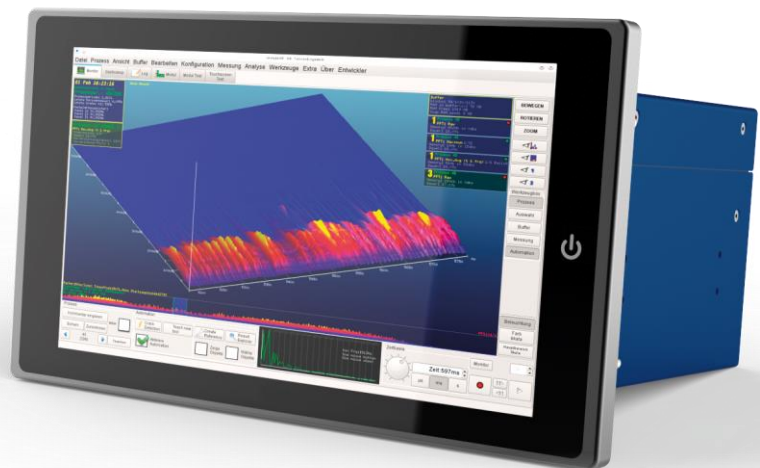


Process Monitoring Bundle

...your tool for contact-free
acoustic process monitoring



Functionality

Detection and analysis of acoustic process signatures up to 1 MHz through air

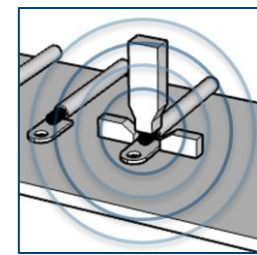
The optical microphone enables true non-contact monitoring of industrial processes. It does not require solid or liquid coupling, nor does it rely on direct optical access to vibrating surfaces.

High frequency acoustic emissions travel only a few tens of centimeters in air. An optical microphone placed in proximity to the process, listens directly to its ultrasound emission, while background noise from the environment is strongly suppressed.

Acoustic signals feature a slim data stream. This allows the implementation of powerful real-time analysis and machine learning methods. 3D-pattern recognition algorithms can automatically separate "good" from "bad" acoustic signatures, enabling 100% process quality control at every stage in the production line.

Features

- ✓ 100% in-situ, real-time process monitoring
- ✓ Identification of process irregularities, cracks, defects, and more
- ✓ Immune to audible noise from neighboring machines and to electromagnetic interference
- ✓ Compact sensor size ensures straightforward integration into existing machinery
- ✓ No coupling to the processed components needed



Process signal



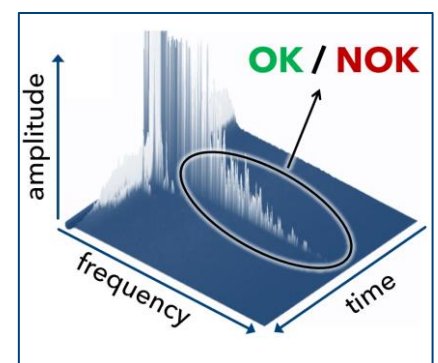
Signal detection



Acquisition & analysis



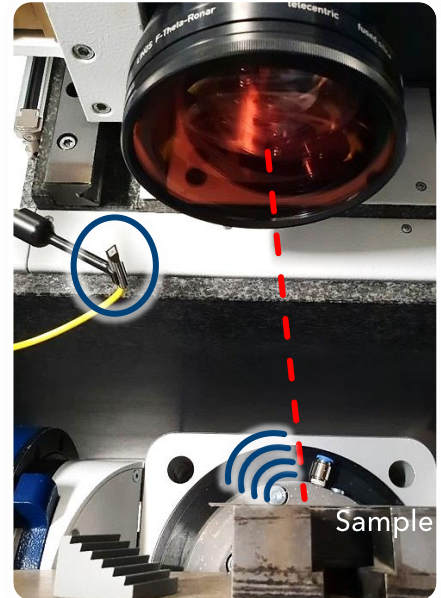
Result



Contact-free Acoustic Monitoring

Laser Processing

The airborne ultrasound emission can be harnessed to monitor the quality of industrial laser material processes, e.g. laser welding, structuring or cutting as well as additive manufacturing such as powder bed fusion and direct energy deposition in real-time.

