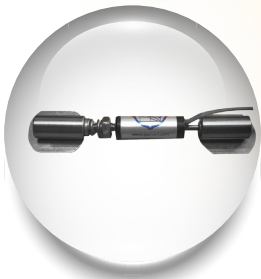


VIBRATING WIRE STRAIN GAUGE

# TECHNOLOGY

Expert Edition

$$f = \frac{1}{2L_w} \sqrt{\frac{F}{m}}$$



Spot Weldable  
Strain Gauge



Arc Weldable  
Strain Gauge



Concrete  
Embedment  
Strain Gauge

## Optimized measurement, Proven safety

Micro strains ( $\mu\epsilon$ ) are collected by the vibrating wire strain gauge which is tensioned steel wire in stainless steel tube works correlative deformation of steel and concrete structure.

The tension in the wire is plucked by electromagnetic coil and measured resonant frequency.

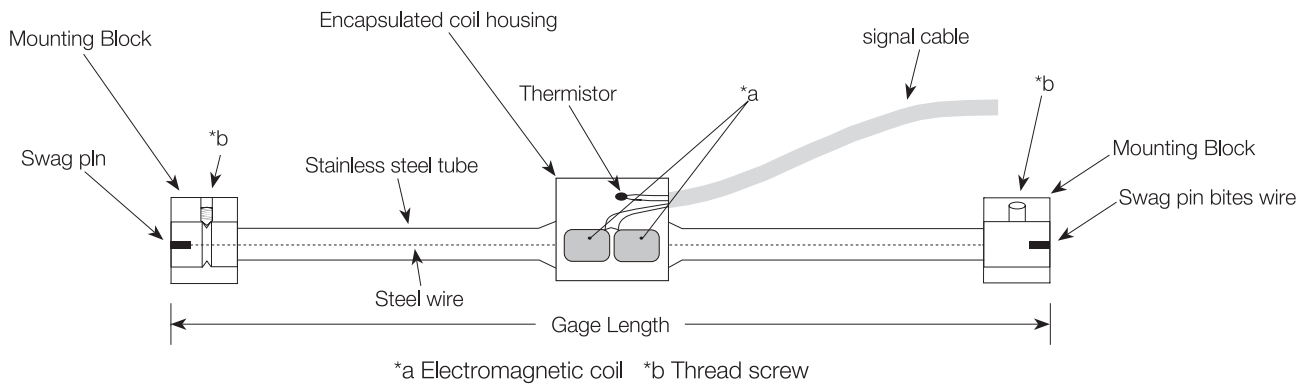
**DONG-A** GEOVAN

Tel. (051) 315 5067 [www.geovan.com](http://www.geovan.com)

# VIBRATING WIRE STRAIN GAUGE TECHNOLOGY



## Detail Sketch of Vibrating Wire Strain Gauge



## Sort of Applied Vibrating Wire Strain Gauges

Primary Sensor	Secondary Sensor	Transducer Name
Arc Weldable Strain Gauge	-	Strain Gauge for Steel
Embedment Strain Gauge	-	Strain Gauge for Concrete
Spot Weldable Strain Gauge	-	Sensitive Strain Gauge for Rebar, Steel Rod
-	3nos VW Inserts into Steel Cell Body	VW Load Cell
-	VW Insert & Diaphragm	VW Piezometer
-	VW Insert & Spring with Rod	VW Displacement Sensor
-	VW Piezometer & Liquid Filled Cell	VW Earth Pressure Cell
-	VW Insert into Rebar	VW Stressmeter
-	VW Piezometer & buoyancy weight	VW Water Level Sensor

## Approximate working frequency upon different vibrating wire lengths

Wire Length	Frequency Range [Hz]
1 inch (25.4mm)	2500 ~ 5000
2 inch (50.8mm)	1200 ~ 3000
3 inch (76.2mm)	825 ~ 2000
4 inch (101.6mm)	600 ~ 1600
6 inch (152.4mm)	450 ~ 1000
10 inch (254mm)	250 ~ 650



