



## DATASHEET

# VIBRATING WIRE STRAIN GAGE

## MODEL EDS-11V



## INTRODUCTION

The model EDS-11V strain meter is suitable for embedment in soil or concrete or for surface mounting by welding on steel structures. It provides significant quantitative data on the magnitude and distribution of compressive and tensile strain and its variations with time.

## FEATURES

- Accurate, robust and low cost.
- Long term stability with high reliability.
- Hermetically sealed under a vacuum of 0.001 Torr; stainless steel construction.
- Easy installation and maintenance.
- Wide range of accessories available.
- Thermistor available for temperature correction.
- Remote digital readout for strain measurement.
- Ease in data logging.

## APPLICATION

- Measurement and monitoring of strain in concrete, rock and steel constructions.
- Study of stress distribution in the supporting ribs of underground cavities and tunnels.
- Determination and monitoring of stress distribution in concrete & masonry dams.
- Testing of wye sections.
- Monitoring of stresses in pressure shafts.



Encardio-rite strain meter incorporates the latest vibrating wire technology to provide remote digital readout of compressive and tensile strain in dams, bridges, underground cavities, tunnels, mines, steel structures and other areas of application where strain measurement is required. Long term stability is achieved by:

- Thermal and load cycling
- Unique method of wire clamping
- By generating a vacuum of 1/1000 Torr inside the sensor by electron beam welding. This results in the effect of oxidation, moisture, environmental conditions and any ingress of water being completely eliminated.

## OPERATING PRINCIPLE

The Encardio rite vibrating wire strain meter basically consists of a magnetic, high tensile strength stretched wire, one end of which is anchored and the other end is displaced proportionally to the variation in strain.

Any change in the strain, directly effects the tension of the wire, resulting in a corresponding change in frequency of vibration of the wire. The resonant frequency, with which the wire vibrates, is read by the read out unit. The strain is proportional to the square of the frequency and the read out unit is able to display this directly in m strains.

## STRAIN METER & ITS ACCESSORIES

### EDS-11 Strain meter

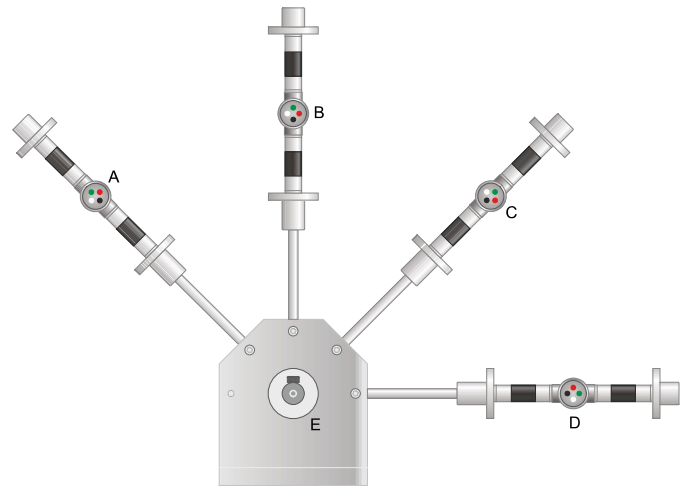
The coil magnet assembly is enclosed in a stainless steel 'magnet enclosure'. The magnet enclosure is electron beam welded to two stainless steel tubes with integral stainless steel bellows which are rubberized for protection. The purpose of the bellows is to reduce the modulus of elasticity of the strain meter such that it truly reflects the expansion and contraction of the concrete that it is embedded in or the steel structure to which it is welded. The bellows are a special feature of Encardio-rite strain meters. The ends of the stainless tubes are electron beam welded to two cylindrical end blocks, one of which has a 'V' groove around its circumference. The vibrating wire assembly is permanently anchored to the end blocks.

The leads from the coil magnet are terminated on a glass to metal seal which is integrally electron beam welded to the stainless steel body of the strain meter. The two pins marked red and black on the glass to metal seal are connected to the coil magnet. The other two pins are used with thermistor for measurement of temperature. A cable joint housing and cable gland is provided for the cable connection. Standard cable gland is PG-9. It is suitable for a cable size of 6-8 mm. In case the cable size is different, the factory must be informed and proper cable glands obtained.

### EDS-12/13 Spider for strain rosettes

Encardio-rite manufactures spiders for five and thirteen position strain rosettes. The spider is precision machined to the specified angles. The strain meters are screwed on

to 200 mm rods attached to the spider at the correct angular positions.



