

### Typical Applications

- Structural Health Monitoring (Airplanes, Bridges, Buildings, Cranes, Tunnels, Machines, etc.)
- Fatigue Analysis, Bridge Load Rating, Fracture Critical Monitoring, Extreme Load Tests

### Benefits

- **Long battery lifetime** (10 years, typical)
- **Small size and light weight**
- **High Accuracy:** 1 microstrain typical resolution
- **Wireless communication:** no wiring needed
- **High-rate data transmission triggered by sudden strain changes:**
  - Perfect for recording the waveform of a sudden strain change (e.g., strain event) caused by live load (e.g., heavy trucks passing over a bridge, wind gust, loading cycles).
  - User adjustable sampling rate for event detection and high-rate data from 10 to 100 samples per second
  - User adjustable triggering threshold from 8µstrain to 512µstrain for detecting strain event
- **Adjustable sampling interval:** The regular sampling interval can be adjusted remotely by user from 50ms (20 samples/sec) to 15sec
- **Adjustable transmission interval:** Can be adjusted remotely by user from 12sec to 360sec.
- **Easy mounting:**
  - Self-adhesive, no drilling is required (on metallic/smooth surfaces)
  - Flange-mount (on concrete, wood)
- **Quick installation:** 5-6 minutes
- **High compatibility:** integrates with thirds party strain transducers (120 Ohm, 350 Ohm, 700 Ohm, full-bridge, half-bridge, quarter-bridge



and rosette which consists of three strain gauges).

- **Complementary sensing:** the ambient temperature is also measured for reference
- **Different surfaces:** Can be used for strain measurement on different surfaces such as steel, Aluminum, Concrete and wood

### Specifics

- **Dimensions:**
  - Wireless transmitter: 50mm (1.96") x 50mm (1.96") x 34mm (1.34")
  - Strain Gauge sensor: 76.2mm (3") x 33.4mm (1.3") x 10mm (0.4")
- **Weight:** about 147 g (5.19 oz.)
  - Wireless transmitter: 120 g (4.23 oz.)
  - Strain transducer: 17 g (0.6 oz.)
- **Operating temperature:** -40°C to +65°C (-40 °F to +150°F)
- **Long communication range:** 1.0km free space

## Description

SenSpot™ provides an easy-to-install and scalable instrument for distributed testing and monitoring. SenSpot™ uses Resensys's proprietary sensing, scheduling and ultra-low power synchronization technology. SenSpot™ is designed to operate maintenance-free for more than a decade. After installation, SenSpot™ does not need calibration, battery replacement or any other maintenance during its entire service life. Due to the small size and the light weight, large number of adhesive mount wireless SenSpot™ sensors can be installed on a structure in a short time.

Strain gauge SenSpot™ comes with a wide range of transducers from third party manufactures such as OMEGA and HBM with different configurations (Full-bridge, Quarter-bridge) and various resistance values from 120 ohm to 1000 ohm. They also can be customized for different surfaces such as steel, aluminum and wood based on customer application.

The sampling interval can be remotely adjusted by user based on SenMax™ transmission interval. The highest sampling rate is 50ms or 20 samples/s when the SenMax™ transmission interval is 12s and the lowest sampling rate is every 15s when SenMax™ transmission interval is 360s.

Resensys wireless strain gauge SenSpot™ comes in three different versions:

- 1- Type A: strain gauge which can measure strain values from 50ms to every 15s. This type does not have the capability of detecting sudden change of strain (or event) values.
- 2- Type E: In addition to the features of type A, it measures the strain values with the nominal

rate of 40 samples/s (every 25 ms) in the background. This data is used only for detecting high sudden change of strain (e.g., an event) and is not transmitted. If an event is detected, data of one second pre-event together with eight seconds of post-event data is transmitted with high sampling rate of 40 samples/s. In this case, the user can capture the whole strain waveform of the event. In many applications where the SenSpot™ is deployed on a bridge structure, these events happen when a very heavy truck is passing the bridge. So, the transportation authorities can find out when and how many of heavy trucks have passed the bridge in certain time interval.

This capability is particularly useful for fatigue analysis when the number of high strain/stress cycles is important to calculate the structure wear and tear and remaining life time. Sampling rate can be configured from 10 samples/s to 100 samples/s and the triggering threshold can be set from 8µstrain to 512µstrain remotely by the user. This gives user a great flexibility at balancing between the SenSpot™ performance and battery life depending on bridge condition and location of the deployed SenSpot™.

