Tilt-Array
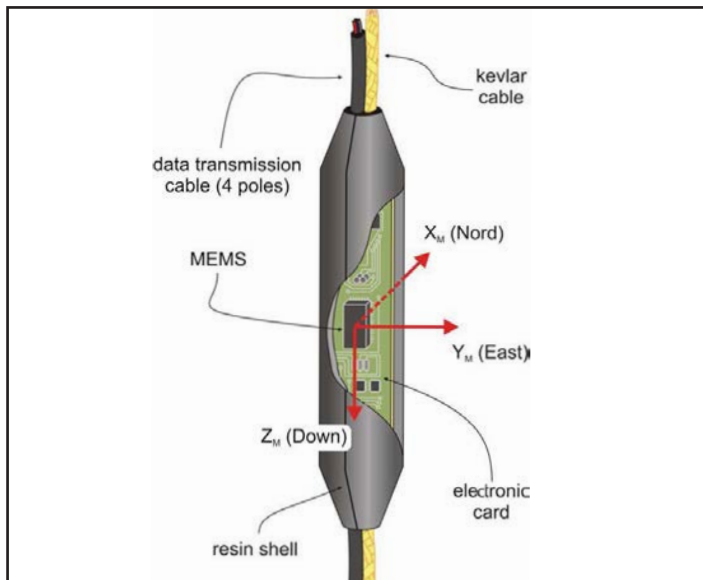
The Geosense® TiltArray™ can be used to monitor the magnitude and direction of lateral deformation vertically, and vertical deformation horizontally

Tilt-Array

Overview

The Geosense® TiltArray™ can be used to monitor the magnitude and direction of lateral deformation vertically, and vertical deformation horizontally.

During manufacture the nodes are installed, connected and tested for a correct response and then moulded along a Kevlar cable at set spacing (usually 0.5 m). Their calibration files are recorded and stored on each node's internal memory and copied to a non-volatile memory (SD card). Once the Geosense® TiltArray™ is connected to a data logger or readout unit the data can be downloaded.

Different types of nodes are available to suit the application and magnitude of deformation expected. In addition Piezometer and Barometric nodes are also available.

The Geosense® TiltArray™ LINK V/H node is able to measure its position form vertical (gravitational acceleration), by means of a MEMS 3D digital linear acceleration sensor and a 3D digital magnetic sensor which enables the heading (azimuth) of each node related to magnetic North.

The Geosense® TiltArray™ LINK HR V/H has a 2D electrolytic sensor which is capable of measuring very small deformations.

The Geosense® TiltArray™ LINK HR 3D V/H combines the features of MEMS 3D digital linear acceleration sensor, a 3D digital magnetic sensor plus a 2D electrolytic sensor which provides flexibility especially if the predicted deformation is unknown.

In addition, each node is equipped with a digital thermocouple which controls any eventual temperature variation and allows for measurement corrections.

APPLICATIONS

Lateral displacement of dams & embankments

Deflection of bridge piers and abutments

Deflection of dam membranes, diaphragm and retaining walls

Stability of tunnels, shafts, underground workings and piled foundations

FEATURES

Can be used vertically & horizontally

3D MEMS digital linear accelerometer

2D electrolytic tilt sensor

3D magnetic sensor

Temperature sensor

Piezometer sensor

Barometric sensor

Maximum outside diameter of 27mm

Waterproofing to 20 bar

Remote data logging

Tilt-Array

Specifications

ITEM	TA -LINK V	TA-LINK H	TA-LINK HR V	TA-LINK HRH	TA-LINK HR 3DV	TALINK HR 3DH
Range	360º	360º	± 50º (linear ± 25º)	± 50º (linear ± 25º)	± 25º ELE 2D 360º ACCEL 60º MAG	± 25º ELE 2D 360º ACCEL 360º MAG
Sensors	MEMS ACCEL 3D MEMS MAG 3D Temperature	MEMS ACCEL 3D MEMS MAG 3D Temperature	ELE 2D	ELE 2D	MEMS ACCEL 3D MEMS MAG 2D EL 2D Temperature	MEMS ACCEL 3D MEMS MAG 2D EL 2D Temperature
Axes	x, y, z	x, y, z	x, y	x, y	x, y, z	x, y, z
Max displacement measurement*	~400mm	~400mm	~150mm	~150mm	~150mm	~150mm
Accelerometer range	± 2g	± 2g	–	–	± 2g	± 2g
Magnetometer range	± 1.3 gauss	± 1.3 gauss	–	–	± 1.3 gauss	± 1.3 gauss
Accelerometer sensitivity	± 20g	± 20g	–	–	± 20g	± 20g
Accelerometer accuracy	± 1mg	± 1mg	–	–	± 1mg	± 1mg
Accelerometer stability	± 0.01% /ºC	± 0.01% /ºC	–	–	± 0.01% /ºC	± 0.01% /ºC
Magnetometer stability	± 0.5mgauss	± 0.5mgauss	–	–	± 0.5mgauss	± 0.5mgauss
Magnetometer sensitivity	± 1% FS/gauss	± 1% FS/gauss	–	–	± 1% FS/gauss	± 1%FS/gauss
Magnetometer resolution	± 0.8mgauss	± 0.8mgauss	–	–	± 0.8mgauss	± 0.8mgauss
Electrolytic sensor linearity (± 25º)	–	–	≤ 1º	≤ 1º	≤ 1º	≤ 1º
Electrolytic sensor resolution	–	–	≤ 0.003º	≤ 0.003º	≤ 0.003º	≤ 0.003º
Electrolytic sensor repeatability	–	–	≤ 0.1º	≤ 0.1º	≤ 0.1º	≤ 0.1º
System accuracy	Site dependent	Site dependent	Site dependent	Site dependent	Site dependent	Site dependent
Node dimension (L x W)	188 x 28mm	188 x 28mm	188 x 28mm	188 x 28mm	188 x 28mm	188 x 28mm
Node centres**	500, 1000mm	500, 1000mm	500, 1000mm	500, 1000mm	500, 1000mm	500, 1000mm
Node weight	159g	159g	159g	159g	159g	159g
Minimum borehole diameter	70mm	70mm	70mm	70mm	70mm	70mm
Kevlar cable strength	1500kg	1500kg	1500kg	1500kg	1500kg	1500kg
Operating temperature	-30 to +85ºC	-30 to +85ºC	-40 to +85ºC	-40 to +85ºC	-40 to +85ºC	-40 to +85ºC
Data retrieval	Manual readout or G8 Logger	Manual readout or G8 Logger	Manual readout or G8 Logger	Manual readout or G8 Logger	Manual readout or G8 Logger	Manual readout or G8 Logger

