ENCARDIO RITE
METASENSING FOR MEGA STRUCTURES

LIQUID LEVEL SETTLEMENT SYSTEM

DATASHEET

MODEL ESM-40S

OVERVIEW

The Encardio Rite model ESM-40S is a high-sensitivity liquid level settlement measuring system designed for the remote monitoring of minute differential settlements in tunnels, deflection in bridges, and settlement of buildings, floor slabs with high precision. The system comprises high sensitivity settlement sensors connected in series to a reference reservoir and desiccant unit via fluid-filled and air vent tubes, respectively. Settlement or heave at any monitored location causes a change in liquid head, which is read by the settlement transducer.

The settlements sensors are available with digital SDI-12 or Modbus output options. The maximum distance of the datalogger from the most distant SDI-12 sensor can be up to 200 m, while for Modbus output, the maximum distance can extend up to 1.2 Km. A maximum of 32 sensors can be used in a chain if using the Modbus output.

Real-time settlement/heave (deformation) profile provides valuable insights into the structural behavior during and after construction, and indicates potentially dangerous conditions that may adversely affect stability of the structure. Instant detection of even the slightest changes enables authorities to make timely decisions, enhance safety, minimize project delays, and achieve greater cost efficiency.

FEATURES

- **High sensitivity:** Capable of detecting minute differential settlements with high precision, making it ideal for critical structural monitoring.
- **Reliable and accurate:** Ensures consistent and dependable measurements for long-term monitoring projects.
- **Robust construction:** Built to withstand harsh environmental conditions, ensuring durability and reliability in various applications.
- **Easy installation:** Designed for straightforward setup, reducing installation time and effort.
- **Unaffected by atmospheric pressure:** Readings are not influenced by changes in atmospheric pressure, ensuring accuracy.
- **Non-freezing liquid:** The system uses a 50% water and 50% Ethylene Glycol mixture, reducing the risk of freezing and ensuring fluid stability.
- **Digital output options:** Available with SDI-12 or Modbus output for flexible data integration with existing systems.
- **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 NexaWave Digilog, a digital datalogger equipped with GSM/GPRS capabilities. Option of dataloggers with RF communication are also available.
- **Infrastructure data intelligence platform**: Transmit data to a local or cloud server hosting the **Proqio** platform for 24/7 insights. **Proqio** enables efficient data processing, analysis and real-time visualization. Benefit from instant alerts for critical events and automated reports, supporting informed decision-making.
- **Cross-compatibility:** The sensor can work with any manufacturer's Dataloggers and Data Management Systems.

SYSTEM COMPONENTS

The ESM-40S settlement monitoring system includes:

- **Settlement sensors (Model ESM-40S/1)**, consist of low-pressure, high-sensitivity digital transducers and a liquid vessel. They feature quick-connect couplings for fluid and air vent tubes and include a 'T' connector for interconnecting signal cables. Wall mounting plates are provided for secure installation.
- **Reference reservoir (Model ESM-40S/2)**, with liquid level measuring scale, and wall mounting accessories.
- **Desiccant unit (Model ESM-40S/3)**, with wall mounting accessories; includes a moisture trap.
- **Fluid and air vent tubes (Model ESM-40S/4),** 8 mm o.d each.
- **De-aerated fluid,** a 20-liter supply of fluid consisting of a 50% water and 50% ethylene glycol mixture.
- **Pressure gage & valve assembly (Model ESM-40S/5),** with accessories; used for monitoring and controlling system pressure.
- **Pressure vessel and air pump (Model ESM-40S/6),** with necessary accessories to facilitate system pressurization.
- **Bus signal cable,** for connecting the settlement sensors in series (with a single cable), running from the farthest sensor to the datalogger.
- **NexaWave Digilog datalogger (Model ESDL-30),** supports SDI-12 communication, with an optional Modbus card available on request. This datalogger version can connect up to seven Modbus sensors.

SPECIFICATION

Range	1000 mm; can be calibrated to 500 mm
Sensor resolution	0.01 mm
Sensor accuracy[1]	Better than ± 0.4 mm
Sensor output	Digital output - SDI-12 serial interface or Modbus RS-485 (6 core bus cable)
Operating Temperature range	-20 to 80°C
Protection	IP67
[1] As tested under lab conditions	

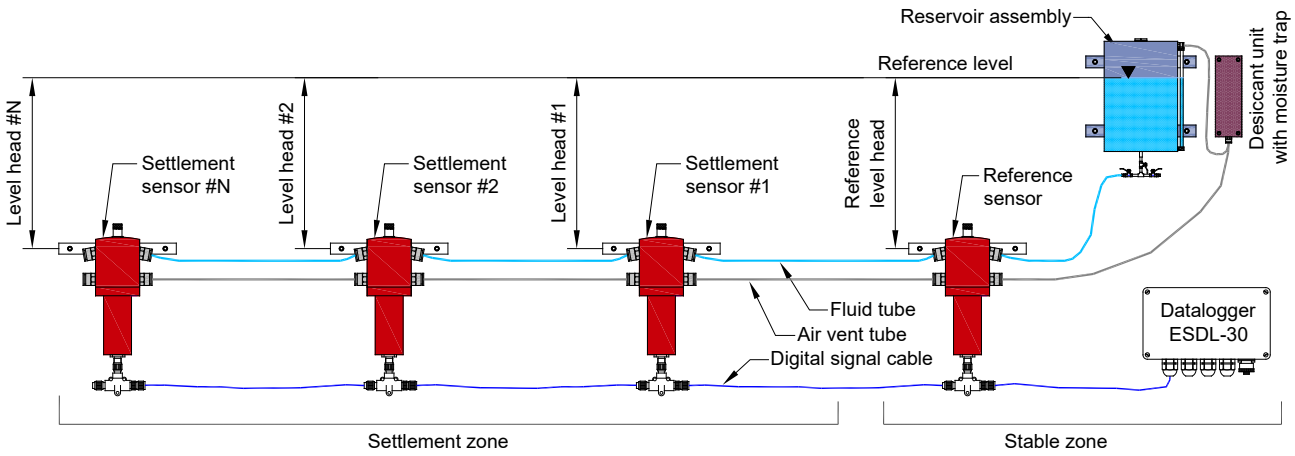
OPERATION

The settlement sensors are installed at various locations where settlement needs to be monitored. They are connected in series via a fluid-filled tube to a reference sensor, ideally mounted on stable ground. Settlement of all other sensors are measured with reference to this reference sensor.

All interconnected settlement sensors are mounted at almost same elevation and have a common fluid level initially. The reference settlement sensor is installed near the reference reservoir to compensate for any fluid level changes in the reservoir. The fluid level in the reference reservoir is maintained almost constant. For optimal performance, it is recommended to use the pressure vessel and air pump to properly introduce the de-aerated fluid into the system.

Any settlement or heave at the monitoring locations causes difference in elevation between the sensor and reference reservoir, resulting in change in liquid head, which is read by the settlement transducer. A higher liquid head indicates settlement, while a lower head indicates heave.

A key component of the system is the air vent tube, which interconnects all the settlement sensors and is terminated in a desiccant unit with a moisture trap. By keeping the common vent line open to the atmosphere, the system ensures that readings are unaffected by local air currents and atmospheric pressure changes.



*All specifications are subject to change without prior notice

DATASHEET | 2101-21 R02

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