FlatMesh™

Product Data Sheet: FlatMesh Optical Displacement Sensor Node

The FlatMesh Optical Displacement Sensor Node is an instrument which uses optical means to take high precision displacement measurements and pass these through Senceive's FlatMesh wireless communications network to a FlatMesh Gateway. It can also be combined with Senceive's world-leading triaxial tilt sensor to obtain high precision tilt measurements that are linked to an external reference.

Successfully applied in many applications, including those measuring:

- Convergence/divergence for Tunnel/Arch intrados or bridge abutments
- Vertical movements for structural settlement/ heave
- Lateral movements such as rail track slew
- Earthworks and embankment movement

Key features

- Fully integrated unit
- Extremely low noise performance
- Optical sensor resolution of 0.1 mm and repeatability of ±0.15 mm
- Resolution of 0.0001° (0.0018 mm/m) and repeatability of ±0.0005° (±0.009 mm/m)
- Integrated long life battery
- 10 year battery life, including when acting as a relay node within the mesh communications network
- Easy to align with target when using the magnet triggered aiming mode
- Integrated temperature sensor
- Versatile mounting options
- Waterproof to IP66 / IP67 / IP68
- Firmware is remotely upgradeable over the air via the gateway reducing costly site visits

FlatMesh Optical Displacement Sensor Node

Physical Specifications

Parameter	Value
Dimensions	90 x 90 x 60 mm
Dimensions including vent	90 x 96 x 60 mm
Total Mass	0.6 kg (approx.)
Housing Material	Die cast aluminium body
Internal Protection Marking	IP66 / IP67 IP68 (1 m for 24 hours)
Mounting Options	Clearance holes for M4 socket head screw in bottom, M4 blind holes in side Plates and brackets available for magnetic fixing, trackbed, stake and pole mounting, and many other applications
Operating Temperature Range	-10°C to +50°C (full functionality) -25°C to +70°C (mesh radio, temperature and tilt only)

Internal Battery

Parameter	Value
Battery Type	Lithium Thionyl Chloride, non-rechargeable
Nominal Voltage	3.6 V
Nominal Capacity	19000 mAh
Typical Battery Life	10 years at 1 hour reporting interval, including when acting as a relay node 8 years at 30 minute reporting interval, including when acting as a relay node Battery life may be reduced when measuring to poorly reflecting surfaces Consult with Senceive for your application

FlatMesh Optical Displacement Sensor Node

Optical Sensor Specifications

Parameter	Value
Resolution	0.1 mm
Repeatability	±0.15 mm
Range	50 metres (natural surface) 100 metres (white target) 150 metres (reflecting target)
Laser Type	Class 2, 655 nm (visible red)

FlatMesh Radio Specifications

Parameter	Value
Communication Type	Proprietary FlatMesh v3 Mesh Networking Protocols IEEE 802.15.4 compliant
Frequency Band	2400 – 2485 MHz ISM Band
Maximum Transmit Power	6.5 dBm (EN 300 328 v1.8.1)
Maximum Permitted Antenna Gain	2.2 dBi
Range	Up to 300 m depending on the environment and fitted antenna Consult with Senceive for your application
RF Module	Senceive FM3Node

Tilt Sensor Specification

Parameter	Value
Resolution	0.0001° (0.00175 mm/m)
Repeatability (-IX variant)	±0.0005° (±0.0087 mm/m)
Repeatability (-IXH variant)	±0.0025° (±0.0436 mm/m)
Range	±90°

FlatMesh Optical Displacement Sensor Node

Certifications

- Tested to conformity with all the essential requirements of the Radio Equipment Directive 2014/53/EU and RoHS Directive 2011/65/EU
- FCC Grant of Equipment Authorization
- RCM (Australia and New Zealand)

Ordering Information and Accessories

Model	Description
FM3N-LDS-IX	**FlatMesh 3 Optical Displacement Sensor with integrated Triaxial Tilt Sensor**
FM3N-LDS-IXH	**FlatMesh 3 Optical Displacement Sensor with integrated Triaxial Tilt Sensor (High-G)**
FF-MP-S360	**Swivel mounting kit with 360-degree adjustment range** Screw directly to vertical walls
FF-MP-V	**Vertical mounting plate** Use U-bolts to fix to poles or stakes Use glue to fix to walls where drilling is not permitted (Order with FF-MP-S360)
FF-MP-RA	**Right angle mounting bracket** Screw to concrete tunnel linings and inclined walls (Order with FF-MP-S360)
FF-MP-T2	**Trackbed mounting plate kit**
FF-MP-M2	**Magnetic mounting kit** High degree of adjustability, perfect for cast iron lined tunnels
FA-FM-WPS	**Waterproof straight antenna** Overall node height 168 mm (approx) when fitted Maximum gain +1.1 dBi
FA-FM-LPS	**Waterproof low profile straight antenna** Minimum overall node height, perfect for trackbed and tight spots Overall node height 92 mm (approx) when fitted Maximum gain 0 dBi
FA-FM-ADJ	**Adjustable angle antenna** Flexible installation, perfect for use in tunnels and indoor environments Overall node height 202 mm (approx) when fitted and upright Overall node height 102 mm (approx) when fitted and at 90-degree angle Maximum gain +2 dBi
FC-NC	**Antenna cover kit** Use with FA-FM-LPS antenna Overall node height 96 mm (approx) when fitted

GeoWAN™

Product Data Sheet
GeoWAN Optical Displacement Sensor Node

The GeoWAN Optical Displacement Sensor Node is an instrument which uses optical means to take high precision displacement measurements and pass these through Senceive's GeoWAN wireless communications network to a GeoWAN Gateway.

