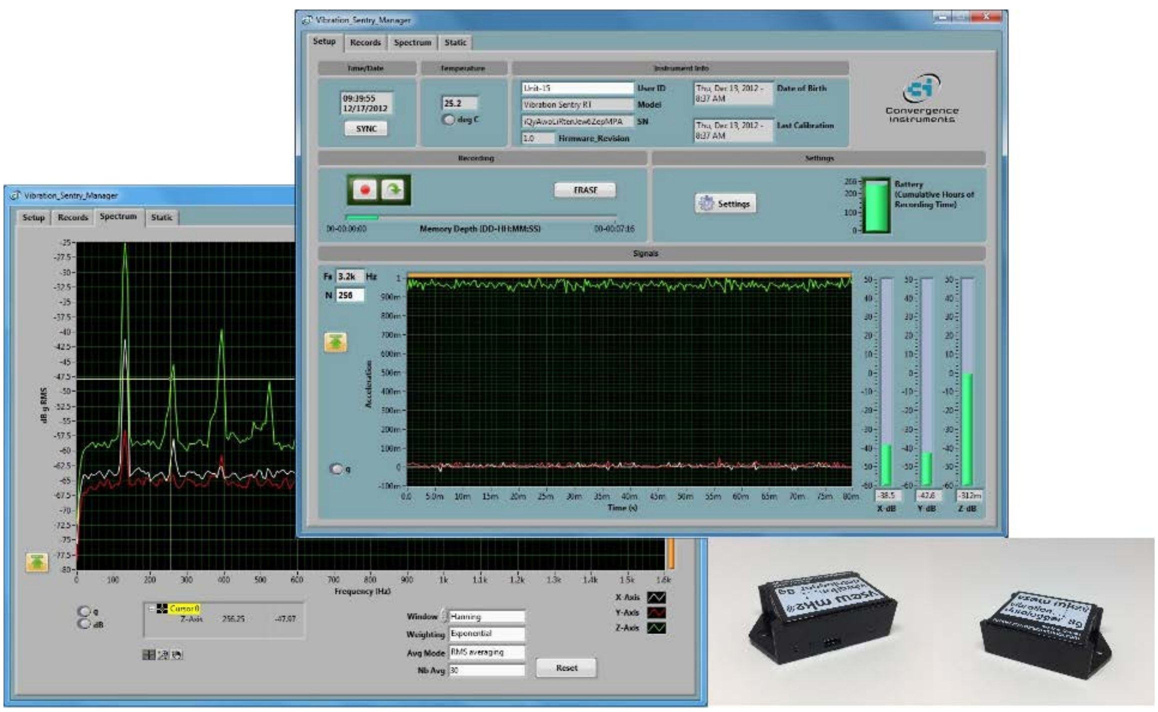
Convergence Instruments

VSEW_mk2-8g

Data Sheet



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1 Product Description

The VSEW_mk2 is a new model in the VSE series of smart vibration datalogers. It can record accelerations, vibrations, velocities and inclinations. It includes a 3-axis MEMS accelerometer, an accurate date/time clock and a non-volatile 128 Mb recording memory. Depending on the settings it can record acceleration or velocity signals and/or RMS levels for months. Its very small size allows it to be attached to, or embedded within, the monitored equipment.

The *VSEW_mk2* model is an evolution of the *Vibration Sentry E* model. It has the following new features:

- Can measure, record and trigger on velocity signals, in addition to acceleration signals.
- Has WiFi reporting and email alarms.
- Includes an accelerometer with exceptional noise floor (20 times better noise floor than the *Vibration Sentry E -16g).*
- Sampling rates up to 4 kHz.
- Improved anti-aliasing filter.

The *VSEW_mk2* includes the following features:

- 3-Axis integral MEMS accelerometer
- Measures and records:
  - Raw acceleration or velocity signals
  - Acceleration or velocity statistics
  - Vibration or velocity levels
  - Inclinations
- All-digital design.
- Integrated oscilloscope function that can show the vibration or velocity signals in real time.
- Allows the observation of recorded data while the recording is ongoing.
- Works standalone, or USB or WiFi connected for setup and data transfer to PC.
- Long life internal rechargeable battery that recharges from USB.
- Self-calibrated using the earth's gravity as a reference.
- Observes and records 100% of the acceleration signals (no missed samples).
- Editable individual custom ID for easier instrument management.
- Completely sealed weatherproof enclosure.

