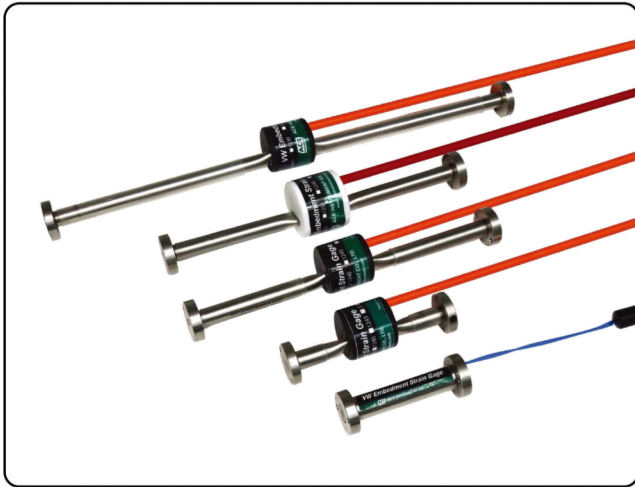


## VW embedment strain gages



### Description

**VW embedment strain gages** are composed of a stainless steel tube with flanges at both ends. Inside the tube is a vibrating wire near by the plucking coil that is held in tension between the ends of the tube.

The vibrating wire of VW embedment strain gage is tension between two end flanges which are fixed inside the concrete. The wire is plucked so that it vibrates at its resonant frequency. This frequency depends on the wire tension, which will vary as the strain of concrete. The change in frequency is calculated the strain or stress directly by the VW readout unit.

The gage is equipped with a temperature device for compensating of temperature variations.

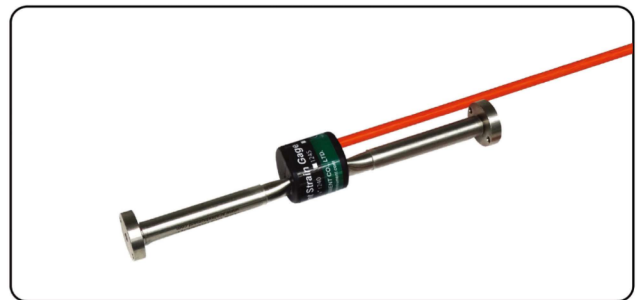
### Features

- Not affected by cable length and resistance change, reproducibility are very excellence
- Built-in temperature device
- Possible to automatic measurement

### Applications

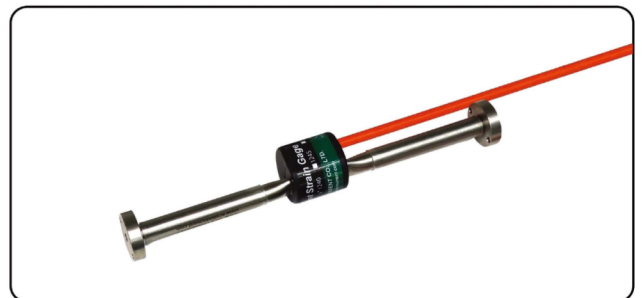
#### [Model 1240 standard]

The model 1240 VW embedment strain gage is designed to measure strain in reinforced concrete and mass concrete. The rosette block is used to mount 2~4 VW embedment strain gage on steel members in four directions to measure the magnitude, distributed direction and trend of strain. The enclosure for no stress strain gages is used to verify difference of strain between no stress and loading conditions, and to find the trend of stress after embedded in dams and embankments.



#### [Model 1240A wide range]

The range of model 1240A is  $5000\mu\epsilon$ . This model is designed with pre-stress pipe so that it is suitable to measure at soft concrete. It is provided calibration sheet.



#### [Model 1230 shotcrete]

The gage length of model 1230 is 77mm and it is useful for thin shotcrete lining at tunnel.



## VW embedment strain gages

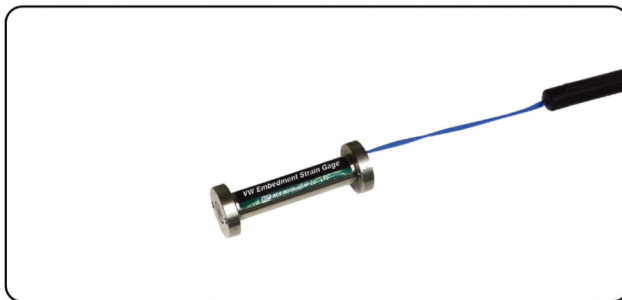
### [Model 1230B biaxial]

The model 1230B is useful for measuring strain toward tangential and radial directions in tunnel shotcrete through out installation of bracket. There are 2ea of model 1230 in 1 as kit so that it is easy to use



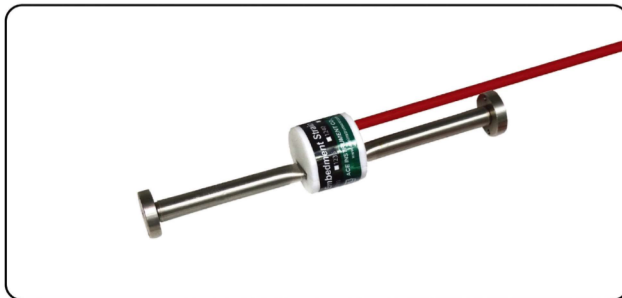
### [Model 1235 miniature]

The model 1235 of the super small sized is applicable usefully when mock-tested with the gage of 54mm or there is the limit on the condition of establishment.



