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VW Strain Gauge – Embedment



Introduction

Strain gauges offer the ability to measure the effect of loads, settlement or other changes in a structure. They record strain, which is a dimensionless measure of deformation. Stress is related to strain by a material's properties and is predictable within a certain range of applied strain.

Strain gauges are useful for determining the effects of applied loads to a structure, such as the loading of post tension cables or removal of temporary supports. Piles of driven, cast or pre cast construction can also benefit from strain measurement as with sufficient strain gauges information such as the depth at which the load is transferred to the soil and the percentage of the load born as end bearing can be determined.

Geosense® VWS-2100 series vibrating wire embedment strain gauges are designed for direct embedment in concrete.

Working principle

The strain gauge operates on the principle that a tensioned wire, when plucked, vibrates at its resonant frequency. The square of this frequency is proportional to the strain in the wire. The gauge consists of two end blocks with a tensioned steel wire between them.

Around the wire is a magnetic coil which when pulsed by a vibrating readout or data logger interface plucks the wire and measures the resultant resonant frequency of vibration.

Deformation within the concrete will cause the two end blocks will move relative to each other. The tension in the wire between the blocks will change accordingly thus altering the resonant frequency of the wire.

Features

- Reliable long term performance
- Rugged, suitable for demanding environments
- High accuracy
- Insensitive to long cable lengths
- Totally waterproof
- Direct embedment in concrete
- Auto resonant units available

Applications

Measurement of stress and strain deformation in:

- Driven and bored piles
- Tunnels and deep excavations
- Mass concrete pours
- Pre-cast piles
- Concrete dams
- Retaining walls
- Dynamic measurements w. auto resonant version
- Building foundations

Specifications

VWS-2100 vibrating wire strain gauges may be read by the VW-2106 or any vibrating wire readout device and may be readily connected using any datalogger with vibrating wire interface modules.

Vibrating wire strain gauges output a frequency signal and are therefore insensitive to resistance changes in connecting cables caused by contact resistance or leakage to ground.



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Model number	VWS-2100	VWS-2120	VWS-2125
Gauge length	150mm	50mm	250mm
Overall length	156mm	54mm	260mm
Resolution	1 ε	1 ε	1 ε
Strain range	3000 ε	3000 ε	3000 ε
Accuracy ¹	±0.1% to ±0.5% FS	±0.1% to ±0.5% FS	±0.1% to ±0.5% FS
Non linearity	<0.5% FS	<0.5% FS	<0.5% FS
Temperature range	-20°C to +80°C	-20°C to +80°C	-20°C to +80°C
Frequency range	850-1550	1500-3500	1500-3500

Cable may be readily and simply extended on site without special precautions. Gauges may be read up to 1000 metres away from their installed location without change in calibration.

VWS-2100 strain gauges are fully waterproof all stainless steel construction with coils encapsulated with epoxy resin. The protective tube assembly is totally sealed to the embedment flanges by laser welding, eliminating any possibility of seal degradation. During the testing and stressing procedures welds are fully checked by tensile testing carried out in excess of the elastic limit of the protective tube assembly.

Strain gauge rosettes and zero strain containers are available for VWS-2100 gauge series. VWS-2125 can be used within mass concrete with coarse aggregates as heavy duty construction resists bending and the large end flanges provide a high contact area.

Readout Systems



Single Channel VW Readout

This unit allows a user to collect readings from a VW Sensor and Thermistor during installation or for short term jobs where an operator can check manually. With a switching box multiple VW system can be read one after the other.



Single Channel VW Datalogger

A low cost battery powered system for unattended monitoring of a single VW Sensor and thermistor.



Ten Channel VW Datalogger

Each channel records data from a VW sensors or thermistor.

Typically will record data for 5 VW sensors and integral thermistors.

Custom datalogger systems for any number of sensors in any configuration are also available and can be designed on request.

Please see our other data sheets for details of readout equipment, terminal boxes and data loggers specific to vibrating wire devices.

PCTE

PCTE have over 30 years' experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing the issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.

Other Equipment

GeoSense offer a complete range of structural health monitoring equipment, including VW strain gauges, extensometers, load cells and tilt meters.

The Olson Instrument range includes the NDE360, CTG, Freedom Data PC and DAS as well as the resonance tester. The full Proceq range of equipment is available for insitu non-destructive concrete measurement, including Schmidt Hammers, Covermeters, Half Potentials, Resistivity, Ultrasonics and Permeability.

We also supply Engius maturity, temp and humidity logging systems, corrosion rate monitoring equipment and GPR.