

# **INCLINOMETER PROBES**

The inclinometer probe consists of a wheeled torpedo equipped with force-balanced or solid-state accelerometers which provide high precision, durability and quick response.

Sigeo inclinometer probes can be used in conjunction with all commercial available inclinometer casing with ID grooves from 38 mm to 84 mm.

Inclinometer probe is supplied with a robust anti-shock plastic ABS carrying case with place for the dummy probe too.

Horizontal uniaxial accelerometer probe is also available for monitoring vertical movements (settlement or heave).

**Monitoring of lateral earth movements in landslide areas**

**Detecting the shear planes in earthfill dams**

**Deformation of tunnels, excavation walls and shafts**

**Horizontal inclinometers are used to control settlement in foundations or embankments**



# INCLINOMETER PROBES

## INCLINOMETER SYSTEM PERFORMANCES (with ARCHIMEDE datalogger)

Readout value	<b>20.000 sin alpha</b> (for both probe)	It is the amplified value of angle that can be read on the digital readout, expressed in sin alpha
Repeatability	<b>± 0.050mm x 500mm</b> (with servo-probe, ± 30°) <b>± 0.075mm x 500mm</b> (with MEMS probe, ± 30°)	It is the difference between two or more repeated readings taken at the same inclination
Reading resolution	<b>± 0.025mm x 500mm</b> (for both probe)	It is the smallest increment in angle resolution change that can be read on the readout display as 1 digit
Sensor orientation	<b>0.5 dg</b> (for both probes)	It is the maximum azimuthal rotation between the probe wheels and sensitive axis of the sensor. Differences in rotation introduce systematic error declared in the calibration sheet. The value of 0.5° introduces a negligible error that doesn't require any data correction
Total accuracy	<b>± 3.00 mm x 30 m</b> (with servo-probe, ± 30°) <b>± 4.00 mm x 30 m</b> (with MEMS probe, ± 30°)	It is the system accuracy attainable during the measurements in field. It is expressed as lateral deviation over a length of 30 m of casing, correctly installed (vertical deviation within 3°)

## TECHNICAL SPECIFICATIONS

	Model OS242SV3000	Model OS242HV3000	Model OS241HH3000
Applications	(sub)vertical casing	(sub)vertical casing	horizontal casing
Sensor	force balance servo-accelerometer	solid-state accelerometer (MEMS technology)	solid-state accelerometer (MEMS technology)
Measuring range	±30° (±90°optional)	±30° (±90°optional)	±30°
Sensitive axis	one or two	one or two	one
Electric output signal	±5 V at full scale	±2 V at full scale	± 2 V at full scale
Excitation voltage	±12 to ±15 V	10 to 30 V	10 to 30 V
Resolution	3.0x10 <sup>-6</sup> rad	4.3x10 <sup>-5</sup> rad	4.3x10 <sup>-5</sup> rad
Non-linearity + hysteresis	0.02% FS (for ±90°probe: 0.06% FS)	0.05% FS (for ±90°probe: 0.20% FS)	0.05% FS
Repeatability	0.01%FS (for ±90°probe: 0.02% FS)	0.05%FS (for ±90°probe: 0.20% FS)	0.05%FS
Temp. operating range	from -40°C to +80°C	from -20°C to +70°C	from -20°C to +70°C
Scale thermal factor sensitivity	±0.0002% / °C	±0.01% / °C	±0.01% / °C
Material	stainless steel	stainless steel	stainless steel
Diameter	28 mm	28 mm	28 mm
Length (without connector)	750 mm	750 mm	750 mm
Wheel carriage	pair of wheels mounted on long-life sealed ball bearings	pair of wheels mounted on long-life sealed ball bearings	pair of wheels mounted on long-life sealed ball bearings
Wheel diameter	32 mm	32 mm	32 mm
Distance between wheel axis	500 mm (metric)	500 mm (metric)	500 mm (metric)
Weight	2.0 kg	2.0 kg	2.0 kg

**CE** electromagnetic compatibility according to EN 61326-1 and EN 61326-A1 directives for EMC emission and immunity

## INCLINOMETER CABLE (PRODUCT CODE OWE306KE000)



Inclinometer cable is used to position the probe in the casing. It has 6 electrical leads – 18 AWG - conducting power and signal. The external yellow polyurethane jacket with copper crimped depth marks resists abrasions and chemicals. A stainless steel shield moulded within the external jacket reduces cable twisting and a stainless steel core wire controls stretching. An internal binder sheath eliminates slipping of the single conductors relative to the external cable jacket. Cable is supplied in specified lengths graduated every 500 mm, wrapped on a portable cable reel with the connector of probe attached at factory. Probe connector is stainless steel made watertight up to 20 bar.

