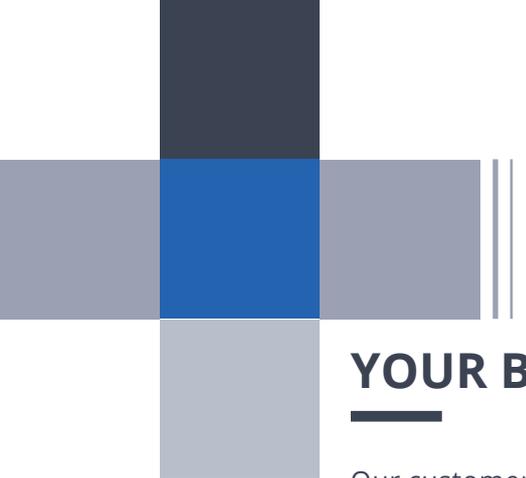


WELDWATCHER[®]

Automated Online Monitoring
of Laser Processes

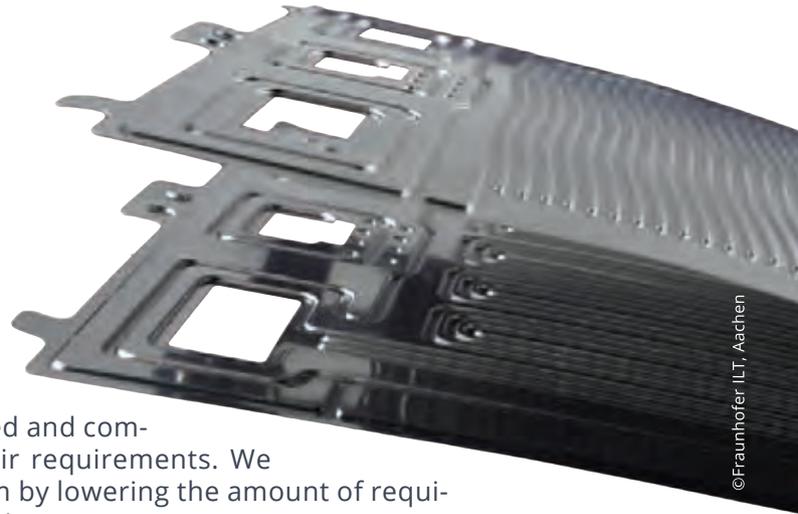
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YOUR BENEFITS

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.



©Fraunhofer ILT, Aachen

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 *VisuStation* 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.

BENEFITS

APPLICATIONS

With nearly 1.500 systems installed worldwide, we have a lot of experience in all sorts of laser processes. Simply contact our experts to review your requirements and discuss solutions that are right for your application.

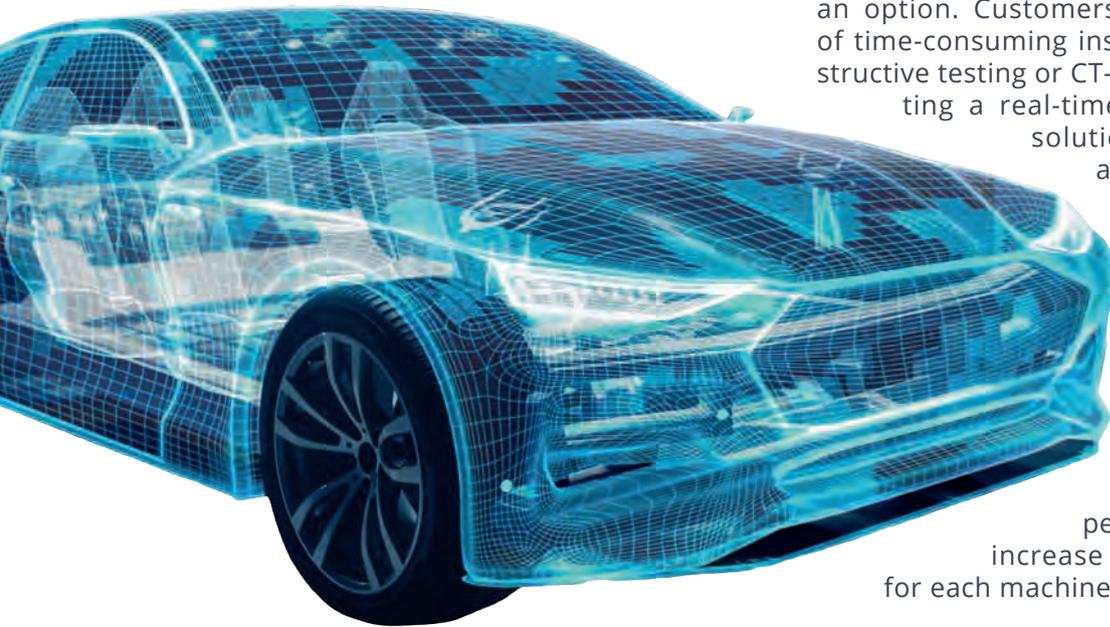
We would be happy to visit your location in order to better understand your process and determine how our solutions might meet your expectations. More information on some of the applications on www.4d-gmbh.de.