2 Applications

- Building-health monitoring on construction sites.
- Long-term seismic monitoring.
- Long-term inclination monitoring.
- Long-term measurement and recording of acceleration signals, velocity signals, signal statistics (peaks and average) and RMS levels.
- Continuous monitoring of machinery wear.

3 Specifications

Category	Specification
Number of Axes	• 3
Acceleration Sensor	• MEMS 3-axes
Dynamic Range (-8g)	• +-8 g
Bandwidth High Limit	• Adjustable, up to 2 kHz (@ 4 kHz Sampling Rate)
Bandwidth Low Limit	• DC (High-Pass Filter Bypass) • Adjustable from 10 mHz to *Fs/2* (High-Pass Filter On)
Acceleration Noise X-Y Axes (Typical)	*Note: Acceleration noise is primarily affected by the sampling rate. The higher the sampling rate, the higher the noise.* • -82 dBg (80 μg RMS) @ 125 Hz Sampling Rate • -66 dBg (500 μg RMS) @ 4 kHz Sampling Rate
Acceleration Noise Z Axis (Typical)	*Note: Acceleration noise is primarily affected by the sampling rate. The higher the sampling rate, the higher the noise.* • -80 dBg (100 μg RMS) @ 125 Hz Sampling Rate • -64 dBg (600 μg RMS) @ 4 kHz Sampling Rate
Velocity Noise X-Y Axes (Typical)	*Note: Velocity noise is primarily affected by the high-pass cutoff frequency. The lower the cutoff frequency, the higher the noise.* • -94 dB-m/s (20 μm/s RMS) @ 1 Hz High-Pass Cutoff • -103 dB-m/s (7 μm/s RMS) @ 10 Hz High-Pass Cutoff
Velocity Noise Z Axis (Typical)	*Note: Velocity noise is primarily affected by the high-pass cutoff frequency. The lower the cutoff frequency, the higher the noise.* • -92 dB-m/s (25 μm/s RMS) @ 1 Hz High-Pass Cutoff • -101 dB-m/s (9 μm/s RMS) @ 10 Hz High-Pass Cutoff
Inclination Angle Noise	*Note: Measured using acceleration average, with a log interval of 1s, with the instrument positioned with the Z axis vertical, and X and Y axes horizontal* • $1\,E-3°$
Inclination Angle Temperature Stability	*Note: Measured using acceleration average, with a log interval of 1s, with the instrument positioned with the Z axis vertical, and X and Y axes horizontal* • $0.2°$ over the temperature range -20 °C to 60 °C
Connectivity	• USB • WiFi
Measurements	• Raw Acceleration (g or m/s^2) • Raw Velocity (m/s) • Min, Max and Avg Acceleration values (g or m/s^2) • Min, Max and Avg Velocity values (m/s) • Inclinations

	• Min, Max and Avg RMS Vibration level (linear or dB, g or m/s^2) • Min, Max and Avg RMS Velocity level (linear or dB, m/s)
Alarm Emails	• Acceleration Signal Threshold (X, Y, Z axis) • Velocity Signal Threshold (X, Y, Z axis) • RMS Acceleration Level Threshold (X, Y, Z axis) • RMS Velocity Level Threshold (X, Y, Z axis) • Battery
Duty Rate of Signal Capture	• 100% - No Missed Samples
Spectral Display	• 3-Axes 1024-point Power Spectrum – dB or Lin Scale.
Modes of Operation	• Idle (Micro-Power) • USB-Connected (Active) • Recording (Stand-alone) • Auto-Rec (Stand-Alone) o Idle when no activity o Recording while activity is present
Calibration	• Self-Calibration using the earth's gravity as a reference
Battery Type	• Integral Li-Poly - USB-Rechargeable
Recharge Time	• 2 H 30 (Typical)
Battery Autonomy (Full-Charge)	• Up to one year while in *Idle* • 16 days to 125 days while recording, depending on settings
Battery Life	• > 300 Charge/Discharge Cycles
Temperature Range	• -20 degC to 60 degC (-4 degF to 140 degF)
Recording Memory	• Non-Volatile Flash Memory
Recording Memory Capacity	• 128 Mb • Ex: can continuously record single-axis raw signals for 17 min @ 4 kHz Sampling Rate • Ex: can continuously record 3-axes full-statistics levels at 1s intervals for 5 days • Ex: can continuously record 3-axes full statistics levels a 1min intervals for 10 months.
Recording/Erasure Cycles	• Greater than 100 000
Data Retention	• Greater than 20 Years
Dimensions	• 76.2 mm x 39.4 mm x 20.6 mm • (3" x 1.55" x 0.81")
Weight	• 65 g

Construction	• Integrally Potted Weather-Proof ABS Enclosure

Table 1

3.1 Frequency Response

3.1.1 Upper Frequency Limit

Figure 1 shows the response of the accelerometer structure and its acquisition chain, along the X and Y axes, at 4 kHz sampling rate.

