DATASHEET

Wi-SOS MeshNET Smart Wireless Mesh Network

2.4GHz band radio
Self-healing mesh
Instant data access
High connectivity
Easy to deploy
Low power
Low cost

Network Rail Approved
(PA 05/06364)
London Underground Approved Product
(APR 3224)

GEOSENSE

Wi-SOS MeshNET Smart Wireless Mesh Network

Overview

The Wi-SOS MeshNET is a 2.4GHz band, wireless mesh network consisting of a series of wireless Nodes and a Gateway. The Gateway collects the data from the Nodes, stores it locally and it is available to send data to the clouds via 4/3/2G, WiFi wirelessly or via wired Ethernet, RS485. All the data is displayed via the Web Port, where customer data can further be viewed and downloaded locally via .csv, remotely via SFTP/FTP or programmably via API.

The Wi-SOS MeshNET (Wireless Sensor Observation System) uses the proven WISENMESHNET® wireless platform to transmit and receive remotely signals from any sensor with a vibrating wire, voltage, 4-20mA, mV/V, RS-485 or resistance outputs. In addition, Triaxial Tilt Meters, Laser Distance Meters, Combined Triaxial Tilt and Laser Distance Meters, Cameras and Visual warning Nodes are available, all of which can be connected into the same Wi-SOS MeshNET System.

Wi-SOS MeshNET provides an easy to deploy, low cost, low power solution with high connectivity up to a 300m range in optimum site conditions making it an ideal choice for applications where Nodes are concentrated in relatively small areas.

The Nodes communicate and relay data by finding the optimal route, transmitting data to the Gateway in a series of 'hops' by communicating with their neighbours. If a Node loses communication, the other Nodes find an alternative pathway to the Gateway. This is often referred to as 'self healing' and provides a significant level of robustness and redundancy.

The system has a proven track record worldwide over the past ten years within a wide range of construction projects, even in high density urban areas.

The Wi-SOS MeshNET WebCentre provides a platform to visualise and download data, together with the ability to set alarms.

APPLICATIONS

Wireless monitoring of:

- Pressure
- Displacement
- Strain
- Load
- Settlement
- Convergence
- Temperature

Monitoring tilt & distance of:

- Retaining & diaphragm walls
- Rail tracks
- Party walls
- Structures
- Tunnels
- Bridges
- Slopes
- Piles
- Concrete dams

FEATURES

- Resilient mesh radio network
- Vibrating wire, Digital & Analogue sensor inputs
- Long battery life
- Economical compared to manual monitoring
- Large number of sensors per gateway
- Nodes store data while working in mesh
- Gateway stores data locally with large data storage
- Ultra low power
- Battery powered Gateway
- 10W solar panel unit for Gateway
- Instant data access via WebCentre

Wi-SOS MeshNET Smart Wireless Mesh Network

Smart Gateway

The Smart Gateway is the central hub for data within the WI-SOS MeshNET Wireless Sensor Network system. It is responsible for command issuing such as sampling intervals and data collection from all the Nodes involved in the mesh network. It also forwards the data and system information to the WI-SOS MeshNET WebCentre or via FTP push, Modbus TCP and API to a designated server via mobile network or the local server via standard RS232 connections.

LOCAL STORAGE	
Memory	8GB (~1.5 years)
POWER	
Primary power	4 x 3.6V Lithium D-Cell
Secondary DC power	7 - 32VDC adaptor
Tertiary power (external)	3.6VDC Battery or Solar panel (see below)
Nominal consumption	4.5 Watts
PHYSICAL PROPERTIES	
Dimensions (L x W x H)	180 x 140 x 60mm
Weight	2.0 kg
Enclosure material	Die cast aluminium alloy
Enclosure	IP66
Operating temperature range	- 40 to + 85 ºC
SOLAR UNIT	
Battery	Rechargeable (LiFePO4)
DC output	11.2 – 14.6VDC
Capacity when fully charged	5AHr
Solar panel	10W
Single re-charge duration	8-12 hours
Dimensions(L x W x H)	180 x 140 x 60mm (without bracket)
Weight	2.2kg
NETWORK INTERFACES	
Wireless Module	Integrated 4G modem & antenna 3G/2G back compatibility
WSN Protocol	WISENMESHNET® Protocol
CONNECTIVITY	
Wired port RS232	
ACCESSORIES	
High gain antenna, 50m antenna, coaxial extension cable, WiFi & ETHERNET daughter boards, RS232 to USB cable, 110-240VAC outdoor adaptor	