Cable lengths 30,50,60,100,150,200 m

Graduation	500 mm (metric)
Layout	6 conductors 18 AWG
Depth tactile marks	every 500 mm
Stress member	steel core, diam. 2.5 mm
Max strength	500 kg
Outer jacket	yellow colour polyurethane
Overall diameter	nominal 12 mm

## ARCHIMEDE INCLINOMETER READOUT



Archimede is a battery operated datalogger with a large graphic color backlight display, housed in a crushproof, water-resistant plastic case. This datalogger has been specially designed for field use in heavy operating conditions. A convenient remote handswitch allows one-man surveys. Its powerful display is able to show a preliminary inclinometer graphs on field.

Archimede could be supplied with a Bluetooth interface in order to sent stored data to the office by means of smartphone.

SMART Manager Suite is the software package designed by Sisgeo that permits to manage Archimede directly on you PC, automatically update FW and SW and obtain on-line technical assistance.

### Electronic performances

A/D converter	2 x 24 bit
Input impedance	>10 MΩ for voltage <2.5 V
Resolution	10 μV with FS ±400 mV 100 μV with FS ±5 V 100 μV with FS ±12 V
Accuracy	0.01 % FS

### Data capacity

Storage memory	2 GB
Max depth	500 m, according to the inclinometer system features
Reading interval	0.5 m, 1.0 m

### Display

Display	TFT color graphic, LCD backlight sunlight reliable
Size	320 x 240 pixel

### COMS port

Speed	USB 2.0 1.0 Mbit/sec
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### Batteries

Operating time	12 V – 4.5 Ah – Ni-MH approximately 8 hours
Recharging time	2.5 hours

### Probe power supply

Probe power supply	± 12 V for servo-accelerometer probe 12 V for MEMS probes ± 2.5 V for spiral meter
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### Other features

Operating temp. range	-20°C to +60°C
Storage temperature	-30° C +85° C
Case	crushproof ABS, IP67
Dimensions	200 x 280 x 65 mm
Weight	2 kg

## INCLi2 INCLINOMETER SOFTWARE

Inclinometer data are managed by **INCLi2** a software designed by FIELD. Data files can be created by manual data entry or directly from ARCHIMEDE datalogger through its USB COM port. Software functions can be selected through the main menu.

### DATA PROCESSING

The deflection curve of inclinometer casing is calculated by reading the probe rotation angle - at different measuring depths - related to the vertical Z-X and Z-Y planes. Data processing allows the following choices:

**absolute:** providing the actual profile of casing according to the three coordinate axis;

**differential:** the most common type of processing. The displacements of the inclinometer casing are referred to the initial reading;

**local:** showing local displacements at each depth with reference to the initial reading;

**local displacement versus time:** deformation versus time of reading at the same depth.

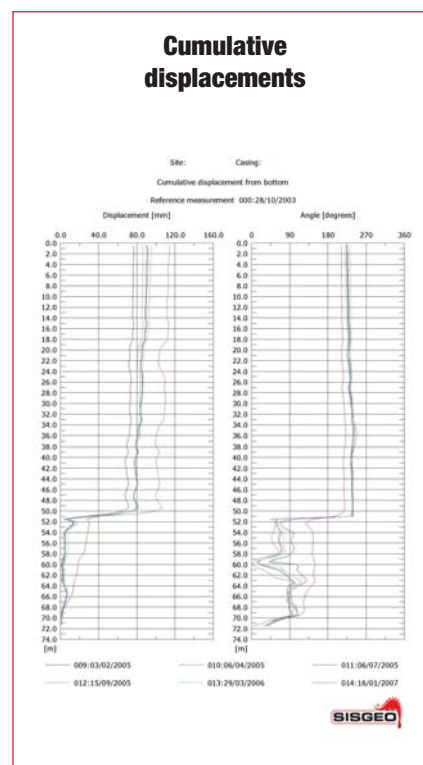
### Operative System requirements

INCLi2 works on Microsoft® Win 95/98, 2000, Millenium, NT, XP, Vista 32 and 64 bit, Windows 7 32 and 64 bit.



