

Vibrating Wire

WIRELESS DATA LOGGERS EDGE DEVICES

The vibrating wire (VW) one- and five-channel data loggers automate data collection by connecting your vibrating wire instruments such as piezometers, load cells, strain gauges and pressure cells wirelessly to your monitoring systems.

The vibrating wire data loggers are autonomous battery-powered devices with C-size batteries that can last up to 22 years with minimum 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 vibrating wire data logger comes with 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. The vibrating wire 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 1-channel version of the vibrating wire data logger is the perfect fit for applications in which you need to connect single, scattered sensors such as piezometers, crackmeters and joint meters.





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FEATURES

- ▶ Accurate vibrating wire measurement, with integrated barometer.
- ▶ Robust, small and IP68 grade weather-proof box.
- ▶ Long battery life (>22 years @1h sampling rate).
- ▶ Sensor detection - Filter for anomalous readings when the VW sensor disconnects.
- ▶ Two versions available - 1 and 5 channels.
- ▶ Long range communications through LoRa communications.

SOFTWARE

- ▶ User-friendly Android configuration app included.
- ▶ Web browser software for network, device and data management.
- ▶ Data processing with formulas to convert raw readings into engineering unit values.
- ▶ Single-gateway network setup with CMT Edge software (dataserver and radio server hosted in the gateway and data access through standard CSV downloads, FTP push, Modbus TCP, API REST and MQTT).
- ▶ Multi-gateway network setup with CMT Cloud software and advanced features with data access via standard CSV downloads, FTP push, API REST and MQTT push.

APPLICATIONS

GEOTECHNICAL MONITORING

- ▶ Ground stability wirelessly using vibrating-wire multi-point extensometers.
- ▶ Ground settlement connecting settlement cells to a vibrating wire data logger.
- ▶ Pore water pressure and level with vibrating wire piezometers.

