

WELDWATCHER®

Automated Online Monitoring of Laser Processes



A WHOLE DIMENSION AHEAD.

YOUR BENEFITS

Our customers value a fully tailored and completely integrated solution to their requirements. We reduce maintenance to a minimum by lowering the amount of required sensors for the sake of simplicity.

Monitoring

The system automatically evaluates the stability of your laser process. It helps to systematically reduce scrap and down time.

Installation

We take care of the commissioning. A thorough training enables you to operate the system by yourself or with remote assistance of our experts.

Integration

The data communication with the machine is available for all common field bus types. For the optical readout of the process radiation we can choose from a variety of different adapters.

Traceability

The WELDWATCHER® automatically stores all incoming data assigned to seam IDs in a database, which you can easily synchronize to your network.

Handling and Visualization

The WELDWATCHER® visualizes each individual part and marks all areas found to be NOK. Attach our VISU**STATION** for a centralized rework and inspection station.

Service

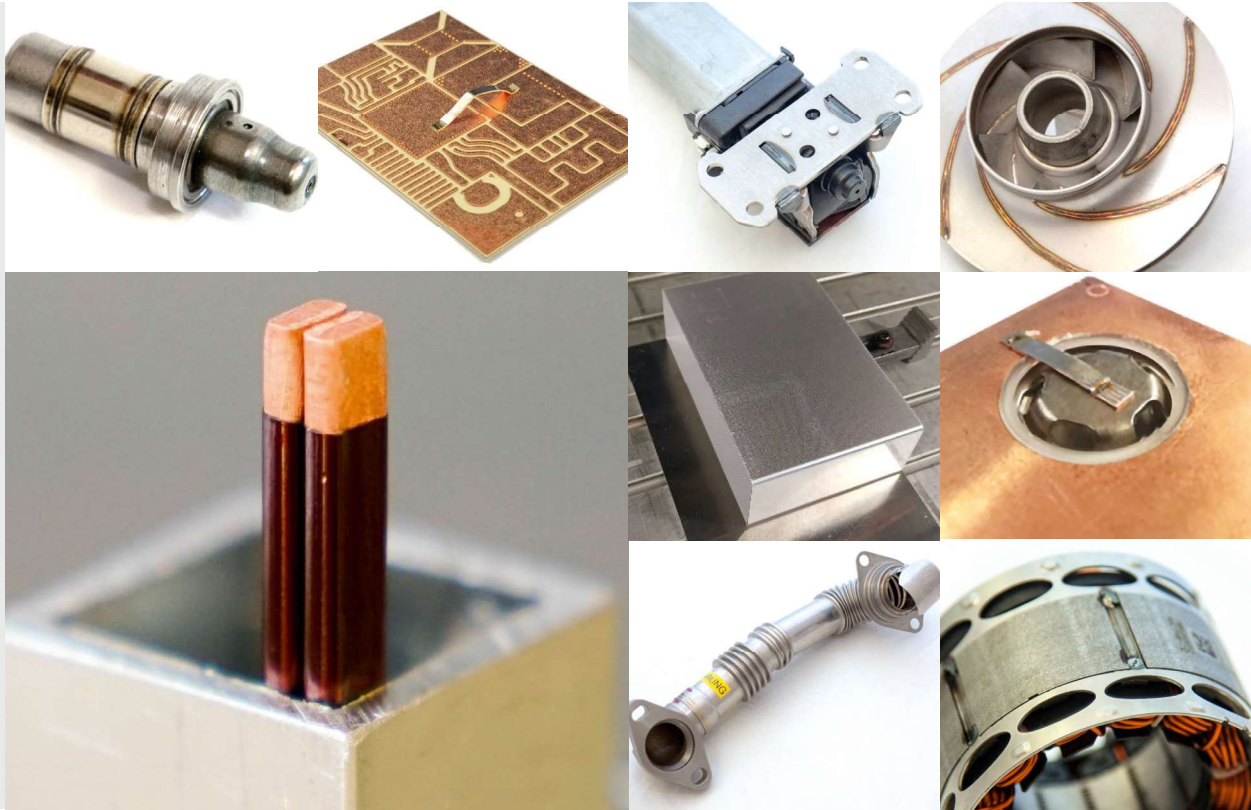
We provide on-site, remote and tandem service worldwide. On-site service is available in most countries through our partner network.



