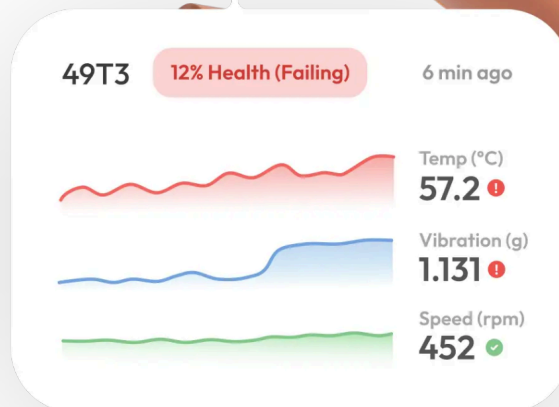




Revolutionising Conveyor Monitoring:

An Introduction to the Sensor Seal System

July 2025

Introduction

In the demanding environments of mining, manufacturing, and logistics, conveyor systems are the lifeblood of your operation. However, the frequent failure of idler rollers can lead to costly downtime, damaged equipment, and significant safety risks. Traditional monitoring methods are often labour-intensive, inaccurate, or prohibitively expensive.

Lorbrand, a leader in conveyor components for over three decades, introduces the **Sensor Seal system**—a groundbreaking solution engineered to shift your maintenance strategy from reactive to predictive. By providing continuous, real-time data from deep within your conveyor rollers, the Sensor Seal system empowers you to anticipate failures, optimise maintenance schedules, and enhance operational efficiency.

This innovative system is built around a self-powered sensor integrated directly into the roller's seal. It harvests energy from the roller's rotation to monitor key health indicators and transmit this data wirelessly. This elegant design eliminates the need for any external wiring, making large-scale deployment both practical and cost-effective.



Two Tailored Solutions: The S1 and S2 Sensor Seals

Understanding that every conveyor system has unique demands, the Sensor Seal is available in two distinct models, each utilising a different network architecture to best suit your specific needs.

Model S1: Long-Range Star Network for Targeted Monitoring

For applications where critical idlers are spread sporadically across vast distances, such as long overland conveyors, the **S1 model** is the ideal solution.

Network Architecture	The S1 operates on a long-range star network . In this topology, each Sensor Seal communicates directly with a central gateway in a "star" configuration. There is no communication between the sensors themselves.
Communication Protocol	Leveraging the power of LoRa technology in the sub-GHz ISM band (typically 868/915 MHz), the S1 can achieve a communication range of over a kilometer with a clear line of sight.
Best For	• Monitoring a few critical idlers over a large area. • Very long overland conveyors where sensors are widely spaced. • Installations where sensor density is low.

Model S2: High-Density Mesh Network for Comprehensive Coverage

For conveyors requiring intensive monitoring with a high concentration of sensors, the **S2 model** offers a robust and self-healing solution.

Network Architecture	The S2 creates a high-capacity mesh network , where the Sensor Seals communicate with each other, collaboratively relaying data along the conveyor to the nearest gateway. This creates a robust and self-healing data path.
Communication Protocol	Operating in the globally recognised 2.4 GHz ISM band, the S2's in-house protocol is optimised for high data throughput and reliability in the unique environment of a conveyor structure.
Best For	• Large fully-fitted conveyors or critical sections with a high sensor count. • Applications requiring high-speed data transfer and collaborative tasks.

For the mesh network to be effective, a spacing of less than 5 meters between sensors is recommended, with a maximum of 20 meters.

Key Technical Specifications

The Sensor Seal system is engineered for harsh industrial environments. While specific performance depends on the model and application, the core specifications are consistent.

Operational RPM	The system operates reliably across a wide range of speeds, typically from 330 to 1,200 rpm . In certain scenarios and with specific firmware, functionality can be achieved at speeds as low as 250 rpm. The absolute maximum rotational velocity is 1500 rpm.
Operating Temperature	Designed for extreme conditions, the Sensor Seal operates in ambient temperatures up to 80°C . The internal device temperature is rated for -40°C to 80°C.
High-Resolution Sensing	The system provides critical data with high precision, including: • Bearing temperature measurement at a resolution of 0.1°C. • Vibrational analysis via an onboard accelerometer. • RPM measurement with up to $\pm 0.05\%$ accuracy.

Flexible Monitoring Solutions: On-Premise or Cloud

The Sensor Seal system is designed to integrate flawlessly into your operational workflow with flexible software solutions. Crucially, whether you choose an on-premise deployment or our cloud platform, the monitoring software and service is provided **free-of-charge for the lifetime of the products, with no recurring subscription costs.**

Option 1: On-Premise Deployment for Full Local Control

For operations requiring all data to remain entirely on-site, we offer two distinct on-premise solutions.

- **Protocol Bridge for Direct SCADA/PLC Integration:** A lightweight service that runs on a local server to seamlessly translate and deliver sensor data directly to your existing control systems. It supports standard industrial protocols like OPC UA, Modbus TCP, Siemens S7, and EtherNet/IP.
- **On-Premise Monitoring Server:** A complete, turnkey software package installed on your local server. It includes a secure database and a user-friendly private web dashboard for comprehensive monitoring. This option also includes the full protocol bridging capabilities.

