EDGE DEVICES – WIRELESS SENSORS

Vibration Meter

Worldsensing's Vibration Meter is a Wireless Sensor that automates data collection for continuous, long-term vibration monitoring. It features a triaxial accelerometer and an edge algorithm that responds to anomalies: it detects when thresholds for vibration-based parameters are exceeded.

Key Features

FLEXIBLE CONFIGURATION OPTIONS

Up to four operational modes let the Vibration Meter adapt acquisition parameters, processing logic, and reported variables to specific scenarios. Configurable locally via the WS App or remotely through CMT Edge or Cloud, it delivers key indicators required byeach application:

- Particle peak velocity and frequency (PPV)
- Peak Ground Acceleration (PGA)
- Resonant frequencies of structural elements (PSA)
- Weighted effective acceleration for human comfort (MTVV)

TWO PRODUCT VARIANTS FOR EXTENDED APPLICATION COVERAGE

The Vibration-IHP suits standard vibration monitoring, while the Vibration-IR extends amplitude (up to 200 mm/s) and frequency range (up to 315 Hz) for demanding PPV applications such as blasting.

FAST RESPONSE WHEN NEEDED

The Vibration Meter's Alert Mode ensures rapid response when vibration exceeds a defined threshold, instantly sending triggered data and temporarily increasing reporting frequency to capture all critical events.

WIRELESS, AUTONOMOUS AND LOW-POWER

Rugged and IP68-rated, the device operates with minimal maintenance, offering up to 1.5 years of battery life and a radio range of up to 15 km to the nearest gateway.

INDUSTRY COMPLIANT

The Vibration Meter ensures measurement quality and compatibility across comfort, structural integrity, and seismic engineering applications.

Vibration-IHP
LSG7ACL-BILH-VIB

Vibration-IR
LSG7ACL-BILR-VIB

Operational Modes

The Vibration Meter offers multiple operational modes to address a diverse range of vibration monitoring applications. Each mode is designed to extract key parameters for spefic scenarios, enabling accurate assessment of structural behavior, ground response, and human comfort.

MTVV | MAXIMUM TRANSIENT VIBRATION VALUE

Evaluates human comfort inside buildings affected by vibration from construction, mining activities, or infrastructure operation. Based on ISO 2631-2.

APPLICATIONS:

- Used to assess human comfort in urban settings.
- Ideal for monitoring construction, traffic, or industrial vibrations affecting occupants.

PPV | PARTICLE PEAK VELOCITY

Processes vibration in terms of velocity, providing PPV and predominant frequency, key indicators in geotechnical monitoring. Use the Vibration-IR for extended frequency range.

APPLICATIONS:

- Applied in construction, mining, and blasting projects to ensure infrastructure protection and regulatory compliance by quantifying vibration intensity and frequency.

PGA | PEAK GROUND ACCELERATION

Analyzes vibration acceleration to determine PGA, a core metric in assessing seismic intensity. Used in earthquake engineering for structural analysis. Frequency band and resolution can be adjusted via sampling rate to suit each scenario.

APPLICATIONS:

- Designed for earthquake monitoring and post-event assessment of critical assets, supporting faster response and regional seismic analysis.

PSA | POWER SPECTRUM AVERAGE

Identifies predominant structural frequencies by averaging multiple vibration observations. Ideal for assessing the health of elements such as cables, pillars, or other structural components of a bridge. Triggered acquisition and delayed start help capture resonance while excluding transient noise.

APPLICATIONS:

- Used to track the resonance frequency of bridges, buildings, and stay cables.
- Detect changes in structural stiffness and integrity over time to help prevent failures.

Advanced configuration options

Feature	Description	Configuration options
Transmission Threshold	The device will send the most relevant events in the series that are above the transmission threshold for every set reporting period t. • PGA, PPV, 4 Maximum events • MTVV, 9 Maximum events	Thershold value
Alert Threshold	Any value exceeding the alert threshold will trigger an alert state in which: • It sends a triggered message with the threshold breach values • The reporting period is automatically changed to a ta of 2 min • Relevant events exceeding the transmission threshold will be sent within this new reporting period • Only for PGA, PPV and MTVV modes	Threshold value
Raw Data Storage	Raw data for values are stored in internal device memory if feature is activated and conditions are met. Retrievable by local connection	Enabled/Disabled
Heartbeat Functionality	Provides a data point in a reporting period with no events above the transmission threshold.	Enabled by default

TECHNICAL SPECIFICATIONS

GENERAL

Primary sensor	3-Axis MEMS Accelerometer
Secondary sensor	Temperature Sensor Relative Humidity Sensor
Power Source	3.6 VD-size user-replaceable, high energy density batteries
Operating Temperature	−40 °C to 80 °C (−40 °F to 175 °F)
Reporting Formats	Periodic Mode Alert mode (for MTVV, PVV, PGA modes only)
Reporting 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	• Worldsensing App • CMT Cloud • CMT Edge

ACCELEROMETER

Original Sampling Rate	4k Hz
Original Frequency Band	DC - 1000 Hz
Noise Floor	• 22.5 µg/√Hz for Vibration-IHP • 75 µg/√Hz for Vibration-IR
Accuracy	Within the 5% between 4 and 100 Hz

TEMPERATURE SENSOR

Range	−40° to 80 °C
Accuracy	±0.2 °C
Resolution	0.1 °C

HUMIDITY SENSOR

Sensor type	Humidity sensor to detect lack of sealing/locking of the enclosure. Statistics of the relative humidity measurements transmitted in the health messages.

