EDGE DEVICES – WIRELESS SENSORS

Vibration Meter

LSG7 ACL-BILH-VIB

Worldsensing Vibration Meter is a wireless sensor that automates data collection for long term, continuous vibration monitoring. It features a tri-axial accelerometer and an exception-based, edge algorithm that allows the detection of threshold breaches for vibration-based parameters such as L_{AW}/PPV and frequency.

The Vibration Meter is suitable to comply with vibration regulations regarding building integrity (DIN 4150-3, BS7385-2, among others) and vibrations effect on people (IS02631-2).

LONG-RANGE AND LOW-POWER

The Vibration Meter is a robust. IP68 device, and can operate under minimum maintenance. Up to 1.5 years battery lifespan using a 30 min reporting period, considering a vibration scenario with relevant events triggering alert mode two or three times per week. With excelling radio-range, the vibration meter can stream data up to 15 km to the nearest gateway.

ENHANCED VIBRATIONS MONITORING

The Vibration Meter can be a complement to an existing high sensitivity vibration monitoring system. It allows you to increase the data density to detect isolated events, thus increasing the reliability of the entire system.

EASY AND EFFICIENT NETWORK MANAGEMENT

One Worldsensing Gateway can support hundreds of Worldsensing edge devices in the same network that are also measuring other sensors installed in the monitoring sections. Worldsensing edge devices can also be easily configured and connected with a USB cable and an Android phone. The device network can also be easily managed through the Connectivity Management Tool.

FEATURES
Tri-axial MEMS accelerometer.
Band pass filter according to the processing requirements, from an original band range of 0.5–250 Hz
Robust, small and IP68 grade weather-proof box.
Advanced edge processing with exception-based algorithms
Up to 1.5 years battery lifespan using a 30 min reporting period, considering a vibration scenario with relevant events triggering alert mode two or three times per week.
SOFTWARE
User-friendly Android configuration app included.
Web browser software for network, device and data management.
Single-gateway network setup with CMT Edge software (data server and radio server hosted in the gateway and data access through standard CSV downloads, FTP push, API REST and MQTT[1]).
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[1].

[1] MQTT available upon request.

APPLICATIONS
Vibration monitoring for building integrity.
Vibration monitoring for vibrations effect on people.

ADVANTAGES
Can be used to comply with MTVV-based regulations such as IS02631-2
Very low maintenance equipment due to its robustness and low power consumption.
Very low maintenance equipment due to its robustness and low power consumption.
Ability to set different levels of criticality for events to receive timely data on vibration occurrences, ensuring swift responses and improved operational safety.
Easy configuration through the Worldsensing mobile application and through CMT Edge and Cloud.
Customer support from a team of application monitoring and network experts.

TECHNICAL SPECIFICATIONS

GENERAL

Sensor type	3-Axis MEMS Accelerometer
Sampling Rate	1000 Hz derived from a 4k Hz signal
Secondary sensor	Thermometer
Noise Floor	22.5 µg/√Hz
Original Frequency Band	0.5–250 Hz
Power Source	3.6 VD-size user-replaceable, high energy density batteries
Reporting Period	Selectable from: 30 s. 1, 2, 5, 10, 15, 30 min, 1, 2, 4, 6, 12, 24 h
Reporting format	• Time stamp and reported parameters for the most critical events of the reporting period based on the operation mode: 5 for PPV and 9 for MTVV. • Total number events per reporting period.
Time synchronization discipline by radio	Better than ±30 seconds
Device configuration	• Worldsensing App • CMTCloud • CMTEdge
Advanced functionalities	• Configurable operation mode according to PPV and MTVV-based regulations. • Two configurable thresholds for different levels of event criticality. • Alert mode that automatically changes reporting period to 2 min when alert threshold is exceeded. • Raw data storage for critical events at 1000 sps in three components. Retrievable by local connection. • Heartbeat message functionality • Field samples and signal coverage test when connected to the app.

DEVICE CONFIGURATION

Operation Mode	• PPV • MTVV
Transmission Threshold	Minimum vibration level for data reporting. Value based on output parameters for the selected operation mode.
Alert Threshold	Based on output parameters. Exceeding values will trigger alert mode in the device.

