



# ENCARDIO RITE



## INCLINOMETER SYSTEM

### MODEL EAN-25M

#### INTRODUCTION

The Inclinator is used to measure lateral movement of earthworks or structures. It provides significant quantitative data on magnitude of inclination or tilt of foundations and its variations with time. It also provides the pattern of deformation, zones of potential danger and the effectiveness of construction control measures undertaken.

Proper evaluation of inclination helps in monitoring the behavior after construction and indicates potentially dangerous conditions that may adversely affect the stability of the structure, its foundation and appurtenant. It also provides basic data for design improvement that will promote safer and more economical design and construction.

The Encardio-rite model EAN-25M inclinometer is a highly accurate instrumentation system, specially designed for the measurement of lateral movement. It incorporates the latest technology in having built in data storage facilities and capability of analyzing the stored data.

#### APPLICATIONS

- ◆ To accurately measure lateral movement of earthworks and structures, landslides and embankment fills.
- ◆ Deflection of piles, piers, abutments or retaining walls.
- ◆ Construction control, stability investigation and monitoring of earth/concrete dams, ports, slopes, foundations, shallow underground works and surface excavations.

#### OPERATING PRINCIPLE

The first step is to make a near vertical gage well by attaching a series of access tubes to each other. The tube may be installed in a borehole, embedded in an earth/rock fill or concrete structure during construction or fixed to the vertical face of a completed structure. The inclinometer probe is then made to pass through the entire length of the gage well, taking readings at fixed predetermined depths from the top surface. During the process, two accelerometer probes sense the inclination of access tube in two planes at right angles to each other. The high level voltage output from the probe is directly proportional to the sine of the angle of inclination of the long axis of the probe from vertical.

#### FEATURES

- ◆ Reliable, accurate and simple to read.
- ◆ Proven technology.
- ◆ Storage of more than 26,000 readings possible with logger readout.
- ◆ Rugged and waterproof.
- ◆ The access tubes may be installed in a bore hole, embedded in a fill or concrete during construction, or fixed to the face of a completed structure

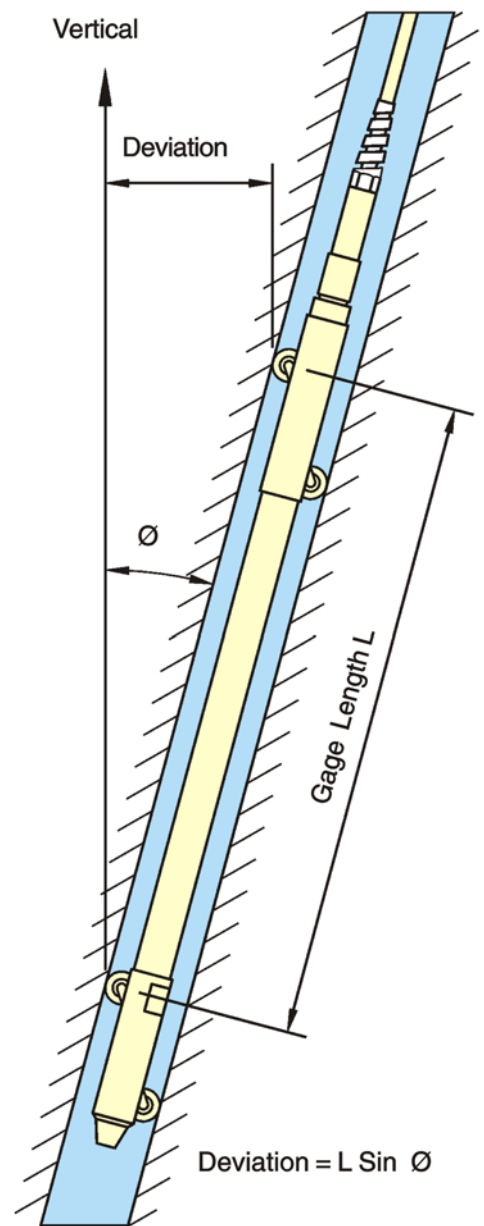


Figure 1

A set of initial base reading is taken at given depths within the gage well. This forms the reference datum. All subsequent readings are taken over a period of time at identical depths, thereby indicating rate, magnitude, and direction of lateral deformation. This inclination is displayed in terms of angular or horizontal displacement (deviation) on the electronic readout equipment at the ground level with the operator.

Provided that one end of the access tubing is known to be fixed, it is possible to obtain a complete profile of the gage well by taking a succession of readings. By comparing these profiles, the horizontal displacement of the gage well at different depths over a period of time may be determined.

If measurement of vertical displacement is also required, then magnetic targets may be positioned over the access tube, to be fixed to the surrounding ground at selected points. Monitoring of the targets is then possible with a reed switch probe. For details refer to data sheet 1098 "Magnetic Probe Extensometer".

## DESCRIPTION OF SYSTEM

The Encardio-rite model EAN-25M Inclinometer system basically consists of four components:

- ✦ Access tube and fittings
- ✦ Tilt sensing probe
- ✦ Interconnecting cable with reel and grip
- ✦ Data logger

### EAN-25/1 Access tube and fittings

ABS access tubes have longitudinal keyways, specially produced to close tolerances. The wheels of the tilt sensing probe can run smoothly inside these keyways.

Access tubes are 3 m in length unless otherwise specified by the customer. Different kinds of couplings are available to rapidly join the access tubes. Telescopic couplings are available in case settlement is expected to take place. The design of these couplings ensures that correct alignment of keyways is maintained throughout depth of gage well.