APPLICATIONS

With experience in 27 years of installing process monitoring solutions worldwide we cover almost any laser application. Simply contact our experts to review your requirements and discuss solutions that are right for your application.

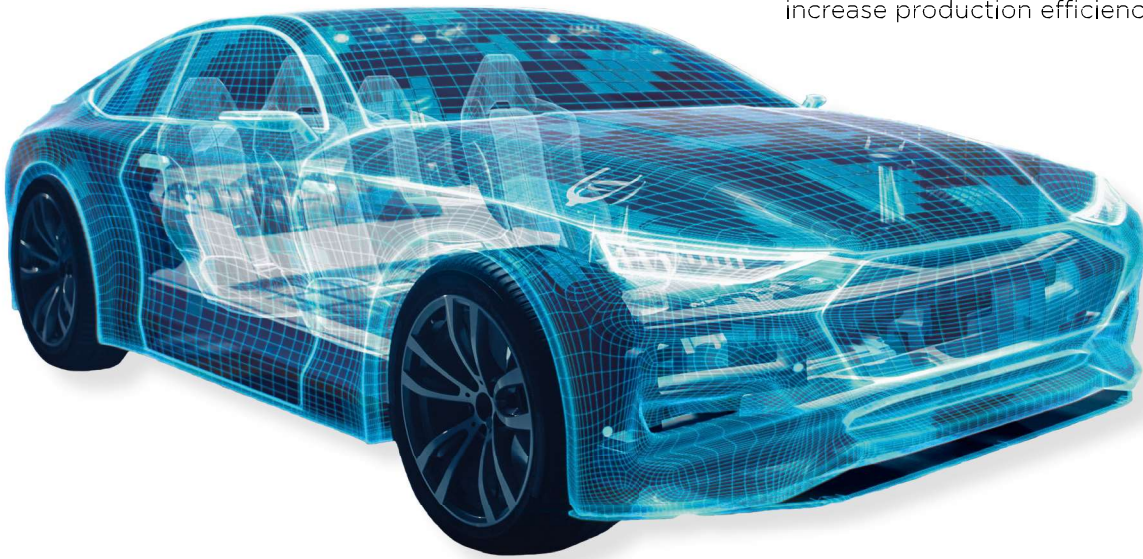
We would be happy to visit your location in order to better understand your process and determine how our solutions might meet your expectations. More information on select applications on www.4d-photonics.com.



E-MOBILITY

In the past years we've learned that the requirements of e-mobility applications are quite similar compared to our original core business especially when it comes to cycle times. Hundreds of WELDWATCHER® systems in the automotive seating industry monitor thousands of welds each day. Scanner-based laser welding is extremely quick and the online process monitoring solution must follow these speedy requirements.

