RESENSYS

SenSpot™ Wireless 1D/3D Vibration
Ultra-Low Power Precision Sensing & Wireless Communication

Typical Applications

- Bridge health monitoring

- General structural integrity monitoring (buildings, dams, tunnels, levies, etc.)

- Man-made seismic effect monitoring

- Detection of vehicular or barge collision

Features & Benefits

- **Long lifetime** (battery life of 10 years)

- **Wireless communication** (IEEE 802.15.4)

- **Lightweight,** about 120 grams

- **Easy mounting**

  - Self-adhesive, no drilling is required (e.g., steel)

  - Flange-mount, drilling is required (e.g., concrete)

- **Quick installation**, 1-2 minutes

- **Adjustable sampling interval:** 50 to 500 samples per second (The lower range is customizable)

- **Adjustable sensitivity threshold:** From 8mg to 512mg. Threshold can also be set adaptive to limit number of events

- **Number of samples:** two options
  - Normal or short waveform: 1024 samples per event
  - Long waveform: 4096 samples per event

- **Adjustable Transmitting interval**

- **Full range:** ±2g ("g" is the acceleration of gravity)

- **Resolution:** 4 ug

- **Noise Level:** X & Y &Z Direction: $20\mu g/\sqrt{Hz}$

- **Working temperature:** -40°C to +125°C

- **Shock survival:** 1000g, 0.1s, no damage to the electronics

- **Long communication range:** 1.0km free space

- **Small size:** 50mm (1.96") x 50mm (1.96") x 34mm (1.34")

- **Power source:** replaceable lithium-ion battery

Description

SenSpot™ provides an easy to install, scalable solution for distributed structural integrity monitoring. SenSpot™ vibration uses Resensys's proprietary Active RF Technology, similar to other SenSpot™ in its family. Resensys SenSpot™ technology offers a high-performance method for large-scale sensing, synchronization, and ultra-energy efficient wireless communication.

SenSpot™ is designed to operate maintenance-free for decades. After installation, SenSpot™ does not need calibration, battery replacement, or any other maintenance during its entire service life. Due to

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small size and lightweight, adhesive-mount Sen-Spot™ sensors can be applied easily to as many critical spots on a structure as needed, with minimal installation effort. SenSpot™ vibration can be used on different elements of a structure to monitor vibration.

Whenever the change of acceleration in any direction exceeds the defined threshold, in other words, when it detects an event, the SenSpot™ starts sampling the acceleration in all directions with the defined sampling intervals and save them inside internal memory to send them later to the gateway. Vibration SenSpot™ comes with two options: normal or short waveform version which takes 1024 samples after event detection and long waveform version that takes 4096 samples after event detection. More samples per event is especially useful in spectral analysis applications in frequency domain since higher number of samples in time domain means higher resolution in frequency domain from FFT and thus, more accurate frequency response.

The downside of long waveform version is that it needs more time to send all the data to the gateway and as a result, the number of events that can be detected and sent to the gateway is significantly limited and it also increases power consumption.

In addition to these event measurements, the vibration SenSpot™ periodically measures the acceleration values regardless of whether or not any event has been detected. These measurements serve as keep alive measurements so the user can still check the data and make sure the acceleration values are within acceptable range if no event is detected for a long time.

The period of these keeps alive measurements depend on the gateway transmission interval and during normal transmission interval (not in fast sampling mode), it is around every six hours.

The SenSpot™ can be set either locally or remotely with SenScope to generate wireless command whenever it detects an event. This wireless command can be used by Resensys Camera. In this case, Resensys Camera, take two consecutive photos upon receiving the wireless command. This combination of Vibration SenSpot™ and Resensys Camera is a perfect solution for applications such as barge collision monitoring system. When a barge hits the bridge fenders, it vibrates the fender and SenSpot™ detects an event. At the same time, the camera takes a photo of the hitting barge. As a result, the entity that is in charge of the bridge can identify the violating barge and take enforcement actions against it such as imposing penalty on it.

The sensitivity threshold and sampling interval can be adjusted remotely by user through SenScope software interface and after deploying the SenSpot™ based on the application and bridge condition (Please refer to SenScope manual for more information) in order to limit the number of event and consequently, preserve the battery life. The event detection capability can be disabled remotely by the user. In this case, battery power consumption significantly reduces and SenSpot™ would only send keep alive data.

