GEOSmart IN-PLACE INCLINOMETER (METRIC)

Datasheet C2 GEOSmart

Description

GEOSmart is an in-place inclinometer consisting of closely spaced MEMS (Micro-Electro-Mechanical Sensors) 0.5 metres apart that are mounted on stainless steel tubing with a single cable running the length of the string which reduces the number of cables protruding from the top of the borehole. GEOSmart is installed in either Schedule 40 or 70mm casing and is used to monitor displacement in geotechnical applications including diaphragm walls, embankments, retaining walls, landslides and potential slope failures. Due to its lightweight robust construction with joints capable of bending up to 90º, GEOSmart is conveniently transported to site and can be installed by one site technician.

Features	Benefits
• **Real Time Monitoring**	GEOSmart is ideal for continuous, unattended monitoring and can deliver readings in real time.
• **Sensors are connected sequentially**	Only one signal cable per borehole, quicker installation and simplified connection to the data logger.
• **Borehole displacement in engineering units (mm/m)**	Less post processing in the monitoring software resulting in the reduction of possible calculation errors.
• **Nodes pre-loaded with calibration information**	Quicker and easier installation as segments can be installed in any order.
• **Modular and robust design**	GEOSmart can be removed at the end of the project and redeployed on new applications.
• **Lightweight with joints capable of bending 90°**	Compact and convenient shipping in a box approximately 60 x 60 x 32cm that can be installed on site by one person.

Comprehensive information about this product and our full range is available at soilinstruments.com
If you would like to speak with someone directly please call +44 (0)1825 765044 or email sales@soilinstruments.com

MICROELECTROMECHANICAL SYSTEMS (MEMS)

MEMS

Microelectromechanical Systems, or MEMS, is a technology that uses miniaturised mechanical and electromechanical elements that are made using the techniques of microfabrication. The physical dimensions of MEMS devices can vary from well below one micron all the way to several millimetres.

Our MEMS microsensor is a small discrete device that converts a measured mechanical signal, gravity (g) into a voltage signal.

Operation

The system contains a number of sensor nodes in a vertical string installed in either Schedule 40 PVC or in 70mm inclinometer casing.

The pipe or casing provides access for subsurface measurements. The joints between each sensor are robust, allowing the system to maintain a consistent orientation of all the nodes, regardless of whether it is installed in PVC pipe or ABS inclinometer casing.

The pipe or casing is typically installed in a vertical borehole that passes through a suspected zone of movement. The nodes are spaced 0.5 metres apart and provide a reading resolution similar to a traversing probe. The system spans the zone of movement and when the ground moves, the pipe/casing moves with it, changing the inclination of the nodes inside.

Inclination measurements from the nodes are processed to provide graphs of the casing profile and changes in the profile. Changes indicate displacement (movement). The GEOSmart system is connected to a data acquisition system, and readings are transmitted to processing software that can trigger alarms based on displacements or rate of change.

Associated products

For details on:	Catalogue Number:
Easy Connect (EC) inclinometer casing	C9
Quick Drive inclinometer casing	C9-4
IPI handheld readout	C12 -7.4
Standard inclinometer casing	C18
Data Logger	D1
Argus monitoring software	D4

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GEOSmart System Configuration

GEOSmart is very easy to specify, simply select the casing type, quantity of GEOSmart segments depending on the depth of the borehole, one suspension kit, end plug and signal cable per borehole. GEOSmart is configured automatically so the segments can be installed in any order.

- **Casing:** Choose 70 mm diameter inclinometer casing or Schedule 40 PVC pipe.
- **Suspension Kit:** Order one suspension kit for each borehole. The kit includes the suspension gate and hardware for securing the system.
- **GEOSmart Segments:** Select the quantity of segments required based on the depth of the borehole. When ordering please indicate the type of casing to ensure that the correct centralisers are fitted.
- **GEOSmart Dummy Segments:** The GEOSmart system can also be installed with sensor-less nodes at the top of the string, reducing costs by only monitoring the zone of interest and bypassing the upper layers.
- **Signal Cable:** GEOSmart segments consist of interconnected nodes with a connector at the top and bottom of the segment. An end plug is required for the bottom of the system. A jumper cable connects the top of the system to the data logger.
- **Data Logger:** Soil Instruments work closely with a selection of datalogger suppliers and are able to provide tailored solutions to meet your exact requirements, please contact Soil Instrument's applications team who will be happy to assist you.
- **Data Reduction Software:** Readings retrieved from the logger can be processed manually by spreadsheet or automatically by the Argus web based monitoring system.

