



Product Data Sheet: FlatMesh Crack Sensor Node

The FlatMesh Crack Sensor Node interfaces to a linear displacement sensor. Its high precision sampling circuit powers the sensor and reports its measurements through Senceive's FlatMesh wireless communications network to a FlatMesh Gateway.

Successfully applied in many applications, including those measuring:

- Crack movement
- Pile separation
- Structural movement
- Expansion joint monitoring

Key features

- Waterproof, robust connectors for simple installation
- Automatic sensor type detection
- Extremely low noise performance
- 16-bit resolution (65,536 steps over the full scale)
- Integrated long life battery
- 12-15 year battery life, including when acting as a relay node within the mesh communications network
- Integrated temperature sensor
- One and two channel variants readily available
- Waterproof to IP66 / IP67 / IP68
- Firmware is remotely upgradeable over the air via the gateway reducing costly site visits
- Variety of fixings available for easy installation on site

FlatMesh Crack Sensor Node



Physical Specifications

Parameter	FM3N-CS/CS2
Dimensions excluding antenna and vent	90 x 90 x 60 mm
Dimensions excluding antenna	90 x 96 x 60 mm
Total Mass	0.57 kg
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
Operating Temperature Range	-40°C to +85°C

Internal Battery

Parameter	FM3N-CS/CS2
Battery Type	Lithium Thionyl Chloride, non-rechargeable
Nominal Voltage	3.6 V
Nominal Capacity	19000 mAh
Typical Battery Life	12-15 years at 30 minute reporting intervals, including when acting as a relay node. Consult with Senceive for your application.

FlatMesh Crack Sensor Node



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

Crack Sensor Interface

Parameter	Value
Circuit Topology	Voltage divider
Stimulus	2.5 V, 100 mA max
Resolution	0.0015% of full scale
Noise Level	0.005% of full scale (typical peak to peak)

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)

FlatMesh Crack Sensor Node



Ordering Information and Accessories

Model	Description
FM3N-CS	FlatMesh 3 Crack Sensor Node (one port)
FM3N-CS2	FlatMesh 3 Crack Sensor Node (two port)
FS-CS25 Use with FF-CS1	Potentiometric 25 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-CS125 Use with FF-CS1	Potentiometric 125 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-CS200 Use with FF-CS1	Potentiometric 200 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-DW150	Potentiometric 150 mm draw wire sensor IP65 rated, with connector fitted
FF-CS1	Crack Sensor mounting kit (pair)
FF-CS1-060	Crack Sensor mounting kit (pair, low-profile)
FF-MP-S360	Swivel mounting kit with 360-degree adjustment range Screw directly to vertical walls
FF-MP-V (Order with FF-MP-S360)	Vertical mounting plate Use U-bolts to fix to poles or stakes Use glue to fix to walls where drilling is not permitted
FF-MP-T2	Trackbed mounting plate kit
FF-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



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- Pile separation
- Structural movement
- Expansion joint monitoring

Key features

- Waterproof, robust connectors for simple installation
- Automatic sensor type detection
- Extremely low noise performance
- 16-bit resolution (65,536 steps over the full scale)
- Integrated long life battery
- 12-15 year battery life, including when acting as a relay node within the mesh communications network
- Integrated temperature sensor
- One and two channel variants readily available
- Waterproof to IP66 / IP67 / IP68
- Firmware is remotely upgradeable over the air via the gateway reducing costly site visits
- Variety of fixings available for easy installation on site

FlatMesh Crack Sensor Node



Physical Specifications

Parameter	FM3N-CS/CS2
Dimensions excluding antenna and vent	90 x 90 x 60 mm
Dimensions excluding antenna	90 x 96 x 60 mm
Total Mass	0.57 kg
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
Operating Temperature Range	-40°C to +85°C

Internal Battery

Parameter	FM3N-CS/CS2
Battery Type	Lithium Thionyl Chloride, non-rechargeable
Nominal Voltage	3.6 V
Nominal Capacity	19000 mAh
Typical Battery Life	12-15 years at 30 minute reporting intervals, including when acting as a relay node. Consult with Senceive for your application.

