



The cover of the speaker is connected to the hull by laser, inside is the protected electronics. © Headwave/Evosys

## Contour Welding Connects Helmet and Loudspeaker

# Music in the Ears – Even When Riding a Motorcycle

The Headwave Tag 2 motorcycle helmet is designed to provide users with a high quality sound experience for music and navigation announcements. The connection technology presented the manufacturer with challenges: the speaker housing is three-dimensional, flexible and must withstand high loads. Evosys Laser GmbH is responsible for the secure connection of the housing parts, fusing the elements firmly together by laser welding.

**T**he Headwave Tag 2 is a speaker designed for motorcyclists that, unlike conventional sound systems in this field, transmits music to the helmet via structure-borne sound. This turns the helmet itself into a sound body and transmits navigation announcements and music it receives from the smart-

phone via Bluetooth. The system is completely cable-free so that nothing blocks or presses on the ears.

### *Defies Rain and Speeds up to 300 km/h*

To make this possible, the speaker is so securely connected to the helmet via a

special adhesive pad that even speeds of up to 300 km/h are feasible.

In addition, the system is so robust that it can withstand the elements despite the high mechanical stresses. To reliably protect the electronics inside, the IP67 protection level is essential for this.

Initially, adhesive bonding was planned as the joining technology for the housing, since it is supposedly easy to implement. However, it quickly became clear that this joining technology was not a viable option due to the time-consuming preparation and application of the adhesive for the components. The handling of adhesives and their waste products in production also ruled out this alternative. Headwave GmbH from Berlin, Germany, therefore enlisted the experience and expertise of Evosys Laser GmbH from Erlangen, Germany, to meet the challenges of joining the housing of the Tag 2. For the joining process, the company opted for laser welding of plastics because the process offers high



The Headwaver fits on any helmet and communicates wirelessly via Bluetooth.

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weld seam strength with maximum tightness and produces reliably. In addition, the good possibilities for online process monitoring spoke in favor of using laser technology.

### Laser Beam Fuses Joining Partners

Laser welding involves joining a laser-transparent plastic with a laser-absorbing plastic. Using the Headwave Tag 2 as an example, this means that the laser beam is guided through the laser-transparent upper part on the helmet side. The beam passes through to the outer housing part, which has absorbing properties due to additives. This is done under the condition that the absorbing

housing part is translucent so that the status LEDs remain visible.

By focusing the laser energy on the lower joining partner, this melts on the surface. In addition, the two parts are pressed together by means of a device, which causes heat to be transferred to the laser-transparent plastic part. As a result, both joining partners melt in this area of laser activity and a stable, materially bonded joint is created without any major mechanical component stresses.

The laser welding process also had to overcome a number of challenges in terms of material and geometry that other joining processes usually fail to overcome. In addition to the three-dimensional geometry of the joining zone, both halves of the component are made of a flexible TPU. The material's flexibility and pliability enable the Tag 2 to fit securely to the helmet.

### Individual and Process-Reliable Production

Since the high-quality loudspeakers are only manufactured in small quantities, production is carried out on a subcontract basis directly at Evosys' service subsidiary. The company uses various laser systems to realize the precise welding. For Tag 2, an EVO 1800, a stand-alone system with manual loading, is used. It can be used for both quasi-simultaneous and contour welding. The latter process variant, in which the laser scans the welding contour once or twice, is used for the loudspeaker housing. The two individual parts are loaded by means of a drawer mechanism. The lower tool then moves upward, and the system checks whether the starting position of the component is correct. If the zero point is within the specifications, the welding process starts automatically. The diode laser, which operates at a wavelength of 980 nm and a power of 250 W, completely scans the welding contour twice. At feed rates between 400 and 500 mm/s, one cycle takes twelve seconds.

Another advantage of laser processing is that qualified statements on the welding success can already be made during the joining process. The welding system used records important process parameters during production and



The diode laser of the EVO 1800 joins the parts by contour welding – in twelve seconds per helmet. © Evosys

reacts as soon as a deviation from target values occurs with automatic corrections or a note to the operator.

The production of the Headwave Tag 2 shows that even complex geometries and flexible materials can be reliably welded in series and that laser plastic welding is an extremely economical process, especially for consumer products. A decisive criterion here is the timely coordination of design and process layout. The clean and robust process produces good weld seam qualities and stands for high output. ■

## Info

### Text

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[www.evosys-laser.com](http://www.evosys-laser.com)

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