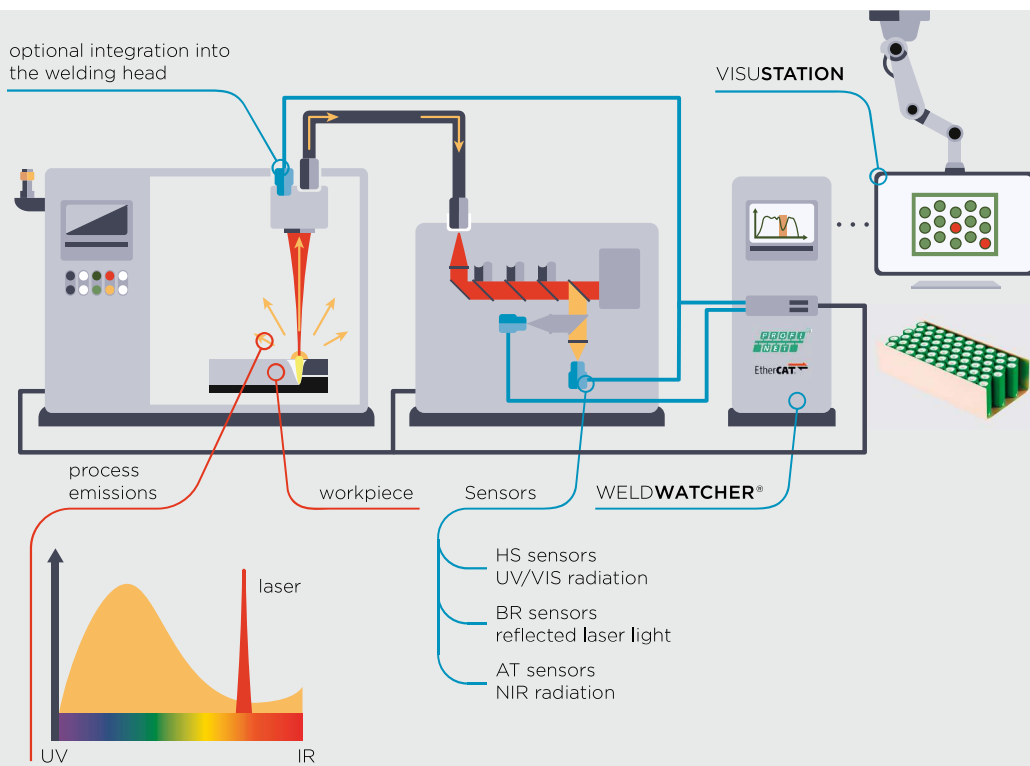
Like in the seating industry, many applications in e-mobility require very high processing speeds as well. When thousands of welds in batteries or hairpin motors have to be welded, manual inspection of the results is no more an option. Customers value the reduction of time-consuming inspection steps like destructive testing or CT-analysis by implementing a real-time process monitoring solution for their welding and ablation processes. By merging the data of sequential production steps, users additionally profit from holistic overviews of each produced battery module or of each motor. And like in the seating industry, periodic statistics help to increase production efficiency for each machine.



HOW IT WORKS

The WELDWATCHER® integrates seamlessly into your fully automated production line. It acquires the intensity of process light over time and indicates typical welding faults, such as gaps between sheets, lack of fusion or pores by analyzing the beam flux density, spectral components and the progress in time.

At the laser welding process a partially ionized metal vapor occurs. This vapor escapes from the weld pool and emits a broadband light, the so-called process light. Its characteristics like spectrum and intensity correlate with many properties of the process.



#BAYWATCHER



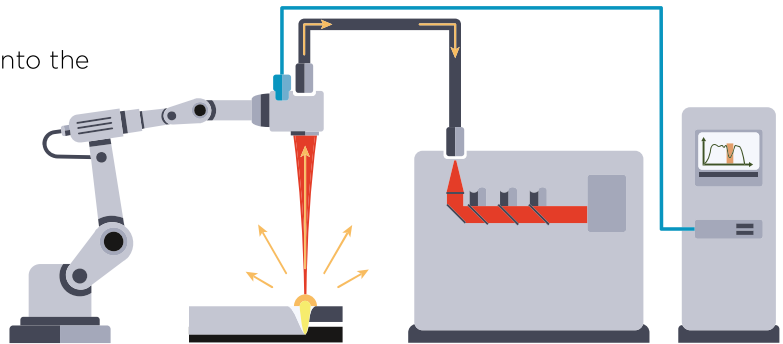


Our “BAYWATCHER” in action on the coast of the Baltic Sea during our 4D team seminar in Kühlungsborn

