non-contact measurement of vibrations
compact distance sensor for predictive maintenance, Industry 4.0 and IIoT

- non-contact: access small, blocked, moving, hot, wet targets
- no wiring or batteries, no downtime for installation
- operating distance 0.5 mm to 3,000 mm
- small form factor
- suitable for high volume applications
- immune to ambient and environmental noise
- wide bandwidth, also for ultra-low vibration frequencies
With the newly developed VocalZoom sensor, vibrations – e.g. from machine parts – can be measured and analyzed without contact. The optical measuring method based on a self-mixing laser diode (SMLD) enables the sensor to achieve high resolution and accuracy over a measuring distance of 5 mm to 3 m. Advanced measurement technology and data processing in a dedicated ASIC on the sensor board ensure that the usable data is directly available at the sensor output and can be transferred to a PC via an HDMI or USB connection for further analysis.

The very compact VocalZoom sensor (15 × 6 mm) allows contactless measurement of vibration (speed and position) from a distance of up to three meters. A single machine can also be easily monitored with several sensors targeting at different spots without the need for expensive and time-consuming cabling. Downtimes for sensor installation are just as unnecessary as certified machine technicians. Because the sensor works without contact, any surface and any material can be measured – even very small, inaccessible or moving targets as well as hot or wet surfaces. For monitoring large areas, the sensor can be mounted on a robot or drone and pointed to many targets sequentially.

The measuring method is based on a self-mixing laser diode (SMLD), in whose cavity the emitted laser light interferes with reflections from the target. With this technology, an interferometer can be realized, recording these interferences using high-precision measurement technology and extracting the usable signal (speed and distance) in a dedicated ASIC with the aid of sophisticated signal processing. Due to this technology, the sensor does not require complex optics and operates with a simple focusing lens. With the VocalZoom sensor, vibration frequencies up to 6 kHz can be recorded as well as very slow vibration processes in an ultra-low frequency range. In addition, the interferometer is insensitive to ambient and background light or noise.

**Sensor features**

- **non-contact:**
  - access small / blocked targets
  - measure moving components
  - measure wet and hot surfaces
  - measure through glass

- **small and low-cost:**
  - cheapest sensor solution (TCO) in the market
  - small form factor to fit any configuration and geometry

- **accurate:**
  - laser accuracy is better than mechanical sensors
  - immune to ambient and environmental noise

**your customized solution**

AMS Technologies’ technical experts are happy to support you with tailoring a non-contact vibration sensing solution exactly to your needs. As an experienced solution provider, AMS Technologies has the resources to:

- **ruggedize the sensor**
- **design and manufacture customized sensor housing and/or mounting solutions**
- **integrate the sensor with electronic components, including customized wired or wireless interfaces to your application**

Contact AMS Technologies with your requirements today!
evaluation kit EVK

With the EVK evaluation kit, interested parties can evaluate all functions of the VocalZoom sensor. For easier handling, the sensor is housed in a case with a standard tripod socket (1/4” UNC), allowing the unit to be mounted on a variety of commercially available tripods and brackets. A 150 cm micro HDMI cable connects the sensor case to the interface unit, which in turn provides a USB interface to a PC. The EVK is supplied with software for recording, displaying, analyzing and storing sensor data (speed and distance).

evaluation kit EVK features

- sense vibrations, distance and velocity by aiming the laser to a target
- acquire data using simple to use application (included)
- data acquisition: single capture / continuous
- visualize signals in time or frequency domain:
  - velocity waveform
  - FFT (velocity spectrum)
  - distance waveform
- get sensor signal quality indication
- easy to install enclosure with standard (1/4” UNC) tripod connection
- streaming SPI data (from sensor) over USB
- internal SD card – supports pre-programming of data recording scheme, up to 24 h of data
- USB power connector (for usage with external power bank)
- EVK contents:
  - packaged module:
    - short range (EVK SR - AS02500) or far range (EVK FR - AS02400)
  - interface box: Micro-HDMI input (from sensor) and USB output (to PC)
  - 150 cm Micro-HDMI cable (interface box to sensor)
  - VZ data acquisition and basic analysis software
  - IR card (optional) for laser spot localisation on the target

application and target markets

predictive maintenance – measuring and analyzing vibrations of:
- motors
- conveyor belts
- water pumps
- bearings
- gear boxes
- …

target markets:
- electric engines (retrofit on large installed base of residential airconditioning units; contactless access to best location for measuring bearing failure in electric motors; works even on very small devices like servo engines; measuring of multiple fans in large data centers with one contactless sensor on a robot)
- oil and gas (vibration-based flow meters; sand detection in pipes, steam pressure measurement on hot pipes; rotating drillers & driller bits – moving, dirty and wet components)
- energy (retrofit of sensing on existing power transformers and turbines; avoids unacceptable downtime for installation; works even on hot turbines and demanding regions for sensor wiring; multiple sensors on one transformer or turbine provide a large amount of valuable data)
- food, pharmaceuticals, consumable goods (motion sensing; leak detection in pipes; contactless sensing of moving parts in large process plants)
enabling your ideas.
Optical, Power and Thermal Management Technologies

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