Wi-SOS MeshNET Smart Wireless Mesh Network

Vibrating Wire Node

Can be used with all types of vibrating wire sensors and thermistors.

GENERAL			
Node type	1, 4, 8 Channel		
Sensor inputs	Hz, Ohms		
Sampling rate	1 to 60 minutes		
Configuration software	WI-SOS MeshNET WebCentre		
Local storage	Minimum 450 Messages during Meshing		
Operating temperature	-40 to +85 ºC		
VIBRATING WIRE			
Excitation wave	± 5 V		
Sweep range	400 to 6000 Hz		
Resolution (Sweep dependent)	0.002Hz@400Hz or 0.05Hz@6000Hz		
Accuracy	0.015%		
THERMISTOR			
Measurement range	0.052kΩ to 113.096 kΩ		
Resolution	0.1°C		
Accuracy (20ºC)	0.05ºC		
PHYSICAL			
Dimensions (L x W x H)	1 ch: 100 x 100 x 60 mm; 4 & 8 ch: 180 x 140 x 60 mm		
Weight	1 channel 0.6kg, 4 & 8 channel 1.2kg		
Antenna length	200 mm		
Enclosure material	Die cast aluminium alloy		
Enclosure	IP66		
BATTERY			
Battery type	3.6V Lithium primary D-Cell		
No of channels	1 channel	4 channel	8 channel
Battery (cell) requirement	1 cell	2 cells	2 Cells
Battery life[1] at 60 minute intervals	>10 years	> 10 years	>15 years
Battery life[1] at 5 minute intervals	> 5 years	> 1.5 years	>1.5 years

[1] Best case scenario with minimal hops. For example, a node taking 9 hops could lead to a reduction of up to 40%. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

Digital Hub

The DigitalHUB allows a string of digital sensors such as In-Place Inclinometers, Tilt Beams and Submersible Tilt Meters or any sensor with an RS-485 output to be connected to it. With its in-built SIM card it can transfer data directly into the Wi-SOS Mesh WebCentre and also be integrated with other Wi-SOS MeshNET products.

GENERAL	
Sensor inputs	RS-485, RS-485 BUS
Sampling rate	1 to 60 minutes, 60-127 with external
Configuration software	Wi-SOS MeshNET WebCentre
Local storage	Minimum 450 Messages during Meshing
Operating temperature	-40 to +85 ºC
PHYSICAL	
Dimensions (L x W x H)	180 x 140 x 60 mm
Weight	1.5kg
Antenna length	200 mm
Enclosure material	Die cast aluminium alloy
Enclosure	IP66
POWER	
Primary power	4 x 3.6V Lithium D-Cell
Secondary DC power	DC power 7 - 32VDC adaptor
Tertiary power (external)	3.6VDC Battery or Solar panel (see below)
Nominal consumption	4.5 Watts
Battery type	3.6V Lithium primary D-Cell
Maximum working current	Sensor specific ≤ 300mA
Battery (cell) requirement	4 cells
Battery life at 60 minute intervals	> 6 months when using primary power
SOLAR UNIT	
Battery	Rechargeable (LiFePO4)
DC output	11.2 – 14.6VDC
Capacity when fully charged	5AHr
Solar panel	10W
Single re-charge duration	8-12 hours
Dimensions(L x W x H)	180 x 140 x 60mm (without bracket)
Weight	2.2kg
NETWORK INTERFACES	
Wireless Module	Integrated 4G modem & antenna 3G/2G back compatibility
WSN Protocol	WISENMESHNET® Protocol

Wi-SOS MeshNET Smart Wireless Mesh Network

Analogue Node

Can be used with all types of sensors with a 4-20mA or Voltage output.

