EDGE DEVICES - WIRELESS SENSORS

GNSS Meter

LSG7GNS-SXLH

Worldsensing's GNSS Meter is a wireless sensor that enables precise automated measurement of surface point movements. It features advanced multi-band Real-Time Kinematic (RTK) technology and innovative edge processing that delivers millimetric precision with great reliability.

Key Features

MILLIMETRIC PRECISION
Achieve sub-centimeter precision down to 2 mm with RTK technology, ensuring the most cost-efficient data collection available. Position measurements provided every hour with two levels of aggregation: 6 h, and 24 h

FLEXIBLE CONFIGURATION OPTIONS
The GNSS Meter has flexible configuration options that allow the nodes to function as either a base station or a rover, adapting to various monitoring needs. Check the radio link from the base to the rover using the Worldsensing App.

ADVANCED EDGE DATA-PROCESSING
Statistics related to the quality of the position measurement and the performance of the system, transmitted via radio and available in CMT.

WIRELESS, AUTONOMOUS AND LOW-POWER
The GNSS Meter leverages the excelling capabilities of efficiency of our Loadsensing portfolio. Autonomous, battery-powered devices with D-size batteries that can last more than 3.6 years in most cases.

INTEGRATED TILTMETER AND ENVIRONMENTAL SENSORS
The GNSS Meter comes with an integrated tiltmeter to ensure the transmission of measurements even when conditions for precise RTK measurement are not met, and it also allows for the monitoring of changes from vertical in structures and mounting elements.

REPORT DISPLACEMENTS
Calculate vertical, and horizontal (E/W, N/S, absolute) displacements from the initial position within CMT.

loadsensing

Low-power, long-range technology

The GNSS Meter leverages Worldsensing's field-proven Loadsensing technology, which ensures long-range radio connectivity without dependence on internet or cellular networks.

Designed for scalability and robustness, the GNSS Meter integrates seamlessly with the rest of the Loadsensing portfolio that stream data from other geotechnical sensors such as piezometers, inclinometers, and extensometers, allowing comprehensive, automated monitoring.

Its industrial-grade, field-tested devices ensure reliable and unattended operation, even in the harshest environments. The GNSS Meter supports multiple base deployments within the same LoRa network, guaranteeing accurate and reliable transmission of corrections from base to rovers.

www.worldsensing.com
connect@worldsensing.com

Barcelona
Viriat 47, Edificio Numancia 1, 10th floor,
08014 Barcelona, Spain
(+34) 93 418 05 85

United Kingdom
United States
Singapore

Main Applications

The GNSS Meter is designed for cross-industry applications, offering millimetric precision in areas such as slope stability, settlement, and subsidence monitoring. It is ideal for dense point monitoring or as a complement to in-ground sensors like inclinometers and extensometers, as well as geospatial techniques like satellite InSAR, ground-based radar, and total stations, enhancing overall data reliability and robustness.

SUBSIDENCE AND HEAVE

- Coastal subsidence
- Mining and underground excavations
- Mine closures
- Swelling rocks and expansive soils
- Points of control for satellite InSAR, ground-based radar, total stations, and other geospatial monitoring techniques.

SLOPE STABILITY

- Areas and assets affected by landslides
- Open pits and slope stability
- Surface points of control for in-place inclinometer strings, extensometers, and settlement systems

SETTLEMENT

- Embankments, soil consolidation, and land reclamation projects
- Bridge abutments settlement
- Foundations settlement

