

SABRINA SCHILLING

Laser and aluminium unite to create tight weld seams for a bright future

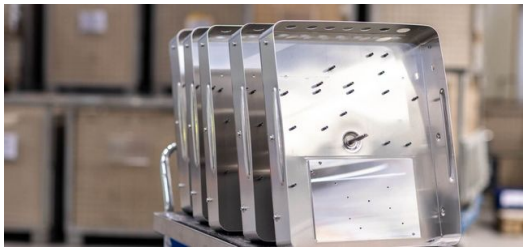
CooolCase provides the photovoltaic industry with exactly what it currently needs – a reliable process for welding mass-produced aluminium housings for inverters, with completely tight seams.

"We never expected this technology to be so successful!" says Melinda Krusemark, Head of Sales and Marketing at CooolCase. The technology she is referring to is the production of aluminium housings for inverters, which convert the direct current from photovoltaic cells into alternating current, making it suitable for use in the power supply system. The appliances are usually located outdoors and are at the mercy of all kinds of wind and weather. Therefore, it is crucial that the inverter housings are fully sealed, preventing any moisture from entering and protecting the sensitive electronics inside.

Dresden-based company CooolCase specialises in metal housings that fulfil these specific requirements. Melinda Krusemark and her brother Marvin Michel are currently taking over the helm of the company from their father, and their timing couldn't be better! The two young entrepreneurs are making their debut in the solar industry with an innovative laser welding method, and have clinched the deal of a lifetime.



Melinda Krusemark and the CooolCase team are ready to take the step into the solar industry.



CooolCase manufactures housings for solar inverters.

STICKER LEADS TO MAJOR ORDER

The Dresden industrial fairytale begins a few months earlier in Aachen, where RWTH Aachen University is conducting a study for a leading manufacturer of solar inverters. The initial investigation focuses on identifying the most efficient method for producing sealed aluminium housings. The traditional method used until then was die casting – functional, but wasteful. The process uses excessive aluminium, as the walls are unnecessarily thick due to production constraints, leading to higher costs per housing. The RWTH study shows that laser welding is the most cost-effective production method. Instead of casting thick-walled housings, it is better to weld thin aluminium sheets together.

The challenge is that reliably sealing aluminium alloys, which are susceptible to porous hot cracks, is no easy task. A process with industrial suitability has only recently become available, and as a result, only a few companies have mastered the technology to date. The inverter manufacturer is struggling to find a suitable contract manufacturer for its housings. During its research, however, it comes across a sample of tightly welded aluminium seams of unknown origin. The only clue is a small, blue-grey "CooolCase" sticker. The Dresden-based company had previously conducted a few welding tests at TRUMPF for a different project, and this experience is about to pay off. The inverter manufacturer gets in touch with CooolCase, presenting the prospect of a major order.

LASER WELDING SAVES MATERIALS

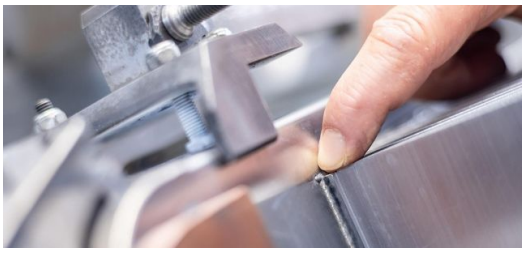
Melinda Krusemark recalls: "It came entirely out of the blue! With only 85 people in the company, we're technically too small for the project, but we believe in our abilities" says Marvin Michel, Managing Director of CooolCase GmbH. From both an entrepreneurial and technological standpoint, this makes perfect sense, he adds: "Solar inverters are in huge demand right now. And with high quantities, unit costs become crucial. That's where the laser welding process makes a difference. Compared to casting, we use 50% less material per housing! On top of that, we don't use any tools that wear out." The siblings decide to give it a go.

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However, there is still a way to go before CooolCase can actually start welding inverter housings on a large scale. The housing that the customer requires may look unspectacular, but it is quite complex in terms of welding technology. So CooolCase teamed up with TRUMPF to find the optimum parameters and welding strategies. The experts opt for TRUMPF's TruLaser Weld 5000 laser welding system and start the development phase on the actual customer product.



In conjunction with TRUMPF, the two young entrepreneurs from CooolCase are working to optimise welding processes.



The weld seams of the housing must be perfectly sealed to ensure the inverter electronics are fully protected from environmental influences.



With the fast cycle time of the TruLaser Weld 5000's rotary table, CooolCase produces 100 housings a day.

THREE TRICKY WELDING JOBS

The part involves three tricky welding jobs, requiring CooolCase and TRUMPF to leverage all their expertise. First, there are the seams on the sides and the rounded corner joints. Here, CooolCase relies on precisely controlled heat conduction welding, which introduces minimal energy into the part. "Otherwise, hot cracks could form at the weld seams, leading to leaks," explains Michel. Secondly, a stiffening plate must be attached to the housing. To achieve this, the laser system switches to deep penetration welding, whereby the laser light penetrates two millimetres of aluminium, creating a consistently tight seam that prevents any H_2O molecules of moisture from passing through.

Now comes the technical welding highlight – CooolCase attaches a heat sink to an opening on the roof of the housing. However, it is made of an aluminium alloy that is difficult to weld and also differs from the material used for the rest of the part. "This alloy is particularly prone to hot cracks, and that is precisely what must be avoided at all costs with the housing". That's why the TruLaser Weld 5000 switches welding methods once again, now adding a supplementary wire using FusionLine. "Finding the right parameters was like walking a tightrope," he grins. "But I won't give away any details." In any case, the housing is now fully sealed, and the electronics inside are protected from the elements.



Using the TruLaser Weld 5000, CooolCase tackles three challenging welding jobs in the production of inverter housings.



Using the TruLaser Weld 5000, CooolCase reduces the production time for an inverter housing by 2.5 minutes.

SOLAR INDUSTRY HAS A BRIGHT FUTURE

CooolCase can now embark on mass production of inverter housings. Thanks to the high productivity of the laser during welding and the quick cycle time of the rotary table on the TruLaser Weld 5000, they are now producing 100 housings a day. And the timing couldn't be better! Manufacturers of inverters for solar systems are facing a double challenge as the ongoing energy transition is driving a massive expansion of photovoltaic systems, leading to a surge in demand. In addition, many inverters in older, existing systems currently have to be replaced as they reach the end of their service life. "Our company is experiencing solid growth as a result of the inverter order," says Melinda Krusemark: "We feel like we've won the lottery."



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TRUMPF GROUP COMMUNICATIONS