* Based on 500m centres
** Other centres available on request

Tilt-Array

Installation

INSTALLATION

The installation procedure for the Geosense®
TiltArray™ is similar to that of a standard portable
or In-place inclinometer although as the node
diameter is only 27mm it can be installed into small
boreholes and/or inside old inclinometer casing that
has become redundant due to previous landslide
movements.

Tilt Array Nodes

CENTRALISER
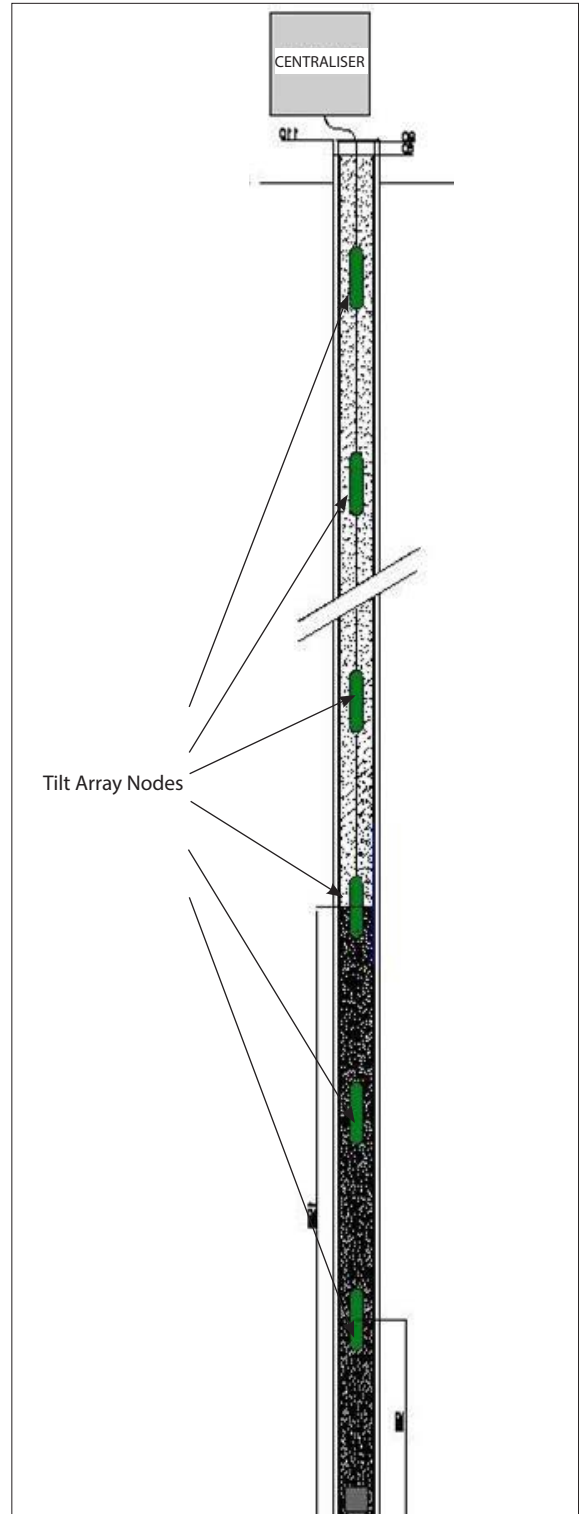
Tilt-Array

Piezo Link & Baro Link

PIEZO LINK

Geosense® TiltArray™ PIEZO LINK has an integral piezometric absolute pressure, thermally compensated sensor which can be used to measure pore water pressure. When used in combination with the TiltArray™ BARO LINK groundwater level can also be measured.

BARO LINK

Geosense® TiltArray™ BARO LINK has an integral absolute pressure sensor for the measurement of atmospheric pressure which can be used for barometric compensation and typically is mounted within the G8 GeoLogger.

PIEZO LINK

Range	2, 3.5, 7, 10, 20, 35 bar
Sensors	Piezometric with absolute calibration & temperature calibration
Nonlinearity	± 0.1% FS
Repeatability	± 0.01% FS
Long term stability	± 0.01% FS
Operating range	-30ºC to + 85 ºC
Node dimension (L x W)	120 x 40mm
Node centres	300, 500, 1000mm
Node weight	290g
Minimum borehole diameter	70mm
Kevlar cable strength	1500kg

BARO LINK

Range	600 – 100m Bar
Sensors	Barometer
Accuracy	± 1% FS
Resolution	1m Bar
Auxiliary input	Current or voltage
Measuring range	4 -20mA / 0-10V
Dimension (L x W X D)	80 x 23 x 45Ømm
Node centres	300, 500, 1000mm