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# SENSORIA®

*Edge-to-Edge Intelligence*

# WIND BLADE MONITOR

# OVERVIEW

## Simplify Blade Integrity Management

Sensoria® by MISTRAS Group takes the guesswork out of wind blade integrity management. With a 24/7/365 blade monitor to remotely detect and report damages, the Sensoria® Insights portal to visualize blade integrity in real time, and support for inspection & maintenance services through Sensoria® Dispatch, the solution provides *Edge-to-Edge Intelligence* to help maximize blade uptime and performance.

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### Sensoria System

24/7/365 Blade Condition Monitoring System

### Sensoria Insights

Web-Based Blade Integrity Data Portal

### Sensoria Dispatch

On-Demand Support Services

# HOW SENSORIA WORKS

## Damage Detection

Acoustic Emission (AE) sensors are placed on a blade to detect damages, including cracks, corrosion, skin ruptures, lightning strikes, and high-energy impacts.


## Damage Alerts

If damages are detected and verified by an analyst, an alert is sent to operators' mobile devices.

## View Data in Real Time

Data collected from the sensors is immediately output on the Sensoria Insights data portal for immediate access and analysis.

## Sensoria Dispatch Field Services

If detected damages require further investigation or repair, operators have access to an optional suite of inspection, maintenance, and repair services through Sensoria Dispatch.

## Sitewide and Fleetwide Support

The Sensoria Insights data portal shows blade integrity for individual blades, full sites, and entire turbine fleets. With analytics on damage evolution and trend tracking and analysis, fleet engineers can use the portal with the fleet's overall performance in mind.

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# SYSTEM INSTALLATION

- An Acoustic Emission (AE) sensor is installed inside each blade to detect various damages
- The sensors "listen" for changes in normal operating background noise in the blade and send data to the Sensoria system – a data acquisition box installed in the hub
- The system processes and feeds data to the Insights Portal for immediate viewing and analysis

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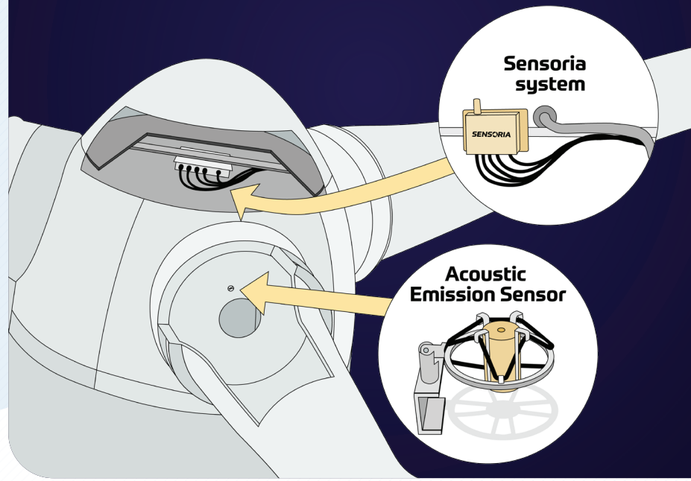
***Acoustic Emission [AE]:*** sound waves produced by a material when it is subjected to stress



# SENSORIA INSIGHTS PORTAL


- The Sensoria Insights web app is a portal to access and analyze integrity data collected from the Sensoria system
- The portal tracks blade integrity over time, helping operators prioritize inspection and maintenance decisions
- Integrity data for individual blades, full sites, and organization-wide fleets can be viewed within the portal
- Mobile accessibility makes blade data easy to view on-site or remotely

# FEATURES

The system transforms wind blade integrity management operations by keeping personnel in the know on blade conditions at all times.

- Real-Time Damage Notifications
- Damaged Blade Identification
- Intuitive Blade Condition Reports
- Damage Trend Tracking
- Blade, Site, and Fleet Data Views
- Mobile Data Accessibility

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# BENEFITS

Whether you're managing a small number of wind turbines, an expansive wind farm, offshore wind assets, or an entire turbine fleet, the foundation of integrity management is having access to timely and accurate integrity data. Sensoria® simplifies and streamlines the collection, delivery, and storage of blade integrity data, helping you to enhance blade condition and optimize your maintenance and resource planning.

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- **Minimize Risk and Unplanned Outages**
- **Maximize Blade Performance**
- **Make Informed Maintenance Decisions**
- **Increase Peace of Mind**
- **Focus On Higher-Value Tasks**
- **Drive Value Throughout Your Organization**

# AE MONITORING TECHNOLOGY VS. TRADITIONAL METHODS

The remote, AE monitoring technology utilized by Sensoria provides significant time and cost efficiencies compared to traditional methods.