INTEGRATION OPTIONS

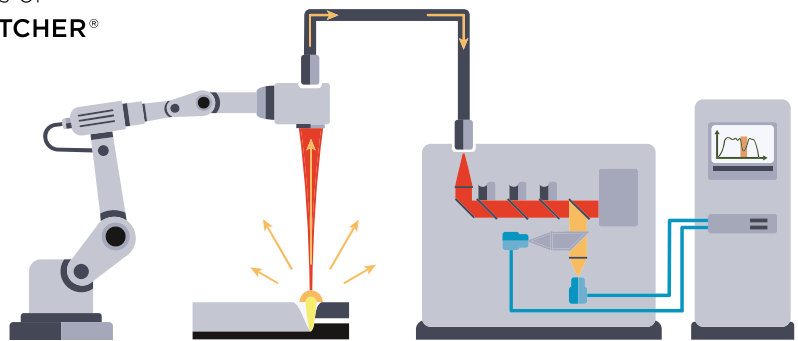
A: One WeldWatcher® per Head

In some cases the handy integration into the laser is not possible due to technical reasons. In these cases we integrate the sensor(s) into the optical welding head directly. Adapters for all common brands are available.



B: Only one WeldWatcher® per Laser

In most cases the integration into the laser offers a lot of advantages. For example, with the capability to monitor all optical paths of the laser source, only one WELDWATCHER® is required. Additionally, many of our customers value the absence of cables and additional sensor housings at the optical head due to better freedom of action.



SENSOR TECHNOLOGY

Our sensor families cover the full spectrum from UV/VIS (a.k.a. “plasma”), back reflection to NIR (a.k.a. “temperature”), each available with different sensitivities. All sensors can quickly be adjusted by software during production. We combine or mix multiple sensors in cases where a single sensor does not provide sufficient data for a profound OK/NOK evaluation. In most cases we can maintain the full functionality of your camera or OCT devices.

Universal Sensor

For most applications our Universal Sensor housings provide an economic solution especially for unmoved optics or for the integration into the laser source or beam switch. This method eliminates bulky integrations at the processing heads and the use of expensive torsion proof robot cabling.

Fiber Sensor

The Fiber Sensors are applicable to common types of fiber lasers. They offer the unique advantages of sensors in lasers without the need of a beam switch: free movement of your optical heads and clean environment in the laser. They monitor the whole optical path and there are no cables to be aligned in your handling devices.

Compact Sensor

Our Compact Sensors are designed for the direct integration into welding heads. They provide IP67 sealed housings and connectors. Rigid robot cables and adapters for most welding heads and scanners make these sensors the #1 choice wherever an integration into the laser is not possible. It comes with pre-installed 2-channel setup. Our WELDWATCHER® can evaluate both channels or mix it to 1 evaluation channel depending on your requirements.