- 3- Type R: This type is similar to type A but it has an internal multiplexer and can measure up to four different strain gauges simultaneously. This type is specifically useful for measuring rosette strain gauges which typically consists of three stacked strain gauges. Another application is when there are a lot of closed spots on the structure that should be measured. With using this type, user can save the number of SenSpot™ s necessary for measurement.

## Wireless Transmitter Dimensions

The wireless transmitter is universal and it reads the analog measurement from the sensing element and transmits the digitized data wirelessly to SeniMax™ Gateway or to USB-Sink receiver. These SenSpot™ sensors can be attached with the adhesive on the enclosure (e.g., on metallic surfaces) or it can be bolted (on concrete) as well.

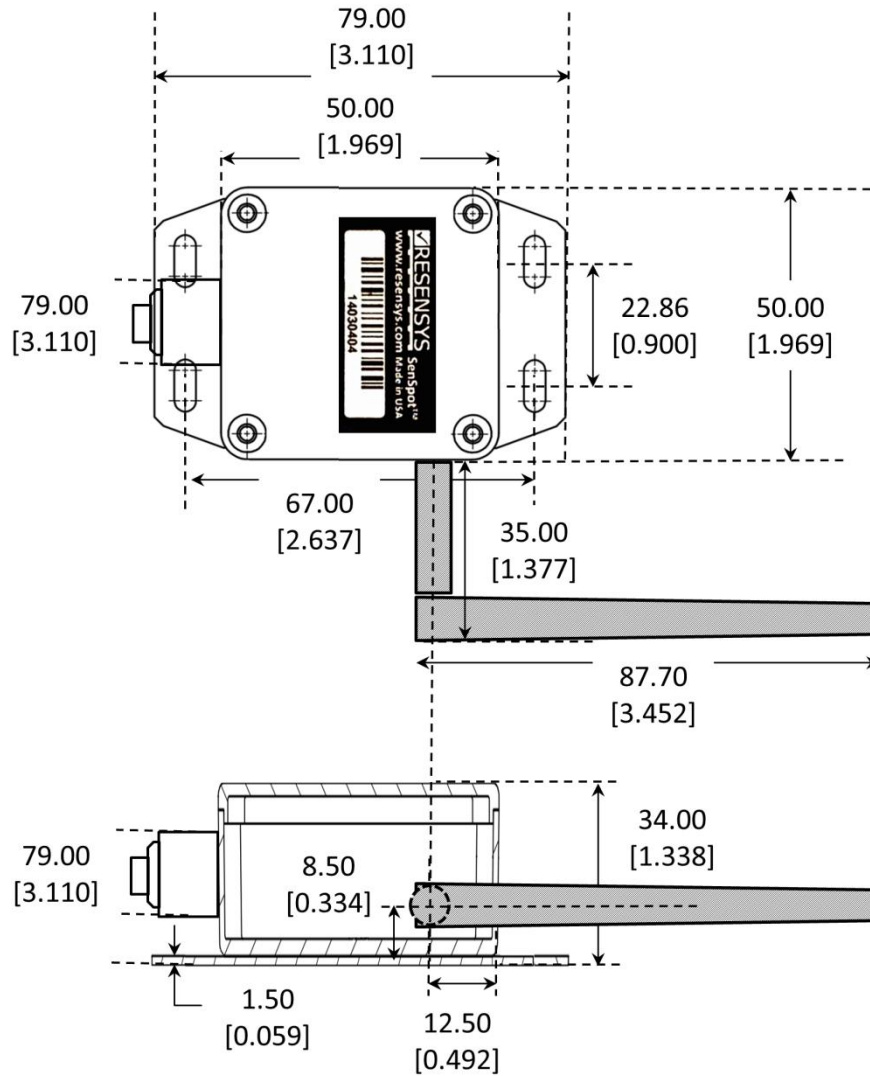


Figure 1: Wireless transmitter dimensions for strain gauge SenSpot™. All dimensions are in mm [inch].

# Strain Gauge Sensing Element Dimensions

The strain gauge sensing element produces the strain analog signal through its cable after it gets the excitation signal from the wireless transmitter part. This sensor is self-adhesive and it is meant to be used on steel structures.