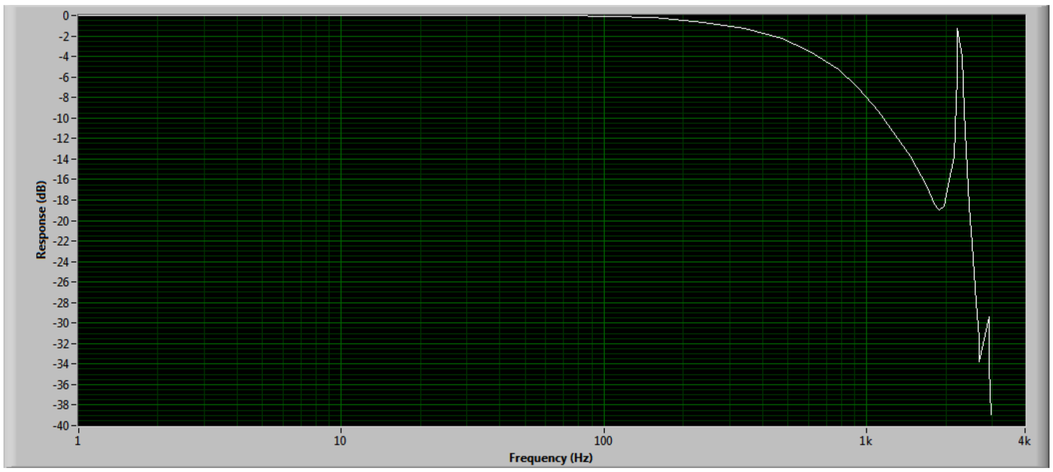

Figure 1 X and Y axes

Figure 2 shows the response of the accelerometer structure and its acquisition chain, along the Z axis, at 4 kHz sampling rate.

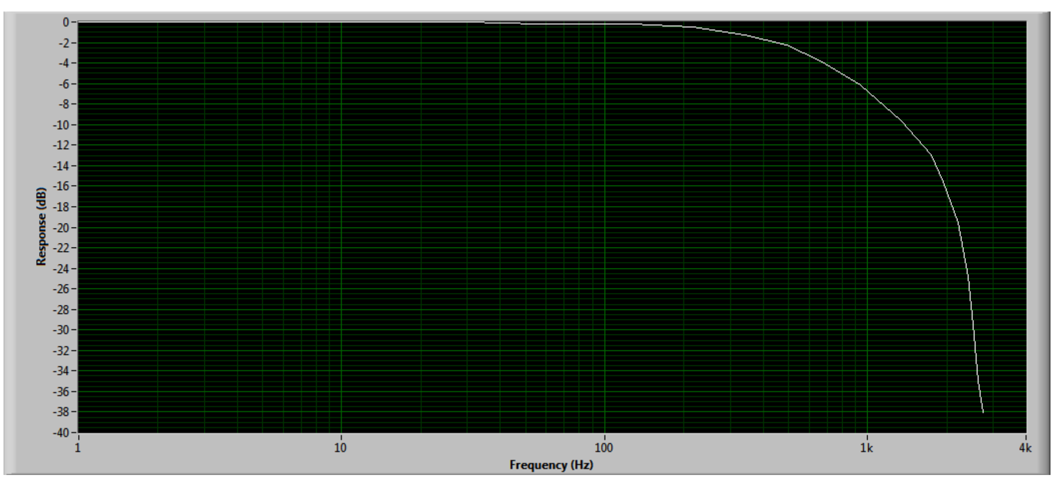

Figure 2 Z axis

3.1.2 Low-Frequency Limit

The low-frequency can optionally be limited by the digital high-pass filter. The cutoff frequency is adjustable, and can be adjusted to extremely low frequencies thanks to the filter's exceptionally high resolution. ***Figure 3*** shows the low-frequency response for a high-pass filter adjusted to 1 Hz, 5 Hz and 10 Hz, and operating at 4 kHz sampling frequency.

