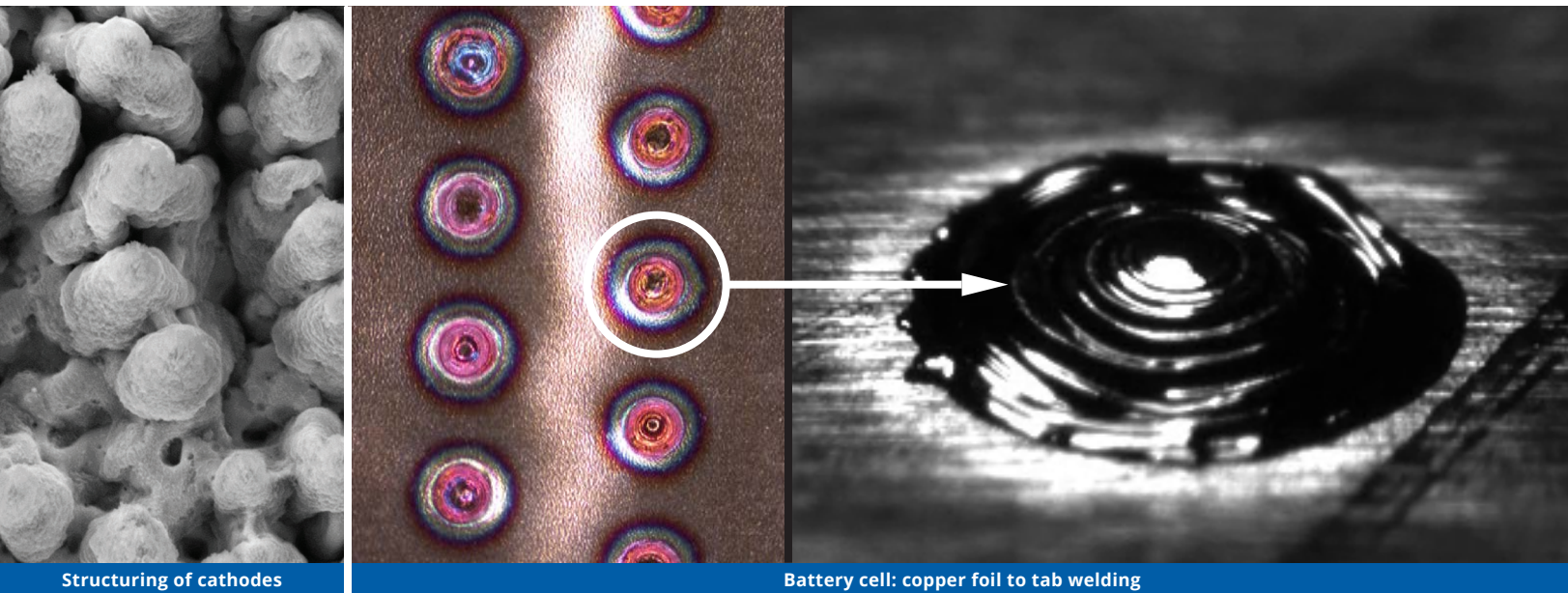
Laser Solutions for Battery Manufacturing



Electrodes · Battery Cell · Battery Pack

Get Connected with a More Efficient Process

The production of battery cells, battery packs, and charging systems presents the automotive manufacturer with several challenges; namely, the need to produce low resistance electrical connections and lightweight, yet mechanically robust, assemblies. And, the same need to minimize costs that has long driven automotive production remains in place. Laser solutions from Coherent can help you meet all these challenges.