Casing

GEOSmart Segments

Suspension Kit

THE TECHNICAL RATING FOR THIS PRODUCT: **INTERMEDIATE**

As the correct installation of any monitoring sensor or system is vital to maximise performance and accuracy, Soil Instruments makes the following recommendations, for the skill level of the installation contractor.

ADDITIONAL SUPPORT
We offer installation and monitoring services to support this system. For more information please email : **sales@soilinstruments.com** or call **+44 (0) 1825 765044**

ADVANCED	The installer is trained and experienced in the installation of this type of instrument or systems, and is ideally a specialist Instrumentation and Monitoring contractor.
INTERMEDIATE	The installer already has previous experience and/or training in the installation of this instrument or system.
BASIC	As a minimum the installer has read and fully comprehends the manual, and if possible has observed these instruments or systems being installed by others.

Specifications

Sensors

Calibrated Range	±30° from vertical over a temperature of –10°C to +40°C
Resolution[1]	9 arc seconds / 0.04 mm/m
Operating Temperature	-20°C to +50°C
Repeatability	±82 arc seconds / 0.4mm/m
Casing Diameter	Fits 70mm OD, Inclinometer casing or 1.5" nominal bore Schedule 40 PVC pipe
Input Voltage	From 10Vdc to 30Vdc
Distance Between Sensors	0.5m
Minimum Number of Sensors	2
Maximum Number of Sensors	200
Ingress Protection	IP68 to 2MPa

Cable Length Specification

	Maximum distance between top of borehole and datalogger	
Number of Nodes	Cable Length (12Vdc Supply)	Cable Length (24Vdc Supply)
10	320	-
25	122	-
50	52	215
75	24	139
100	5	97
125	-	69
150	-	47
175	-	28
200	-	12

Data Loggers

Dataloggers can be customised to meet your individual requirements, please contact Soil Instruments for more information.

Ordering Information

C2 - GEOSmart Segments

for 70mm casing. Include +/- 30° biaxial sensor.

C2-SEG-2.5MC	GEOSmart segment 2.5m length, 5 nodes for casing
C2-SEG-2.0MC	GEOSmart segment 2.0m length, 4 nodes for casing
C2-SEG-1.5MC	GEOSmart segment 1.5m length, 3 nodes for casing
C2-SEG-1.0MC	GEOSmart segment 1.0m length, 2 nodes for casing
C2-SEG-0.5MC	GEOSmart segment 0.5m length, 1 node for casing
C2-DUM-1.5MC	GEOSmart Dummy Segment 1.5m length for casing
C2-DUM-0.5MC	GEOSmart Dummy Segment 0.5m length for casing

C2 - GEOSmart Segments

for 1.5" nominal bore Schedule 40 PVC pipe. Include +/- 30° biaxial sensor.

C2-SEG-2.5MP	GEOSmart segment 2.5m length, 5 nodes for PVC
C2-SEG-2.0MP	GEOSmart segment 2.0m length, 4 nodes for PVC
C2-SEG-1.5MP	GEOSmart segment 1.5m length, 3 nodes for PVC
C2-SEG-1.0MP	GEOSmart segment 1.0m length, 2 nodes for PVC
C2-SEG-0.5MP	GEOSmart segment 0.5m length, 1 node for PVC
C2-DUM-1.5MP	GEOSmart Dummy Segment 1.5m length for PVC
C2-DUM-0.5MP	GEOSmart Dummy Segment 0.5m length for PVC

C2 - GEOSmart Suspension Kit

C2-SUS-P	GEOSmart Suspension Kit for PVC
C2-SUS-C	GEOSmart Suspension Kit for 70mm Casing

C2 - Jumper Cables

C2-JUM-25M	Jumper cable, 25m, GEOSmart to Logger
C2-JUM-50M	Jumper cable, 50m, GEOSmart to Logger

C2 - End Plug

C2-END-6P	GEOSmart End Plug (6 pin)

C2 - Accessories

C2-CEN-P	GEOSmart Centralizer for PVC
C2-CEN-C	GEOSmart Centralizer for 70mm Casing
C2-CLEV-1	Clevis Pin

Manuals

MAN-SET-CD	CD Containing all product manuals

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