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| | TRADITIONAL METHODS | SENSORIA |
|---|---|---|
| 24/7/365 Continuous Data Collection | | ● |
| Remote Monitoring | | ● |
| Visible & Hidden, Small-Scale Damage Detection | ● | ● |
| Detects Corrosion, Skin Ruptures, Lightning Strikes | ● | ● |
| Real-Time Detection of Potential Damages | | ● |
| Inspection Coverage of Entire Blade | | ● |
| Damage Progression and Tracking Analysis | | ● |

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# SUPPLEMENTARY SERVICES FROM SENSORIA DISPATCH

When additional support is needed to supplement your on-site teams, MISTRAS Group's highly-trained and certified rope access technicians and drone pilots can be contacted for inspection and maintenance support services to maximize turbine uptime.

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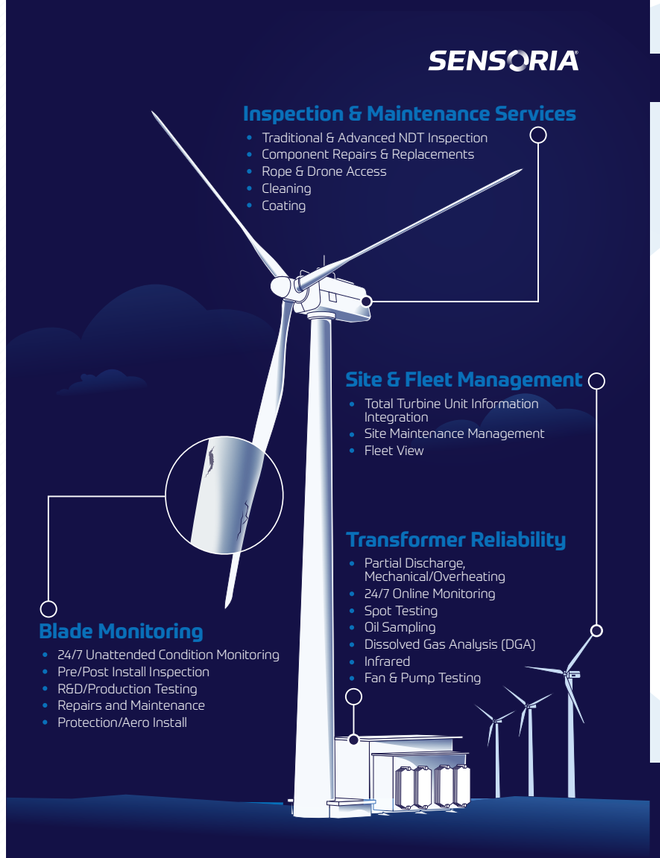


## SYSTEM OPERATING SPECIFICATIONS

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| GENERAL | |
|---|---|
| Case w/ connectors & Antenna | 13" x 8" x 3" |
| Weight | 3lbs. |
| Power Consumption | 10 Watts |
| **POWER REQUIREMENTS** | |
| BMS AC, Wi-Fi Model, P/N 1286-5315 | 100 - 240 VAC, 50/60 Hz |
| BMS AC, Cellular Model, P/N 1286-5355 | 100 - 240 VAC, 50/60 H |
| BMS DC, Wi-Fi Model, P/N 1286-5375 | 20 – 55 VDC |
| **CYBERSECURITY** | |
| VPN | Open VPN client included |
| Secure Logon | Encrypted passwords |
| Secure Boot | Encrypted OS/Programs |
| Remoted Updates | Secure Remote Updates & Remote Reboot |

| INTERFACE | |
|---|---|
| Ethernet | 1000/100/10 BaseT, GigE" |
| Wi-Fi | IEEE Std 802.11a, 802.11b, 802.11g, and 802.11n |
| Cellular | Skywire Nimblelink 4G Modem for AT&T and Verizon. Sierra Airlink RV55 Wi-Fi /Cellular LTE-A Pro Router |
| **MISCELLANEOUS** | |
| Temperature | -40° - 140°F (-40° - 60°C) |
| Battery Backup | Up to 1.5 hours |
| Watchdog Timer | Monitor acquisition, communication, security |
| Digital Signal Processing | Performed by dedicated Feature Extraction Processor implemented in a FPGA using 18 bit data |
| Inertial Measurement Unit | X, Y, Z axis vibration, DC to 1 kHz, X, Y, Z rotational speed 0 to 1000 RPM |

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## Wind Blade Monitor

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