ModeSenseAI™

An Innovation from ALC®

INTELLIGENT STRUCTURAL MONITORING FOR LIGHTING INFRASTRUCTURE

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Continuous Structural Insight.

ModeSenseAI™ provides continuous structural insight for lighting infrastructure, enabling authorities to assess column condition and support evidence-based decisions on inspection, maintenance and replacement.

Lighting columns and roadside structures are exposed to corrosion, fatigue, ageing and increasing wind events. Understanding structural condition is essential for managing safety, maintenance planning and asset investment.

ModeSenseAI™ continuously measures structural behaviour and converts vibration data into clear condition information presented through an intuitive asset management portal.

Complex structural analysis takes place automatically. Users receive prioritised, practical insight that supports operational decision-making.

Managing Structural Risk.

Lighting columns represent a low-frequency but high-consequence public safety risk. Structural deterioration may develop gradually and remain undetected between inspection cycles.

ModeSenseAI™ provides continuous structural behaviour monitoring that supports:

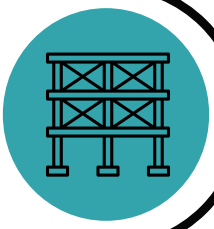
- Evidence-based maintenance decisions
- Early identification of structural change
- Targeted inspection and intervention
- Reduced uncertainty in asset condition assessment

The system enables authorities to move from periodic inspection to condition-informed asset management.

How ModeSenseAI™ Works.

ModeSenseAI™ measures structural vibration at the lighting column and securely transmits the data for analysis. The system architecture consists of four elements:

Wind-induced vibration excites the structural response of the column.



01 STRUCTURE

MONITORING NODE 02

Installed via the standard ANSI C136.41 (NEMA) socket, the node measures structural acceleration and vibration behaviour.

Data is transmitted securely using LTE Cat M1 cellular connectivity with GSM fallback where LTE is unavailable.

03 CELLULAR CONNECTIVITY

CLOUD ANALYSIS & PORTAL 04

Results are reviewed, feedback is gathered, and improvements are made to refine the outcome for lasting impact.

Digital Twin Structural Intelligence.

ModeSenseAI™ interprets vibration behaviour using physics-informed structural analytics.

Measured structural response is compared with expected behaviour over time to develop a digital twin representation of each monitored asset. Changes in structural behaviour can therefore be identified and assessed.

The analytical framework supporting ModeSenseAI™ has been informed by ongoing research, including studies exploring the use of machine learning techniques to support future analytical capability as monitoring datasets grow.

Designed for Operational Clarity.

The ModeSenseAI™ portal has been designed specifically for lighting and highway asset teams. No specialist structural engineering expertise is required to interpret the results. The portal presents structural condition information in a clear, operational format.

RAG Condition Dashboard.

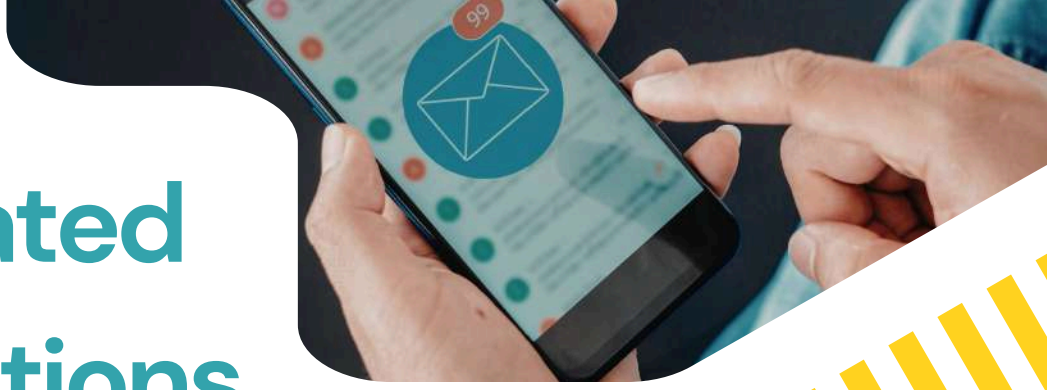
Each monitored asset is automatically classified using a Red-Amber-Green (RAG) condition status.

SIGNIFICANT DEVIATION INDICATING INVESTIGATION MAY BE REQUIRED

CHANGE DETECTED IN STRUCTURAL BEHAVIOUR

STRUCTURAL BEHAVIOUR WITHIN EXPECTED PARAMETERS

Condition status updates continuously based on measured structural response.



Automated Notifications.

The system provides automated notifications when changes in structural behaviour are detected. Notifications may include:

- Condition Escalation Alerts
- Continuous Monitoring During and After Extreme Weather Events
- Abnormal Vibration Behaviour

This ensures attention is directed only where it may be required.

GPS Asset Identification.

Each monitored column is geolocated and displayed within the portal map interface. This allows asset managers and engineers to:

VISUALISE

Visualise structural condition geographically

IDENTIFY

Identify clusters of deterioration

PLAN

Plan targeted inspections

LINK

Link structural condition data with existing asset records

Transparent Engineering Data.

Detailed vibration plots remain available in the portal for transparency and engineering review.

1. DETAILED VIBRATION DATA

Available in the portal for transparency and engineering review.

2. AUTOMATED ANALYSIS

Converts complex vibration signals into actionable asset health outputs.

3. MAINTAIN

Prioritise maintenance using clear, automated, actionable asset health outputs.

3 Steps

FROM DATA TO ACTION

Automated analysis transforms this complex data into clear RAG status and Remaining Useful Life indicators, enabling routine asset management without manual interpretation.

Improved Management.

ModeSenseAI™ supports improved management of lighting infrastructure.

FOR ASSET MANAGERS

Provides portfolio-wide structural visibility and supports risk-based capital planning.

FOR HIGHWAY ENGINEERS

Supports early identification of structural change and reduces the need for intrusive inspections.

FOR AUTHORITIES

Reduces uncertainty in asset condition, supports targeted intervention and improves lifecycle asset management.

International Deployment.

ModeSenseAI™ has been developed in response to structural monitoring challenges identified by Network Rail in the United Kingdom.

Other Deployments Include Skanderborg (Denmark), Utrecht (Netherlands) and Singapore:

These applications demonstrate reliable performance across a range of climatic conditions, asset portfolios and infrastructure environments.

Technical Summary.

PARAMETER	SPECIFICATION
Diameter (MAX at Base)	76mm
Height (Incl. Pins)	107mm
Ingress Protection	IP67
Operating Temperature Range	-25°C to +85°C
Primary Network	LTE Cat M1
Fallback Network	GPRS
Compliance	ANSI C136.41 (NEMA Twist-Lock)
Input Voltage	230 VAC ±10%
Frequency	50/60 Hz
Maximum Input Current	7.5 A (Including Switched Load)

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