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## DATASHEET

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# EARTH & CONCRETE PRESSURE CELL

## MODEL EPS-30V



### INTRODUCTION

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The earth and concrete pressure cells are designed to measure total pressure in earth fills and embankments, pressure on the surface of retaining walls, buildings, bridge abutments, tunnel linings and to measure stress in mass concrete.

#### FEATURES

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- Reliable, accurate, robust and low cost
- Long term stability with high reliability.
- High sensitivity and high pressure range.
- Low volumetric displacement.
- Fluid filled for high rigidity, accurate and fast response.
- Thermistor available for temperature correction.
- Remote digital readout available.
- Ease in data logging.
- Transmission of signal as a frequency over long cable lengths.

#### APPLICATION

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- To measure the orientation and magnitude of total pressure and stress distribution within dam embankments and the interface of soil and concrete.
- To determine contact pressure on retaining and diaphragm walls, piers and abutments.
- For measuring pressure on and within lining of underground excavations.
- Monitoring of stress in the rock walls of unlined caverns and tunnels.
- Evaluating foundation bearing pressures



Proper evaluation of total pressure may help in:

- Verifying design assumptions that will promote safer and more economical design and construction.
- Monitoring for safety; warning of soil pressures in excess of those the structure is designed to withstand.

## DESCRIPTION

The Encardio-rite earth and concrete pressure cell basically consists of a flexible, circular flat capsule connected to a specially designed pressure sensor by a 6 mm  $\phi$  x 170 mm long stainless steel tube.

Like any closed hydraulic system, pressure cell is sensitive to temperature effects. Any change in temperature of surrounding concrete can give an unauthentic reading, magnitude of which depends upon elasticity of surrounding concrete and relative coefficient of expansions of materials in contact & filled fluid inside the pressure cell. The sensor has an in-built thermistor to assist in separating these unauthentic temperature effects from actual pressure changes.

Encardio-rite offers three types of pressure cells – earth pressure cells, concrete pressure cells and interface pressure cells.

### Model EPS-30V-S earth pressure cell for use in soil, earth fills and embankments

The earth pressure cell measures stress in soil or pressure of soil on structures. Cell responds not only to soil pressure but also to ground water pressure/pore water pressure and therefore is termed as total pressure cell or total stress cell.



### Model EPS-30V-C concrete pressure cell for use in concrete

For applications in which the concrete pressure cell is embedded in concrete, a 600 mm long, fluid filled, pinch tube is welded to the sensor.

During concrete lining, temperatures often rise and push the capsule to expand in the still green concrete. On cooling, the capsule contracts, forming a gap between capsule and concrete. This prevents transmission of pressure from concrete to the cell.



After concrete around the pressure cell has fully cured and has cooled off to the ambient temperature, the pinch tube is pinched at intervals, using a set of pliers, squeezing the fluid out of the tube into the capsule. This forces the capsule to expand until the gap is eliminated.

### Model EPS-30V-I interface pressure cell for use at soil and concrete (or rock) interface

The pressure cell measures the contact earth pressure on the surface of concrete or rock. The cell has extra thick and rigid steel plate at the concrete contact side to minimize the point loading effect.

The interface pressure sensor is frequently used in raft foundations, base slabs or footings to measure the soil pressure on foundation and structure.



### Fluid filled pressure capsule

The pressure capsule consists of two rectangular stainless steel plates welded around the edge. The narrow gap between plates is filled with fluid using a special process which ensures that all the air is excluded.

The size of pressure capsule/pads varies depending on the application.

- EPS-30V-S Earth pressure cell has pressure capsule with size 200 mm dia x 7 mm thick.
- EPS-30V-C Concrete pressure cell has pressure capsule with size 200 mm dia x 7 mm thick.
- EPS-30V-I Interface pressure cell has pressure capsule of size 200 mm dia x 10 mm thick. The diaphragm on one of the side is rigid.

### Vibrating wire pressure sensor

A stainless steel pressure sensor incorporates the latest vibrating wire technology and has inherently high sensitivity. Each pressure sensor is individually temperature compensated to 0.03%/°C.



## OPERATING PRINCIPLE

The pressure applied by the earth or concrete acts on the pressure capsule and is transmitted through the fluid to the pressure sensor that converts it into an electrical signal in form of frequency.

The pressure cell basically consists of a magnetic, high tensile strength stretched wire, one end of which is anchored and the other end fixed to a diaphragm which deflects in proportion to the applied pressure. Any deflection of the diaphragm changes the tension of the wire, thus affecting the resonant frequency of vibrating wire.

The frequency output can be accurately measured by any vibrating wire readout unit. The data can also be automatically collected at desired frequency, stored and transmitted to remote server by a suitable datalogger.

## ORDERING INFORMATION

**Model EPS-30V-S/C/I-Range-Cable housing type**  
(cable  $\phi$  3.5-8 mm or 9-14 mm)

## SPECIFICATIONS

Sensor type	Vibrating wire
Range (MPa)	0.5, 1.0, 2.0, 3.5, 5.0, 10.0, specify
Accuracy of pressure transducer	$\pm 0.5$ % fs standard $\pm 0.1$ % fs optional
Temperature limit operational	-20° to 80°C
Over range limit	150 % of range
Thermistor	YSI 44005 or equivalent (3 kOhms at 25°C)
Enclosure	Stainless steel