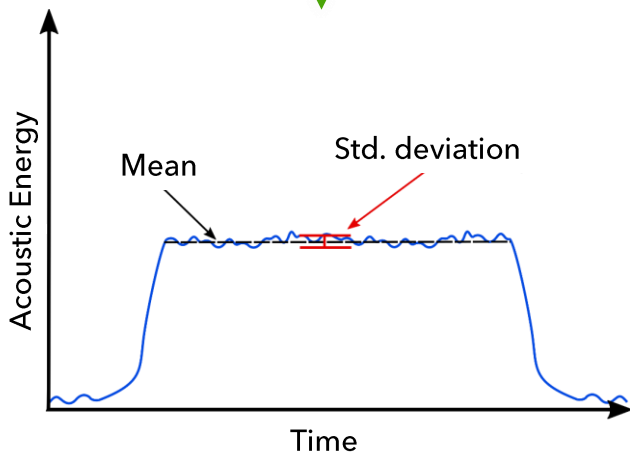


Laser Structuring of Steel Surfaces



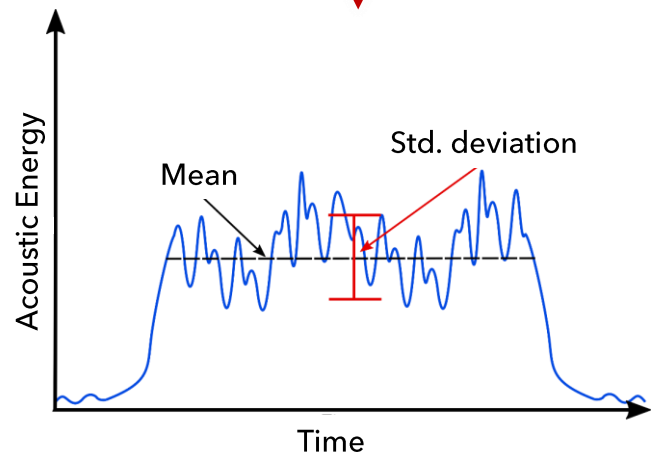
OK surface ✓

Correct laser parameters lead to signal with **low variance**



NOK surface ✗

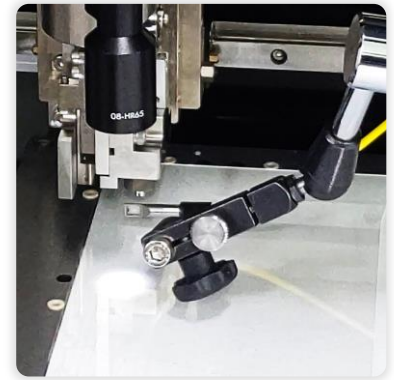
Incorrect laser parameters lead to signal with **high variance**



Contact-free Acoustic Monitoring

Hearing The Difference

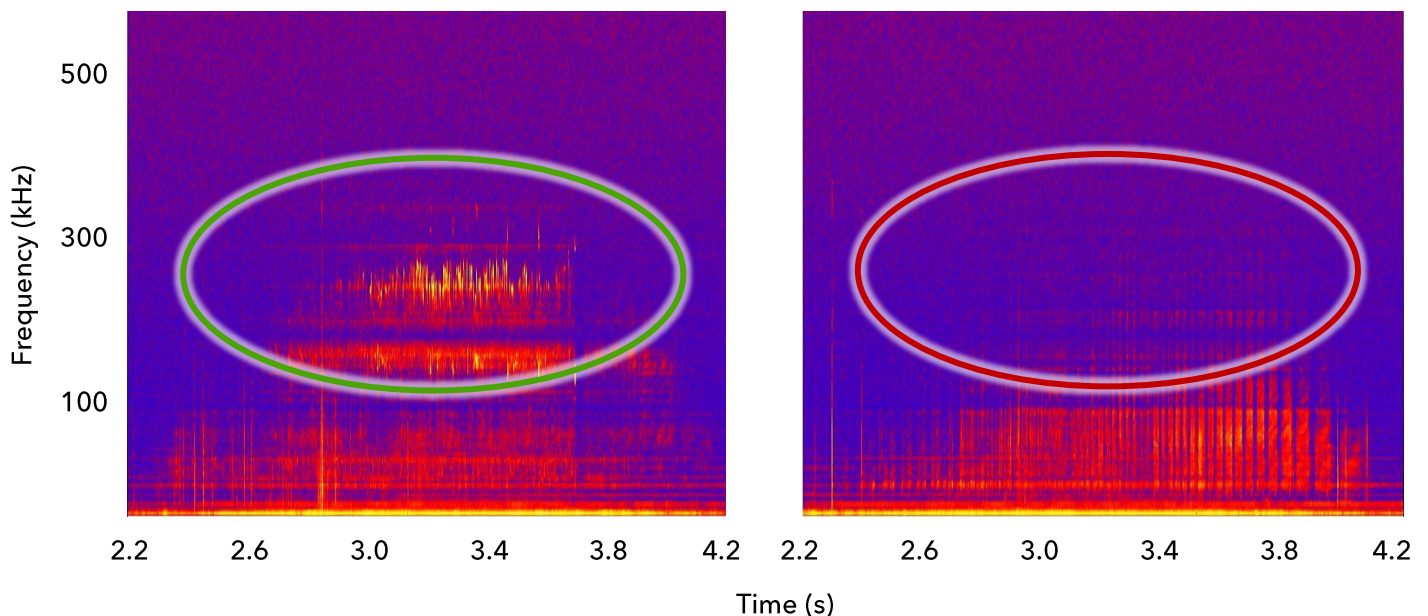
Broadband detection of a process's ultrasound emission in air can reveal tool wear, surface conditions, process irregularities and more. Harnessing the acoustic signature in the high ultrasound range allows for analysis free from audible background noises.



