FLUKE
Reliability

Fluke 3562 Screening Vibration Sensor

Frequently asked questions

Q: Why should I use a vibration screening sensor and what is the benefit?

A: Vibration anomalies are some of the first indications of misalignment, looseness, bearing wear or imbalance faults within mechanical rotating equipment. By continuously monitoring assets, maintenance and reliability teams can gain a better understanding of when maintenance repairs and replacement should be completed. Wireless sensors overcome the challenges faced by maintenance teams in all industries: limited time, resources, and access to machines – behind panels, up high, hazardous, etc. Predictive maintenance with vibration screening is more cost effective than reactive maintenance due to:

- Detecting problems early requires less involved repair
- Planning and scheduling will improve execution efficiency and overhaul quality, increases production revenue, lowers energy waste and costs

Q: How are vibration sensors part of a bigger reliability solution?

A: These are the 3 keys to new program success:

1. Asset Coverage: Include as many machines as practical in a combined condition monitoring strategy
2. Data Capture: Getting vibration data is the heart of condition monitoring
3. Team Enablement: Understand what the data means and what action, if any, to take proactively

Q: What are the key features of the Fluke 3562 Screening Vibration Sensor?

A: The 3562 features a revolutionary batteryless sensor and long-range radio prowess, enabling maintenance teams to continuously screen vibration readings for the vast majority of their facility's assets, not just the critical few.

Features such as the long wavelength, sub-GHz radio allows the sensor to communicate with a gateway over extremely long distances, requiring fewer gateways throughout a facility. The TEG harvester or PV harvester generates power for the sensor to deliver constant vibration tracking. The sensor and software application, LIVE-Asset™ Portal, ensure maintenance teams are immediately notified when a closer look is warranted for any given asset.

Q: What does the sensor measure?

A: 3 axes of vibration and 2 temperature measurements

- Vibration: Frequency Range 6 Hz to 1,000 Hz
- Sensor (ambient) and Harvester (surface) Temperature: Displays trends between -20° F & +176° F (-40°C to 85°C (-40°F to 185°F))
- Relative Humidity (0-100%)

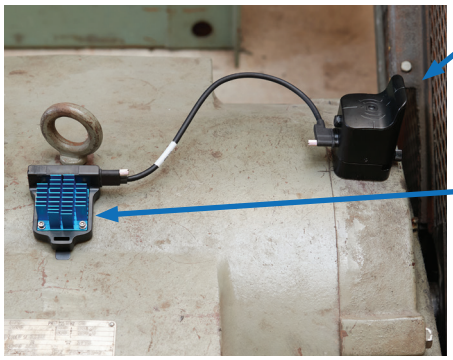
Q: How is vibration measured?

A: Each sensor measures vibration using a MEMS triaxial accelerometer, then converts the measured time domain waveform into the frequency domain via a Fast Fourier Transform (FFT). The 9 highest frequency domain peaks (measured in inches per second – peak) from each axis is sent to the Live-Asset Portal software to be viewed in an asset's insight section.

Q: What is Overall Vibration and how is it trended?

A: **Overall Vibration levels** (velocity)
Mechanical vibration is a notoriously difficult subject to master. Unlike a vibration analyzer, the screening vibration sensor has been designed to yield significant benefits without requiring advanced training. Captured data is used to calculate one, single overall vibration value that can be used as an indicator of the overall health of the machine and can be trended over time. This number is like an average.

Q: How is temperature measured, trended, and root cause?



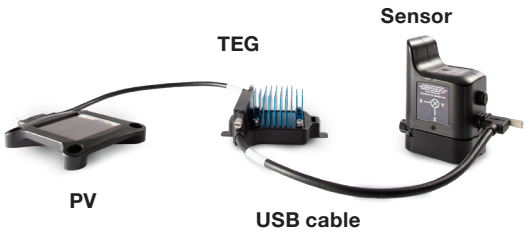
A: There are 2 temperature sensors

1. **Sensor temperature** is measured using an IC based temperature sensor within the main sensor assembly. The black nozzle above the USB-C port is the Gortex vent used to allow air flow for the temperature (and the humidity) sensor. Ambient temperature will contribute, but an increasing bearing temperature could be a leading cause to a rising reading for the Sensor temperature (depending on placement of the sensor).
2. **Harvester temperature** is measured using a thermistor embedded within the base of the TEG harvester. This value is measured using an ADC located within the main sensor assembly. Ambient temperature will contribute, but the leading cause of an increase in Surface temperature could be from an increase surface temp could be from an increase in heat from the motor (depending on placement of the TEG harvester).