GENERAL	
Node type	2 Channel
Sensor inputs	mA, Volt
Sampling rate	1 to 60 minutes
Configuration software	WI-SOS MeshNET WebCentre
Local storage	Minimum 450 Messages during Meshing
Operating temperature	-40 to +85 ºC
EXTERNAL SENSOR	
Measurement range	4-20mA, 1-5 Volt
Accuracy	0.1%
Resolution	0.0003mA or 0.0001V
PHYSICAL	
Dimensions (L x W x H)	180 x 140 x 60 mm
Weight	1.5kg
Antenna length	200 mm
Enclosure material	Die cast aluminium alloy
Enclosure	IP66
BATTERY	
Battery type	3.6V Lithium primary D-Cell
Maximum working current	Sensor specific ≤300mA
Battery (cell) requirement	4 cells
Battery life[1] at 60 minute intervals	>4 years
Battery life[1] at 5 minute intervals	6 months

[1] Best case scenario with minimal hops. For example, a node taking 9 hops could lead to a reduction of up to 40%. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

120Ω Foil Gauge Node

Can be used with any 120Ω sensor.

GENERAL	
Node type	6 Channel
Sensor inputs	mA, Volt
Sampling rate	1 to 60 minutes
Configuration software	Wi-SOS MeshNET WebCentre
Local storage	Minimum 450 Messages during Meshing
Operating temperature	-40 to +85 ºC
EXTERNAL SENSOR	
Sensor type	1/4 Bridge
Measurement range	119 to 121Ω
Accuracy	0.015%
Resolution	0.1% ± 0.0005 Ω
PHYSICAL	
Dimensions (L x W x H)	180 x 140 x 60 mm
Weight	1.2kg
Antenna length	200 mm
Enclosure material	Die cast aluminium alloy
Enclosure	IP66
BATTERY	
Battery type	3.6V Lithium primary D-Cell
Battery (cell) requirement	2 cells
Battery life[1] at 60 minute intervals	> 7 years
Battery life[1] at 5 minute intervals	> 9 months

[1] Best case scenario with minimal hops. For example, a node taking 9 hops could lead to a reduction of up to 40%. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

Wireless Tilt Meter

The Wi-SOS MeshNET Omni Tilt Meter utilises the latest triaxial tilt technology for all tilt monitoring in applications. It is also available in a configuration designed specifically for rail track monitoring with an internal antenna.

SENSOR	
Type	Triaxial
Range	± 90°
Accuracy	0.002°(0.0349mm/m)
Resolution	0.0001°(0.001745mm/m)
Long-term stability	< 0.014° (0.2443mm/m)
Temperature sensor resolution	0.1 °C
Temperature sensor accuracy	±0.5 °C
LOCAL STORAGE	
Memory	Minimum 450 Messages during Meshing
PHYSICAL	
Enclosure dimensions (W x L x H)	80 x 75 x 57mm
Weight	0.43kg
Operating temperature	-40°C to 85°C
Enclosure	IP66
Antenna length	200 mm
Enclosure material	Die Cast Aluminium alloy
BATTERY	
Battery type	1 x 3.6V Lithium primary D-Cell
Maximum working current	17mA
Battery (cell) requirement	1 cell
Battery life[1] at 60 minute intervals	>10 years
Battery life[1] at 5 minute intervals	> 5 months

[1] Best case scenario with minimal hops. For example, a node taking 9 hops could lead to a reduction of up to 40%. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

Wireless Tilt & Laser Distance Node

The Wi-SOS MeshNET Omni Tilt & Laser Distance Meter combines the latest triaxial tilt and Class 2 laser technology to provide high precision tilt and displacement measurements.