FlatMesh Crack Sensor Node



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

Crack Sensor Interface

Parameter	Value
Circuit Topology	Voltage divider
Stimulus	2.5 V, 100 mA max
Resolution	0.0015% of full scale
Noise Level	0.005% of full scale (typical peak to peak)

Certifications

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- FCC Grant of Equipment Authorization
- RCM (Australia and New Zealand)

FlatMesh Crack Sensor Node



Ordering Information and Accessories

Model	Description
FM3N-CS	FlatMesh 3 Crack Sensor Node (one port)
FM3N-CS2	FlatMesh 3 Crack Sensor Node (two port)
FS-CS25 Use with FF-CS1	Potentiometric 25 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-CS125 Use with FF-CS1	Potentiometric 125 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-CS200 Use with FF-CS1	Potentiometric 200 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-DW150	Potentiometric 150 mm draw wire sensor IP65 rated, with connector fitted
FF-CS1	Crack Sensor mounting kit (pair)
FF-CS1-060	Crack Sensor mounting kit (pair, low-profile)
FF-MP-S360	Swivel mounting kit with 360-degree adjustment range Screw directly to vertical walls
FF-MP-V (Order with FF-MP-S360)	Vertical mounting plate Use U-bolts to fix to poles or stakes Use glue to fix to walls where drilling is not permitted
FF-MP-T2	Trackbed mounting plate kit
FF-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



Product Data Sheet: FlatMesh Vibrating Wire Sensor Node

The FlatMesh Vibrating Wire Sensor Node brings a wide variety of vibrating wire sensors into the FlatMesh system. It is a highly integrated system which is capable of exciting and sampling vibrating wire sensors and reporting its measurements through Senceive's FlatMesh wireless communications network to a FlatMesh Gateway.

Examples of sensors supported:

- Piezometers
- Strain Gauges
- Crack Meters
- Load Cells
- Pressure Cells
- Extensometers
- In-Place Inclometers

Key features

- Waterproof, robust connectors for simple installation
- Resolution of 0.001 Hz and repeatability of ± 0.02 Hz
- Integrated long life battery
- 10-15 year battery life, including when acting as a relay node within the mesh communications network
- 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 Vibrating Wire Sensor Node



Physical Specifications

Parameter	FM3N-VW11	FM3N-VW41
Dimensions excluding antenna and vent	90 x 90 x 60 mm	90 x 130 x 50 mm
Dimensions excluding antenna	90 x 96 x 60 mm	90 x 136 x 50 mm
Total Mass	0.57 kg	0.75 kg
Housing Material	Die cast aluminium	
Protection (BS EN 60529: 1992+A2:2013)	IP66 / IP67 / IP68 (1 m for 24 hours)	
Mounting Options	1/4" UNF holes in bottom M4 blind holes in side	M6 holes in bottom
Operating Temperature Range	-40°C to +85°C	

Internal Battery

Parameter	FM3N-VW11	FM3N-VW41
Battery Type	Lithium Thionyl Chloride	
Nominal Voltage	3.6 V	
Nominal Capacity	19000 mAh	34400 mAh
Typical Battery Life	10-15 years at 20 minute reporting intervals, including when acting as a relay node. Consult with Senceive for your application.	

Channel Combinations

Model	Ports	Applications
FM3N-VW11	1 VW and 1 Thermistor Channel	Single sensor
FM3N-VW41	1 VW and 1 Thermistor Channel (x4)	Four strain gauges in an array 2+ sensors in close proximity

FlatMesh Vibrating Wire Sensor Node



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

Vibrating Wire Interface

Parameter	FM3N-VW11; FM3N-VW41
Connector	M12 Female 5-pole A-coded Screw-in Type
Frequency Resolution	0.001 Hz
Frequency Repeatability	±0.02 Hz
Frequency Range	200-6000 Hz
Stimulus Type	Swept Sine Wave, 6 V peak to peak
Thermistor Type	3 kΩ NTC
Temperature Resolution	0.05°
Temperature Accuracy	±0.1°C
Temperature Range	-40°C to +85°C

