VIBRATING WIRE NODES

The Loadsensing vibrating wire (VW) one- and five-channel nodes easily connect vibrating wire instruments such as piezometers, load cells, strain gauges and pressure cells to the internet.

The Loadsensing vibrating wire nodes are autonomous battery-powered devices with C-size batteries that can last up to 10 years with minimal to zero maintenance required. The units may also be used as standalone loggers for manual monitoring and can be easily configured and connected with a USB cable and an Android phone.

Vibrating wire sensors are widely used in geotechnical, hydrological and structural monitoring because of their robustness and long term stability. The VW nodes provide accurate measurements of the vibrating wire sensors and their thermistors.

The nodes have an internal barometer which collects and transmits barometric pressure data with each reading. This compensates for changes in atmospheric pressure that vibrating wire sensors, particularly piezometers, are usually subjected to in various applications. This feature also eliminates the need for an external barometric sensor in order to acquire accurate measurements.

Construction sites and mines are constantly changing, and sensors may sometimes get disconnected due to a cut cable or other physical damages. Loadsensing nodes are capable of detecting if a sensor is properly connected and if not, the reading is discarded to avoid false measurements.

LS-G6-VW
5 channel

LS-G6-VW-1M
1 channel -
aluminum box
version

LS-G6-VW-1P
1 channel -
polycarbonate
box version

LS-G6-VW

The 5-channel data node may be used for scenarios in which one borehole contains multiple sensors. This can be the case in mining or civil works, for example, where up to 5 piezometers or multipoint borehole extensometers may be installed in a single borehole. It is also ideal for groups of sensors like strain gauges and load cells with 3 to 5 sensors.

LS-G6-VW-1M

The aluminium alloy box version is offered with an external antenna which improves the range for long distance applications such as strain gauges or pore water pressure monitoring.

LS-G6-VW-1P

The polycarbonate box version may be used for city installations since the internal antenna is protected from vandalism and can be integrated into walls. It is also ideal for saline atmospheres and other corrosive environments (mines, seaports).

FEATURES

- Accurate vibrating wire measurement
- Integrated barometer
- Long battery life (>7 years @1h sampling rate)
- Sensor detection
- Three versions available - 1 and 5 channels
- Durable and versatile

SOFTWARE

- User-friendly Android configuration app included
- Web browser software
- Single-gateway network setup with the dataserver and radio server hosted in the gateway and data access through standard CSV downloads, FTP push, Modbus TCP and API REST
- Multi-gateway network setup with a network management software and advanced features with data access via standard CSV downloads, FTP push, API REST and MQTT push*

* MQTT available upon request

APPLICATIONS

- Foundations and deep excavations
- Tunnels
- Embankments and landfills
- Mines
- Bridges and structural health monitoring
- Landslides and slope stability

ADVANTAGES

- High reliability and robustness
- Long-range communications (up to 15 km)
- Robust, small and weather-proof box
- Easy configuration
- Connectivity for individual sensors and most common borehole installations
- Proven track record, pioneer in the field

Main specifications

GENERAL

Battery life estimation**	1 channel, 1 cell	5 channels, 4 cells	Estimations for Saft LSH 14 batteries based on the lifetime mathematical model.
sampling rate 5 min	0.9 year	2.2 years	
sampling rate 1 h	3.5 years	7.1 years	
sampling rate 6 h	4.6 years	>10 years	

**Typical Europe radio configuration. Spreading factor 9, radio transmit power 14dBm. Considering laboratory conditions. Consumption varies depending on the sensor used, sampling rate and environmental and wireless network conditions.

Battery type: 3.6V C-Size user-replaceable high energy density, batteries (recommended Saft LSH 14)

Sampling rate: 30 seconds to 1 day

Configuration software Android App with a threshold configuration feature used to discard readings and perform radio signal coverage tests for easy installation

VIBRATING WIRE

Node	LS-G6-VW	LS-G6-VW-1M	LS-G6-VW-1P
Channels (frequency and temperature):	5	1	1

Measurement method: Embedded algorithms increasing immunity to noise

Excitacion wave: +/- 5 V

Measurement range: 300 to 7 000 Hz

Resolution (-40 to +85°C): <0.01 Hz

Accuracy (-40 to +85°C): Because resolution and accuracy depends on the configured Sweep, we present these specifications in the following table:

Vibrating wire sweep range***	Excitation Frequencies (Hz)	Accuracy - Error (%)	Resolution (Hz)
Sweep A	450 - 1 125	0.013	0.002
Sweep B	800 - 2 000	0.008	0.002
Sweep C	1 400 - 3 500	0.010	0.004
Sweep D	2 300 - 6 000	0.009	0.007

*** The Vibrating Wire sweep range selection is determined by the frequency range of the type of instrument you are reading.

