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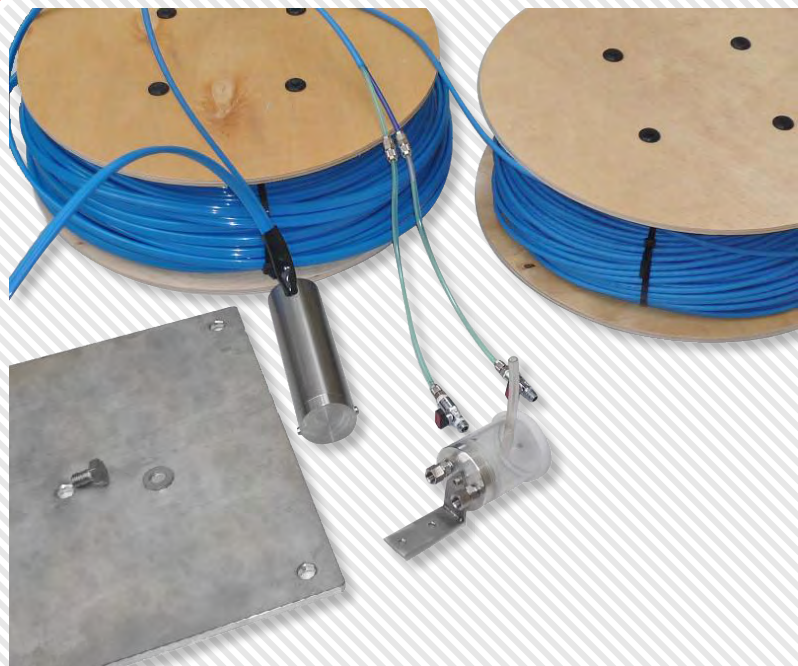


Vibrating wire Settlement Cells

www.pizzi-instruments.it
Instruments and Systems for Geotechnical and Structural Monitoring

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Vibrating wire Settlement Cells



Description

Vibrating wire settlement cells are used for measuring the relative settlement between two distant points, one of which is sited in a place which is difficult to access, or inaccessible.

The instrument is composed of:

- **Vibrating wire settlement cells, piezometric type**
- **Reservoir**
- **Pre-filled pipeline with deaerated liquid**
- **Electrical cable for signal transport**
- **Dehumidification cabinet**

The reference tank is positioned in a stable area, possibly not subject to the settlement being measured and optically reachable by topographic measurement; the tank

is connected, by means of two tubes filled with appropriate deaerated liquid, to the vibrating wire settlement cell, placed at the point where the measurement is being made. Settlement is calculated by converting pressure difference to difference in level, measured with regard to the fixed reference tank.

The cell has an internal sensor for measuring local temperature in order to compensate settlement measurements.

The cell compensates variations in atmospheric pressure by means of an electric cable containing a compensation tube.

Applications

- Road and rail embankments
- Earthfill dams
- Concrete or bituminous facing
- Foundations
- Landfills
- Earthworks
- Rock movement
- Other

Features and benefits

The vibrating wire settlement cells is a robust instrument with good precision. Accuracy depends on the full-scale range of the sensor, its resolution and repeatability. Sensor precision, which is proportional to the full-scale range of the instrument, is the least influential of the above three characteristics on the overall accuracy of measurement of settlement and clearly with such instruments the variation of level between the two extreme points (reference and sensor) over time should be measured, and not just the total difference of level between the two extreme points.

The instrument has:

- **Good resolution**
- **Excellent repeatability, precision**
- **Ruggedness**
- **Absence of drift over time**
- **Atmospheric pressure compensation**

Technical assistance

If you have any requests or questions about our instruments or if you have special needs that require different solutions from the standard, please contact us. Our team will provide all the necessary information and will be very happy to work with you to study, develop and customize instruments and solutions suitable for your specific needs.

Measuring principle

The vibrating wire settlement cell is connected, by means of a pair of tubes, to a liquid tank of known specific weight. Due to the difference in level between the tank and the cell, a column of water forms the connecting tubes and acts on the instrument membrane, applying a hydrostatic load proportional to the difference in level between the membrane and the free surface of the liquid in the tank.

On variation of the difference in height/level/distance, the hydrostatic load varies proportionally and the instrument assesses it as a normal change in pressure; measurement is made with the portable units or automatic acquisition units used for any other vibrating wire sensor.

Composite systems are available: they allow the use of several measuring cells powered by the same hydraulic system.

The water level in the reference tank, maintained at a constant level, is easily measured with topographic measurements.

By placing various sensors in an embankment (or points to be monitored) and connecting them hydraulically to a reference system placed externally to the structure (roughly at the same height or at a higher level, compatible with the total field of the instrument), it is easy to automatically detect their settlement i.e. settlement of the ground at points where the cells are applied.

The choice of the full range of the sensor is essential and depends only on differences in quote between the sensor and the reference tank.

This choice has an influence on measurement quality because it is decisive for sensitivity and hence resolution; the greater the full-scale range, the worst the resolution (that is the interval between two values of level neither perceptible nor measurable).

To optimize results obtained using automatic settlement cells, the difference in height between the sensor and the tank needs to be minimized.

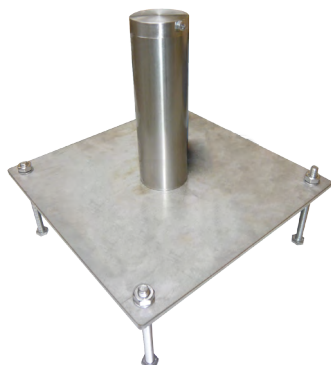
Components of the system are:

Reference tank

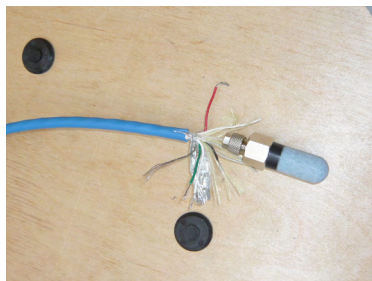


Pair of tubes in Rilsan in a PVC casing and connecting cable (2x2x0,35mm²) with PUR coated sheath and Kevlar reinforcement, incorporating a Rilsan tube for barometric compensation.

Vibrating wire settlement cells



Filter for atmospheric compensation tube



Manifold for the application of multiple cells



Technical specifications

Sensor

Type	Vibrating Wire Piezometer
Range of the sensor (H2O)	10m-20m-30m-50m-100m
Precision of the sensor	$<\pm 0,1\%$ F.S.
Resolution of the sensor	0,02% F.S.
Linearity of the sensor	$<\pm 0,2\%$ F.S.
Electric Unit Range of the sensor (Hz)	550 – 1200
Temperature Drift	0,025 % F.S. for °C
Repeatability and accuracy in the measurement	$\pm 0,02\%$ F.S. \div $\pm 0,1\%$ F.S.
Total accuracy of the system	Depending on the installation environmental conditions and on the instrumental range
Material: body of the cell, reference tank, tube	Stainless steel – PVC
Dimensions of the plate	460 x 460 mm

Accessories and related products

Junction Box with filter	Available under different models for the connection of different instruments
Measurement and selection box with filter	Measurement Box with MUX boards for the automatic selection
Measurement box with filter	Measurement Box
Multicore cable	Available with different conductors for the connection of different sensors to one cable
DEC5	Portable Readout Unit
DEC3000	Portable Datalogger
CUM3000	Multichannel Datalogger
MUX	Multiplexer for the connection of different sensors to datalogger

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The product information may be subject to variations at any time.

Please carefully check the release and contact Pizzi Instruments for further details.

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