APPLICATIONS

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 on-line 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.

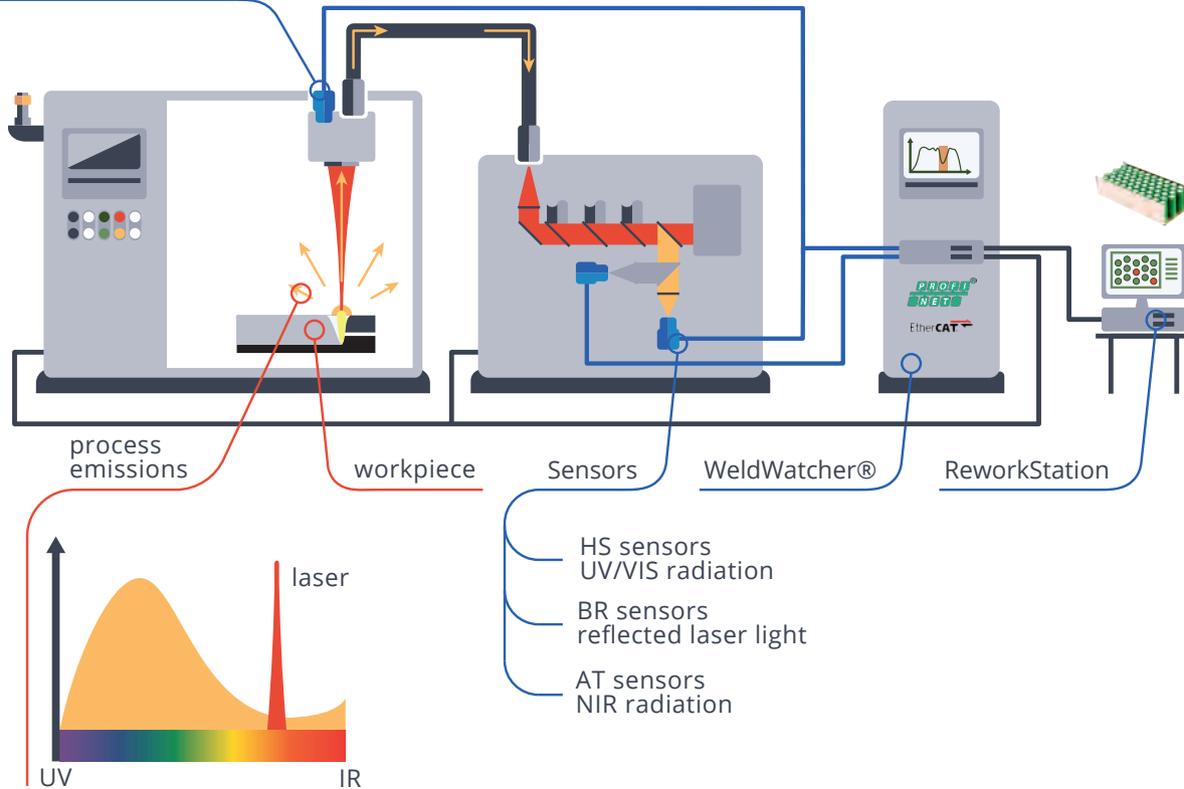
E-MOBILITY

HOW IT WORKS

The *WeldWatcher*® integrates seamlessly into your fully automated production line. It acquires the amount of process light over time and indicates typical welding failures, 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.