### EAN - 25/1.1 ABS self aligning access tube

Self aligning ABS tubing, 70 mm o.d., 58 mm i.d., 3 m length.

### EAN - 25/1.2 ABS fixed coupling (70 mm)

ABS fixed coupling for 70 mm o.d. access tube, 77 mm o.d. x 160 mm length.

### EAN - 25/1.3 ABS telescopic coupling (70 mm)

ABS telescopic coupling for 70 mm o.d. access tube, 77 mm o.d. x 300 mm length, displacement up to 150 mm.

### EAN - 25/1.4 End cap for ABS tubing (70 mm)

ABS end cap for 70 mm o.d. access tube to fit at top or bottom.

### EAN-25/1.5 Top cap for ABS tubing (70 mm)

ABS lockable top cap for 70 mm o.d. access tube.

### EAN-25/1.6 Pop rivets for ABS tubing

Pop rivets packets of 100 numbers.

### EAN-25/1.7 Pop rivet gun

Hand held manually operated.

### EAN-25/1.8 Power drill

230 V 50 7Hz operation power drill with two 3.2 mm  $\phi$  drill bits.

### EAN-25/1.9 Mastic tape

50 mm width x 10 m long mastic tape.

### EAN-25/1.10 Sealing accessories

BOPP tape 50 mm width x 65 mm long.



ABS casing

## EAN-25/2M TILT SENSING PROBE

### EAN-25/2.1M Inclinometer probe

The inclinometer probe of stainless steel construction, is fitted with two pairs of pivoted sprung wheels which can rotate freely. The standard gage length between the wheels is 500 mm. The spring loaded wheels help to position the probe centrally inside the gage well at any required depth.

The probe consists of two precision accelerometers. One of the accelerometer has its axis in the plane of the wheels and other at 90° to it. The probe senses horizontal deviation between the probe axis and the vertical plane, simultaneously in the orthogonal axis.

A six pin connector is provided for connection to the cable.

### EAN-25/2.2 Dummy probe

It has the same dimension as the actual probe. It is used for checking the gage well. Cord length is same as cable length in the actual probe.

### EAN-25/2.3 Calibration check jig

It enables verification of calibration of the data logger for known angles of tilt of the sensing probe.

## EAN-25/3 OPERATING CABLE

### EAN-25/3.1 Operating cable and cable reel

Six core abrasion resistant, weather proof signal cable with cores in black, white, red, green, blue, grey with central high tensile straining member, graduated at every 0.5 m. Outer sheath is of polyurethane of nominal diameter 10.4 mm. Length as specified by the customer.

A six pin connector is provided for connecting to the probe. The cable reel comprises of a plastic winding



Probe

reel on tubular frame to hold the specified length of the cable.

### EAN-25/3.2 Cable lowering pulley

It can be directly clamped to the ABS tubing at the top of gage well. It has an arrangement to clamp the cable at any point, for convenience in taking the readings.

## EDI-53 INS DATA LOGGER

The data logger is compatible with the inclinometer probe. It is battery operated with an easy to read display. It is housed in a rugged and weather proof enclosure.

The data logger has built in data storage facility. Data can be transferred to an IBM compatible PC for further processing or archiving. The PC should have an unused RS232 communications port (COM1 or COM2 only).



Easy to carry cable reel with provision to hold datalogger as well as probe

### Data logger features

- ✦ Large LCD display with large character and easy view.
- ✦ User freindly to operate
- ✦ Storage of more than 26,000 readings with time and date.
- ✦ Ability to download readings to an IBM compatible computer either directly or through a modem.

## SYSTEM SPECIFICATIONS

### Probe specifications

<b>Measuring range<sup>1</sup></b>	$\pm 15^\circ$ of vertical $\pm 30^\circ, \pm 50^\circ$ optional
<b>Resolution</b>	$\pm 0.025$ mm/500 mm
<b>Distance between wheels</b>	500 mm
<b>Operating temperature</b>	0°C to 80°C
<b>Probe dimensions</b>	Overall 32 mm $\phi$ x 700 mm length
<b>Probe weight</b>	2.0 kg
<b>Probe casing</b>	Stainless steel
<b>System accuracy</b>	$\pm 6$ mm/30 m

<sup>1</sup> Measuring range is reduced to  $\pm 14^\circ$  (for  $\pm 15^\circ$  range) when used with EDI-53INS readout at  $\pm 4$  V fs input range.

### Logger readout specifications

<b>Display</b>	LCD
<b>Battery</b>	Nickel Cadmium rechargeable 6 V, 45 Ah, VLRA
<b>Resolution</b>	0.0001 V @ 2 V fs range
<b>Range</b>	$\pm 2$ V, $\pm 4$ V, $\pm 8$ V (factory configured)
<b>Temperature range</b>	0°C to 50°C
<b>Data storage</b>	> 26,000 readings
<b>Communication</b>	2400 baud RS 232C
<b>Size</b>	237 mm (w) x 248 mm (h) x 70 mm (d)
<b>Weight</b>	4.5 kg.

All specifications subject to change without prior notice.

## ENCARDIO-RITE ELECTRONICS PVT. LTD.

A-7 Industrial Estate, Talkatora Road, Lucknow, UP-226011, India

Tel +91 (522) 2661044 Fax +91 (522) 2661043 E-mail [geotech@encardio.com](mailto:geotech@encardio.com)

Visit us at: [www.encardio.com](http://www.encardio.com)

DATA SHEET 1064-08 R4