# ElringKlinger AG

www.elringklinger.de

ElringKlinger AG is an independent global supplier to the automotive industry. The company delivers innovative product solutions in both the passenger car and commercial vehicle sector for all types of drives. Whether electric motor, hybrid technology or combustion motor: ElringKlinger is a strong and reliable development partner and series supplier which contributes to sustainable mobility with its extensive experience and expertise. The company, headquartered in Dettingen/Erms in Baden-Württemberg, Germany, is represented at over 40 locations worldwide.

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**INDUSTRY**
Automotive industry

**NUMBER OF EMPLOYEES**
9,000

**SITE**
Dettingen/Erms (Germany)

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**TRUMPF PRODUCTS**

- EasyModel AI

**APPLICATIONS**

- Laser welding

## Challenges

New battery packs for electric vehicles are becoming more complex – and so are the cell contacting systems (CCS) installed in them. Increasingly, higher power outputs are required, particularly when loading the battery – for example, more than 300 kilowatts is required for ultra-fast loading. As a result, innovative CCS can contain a lot of welding positions, which the laser must weld in short cycle times using a zero-defect strategy. A further challenge is the high degree of variety and large number of metallurgical compounds that must be taken into account during welding. And while CCS were around 600 millimeters long in the conventional module-to-pack design, they can now reach lengths of up to two meters in the innovative cell-to-pack design. This requires complex fixtures, which can cause obstructions. This must also be taken into account when joining the welding positions with the laser.

Alongside his team, Daniel Weller is responsible for the development, testing and design of laser processes at ElringKlinger in Neuffen, Germany. His team works on a pre-series plant to ensure that a CCS can be manufactured smoothly and with consistent quality on every production line at all ElringKlinger sites.



"For good results in characteristics recognition, we now need hours rather than days."

**DR. ING. DANIEL WELLER**

JOINING TECHNOLOGY SPECIALIST IN THE BATTERY TECHNOLOGY BUSINESS DIVISION AT ELRINGKLINGER AG

**Solutions**

During a visit to the TRUMPF Laser Application Center, Daniel Weller becomes aware of a new development in the field of detection systems. "Up until now, we worked with TRUMPF's VisionLine Detect image processing, which helped us a lot with processing conventional Cell Contacting Systems (CCS)," states Daniel Weller. However, with the cloud-based EasyModel AI training platform, TRUMPF raises the bar even further: the combination of EasyModel AI and the KI Filter option for TRUMPF VisionLine Detect image processing recognizes variable environmental conditions, component reflections, changing lighting situations and fluctuations in material properties. "Shortly after TRUMPF's EasyModel AI became officially available, we were awarded the contract for a complex cell contacting system that presented us with major challenges, measuring two meters in length and featuring 50 welding positions. EasyModel AI came at exactly the right time," says Weller.

EasyModel AI is a tool which allows even users without programming knowledge to easily create and train their own image-based AI models tailored specifically to components. "As the first step, we use VisionLine Detect to simply record images of those segments of the component on which welding positions must be set. The images are stored with us using Quality Data Storage and we can then upload them into EasyModel AI, which we can simply access via our MyTRUMPF platform," explains Weller. Once a project has been created, Weller and his colleagues mark the welding positions to be detected on the images and the AI starts evaluating and calculating a model. This can be optimized intuitively by the operator piece by piece. Only a small number of training images suffice for a functioning AI model. Once a satisfactory model is available, it is transferred to the production line. There, the AI Filter option for VisionLine Detect is used. The filter accurately distinguishes between relevant image areas and areas such as fixtures, soiling or reflections. "The difference between VisionLine Detect with and without an AI filter is particularly clear here," says Weller explaining further. "The AI filter binarizes the image - i.e. it creates a display in black and white only. The detected component is displayed in white, while the surrounding areas are displayed in black. This allows the edge detection algorithms to easily identify the welding area to be detected." Previously, Weller and his team used VisionLine Detect image processing with position-dependent lighting. This was deliberately varied in order to reliably detect the respective positions. The process had to be individually adapted to the respective position in the processing field to compensate for the different reflections of the component surfaces. The process was time-intensive and dependent on numerous influencing factors – additionally, it had to be carried out separately for each component position.

**Implementation**

To implement the new solution, ElringKlinger simply had to activate the EasyModel AI option with AI Filter and complete a short introductory phase. "The TRUMPF employees guided us through all the

process steps directly on the component during commissioning the pre-series plant," explains Weller. "After one or two hours, we had completed our first component." If there are any uncertainties these days, TRUMPF experts simply respond to these remotely or in Teams meetings. The cooperation is facilitated by Quality Data Storage by TRUMPF. Data can be stored there and shared with TRUMPF specialists as required.

For Weller, the simplicity of the training process counts as one of the main advantages of EasyModel AI: "For good results, we no longer need days, but hours." It is also important that no prior knowledge is required to achieve good results. "This becomes particularly important once the series has started and our less experienced colleagues at the various locations need to make minor adjustments. The system works according to the 'what-you-see-is-what-you-get' principle. This is easy to understand even for non-programmers," says Weller. The option to carry out smaller adjustments is also an advantage for him and his colleagues: "Every CCS is designed differently but sometimes the differences are only minimal. Using AI, we are now able to use existing training images of CCSs as a basis for new models, by simply retraining minor deviations. This further speeds up the development phase."







**Forecast**

"With a length of two meters, we have probably reached the end of the requirements for cell contacting systems in the passenger car sector," says Weller and adds. "But the cell-to-pack battery pack design is increasingly being used in trucks where we expect larger and more complex CCS in the future." Of course, the detection of welding positions can still be carried out with simple image processing but it is faster and easier with AI-based solutions such as EasyModel AI, AI Filter and VisionLine Detect. "When setting up series production, the most important thing is to have reliable, reproducible processes, but speed is also crucial," says Weller. "Every day in development costs money and delays market launch." Weller and his team are already using EasyModel AI for small series and sample parts, which has previously been to cumbersome. There are also other processes at ElringKlinger where Weller can imagine EasyModel AI being used: "I see great potential for the solution in all those places where many welding positions have to be set within tight tolerances."

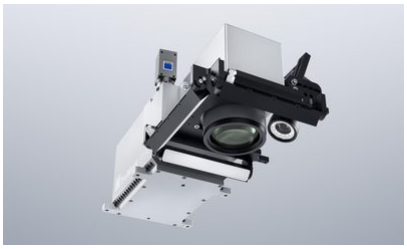
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## EasyModel AI

Variable environmental conditions such as contamination on the fixture, reflections from the component or changing lighting situations make characteristic recognition more difficult for positioning of the laser beam. The solution: Artificial Intelligence. EasyModel AI is a cloud-based AI training platform that allows even users without programming skills to easily label data. Just a small amount of training data is enough for powerful AI models. These can be used with the AI Filter option for VisionLine Detect. Experience the difference and benefit from the EasyModel AI combined with TRUMPF image processing.

Zum Produkt



## VisionLine Detect

TRUMPF VisionLine image processing helps to prevent errors in components. Camera-based image processing always maintains an overview in cutting and welding applications. VisionLine automatically detects the position of the components and transmits this information to the control. The 3D information created via sensor can be used to position and check the component characteristics, such as the height difference between two components.

Zum Produkt

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