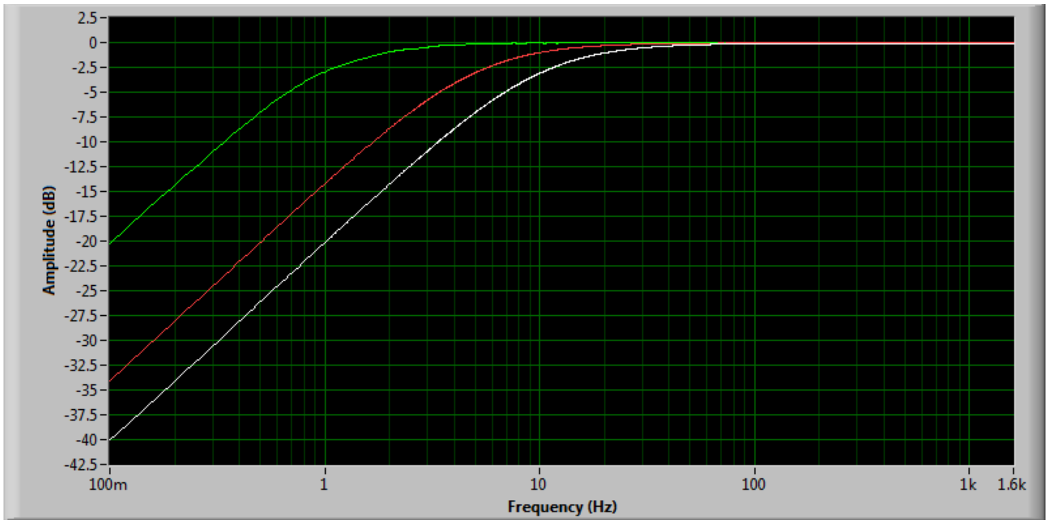

Figure 3 High-Pass Filter

3.2 Noise

3.2.1 Acceleration Noise

Figure 4 shows the RMS noise along the three axes, as a function of sampling frequency.

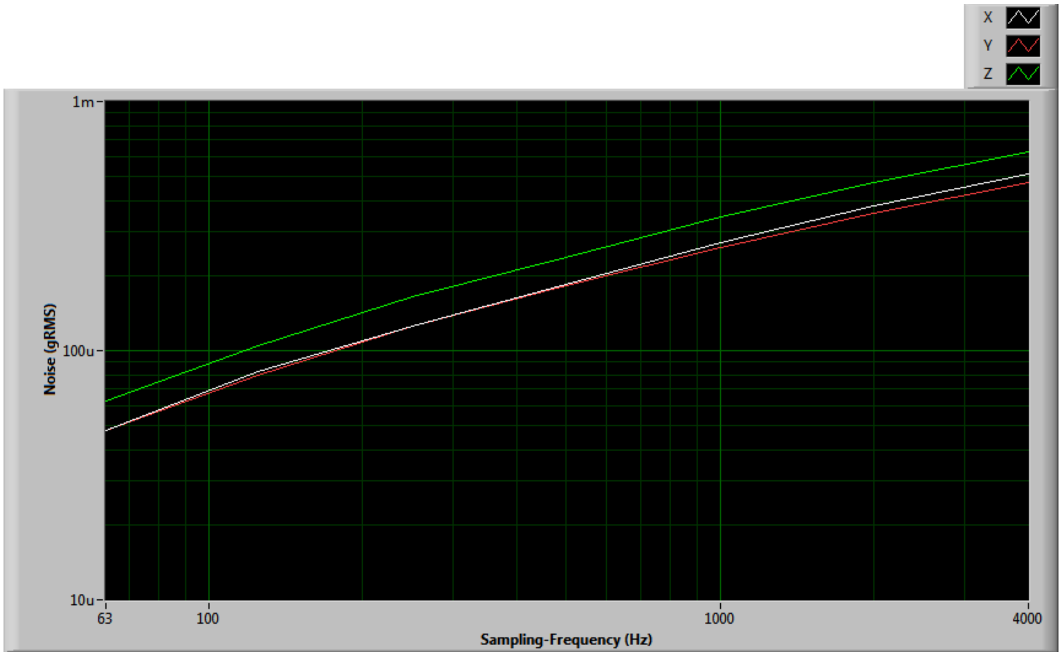

Figure 4

Figure 5 shows the acceleration noise spectrum when the accelerometer is sampling at 4 kHz.