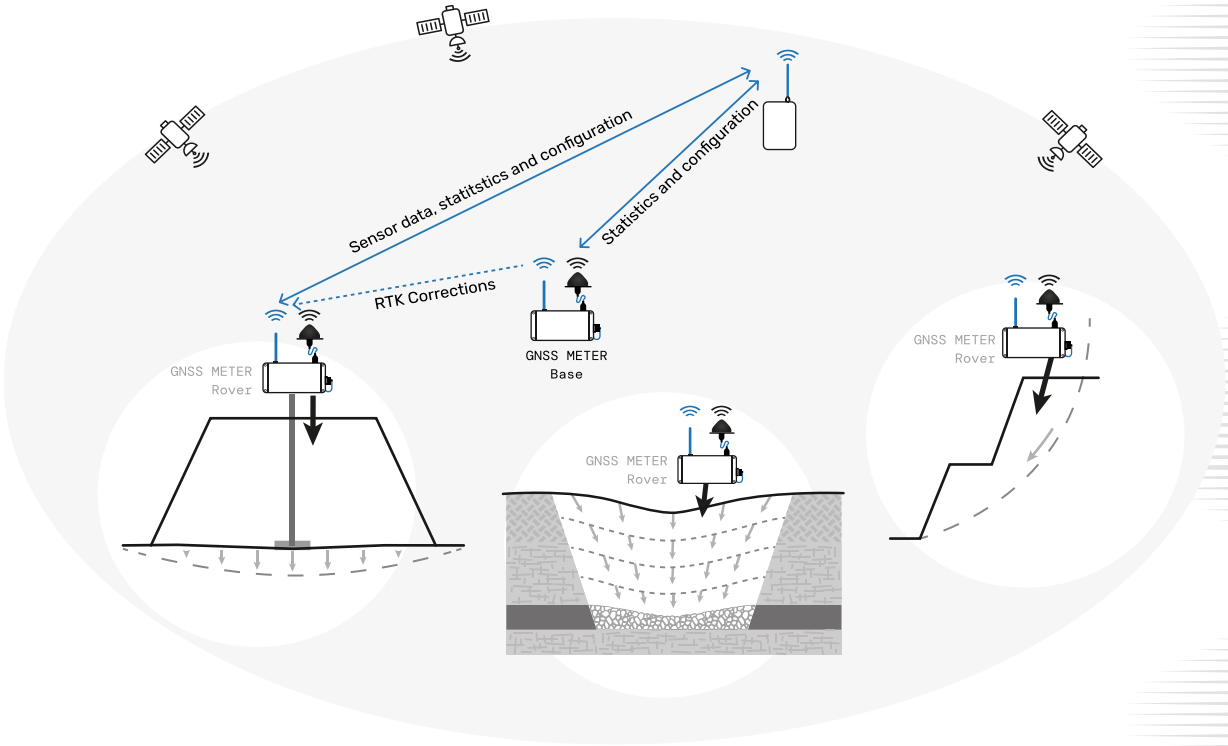

Fig 1 illustrates the GNSS Meter's operation. Rovers collect satellite data and receive RTK corrections from a base station via LoRa, which enables precise positioning. The GNSS Meter then transmits sensor data and performance statistics to the gateway using LoRa. Remote configuration is also possible via CMT through the gateway, ensuring flexibility and control.

TECHNICAL SPECIFICATIONS

GENERAL	
Sensor type	GNSS
Secondary Sensor	Tiltmeter
Environmental sensor	Integrated temperature and humidity sensor
Power Source	4 x 3,6 V D-size user-replaceable, high energy density batteries
Reporting Period	1 h
Communications	LoRa radio
GNSS time synchronization	±1 s
Reporting Format	Position (WGS84) data for: • Last hour sample • Last 6 h aggregated • Last 24 h aggregated
Device configuration	• Worldsensing App • CMT Edge
GNSS SENSOR	
Correction Technology	Real time Kinematic (RTK)
GNSS Channels	184
GNSS Constellations/ Frequency bands[1]	Selectable (3 max.) from: • GPS / QZSS: L1C/A, L2C • GLONASS: L1OF, L2OF • Galileo: E1-B/C, E5b • BeiDou: B1I, B2I
GNSS warmup time	Selectable from: • 10s • 20s • 30s

Axes	3-axis inclination measurement with respect to gravity's direction. Reports the two axes of rotation from the horizontal plane in any orientation
TILTMETER	
Sensor	3-axis MEMS accelerometer
Range	±90°
Repeatability	< 0.0003°
Offset temperature dependency	± 0.002°/°C
TEMPERATURE SENSOR	
Range	-40°C to 80°C
Resolution	0.1°C
HUMIDITY SENSOR	
Sensor type	Humidity sensor to detect lack of sealing/locking of the enclosure. Statistics of the relative humidity measurements transmitted in the health messages.