## Strain Gauge Specification

Classification	Arc Weldable Strain Gauge	Concrete Embedment Strain Gauge	Spot Weldable Strain Gauge
Model	GV-2405	GV-2410	GV-2411
Range	3500 +/-100 $\mu\epsilon$		
Resolution	1 $\mu\epsilon$		
Gauge length	150mm	150mm	50mm
Accuracy	less than +/-0.25%		
Nonlinearity	less than +/-0.25%		
Sensitivity	1 $\mu\epsilon$		
Built in Temperature sensor	NTC 3k ohm thermistor		
Temperature range	-20 ~ +80		
Thermal Coefficient of Expansion	12 $\mu\epsilon/$		
Accessory	Mounting Blocks, Clamp	Clamp	Protective cover

## Converts Frequency to Micro Strain ( $\mu\epsilon$ )

Sensor Name	Sweep Range(Hz)	Unit	Calculation Example (gauge factor)	Remark
All	450 ~ 6000	$\mu\text{sec}$	Period	A
Load Cell, Piezometer	1200 ~ 3500	digits	$\text{Hz}^2 \cdot 10^{-3}$	B
Arc Weldable Strain Gauge	450 ~ 1000	$\mu\epsilon$ micro strain	$\text{Hz}^2 \cdot 10^{-3} \cdot (4.06)$	C
Embedment Strain Gauge	450 ~ 1000	$\mu\epsilon$ micro strain	$\text{Hz}^2 \cdot 10^{-3} \cdot (3.30)$	D
Spot Weldable Strain Gauge	1000 ~ 3500	$\mu\epsilon$ micro strain	$\text{Hz}^2 \cdot 10^{-3} \cdot (0.39)$	E
Stressmeter	2500 ~ 6000	digits	$\text{Hz}^2 \cdot 10^{-3}$	F

# VIBRATING WIRE STRAIN GAUGE TECHNOLOGY



## Accurate Data Collection

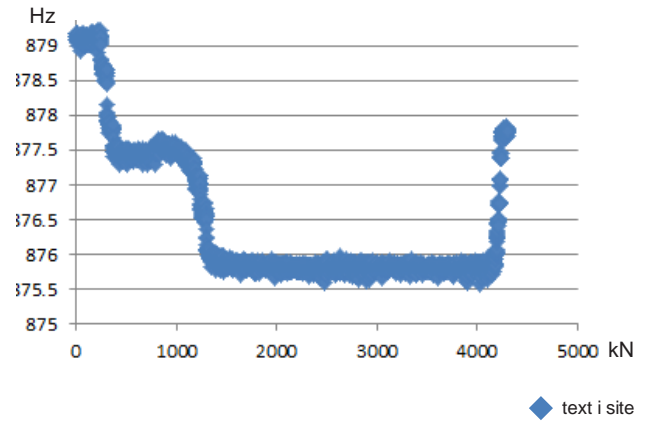
### Batch Calibration Service

Sensor Nr	Hz R0	Hz R1	Gage Factor (k)
1	918.60	676.03	5.0025
2	917.28	678.27	5.0740
3	905.49	637.08	4.6734
4	915.79	643.23	4.5536
5	947.79	655.58	4.1300
6	906.49	666.57	5.1269
7	915.63	676.26	5.0780
8	908.16	651.87	4.8397
9	935.58	635.65	4.1061
10	904.32	661.78	5.0942
11	917.78	573.84	3.7718
12	913.64	657.88	4.8142
13	919.59	629.67	4.3081
14	927.45	717.52	5.6032
15	928.43	689.11	4.9986
16	910.33	697.84	5.6627
		Average	4.8023

micro\_strain( $\mu$ ) =  $F^2 \times 10^{-3} \times k$   
 R0 Initial Record, R1 FS 1935  $\mu$  Record

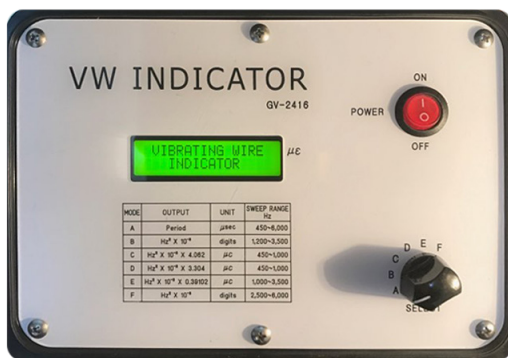
### Real Time Field Graph

#### Geovan Strain Gage Recording



geovan strain gauge showing really nice correlation curve against 5,000kN applied load

### Reading by Manual Indicator



### Recording by Data Logger

