ASAM Modules for Machinery and Structural Monitoring

Technology white paper
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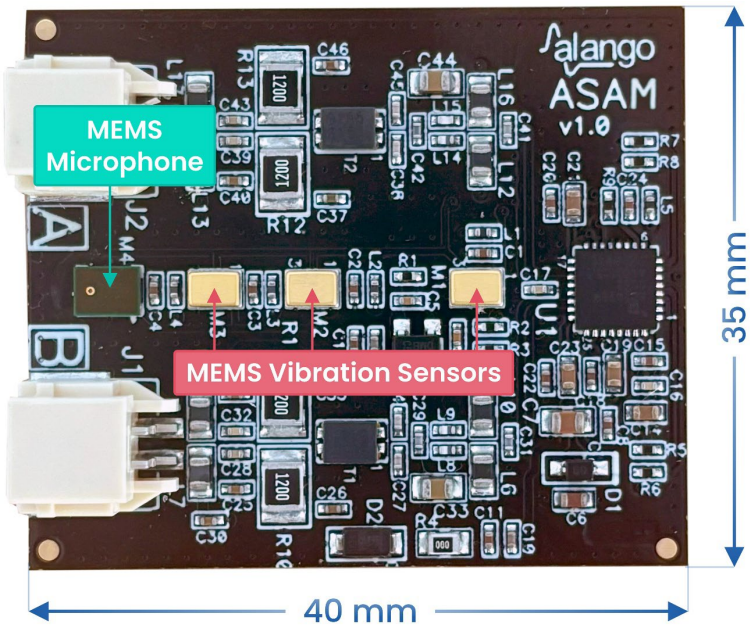
Overview

Alango Sound Acquisition Modules (ASAM), powered by Vibrozio™ DSP technology, provide a new class of non-invasive acoustic sensing for predictive maintenance and structural monitoring. Unlike traditional vibration sensors or contact microphones integrated within the monitored equipment, ASAM modules acquire sound generated within machinery or structures through the external surface.

This enables early detection of anomalies that may not manifest as strong mechanical vibrations—such as air leaks, fluid turbulence, bearing wear, or friction noise.

ASAM Hardware Snapshot

The image below shows the ASAM v1.0 wired module. It includes three embedded vibration sensors, a microphone and dual connectors for chaining multiple units via twisted pair cable. No external power supply is required. Designed for non-invasive acoustic monitoring of machinery and enclosures.



Wireless modules are under development now.

ASAM modules can be customized on a customer request to fit specific cost, size, connectivity or performance requirements.

Key Differentiators

- **Non-Invasive Deployment:** ASAM sensors mount externally and require no intrusion into machinery or removal of panels.
- **Multi-Sensor Array:** The default ASAM configuration includes three vibration sensors to enhance SNR in low-vibration scenarios. Custom designs can scale sensor count to balance cost and performance.
- **Daisy-Chainable Architecture:** Multiple modules can be linked using a single twisted pair cable, simplifying installation in large or distributed systems.
- **Compact, OEM-Friendly Design:** Easily integrated into enclosures, junction boxes, or third-party monitoring platforms.
- **Combined with Alango proprietary Vibrozio DSP technology**, it enables filtering out irrelevant vibration components induced by ambient noise, enabling clean acquisition of internal signals.

Use Cases

- **Rotating Equipment Monitoring:**
  Detect internal wear in motors, fans, pumps, compressors
  Capture early audio signatures of bearing degradation or lubrication issues
- **Fluid and Gas Flow Systems:**
  Detect turbulence, leaks, or cavitation through pipe walls
  Monitor valves and actuators for stick-slip or mechanical fault
- **Low-Vibration Machinery:**
  Complement vibration sensors for equipment that produces minimal movement but emits sound (e.g., electronics, precision machines)
- **Hazardous or Inaccessible Zones:**

Monitor equipment located behind shielding, in pressurized zones, or where maintenance access is limited

- **Structural Health Monitoring:**
  Capture acoustic signatures of structural fatigue, cracking, or delamination in mechanical assemblies
- **Semiconductor Fabs:**
  Detect leaks or anomalies in cleanroom gas and vacuum line infrastructure

Benefits

- Improves detection sensitivity for a broader class of failure modes
- Enables earlier and more accurate fault detection
- Reduces unplanned downtime and maintenance costs
- Provides additional sensing modality for AI-driven predictive models

Application Fields

- Industrial manufacturing (process lines, robotics, automation)
- HVAC and building management systems
- Energy and utilities infrastructure
- Aerospace and transportation equipment

Contact Alango Technologies

To explore integration, evaluation, customization or co-development with ASAM modules for industrial or structural monitoring, please, contact us via https://alango.com or write to asam-modules@alango.com