



Battery Cells Perfectly Welded with 3D Laser Triangulation by Manz

Reutlingen, Germany, March 15, 2016. High-tech equipment manufacturing for future growth markets: "Electronic Components," "Electronic Devices," "Solar," and "Energy Storage" are the core business areas of Manz AG. Our expertise is based on seven core technologies: automation, roll-to-roll, metrology, printing and coating, laser process technology, wet chemical processes and vacuum coating. Today: Our expertise in metrology, using the example of laser triangulation for making three-dimensional measurements of welding points on batteries.

Batteries for electric cars are extremely heavy and consist of a large number of cells that are connected by metal strips and welded to a battery module to create the desired circuit. The metal connections are welded at lightning speed using sophisticated automation, with hundreds of welding points made per minute. Because the height of the battery cells is subject to change due to production tolerances, and because the welding laser has a tight process window, it is necessary to adjust the laser's focal point for each welding point.

Manz has developed laser welding equipment for this purpose that uses 3D laser triangulation to exactly determine the position and height of the cells in a battery module in all three spatial dimensions. The sensor directs fine lines of blue light onto the top of the cells, where the points for welding the connection strips are located. A camera positioned at an angle measures the reflected light. Height differences between the battery cells appear in the image as steps in the lines of reflected light. Software from Manz uses all the lines recorded during a pass over the battery pack to create a height-encoded image. Prominent points are highlighted in color. At all points, the precision is finer than 20 micrometers.

The combination of 3D laser triangulation and welding lasers currently achieves more than 500 welds a minute. This pace can even be increased if two or more sensors are used in parallel. Manz has many years of experience with 3D laser triangulation. The company has previously used the method to determine the evenness of solar cells. Manz has even built several tools for one notebook manufacturer to determine the depth of the pocket in which the touchpad is "seamlessly" inserted. www.manz.com

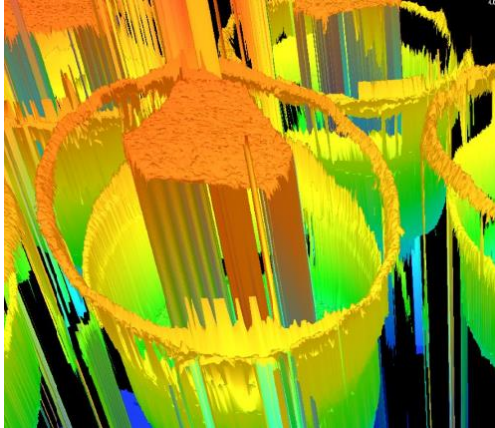


Photo 1: Three-dimensional measurements of the welding points on the battery cells are made using 3D laser triangulation. Easy to see: the protruding battery pole in the middle of the cell.

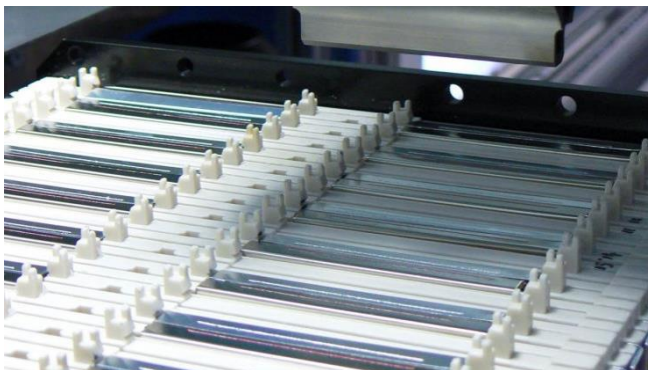


Photo 2: Welding of battery cells with a laser process system.



You can find a detailed description of Manz's use of 3D laser triangulation for welding batteries in issue 1/2016 of *Inspect* magazine from the renowned publisher Wiley: www.inspect-online.com



High resolution photos are available from Stefan Richter, Storymaker GmbH: s.richter@storymaker.de, tel.: +49 (0)7071 – 93872213.

Company profile:

Manz AG – passion for efficiency

As one of the world's leading high-tech equipment manufacturers, Manz AG, based in Reutlingen, Germany, is a pioneer for innovative products in fast-growing markets. Founded in 1987, the company has expertise in seven technology sectors: automation, vacuum coating, laser processing, screen printing, metrology, wet chemical and roll-to-roll processing. Manz deploys and continuously develops these technologies in three strategic business segments: Electronics, Solar and Energy Storage.

The company is led by founder Dieter Manz and has been listed on the stock exchange in Germany since 2006. It currently develops and produces in Germany, China, Taiwan, Slovakia, Hungary and Italy. It also has sales and service branches in the United States and India. Manz's claim "passion for efficiency" offers the promise of production systems of the highest efficiency and innovation to its customers in dynamic, future-oriented industries. With its comprehensive expertise in developing new production technologies and related machines, the company substantially contributes to reducing production costs for end products, making them accessible to large groups of buyers the world over.

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