THERMISTOR

Measurement range: 0 ohm to 4 Mohm

Resolution: 1 ohm

Accuracy (20°C): 0.05°C (0.04 % FS) *Sensor error is not included*

BAROMETER

Pressure Range: 300 to 1 100 hPa

Relative accuracy (950 to 1 050 hPa at 25° C): ±0.12 hPa

MEMORY - CIRCULAR BUFFER STRUCTURE

Memory records: Up to 72 500 readings including time and 5 sensors

Memory records: Up to 200 000 readings including time and 1 sensor

MECHANICAL

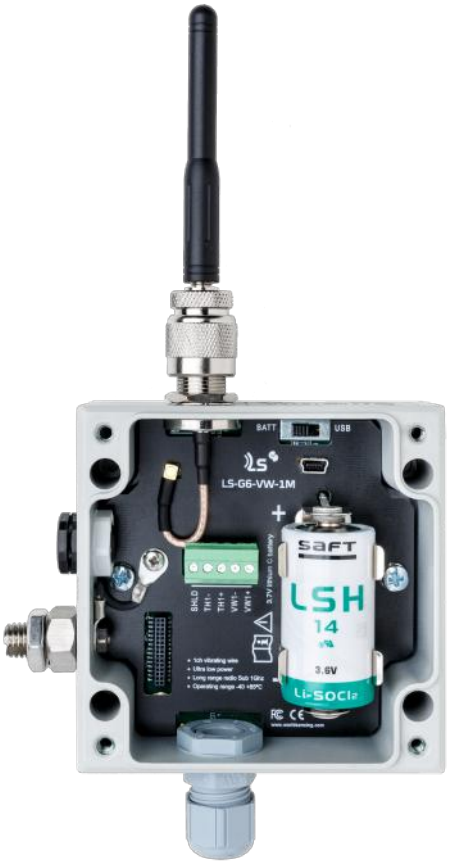
Node	LS-G6-VW	LS-G6-VW-1M	LS-G6-VW-1P
Box dimensions (WxLxH):	100x200x61 mm	100x100x61 mm	151x80x60 mm
Overall dimensions:	140x220x61 mm (excluding antenna)	140x120x61 (excluding antenna)	160x85x60 mm
Operating temperature:	-40ºC to 80ºC (-40ºF to 175ºF)		
Weather protection:	IP67		
Weight (excluding batteries):	1 268 g	662 g	297 g
Antenna:	External: 114 mm length (including connector)	External: 114 mm length (including connector)	Internal
USB (configuration/ ext. power):	External Mini USB	Internal Mini USB	
Box material:	Aluminium alloy	Aluminium alloy	Polycarbonate
Clamping range ⌀:	4-10 mm		
Batteries:	from 1 up to 4	1	1
Grounding connector:	Integrated	Integrated	-
Surge:	Complies with IEC61000-4-5, Class 2, test level ±1 kV, 2 ohms		-

Main specifications

RADIO - ISM sub 1 GHz operating frequency bands adjustable		
	External antenna (LS-G6-VW, LS-G6-VW-1M)	Internal antenna (LS-G6-VW-1P)
Range open sight	15 km	10 km
Range city street	4 km	2 km
Range manhole in a city street	2 km	1 km
Tunnel	4 km	2 km
Bidirectional communications: remote sampling rate change / Clock synchronization		
Maximum link budget: 151 dB / 157 dB		
Configuration: Star (no repeaters needed)		

ACCESSORIES****			
Accessories compatibility	LS-G6-VW	LS-G6-VW-1M	LS-G6-VW-1P
Plate for pole mounting Includes: U-bolts and nuts for a pole ⌀ less than 50 mm	✓	✓	
Plate for pole mounting Includes: U-bolts and nuts for a pole ⌀ less than 35 mm	✓	✓	
External mounting brackets (set of 2) for wall mounting	✓	✓	
Wall Brackets (4 polycarbonate wall brackets and 4 screws)			✓
Surge module to comply with IEC61000-4-5 Class 4, test level ±4 kV, 2 ohms	✓	✓	✓

**** Other mounting brackets and accessories available on request.



An inner view of a Loadsensing vibrating wire node 1 channel. The nodes are autonomous battery-powered devices with C-size batteries that can last several years with minimal to zero maintenance required.

Note: Specifications are subject to review and change without notice.

SYDNEY
9/31-33 Chaplin Drive
Lane Cove West, NSW, 2066
+61 (2) 9693 5493
salesnsw@geomotion.com.au

MELBOURNE
22/15 Earsdon Street
Yarrville, VIC, 3013
+61 (3) 8060 7969
salesvic@geomotion.com.au

PERTH
2/34 Millrose Drive
Malaga, WA, 6090
+61 (8) 9284 0244
sales@geomotion.com.au