### FEATURES

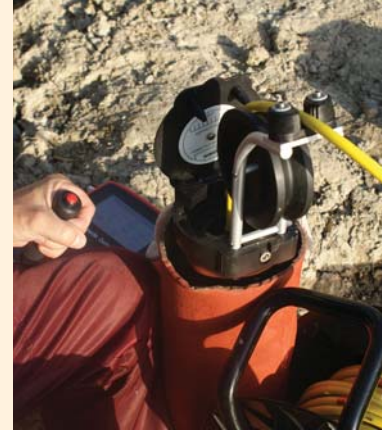
- Instant screen graphics allow the measurement status checks, reducing time and the need for printed copy.
- Choice of plot types includes vertical checks, absolute position, displacement/time plots, and various combinations of incremental and cumulative displacement.
- User could choose between 5 different languages: Italian, English, Spanish, Russian and Turkish.
- Simplified management of inclinometer casing sites and relative measures
- Up to 30 measures displayed at the same time.
- Tables and graphics printer preview.
- Graphic output file creation.



# INCLINOMETER PROBES

## ACCESSORIES AND SPARE PARTS TESTS

<b>0S1CSU10000</b>	<b>Pulley and cable stop</b>	Fixed to the top of the casing and used to hold the cable during measurements
<b>0S2RC000000</b>	<b>Operating cable reel</b>	The cable reel is supplied with the inclinometer cable and water-tight connector. Available with 30, 50, 60, 100, 150, 200 m cable
<b>0S21ST00000</b>	<b>Test (dummy) probe</b>	Dummy probe to check the integrity of any installed inclinometer casing, prior to surveying with the measuring probe. It has the same physical dimensions as the measuring probe and it is supplied with steel wire with vinyl jacket and cable reel
<b>0S2CON00S00</b>	<b>Watertight connector</b>	Spare part to permit the connection between the inclinometer probe and the cable. It is mounted on the inclinometer cable
<b>0S2SET02B00</b>	<b>Swing wheel spare set</b>	Each set includes two stainless steel wheel carriages



Pulley and cable stop

## CALIBRATION FRAME (PRODUCT CODE 0S0WICAL1000)



It is used to check the calibration of the inclinometer probes. The calibration frame consists of an anodized aluminium frame with a pivoting arm made by a length of epoxy painted inclinometer casing. The pivoting arm permits calibration at  $-11^\circ$ ,  $-6^\circ$ , zero,  $+6^\circ$  and  $+11^\circ$ . The frame is ready for wall mounting.

### TECHNICAL SPECIFICATIONS

Material	epoxy painted aluminium
Inclinometer casing length	630 mm
Number of calibration positions	Five (5)
Calibration positions	$-11^\circ$ , $-6^\circ$ , zero, $+6^\circ$ , $+11^\circ$
Dimensions	350 x 800 x 127 mm

## SPIRAL PROBE (PRODUCT CODE 0S30PR120000)

Spiral probe is used to define the true azimuth of inclinometer casing after installation. Spiral probe provides measurements that can be used to correct the data obtained from twisted inclinometer tubes. Fully compatible with inclinometer operating cable and Archimede portable datalogger. During measurements the spiral probe, connected to the inclinometer cable and readout, is lowered to the bottom of casing. Readings are taken at 1 meter intervals as the probe is drawn through to the top of the tube.

Type of sensor	Rotary contactless potentiometer (magneto-resistive)
Measuring range	$\pm 5$ degrees over the probe length (1 meter)
Resolution	$\pm 0.01^\circ$
Accuracy	$< 0.5\%$ FS
Output signal	$\pm 200$ mV at FS
Power supply	$\pm 2.5$ V DC
Connector	watertight, 6 pins compatible with inclinometer operating cable
Diameter	28 mm
Overall length	1.263 mm (without connector)
Wheel distance	1.000 mm



[www.sisgeo.com](http://www.sisgeo.com)

**SISGEO s.r.l.** Via F. Serpero 4/F1 20060 Masate (MI) Italy Ph +39 02 95764130 Fax +39 02 95762011  
[info@sisgeo.com](mailto:info@sisgeo.com)

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