Dimensions

Vibration SenSpot™ comes in either self-adhesive or flange-mount form factors. A general diagram of this unit is shown below.
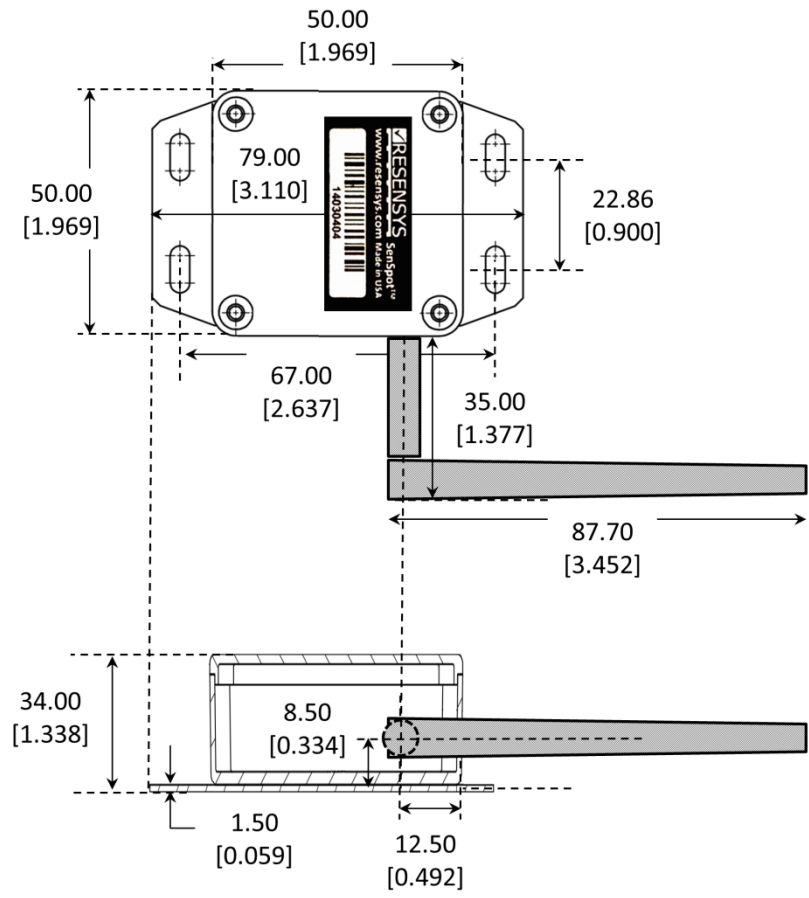

Figure 1: Vibration SenSpot™ dimensions. All dimensions are in mm [inch].