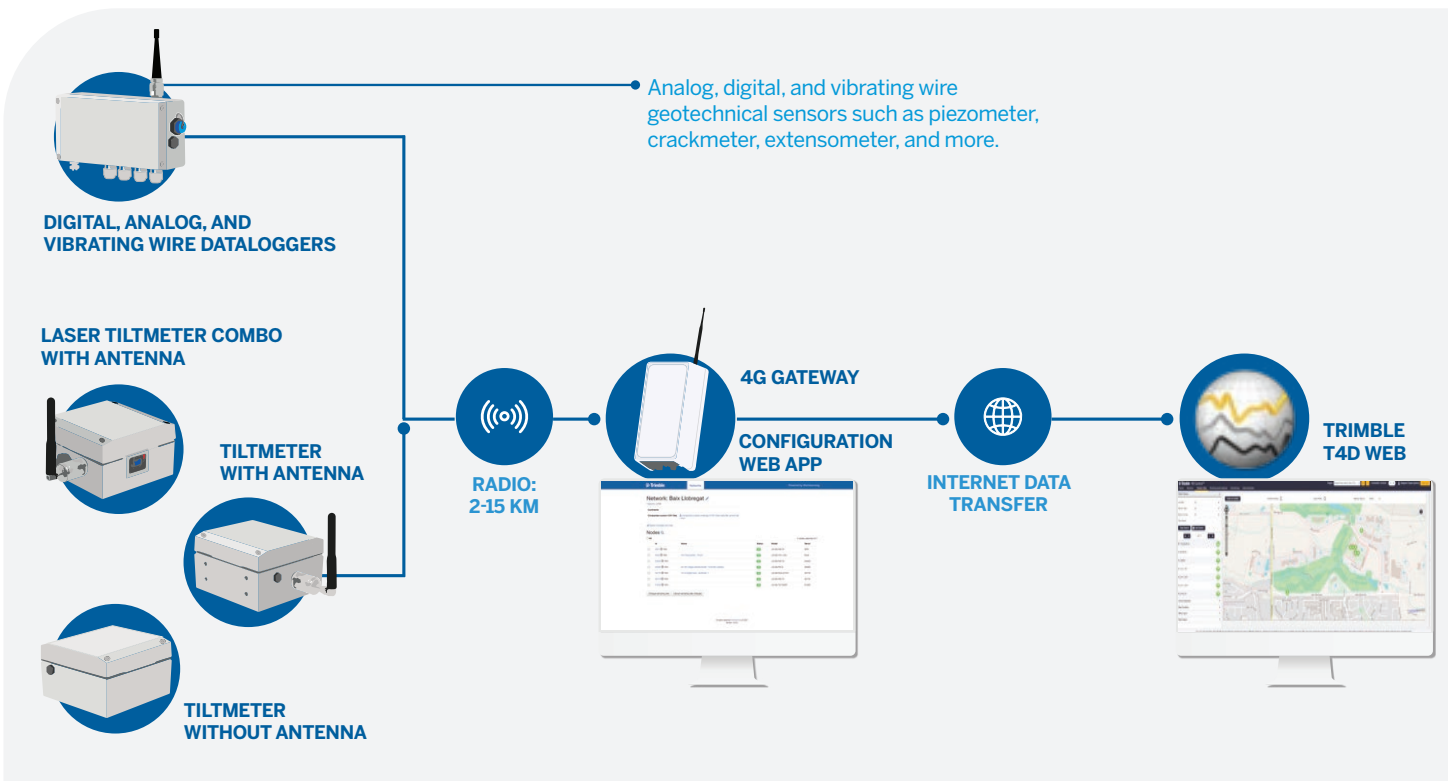
STRUCTURAL HEALTH MONITORING

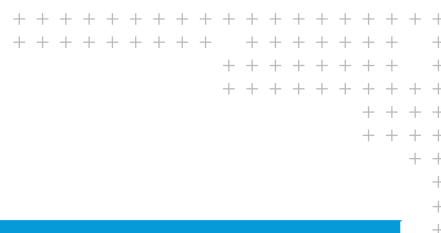
- ▶ Monitor the structural health of buildings and other infrastructure using crackmeter and joint meters.
- ▶ Structural loads and tensions with load cells and strain gauges.

ADVANTAGES

- ▶ Suitable for unattended, large scale projects.
- ▶ Very low maintenance equipment due to its robustness and low-power consumption.
- ▶ Easy configuration through the Trimble Geotech configuration app.
- ▶ Customer support from a team of geotechnical monitoring and network experts.
- ▶ Pioneer company in the field, long history in monitoring large-scale civil.

IoT-based Geotechnical Monitoring SYSTEM INSTALLATION





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GENERAL	
Input types:	Vibrating wire and thermistor per channel.
Data logger:	LS-G6-VW-MON LS-G6-VW-1M-MON
Channels (VW + TH):	5 1
Power source	3.6 V C-Size user-replaceable high energy densit
Reporing period	Selectable from: 30 s, 1, 2, 5, 10, 15, 30 min, 1, 2, 4, 6, 12, 24 h
Time synchronization discipline by radio	Better than ±30 seconds
Device configuration	Trimble Geotech configuration app
Advanced functionalities:	<ul style="list-style-type: none"> Field samples and signal coverage test when connected to the app. Threshold configuration to discard anomalous readings when vibrating wire sensor is disconnected. Custom sweep frequency range configuration.

VIBRATING WIRE			
Measurement method:	Embedded algorithms increasing immunity to noise		
Excitacion wave:	± 5 V		
Measurement range:	300 to 7,000 Hz		
Resolution ¹ :	<0.01 Hz		
Accuracy¹ as f(sweep range):			
Vibrating wire sweep range ²	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

THERMISTOR	
Measurement range:	0 ohm to 4 Mohm.
Resolution:	1 ohm.
Accuracy (20 °C) ³ :	0.05 °C (0.04 % FS).

BAROMETER	
Pressure range:	300 to 1100 hPa
Relative accuracy:	(950 to 1050 hPa at 25 °C)

MEMORY - CIRCULAR BUFFER STRUCTURE	
Maximum memory records:	73,500 readings for 5 channels 200,000 readings for 1 channel

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:	IP68 ⁴	
Weight (excluding batteries):	1,268 g	662 g
External antenna:	114 mm length (including connector)	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	
Battery holder capacity;	from 1 up to 4	1
Grounding connector:	Integrated	Integrated
Surge protection:	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	
Radio configuration: LoRa/ LoRaWAN	

BATTERY LIFE ESTIMATIONS ⁵			
Vibrating Wire 1 Channel			
Battery model	LSH14	LM26500	
Number of cells	1 cell	1 cell	
Sampling rate	5 min	4.8 months	6.4 months
	1 h	3.4 years	4.5 years
	6 h	7.1 years	11 years
Vibrating Wire 5 Channel			
Battery model	LSH14	LM26500	
Number of cells	4 cells	4 cells	
Sampling rate	5 min	3.7 years	4.6 years
	1 h	11.4 years	22.7 years
	6 h	13.1 years	>25 years



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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).		

- 1 Resolution and accuracy within operating temperature.
- 2 The vibrating wire sweep range selection is determined by the frequency range of the type of instrument you are reading.
- 3 The accuracy and resolution are calculated based on a 3K thermistor.
- 4 Water ingress protection also depends on the quality and condition of the cable coming from the sensor. Additionally, the cable's curvature near the cable gland can reduce this protection.
- 5 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 life estimations based on the lifetime mathematical model using Barcelona weather profile. Average values provided

Specifications subject to change without notice.

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