

# PetaSense

## Learning Sensors for Predictive Maintenance



Wirelessly monitor and predict machine health



# Petasense Vibration Mote

Wireless sensors for machine condition monitoring



## Truly Wireless

Eliminate costs and hassles of wiring with battery powered, WiFi enabled vibration sensors



## Easy Installation

Start collecting data in minutes by installing the Mote with adhesive or stud mounting



## Rugged Enclosure

Compact form factor and durable design to fit tight spaces and withstand harsh conditions



## Smart Device Access

Take instant measurements from nearby machines using Bluetooth on your mobile device



## Enterprise-grade Security

TLS protocol with AES encryption ensures secure device-to-cloud connectivity



## Industrial Compliance

Class 1 Div 2 for hazardous environments, FDA-approved enclosure, FCC, IC, UL, RoHS, and NEMA 250 compliant

### Model 1 low bandwidth (1.6kHz)

Detect imbalance, misalignment, structural and rotating looseness, and late stage bearing wear

### Model 2 high bandwidth (5.5kHz)

Detect bearing wear, pump cavitation, gear teeth problems, and other unknown issues





# Petasense Cloud and Mobile

Anytime anywhere access to machine health



## Reliable Cloud Infrastructure

Collect, store and analyze data in the cloud, hosted on Microsoft Azure



## Machine Health Dashboard

Access real-time health of machines with a simple color-coded condition system



## Reports and Alerts

Receive frequent machine condition reports and instant notifications when vibration levels exceed alarm limits



## Vibration Analysis Software

Explore trend, waveform and spectrum charts with interactive cursors and sidebands



## RESTful Web APIs

Easily integrate with SCADA, data historians and EAM/ERP systems



## Enterprise-grade Security

Highly secure web and mobile access to machine health using https with TLS 1.2



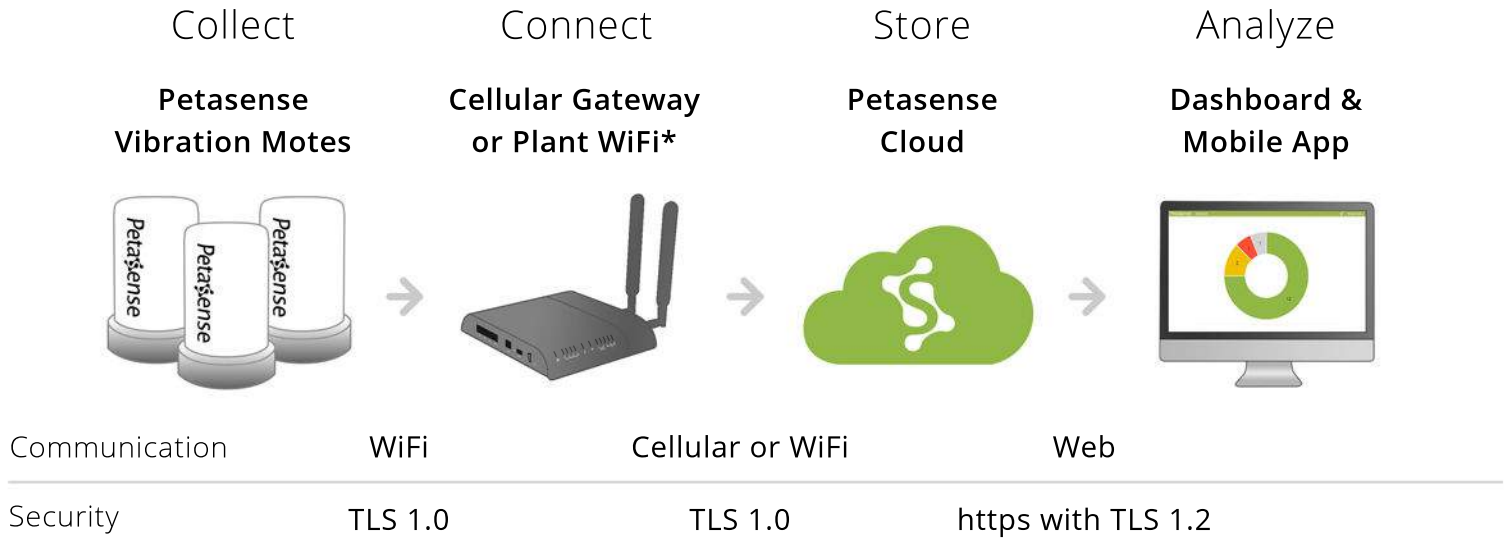
## Machine Learning

Utilize advanced data-science algorithms and multi parameter analysis to predict and diagnose equipment failures

- Detect deviations from machine-specific baselines
- Easily incorporate parameters from other sensors and alternative data sources