optional integration
into the welding head

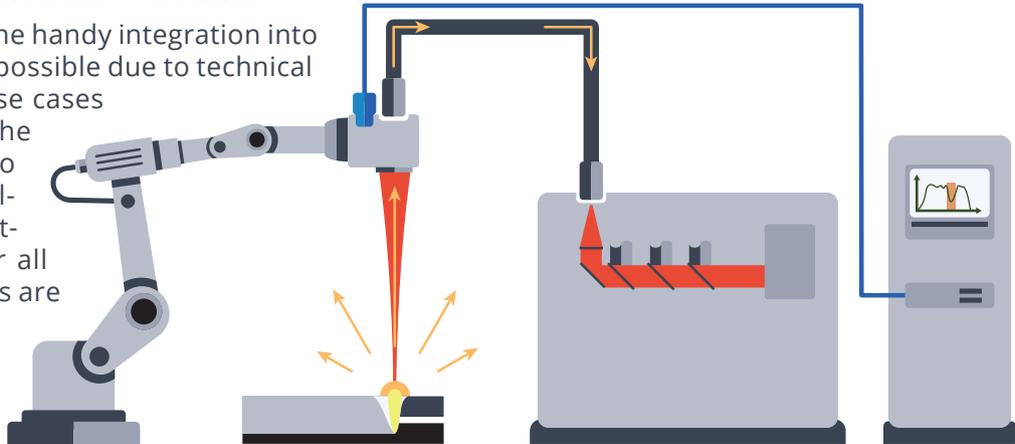


HOW IT WORKS

INTEGRATION OPTIONS

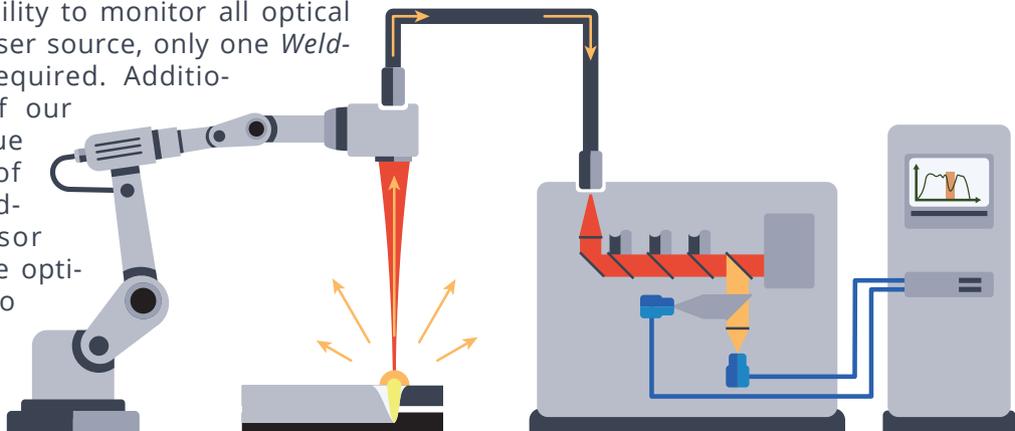
A: ONE WELDWATCHER® PER HEAD

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 *Weld-Watcher®* 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.



INTEGRATION

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.

