PRESS RELEASE

World Record with a High-Power Laser: TRUMPF Speeds Up the Welding of Thick Steel Components

14 cm. (5.51 in.) of welding depth in a single pass // Process is expected to significantly speed up the production of large steel structures // Application examples include wind energy and shipbuilding

Aachen, Ditzingen, Schramberg, Germany, November 9, 2026 – High-tech company TRUMPF, in collaboration with research partners from RWTH Aachen University, has set a new world record in laser-based deep welding. Using a high-power laser, the team succeeded in joining steel to a depth of 14 cm. (5.51 in.) in a single welding operation. Until now, comparable laser processes had only achieved welding depths of 6 cm (2.36 in). The new process, known as laser welding in a vacuum (LaVa), can significantly speed up the production of large steel and aluminum structures, such as those used in wind turbines or shipbuilding.

“With this record, we are demonstrating that the boundaries of industrial laser welding can be significantly pushed,” says Simon Olschok, who is responsible for the deep welding experiments at RWTH Aachen University. The experiments are based on a 50kW high-power laser from TRUMPF. “What still requires many individual weld passes today could be achieved in significantly fewer steps in the future.”

“Welding often dictates the pace of the entire manufacturing process today. If we drastically reduce the number of weld passes, manufacturers gain valuable time and increase productivity,” adds TRUMPF Business Development Manager Marc Hummel, who is responsible for applications involving high-power lasers.

From offshore wind farms to nuclear fusion

Numerous industries can benefit from deep-penetration welding using lasers. These include, for example, manufacturers of offshore wind turbines who produce steel structures several centimeters thick for monopiles and foundations. Shipyards, pipeline manufacturers, and companies in the plant and heavy machinery sectors could also significantly accelerate their manufacturing

processes. For all these applications, manufacturers must join particularly thick-walled steel components economically and reliably.

Welding Thick Steel Components Quickly

Until now, manufacturers often had to produce thick-walled steel components using many individual weld passes, building up the weld seam layer by layer – a process that is both expensive and time-consuming. The new laser process significantly reduces the number of weld passes required.

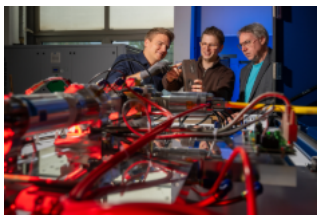
“For us, the world record is not an end in itself. What matters is the benefit to the industry. If users can manufacture thick steel components with significantly fewer weld passes in the future, they will save energy, time, and costs while increasing their productivity. This is precisely where the potential of this technology lies,” says Hummel.

The record was achieved using a 50-kilowatt high-power laser from TRUMPF. Thanks to the BrightLine Weld beam shaping technology, users can precisely distribute the energy in the laser beam, making the welding process more stable and precise. Under reduced ambient pressure (50 mbar), the laser beam was also able to penetrate significantly deeper into the material than under normal pressure. Unlike electron beam welding, however, no technically complex high vacuum is required. This makes the process more attractive for industrial applications.

Laser Power Opens Up New Possibilities

“With increasing laser power, we expect further advances in deep welding. The experiments are already demonstrating the potential that modern high-power lasers, in combination with beam shaping, open up for industrial manufacturing,” add RWTH Aachen University’s Olschok.

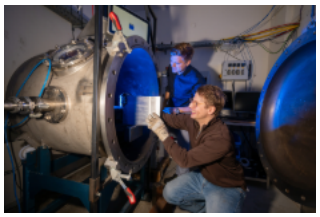
The goal is to economically weld even thicker materials in a single pass in the future and open further applications for laser welding.



Inspection of the Weld Seam

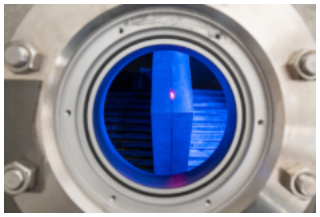
Marc Hummel, TRUMPF, inspects the weld seam with Dominic Ix and Simon Olschok from RWTH Aachen. (Image: TRUMPF)

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Welding Preparation

Marc Hummel of TRUMPF and Dominic Ix of RWTH Aachen are shown preparing for the world record attempt. (Image: TRUMPF)



Laser Welding in a Vacuum

The new process, known as laser welding in a vacuum (LaVa), can significantly speed up production of large steel and aluminum structures, such as those used in wind turbines or shipbuilding. (Image: TRUMPF)



Marc Hummel with a World-Record-Breaking Component

TRUMPF's Marc Hummel presents the world-record-breaking component. (Image: TRUMPF)

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About TRUMPF

TRUMPF is a high-tech company offering manufacturing solutions in the fields of machine tools, laser technology, and the semiconductor industry. It drives digital connectivity in manufacturing through consulting, platform products, and software. TRUMPF is one of the technology and market leaders in highly versatile machine tools for sheet metal processing, and in the fields of industrial lasers and power electronics. In 2025/26, TRUMPF employed 17,583 people and generated sales of 5.16 billion USD. With about 90 companies, the TRUMPF Group is represented in nearly every European country as well as in North America, South America, and Asia. The company has production facilities in Germany, France, the United Kingdom, Italy, Austria, Switzerland, Poland, the Czech Republic, the United States, Mexico, China and India. Find out more about TRUMPF at www.trumpf.com

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