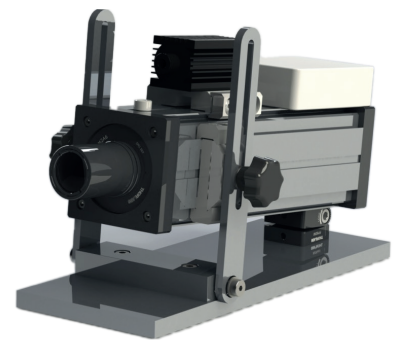
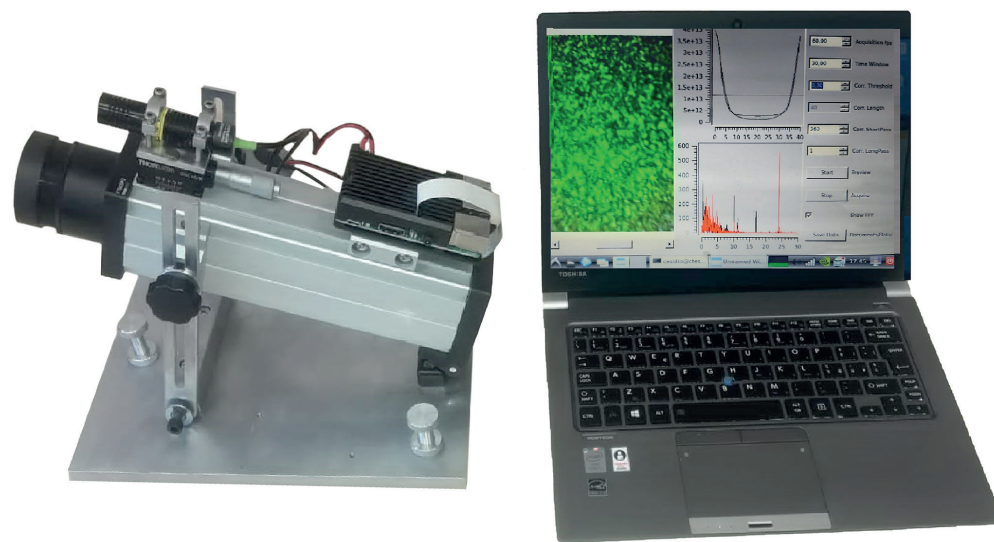




TIS - Infrasonic Speckle-tracking Telesensor for the monitoring of structures



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WHAT IS THE TIS

The TIS - Infersonic Speckle-tracking Telesensor - is an innovative laser measuring system that characterizes the behavior of structures under dynamic loads.

It is extremely sensitive and can intercept vibrations induced by micro seismicity, wind as well as traffic and other human activities.

It is particularly suitable for rapidly deployed measurement and monitoring of infrastructure (bridges, buildings, machinery) and small landslides. It can be used for dangerous or not directly accessible places.

Unlike other sensors, it can be placed at up to 150 meters from the surface being monitored and it does not need to be positioned perpendicularly. Measurement can be taken also in darkness or in the presence of moisture.

OPERATING PRINCIPLE

Differently from other optical vibration sensors, which work with the detection of reflected light, the TIS is based on the acquisition and analysis of digital images of scattered light.

When a laser illuminates a rough surface, the scattering of light brings about a random diffraction image - the speckle pattern - which is extremely sensitive to the microscopic detail of the reflecting surface.

Each vibration induced by dynamic loads moves the structure, changes its inclination and, consequently, the pattern.

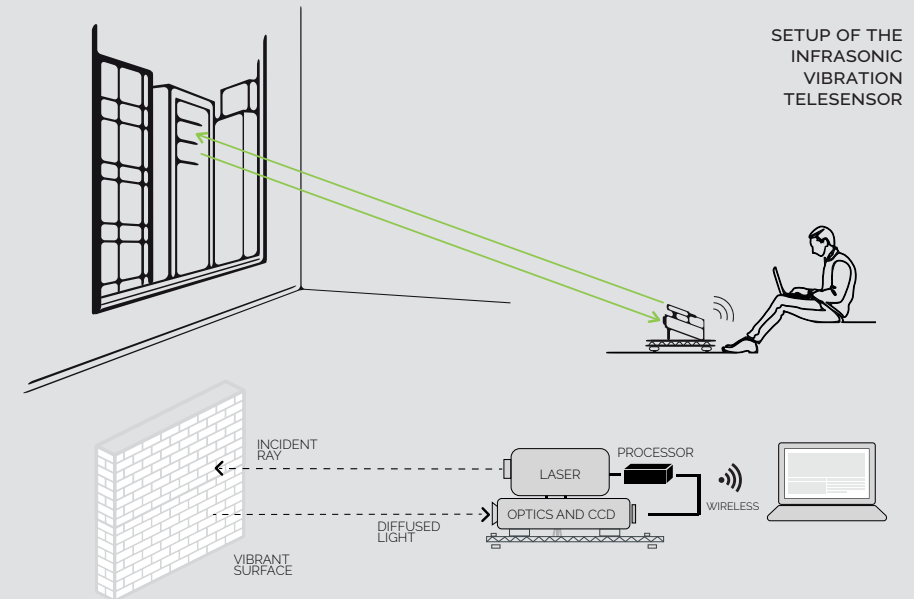
By analyzing the correlation between the various images acquired over time, the TIS measures the changes in the pattern in terms of the amplitude, frequency and spectral content of the vibration.

TECHNICAL FEATURES

The TIS is a compact and lightweight instrument.

Internally, the TIS comprises an optical transceiver device, an inertial accelerometer that removes the effect of ground vibrations, and hardware and software components that acquire and process the data for vibration analysis

Data transfer to and from the TIS can be done wirelessly or via Ethernet.



SETUP OF THE
INFRASONIC
VIBRATION
TELESENSOR

Weight	7 kg
Size L x W x H	300 mm x 100 mm x 100 mm
Bandwidth¹	0 - 100 Hz
2D Angular Velocity²	from 0.1μrad/s to 10mrad/s
2D Angular Displacement	from 0.015μm to 1.5mrad
2D Deduced Linear Velocity³	from 0.1μm/s to 10mm/s
2D Deduced Linear Displacement³	from 0.01μm to 1.5mm
Resolution	Velocity < 0.05 μrad/s/√Hz Relative Displacement < 0.08μm
Accepted angles of incidence towards normal surface area	±45 degrees at 50m
Laser Spatial resolution	up to 150 m
Operatività	on all rough surfaces, either corroded or dirty, such as masonry, cement, wood, metals

¹ Up to 300 Hz "relaxing" the sensitivity values (ongoing development)

² Around the horizontal-vertical axis for angle quantities and in the two orthogonal directions for linear quantities

³ At 1 Hz



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through research"



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