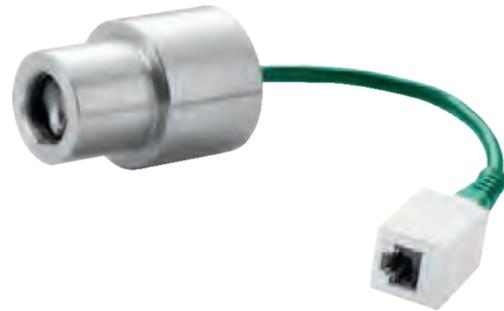
UNIVERSAL SENSOR

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.



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.



FIBER SENSOR

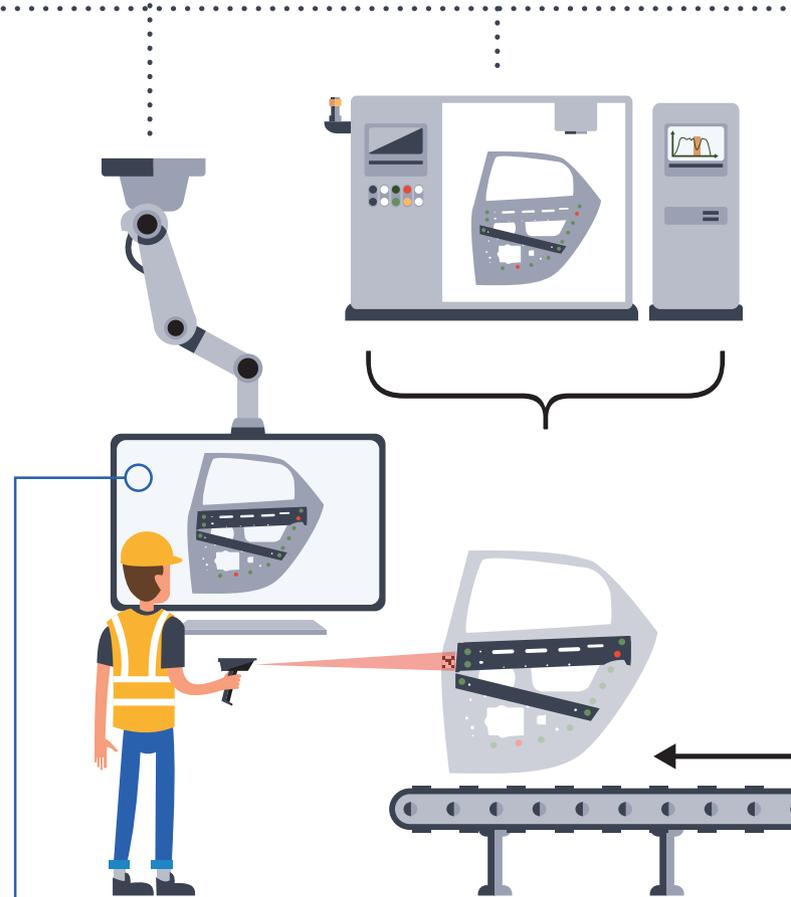
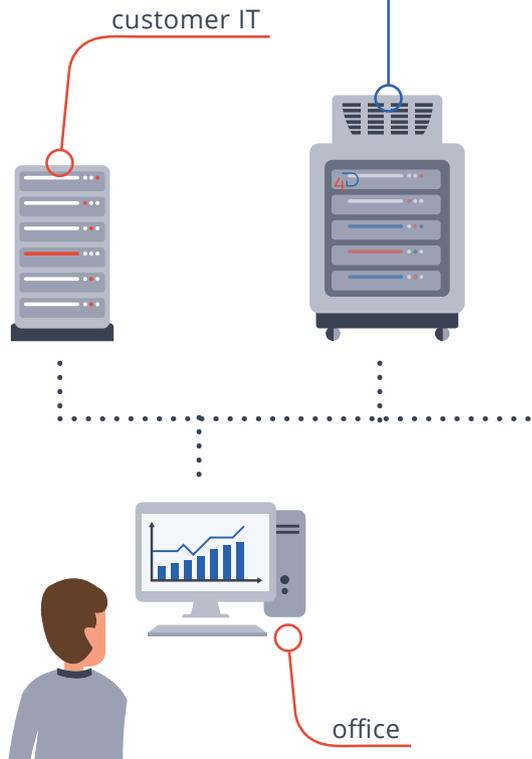
The Fiber Sensors are applicable to common types of fiber lasers. They offer the unique advantages of sensors in lasers without the need of a beam switch: Free movement of your optical heads and clean environment in the laser. They monitor the whole optical path and there are no cables to be aligned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



