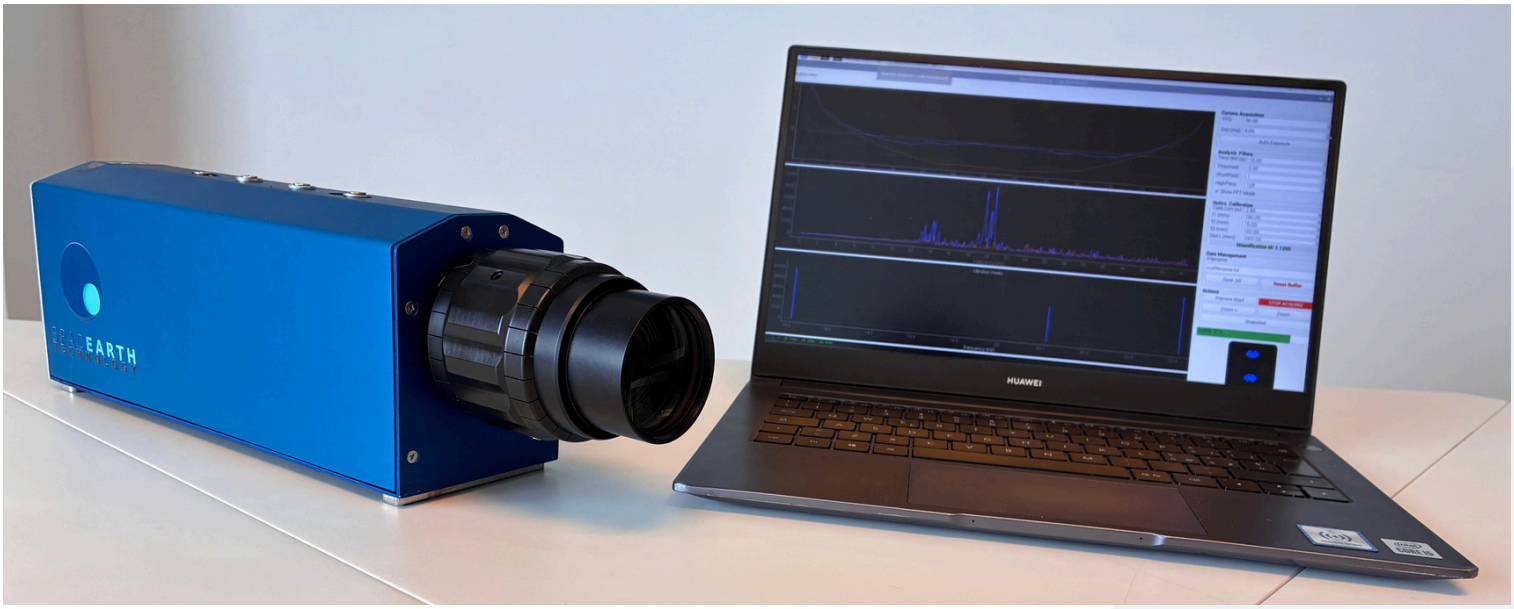
INFRASONIC SPECKLE-TRACKING SENSOR



WHAT IS

The VIS - *Speckle tracking Infrasonic Vibrometer* - is an instrument for remote measurement of vibrations that characterize the behaviour of structures subjected to dynamic loads. With a laser emission around 5 mW the device is able to detect target vibrations induced by micro-seismicity, wind, traffic and other human activities.

Unlike other “in situ” sensors, it can be positioned up to 100 meters from the surface to be monitored and does not need to be positioned perpendicular to the target surface, ensuring accurate measurements even in areas that are difficult to access.

