

FTO Checker

Freedom to Operate — Preliminary Report

Thanks for using **FTO Checker**! Our goal is to help you kick-start your freedom to operate search with modern AI and prepare meaningful discussions with patent professionals.

This report highlights existing patents that may be technically relevant to your invention, using multiple, complementary search strategies.

It also includes a short summary of recent **scientific** and **general web** publications related to your invention, so you can stay aware of emerging trends, opportunities, or concerns in the technical landscape.

We have attached a CSV file listing all currently active patents surfaced by FTO Checker based on their overlap with your invention — beyond the top 10 detailed in this report.

Enjoy the read!

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Your invention description

"A compact embedded module for continuous vibration monitoring in industrial equipment. It includes a MEMS accelerometer, onboard signal conditioning, and a microcontroller running a lightweight anomaly detection algorithm (e.g. moving average, FFT-based thresholding). Data is processed locally and only anomalies are transmitted over Wi-Fi or Modbus. The system is designed to retrofit on legacy machines for predictive maintenance."

Executive summary

- **Total patents searched:** 163.6 million ([The Lens database](#))
- **Jurisdiction(s) of focus:** EP, US
- **Potentially relevant patents:** 94
- **Currently active patents:** 73
- **Patents listed below:** 10 most relevant to your invention
- **Search methods:** keywords, patent language, IPC-CPC codes, semantic analysis, inventors
- **Report date:** 2025-06-30

The patent search identified 94 potentially relevant patents, with 73 still active, indicating a moderately crowded space in the field of vibration monitoring and anomaly detection for industrial equipment. Key themes include intelligent sensors, local data processing, and predictive maintenance, with several patents emphasizing edge processing and communication protocols. The use of multiple search methods, with an average of 2.2 methods per patent, highlights the robustness of the findings. The presence of concentrated IP efforts from key players suggests competitive activity. These insights can guide the inventor in refining their innovation strategy, ensuring differentiation, and identifying potential collaborators or competitors in the market.

Your top 10 most similar patents

1. FREQUENCY-ADAPTABLE STRUCTURAL HEALTH AND USAGE MONITORING SYSTEM (HUMS) AND METHOD WITH SMART SENSORS

[View patent](#)

Publication number: 006-949-603-516-305

Jurisdiction: US

Similarity score: 67%

Search methods: patent language, inventors

Why we selected this patent: The patent was selected using the patent language method and a custom method due to its focus on intelligent sensors and anomaly detection, which connects to your invention's vibration monitoring and anomaly detection features. Both systems involve local data processing and communication for predictive maintenance, suggesting a conceptual similarity.

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2. Frequency-adaptable structural health and usage monitoring system (HUMS) and method with smart sensors

[View patent](#)

Publication number: 153-406-826-899-816

Jurisdiction: US

Similarity score: 56%

Search methods: patent language

Why we selected this patent: The patent was selected due to its focus on intelligent sensors and anomaly detection, which aligns with your invention's vibration monitoring and anomaly detection capabilities. Both systems involve processing data locally and using communication protocols for data transmission, suggesting a conceptual similarity in how they handle monitoring and data management.

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3. **Systems and methods for self-learning artificial intelligence of things (AIOT) devices and services**

[View patent](#)

Publication number: 038-064-199-715-574

Jurisdiction: US

Similarity score: 44%

Search methods: keywords, patent language

Why we selected this patent: The patent was selected using the keyword method and patent language method due to its focus on anomaly detection and edge processing, similar to your invention. Both systems emphasize local data processing and anomaly transmission. The connection lies in the shared goal of efficient predictive maintenance through advanced sensor technology and data handling.

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4. **SYSTEMS AND METHODS FOR SELF-LEARNING ARTIFICIAL INTELLIGENCE OF THINGS (AIOT) DEVICES AND SERVICES**

[View patent](#)

Publication number: 017-535-384-900-954

Jurisdiction: US

Similarity score: 44%

Search methods: keywords, patent language

Why we selected this patent: The patent was selected using the keyword method, focusing on terms like "anomaly detection" and "edge processing." It connects with your invention through its focus on anomaly detection at the edge and data transmission for predictive maintenance. Both systems aim to enhance industrial equipment monitoring, though the patent emphasizes AI-driven classification and self-learning capabilities.

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5. **Target aware adaptive application for anomaly detection at the network edge**

[View patent](#)

Publication number: 005-203-155-915-080

Jurisdiction: US

Similarity score: 33%

Search methods: semantic analysis

Why we selected this patent: The patent was selected due to semantic similarity in anomaly detection on edge devices. Both your invention and the patent focus on deploying anomaly detection locally on compact devices. While your invention uses lightweight algorithms, the patent emphasizes deep learning models tailored for edge devices without needing cloud communication.

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6. **TARGET AWARE ADAPTIVE APPLICATION FOR ANOMALY DETECTION AT THE NETWORK EDGE**

[View patent](#)

Publication number: 032-340-110-578-404

Jurisdiction: US

Similarity score: 33%

Search methods: semantic analysis

Why we selected this patent: The patent was selected due to semantic similarity in anomaly detection on edge devices. Both inventions focus on local processing for anomaly detection, though the patent emphasizes deep learning models. This connection lies in optimizing anomaly detection for edge devices without relying on external servers, aligning with your invention's goal of local processing and minimal data transmission.

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7. **ALARMING DEVICE**

[View patent](#)

Publication number: 008-082-060-724-100

Publication number: 098-002-900-724-100

Jurisdiction: EP

Similarity score: 33%

Search methods: semantic analysis

Why we selected this patent: The patent was selected due to its semantic similarity in anomaly detection and communication features. Both inventions focus on detecting anomalies and transmitting alerts, though your module is for vibration monitoring in industrial equipment. The connection lies in the shared goal of identifying and communicating anomalies for maintenance purposes.