Direction Diagram

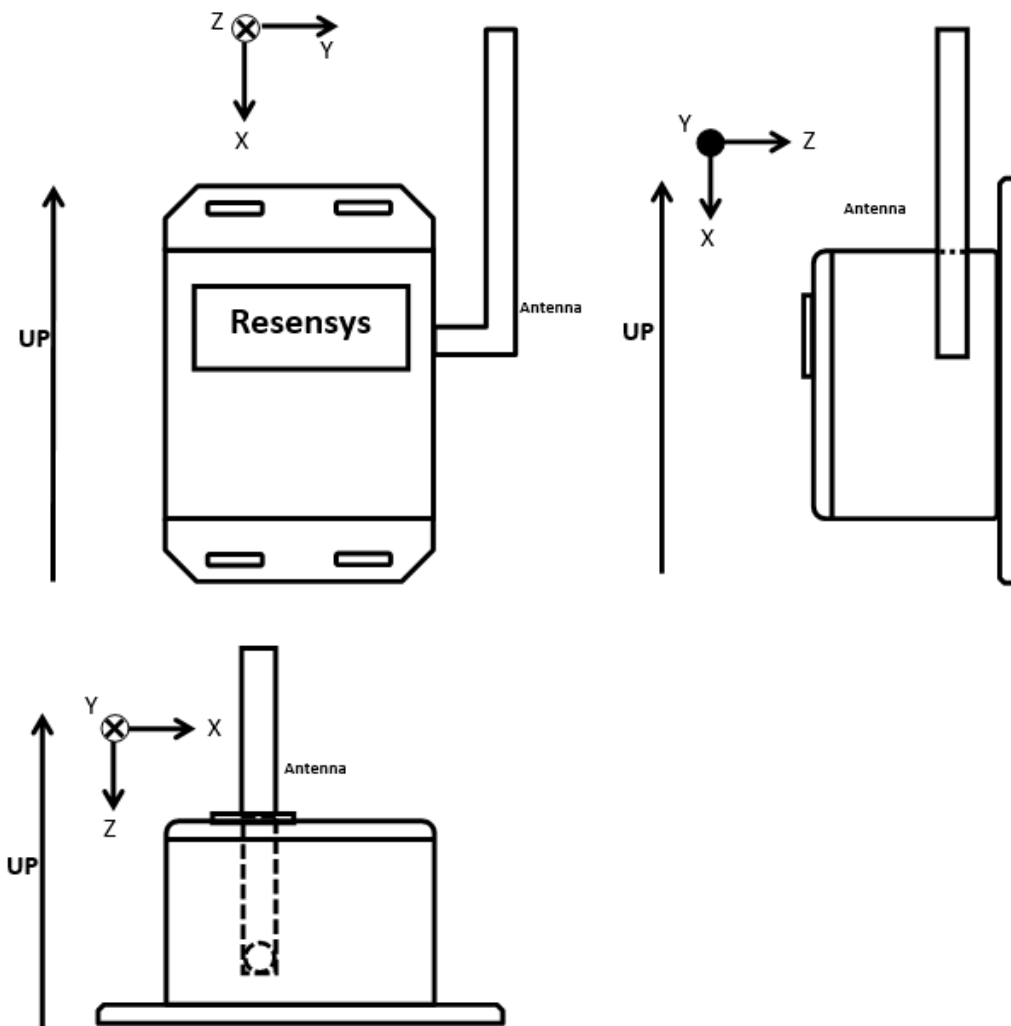For SenSpot™ Wireless 1D Vibration, **ONLY** the acceleration in the Z direction is measured.
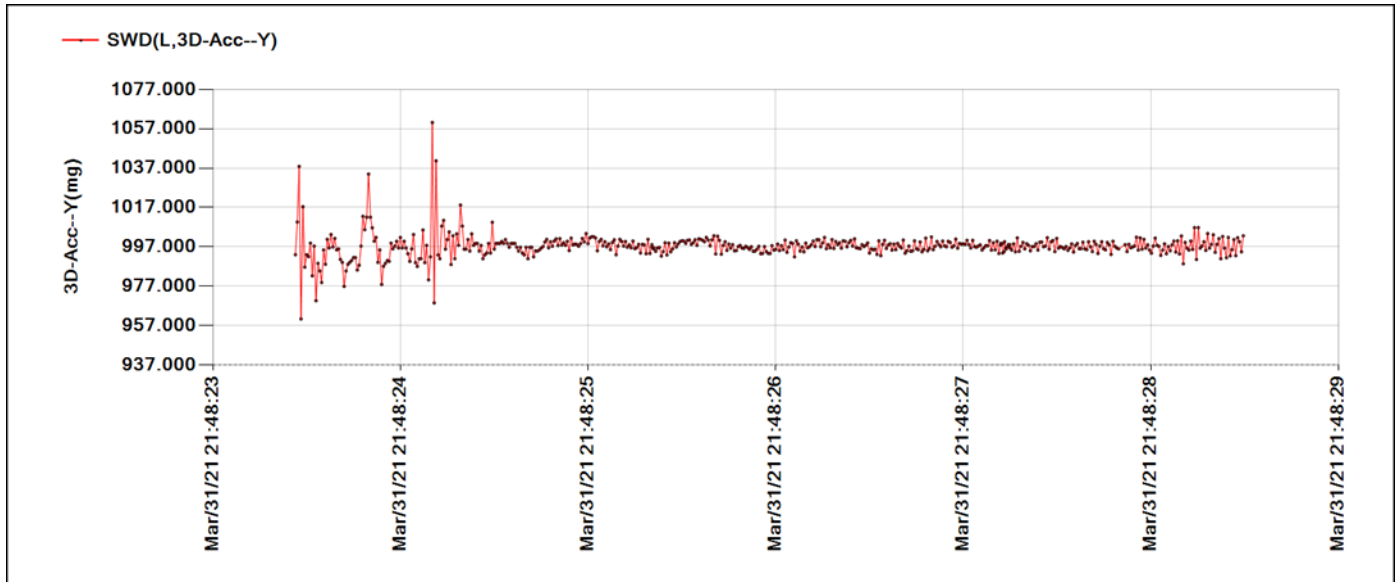
Figure 2: X, Y and Z orientations

The data shown in SenScope™

Figure 3: Vibration measurements for a Vibration SenSpot™ (HPA)