Change in Ultrasound Signature during Glass Processing

New Wheel ✓

Old Wheel ✗



Contact-free Acoustic Monitoring

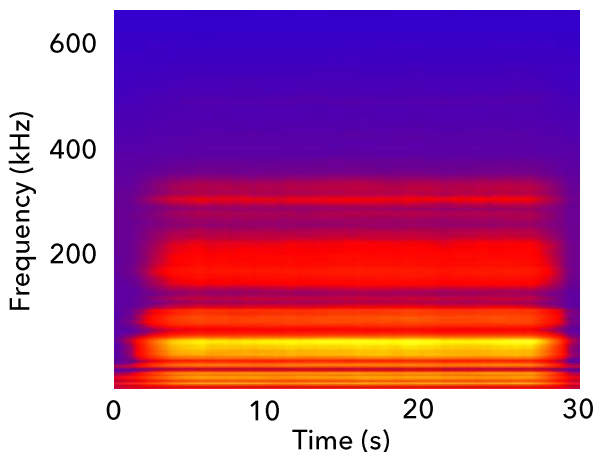
Tool Wear

XARION's optical microphone enables monitoring of a tool's sharpness by analyzing the acoustic emission in air during dry processing. Sharp tools exhibit a more intense broadband acoustic emission compared to dull tools.

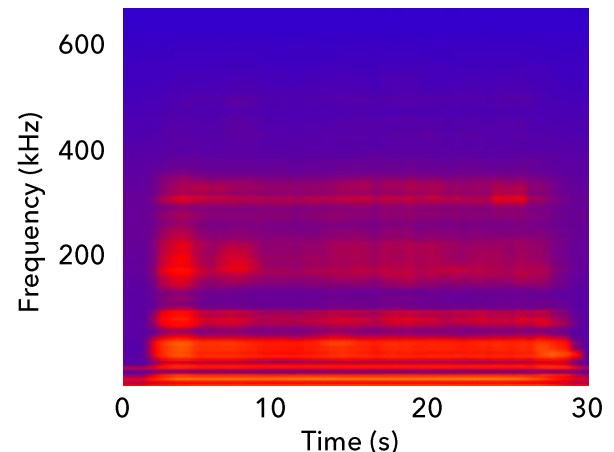


Tool Sharpness Monitoring

Sharp tool ✓



Dull tool ✗



Specifications

Contact-free Acoustic Process Monitoring System

Sensor hardware

- ✔ **Eta250 Ultra Optical Microphone**
 - Bandwidth 10 Hz - 1 MHz for airborne acoustics
 - Compact fiber-coupled sensor head (5 mm diameter)
 - Analog voltage output, designed for 50 Ohm and high impedance
 - Customizable cable length (standard: 5 m)
 - Sensor mounting system for sensor positioning in process environment



Data acquisition

- ✔ **HF-MES Data Acquisition and Analysis System**
 - FPGA-based real-time full spectrogram display with up to 30,000 spectra per second
 - Hour-long streaming with up to 4 MHz / 24 bit and 6 TB storage
 - Industrial communication buses and raw data export
 - Onboard data analysis, e.g. energy calculation and pattern recognition
 - Rugged, transportable casing

