

# Vibrating Wire

## WIRELESS DATA LOGGERS EDGE DEVICES

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

The vibrating wire data loggers 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 data loggers provide accurate measurements of the vibrating wire sensors and their thermistors.

The data loggers 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.



LS-G6-VW-MON  
5 channel

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

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

### LS-G6-VW-MON

The 5-channel data data logger 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-MON

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.





# Vibrating Wire

## EDGE DEVICES - WIRELESS DATA LOGGERS

### FEATURES

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

### SOFTWARE

- ▶ User-friendly Android configuration app included.
- ▶ Web browser-based software.
- ▶ Single-gateway network setup (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 and advanced features with data access via standard CSV downloads. FTP push. API REST and MOTT push\*.

\* MQTT available upon request

### APPLICATIONS

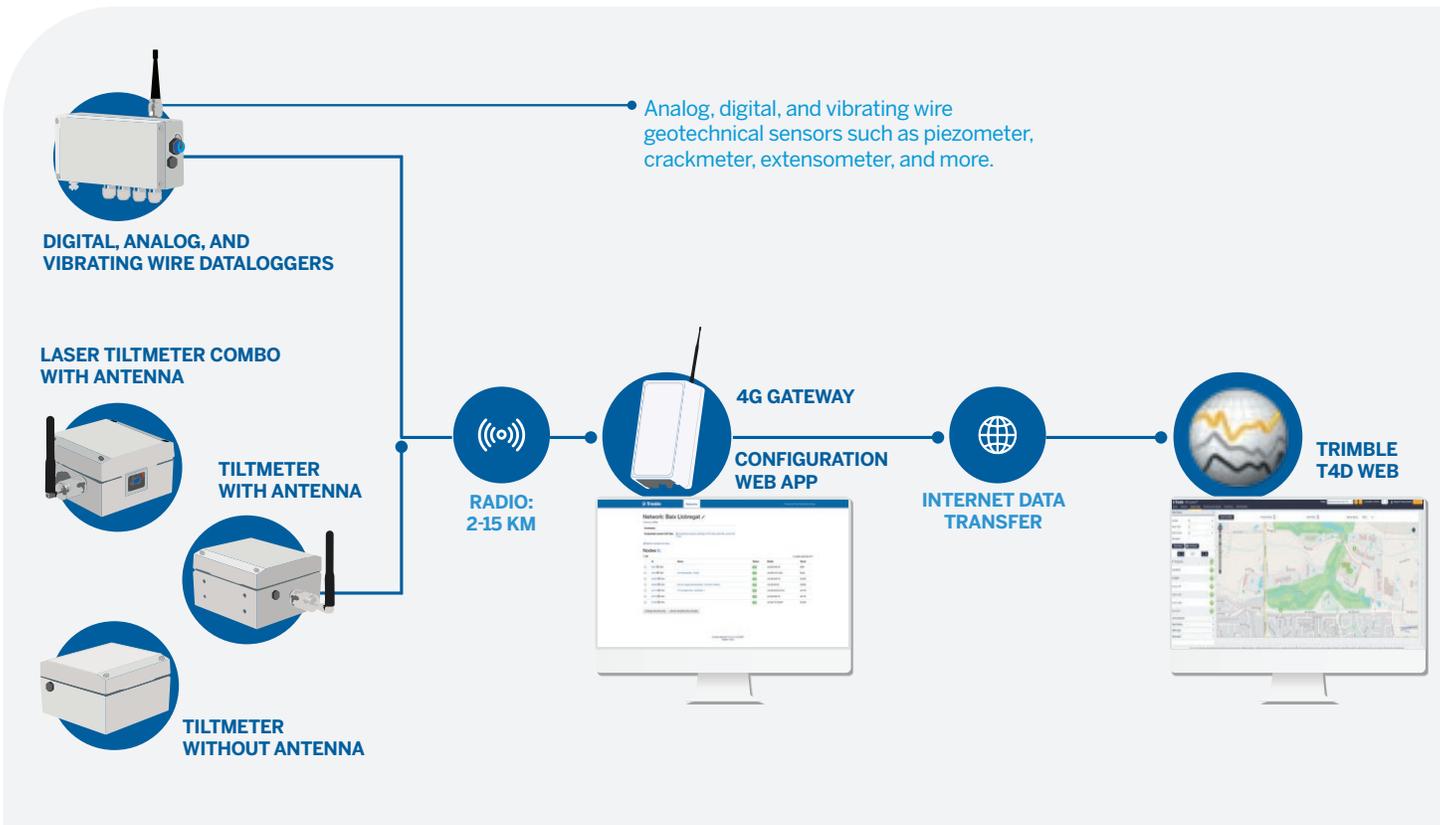
- ▶ Foundations and deep excavations.
- ▶ Tunnels.
- ▶ Embankments and landfills.
- ▶ Mines.
- ▶ Bridges and structural health monitoring.
- ▶ Landslides and slope stability.