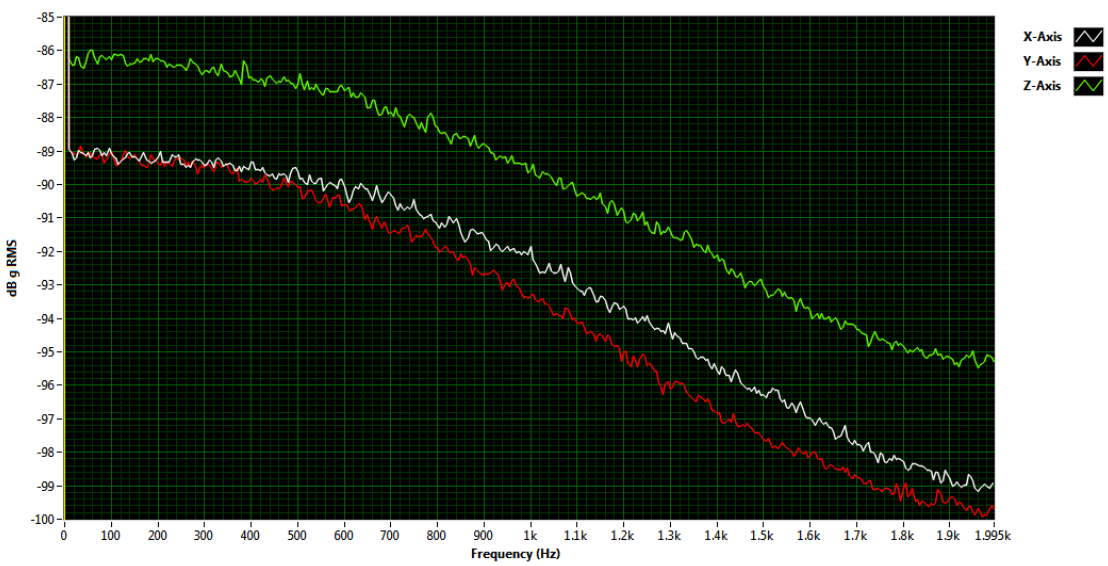

Figure 5

3.2.2 Velocity Noise

Figure 6 shows the RMS velocity noise as a function of the cutoff frequency of the high-pass filter. The velocity noise is not significantly influenced by sampling frequency.

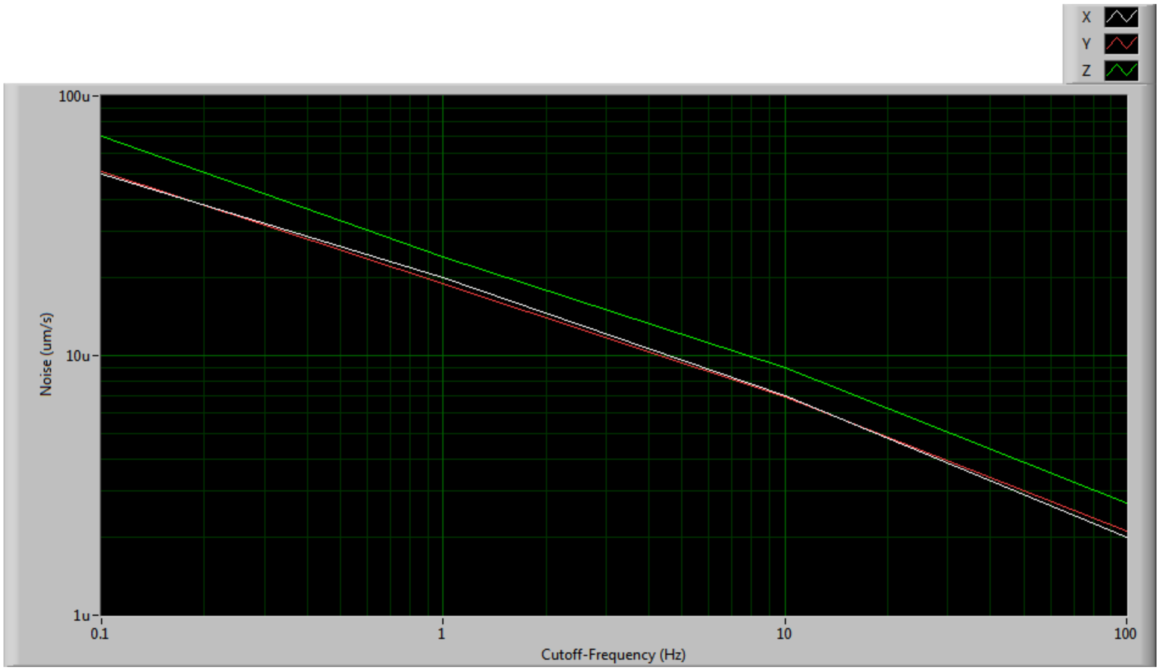

Figure 6