Q: How is the Humidity measured?

A: The black nozzle above the USB-C port is the Gortex vent used to allow air flow for the humidity/temperature sensor.

Q: What does batteryfree mean and how is this accomplished?



A: The 3562 vibration sensors are batteryfree, operating entirely and continuously from low levels of harvested energy. The sensor system is fueled by the Everactive® Edge self-powered circuit and networking technology.

Because the power requirements of sensor's custom integrated circuits are so low (up to 1 / 1,000th of that of competitors), our sensors can operate off trace amounts of existing energy sources within most environments. Currently, the two most utilized sources are heat and light.

To harvest from heat – a thermoelectric generator (TEG), which generates current from a temperature differential between two sides of the bimetallic device. The sensor only needs a –9°C (15°F) difference between either side of a Scrabble tile–sized Peltier device within the TEG. The TEG is placed on the warmest part of the machine to provide maximum power.

To harvest from light – a photovoltaic (PV) harvester and only need ~200 Lux to power the sensor—roughly the light in a dimly lit facility. Outdoors, where sunlight is exponentially brighter, we are exposed to more than enough energy to power the sensor during daylight hours.

Q: What happens if the energy harvesting source goes away?

A: The sensor contains supercapacitors to store the energy harvested. If the harvesting source were to go away (i.e., the lights or machine turns off) the sensor will stay alive for several hours at a 60–second measurement and transmission interval. With a longer measurement and transmission interval, the device will stay remain powered for a longer period. Once the harvesting source returns, the sensor will power–on in a matter of minutes.

Q: How does the sensor power build up on start–up or re–start?

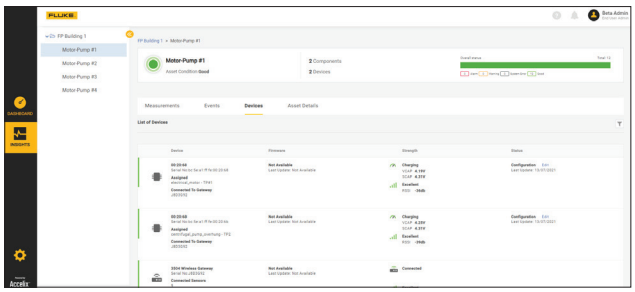
What does the VCAP / SCAP Chart tell me?

VCAP is the voltage directly powering the device.

SCAP is the super cap storage voltage level.

- VCAP and SCAP are used to understand and diagnose the strength of the harvesting source and power of the device.
- The sensor will self–regulate data transmission based on the available energy in the system

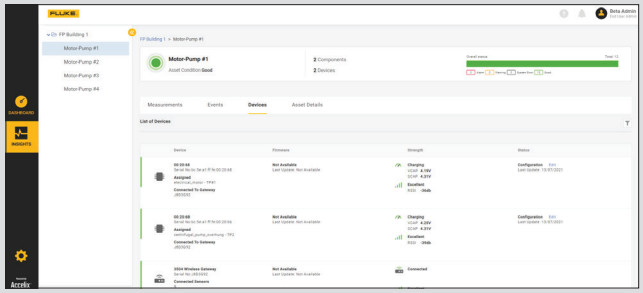
A: While first charging up, VCAP will quickly ramp up and enable the part to start to function. If VCAP reaches around 3V, it will start to charge the super cap. The rate of charge will depend upon the available energy from the harvesting sources. During this time, the part will be in "Energy Aware" mode where it reports data less frequently in order to reach a full charge more quickly. Once both VCAP and SCAP reach 3V, then the device will transmit data once every minute. If there is extra energy coming in from the harvesters, then SCAP and VCAP will begin to climb up to ~4v.



At this point, the SCAP will continue to "deep charge" and provide an extended life after power harvesting ceases.
After power harvesting ceases, VCAP and SCAP will decrease, the 2 voltages will track downward until they reach a point where the part will no longer transmit.

Q: What does the RSSI number tell me?