Universal Sensor



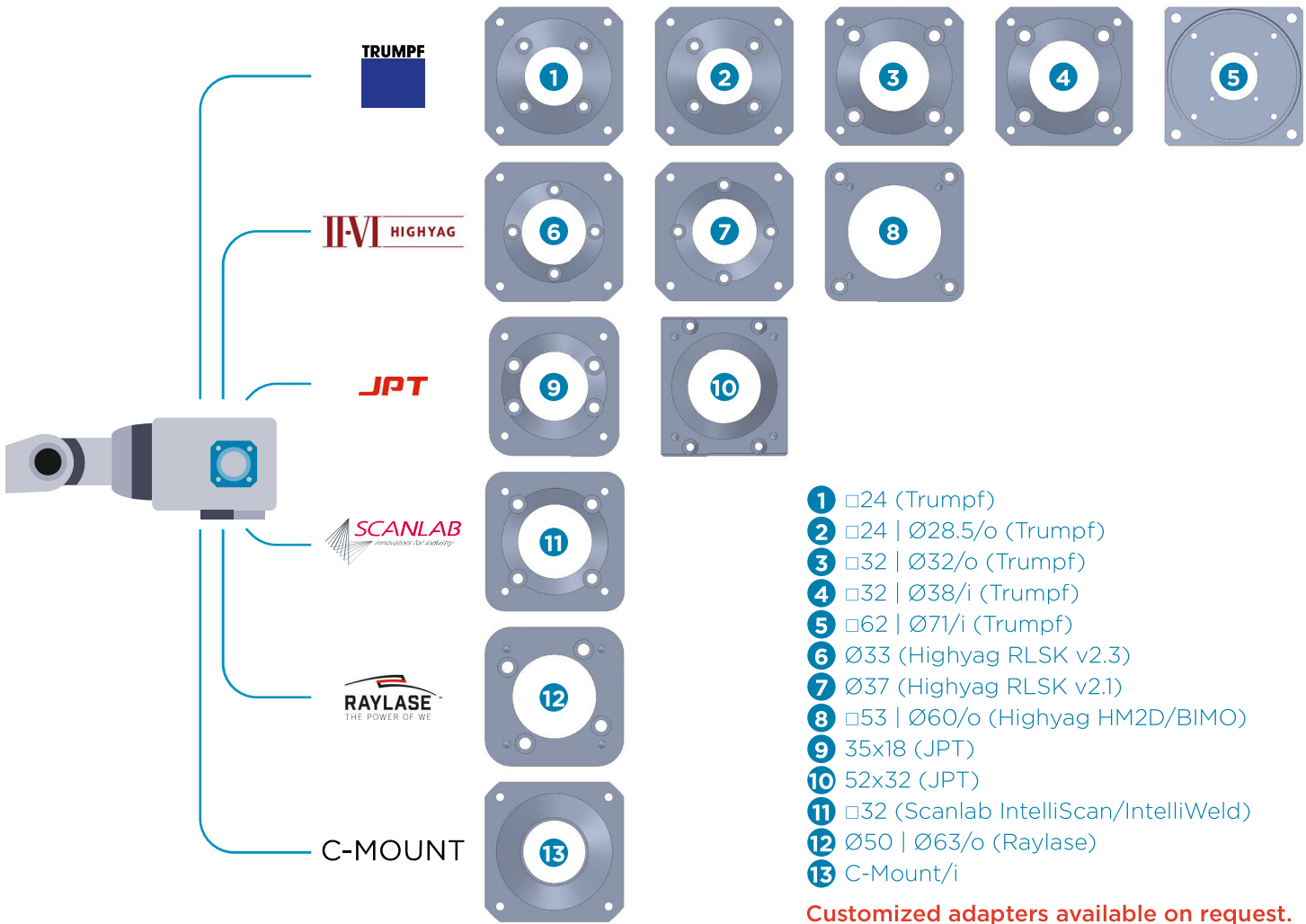
Fiber Sensor



Compact Sensor



INTEGRATION INTO (ALMOST) ANY HEAD



OUR ADAPTERS FOR COMPACT SENSORS

Picking and integrating the right adapter for your application is part of our free service. Our engineers will go through your technical setup together with your team.

As soon as we found the right options we provide optional on-site feasibility studies. A thorough report helps to convince yourself to which extent the WELDWATCHER® solution will be beneficial for your productivity.