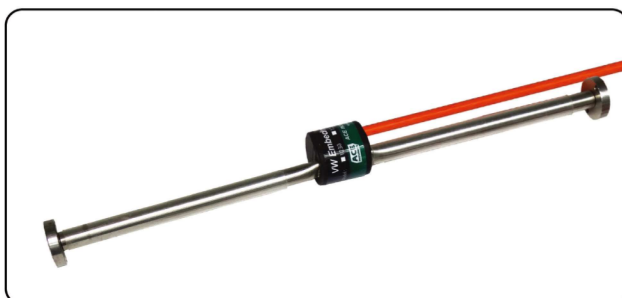
### [Model 1243 high temperature]

The model 1243 is useful for test of the concrete pile improving steel because it can stand high temperature up to 200°C.



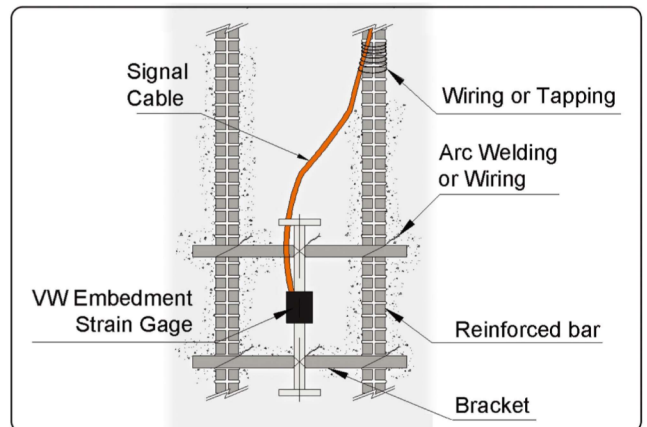
### [1245 long range]

The model 1245 as the gage with 250mm shows the excellent performance more than normal type model since the seal or compression is great big at the prestressed concrete.



### Recommendation

- Measured data of model 1230 is converted it into stress by multiplying conversion factor. It is important that they is installed with VW NATM shotcrete stress cells to monitor changes in stress for rocks for radial stress if is possible.
- In embedment of model 1230 strain gage composed of a tangential and radial gage, the radial direction of them must be installed so that it ensures good physical contact between the cell and the surrounding rock.
- In case of required calibration sheet, it is possible to calibrate each strain gages



[Installation in reinforced concrete]

## VW embedment strain gages

### Specification

Model	1230 (Shotcrete)	1230B (Biaxial)	1235 (Miniature)	1240 (Standard)	1245 (Long range)	1243 (High temperature)	1240A (Wide range)
Sensor element	Vibrating wire sensor						
Range	3,000 microstrain						5,000 microstrain
Resolution	0.5 microstrain						
Accuracy	±0.1% FSR						
Nonlinearity	±0.5% FSR						
Coefficient of linear expansion	11 × 10 <sup>-6</sup> /°C						
Operating temperature	-40~80°C					-29~200°C	-40~80°C
Built-in temperature device	Thermistor (3k $\Omega$ )						
Temperature device range	-40~105°C						
Temperature device accuracy	±0.5°C						
Water proof	300m H <sub>2</sub> O						
Gage length	77.5mm		54.8mm	153.6mm	250mm	153.6mm	Individual calibration
Gage factor	0.7756		0.391	3.304			
Materials	Stainless steel, high grade epoxy potting						
Weight	0.2kg	0.4kg	0.2kg	0.3kg		0.2kg	0.2kg
Signal cable	Ø4.5mm, 0.24mm <sup>2</sup> × 4C shielded PVC sheath cable					Ø5mm, 0.3mm <sup>2</sup> × 4C shielded silicone sheath cable	Ø4.5mm, 0.24mm <sup>2</sup> × 4C shielded PVC sheath cable

### The readout

It is connected to the system such as the VW readout units, data loggers to be data logging and data acquisition system to monitor readings. It is compatible with other company's readout unit.

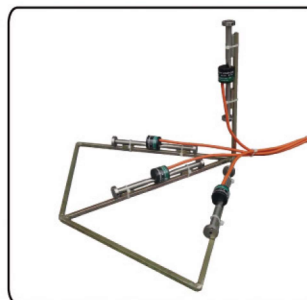
- ACE-800 (VW readout)
- ACE-1000 (VW data recorder)
- ACE-1100 series (VW mini logger)
- ADL-16V (VW data logger)
- ADL-200A (Smart logger)
- VL Module (Smart LoRa system)

### Ordering information

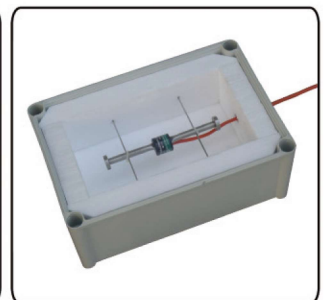
- Keeping VW readout unit
- Cable length

### Ancillary equipments

- Universal terminal box (model 7012/7024)
- Rosette block for 3, 4, and 5 directions
- Enclosure case kit for no stress strain gages (PC-80)



[4-Direction Rosette Block]



[Kit of No-stress strain gage]