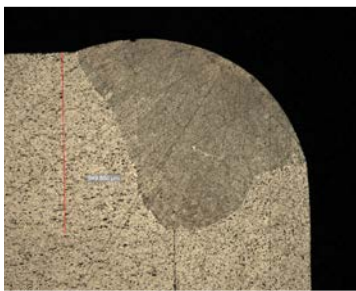
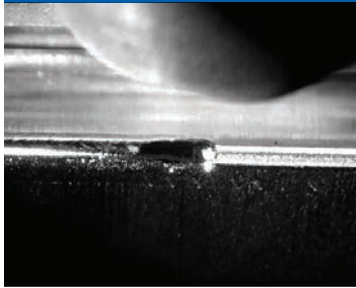
Structuring of cathodes

Battery cell: copper foil to tab welding

Lasers, with their ability to deliver a precise amount of energy with unmatched spatial accuracy, are a particularly useful tool at several steps in battery and electrical system manufacturing. Whether cutting, welding, microstructuring, marking, lasers improve product quality by minimizing the heat affected zone, and lower costs by increasing throughput and eliminating rework or post processing. Some of the specific production tasks as which lasers excel include:

- Marking of components like busbars and housings
- Welding of components like cans, lids, foils, tabs, and busbars
- Welding of subcomponents like current interruption devices (CID) and safety vents
- Structuring of electrodes
- Drying of active material
- Cutting of separators and electrodes

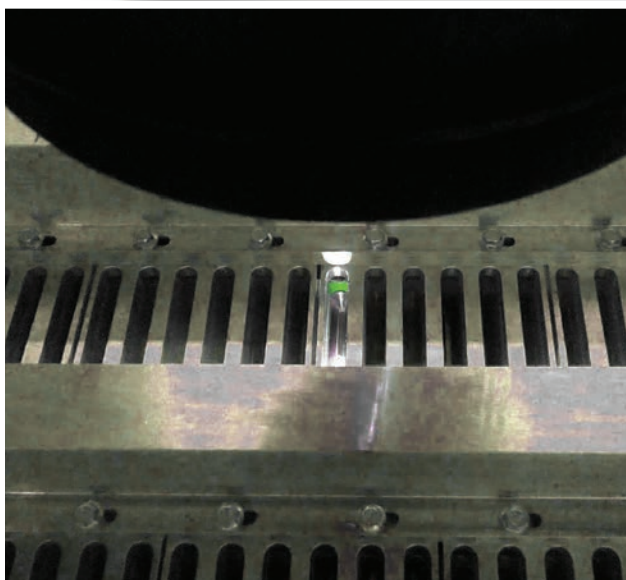
Battery cell: can to can/lid welding



Battery cell and housing: permanent marking



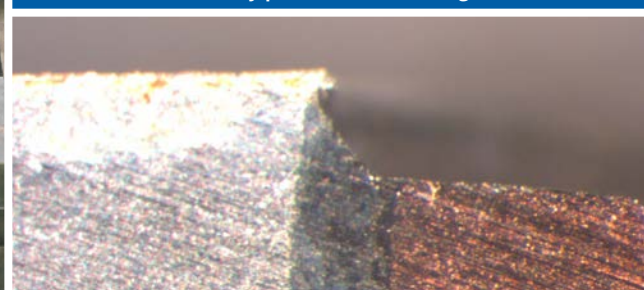
Battery cell: CID (Al/Al) welding



Battery cell: busbar welding (Al/Cu and Cu/Al)



Battery pack: busbar welding



Battery pack: battery terminal welding (Cu/Al)

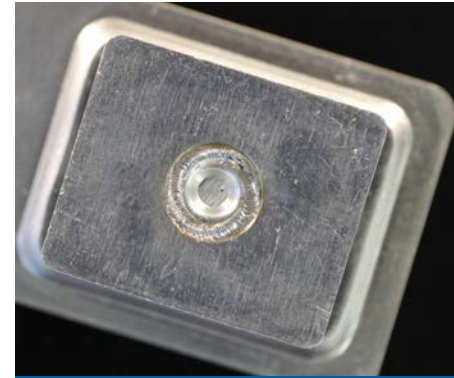
Supercharge Your Production

Time is money – whether it's takt time, time spent inspecting parts, or time lost on rework. That's why we've developed lasers and sub-systems that deliver precision and high-speed processing. They'll perform your task right the first time, and do it quickly, maximizing your throughput, and lowering your costs.

