MOVE SOLUTIONS

DATASHEET OF TRIAXIAL SHM ACCELEROMETER

SYSTEM FOR MONITORING

Move Solutions for monitoring the stability of a structure recommends **DECK** sensors, devices capable of capturing the amplitude of dynamic oscillation. Thanks to the use of this sensor it is possible to continuously monitor the modal parameters of the structure and verify its stability over time. It is also possible to understand the amplitude of the dynamic deformation, or even any seismic vibrations and monitor the risk.
The Move monitoring system also includes **Accelerometers** for modal study, **Tiltmeters** for static monitoring and **Strain gauges** for monitoring cracks and openings. Using the **Communication Node** with multiple inputs (analog or digital) it is possible to monitor the water pressure and many other parameters of the surrounding areas.

FEATURES	MEASUREMENTS
• High precision	• Dynamic displacement amplitude monitoring
• Data analysis with advanced algorithms	• Modal analysis of the structure
• No wiring	• Vibrational study of the structure
• Long-range communication	• Static monitoring of the inclination of the structure
• Modular system	• Analysis of the amplitude of the dynamic deformation
• High autonomy	• Monitoring of cracks and openings
• Complete management and customization	• Real-time water pressure monitoring
• Minimum maintenance required	• Highlighting of seismic vibrations
• Strong design	

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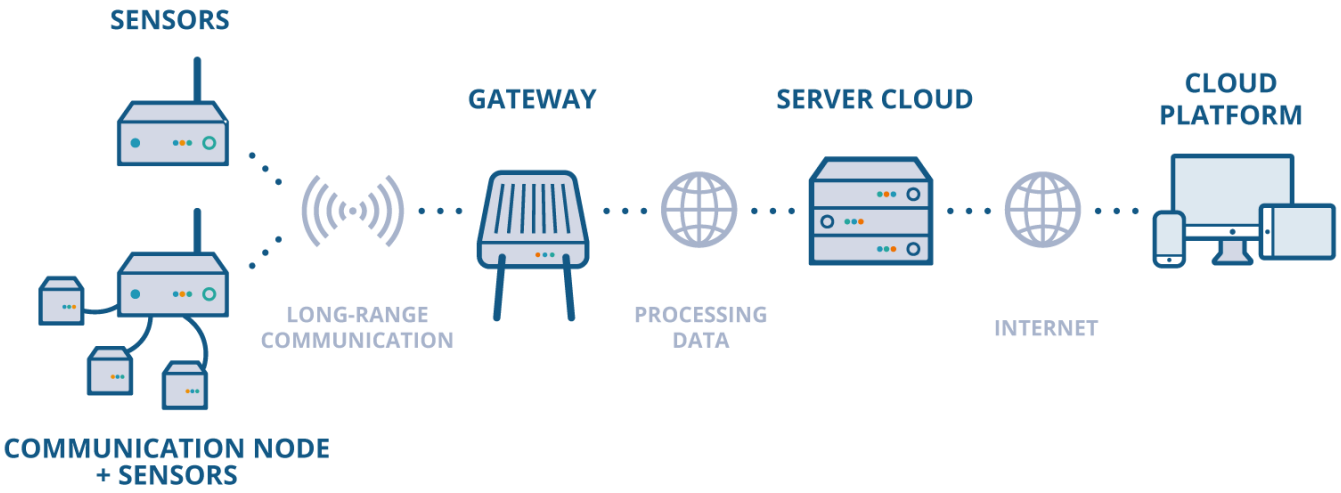
HOW IT WORKS

Move Solutions includes a complete package of wireless devices and a **Web Platform** for data visualization and sensor management. Once the sensors and system gateways are properly installed on site, they are ready to receive, store and send data.
You can view all this data in real time through a Web interface that allows users to remotely monitor the site or infrastructure. The user can set different parameters for each individual sensor, including sampling rates, resolution, alarm thresholds, activation and much more. The Move Solutions monitoring system guarantees accuracy, safety and reliability and a significant reduction in overall monitoring costs.

LOGISTICAL-ECONOMIC ADVANTAGES

- Remote monitoring of difficult to access structures
- Ease of installation and use of the system
- Data processing to optimize operations
- Easy addition of sensors to extend the monitored area
- Cost reduction through easy maintenance
- No wiring, saving on installation materials
- Consequent labor savings
- Risk reduction and high reliability



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TRIAXIAL SHM ACCELEROMETER

The triaxial Accelerometer is able to measure the acceleration of the point where it is installed, which is essential for measuring the vibration frequencies and for carrying out a modal study of the structure.
With the use of Accelerometer devices it is possible to highlight any seismic vibrations and monitor its risk. All sensors also record temperature, are battery powered and use the LoRaWAN wireless communication protocol.

ACCELEROMETER OUTPUT

The accelerometer acquires accelerometric data on three axes at a sampling rate of 80Hz. The measured acceleration values are expressed in mg.
The accelerometer acquires a 10 second window where acceleration above the threshold is detected. Alternatively, it is possible to take advantage of the planned acquisition mode which, thanks to the synchronization between sensors, allows extrapolation of forms and modal frequencies of the structure. In addition, the sensors acquire temperature at each event.
The acquisition methods, the activation thresholds and the full scale can be configured remotely via the Web Platform provided in the service.