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8. Alarming Device

[View patent](#)

Publication number: 131-415-810-146-066

Jurisdiction: US

Similarity score: 33%

Search methods: semantic analysis

Why we selected this patent: This patent was selected due to its semantic similarity in anomaly detection and communication for alerting. Both the invention and the patent involve detecting anomalies and transmitting signals, though the patent focuses more on inter-device communication.

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9. Alarming device

[View patent](#)

Publication number: 133-036-460-387-267

Jurisdiction: US

Similarity score: 33%

Search methods: semantic analysis

Why we selected this patent: The patent was selected due to semantic similarity in its focus on anomaly detection and communication between devices. It connects with your invention through its emphasis on detecting anomalies and transmitting signals, akin to your module's anomaly detection and data transmission features.

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10. System and methods for monitoring machine health

[View patent](#)

Publication number: 156-173-448-672-212

Jurisdiction: US

Similarity score: 22%

Search methods: keywords, patent language

Why we selected this patent: The patent was selected using the keyword method and patent language method due to its focus on sensor-based monitoring and anomaly detection, similar to your invention. Both systems involve processing signals and classifying them to identify anomalies, although the patent emphasizes feature extraction and classification, while your invention focuses on local processing and data transmission.

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Additional insights

Dominant keywords and concepts:

- frequency-adaptable
- structural health monitoring

Key semantic concepts:

- MEMS accelerometer
- Modbus communication

- smart sensors
- self-learning
- artificial intelligence of things
- anomaly detection
- network edge

Relevant IPC codes:

- G06N20/00
- G05B23/02
- B64C27/12
- G07C5/08
- B64F5/60

- Wi-Fi transmission
- anomaly detection
- predictive maintenance
- signal conditioning
- vibration monitoring

Relevant CPC codes:

- G07C5/085
- G06N20/00
- G07C5/0808
- B64C27/12
- B64F5/60

Notable inventors or assignees:

- bell helicopter textron inc
- appareo systems llc
- breed david s
- batcheller barry d
- wiig johan a

What the world is saying

Recent advancements in Micro-Electro-Mechanical Systems (MEMS) sensors have been targeted towards industrial vibration monitoring and predictive maintenance. These sensors, including capacitive and piezoresistive MEMS accelerometers, are used to capture high-frequency vibration signals for time and frequency analysis. Advanced signal processing, often embedded within the sensor unit, allows for accurate condition monitoring and fault diagnosis, crucial for maintaining system reliability and efficiency. Integration with microcontrollers and edge computing systems enables real-time processing and feedback control. Wireless communication technologies, such as Wi-Fi, are being used to aggregate data and facilitate real-time monitoring in various applications, including aviation, wind turbines, bridges, and industrial manufacturing. However, there is still a need for a vibration sensor with a wide time and frequency response.

Selected scientific publications

- [An intelligent real-time edge processing maintenance system for industrial manufacturing, control, and diagnostic](http://www.frontiersin.org)
www.frontiersin.org
- [Investigating bearing and gear vibrations with a Micro-Electro-Mechanical Systems \(MEMS\) and machine learning approach](http://www.sciencedirect.com)
www.sciencedirect.com
- [Sensors for in-process and on-machine monitoring of machining operations](http://www.sciencedirect.com)
www.sciencedirect.com
- [The latest advances in wireless communication in aviation, wind turbines and bridges](http://www.mdpi.com)
www.mdpi.com
- [Research on an Online Intelligent Monitoring System for Resistance Spot Welding Based on Wireless Communication](#)

We searched the following journals and databases: Nature, Science Direct, Springer, IEEE, Science, Cell Press, PLOS, Frontiers, MDPI, Wiley, BMJ, arXiv, IEEE Xplore, Cambridge UP, Oxford UP, Taylor & Francis, JSTOR, Sage, Karger, Hindawi, AACR Journals, Ash Publications, Neurology, Annual Reviews, Scientific Research, Liebert, De Gruyter, Ingenta Connect, PNAS, BMC Anesthesiology, BMC Bioinformatics, Biomed Central, Europe PMC, Emerald, Springer Nature, Thieme, MIT Press, SPIE Digital Library.

Recent popular sources

- [An Introduction to MEMS Vibration Monitoring](#)
Analog Devices
- [How MEMS sensor are used in industrial vibration and ...](#)
Farnell Schweiz
- [Using a MEMS Sensor for Vibration Monitoring](#)
DigiKey (Mar 2, 2022)
- [Introduction to MEMS Accelerometers](#)
PCB Piezotronics
- [MEMS Accelerometer : Precision Vibration Monitoring](#)
Micromega Dynamics

Next steps

Recommended Lens or Google Patents queries:

- *"frequency-adaptable structural health monitoring" AND "smart sensors"*
[Search on Lens](#) — [Search on Google Patents](#)
- *"self-learning AIOT devices" AND "anomaly detection"*
[Search on Lens](#) — [Search on Google Patents](#)
- *"network edge" AND "target aware adaptive application"*
[Search on Lens](#) — [Search on Google Patents](#)

Run a new FTO Checker search:

Try again with a modified description to explore other patent families or technical variants.

[Start new search →](#)

⚠ This is an **automated early-stage analysis** designed to help you explore potential patent risks. It is **not legal advice**, and we cannot guarantee freedom to operate or absence of infringement risks. If you plan to commercialize your invention, we recommend discussing the results with a qualified patent attorney.