EV BATTERY MODULE ASSEMBLY

Improve battery module quality with robust weld seam and glue bead inspections.

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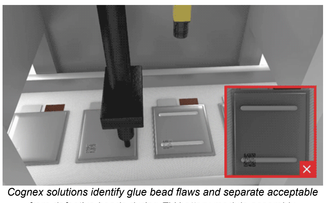
Electric vehicle (EV) battery module assembly is the process of interconnecting a group of finished battery cells with busbars, a battery management system, and other components. The cells are then placed into a protective metal housing. Interconnecting cells increases the battery module's electrical voltage and capacity.

The first step in battery module assembly is joining the cells with an adhesive to form cell stacks. Machine vision systems inspect the uniformity of glue beads, ensuring a solid connection for optimal electrical conductivity. Next, an alignment machine picks up a cell stack and places it into the battery module housing. Battery manufacturers mount machine vision systems on a robotic arm to pick up and put the cells into the housing with acute accuracy and precision.



Cognex solutions identify glue bead flaws and separate acceptable from defective beads during EV battery module assembly.

Glue bead inspection

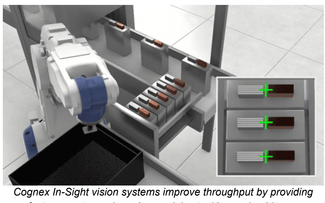
The glue used to bond battery cells is thin and transparent, complicating the bead inspection. Acceptable glue beads can vary significantly in appearance and seem nearly identical to defective beads. Distinguishing between the two can be a time-consuming process.

Standalone 2D machine vision systems such as the Cognex In-Sight series are embedded with advanced software such as BeadInspect to analyze glue bead shape, size, and appearance quickly. If more robust inspections are required, many 2D systems can be outfitted with VisionPro Deep Learning,an image analysis software that uses artificial intelligence (AI) to separate defective from acceptable beads by comparing thousands of "good" and "bad" images. When an inspection system needs to measure the height or profile of the bead, 3D machine vision systems such as the In-Sight 3D-L4000 are the most effective solution, using a speckle-free blue laser to capture high-quality images and minimize glare.

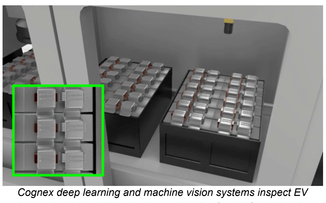
Module stacking guidance

Markings on the battery module housing tray serve as a critical reference position for pick-and-place operations. Guiding the cell stacks into EV battery modules requires extreme accuracy and precision. To optimize efficiency and minimize time to market, manufacturers need a machine vision system that quickly and reliably recognizes patterns and markings.

Cognex In-Sight vision systems are mounted on a robotic arm and quickly guide cell stacks into the module housings by identifying fiducial "flags" that appear as notches to the camera. The solution quickly locates and calibrates the fiducial marks on the battery module to calculate coordinates.



Cognex In-Sight vision systems improve throughput by providing fast, accurate, and precise module stacking and guidance.



Cognex deep learning and machine vision systems inspect EV battery busbar welding seams, separating flawed from visually similar, but acceptable seams.

Busbar Weld Seam Inspections

Laser welding is a standard method of welding busbars to modules as it's generally faster than other methods and can join diverse materials with minimal deformations. The weld seams must be evenly distributed; gaps can cause a power blowout or slow energy transfer. No two welding seams are alike, and differentiating acceptable variations from defective welds is a complex task that is too difficult for rule-based machine vision.

Solutions such as the In-Sight 2800 and In-Sight D900 are 2D vision systems that leverage VisionPro Deep Learning software to differentiate between acceptable and defective weld seams. The In-Sight 3D-L4000 uses a speckle-free blue laser to capture clear images at high speeds, while a comprehensive suite of vision tools enables the system to isolate defective welds and acceptable variations.

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IN-SIGHT D900

IN-SIGHT 3D-L4000