PPV-BASED MODE SPECIFICATIONS

Reported parameters	• Timestamp • $PPV_{X,Y,Z}$ (mm/s) • $f_{X,Y,Z}$ (Hz) • T (°C) • PVS (mm/s) • Duration
Internal Resolution (velocity)	0.00154 mm/s @4 Hz
Output Resolution (PPV)	0.01 mm/s
Velocity Accuracy	See calibration sheet
Frequency Output Resolution	0.5 Hz
Frequency accuracy	1% (2% along the full temperature range)

Velocity and Frequency Ranges (configurable)

		Vibration-IHP	Vibration-IR
Ranges		0–30 mm/s - 1–100 Hz 0–60 mm/s - 1–100 Hz 0–120 mm/s - 1–100 Hz 0–50 mm/s - 1–250 Hz	0–120 mm/s - 1–250 Hz 0–200 mm/s - 1–250 Hz 0–200 mm/s - 1–315 Hz

Sampling Rate	1000 Hz (derived from 4 kHz). 2000 Hz for the 1–315 Hz config.
Analysis time	Configurable from: 10, 15, 30, 60, 75, 150, 300 s
Predominant Frequency Determination	Configurable from: • Flat • BS 7385-2 • ABNT-NBR-9653 • DIN 4150-3 • IN-1226 • Circulaire ICPE de 1986 • SBR-A • USBM-RI8507
Transmission and Alert threshold steps	0.01 mm/s
Reported Raw Data	Velocity in x, y, z at 1000 (Hz)

MTVV-BASED MODE SPECIFICATIONS

Reported Parameters	• Timestamp • $L_{AW-X,Y,Z}$ (dBm) • T (°C) • Duration
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 (ISO 2631-1)

Frequency Weighting	Wm (ISO 2631-2)
Transmission and Alert threshold steps	0.05 dB
Reported Raw Data	Weighted (Wm) acceleration in x,y, z at 1000 (Hz)

PGA- BASED MODE

Reported Parameters	• Timestamp • $PGA_{x,y,z}$ (mg) • $f_{x,y,z}$ (Hz) • RMS vector (mg) • T (°C)
Raw acceleration Range	±2 g
Internal Acceleration Resolution	3.9 μg
Output Resolution	0.1 mg
Sampling Rate	Configurable from: • BAND 1: 62.5 Hz • BAND 2: 125 Hz • BAND 3: 250 Hz • BAND 4: 500 Hz

Band specifications	Analysis time	Low Corner frequency/ Resolution	High Corner Frequency.
Band 1	60 s	0.02 Hz	15 Hz
Band 2	30 s	0.03 Hz	30 Hz
Band 3	15 s	0.06 Hz	60 Hz
Band 4	8 s	0.12 Hz	125 Hz

Transmission and Alert threshold steps	1 mg
Reported Raw Data	Raw acceleration in x,z,y in windows of 2048 samples

PSA- BASED MODE

Reported Parameters	• PGA (vector) (mg) • $f_{x,y,z}$ (Hz) {1st to 5th} • $RMS_{x,y,z}$ (mg) • T (°C) • PGA timestamp
Raw acceleration Range	±2 g
Internal Acceleration Resolution	3.9 μg
Sampling Rate	Configurable from: • BAND 1: 62.5 Hz • BAND 2: 125 Hz • BAND 3: 250 Hz • BAND 4: 500 Hz

Band specifications	Analysis time	Low Corner Frequency/ Resolution	High Corner Frequency.
Band 1	60 s	0.02 Hz	15 Hz
Band 2	30 s	0.03 Hz	30 Hz
Band 3	15 s	0.06 Hz	60 Hz
Band 4	8 s	0.12 Hz	125 Hz

Energy Weighting	On/Off
Acquisition Modes	• Periodic • Always on
Periodic Acquisition Mode Specifications	
Number of windows	1 to 512
Alway On Acquisition Mode Specifications	
Delay	Off / On (1–15 seconds)
Transmission threshold step	1 mg
Reported Raw Data	PSD amplitudes 1024 datapoints

MEMORY

Memory Structure	Circular Buffer
Maximum Memory Records	150 000
Local Maximum Waveform Records	• >500 for MTVV, PPV, PGA modes • >1 000 for PSA mode

MECHANICAL SPECIFICATIONS

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	1 D-size battery holder
Impact resistance[1]	1 m drop onto concrete (20 000 g)

BATTERY LIFE ESTIMATIONS[2]

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

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 configuration	• Single-net through CMT Edge • Multi-net through CMT Cloud

RADIO RANGE[3]

Range open sight	15 km
Range city street	4 km
Range manhole in a city street	2 km
Tunnel	4 km

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.

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

[2] 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.

[3] 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

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

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

Mounting Options

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 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.