PVV-BASED MODE SPECIFICATIONS

Reported parameters	• $PPV_{X,Y,Z}$ (mm/s), • $f_{X,Y,Z}$ (Hz) • T (°C) • PVS (mm/s)
Range (velocity)	0–60 mm/s
Internal Resolution (velocity)	0.00154 mm/s @4 Hz
Output Resolution (PPV)	0.01 mm/s
Frequency output range	1–100 Hz
Frequency accuracy	1% (2% along the full temperature range)
Frequency output resolution	0.5 Hz

MTVV-BASED MODE SPECIFICATIONS

Reported Parameters	• $L_{AW\text{-}X,Y,Z}$ (dBm) • T (°C)
Acceleration Range	±2 g
L_{AW} Range	<100 dB
Internal Acceleration resolution	3.9 µg
L_{AW} Output Resolution	0.05 dB
MTVV computation	Running RMS method
Frequency Weighting	Wm

MEMORY

Memory Structure	Circular Buffer
Maximum memory records	>500 – including 3 axis at 1000 Hz at 2048 sample-length
Maximum waveform records	>500 – including 3 axis at 1000 Hz at 2048 sample-length

MECHANICAL	
Box dimensions (WxLxH)	100 x 100 x 61 mm
Overall dimensions	103 x 100 x 61 mm
Operating temperature	–40 °C to 80 °C (–40 °F to 175 °F)
Weather protection	IP68 (at 2 m for 2 h)
Weight (excluding batteries)	390 g
Antenna	Internal
Mounting options	Clearance holes for M4 hexagon socket head cap screws in bottom.
Configuration port	Internal USB-C
Box material	Aluminum alloy
Lid material	Polycarbonate
Battery holder	D-size battery holder
Impact resistance[2]	Drop from 1 meter onto a concrete surface (20 000 g)

BATTERY LIFE ESTIMATIONS[3]

SF9				
Threshold Sensitivity		20 events/h	60 events/h	No events
Reporting Period	10 min	1.5 years	13 months	2.3 years
	30 min	2 years	15 months	2.5 years
SF11				
Threshold Sensitivity		20 events/h	60 events/h	No events
Reporting Period	10 min	11 months	8 months	1.7 years
	30 min	1.4 years	1 year	2.2 years

[2] The Vibration Meter has good impact resistance. However it should be treated carefully like any precision instrument.

[3] Battery life estimations using recommended Saft batteries LSH20. Computations considering a transmission power of 14 dB, at 27 °C, and event duration of 60 seconds. Device configured at operational mode PPV (most energy-demanding configuration). Reported events truncated when the maximum number of events per period are exceeded.

RADIO SPECIFICATIONS

Radio band	ISM sub 1 GHz
Operating frequency bands	Adjustable
Bidirectional communications	Remote reporting period change/ clock synchronization
Maximum link budget	151 dB/ 157 dB
Radio configuration	LoRa/ LoRaWAN
Network topology	• LoRa Star • LoRa Tree (K20 Edge repeater)
RADIO RANGE[4]	
Range open sight	15 km
Range city street	4 km
Range manhole in a city street	2 km
Tunnel	4 km

[4] The distances have been tested by Worldsensing and have been accomplished in actual projects using the standard antenna. However, radio range depends on the environment so these distances are only indicative. Consult with us for your application.

ACCESSORIES[5]	
LS-ACC-IN15-HP	Versatile plate for horizontal surface mounting recommended for both horizontal and vertical mounting; attachment option: anchor rods or glue. Includes a threaded hole available for installing a monitoring prism or a button head screw for precise leveling.
LS-ACC-IN-HPTM	Horizontal surface mounting plate for track monitoring; attachment option: glue.
LS-ACC-IN15DP	Versatile double plate for horizontal surface mounting; suitable for applications that need to eliminate the need to open the casing during installation; attachment option: glue; includes a threaded hole available for installing a monitoring prism or a button head screw for precise leveling.
LS-ACC-ANC-H[6]	Kit of 3 anchor rods for injection M8, 110 mm length. Nuts and washers included.
WS-ACC-CELL-1D	Saft LSH20 high power density 3.6 V, D-size spiral cell.
WS-ACC-G7-USBC	Mobile phone to Vibration Meter cable USB-C to USB-C. Length: 1 m.

[5] Other mounting brackets and accessories available upon request.

[6] The kit can be used to fix the following mounting kits: LS-ACC-IN15-HP.

Fig. 1: Versatile horizontal surface mounting plate (LS-ACC-IN15-HP), recommended for both horizontal and vertical mounting. The plate has three clearance holes for MB anchor rods and an MB threaded hole available for installing a monitoring prism or a button head screw for precise leveling.

Fig. 2: Vibration Meter mounted on a double plate for horizontal surface mounting (LS-ACC-IN15DP). This is suitable for applications that need to avoid opening the casing during installation.

Fig. 3: The Vibration Meter with the LS-ACC-IN-HPTM horizontal surface mounting plate.

FOR MORE INFORMATION

Scan to access the user guide for this device.

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