

## 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.

Optical Displacement sensing is perfect for 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 0.1mm and repeatability of  $\pm 0.15\text{mm}$
- Triaxial tilt sensor resolution of  $0.0001^\circ$  ( $0.0018\text{mm/m}$ ) and repeatability of  $\pm 0.0005^\circ$  ( $\pm 0.009\text{mm/m}$ )
  - Integrated long life battery
- 10 years 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 IP68 (1m for 24 hours)
- Firmware is remotely upgradeable over the air via the gateway reducing costly site visits

### Physical Specifications

| Parameter | Value |
|-----------|-------|
|-----------|-------|

|   |  |
|---|--|
| <b>Dimensions excluding antenna</b>                 | 90 x 90 x 60 mm<br>90 x 96 x 60 mm (including vent)  |
| <b>Total Mass</b>                                   | 0.6 kg (approx.)   |
| <b>Housing Material</b>                             | Die cast aluminium   |
| <b>Protection</b><br>(BS EN 60529: 1992 + A2: 2013) | IP68 at 1m for 24 hours  |
| <b>Mounting Options</b>                             | Clearance holes for M4 socket head screw in bottom, M4 blind holes in side<br>Plates and brackets available for magnetic fixing, track bed, stake and pole mounting, and many other applications |
| <b>Operating Temperature Range</b>                  | -10°C to +50°C (full functionality)<br>-25°C to +70°C (mesh radio, temperature and tilt)   |

| Parameter            | Value                  |
|----------------------|------------------------|
| <b>Resolution</b>    | 0.0001° (0.00175mm/m)  |
| <b>Repeatability</b> | ±0.0005° (±0.0087mm/m) |

|       |      |
|-------|------|
| Range | ±90° |
|-------|------|

## FlatMesh Radio Specifications

| Parameter                                  | Value   |
|--|---|
| Communication Type                         | Proprietary FlatMesh v3 Mesh Networking Protocols<br>IEEE 802.15.4 compliant          |
| Frequency Band                             | 2400 – 2485 MHz ISM Band  |
| Maximum Transmit Power (EN 300 328 v2.1.1) | 6.5dBm  |
| Maximum Permitted Antenna Gain             | 2.2dBi  |
| Range                                      | Up to 300m depending on the environment<br>Consult with Senceive for your application |
| RF Module                                  | Senceive FM3Node  |

## Optical Sensor Specifications

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

## Tilt Sensor Specifications (-IX version) Internal Battery

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

## Certifications

- Tested to conformity with all the essential requirements of RED Directive 2014/53/EU and RoHS Directive 2011/65/EU

## Ordering Information and Accessories

| Model       | Description   |
|-------------|---|
| FM3N-LDS    | <b>FlatMesh 3 Optical Displacement Sensor</b>   |
| FM3N-LDS-IX | <b>FlatMesh 3 Optical Displacement Sensor with integrated Triaxial Tilt Sensor</b>  |
| FF-MP-S360  | <b>Swivel mounting kit with 360-degree adjustment range</b> screw directly to vertical walls  |
| FF-MP-V     | <b>Vertical mounting plate</b> <ul style="list-style-type: none"> <li>- use U-bolts to fix to poles or stakes</li> <li>- use glue to fix to walls where drilling is not permitted - Use with FF-MP-S360</li> </ul>  |
| FF-MP-RA    | <b>Right angle mounting bracket</b> <ul style="list-style-type: none"> <li>- screw to concrete tunnel linings and inclined walls</li> </ul> Use with FF-MP-S360   |
| FF-MP-T2    | <b>Track bed mounting plate kit</b>   |
| FF-MP-M2    | <b>Magnetic mounting kit</b><br>High degree of adjustability, perfect for cast iron lined tunnels   |
| FA-FM-WPS   | <b>Waterproof straight antenna</b><br>Overall node height 168mm (approx) when fitted Maximum gain +1.1dBi   |
| FA-FM-LPS   | <b>Waterproof low profile straight antenna</b><br>Minimum overall node height, perfect for track bed and tight spots<br>Overall node height 92mm (approx) when fitted Maximum gain 0dBi   |
| FA-FM-ADJ   | <b>Adjustable angle antenna</b><br>Flexible installation, perfect for use in tunnels and indoor environments<br>Overall node height 202mm (approx) when fitted and upright<br>Overall node height 102mm (approx) when fitted and at 90-degree angle<br>Maximum gain +2dBi |
| FC-NC       | <b>Antenna cover kit</b><br>Use with FA-FM-LPS antenna<br>Overall node height 96mm (approx) when fitted   |