EDS-12/13: Spider for strain rosettes

The Encardio-rite model EDS-12 five position spider permits precise and accurate installation in a concrete dam or structure of four strain meters at angles of 0°, 45°, 90°, 135° in one plane and one strain meter at right angles to this plane. The Encardio-rite model EDS-13 thirteen position spider has eight rods in the vertical plane at 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°; four rods in a plane at 45° to the above plane at angular positions of 22.5°, 112.5°, 202.5°, 292.5° and one rod placed horizontally.

### EDS-14 No stress strain container

The strain meter is designed to respond to change in dimensions of the concrete in which it is embedded, whether the deformation is due to stress, creep, temperature change, moisture change or chemical growth of the concrete.

The main purpose of the strain meter, however, is to indirectly determine stress. Change in stress is revealed simple by multiplying the measured strain by the modulus of electricity of the concrete in which it is embedded. However for stress which develops over a long period of time, account must be taken of changes in module of elasticity and of deformation due to creep and to all causes other than stress.

It is often desirable to measure separately the deformation due to all causes other than stress. This is done by installing a "no stress strain meter" which is exposed to the same conditions as the surrounding concrete except as to stress. The EDS-14 no stress strain container is a two walled hollow cylinder with a dimension of 400 mm  $\phi$  x 600 mm height. The welded leak proof container has an outer wall of 2 mm thick mild steel and an inner wall of 1 mm thick copper.

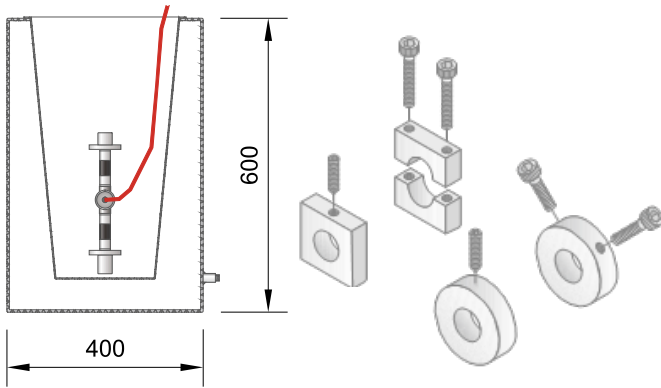
The gap between the walls is 50 mm. The purpose of the gap is to prevent true stress from acting on the strain meter which is installed inside the container. This strain meter therefore only reads deflection which takes place in the concrete due to autogenously growth of the concrete.



### EDS-15/16 Mild steel brackets and stainless steel flanges

The model EDS-15 mild steel brackets are used when the strain meter is used for welding applications on steel structures or attaching to concrete structures with saddle mounts. For ease in mounting, one of the brackets is split in the middle. The grub screw in the other bracket firmly locates it into the groove of the end block of the strain meter.

The model EDS-16 stainless steel flanges (48 mm dia) are used when the strain meter is used for embedment in concrete. One of the flanges fits into the 'V' groove of the left hand end block of the strain meter. The other flange is fixed at a center distance of 140 mm from the first flange.



EDS-14: No stress strain container

EDS-15/16: Brackets and flanges

### EDS-17 Dummy strain meter

The strain meter brackets are welded in position by placing a dummy strain meter in between them to maintain the correct distance and alignment. The dummy strain meter is finally removed and replaced by the actual strain meter.



### EDS-18 Extender

The Encardio-rite model EDS-18 extender allows to increase the length as well as sensitivity of the model EDS-11V strain meter. The extender has a male M6 x 10 thread which fits into the female tapping of the strain meter end block. The effective length of the strain meter is increased to 280 mm by the extender, thus increasing the sensitivity by 100 %.

### SPECIFICATIONS

Type	Vibrating wire
Range	± 1500 µ strain
Sensitivity	1 µ strain
Active gage length	140 mm
Total length	190 mm
Accuracy	± 1 % fsd ( combined effect of non-linearity + hysteresis + repeatability)
Temperature limit Operational	-10° to 80°C
Compensated	0° to 55°C
Over range limit	125 % of range
Over range effect	± 0.1% fsd upto 120%
Insulation resistance	500 M Ohm
Coil resistance	120-140 Ohm
Enclosure	Stainless steel
Protection	IP-68 (NEMA 6)
Sealing	Hermetically sealed by electron beam welding with a vacuum of 0.001 Torr. inside it
Vibration limit	2 g, 20-500 Hz
Humidity limit	100% RH
Thermistor	YSI 44005 or equivalent (3 kOhm at 25°C)
Cable connection	Glass to metal seal solder pin connector

\*All specifications are subject to change without prior notice

### ENCARDIO-RITE ELECTRONICS PVT. LTD.