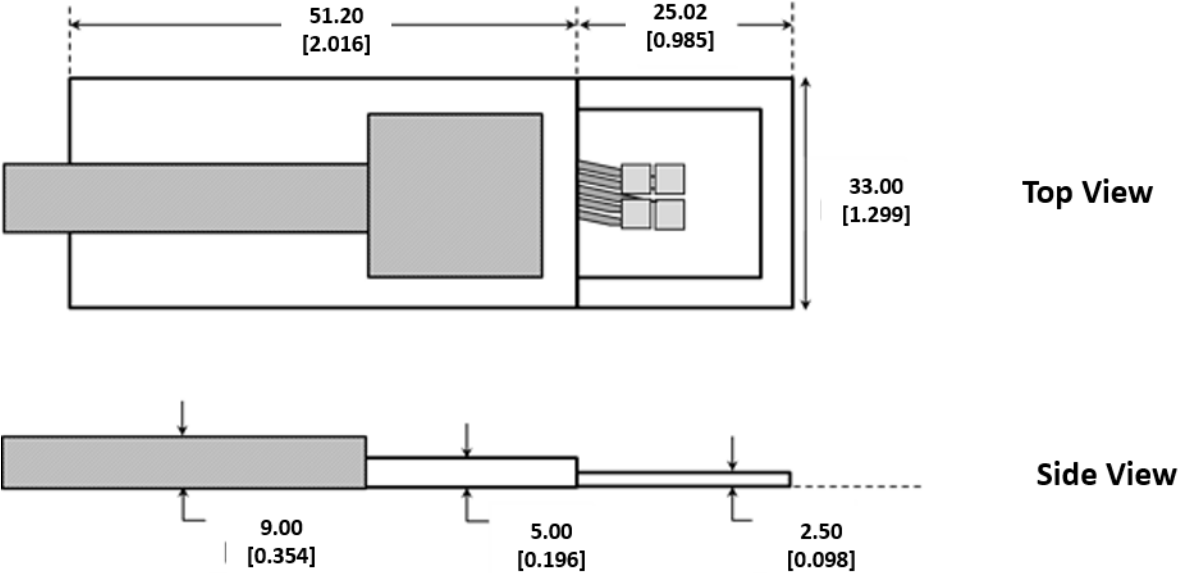


Figure 2: Strain gauge SenSpot™ sensing element dimensions. All dimensions are in mm [inch].

