DATASHEET

VERTICAL IN-PLACE INCLINOMETER

MODEL EAN-51M/EAN-52M

INTRODUCTION

Encardio-rite model EAN-51M vertical in-place inclinometer is used to measure lateral movement of earthworks or structures. It provides significant quantitative data on magnitude of inclination or tilt of a foundation, embankment or slope and its variations with time. It also provides the pattern of deformation, zones of potential danger and effectiveness of construction control measures undertaken.

FEATURES

- Reliable, accurate and simple to read.
- Proven technology.
- Rugged and robust construction.
- Excellent temperature stability.
- Can be easily connected to a remote data acquisition system for continuous monitoring.

APPLICATION

- To accurately measure lateral movement of structures and embankment fills and landslide areas above dams, highways, earthworks, etc.
- To monitor deformation of embankments, retaining walls etc.
- Construction control, stability investigation and monitoring of ground movement caused by tunnel construction or any such excavation.

Its data logging and real-time monitoring feature helps to provide early warning in case of failures. It also helps in observing behavior of ground movement after construction and indicates potentially dangerous conditions that may adversely affect stability of the structure, its foundation and appurtenant. A suspension stainless steel wire rope is available to position a single or group of sensors where profile of entire borehole is not of interest but only a specific portion needs monitoring.

OVERVIEW

A series of access tubes, attached to each other, are installed in a borehole or embedded in earth/rock fill or concrete structure during construction or fixed to the vertical face of a completed structure. In-place inclinometer system consists of a string of inclination sensors. This string of sensors is positioned inside the inclinometer casing to span the movement zone. Each in-place inclination sensor is fitted with a pair of pivoted sprung wheels.

When ground movement occurs, it displaces the inclinometer access tubing, causing change in the tilt of the in-place inclinometer sensors. This results in change in output of the sensors, proportional to the tilt i.e the angle of inclination from the vertical. The tilt reading applies over the gage length of the sensor (gage length is distance between wheels). This tilt reading can be converted to lateral deviation - "L sin θ" where L is gage length and θ is angle of tilt from vertical.

Displacement i.e. the lateral movement of casing can be calculated by subtracting initial deviation from current deviation. Provided that one end of the access tubing is known to be fixed, it is possible to obtain a complete profile of the access tubing by summing readings of successive sensors. By comparing these profiles, the horizontal displacement of the gage well at different depths over a period of time may be determined.