TILT SENSOR	
Type	Triaxial
Range	± 90°
Accuracy	0.002° (0.0349mm/m)
Resolution	0.0001°(0.001745mm/m)
Long-term stability	< 0.014° (0.2443mm/m)
Temperature sensor resolution	0.1 °C
Temperature sensor accuracy	±0.5 °C
DISTANCE SENSOR	
Laser	Class 2
Laser range	0.05 – 33m, 0.05 – 100mm
Laser accuracy	Better than ±1.0mm (Typical 0.5mm)
Laser resolution	0.1mm
Laser Lens Durability	≥ 500Hrs@3Hz@50°C or 2500Hrs@3Hz@25°C
LOCAL STORAGE	
Memory	Minimum 450 Messages during Meshing
PHYSICAL	
Enclosure dimensions (W x L x H)	80 x 75 x 57mm
Weight	0.43kg
Operating temperature	-40°C to 85°C
Enclosure	IP66
Antenna length	200 mm
Enclosure material	Die cast aluminium alloy
BATTERY	
Battery type	3.6V Lithium primary D-Cell
Maximum working current	500mA
Battery (cell) requirement	1 cell
Battery life[1] at 60 minute intervals	>5 years
Battery life[1] at 5 minute intervals	~ 6 months

[1] Best case scenario with minimal hops. For example, a node taking 9 hops could lead to a reduction of up to 40%. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

Laser Distance Sensor & Node

Utilise Class 2 high precision laser technology to provide high precision displacement measurements. Available in 33 and 100 metre ranges which can be connected to a central 4 channel Node to provide a cost-effective solution where multiple measuring points are required in close proximity.

DISTANCE SENSOR	
Laser	Class 2
Laser range	0.05 – 33m, 0.05 – 100mm
Laser accuracy	Better than ±1.0mm (Typical 0.5mm)
Laser resolution	0.1mm
Laser Lens Durability	≥ 500Hrs@3Hz@50°C or 2500Hrs@3Hz@25°C
LOCAL STORAGE	
Memory	Minimum 450 Messages during Meshing
PHYSICAL - SENSOR	
Enclosure dimensions (W x L x H)	80 x 75 x 57mm
Weight	0.37kg
Operating temperature	-40°C to 85°C
Enclosure	IP66
Connection to node	Cable
Enclosure material	Die Cast Aluminium alloy
PHYSICAL - NODE	
Enclosure dimensions (W x L x H)	180 x 140 x 60mm
Weight	1.3kg
Operating temperature	-40°C to 85°C
Enclosure	IP66
External antenna length	200 mm
Enclosure material	Die Cast Aluminium alloy
BATTERY	
Battery type	3.6V Lithium primary D-Cell
Maximum working current	524mA
Battery (cell) requirement	4 cells
Battery life[1] at 60 minute intervals	>5 years
Battery life[1] at 5 minute intervals	>7 months

[1] Best case scenario with minimal hops. For example, a node taking 9 hops could lead to a reduction of up to 40%. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

Camera Node & Vision Unit

The Camera Node allows the connection of a high quality digital Vision Unit for visual monitoring, together with alarms for safety critical applications such as rail track and landslide monitoring.

GENERAL	
Number of LEDs	3 (Green/Amber/Red)
Audible volume	Max 90 dB@10cm
LED flashing frequency	Red (highest warning) on for 100ms off for 1900ms Amber (warning) on for 100ms off for 2900ms Green (normal) on for 100ms off for 3900ms
LED update interval	1-60 min
Image taken interval	5-60 min
Local storage	Example: 180 days @ 10-min intervals produces 26,000 images
PHSYICAL - NODE	
Dimensions (L x W x H)	180 x 140 x 60 mm
Weight	2kg
Antenna length	200 mm
Enclosure material	Die cast aluminium alloy
Enclosure	IP66
VISION UNIT	
Image sensor	CMOS 2MP colour
Image resolution	1920 x 1080
Image compression	jpeg
Angle of view	horizontal plane 85°; vertical plane 45°
Lens	3.6mm
Cable length	1m
Night vision image	Black & white
Night vision distance	1 to 8m

Wi-SOS MeshNET Smart Wireless Mesh Network

Visual Warning Node

Onsite visible LED coloured light warnings which can be paired with any Node via the mesh net to indicate if any threshold alarm has been reached.