Coherent is your partner in implementing laser technology. Whether you need lasers or sub-systems with scanners, vision systems, or sensors, we can deliver the ideal solution for your application and help you get it running. No matter what level of integration you require, we'll support you with our in-depth applications knowledge to deliver the optimum solution for your specific needs.

Applications, Solutions, & Benefits

Lasers are already being successfully deployed to deliver cost savings and improved results in several e-mobility applications, including foil to tab welding and can/cap welding. Other processes, such as structuring and drying, are currently under development. But, whatever the application and its specific technical requirements, Coherent delivers a laser solution that offers superior performance and reliability.



Battery cell: terminal weld (Al/Al)
























Battery cell: CID welding

Electrodes




















APPLICATION	Structuring	Drying	Separator Cutting	Electrode Slitting	Electrode Cutting	Electrode Marking
CELL TYPE						
YOUR APPLICATION	Structuring/drilling of cathodes	Drying of active material	Separator foil cutting on-the-fly	Separation of electrode coil (mother roll) into several daughter rolls	Separation of coated electrodes	Track and traceability of components
OUR SOLUTION	<ul style="list-style-type: none"> • Widest range of laser technologies • Lasers, sub-systems, and systems depending on your level of integration • Support through our in-depth application knowledge 					
YOUR BENEFIT	<ul style="list-style-type: none"> • Charge cycle life-time improvement • Increased battery capacity retention • Enlarged electrode surface area improves battery performance • Decreased cost 	<ul style="list-style-type: none"> • Coherents experience with customized diode laser solutions • Reduced footprint of the equipment, saves energy, improves process flexibility, and control 	<ul style="list-style-type: none"> • Wear free • Flexible on-the-fly • Wavelength MIR: (10.6 & 9.3 μm) UV: (355 nm) for material optimized cutting results • Roll-to-roll solutions • Small heat affected zone for a wide range of materials including ceramics 	<ul style="list-style-type: none"> • High speed roll-to-roll process • High flexibility • Powerful software features with VLM for on-the-fly processing including multi laser management • Small heat affect to control potential delamination 	<ul style="list-style-type: none"> • High flexibility compared to standard processes • No wear parts • Improved cross section quality • Small heat affect to control potential delamination 	<ul style="list-style-type: none"> • Permanent, abrasion-resistant datamatrix marks • DMC code 5x5 mm in less than 1 sec

CELL TYPE LEGEND	
	Pouch
	Prismatic
	Cylindrical

Battery Cell

APPLICATION	Copper Foil to Tab Welding 	Pouch Welding 	Can Welding, Can/Lid Welding 	Welding of Subcomponents 	Tab to Cell Welding 	Terminal Welding 	Marking 
CELL TYPE	  		 	 		 	  
YOUR APPLICATION	Contacting of collector foils (anode - copper and cathode - aluminum) with the terminal contacts	Welding of non-structural plastic pouches	Laser welding can to caps / lids, material aluminum or steel	Welding of burst vents, current interruption devices etc. into the lid	Welding of dissimilar materials (Cu/Steel)	Contacting of terminal blocks (CU to Al and Al to Al)	Track & traceability: Battery individual serial data encoded in machine-readable datamatrix codes
OUR SOLUTION	<ul style="list-style-type: none"> • Widest range of laser technologies • Lasers, sub-systems, and systems depending on your level of integration • Support through our in-depth application knowledge 						
YOUR BENEFIT	<ul style="list-style-type: none"> • Offers capability of welding up to 100 foils • Up to 80% spatter reduction • Improved process stability • Laser welding avoids shunting problems with ultrasonic welding 	<ul style="list-style-type: none"> • Flexibility & easy customization • Small HAZ will drive more compact pouch designs • Closed loop process control • Hermetically sealed weld 	<ul style="list-style-type: none"> • Up to 80% spatter reduction • Improved process stability • Optimized, repeatable, and consistent processing results • Low heat load • Controlled penetration • Free adjustable weld width • Hermetically sealed weld 	<ul style="list-style-type: none"> • Shorter cycle time • Higher product quality • Reduction of manufacturing costs per part through higher yield • Hermetically sealed weld 	<ul style="list-style-type: none"> • Precise adjustment of penetration • Free flexible programming of weld width and intersection 	<ul style="list-style-type: none"> • Capability of Cu/Al joining by controlling the material dilution • Up to 80% spatter reduction • Improved process stability • Optimized, repeatable, and consistent processing results 	<ul style="list-style-type: none"> • High contrast ratio for good readability • Durable marks • Powerful software, supporting standard industrial interfaces (e.g. CAN bus ...)

