

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.





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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

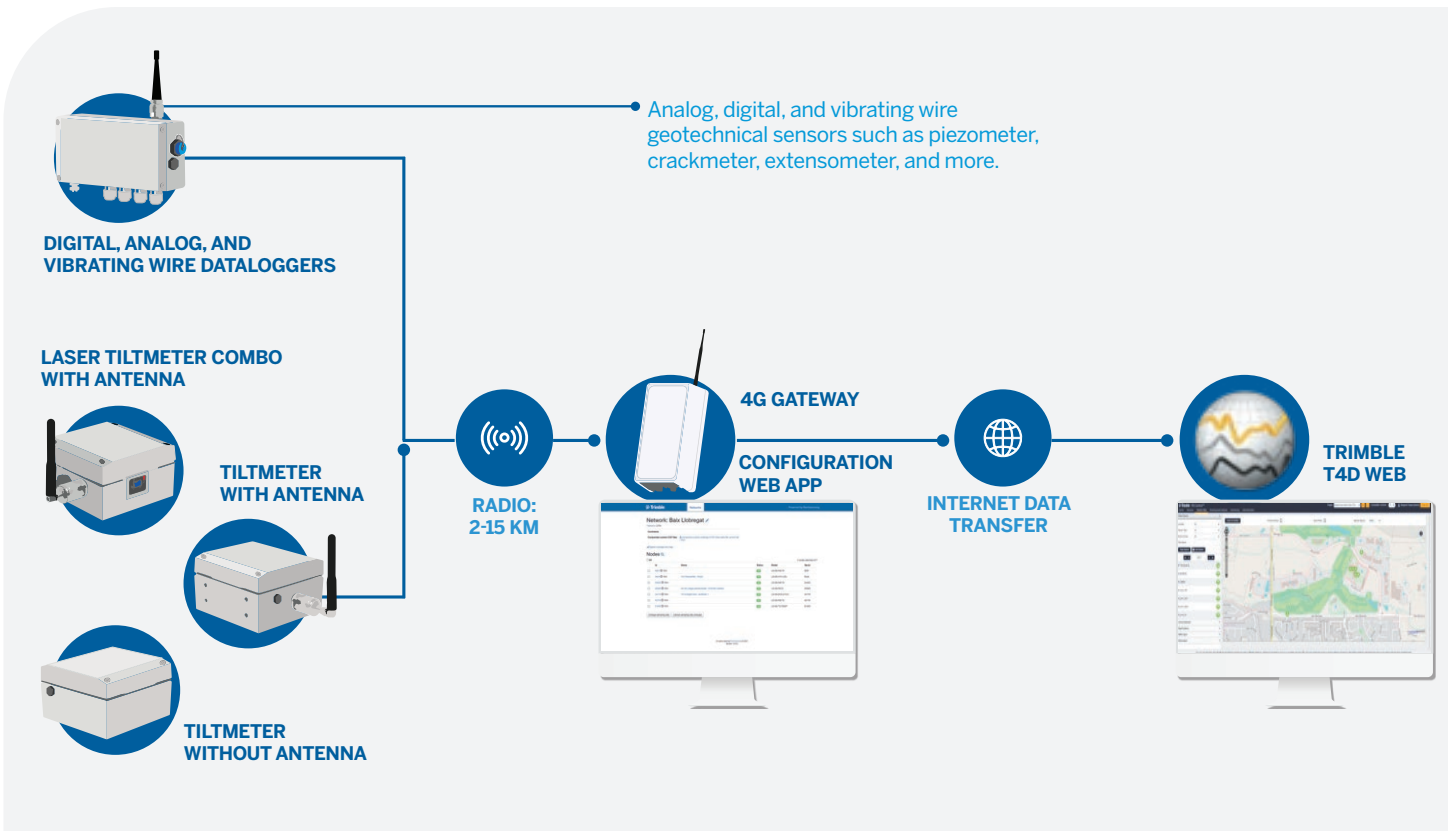
- ▶ Foundations and deep excavations.
- ▶ Tunnels.
- ▶ Embankments and landfills.
- ▶ Mines.
- ▶ Bridges and structural health monitoring.
- ▶ Landslides and slope stability.

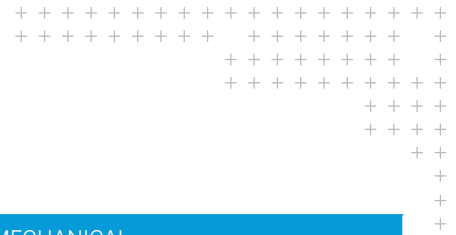
ADVANTAGES

- ▶ 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





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| 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

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