GENERAL	
Number of LEDs	3 (Green/Amber/Red)
LED flashing frequency	Red (highest warning) on for 100ms off for 1900ms Amber (warning) on for 100ms off for 2900ms Green (normal) on for 100ms off for 3900ms
LED update interval	1-60 min
Working current	Max 90mA (typ 8mA)
PHYSICAL	
Dimensions (L x W x H)	100 x 100 x 60 mm
Weight	0.65kg
Antenna length	200 mm
Enclosure material	Die cast aluminium alloy
Enclosure	IP66
BATTERY	
Battery type	3.6V Lithium primary D-Cell
Battery (cell) requirement	1 cell

Wi-SOS MeshNET Smart Wireless Mesh Network

Weather Station & Node

Provides a wireless solution for a complete weather station which can be integrated into a system with any other type of Wi-SOS MeshNET Node.

NODE

Node type	4 Channel
Sensor inputs	Channel 2 – 7 inputs, channel 4 – 1 inputs
Sampling rate	1 to 60 minutes
Configuration software	WI-SOS MeshNET WebCentre
Local storage	Minimum 450 Messages during Meshing
Operating temperature	-40 to +85 ºC

PHYSICAL

Dimensions (L x W x H)	180 x 140 x 60 mm
Weight	1.3kg
Antenna length	200 mm
Material	Die Cast Aluminium alloy
Enclosure	IP66

BATTERY

Battery type	3.6V Lithium primary D-Cell
Maximum working current	Max 524 mA (typical 197). Note external 12VDC recommended)
Battery (cell) requirement	4 cells
Battery life[1] at 60 minute intervals	20 days
Battery life[1] at 5 minute intervals	18 days

WEATHER STATION - PHYSICAL

Dimensions (L x W x H)	600 x 300 x 250 mm
Weight	3.0 kg
Material	Die cast aluminium alloy
Enclosure	IP66

SENSORS

Sensor Type	Temp	Humidity	Light Intensity	Air Pressure	Noise Level	Wind Speed	Wind Direction	Rainfall/T
Range	40~100°C	0~100%RH	0~200000Lux	30~1100hPa	30~130dB	0~45m/s	0~359°	0~6553.5mm/T
Accuracy	±0.3°C	±3%RH	±4%F.S.	±1hPa	±3dB	±(0.3+3%x current speed)m/s	±3°	±1mm
Resolution	±0.1°C	0.1%RH	1Lux	0.11hPa	0.1dB	0.1m/s	1°	0.2mm

[1] Recommended to be used with solar panels. Please contact Geosense for further advice.

Wi-SOS MeshNET Smart Wireless Mesh Network

Radio Specification

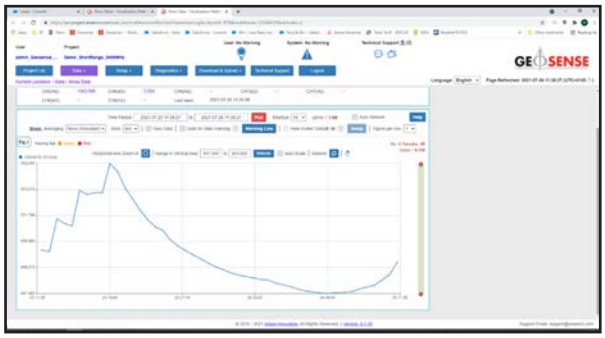
GENERAL	
Radio frequency	2.405 - 2.480GHz (16 Channels of 5MHz Bandwidth)
Channel setting	Channel 26 by default
Transmission speed	250kb/s
Transmit power	Typical <1.4mW (i.e., 1.5dBm); Max. 2mW
Receive resolution	-102dBm
No. of Mesh hops supported	10 Hops (e.g. the radio link from a gateway to the 1st layer node is called the 1st hop)
Range	Up to 300m, dependent on environment & antenna
Sampling Interval	1-60mins
ANTENNA	
2.4GHz-Antenna	Omni-directional 5dBi (20cm in length) or Customised
2/2.5/3/4G-Antenna	Omni-directional 3.5dBi (20cm in length) or Customised
Antenna Connector	SMA (M)
WIRELESS PROTOCOL	
System	WISENMESHNET® IEEE802.15.4 compliant