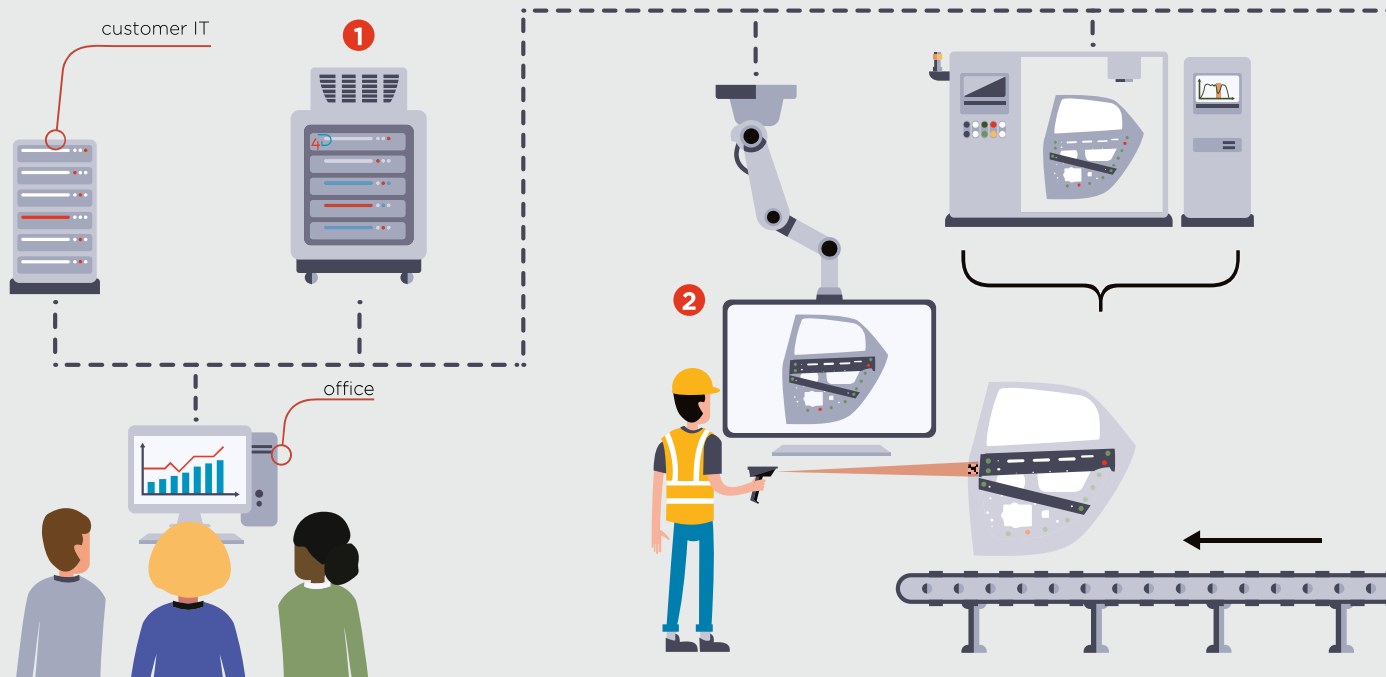


NETWORK

Fully automated process monitoring provides great production data. Beyond our onboard solutions for statistics we supply solutions for data mining of multiple machines and pre-conditioned data for long-term storage and traceability on your IT-systems.

1 4D DataCenter Solution

For very large databases and multiple connected WELDWATCHER® devices the 4D DATA-CENTER solution provides multi-core server power you can rely on. We recommend to use it as a relay server on production level before the data is stored to your IT-network for data retention at very high loads.