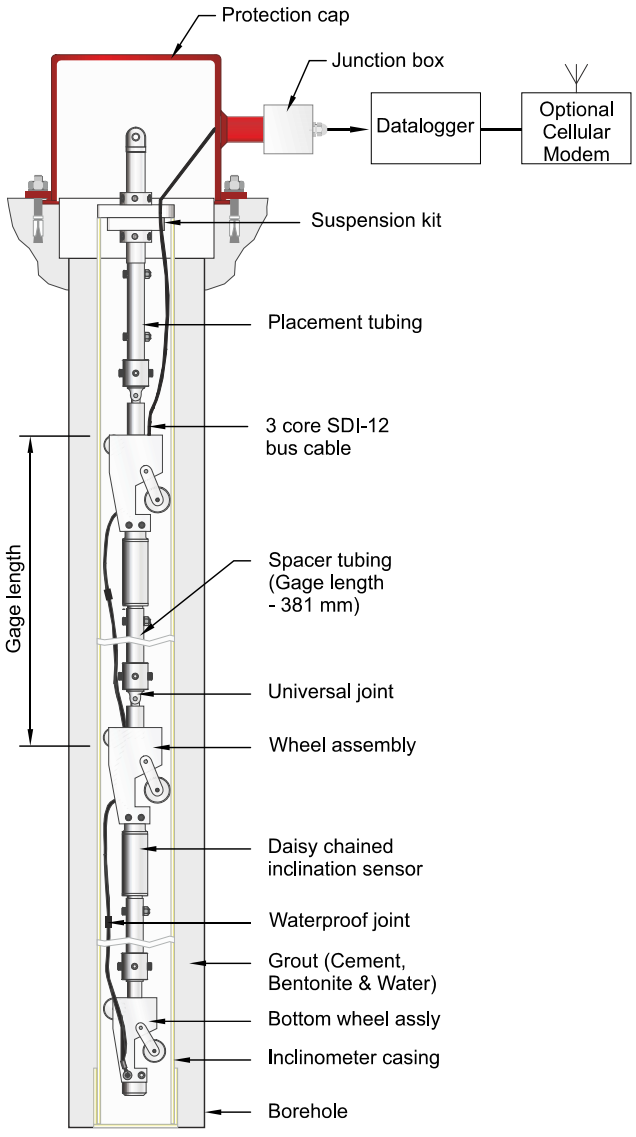
CONNECTION TO DATALOGGER

In-place inclinometer system is connected to a data acquisition system for continuous real-time monitoring of the movements. Encardio-rite has two options of in-place systems for connection to datalogger. In model EAN-51M system, individual signal cables from each of the in-place sensors in a string is taken to the borehole top for connection to the datalogger through multiplexers.

However, for large number of sensors in a single string, routing of individual sensor cable to the top is a cumbersome, costlier affair. It limits the number of sensors to be used in a single borehole and also increases the weight of the IPI assembly.

Model EDI-52M system provides a solution, in which each in-place sensor is equipped with SDI-12 interface so that only a single 3 conductor bus cable needs to be threaded in a daisy chain fashion connecting each sensor to its next immediate neighbor and finally to the top of the borehole and directly to the datalogger (without any multiplexer).

SDI-12 bus cable from different IPI boreholes can also be connected to same datalogger. However, this includes some limitations on the total number of sensors or IPI strings being connected based on site conditions. Although in-place sensors with SDI-12 interface are a bit costlier, the savings in cable costs and the cost of the required multiplexers in the datalogger, reduces this increase to a large extent. For IPIs using a large number of sensors, SDI-12 equipped in-place sensors are a good choice as it will not be possible to accommodate a large number of individual signal cables inside the borehole.



EAN-52M In-place inclinometer system with SDI-12 bus interface to SDI-12 compatible datalogger

DESCRIPTION

Following sub-assemblies are available in the Encardio-rite in-place inclinometer system:

EAN-51M/1.1	Uniaxial sensor with pair of wheels.
EAN-51M/1.2	Biaxial sensor with pair of wheels.
EAN-52M/1.1	Uniaxial sensor with SDI-12, with pair of wheels.
EAN-52M/1.2	Biaxial sensor with SDI-12, with pair of wheels.
EAN-51M/2.1	Spacer assembly for 1 m gage length.
EAN-51M/2.2	Spacer assembly for 2 m gage length.
EAN-51M/2.3	Spacer assembly for 3 m gage length.
EAN-51M/3	Wheel assembly.
EAN-51M/4	Suspension kit with protective cap.
EAN-51M/5	Placement tubing (specify length) for placing string of sensors.
EAN-51M/6	Protective rope to prevent loss of sensor down hole.
EAN-51M/7	Suspension stainless steel wire rope for positioning single or group of sensors in specific portion of borehole
CS-0703	6 core cable for in-place sensors without SDI-12
CS-1002	3 core SDI-12 bus cable for sensors with SDI-12 card.
Casings	For casing refer to datasheet 1064 on model EAN-25 Inclinometer system.

SPECIFICATIONS

Sensor	Uniaxial or biaxial sensor; with SDI-12 or without SDI-12
Measuring range	± 15°
Accuracy[1]	± 0.1% fs
Temperature range	-20°C to 80°C

[1] *As tested under lab conditions*

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

ENCARDIO-RITE ELECTRONICS PVT. LTD.

A-7, Industrial Estate, Talkatora Road Lucknow, UP - 226011, India | P: +91 522 2661039-42 | Email: geotech@encardio.com | www.encardio.com

International: India | UAE | Qatar | Bahrain | Bhutan | Europe | USA

India: Lucknow | Delhi | Kolkata | Mumbai | Chennai | Bangalore | Hyderabad | J&K