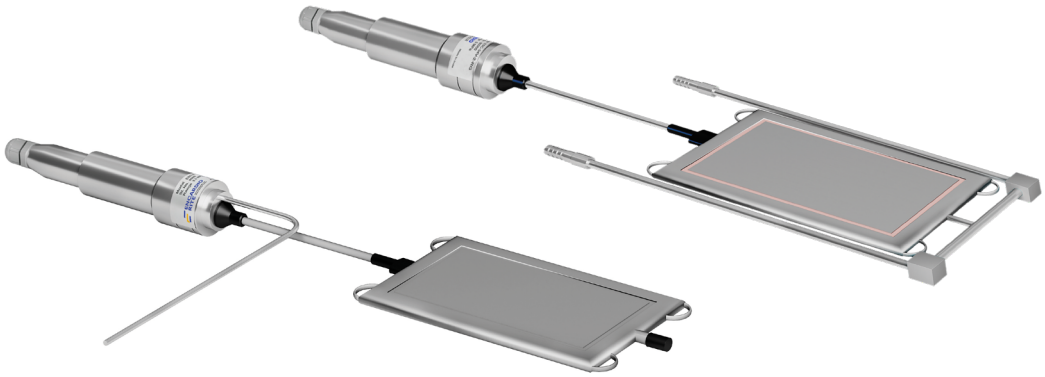
ENCARDIO RITE
METASENSING FOR MEGA STRUCTURES

SHOTCRETE-CONCRETE PRESSURE CELL

DATASHEET

MODEL ESC-30V



OVERVIEW

The Encardio Rite model ESC-30V shotcrete-concrete pressure cell is designed to monitor radial and tangential stresses in shotcrete tunnel linings, which is essential for the New Austrian Tunneling Method (N.A.T.M.). This method supports tunnels by rapidly applying shotcrete to freshly exposed ground, preserving the ground's inherent strength and reducing the need for artificial support. Proper stress evaluation ensures shotcrete lining adequacy and verifies design assumptions, promoting safer and more economical construction.

The pressure cell comprises a flexible rectangular capsule connected to a high precision vibrating wire pressure sensor via a stainless steel tube. The capsule, made of stainless steel plates welded around the edges, with the narrow gap between the plates filled with de-aired fluid. Four lugs at the plate corners facilitate holding the cell in place while the shotcrete is applied.

Increased concrete stress raises fluid pressure in the cell as the steel plates are squeezed together. This pressure is sensed by the sensor's diaphragm, deflection of which alters the tension of the internal vibrating wire, changing its resonant frequency. The measured frequency directly correlates to the applied pressure. The frequency output can be measured manually by a vibrating wire readout or can be automatically collected, stored and transmitted to central server by a suitable datalogger for online data.

Besides monitoring the radial and tangential stresses in shotcrete tunnel linings, the pressure cell can be used for assessing shotcrete lining adequacy, monitoring mine backfill, measuring pressures in underground excavations, evaluating foundation-bearing pressures, assessing stress in rock walls of unlined caverns.

FEATURES

- **Reliable & accurate:** Offer long-term stability, high sensitivity, and a broad pressure range for dependable measurements in various scenarios.
- **Fluid-filled capsule**: The pressure capsule is filled with a special fluid to ensure optimal pressure transmission.
- **High rigidity**: The cell's rigidity exceeds 50,000 MPa, ensuring immediate response to stress changes.
- **Temperature compensation:** Each pressure sensor is individually temperature compensated to 0.03%/°C to minimize measurement errors.
- **Integrated temperature monitoring:** In-built thermistor enhances measurement accuracy by accounting for temperature variations.
- **Low intrusion, high speed:** Minimal volumetric displacement and fluid-filled design ensure fast, accurate responses, even in dynamic environments.
- **Hermetically sealed sensor**: Hermetically sealed under a vacuum of 0.001 Torr and stainless steel construction ensures protection against severe environmental factors.
- **Robust construction**: The stainless steel construction ensures durability and reliability in harsh environments.
- **Versatile options:** Available in variants with a pinching tube or re-groutable arrangement, meeting diverse geotechnical and structural monitoring needs.
- **Long-distance signal transmission:** Maintains signal integrity over long distances, ensuring accurate data collection.
- **Versatile datalogging:** Compatible with various readout units for manual data collection. For continuous monitoring, it can be connected to a suitable datalogger, allowing for data acquisition at desired frequencies.

  Encardio Rite offers a range of NexaWave dataloggers equipped with GSM/GPRS or RF communication capabilities, ensuring reliable and efficient data transmission.
- **Infrastructure data intelligence platform**: Integrates with Proqio software to facilitate data processing, analysis, andreal-time visualization, and generates instant alarms for critical events to keep all stakeholders informed.

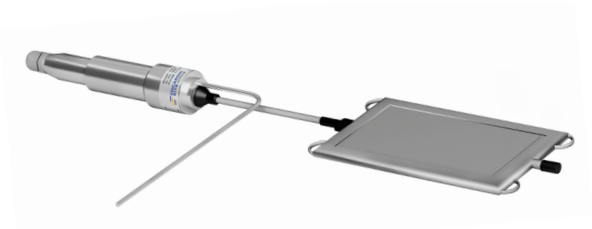
  The sensor can work with any manufacturer's Dataloggers and Data Management Systems.

PRODUCT OFFERINGS

Model ESC-30V shotcrete-concrete cell

This pressure cell features a 600 mm long pinch tube filled with special fluid. One end of the pinch tube is welded to the sensor, while the other end is capped by welding.

During concrete lining, rising temperatures cause the capsule to expand. As concrete cools, the capsule contracts, forming a gap between the capsule and the concrete, which prevents pressure transmission from concrete to the cell.



SPECIFICATIONS

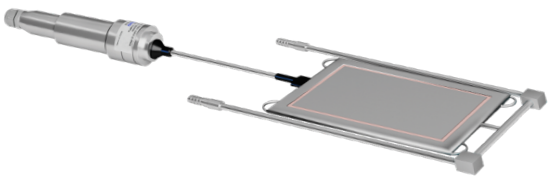
Once the concrete has fully cured and returned to ambient temperature, the pinch tube is pinched at intervals using pliers. This expels fluid from tube into the capsule, causing it to expand and eliminate the gap. Consequently, the capsule re-establishes contact with the surrounding concrete, enabling accurate monitoring of internal stress.

Model ESC-30V-R shotcrete-concrete cell

Unlike the pinching tube method, this system features a re-groutable design enabling the capsule to be re-inflated within the concrete post-curing.

Grout is carefully pumped through a dedicated pipe into the gap between the capsule and the concrete. A sharp increase in cell's pressure reading indicates successful gap closure and restored contact with the surrounding concrete.

Sensor type	Vibrating wire
Range (MPa)	1.0, 2.0, 3.5, 5.0, 10.0, 20.0, 30.0 specify
Accuracy of pressure sensor	± 0.5 % fs standard ± 0.1 % fs optional
Size (mm^2) (pressure pad)	100 x 200, 150 x 250, 200 x 300, 300 x 300
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
Cable connection	Glass to metal seal cable connection



ORDERING INFORMATION

Model ESC-30V-**(R)-Range-Pressure pad size-Cable housing type** (cable Ø 3.5-8 mm or 9-14 mm)

**All specifications are subject to change without prior notice*

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