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

FlatMesh Vibrating Wire Sensor Node



Ordering Information and Accessories

Model	Description
FM3N-VW11	FlatMesh 3 Vibrating Wire Sensor Node (1 x 1-wire port)
FM3N-VW41	FlatMesh 3 Vibrating Wire Sensor Node (4 x 1-wire port)
FS-VWCON11	Sensor Connector for 1-wire sensor Screw terminals for easy installation Sensor cable outside diameter 5.0-8.0 mm Suits FM3N-VW11 or FM3N-VW41
FT-VW-TH11	Test Harness for 1-wire sensors Mates to FS-VWCON11 for easy connection to hand-held vibrating wire readout device (not supplied)
FA-FM-WPS	Waterproof straight antenna Overall node height - 168 mm (approx.) when fitted to FM3N-VW11 or FM3N-VW17 - 158 mm (approx.) when fitted to FM3N-VW41 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 to FM3N-VW11 or FM3N-VW17 - 82 mm (approx.) when fitted to FM3N-VW41 Maximum gain 0 dBi
FA-FM-ADJ	Adjustable angle antenna Flexible installation, perfect for use in tunnels and indoor environments Overall node height when upright - 202 mm (approx.) when fitted to FM3N-VW11 or FM3N-VW17 - 192 mm (approx.) when fitted to FM3N-VW41 Overall node height when at 90-degree angle - 102 mm (approx.) when fitted to FM3N-VW11 or FM3N-VW17 - 92 mm (approx.) when fitted to FM3N-VW41 Maximum gain +2 dBi
FC-NC	Antenna cover kit Fits FM3N-VW11 and FM3N-VW17 only Use with FA-FM-LPS antenna Overall node height 96 mm (approx.) when fitted



Product Data Sheet

GeoWAN Crack Sensor Node

The GeoWAN Crack Sensor Node interfaces to a linear displacement sensor. Its high precision sampling circuit powers the sensor and reports its measurements through Senceive's GeoWAN wireless communications network to a GeoWAN Gateway.

Successfully applied in many applications, including those measuring:

- Crack movement
- Pile separation
- Structural movement
- Expansion joint monitoring

Key features

- Waterproof, robust connectors for simple installation
- Automatic sensor type detection
- Extremely low noise performance
- 16-bit resolution (65,536 steps over the full scale)
- Integrated long life battery
- Up to 12 year battery life
- Integrated temperature sensor
- One and two channel variants readily available
- Versatile mounting options
- Waterproof to IP66 / IP67 / IP68

GeoWAN Crack 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	0.56 kg (single port) / 0.75 kg (dual port)
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	-40°C to +85°C

Internal Battery

Parameter	Value
Battery Type	Lithium Thionyl Chloride, non-rechargeable
Nominal Voltage	3.6 V
Nominal Capacity	19000 mAh
Typical Battery Life	12 years at 30 minute reporting intervals when using radio preset 1 Consult with Senceive for your application

Crack Sensor Interface

Parameter	Value
Circuit Topology	Voltage divider
Stimulus	2.5 V, 100 mA max
Resolution	0.0015% of full scale
Noise Level	0.005% of full scale (typical peak to peak)

GeoWAN Crack 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

Sampling and Reporting

Parameter	Value
Maximum Reporting Frequency	30 seconds
Sample Storage	Stores the last 49 days of samples at a reporting interval of 30 minutes (37 days for a dual port 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)

GeoWAN Crack Sensor Node



Ordering Information and Accessories

Model	Description
LR3N-CS(868)	GeoWAN Crack Sensor Node (one port) Europe
LR3N-CS2(868)	GeoWAN Crack Sensor Node (two port) Europe
LR3N-CS(902)	GeoWAN Crack Sensor Node (one port) North America, South America
LR3N-CS2(902)	GeoWAN Crack Sensor Node (two port) North America, South America
LR3N-CS(915)	GeoWAN Crack Sensor Node (one port) Australia, New Zealand, Chile, Brazil
LR3N-CS2(915)	GeoWAN Crack Sensor Node (two port) Australia, New Zealand, Chile, Brazil
FS-CS25 Use with FF-CS1	Potentiometric 25 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-CS125 Use with FF-CS1	Potentiometric 125 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-CS200 Use with FF-CS1	Potentiometric 200 mm crack sensor IP67 rated, with 1 metre cable and connector Other cable lengths available on request
FS-DW150	Potentiometric 150 mm draw wire sensor IP65 rated, with connector fitted
FF-CS1	Crack Sensor mounting kit (pair)
FF-CS1-060	Crack Sensor mounting kit (pair, low-profile)
FF-MP-S360	Swivel mounting kit with 360-degree adjustment range Screw directly to vertical walls
FF-MP-V (Order with FF-MP-S360)	Vertical mounting plate Use U-bolts to fix to poles or stakes Use glue to fix to walls where drilling is not permitted
FF-MP-T2	Trackbed mounting plate kit
FA-LR-WPS	Waterproof straight antenna Overall node height 168 mm (approx) when antenna fitted Maximum gain +1.8 dBi



Product Data Sheet

GeoWAN Vibrating Wire Sensor Node

The GeoWAN Vibrating Wire Sensor Node family bring a wide variety of vibrating wire sensors into the GeoWAN system. These highly integrated products are capable of exciting and sampling vibrating wire sensors and reporting using Senceive's GeoWAN wireless communications network to a GeoWAN Gateway.

