

Horizontal GeoFlex

System Overview

The GeoFlex system is a string of closely spaced MEMS sensors ideal for geotechnical monitoring applications including:

- Monitoring ground movements induced by tunnel construction.
- Monitoring embankment settlement in roadways, levees and retaining walls.
- Monitoring under large diameter storage tanks.
- Monitoring landslide areas above dams, highways, and railroads to provide early warning of slope failure.

Operation

The system can contain up to 200 sensor nodes in a string installed in 85 mm or up to 50 nodes in a 70 mm inclinometer casing.

The casing provides access for subsurface measurements. The joints between sensors are robust, allowing the system to maintain a consistent orientation of all the nodes.

The GeoFlex is typically installed in a horizontal casing that passes through a suspected zone of movement. The nodes are spaced at 50 cm and provide a reading resolution similar to a traversing probe. The system spans the zone of movement and when the ground moves, the casing moves with it, changing the inclination of the nodes inside.

Cumulating the deflections along the string produces a graph of the casing profile. Changes indicate settlement or heave.

The GeoFlex system uses a data acquisition system to transmit readings to a data logger or cloud processing software that can trigger alarms based on displacements.



Advantages

Real Time Monitoring: The GeoFlex system is ideal for continuous, unattended monitoring and can deliver readings in near-real time.

Single-Cable Installation: Each sensor connects to the previous sensor above, requiring only one signal cable for each string and making data logger wiring easy.

Convenient Shipping and Transport: GeoFlex systems are made easy to ship. Five segments, each 0.5 m long, easily fit in a carton measuring approximately 64 x 64 x 64 cm and weighing less than 2.13 kilograms.

This makes the logistics of a GeoFlex installation easy. You can send the packages to a job site through overnight mail, carry a GeoFlex array in the trunk of your car, or even strap it to the cargo rack on an ATV and haul it to a remote job location.

DGSi also offers placement rods to install at the end of the system, letting you save money by only monitoring the zone of interest.

Durable Components: Nodes, cables, connectors and gage rods are exceptionally durable, making it practical to remove the systems at the end of the project and redeploy them on other projects.

Data Reduction: The GeoFlex system outputs the displacement as engineering units, requiring less computing power and a lighter load on your data acquisition system. No need to keep track of what node has what calibration coefficients or what order you installed the segments in – the data logger detects and configures this automatically.

Complete Solutions: DGSi offers complete monitoring solutions that include data loggers and web-based monitoring software that can check for alarm conditions in near-real time and can plot data immediately after retrieving the readings.

GeoFlex System Configuration

A GeoFlex system requires casing, Geoflex Segments, a suspension kit, a bottom/terminal plug and a jumper cable.

Casing: Choose 70 mm or 85 mm diameter inclinometer casing.

GeoFlex Segments: Choose the number of GeoFlex Segments required, and casing diameter.

Suspension Kit: Order one suspension kit for each installation. The kit includes the suspension gate and hardware for securing the first segment.

Signal Cable: Each string requires a bottom plug to seal the end of the signal cable and a jumper cable to connect to the data logger.

Data Logger:

Campbell Scientific: The GeoFlex system works with many Campbell Scientific data loggers. The CR6 or CR1000Xe can log two GeoFlex systems per logger directly. The CR350 can log two GeoFlex strings.

DGSi GTecLink Wireless Dataloggers: Use the GTecLink data loggers for easy wireless data monitoring. The GeoFlex Node works with up to 50 GeoFlex nodes with an external power source or 10 GeoFlex nodes with internal power.

Data Reduction Software: Process the GeoFlex data with a spreadsheet or the Sensly web-based monitoring system.



Standard GeoFlex System

70 mm Inclinometer Casing		
GeoFlex Segment, 2.5 m.	57803900	
GeoFlex Segment, 2.0 m.	57803920	
GeoFlex Segment, 1.5 m.	57803915	
GeoFlex Segment, 1.0 m.	57803910	
GeoFlex Segment, 0.5 m.	57803905	
Dummy Segment, 1.5 m.	57803993	
Dummy Segment, 0.5 m.	57803990	
85 mm Inclinometer Casing		
GeoFlex Segment, 2.5 m.	57803960	
GeoFlex Segment, 2.0 m.	57803980	
GeoFlex Segment, 1.5 m.	57803975	
GeoFlex Segment, 1.0 m.	57803970	
GeoFlex Segment, 0.5 m.	57803965	
Dummy Segment, 1.5 m.	57803995	
Dummy Segment, 0.5 m.	57803992	
Suspension Kit for 85 mm.	57801758	
Bottom/terminal Plug	57802210	
Jumper Cable, 10 m	57802211	
Jumper Cable, 25 m	57802225	
Jumper Cable, 50 m	57802250	

GeoFlex Node Specifications

Sensor Type: MEMS (Micro Electro-Mechanical Systems) tilt sensor for inclination readings in two axes.

Requirements: Minimum supply voltage of 10 Vdc. Maximum supply voltage of 30 Vdc. Digital RS485 signal requires Campbell Scientific or GTecLink data logger.

Weight: 0.426kg per 50cm gauge length.

Calibrated Range: ±30 degrees from horizontal over a temperature range of -10°C to +40°C.

Resolution: 9 arc seconds or 0.04 mm/m using the CR1000XE data logger.

Repeatability: ±82 arc seconds or ±0.4 mm/m.

Required Casing: Fits 70 mm or 85 mm outer diameter inclinometer casing.

Waterproof: Waterproof to 2 MPa.

Jumper Cable: Jumper Cable for connecting the system to the datalogger.

Sensors per Chain: The tables below show nominal limits for chains of nodes.

Number of Nodes	Max Jumper Cable Length, m (12V Supply)	Max Jumper Cable Length, m (24V Supply)
10	320	-
25	122	-
50	52	215
75	24	139
100	5	97
125	-	69
150	-	47
175	-	28
200	-	12

Pull Cable

Pull Cable	50402310
Extra Carabiner	02750012
Extra Saddle Clamp	02700067

Pull cable is 1/8" stranded stainless steel cable and is used to draw probe to far end of casing.

Order one pull cable for each casing installation. If using a dead-end pulley, length of pull cable should be at least twice the length of the casing.

Data Loggers

CR6 Data Logger.	56700006
CR350	56700350
CR1000Xe	56700001
GTecLink GeoFlex Node	57801700
GeoFlex Indicator	57802990

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