

Press report

Application at LEONI: Connection stud on aluminium busbar

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LEONI and TELSONIC AG provide high-tech support for ambitious production targets at Jaguar

Power supply for big cats

(Kitzingen/Erlangen) With the first fully automatic production cell for aluminium busbars, LEONI is supporting the ambitious objectives of Jaguar, the luxury brand, to reduce weight and cost. The English manufacturer is using round aluminium bus ducts for the first time for the power supply in its latest F-type sports car. To ensure that the connections to the electric equipment in the engine compartment function reliably, the electrical system experts opted for the unique SONIQTWIST® torsional ultrasonic welding system by TELSONIC AG.

"The new fully automatic production cell in our Romanian factory in Arad for the production of aluminium busbars will be the first of its kind in the production of electrical systems", explains Kai Baumann, who shares responsibility for advanced production technology & automation at Leoni. The plant is scheduled for completion in April 2014. The unit will be used to manufacture round aluminium bars - so-called busbars - which are ready for installation and provide the connection between the battery in the boot of Jaguar vehicles and the electric equipment in the engine compartment. Once the straight bar has been placed into the plant as the starting workpiece, all processes are fully automated. This includes the welding of the front end of a steel stud within a copper-nickel sleeve to the aluminium busbar as contact to the starter motor. This connection process is controlled by the pioneers of ultrasonic welding, TELSONIC, using their worldwide unique SONIQTWIST® torsional welding process. With the help of the fully automated process it is possible to increase the annual capacity of the hitherto semi-automatic plant from 15,000 to a peak of 700,000 units.

Weight of component reduced by 50 percent

In order to reduce weight and save costs, the electricity distribution in automotive vehicles will be successively converted to aluminium conductors. Where the battery - usually for reasons of a more balanced distribution of weight - is located in the boot of the vehicle, the savings potential of the system is even greater. The process began in 2008 with rigid flat conductors with larger cross sections. In the Jaguar F-type, which has been available since June 2013, the conductors used are round elements for the first time, with relatively small cross sections of 85 mm² for the reliable supply of electricity from the battery to the engine compartment. The

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aluminium connection has many advantages compared to copper cable. For example, the solid aluminium conductor can be three-dimensionally shaped and has only half the weight of conventional copper components. Baumann explains: "The aluminium bar only weighs about 40 to 60 percent of conventional copper cable. For the battery connection alone, this can amount to a reduction in weight of up to three kilograms." This saving can be achieved because aluminium has a significantly lower relative density than copper.

In the production cell the insulation of the raw parts - which are insulated with a halogen-free polyethylene sheath - is stripped twice, the parts are pressed twice, cleaned very carefully and finally three-dimensionally shaped in free space using LEONI's first six-axis robot. A fully completed busbar leaves the cell every 30 seconds ready for despatch and is then packaged in special crates. The rigid busbars are much easier to handle than the flexible cables. This is also an advantage during the installation at the car manufacturer's. The component is fitted at both ends with a few manual movements using a sophisticated but easy to operate fixing system and, along the bar, it is fixed to the car body using special clips. "Anybody who up to now had to install heavy flexible copper cables will breathe a sigh of relief", ensures the engineering expert Baumann.

Water-cooled welding process

So that the contact in the engine compartment is reliably made, a 30 mm long threaded interface stud is welded to the front end of the aluminium busbar. Beforehand, the stud is pressed into a copper-nickel sleeve which is easier to connect to the aluminium. The nickel coating of the copper contact stud reduces the risk of corrosion between the two metals to a minimum. In addition, the strength of the weld is significantly greater than it would be for a weld joining copper to aluminium. "It must be said, however, that the nickel layer has to be of a very specific and consistent quality for the ultrasonic welding process", explains Axel Schneider, Head of Business Unit at TELSONIC GmbH, pointing out that this is a special challenge but without offering any comment on how this was solved.

The component is then automatically picked from a magazine and placed in exactly the right place on the anvil beneath the sonotrode for welding. In order to ensure that the process is repeated exactly to the same high quality standard under high pressure, the anvil is water-cooled. With precise repetition, the unique SONIQTWIST® torsional ultrasonic welding process developed by TELSONIC reliably welds the two components together in 0.9 seconds.