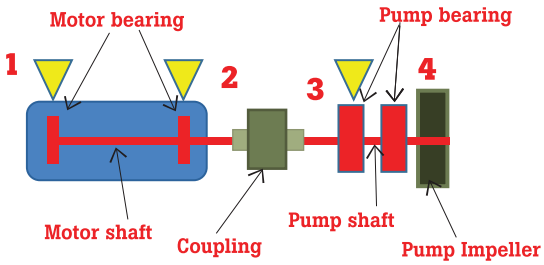
A: RSSI stands for Received Signal Strength Indication and is used to measure the strength of the wireless link from each sensor to the gateway to which it reports. A signal of greater than –40dB is strong, whereas a signal of below –80dB would indicate a weaker link.



Q: Do I need to monitor all bearings on a machine?

A: No, vibration can be transmitted up to 36 inches, as such it is not necessary to use sensors on every bearing on small machines. Larger machines may need more than one set of sensors. It is advised that large machines (motors with 75 horsepower or more) be equipped with a sensor on each bearing. For small machines, mount one sensor on the drive end of the motor and another on the drive end of the driven component (pump, fan, compressors, blower).

- In the large machine example below, one sensor is on each motor bearing, and one is on the pump – ensuring data from both components.



Q: How should I select the bearing location?

A: For vibration testing, simply locate the bearings on your rotating equipment. Mount the wireless sensor on each bearing location that needs monitoring. Vibration from inside transmits via bearings to the outside.

Q: Where do I mount the sensor on the bearing?

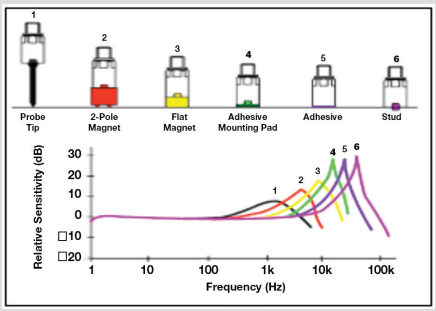
A: Sensors should be mounted to best detect triaxial vibration from rotating shafts in all three directions at the same time. Mount sensors:

- As close to the bearing housings as possible
- Install on solid metal — not on covers, lead boxes or cooling fans
- On the top, side, or end of the bearing housing
- Note: Measurements should not be taken from the pump casing or in the middle of the motor. Vibration from impellers, windings or other components will transmit down the shaft to the bearings.

Q: How is the sensor mounted?

- With 3 options available for mounting the vibration sensor – which should you use?
- What is best? Highest frequency response; most secure; easiest to install; etc.
- It depends on the machine application, plant policies, and the quality of data needed.

In the frequency chart below, we see that the magnet (#3) has a lower cut off frequency than adhesive mounting pad (#4), and both are lower than the stud-mount (#6) How is the sensor mounted?



A: Stud mount, epoxy, or included magnet

Stud mount
- Best frequency response
- Most work needed to install
- Must drill a hole in surface

Adhesive mount
- Better frequency response
- No drilling, yet permanent

Magnet mount
- Low frequency response
- Convenient
- No drilling or glue needed

When to use stud mount, adhesive mount, or magnet mount?

Below are some suggestions (but the final decision lies with the customer):

- Large, critical assets require highest quality data and often have thick metal surface (can drill): stud
- Large, important assets have flatter surfaces that can support magnets (lower frequency response): magnet
- Medium, critical assets need very good data, but stud mount may not be acceptable: adhesive
- Medium/small, important assets need good data, but drilling may not be acceptable: adhesive

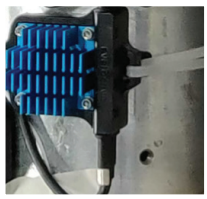
Q: How is the energy harvester mounted?

- With 3 options available for mounting the harvester — which should you use?
- What is best — highest heat transfer; most secure; easiest to install; etc.
- It depends on the machine application, plant policies, and the holding power needed

Note: Epoxy/adhesive should be placed around the outside as not to potentially reduce heat transfer to Peltier located in the center of the TEG bottom

A: Adhesive, plastic tie-wrap, or included magnet

Adhesive mount
- Most secure mounting
- Most work needed to install
- May be tough to remove



Plastic tie-wrap
- Very secure mounting
- No gluing, yet permanent
- Easy to remove later

Magnet mount
- Least secure mounting
- Bend tabs for better holding
- Convenient

When to use plastic tie-wrap, adhesive mount, or magnet mount?

Below are some suggestions (but the final decision lies with the customer):

- Machines that are magnetic, do not require secure mounting, and may need quick removal: magnet mount
- Machines that are not magnetic, or need more secure mounting, and may need removal: plastic tie-wrap
- Machines that need the most secure mounting and removal is not expected: adhesive mount

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