Examples of sensors supported:

- Piezometers
- Strain Gauges
- Crack Meters
- Load Cells
- Pressure Cells
- Extensometers
- In-Place Inclometers

Key features

- High performance, easy to connect multichannel connectors
- Waterproof, robust connectors for simple installation
- Resolution of 0.001 Hz and repeatability of ± 0.02 Hz
- Integrated long life battery
- 10-12 year battery life
- Integrated temperature sensor
- Versatile mounting options
- Waterproof to IP66 / IP67 / IP68

GeoWAN Vibrating Wire Sensor Node



Physical Specifications

Parameter	LR3N-VW11	LR3N-VW41
Dimensions (excluding antenna and vent)	90 x 90 x 60 mm	90 x 130 x 50 mm
Dimensions (excluding antenna)	90 x 96 x 60 mm	90 x 136 x 50 mm
Total Mass	0.57 kg (approx.)	0.75 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	M6 holes in bottom
Operating Temperature Range	-40°C to +85°C	

Internal Battery

Parameter	LR3N-VW11	LR3N-VW41
Battery Type	Lithium Thionyl Chloride, non-rechargeable	
Nominal Voltage	3.6 V	
Nominal Capacity	19000 mAh	34400 mAh
Typical Battery Life	10-12 years at 1 hour reporting intervals Consult with Senceive for your application	

Channel Combinations

Model	Ports	Typical Applications
LR3N-VW11	1 VW and 1 Thermistor Channel	Single sensor
LR3N-VW41	1 VW and 1 Thermistor Channel (x4)	Four strain gauges in an array 2+ sensors in close proximity

Sampling and Reporting

Parameter	LR3N-VW11	LR3N-VW41
Maximum Reporting Frequency	30 seconds	
Sample Storage	Stores the last 37 days of samples at a reporting interval of 30 minutes	Stores the last 14 days of samples at a reporting interval of 30 minutes

GeoWAN Vibrating Wire 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

Vibrating Wire Specifications

Parameter	Value
Frequency Resolution	0.001 Hz
Frequency Repeatability	±0.02 Hz
Frequency Range	200-6000 Hz
Stimulus Type	Swept Sine Wave, 6 V peak to peak
Thermistor Type	3kΩ NTC
Temperature Resolution	0.05°C
Temperature Accuracy	±0.1°C
Temperature Range	-40°C to +85°C

GeoWAN Vibrating Wire 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-VW11(868)	GeoWAN Vibrating Wire Sensor Node (1 x 1-wire port) Europe
LR3N-VW41(868)	GeoWAN Vibrating Wire Sensor Node (4 x 1-wire port) Europe
LR3N-VW11(902)	GeoWAN Vibrating Wire Sensor Node (1 x 1-wire port) North America, South America
LR3N-VW41(902)	GeoWAN Vibrating Wire Sensor Node (4 x 1-wire port) North America, South America
LR3N-VW11(915)	GeoWAN Vibrating Wire Sensor Node (1 x 1-wire port) Australia, New Zealand, Chile, Brazil
LR3N-VW41(915)	GeoWAN Vibrating Wire Sensor Node (4 x 1-wire port) Australia, New Zealand, Chile, Brazil
FS-VWCON11	Sensor Connector for 1-wire sensor Screw terminals for easy installation Sensor cable outside diameter 5.0-8.0 mm Suits LR3N-VW11, LR3N-VW41, FM3N-VW11 or FM3N-VW41
FT-VW-TH11	Test Harness for 1-wire sensors Mates to FS-VWCON11 for easy connection to hand-held vibrating wire readout device (not supplied)
FA-LR-WPS	Waterproof straight antenna Overall node height 168 mm (approx) when antenna fitted Maximum gain +1.8 dBi