### ADVANTAGES

- ▶ High reliability and robustness.
- ▶ Long-range communications (up to 15 km / 9 miles).
- ▶ Robust, small and weather-proof box.
- ▶ Easy configuration.
- ▶ Connectivity for individual sensors and most common borehole installations.
- ▶ Proven track record, pioneer in the field.

# IoT-based Geotechnical Monitoring

## SYSTEM INSTALLATION





# Vibrating Wire

## EDGE DEVICES - WIRELESS DATA LOGGERS

### 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 years	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

Data logger	LS-G6-VW-MON	LS-G6-VW-1M-MON
-------------	--------------	-----------------

Channels (frequency and temperature):	5	1
---------------------------------------	---	---

Measurement method: Embedded algorithms increasing immunity to noise

Excitation wave: +/- 5

Measurement range: 300 to 7000 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	450-1125	0.013	0.002
Sweep B	800-2000	0.008	0.002
Sweep C	1400-3500	0.010	0.004
Sweep D	2300-6000	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 1100 hPa.

Relative accuracy (950 to 1050 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 sensors.

### MECHANICAL

Node	LS-G6-VW-MON	LS-G6-VW-1M-MON
Box dimensions (WxLxH):	100 x 200 x 61 mm	100 x 100 x 61 mm
Overall dimensions:	140 x 220 x 61 mm (excluding antenna)	140 x 120 x 61 mm (excluding antenna)
Operating temperature:	-40 °C to +80 °C (-40 °F to +175 °F)	
Weather protection:	IP67	
Weight (excluding batteries):	1268 g	662 g
Antenna:	External: 114 mm length (including connector)	External: 114 mm length (including connector)
USB (configuration / ext. power):	External mini USB	Internal mini USB
Box material:	Aluminium alloy	Aluminium alloy
Clamping range Ø:	4-10 mm	
Batteries:	from 1 up to 4	1
Grounding connector:	Integrated	Integrated
Surge:	Complies with IEC61000-4-5, Class 2, test level ±1 kV, 2 ohms	

### RADIO

ISM sub 1 GHz operating frequency bands adjustable

	External antenna
Range open sight.	15 km
Range city street.	4 km
Range manhole in a city street:	2 km
Tunnel	4 km
Bidirectional communications: remote sampling rate change / Clock synchronization.	
Maximum link budget: 151 dB / 157 dB.	
Configuration: Star (no repeaters needed).	

### ACCESSORIES

Other mounting brackets and accessories available on request.

Accessories compatibility	LS-G6-VW-MON	LS-G6-VW-1M-MON
Plate for pole mounting Includes: U-bolts and nuts for a pole Ø less than 50 mm.	✓	✓
Plate for pole mounting Includes: U-bolts and nuts for a pole Ø 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.	✓	✓

Note: Specifications are subject to review and change without notice

Contact your local Authorized Trimble Distribution Partner for more information

**NORTH AMERICA**  
Trimble Inc.  
10368 Westmoor Drive  
Westminster CO 80021  
USA

**EUROPE**  
Trimble Germany GmbH  
Am Prime Parc 11  
65479 Raunheim  
GERMANY

**ASIA-PACIFIC**  
Trimble Navigation  
Singapore PTE Limited  
3 HarbourFront Place  
#13-02 HarbourFront Tower Two  
Singapore 099254  
SINGAPORE