# The data shown in SenScope™

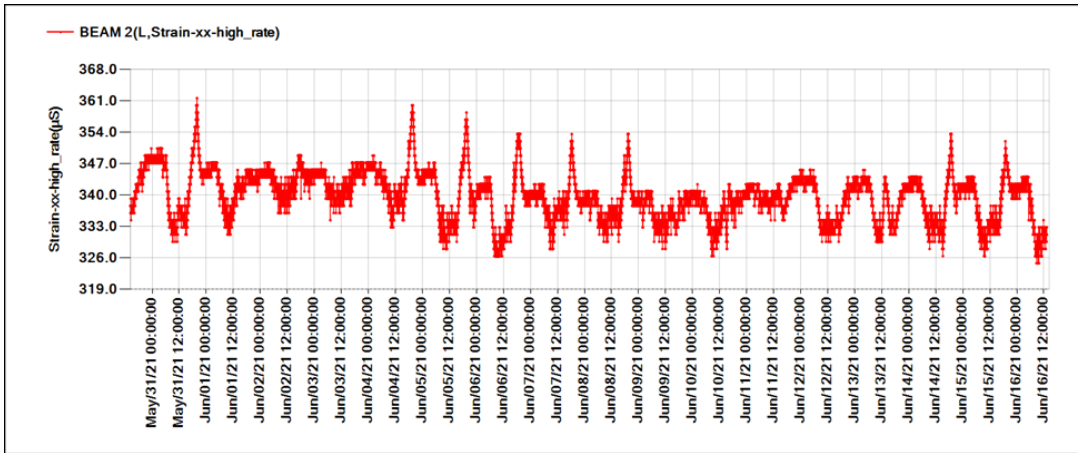


Figure 3: High-rate strain measurements for a Type A (Regular) of strain gauge

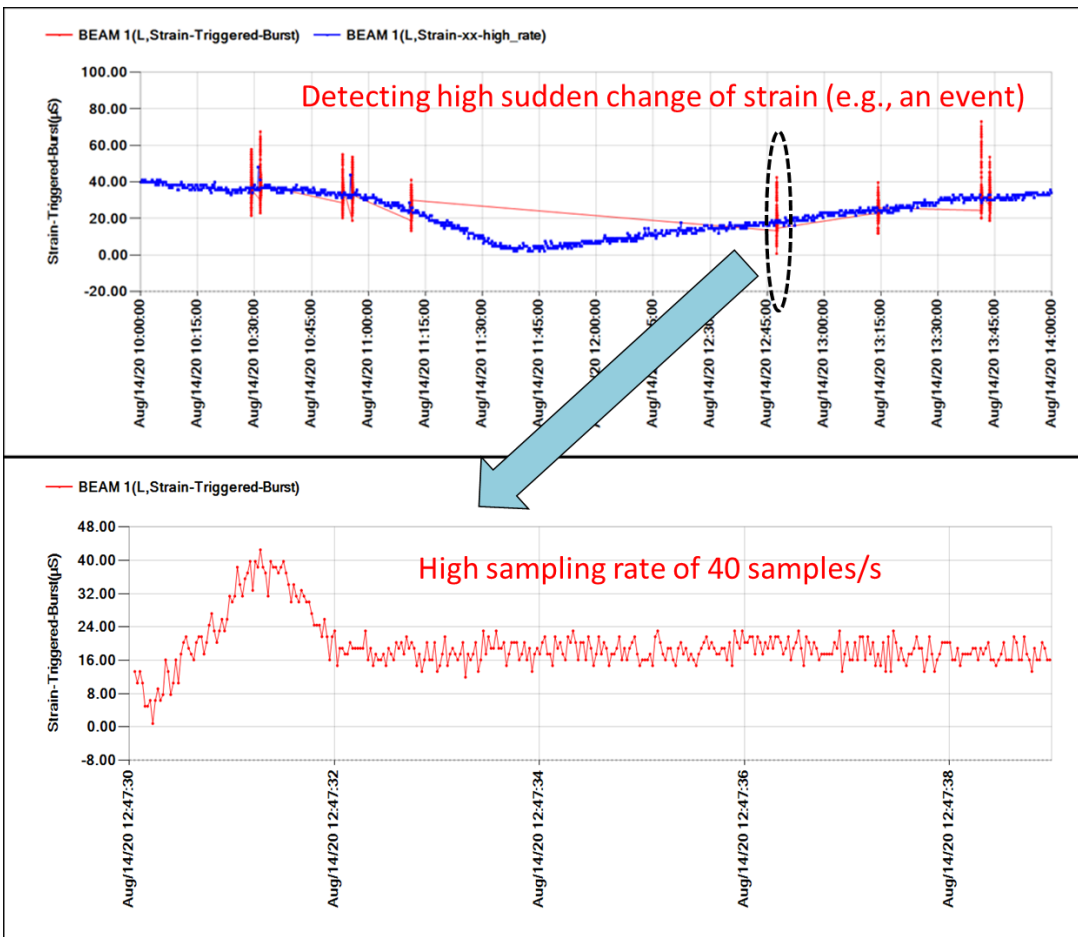


Figure 4: High-rate (blue) and triggered-burst (red) strain measurements for a Type E (Event Detection) of strain

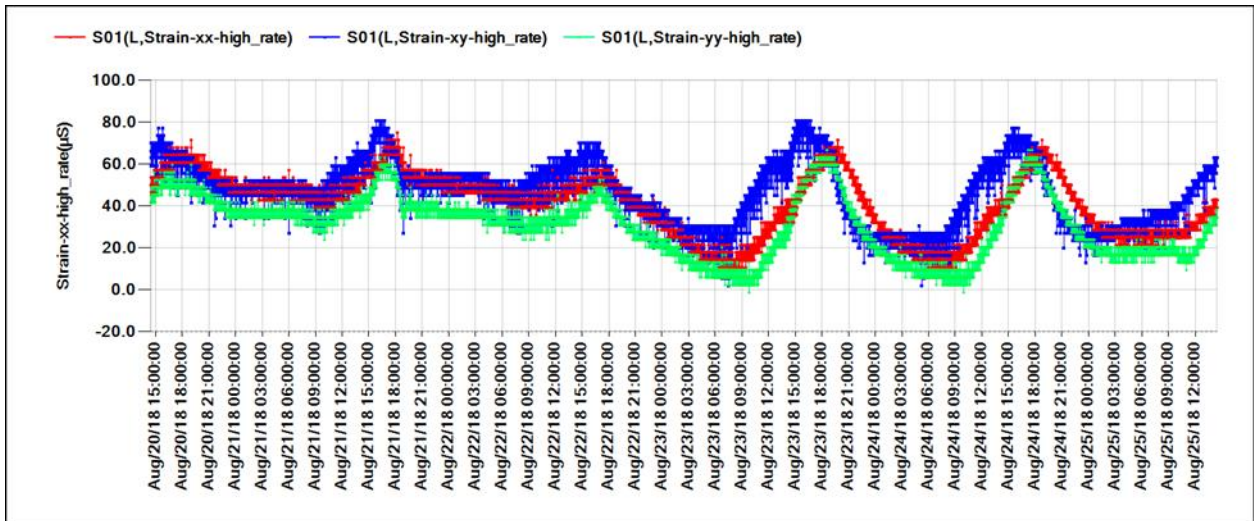


Figure 5: High-rate strain measurements for a Type R (Rosette) of strain gauge