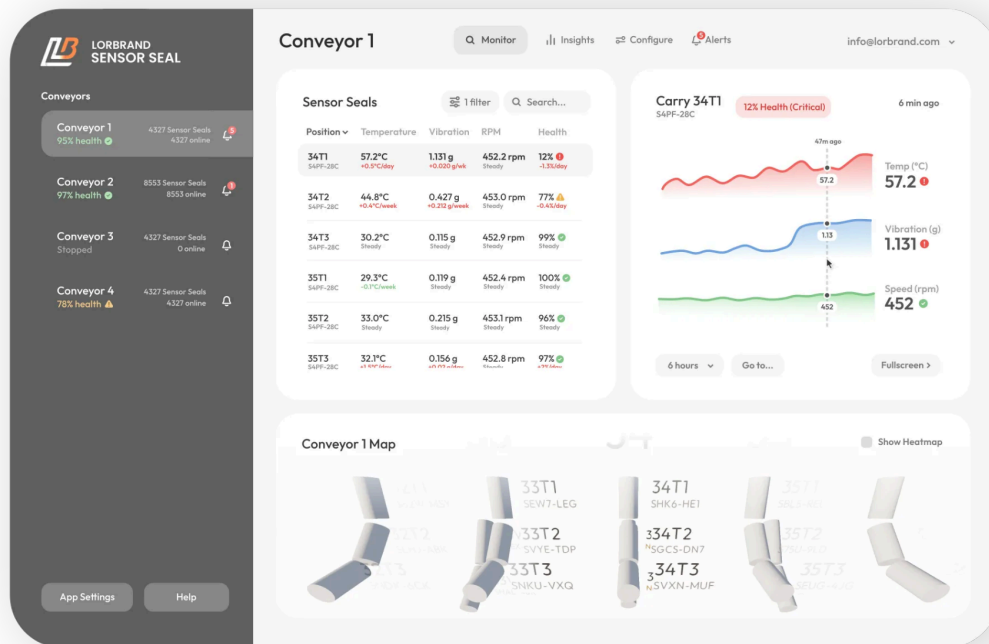
Option 2: Sensor Seal Cloud for Advanced Analytics and Global Access

For the ultimate in predictive power and accessibility, the Sensor Seal Cloud platform is the ideal choice. In this configuration, your on-site gateways securely connect to our servers, unlocking a suite of powerful features.

- **Advanced Machine Learning:** Our cloud platform enhances monitoring by using advanced machine learning (ML) models that analyse data and trends to predict potential failures further in advance, allowing for long-term planning and ordering of spares.
- **Automated Alerts:** The system delivers timely alerts via SMS or email upon detecting anomalies, ensuring your team is immediately notified of developing issues.
- **API for Custom Integration:** An API is available for programmatic data access, allowing for deeper integration with your own custom applications or third-party business intelligence tools.
- **Global Accessibility:** The dashboard can be accessed from anywhere in the world through a standard web browser or can be installed on your devices.

The Intuitive Monitoring Dashboard

Both the On-Premise Server and the Sensor Seal Cloud platform feature the same modern, user-friendly dashboard designed to provide actionable insights at a glance.



The dashboard is structured for an efficient workflow:

1. **System Overview:** The main screen displays a list of all your monitored conveyors and their overall health status, allowing you to quickly identify areas that require attention.
2. **Detailed Conveyor View:** Selecting a specific conveyor brings you to a detailed view showing a list of all its Sensor Seals, their precise installation locations (e.g., "CV-103, 18T3"), and their latest measurements. A 3D view of the conveyor is also displayed.

3. **Detailed Sensor Analysis:** Clicking on an individual Sensor Seal opens up its historical data, presenting detailed graphs of temperature, vibration, and RPM over time. This view allows for in-depth analysis and trend monitoring for a particular roller.

Beyond visualisation, the dashboard provides essential, actionable alerts to identify developing issues. Work is continuously being done to make the platform even more powerful. Future enhancements are planned to include advanced analytics for estimating a roller's remaining lifespan and tools to help create and recommend maintenance plans. We are also developing a fully modular and user-customisable section, giving you even greater control over your data analysis.

The Gateway: Robust, Flexible, and Future-Proof

The Current Gateway v1.1

The Sensor Seal Gateway is a robust, low-power IoT device that collects data from the Sensor Seals and transmits it for analysis. It is engineered for simple installation and reliable operation in industrial settings.

- **Flexible Power Options:** The gateway can be powered via passive Power over Ethernet (PoE) with a wide voltage range of 12V to 57V DC, or through DC screw terminals accepting 12V to 48V. This simplifies wiring and installation.
- **Standard Network Compatibility:** It features a standard IEEE 802.3 Ethernet port, allowing it to connect directly to typical networking equipment like switches, routers, fiber optic transceivers, and wireless bridges.
- **High-Performance Radio:** A built-in sub-GHz LoRa radio (150-960 MHz) facilitates long-range and reliable communication with the Sensor Seals.

Future Innovations: The Next-Generation Gateway

Innovation is at the core of Lorbrand's philosophy. A **new generation of powerful gateways is currently under development**. This next-generation hardware will feature integrated Wi-Fi, Bluetooth, an Ethernet connection, and a touchscreen. A key goal of this new design is to **forgo the requirement of a separate Protocol Bridge**, and enable **intuitive configuration and monitoring via the touchscreen on site**.