Battery Module/Pack

APPLICATION	Busbar Welding 	Cleaning 	Ablation 	Welding 	Marking 
CELL TYPE	  	 	  	  	  
YOUR APPLICATION	Contacting of • battery cell contact tabs (tab to tab) • current collectors (tab to busbar) • individual current collector components (busbars)	Cleaning housing from electrolyte or preparation for painting	Coating removal from busbars	Welding of battery enclosure for the completed battery module assembly	Track & traceability of components
OUR SOLUTION	<ul style="list-style-type: none"> • Widest range of laser technologies • Lasers, sub-systems, and systems depending on your level of integration • Support through our in-depth application knowledge 				
YOUR BENEFIT	<ul style="list-style-type: none"> • Up to 80% spatter reduction • Improved process stability by CleanWeld/FL-ARM • Excellent adjustability of heat load, penetration, and weld width • Optimized, repeatable and consistent processing result • Very well controlled weld depth • High weld quality (low porosity and cracks) • Rectangular, homogeneous cross section 	<ul style="list-style-type: none"> • Reduced scrap • No chemicals • Scalable with dual processing head 	<ul style="list-style-type: none"> • High speed surface cleaning with low HAZ and damage to substrate • No tool wear 	<ul style="list-style-type: none"> • High quality laser weld • Low distortion • Low heat load/high strength • Low porosity • No cracks • Almost spatter free • Welding of aluminum sheets, extrusion profiles, and cast aluminum—with and without filler—with highest quality fulfilling the strength requirements • Crash resistant, leak proof (air tight, splash proof) 	<ul style="list-style-type: none"> • Permanent, abrasion-resistant data matrix • DM2 code 5x5 mm in less than 1 sec • 3D capable • Black marks possible

Partner with Coherent

Bringing a new process online, especially when it incorporates lasers, can be daunting and costly. When you partner with Coherent, you'll benefit from our in-depth expertise in laser applications development. We'll help you choose the right laser technology and develop the process recipe for optimum results. Contact one of our applications specialists today to learn how we can improve your results and reduce your time-to-market.



After-Sale Support

Coherent's global service footprint and expertise keep things running smoothly:

- 700 service engineers, technicians, logistics, and administrative personnel worldwide ensure a fast response to inquiries and service requests
- World-class parts logistics management
- Genuine, certified spare parts
- International training centers

Service agreements offer broad array of solutions tailored to fit your operations' needs:

- Rapid field service response to minimize your downtime
- 24/7 technical support hotline
- Preventive maintenance to keep you up and running
- Emergency field visits
- Tailored spare parts management
- Remote diagnostic and health checks
- Full coverage warranty extensions

Training for higher availability, performance, and lifetime:

- Customer training at all levels, at your site or at one of our Global Laser Training Centers, to get the maximum performance and reliability from your Coherent products
- Custom programs tailored to your specific requirements – preventive maintenance and repair, process optimization, application development, and more



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