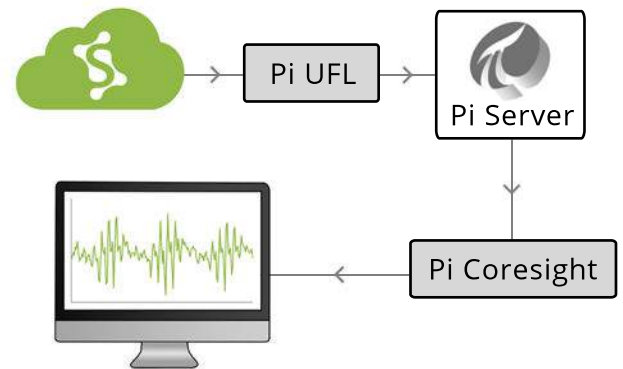
# Petasense Architecture and Security

Enterprise-level integration and security protocols



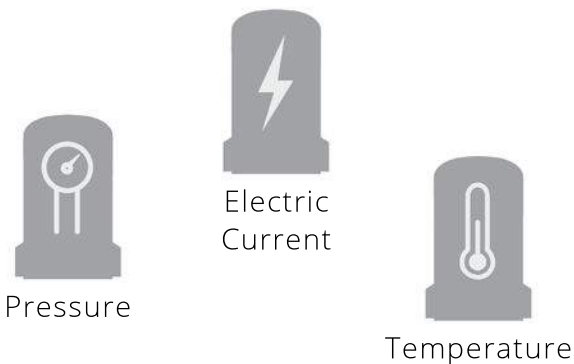
## Integration with OSIsoft Pi

Petasense vibration data can be easily integrated with OSIsoft's Pi server for multi parameter analysis. Data can be sent via Pi UFL or Pi Cloud Connect. As a partner of OSIsoft, Petasense can provide custom integration if needed.




## Future of Industrial IOT

While vibration and temperature are major indicators of machine health, Petasense is also developing other wireless, learning sensors that will help increase plant reliability, improve asset performance and streamline operations.



\* The Cellular Gateway is an industrial grade WiFi access point supplied by a renowned 3rd party company. Existing plant WiFi can be used as an alternative.





# Petasense Specification Sheet

Learning Sensors for Predictive Maintenance

## Smart Features

- Triaxial accelerometer and temperature sensor
- WiFi and Bluetooth Smart enabled
- Standard-size lithium battery (1500 mAh 3V)

## Rugged Enclosure

- FDA-approved plastic
- UL94 V2 (V0 upon request)
- Corrosion resistant stainless steel base (SS316)
- Ingress protection (IP67/IPX9K)

### Model 1

Accelerometer	Tri-axial MEMS sensor
Frequency Response	10 to 1600 Hz (+/- 3 dB)
Measurement Range	+/- 0.004g to +/- 8g
Transverse Sensitivity	<10%
AD Conversion	14 Bit
Sensitivity	0.244 mg/LSB
Sampling Rate	6 options from 20Hz to 6666Hz

### Model 2

Accelerometer	Tri-axial Piezoelectric sensor
Frequency Response	10 to 5500 Hz (+/- 3 dB)
Measurement Range	+/- 0.004g to +/- 5.17g
Transverse Sensitivity	<10%
AD Conversion	12 Bit
Frequency Resolution	8192 lines
Sensitivity	200 mV/g
Sampling Rate	Up to 20 kHz

The following features are common to both models

### Physical

Dimensions	Base diameter: 37.5 mm Height: 56.8 mm
Weight	125 g
Mounting (either adhesive or stud)	<i>Adhesive:</i> food-contact safe cyanoacrylate or industrial grade two-part epoxy <i>Stud:</i> 6.35 mm (1/4") 28 UNF tapped hole
Shock Resistance	2 meter fall, 16 g continuous vibration, UV resistant (optional)

### Environmental

Temperature Sensor Measurement Range	-40°C to 85°C (-40°F to 185°F) (+/- 5% accuracy)
Operating Temperature Range	-40°C to 60°C (-40°F to 140°F)
Storage Temperature	< 95°C (< 203°F) without battery

### Power Supply

Source	CR123A Lithium 1500 mAh 3V battery
Battery Life	1-2 years with 4-6 measurements a day, event detection, Bluetooth enabled, 0-40°C

### Network Connectivity

Wireless Protocol	802.11 b/g/n WiFi 2.4 GHz Bluetooth Low Energy 2.4 GHz
Antenna	Integrated antenna with 2.5dBi max gain
Processor	32-bit 144 MHz ARM Cortex M4F processor Remote firmware updates

### Configuration & Standards

User Interface	<i>Petasense Cloud:</i> internet browser access <i>Petasense Mobile:</i> iOS mobile application (no software installation needed)
Security	Petasense Motes and Cloud communicate using TLS protocol with AES encryption
Qualifications	Class 1 Div 2*, FCC*, IC*, UL* NEMA 250*, RoHS Compliant

\* Pre-assessment completed, results available by end of Q3 2016