WiSenMeshNET:
Dynamic Displacement & Temperature Sensor
Wireless Monitoring System

This internally powered dual sensor node allows remote measurement of dynamic distance displacement associated to track voiding and critical rail temperature (CRT) monitoring utilising a magnetic probe which measures the rail skin temperature.

The spring-loaded displacement sensor has a measurement range of 50mm with range models of 100/150 & 200mm also attainable. The working principle is that the sensor becomes active through the breaching of a user defined vibration threshold trigger from an approaching train. The sensor then measures the track under load during the train passage at a sample rate of 33Hz and remotely reports the maximum, minimum and average deflection (Rail Swing) over this time period. The sensor can also be set to measure is static mode with readings attained at defined time intervals.

The magnetic NTC thermistor temperature sensor is typically magnetically attached to the rail skin web using the 3kohm sensor model able to record track temperatures from -40°C to +85°C.

The sensor node is installed and clamped to the underside of the rail web between the track and the ballast, with the reference plate for the displacement sensor leaned to the ballast and set to the desired initial starting range value such that track voiding deflection is measured for compression and/or expansion.

The node includes an integrated internal radio antenna which then transmits data wirelessly to a site based SmartGateway before data is pushed to the internet for visualisation display and alerting.

The battery lifespan is up to 9.5 years at hourly readings.

WiSenMeshNET nodes communicate via bespoke encrypted mesh radio technology and can be up to 400m from each other or the SmartGateway. The sensors mesh
together and automatically form a network relaying data off each other (up to 10 sub mesh levels of data hop) and back to a central data hub called a SmartGateway which contains the data logging functions, radio mesh control systems and external communication to the WiSen cloud-based datacentre or local hosted system.

FEATURES

- WiSenMeshNET Node
- 33Hz Sample Rate **(Displacement Sensor)**
- ±0.1% FS accuracy
- ±0.015% FS resolution
- -40°C to +85°C Range **(3kΩ NTC)**
- <1°C accuracy (-40°C to +40°C)
- ±0.1°C resolution
- Easy to Install & Remove
- Intelligent node/repeater
- Battery life up to 9.5 years
- 1 second to 24-hour variable readings
- End user configurable
- Rugged & Robust Housing
- IP66
- Easy to Install & Remove

WiSenMeshNET: Dynamic Displacement & Temperature Sensor Node System

PHYSICAL PROPERTIES	
Dimensions (L x W x H)	100mm x 100mm x 60mm
Weight	0.65kg / 3.9kg (Including Clamping Bracket)
Casing and Painting Materials	Aluminium-Alloy, Polycarbonate, Steel & Epoxy Polyester Powder Coating
International Protection Mark Rating	≥IP66
Operating Temperature	-40 to +85°C
LOCAL STORAGE	
Local Flash Memory Storage	Min. 450 Data Packets
POWER	
Primary DC Power	1 xER34615 Lithium D Cell Battery

Battery Life Expectancy [1]

Sampling Time Interval - T	Duration (Days)	Duration (Months)	Duration (Years)
1 Min	121	4.0	0.3
5 Mins	556	18.3	1.5
15 Mins	1469	48.3	4.0
30 Mins	2378	78.2	6.5
1 Hour	3495	114.9	9.5

(1) Quoted battery life are best case scenarios with minimal hops (mesh radio use), excellent signal quality and minimum transmission power. For example, a node taking 9-10 hops could lead to a reduction of 30% of quoted values. Please contact WiSen for further advice.

Accuracy Stop Voltage	2.7VDC
Mesh Stop Voltage	2.1VDC
Battery Connection	Standard Aluminum Battery Holder
Working Current (DC)	Max. 28mA (Typically 9mA @ Mode=0)
PRIMARY SENSOR – DYNAMIC DISTANCE SENSOR	
Sensor Type	Spring Loaded Linear Displacement Transducer
Model Variants	100 | 150 | 200
Measuring Range (s)	0-60mm (100) | 0-110mm (150) | 0-160mm (200)
Sample Rate	33Hz
Accuracy	± 0.1% FS
Resolution	± 0.0015% FS
SECONDARY SENSOR – NTC THERMISTOR SENSOR	
Sensor Type	NTC Thermistor
Model Variants	3kΩ | 10kΩ | 20kΩ
Measuring Range (kΩ)	0.052 kΩ to 113.096 kΩ
Measuring Range (Temperature)	-40 to +85°C (3kΩ) -20 to +85°C (10kΩ) -6 to +85°C (20kΩ)

Accuracy

NTC Thermistor / Temperature Range	3kΩ	10kΩ	20kΩ
Min Measurable Temperature(i.e.100kΩ)	-40℃	-20℃	-6℃
Accuracy@ Min Measurable to 40℃	<0.9℃	<0.5℃	<0.2℃
Accuracy@40℃	~0.9℃	~0.5℃	~0.2℃
Accuracy@50℃	~1.5℃	~0.7℃	~0.4℃
Accuracy@60℃	~2.9℃	~1.1℃	~0.6℃

Resolution	± 0.1℃
NODE VIBRATION TRIGGER THRESHOLD SETTINGS	

Dynamic Mode

Switch Setting	Trigger Threshold
0	Continuous sampling used during initial trigger value identification

	1 (default)	> 1.1g (default)
	2	> 1.3g
	3	> 1.5g
	4	> 2.0g
	5	> 2.5g
	6	> 3.0g
	7	> 3.5g
	8	> 4.0g

Static Mode

Switch Setting	Trigger Threshold
9	Continuous readings at defined time intervals

RADIO SPECIFICATIONS

Protocol	WiSenMeshNET® proprietary radio encryption
Radio Frequency	2.4GHz System

SERVICE INSPECTION

Inspection Period	Every 3 Years by Manufacture (or inspected by arranged methods)

CERTIFICATION

Regional Conformity	UKCA
Network Rail	PADS Number: -
London Underground	Reg Number: -

ACCESSORIES

Power Supply	
WB016-00016	3.6V ER34615 19AHr D Cell Lithium Battery

Mounting	
WM028-00202	WiSen® Dynamic Displacement & Temperature Sensor Railway Clamping Bracket