MOVE SOLUTIONS

DATASHEET OF
DECK DISPLACEMENT SENSOR

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.

All of our sensors use LoRaWAN: a long-range, low-power wireless communication technology used by IoT networks around the world.

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	
• Complete management and customization	• Monitoring of cracks and openings
• Minimum maintenance required	• Real-time water pressure monitoring
• Strong design	• Highlighting of seismic vibrations

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

HOW IT WORKS

Move Solutions includes a complete package of wireless devices and a **Web Platform** for data visualization and sensor management.
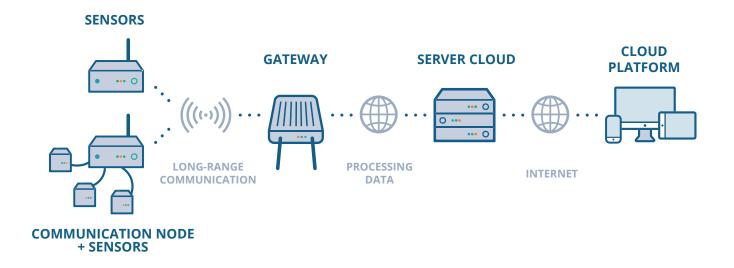
Once the sensors and system gateways are properly installed on site, they are ready to receive, store and send data.

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

SENSORS

GATEWAY

SERVER CLOUD

CLOUD PLATFORM

LONG-RANGE COMMUNICATION

PROCESSING DATA

INTERNET

COMMUNICATION NODE + SENSORS

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MOVE SOLUTIONS

DECK DISPLACEMENT SENSOR

DECK DEVICE

The DECK device is the only patented wireless sensor on the market capable of measuring the uniaxial oscillations of the structure providing displacement values with an accuracy equal to that of the interferometric radar (0.01 mm). The DECK device samples at 100 Hz, constantly and remotely. It is also capable of detecting temperature and vibration frequency. DECK is battery powered and uses the LoRaWAN wireless communication protocol.

OUTPUT DECK

DECK acquires data from 10 seconds before to 20 seconds after (tot. 30 seconds) each stress of the structure when the activation threshold - previously set on the Web Platform - is exceeded.
The displacement values measured are expressed in mm. It also acquires temperature data.

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 DECK sensor is "plug and play"; by screwing the special antenna on its cover, the device will immediately start trying to communicate with the Gateway. To ensure that the device is working properly the DECK device must be oriented and installed correctly, following these specific steps:

1. **ORIENTATION:**
   - The symbol shown in the center of the label indicates which is the axis of the structure (X; Y; Z) with respect to which the DECK device collects measurements. This symbol also shows the orientation and direction of that axis. Therefore:
      - The axis of the structure of interest to the measurement must be aligned and oriented according to the representation of the symbol.
      - The letter identifies DECK's specific measurement axis.
      Z axis = Gravitational axis.
      X - Y axes = Longitudinal or transverse axis of the structure.

2. **INSTALLATION ON THE STRUCTURE:**
   - The installation location may vary depending on the orientation label on the device. Agree with the supplier company on the correct place of installation of the DECK device on the structure.
   - Securely install the DECK device on the wall, ceiling or floor using the special plate and screws/wall plugs supplied.
   - 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 DECK device cover.

After meeting these orientation and installation requirements, the DECK device will be able to detect and forward data to the Gateway without interference or data alteration. Verify, via the Web Platform, if the sensor just installed is working properly. 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.

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Deck is the only sensor on the market for measuring the dynamic oscillation amplitude with an accuracy of 0.01 mm. It also detects the temperature and vibration frequency of any structure.

Perfect for continuous remote monitoring of dams, bridges, viaducts and buildings and for dynamic load tests. Wireless device with battery power and LoRaWAN transmission.

TECHNICAL SPECIFICATIONS

OPERATION	
Operation with programmed acquisitions	Record of an event for each oscillation that exceeds the activation threshold set by the user. For each event: acquisition of displacement for 30 seconds (10 seconds before and 20 seconds after exceeding the threshold). Acquisition of the temperature at each event.
Custom Operation Software	It is possible to request custom features that the customer deems necessary for their business.
Sampling Frequancy	50 Hz

MEASURAMENT	
Acquisition of	- Displacement - Temperature
Displacement Resolution	0.012mm, 0.024mm
Shift Accuracy	±0,01 mm
Measurament of Axis	of the Parallel axis to the gravity axis (Z) or perpendicular (X or Y)
Range	± 1.5 mm, ± 3mm
Displacement Bandwidth (-3DB)	0.70 - 15 Hz
Temperature accuracy	0,5°C

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Temperature Resolution	0,125°C

RADIO	
Central Processing Unit	ARM Cortex M0 32 Bit
Radio channel frequency	868 MHz (EU) - 125 KHz BW (LoRaWAN)
Transmission Power	14 dBm
Link coverage	1km (line of sight with the Gateway)*

GENERAL DATA	
Waterproof Rating	IP67
Reliability	Internal Watchdog (Inside the Microcontroller) External Watchdog (External to the Microcontroller)
Battery	4 lithium battery type "D" 19Ah 3.6V
Operating temperatures	-40°C / +85°C
Dimensions case	140 x 170 x 65 mm
Dimensions case + plate	200 x 200 x 80 mm
Weight	2.4 Kg

INSTALLATION	
Method	Four-point mounting using screws and plugs (Ø10mm, L:30mm)
Site	Fixing on wall, on ceiling or ground

BATTERY AUTONOMY	
Sample rate	Estimated autonomy
5 samplings / hour	2 years*

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

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