SENSORS

4D DATACENTER SOLUTION

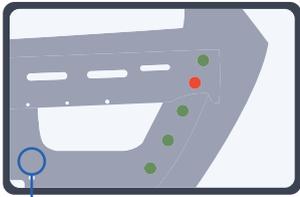
For very large databases and multiple connected *WeldWatcher*® devices the *4D DataCenter solution* provides multi-core server power you can rely on. We recommend to use it as a relay server on production level before the data is stored to your IT-network for data retention at very high loads.



VISU STATION

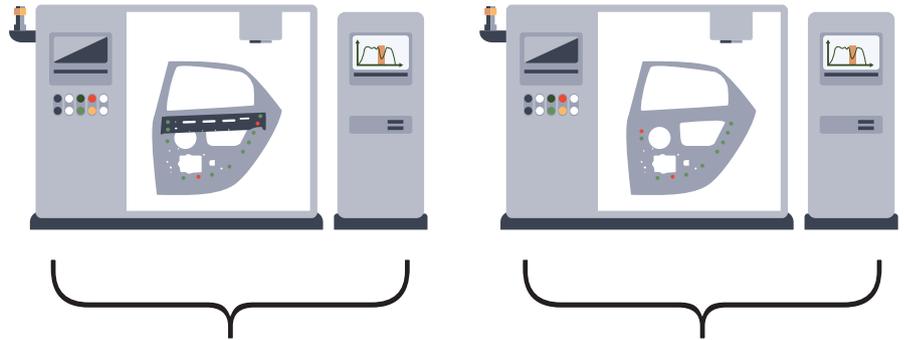
When multiple production steps or multiple lines need to be monitored, our *VisuStation* provides an easy integration into your inspection or rework station. It simply stores all data of all attached *WeldWatcher*® systems and comes with optional inputs for handheld scanners, fieldbus or keyboard input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

NETWORK



INLINEVIEW®

Sometimes it is necessary to provide the results of the *WeldWatcher®* 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.



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.

WHO WE ARE

4D combines 25 years of experience in laser technology with customer-oriented solutions. We develop and manufacture customized systems for laser process monitoring. Customers use these *WeldWatcher*® systems – nearly 1,500 in total – to monitor their laser processes in real-time worldwide.



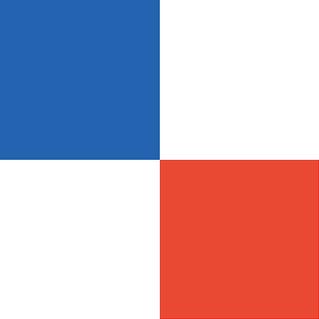
SERVICE



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.



WHO WE ARE



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

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

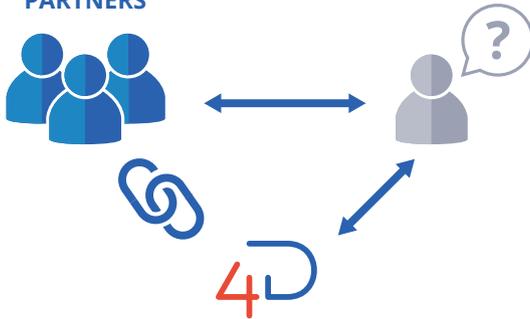
VISION

YOUR CONTACT

We operate worldwide with different Sales & Service partners. Ask for your options for a local partner via mail info@4d-gmbh.de or simply call us **+49 511 23 59 47 0**.

YOUR EXPERT NETWORK

SALES AND SERVICE PARTNERS



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