It can also be combined with Senceive's world-leading triaxial tilt sensor to obtain high precision tilt measurements that are linked to an external reference.

Successfully applied in many applications, including those measuring:

- Convergence/divergence for tunnel/arch intrados or bridge abutments
- Vertical movements for structural settlement or heave
- Lateral movements such as rail track slew
- Earthworks and embankment movement

Key features

- Fully integrated unit
- Extremely low noise performance
- Optical sensor resolution of 0.1 mm and repeatability of ±0.15 mm
- Tilt sensor resolution of 0.0001° (0.0018 mm/m) and repeatability of ±0.0005° (±0.009 mm/m)
- Integrated long life battery
- Up to 10 year battery life
- Easy to align with target when using the magnet triggered aiming mode
- Integrated temperature sensor
- Versatile mounting options
- Waterproof to IP66 / IP67 / IP68

GeoWAN Optical Displacement Sensor Node

Physical Specifications

Parameter	Value
Dimensions (excluding antenna and vent)	90 x 90 x 60 mm
Dimensions (excluding antenna)	90 x 96 x 60 mm
Total Mass	0.6 kg (approx.)
Housing Material	Die cast aluminium body
Internal Protection Marking	IP66 / IP67 IP68 (1 m for 24 hours)
Mounting Options	1/4" UNF holes in bottom, M4 blind holes in side Plates and brackets available for magnetic fixing, trackbed, stake and pole mounting, and many other applications
Operating Temperature Range	-10°C to +40°C (full functionality) -25°C to +70°C (temperature and tilt only)

Internal Battery

Parameter	Value
Battery Type	Lithium Thionyl Chloride, non-rechargeable
Nominal Voltage	3.6 V
Nominal Capacity	19000 mAh
Typical Battery Life	10 years at 1 hour reporting interval when using radio preset 1 8 years at 30 minute reporting interval when using radio preset 1 Consult with Senceive for your application

Optical Sensor Specification

Parameter	Value
Resolution	0.1 mm
Repeatability	±0.15 mm
Range	50 metres (natural surface) 100 metres (white target) 150 metres (reflecting target)
Laser Type	Class 2, 655nm (visible red)

GeoWAN Optical Displacement Sensor Node

GeoWAN Radio Specifications

Parameter	Value
Communication Type	Star Topology
Frequency Band (868 variant)	863 MHz - 870 MHz ISM Band
Frequency Band (902 variant)	902 MHz - 928 MHz ISM Band
Frequency Band (915 variant)	915 MHz - 928 MHz ISM Band
Maximum Transmit Power (868 variant)	14 dBm conducted
Maximum Transmit Power (902 variant)	18 dBm conducted
Maximum Transmit Power (915 variant)	18 dBm conducted
Maximum Antenna Gain	1.8 dBi
Range	Up to 15 km depending on the environment and fitted antenna Consult with Senceive for your application

Tilt Sensor Specification

Parameter	Value
Resolution	0.0001° (0.00175 mm/m)
Repeatability (-IX variant)	±0.0005° (±0.0087 mm/m)
Repeatability (-IXH variant)	±0.0025° (±0.0436 mm/m)
Range	±90°

Sampling and Reporting

Parameter	Value
Maximum Reporting Frequency	30 seconds
Sample Storage	Stores the last 29 days of samples at a reporting interval of 30 minutes (18 days including tilt)

GeoWAN Optical Displacement Sensor Node

Certifications

- Tested to conformity with all the essential requirements of the Radio Equipment Directive 2014/53/EU and RoHS Directive 2011/65/EU
- FCC Grant of Equipment Authorization
- ACB ISED Canada Certificate: 24373-LR3N
- RCM (Australia and New Zealand)

Ordering Information and Accessories

Model	Description
LR3N-LDS(868)	**GeoWAN Optical Displacement Sensor** Europe
LR3N-LDS-IX(868)	**GeoWAN Optical Displacement Sensor with integrated Triaxial Tilt Sensor** Europe
LR3N-LDS-IXH(868)	**GeoWAN Optical Displacement Sensor with integrated Triaxial Tilt Sensor (High-g)** Europe
LR3N-LDS(902)	**GeoWAN Optical Displacement Sensor** North America, South America
LR3N-LDS-IX(902)	**GeoWAN Optical Displacement Sensor with integrated Triaxial Tilt Sensor** North America, South America
LR3N-LDS-IXH(902)	**GeoWAN Optical Displacement Sensor with integrated Triaxial Tilt Sensor (High-g)** North America, South America
LR3N-LDS(915)	**GeoWAN Optical Displacement Sensor** Australia, New Zealand, Chile, Brazil
LR3N-LDS-IX(915)	**GeoWAN Optical Displacement Sensor with integrated Triaxial Tilt Sensor** Australia, New Zealand, Chile, Brazil
LR3N-LDS-IXH(915)	**GeoWAN Optical Displacement Sensor with integrated Triaxial Tilt Sensor (High-g)** Australia, New Zealand, Chile, Brazil
FF-MP-PRL-S	**Precision Laser Bracket with swivel mount**
FF-MP-PRL-M	**Precision Laser Bracket with magnetic mount**
FF-MP-PRL-RS	**Precision Laser Bracket with right angle swivel mount**
FF-MP-PRL-RM	**Precision Laser Bracket with right angle magnetic mount**
FA-LR-WPS	**Waterproof straight antenna** Overall node height 168mm (approx) when antenna fitted Maximum gain +1.8dBi