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## DATASHEET

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# TILT METER & BEAM SENSOR

MODEL EAN-91M/EAN-93M | EAN-91M-B/EAN-93-B



## OVERVIEW

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The Encardio-rite model EAN-91M/EAN-93M box type tilt meter and EAN-91M-B/EAN-93M-B beam sensor are suitable for monitoring small changes in inclination and vertical rotation of structures. The tilt meters provide a relatively low cost system which offers excellent resolution and long term stability.

Tilt changes in structures may be caused due to construction activities such as excavation; tunneling and de-watering that affect the ground that supports the structure. Changes in tilt may also result from loading of a structure, such as loading of a dam during impoundment, loading of a diaphragm wall during excavation or loading of a bridge deck due to wind and traffic. Data from the tilt meter/beam sensor provides early warning of threatening deformations, allowing time for corrective action to be taken or if necessary, for safe evacuation of the area

## FEATURES

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- Weatherproof enclosure.
- Provides reliable and high resolution readings.
- Can be removed and reused.
- Easy to install and take readings.
- Data can be transmitted to remote datalogger.

## APPLICATION

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- Monitoring vertical rotation of retaining walls.
- Monitoring inclination and rotation of Metro stations, tunnels, etc.
- Monitoring stability of structures in landslide areas.
- To evaluate performance of bridges and struts under load.
- To monitor deformation of embankments, retaining walls etc.



## DESCRIPTION

### EAN-91M/EAN-93M tilt meter

Model EAN-91M/EAN-93M tilt meter consists of uniaxial MEMS sensor mounted inside a compact, weatherproof enclosure.

The Model EAN-91M tilt meter output is 4 V nominal at  $\pm 15^\circ$ . This output can be transmitted over long distances without any signal degradation. Model EAN-93M comes with SDI-12 digital interface such that all sensors can be connected through single bus cable to our compact automatic datalogger.

These tilt meters are fixed on to a vertical or horizontal surface either directly using 4 mounting screws or fasteners or using a mounting kit that allows more flexibility in mounting the tilt meter. Movement of the structure causes change in tilt of the tilt meter, which results in change in output of the sensor. Measurement can be made on horizontal or vertical surfaces. Subsequent sets of readings, shows how the structure is behaving and will give an indication of permanent deformation as time progresses.



### Mounting variants

Model EAN-91M/EAN-93M box type tilt meter is supplied with standard mounting screws/fasteners bracket suitable for wall mounting/vertical surface. However, options are also available on request for mounting the tilt meter on a roof/suspended from ceiling or on the floor.

### EAN-91M-B/EAN-93M-B beam sensors

EAN-91M-B/EAN-93M-B beam sensors consist of model EAN-91M/EAN-93M tilt meter fixed to a beam of length 1 m, 2 m, and 3 m and used for monitoring of differential movement and rotation in structures. The beam sensors are also used for monitoring deflection and deformation of retaining walls. These can be mounted both vertically and horizontally. The individual beam sensors can be used in linked form to give a profile.

## READOUT/DATALOGGER

Model EAN-91M tilt meter and EAN-91M-B beam sensor can be read by our EDI series portable digital read-out unit suitable for MEMS tiltmeters. The readings can also be read or logged at a remote location by an automatic data acquisition system like model EDAS-10. In the latter case also, it is recommended to take readings with readout unit while installation and for troubleshooting until the tilt meter is connected to EDAS-10.

Model EAN-93M tilt meter and EAN-93M-B beam sensor data can be monitored through automatic dataloggers suitable for SDI-12 digital interface sensors like Encardio-rite model ESDL-30.

### Breakout box

Breakout box is used to read the EAN-91M tilt meter and EAN-91M-B beam sensor with our EDI series portable readout unit. It contains a six pin weather proof circular connector that provides fast and easy connection of the 6 core cable of tilt meter to portable readout unit. To read bi-axial tilt meters, a switch is provided for switching and taking readings from both axis. It also is equipped with lightning protection. Breakout box can later on be used to extend the cable of EAN-91M/EAN-91M-B sensors to DAS. Even after connection to DAS, the breakout box has facility to allow readings being taken with EDI series readout unit, if required for troubleshooting.

## SPECIFICATIONS

Sensor	Uniaxial ; Biaxial also available on request
Standard range	$\pm 15^\circ$
Output (nominal) (EAN-91/EAN-91-B)	4 V at $15^\circ$ Proportional to $\sin \theta$ of angle
Output (EAN-93/EAN-93-B)	SDI-12 Serial output
Sensitivity	$\pm 10$ arc second
Accuracy <sup>1</sup>	$\pm 0.1\%$ fs
Temperature limit	-20°C to 80°C
Dimension of box (mm)	125 mm x 80 mm x 57 mm

<sup>1</sup>As tested under laboratory conditions

## ORDERING CODE FOR BEAM SENSOR

**EAN-91M-B-Beam length** (1, 2 or 3 m)

**EAN-93M-B-Beam length** (1, 2 or 3 m)

\*All specifications are subject to change without prior notice