GNSS PRECISION[1]

		50th percentile			95th percentile		
Distance base to rover	Axis	*1 h* *last sample*	*6 h* *aggregated*	*24 h* *aggregated*	*1 h* *last sample*	*6 h* *aggregated*	*24 h* *aggregated*
40 m	Horizontal	3 mm	1 mm	1 mm	9 mm	3 mm	2 mm
	Vertical	4 mm	2 mm	1 mm	20 mm	5 mm	3 mm
4 000 m	Horizontal	6 mm	3 mm	2 mm	21 mm	8 mm	4 mm
	Vertical	8 mm	4 mm	2 mm	31 mm	15 mm	7 mm

[1] Users can configure the device to operate with any combination of up to three of these constellations to optimize positioning accuracy and performance.

[2] Under favorable conditions, in an open-sky environment in the Province of Barcelona.

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MECHANICAL	
Box dimensions (WxLxH)	200x100x61 mm
Overall dimensions	205x120x61 mm
GNSS Antenna	• External • 26 dB LNA gain • 66.7x66.7x76 mm
LoRa Antenna	• External • -0.3dBi gain • 11 ⌀mm, 101 mm long
Operating temperature	-40 ºC to 80 ºC (-40 ºF to 175 ºF)
Weather protection	IP68 (at 2 m for 2 h)
Weight (excluding batteries)	960 g
Communication ports	• GNSS Antenna: RP N-Type Female • LoRa Antenna: RP SMA Female • USB Type-C Female
Mounting options	• Compact vertical mount using anchor rods, on 50mm pole using U-bolts or other columns using metal clamps • Compact horizontal mount using anchor rods • Survey pole mount with extended GNSS Antenna • Surface mount with extended LoRa antenna • Surface mount with extended GNSS antenna
Box material	Aluminium alloy
Battery holder	4 cells, D-size battery holder

RADIO SPECIFICATIONS	
Radio band	ISM sub 1 GHz
Operating frequency bands	Adjustable
Bidirectional communications	GNSS sensor configuration including mode (base/rover), creation of new base entities, base position, assigning rovers to a specific base, warm-up time, among others.
Maximum link budget	151 dB / 157 dB
Radio configuration	LoRa/ LoRaWAN
Network topology Node to Gateway	• LoRa Star • LoRa Tree (K20 Edge repeater)
Network topology Base to Rover	• LoRa Star
NODE TO GATEWAY RADIO RANGE[2]	
Range open sight	15 km
Range city street	4 km
Range manhole in a city street	2 km
Tunnel	4 km
BASE TO ROVER RADIO RANGE[2]	
Range open sight	5 km

BATTERY LIFE ESTIMATIONS[3]			
Warmup time	10 s	20 s	30 s
Base	3.1 years	2.7 years	2.4 years
Rover	3.5 years	2.9 years	2.5 years

[2] Base-to-Rover line of sight is required. The distances have been tested by Worldsensing and verified in actual projects using the standard antenna. However, radio range depends on the environment, so these distances are only indicative. Please contact us regarding your specific application.

[3] Battery life estimations using recommended Saft batteries LSH 20/LS33600, for devices with serial number above #168719. Calculations assuming GNSS clear sky visibility default base configuration with a maximum time of 2 minutes to test the radio link between base and rover and 1 hour reporting period. Receiver offset enabled. Typical Europe radio configuration using SF9, radio transmit power 14dBm. Considering laboratory conditions. Consumption varies depending on environmental and wireless network conditions. Battery life estimations based on the lifetime mathematical model using Barcelona weather profile. Average values provided.