New application of a known process

The SONIQTWIST® torsional ultrasonic welding process is based on the well-known linear metal welding process for copper, aluminium, nickel, bronze, brass and other combinations. TELSONIC, who are

pioneers in ultrasonic welding, have built on conventional ultrasonic welding technology and created the fully developed SONIQTWIST® torsional welding process. The sonotrode is excited by a torsional oscillator and as a result it is twisted at high frequency by 40 µm to the right and left in turn. With this technology it is possible to apply very considerable force and output power to the weld. This means that the process is also usable for welding thicker connections with great strength. "In view of the fact that we can apply significantly more energy to the weld with the newly developed movement pattern, the welding points are much denser and hence stronger", asserts Schneider. The torsional ultrasonic welding process is quick, environmentally compatible and can be easily integrated into automatic production processes. In addition, there are a number of options for quality assurance.

With SONIQTWIST®, the experts of the Swiss company TELSONIC AG have developed torsional ultrasonic welding into a reliable process that produces precise results over many repetitions. The production cell is equipped with a TELSONIC portal installation, which can apply more force compared to classic presses of the C type. The entire fully automated production cell has been designed by the plant manufacturer and general contractor, IMA Ingenieurbüro Anton Abele + Partner GmbH from Augsburg, and is highly variable and flexible. It can be operated with a wide variety of models of aluminium busbars and requires two hours' worth of stock. In the final construction stage it will even be possible to run the plant in one-piece-flow production. In that situation, the workpieces are clearly identified by their cross section and length. In each case, the SONIQTWIST® torsional ultrasonic welding process by TELSONIC produces strong connections and thereby ensures reliable power supply for the big cats.

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((Company information on TELSONIC AG))

Pioneer and technology leader in Switzerland

TELSONIC AG is a pioneer in ultrasonics technology. The company, which was founded in 1966, has subsidiaries in Germany, England, South-East Europe, China and the USA, is part of a joint venture in India and has agencies in many countries. Today, TELSONIC is one of the leading ultrasonics companies worldwide and owns numerous patents. Ultrasonics technology is used for welding, cut-and-seal welding, cleaning and screening as well as in chemical processes and packaging. Having introduced the Torsional Welding Power Wheel, TELSONIC has again achieved leadership in technology. The technology has spawned new solutions in many automotive engineering applications and has paved the way for numerous potential savings.

((Company information on LEONI))

Cable systems for the automotive industry

LEONI is a worldwide supplier of wiring, optic fibre, cable and cable systems, and associated services for the automotive and other industries. LEONI develops and produces sophisticated technical products ranging from single-strand vehicle conductors to entire automotive wiring harnesses. In addition, the company's product

range includes wire products, standardised conductors, special cables and assembled systems for various industrial markets. The company group, which is listed on the German MDAX exchange, has a workforce of around 60,000 in 32 countries and achieved a group turnover of EUR 3.81 billion in 2012.

Register of images: TELSONIC AG, application at LEONI



Image No. 36-01 TC_LO-Anschlussbolzen.jpg
Designed for the supply of electricity in Jaguar cars: interface stud welded to a LEONI aluminium busbar using TELSONIC's torsional ultrasonic welding technology.

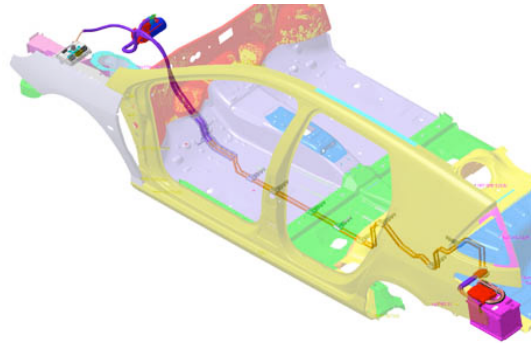


Image No. 36-02 TC_LO-BusbarSkizze.jpg
In order to reduce weight and save costs the electricity distribution in automotive vehicles will be successively converted to aluminium conductors.



Image No. 36-03 TC_LO-USS-Gerät.jpg
The Swiss company TELSONIC AG has developed torsional ultrasonic welding and created a reliable process that produces precise, repeatable results.