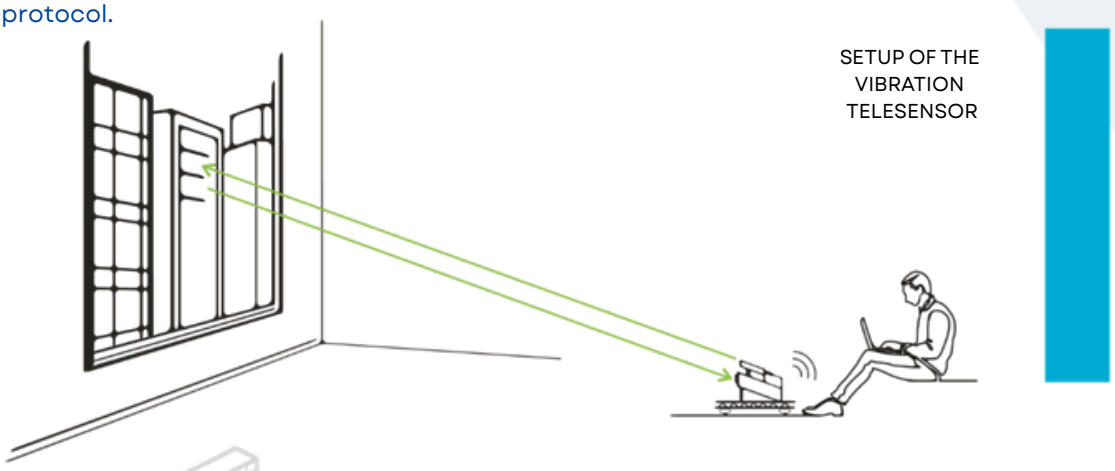
OPERATING PRINCIPLES

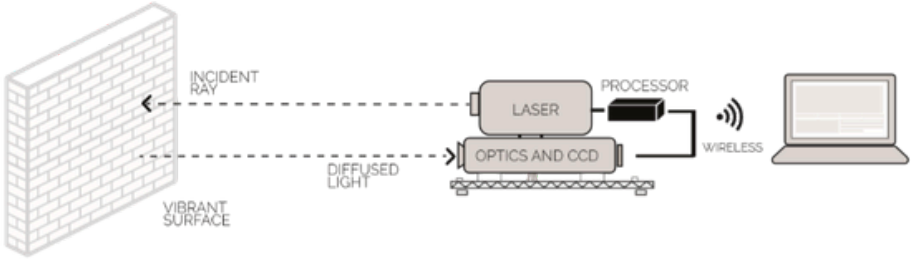
The main feature that distinguishes VIS from other optical vibration sensors is that it is based on the reception of light scattered from the target surface. When coherent laser light illuminates a rough surface, a random diffraction image is produced, known as a speckle pattern, which is extremely sensitive to microscopic details on the reflecting surface. Vibrations in the structure change the inclination of the illuminated surface and, consequently, the speckle pattern. The received scattered light beam is adjusted and projected onto optical sensors in order to detect the target spatial shifts, obtaining a description of the frequency vibrational regime.

TECHNICAL SPECIFICATIONS

The VIS is a compact, lightweight instrument comprising a laser, an optical system consisting of a distance-adjustable lens and lenses capable of modifying the received light beam, and two optical sensors connected to a minicomputer for acquiring and processing data for vibration analysis. Data transfer to and from the VIS can be done wirelessly through VNC protocol.

SETUP OF THE VIBRATION TELESENSOR





INFRASONIC SPECKLE-TRACKING SENSOR

The VIS instrument operates within the visible spectrum, centered on the green wavelength (532 nm). This configuration is specifically engineered to optimize spatial resolution: the shorter wavelength facilitates higher speckle contrast modulation, significantly increasing the sensor's sensitivity to surface micro-displacements.

Measuring translations enable the direct evaluation of the target absolute movement, which is fundamental to quantify deflections and oscillations under dynamic loads. Translational motion detection also provides an immediate interpretation of the in-plane and out-of-plane measurements of structural vibrational response.

The device is supported by software that allows targeting and real-time display of the acquired data, with the option to save and transfer it to another device at a later time.

Characteristics	Values
Size L x W x H	350 mm x 110 mm x 90 mm
Bandwidth	0 - 40 Hz
Operating distance	up to 100 m
Operability	on all rough surfaces (masonry, cement, wood, metals) also during sunlight
Spatial Resolution	0.24 µm
Accepted angles of incidence towards normal surface area	±45 degrees at 50m
Velocity Sensitivity	1.5 µm/s
Laser	5mW (class 3R) | 10mW (class 3B)

BACKED BY INNOVATION SINCE 2020

SpacEarth Technology is supported by **four patents**, reflecting a solid track record of innovation and excellence that started in 2020:

- *March 2020 - Vibration remote sensor based on speckles tracking, which uses an optical-inertial accelerometer and method for correcting the vibrational noise of such a sensor*
- *August 2023 - Speckle tracking vibration sensor with dual optical receiver and method of correcting the vibrational noise of such a telesensor*
- *August 2025 - Speckle tracking vibrometer*
- *August 2025 - Speckle tracking vibrometer with low light emission power 2025*

Watch VIS video

SPACEARTH TECHNOLOGY

www.spacearth.net