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ACCESSORIES

LS-ACC-BIG-HVP	**Versatile Mount Plate for Large Devices** Suited for horizontal or vertical surface mounting, pole mounting with 50mm U-bolts or pole mounting with metal clamps. Compatible with large G6/G7 devices.
LS-ACC-ANT-HVP	**Versatile Mount Plate for GNSS Antenna** Suited for horizontal or vertical mount of the GNSS antenna LS-ACC-GNSS-ANT. It can be either fixed to the versatile mount plate for large nodes or for standalone mount on surface or pole mount using 50mm U-bolts or metal clamps.
LS-ACC-PRS-VP	**Vertical Mount Plate for Prism** Designed to align the prism with the center of the GNSS antenna. It can be mounted with either the versatile mount plate for large nodes (LS-ACC-BIG-HVP) or the versatile mount plate for the GNSS antenna (LS-ACC-ANT-HVP). The assembled set can then be mounted on a wall or pole using anchor rods (LS-ACC-ANC-H), 50 mm U-bolts (WS-ACC-U50), or metal clamps.
LS-ACC-GNSS-RD	**5/8-inch Survey Pole Mount for GNSS Antenna** Mount for the GNSS Meter antenna with a 5/8-inch survey pole connection.
LS-ACC-ANT-LORA	**Mount Bracket for LoRa Antenna** Enables horizontal or vertical mounting of the LoRa antenna with cable extension LS-ACC-ANTE-G7 or LS-ACC-ANTS-G7. Can attach to LS-ACC-BIG-HVP or be used standalone with anchor rods or clamps.
LS-ACC-ANTE-G7	**LoRa Antenna cable extension 2.5 m for G7 Devices** RP-SMA (Male) to RP-SMA (Female). For G7 edge devices.
LS-ACC-ANTS-G7	**LoRa Antenna cable extension 0.45 m for G7 Devices** RP-SMA (Male) to RP-SMA (Female). For G7 edge devices.
LS-ACC-GNSS-CL2	**GNSS Antenna cable extension 1.5 m** Male N-Type RP to TNC Male.
LS-ACC-GNSS-CL3	**GNSS Antenna cable extension 3 m** Male N-Type RP to TNC Male.
WS-ACC-G7-USBC	**USB-C to USB-C 1 m cable** for Mobile phone to device.
LS-ACC-USBC-IP	**Sealed USB-C male to standard USB-C male** 2 m cable for G7 devices equipped with external connector.
WS-ACC-CELL-1D	Saft LSH20 high power density 3.6 V, D-size spiral cell.
LS-ACC-CELL-1D2	Saft LS33600 D-size bobbin cell (19Ah).

Fig. 2: Compact mount with u-bolts. Use the LS-ACC-BIG-HVP versatile mount plate and WS-ACC-U50 50mm U-bolts to secure the device to a 50mm pole. Attach the LS-ACC-ANT-HVP versatile mount plate for the GNSS antenna to the node mount plate for a compact setup. Add the LS-ACC-PRS-VP prism mount plate for prism installation. Not recommended for base stations.

Fig. 3: Survey pole mount. Use the LS-ACC-BIG-HVP versatile mount plate to secure the device to a pole with metal clamps. Install the GNSS antenna on top of the pole using the LS-ACC-GNSS-RD 5/8-inch survey pole mount and the LS-ACC-GNSS-CL2 or LS-ACC-GNSS-CL3 cable extension. Suitable for base stations and rovers.

Fig. 4: Compact horizontal mount. Use the LS-ACC-BIG-HVP versatile mount plate to secure the device to a horizontal surface. Attach the LS-ACC-ANT-HVP versatile mount plate for the GNSS antenna to the node mount plate for a compact setup. Use the LS-ACC-ANT-LORA versatile LoRa mount plate and the LS-ACC-ANTS-G7 cable extension to position the LoRa antenna vertically.

GENERAL DISCLAIMER:

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connect@worldsensing.com

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Viriat 47, Edificio Numancia 1, 10th floor,
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United Kingdom
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