Re.T.I.M.
Real Time Inclination Measurement

Automatic monitoring and alert system, via IoT network, of the deformation state of installations on road and rail networks.

AISICO
for a safer life

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The effects of cyclical loads on the installations along the transport networks can cause a reduction in the expected performances due to a **decrease of their stability over time.** This may be caused by the action of **wind, traffic loads and normal oscillations of bridge decks.**

In particular, for high barriers - noise barriers, integrated noise/safety barriers and windbreaks - installed and/or anchored on works of art, **the loss of stability may represent a danger to traffic circulation and users.**

THE Re.T.I.M. MONITORING SYSTEM

AISICO has developed a continuous and automatic remote monitoring system, called **Re.T.I.M. - Real Time Inclination Measurement**, based on a patented methodology that, via IoT network, measures the deformations of structural elements such as **noise barriers, integrated barriers, lighting poles, windbreaks, vertical signals, portals, etc.**

The **Re.T.I.M.** System consists of a small inclinometer apparatus, self-powered and autonomous, fixed to the monitored structural element. A *gateway - WiFi Sensor Hub -* transmits, in real time, to a **centralized control system**, the values of displacements at regular intervals. The measured displacements, correlated with weather and traffic data, are recorded, archived and processed.

By means of algorithms, the measured deformations can be compared to the previously determined safety levels in order to verify the admissibility of the deformation or the insurgence of a warning or danger condition.

The deformation levels and the ranges of safety values for each structural element are assessed considering the mechanical and geometric features of the structure and by experimental tests, static calculations and numerical simulations.

MONITORING RESULTS AND DATA MANAGEMENT

The evaluation levels of the structure safety conditions may be organized into three different levels.

Admissible
NO ALARM: this level includes the percentage variation of the inclination, compared to the reference value, measured in a short time interval and with a low frequency.

In this condition, no specific extraordinary intervention is required, while normal routine maintenance operations remain active.

Attention
ATTENTION ALARM: the percentage variation of the inclination falls within Level 2 when, with respect to the reference value, it is greater than Level 1, both in terms of measured values, interval and frequency. Under these conditions, a timely control intervention and the activation of a specific extraordinary maintenance are necessary.

Danger
DANGER ALARM: the percentage variation of the inclination, with respect to the reference values, exceeds the threshold of the maximum permitted value - regardless of the measured interval and the frequency - falls within Level 3.

In this case, an immediate maintenance intervention is necessary to prevent and eliminate any potential dangerous situations for road users, and the alert may even lead to traffic limitations and/or blocks.
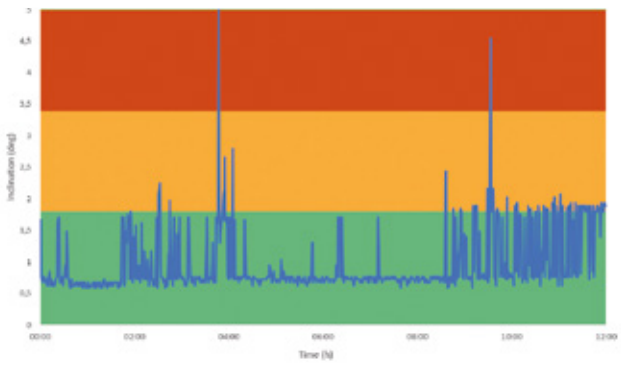
A dedicated web platform in cloud provides a solution to collect and analyse the information received from any individual inclinometer and sends an alarm signal or provides a simple and real-time data control.

The interface makes it possible to display each homogeneous monitored road section: it is possible to identify the exact number and position of each individual IoT sensor, identified by a progressive number and GPS coordinates, in order to speed up any urgent intervention for Attention or Danger alarms.

Web Interface: example of identification and detail of the different installations for each individual sensor

ADVANTAGES OF THE Re.T.I.M. SYSTEM

Real-time remote assessment and control

of the effects of cyclic dynamic loads on parts of the installations, along road and rail networks, and in particular:

• Loosening of the tightening torque of the anchor bolts connecting the barrier to the curb;
• Loss of consistency of the resin and removal of the backing pad from the resin cylinder;
• Loss of consistency of the resin and slipping off from the curb concrete;
• Micro-slits or detachment of the welds on the base plates or the reinforcements of the struts;
• Breakage of the concrete curb at the strut.

Ease of installation

• A single sensor for each homogeneous section with no need to dismantle the monitored structure;
• No interference with the structure operations;
• No modification on the product or on the CE mark.

Absence of maintenance and control costs

The Re.T.I.M. System does not require any maintenance; it is equipped with a self-diagnosis apparatus which highlights any usage anomaly.

Eco-sustainable system

Low energy consumption and a self-powered device through energy harvesting (solar panel).

Fast and accurate information

Data are collected from individual sensors in real-time, at regular intervals, and recorded within the cloud platform. A graph shows the values from the inclination and its evolution over time, allowing real-time and continuous knowledge of the conditions at the basis of structural elements. It provides warning or danger signals if any predefined threshold value is exceeded.

Easy-to-use web interface

All data collected by the individual sensors can be accessed in real-time, recorded and compared through a *web service* platform, also available on smartphones.

Customisable alert system

If the maximum allowed shifts are exceeded, the system automatically sends real-time alerts. The values of the ranges and therefore the alerts may be defined and fixed, according to the customer's needs, via the web interface.

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**SAFER ON THE ROAD,
SAFER IN LIFE.**

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