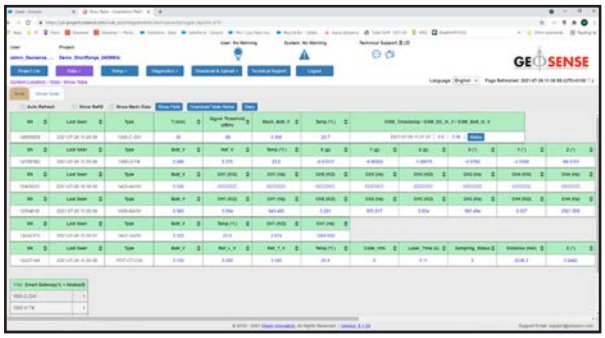
Wi-SOS MeshNET Smart Wireless Mesh Network

WebCentre

All devices are delivered fully-configured, including sampling intervals and alarm thresholds where applicable.

The Wi-SOS MeshNET0 WebCentre provides the user with an on-line platform to view data and status of all Nodes and Gateways and for the data to be downloaded or transferred to any third party server.





USER ACCESS

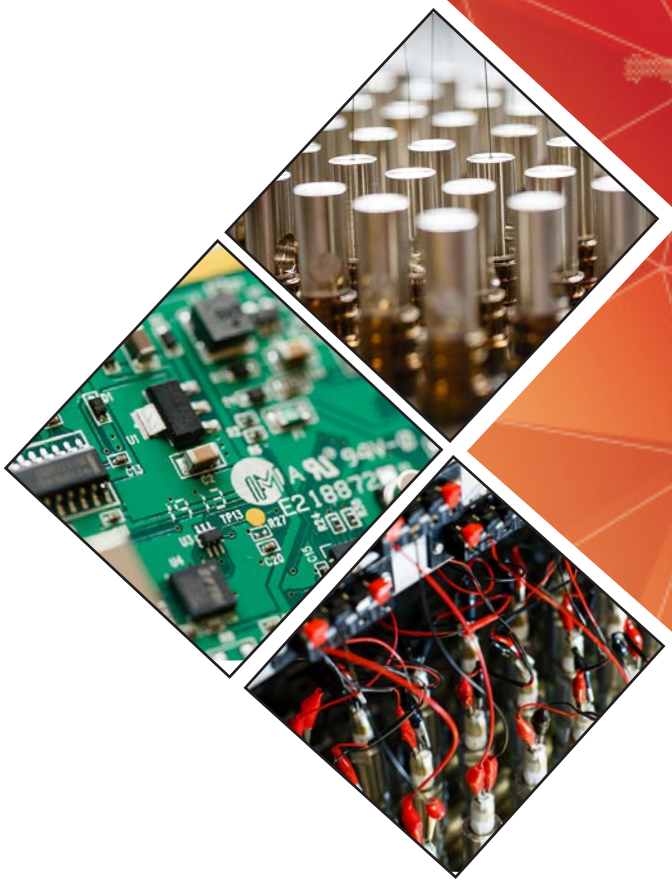
- Password protected access to multiple users
- Access data from multiple project sites
- 24/7 access to data stored in the cloud

NETWORK MONITORING

- Devices and manage alarms
- Status of Nodes and Gateways
- 2D plans
- GSM Network and Packet Loss
- Power input
- Signal power and coverage (RSSI)
- Battery voltage
- Temperature
- Mesh 'hops'

DATA MANAGEMENT

- Manually or automatically download sensor readings and custom aggregations as CSV files
- Convert raw sensor data to engineering units
- Access basic data visualisation charts
- Securely transmit sensor data in near real time via FTP push, Modbus TCP and API
- Sampling rate adjustments
- Integrate 3rd party software



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