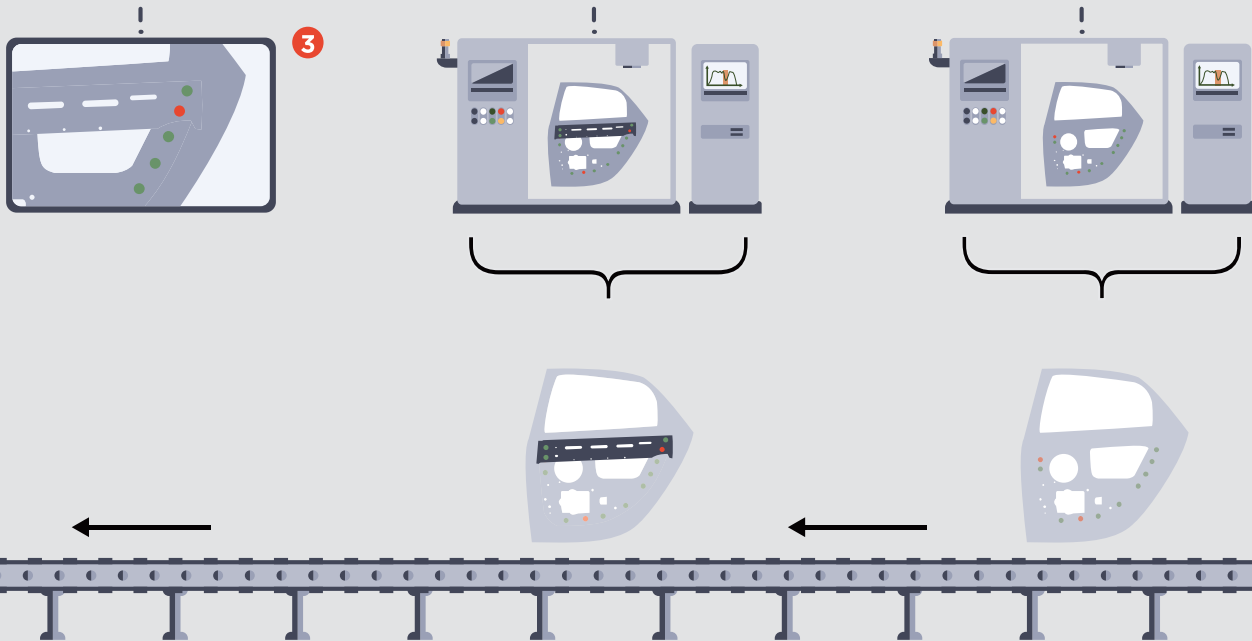


2 VisuStation

When multiple production steps or multiple lines need to be monitored, our VISU**STATION** provides an easy integration into your inspection or rework station. It simply stores all data of all attached WELD**WATCHER**® systems and comes with optional inputs for handheld scanners, field bus or keyboard input to quickly locate the flagged NOK seam on the workpiece.

3 InlineView®

Sometimes it is necessary to provide the results of the WELD**WATCHER**® at a distant location. **INLINEVIEW**® provides a web user interface to easily visualize the workpiece with its results on an additional display. Our customers use this option to directly inform handling workers about the workpiece condition.



WHO WE ARE

4D Photonics combines over 25 years of experience in laser technology with customer-oriented solutions. We develop and manufacture customized systems for laser pro-

cess monitoring. Customers use these **WELDWATCHER®** systems to monitor their laser processes in real-time worldwide.

WORLDWIDE SERVICE.

Currently our global service network consists of 20+ trained process monitoring specialists, who are backed up by our own experts. Depending on your region, language and type of application we recommend your local partner

for immediate on-site support. In many cases we can quickly assist our customers remotely. Every **WELDWATCHER®** is equipped with remote connectivity. Simply provide internet access and help is on the way.





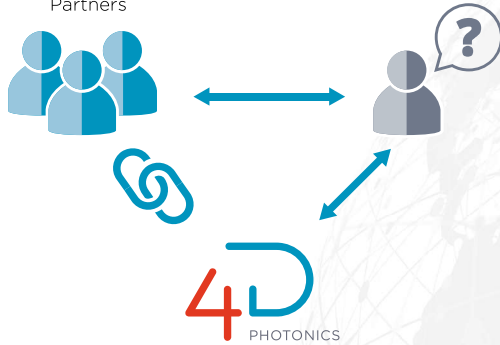
VISION

OUR VISION FOR PROCESS
MONITORING IN AN INCREASINGLY
COMPLEX WORLD OF PRODUCTION:

**LET'S SET NEW STANDARDS
WITH EASY SOLUTIONS TOGETHER**

YOUR EXPERT NETWORK

Sales and Service
Partners



YOUR CONTACT

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