DOWNLOAD DOCUMENTATION

Visit the website at www.movesolutions.it to download further documentation relating to technical specifications and/or information on the Move Solutions™ structural monitoring system.

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QUICK GUIDE TO USE

The triaxial Accelerometer device is “plug and play”; by screwing the special antenna on the cover, the device will immediately start to detect and try to send data to the Gateway device. To ensure correct operation the Accelerometer sensor must be correctly oriented and installed, following these specific steps:

1. **ORIENTATION:**
- The three axes shown on the orientation label, placed on the sensor cover, must be aligned as the axes of interest of the structure.
- The Accelerometer device can be rotated freely on the structure.

2. **INSTALLATION ON THE STRUCTURE:**
- Agree with the supplier company on the correct place of installation on the structure of the Accelerometer device.
- Firmly install the Accelerometer on the wall, ceiling or floor using the special plate and screws/wall plugs supplied. It is possible to rotate the plate relative to the device.
- To install multiple Accelerometers on the same structure, use the same orientation convention, i.e. with the axes shown on the label of each specific device oriented in the same way.
- Install all sensors on the structure before powering and turning on the Gateway device.

3. **SCREWING THE ANTENNA:**
- Before activating the Gateway, screw the LoRaWAN 868 Mhz antenna onto the device cover.

After meeting these orientation and installation requirements, the Accelerometer device will be able to detect and send data to the Gateway without interference or data alteration.
Verify, via the Web Platform, the correct functioning of the sensor just installed. From the moment the Gateway is powered up, and therefore from the actual start-up and activation moment, a maximum waiting of about an hour is required before it is possible to correctly view all the sensors online.

ACCELEROMETER SHM

The accelerometer measures the acceleration and temperature of the exact point where it is installed in relation to the structure. It is possible to measure the vibration frequencies and carry out a modal study of the structure. All accelerometers can be perfectly synchronized with each other. Battery power supply and LoRaWAN wireless transmission. The acquisition modes can be set by the user via the web interface provided in the service.

TECHNICAL SPECIFICATIONS

OPERATION

Threshold Triggered	Acquisition of 1024 triaxial acceleration samples subsequent to exceeding the activation threshold set by the user. Acquisition of the temperature in correspondence of each event.
Time Triggered (Modal Analysis)	Acquisition of 8192 triaxial acceleration samples with a fixed rate set by the user (every 1, 2, 6, 12, 24 hours), synchronized between all sensors. Acquisition of the temperature at each event.
Custom Operation Software	It is possible to request custom features that the client deems necessary for their business.
Sample Rate	40Hz - 80Hz - 160Hz - 320Hz - 640Hz All derived from a 4 kHz sampling by means of downsampling
Absolute synchronization	± 1 seconds
Relative Synchronization (Modal Analysis)	500 µs

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SAMPLE RATE	BANDWIDTH (-3 dB)	THRESHOLD ACQUISITION DURATION	PLANNED ACQUISITION DURATION
40Hz	13.5Hz	25.6s	204.8s
80Hz	27Hz	12.8s	102.4s
160Hz	54Hz	6.4s	51.2s
320Hz	108Hz	3.2s	25.6s
640Hz	216Hz	1.6s	12.8s

MEASUREMENT	
Technology	MEMS technology - Triaxial
Acquisition of	• Acceleration • Temperature
Resolution	15bit (31.25µg, 62.5µg, 125µg)
Range	± 0.512g, ± 1.024mg, ± 2.048g
Noise Density	22.5 µg/√Hz
RADIO	
Radio channel	LoRaWAN communication protocol
Radio channel frequency	ISM 868Mhz
Link coverage	1km (line of sight with the Gateway)*
GENERAL DATA	
Waterproof Rating	IP67
Battery	1 lithium battery type “D” 19Ah 3.6V
Operating temperatures	-40°C/+85°C
Dimensions	75 x 80 x 57 mm
Weight	1.1 Kg
Case material	Alloy GD-AlSi12
Corrosion resistance	>1000 hours in salt spray

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INSTALLATION	
Method	Two-point mounting using screws and plugs (Ø6mm, L:30mm)
Site	• Fixing on wall • Fixing on ceiling • Fixing on ground

BATTERY LIFE

Acquisition Mode	Radio Connection Quality	Battery Estimation[4]
Time Triggered (1 hour)	Good	1.3 years
Time Triggered (2 hours)	Good	2 years
Time Triggered (6 hours)	Good	4.5 years
Time Triggered (1 hour)	Bad	1 year
Time Triggered (2 hours)	Bad	1.8 years
Time Triggered (6 hours)	Bad	4 years
Threshold Triggered (5 events/hour)	Good	1.4 years
Threshold Triggered (5 events/hour)	Bad	1 year

** Wireless coverage of the device may vary depending on the scenario*
** Battery life may shorten when operating in extreme temperatures.*

Note: Specifications are subject to review and change without notice.

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