INCLINOMETER PROBES

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

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

INCLINOMETER SYSTEM PERFORMANCES (with ARCHIMEDE datalogger)

Readout value 20,000 sin alpha (for both probe) It is the amplified value of angle that can be read on the digital readout, expressed in sin alpha
Repeatability ± 0.050mm x 500mm (with servo-probe, ± 30°) It is the difference between two or more repeated readings taken at ± 0.075mm x 500mm (with MEMS probe, ± 30°) the same inclination
Reading resolution ± 0.025mm x 500mm (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 0.5 dg (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 ± 3.00 mm x 30 m (with servo-probe, ± 30°) It is the system accuracy attainable during the measurements in field. ± 4.00 mm x 30 m (with MEMS probe, ± 30°) It is expressed as lateral deviation over a length of 30 m of casing, correctly installed (vertical deviation within 3°)
### Applications
- Model OS242SV3000: (sub)vertical casing
- Model OS242HV3000: horizontal casing
- Model OS241HH3000: horizontal casing

### Sensor
- Model OS242SV3000: force balance servo-accelerometer (MEMS technology)
- Model OS242HV3000: solid-state accelerometer (MEMS technology)
- Model OS241HH3000: solid-state accelerometer (MEMS technology)

### Measuring range
- Model OS242SV3000: ±30° (±90°optional)
- Model OS242HV3000: ±30° (±90°optional)
- Model OS241HH3000: ±30°

### Sensitive axis
- Model OS242SV3000: one or two
- Model OS242HV3000: one or two
- Model OS241HH3000: one

### Electric output signal
- Model OS242SV3000: ±5 V at full scale
- Model OS242HV3000: ±2 V at full scale
- Model OS241HH3000: ±2 V at full scale

### Excitation voltage
- Model OS242SV3000: 10 to 30 V
- Model OS242HV3000: 10 to 30 V
- Model OS241HH3000: 10 to 30 V

### Resolution
- Model OS242SV3000: 3.0x10^-6 rad
- Model OS242HV3000: 4.3x10^-5 rad
- Model OS241HH3000: 4.3x10^-5 rad

### Non-linearity + hysteresis
- Model OS242SV3000: 0.02% FS (for ±90°probe: 0.06% FS)
- Model OS242HV3000: 0.05% FS (for ±90°probe: 0.20% FS)
- Model OS241HH3000: 0.05% FS

### Repeatability
- Model OS242SV3000: 0.01%FS (for ±90°probe: 0.02% FS)
- Model OS242HV3000: 0.05%FS (for ±90°probe: 0.20% FS)
- Model OS241HH3000: 0.05%FS

### Temp. operating range
- Model OS242SV3000: from –40°C to +80°C
- Model OS242HV3000: from –20°C to +70°C
- Model OS241HH3000: from –20°C to +70°C

### Scale thermal factor sensitivity
- Model OS242SV3000: ±0.0002% / °C
- Model OS242HV3000: ±0.01% / °C
- Model OS241HH3000: ±0.01% / °C

### Material
- Model OS242SV3000: stainless steel
- Model OS242HV3000: stainless steel
- Model OS241HH3000: stainless steel

### Diameter
- Model OS242SV3000: 28 mm
- Model OS242HV3000: 28 mm
- Model OS241HH3000: 28 mm

### Length (without connector)
- Model OS242SV3000: 750 mm
- Model OS242HV3000: 750 mm
- Model OS241HH3000: 750 mm

### Wheel carriage
- Model OS242SV3000: pair of wheels mounted on long-life sealed ball bearings
- Model OS242HV3000: pair of wheels mounted on long-life sealed ball bearings
- Model OS241HH3000: pair of wheels mounted on long-life sealed ball bearings

### Wheel diameter
- Model OS242SV3000: 32 mm
- Model OS242HV3000: 32 mm
- Model OS241HH3000: 32 mm

### Distance between wheel axis
- Model OS242SV3000: 500 mm (metric)
- Model OS242HV3000: 500 mm (metric)
- Model OS241HH3000: 500 mm (metric)

### Weight
- Model OS242SV3000: 2.0 kg
- Model OS242HV3000: 2.0 kg
- Model OS241HH3000: 2.0 kg

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### INCLINOMETER CABLE (PRODUCT CODE SIS306KE000)

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.

### Specification
- 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 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 that permits to manage Archimede directly on you PC, automatically update FW and SW and obtain on-line technical

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<tr>
<td>A/D converter</td>
<td>2 x 24 bit</td>
<td>Operating time approximatelly 8 hours</td>
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<tr>
<td>Input impedance</td>
<td>&gt;10 MΩ for voltage &lt;2.5 V</td>
<td>Recharging time 2.5 hours</td>
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<td>Resolution</td>
<td>10 μV with FS ±400 mV</td>
<td>Probe power supply ± 12 V for servo-accelerometer probe</td>
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<td></td>
<td>100 μV with FS ±5 V</td>
<td>12 V for MEMS probes</td>
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<tr>
<td></td>
<td>100 μV with FS ±12 V</td>
<td>± 2.5 V for spiral meter</td>
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<tr>
<td>Accuracy</td>
<td>0.01 % FS</td>
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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 data are managed by 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.

ACCESSORIES AND SPARE PARTS TESTS

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<th>Details</th>
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<td>Pulley and cable stop SIS 0S1CSU10000</td>
<td>Fixed to the top of the casing and used to hold the cable during measurements</td>
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<tr>
<td>Operating cable reel SIS 0S2RC000000</td>
<td>The cable reel is supplied with the inclinometer cable and water-tight connector. Available with 30, 50, 60, 100, 150, 200 m cable</td>
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<tr>
<td>Test (dummy) probe SIS 0S21ST00000</td>
<td>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</td>
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<tr>
<td>Watertight connector SIS 0S2CON000S00</td>
<td>Spare part to permit the connection between the inclinometer probe and the cable. It is mounted on the inclinometer cable</td>
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<td>Swing wheel spare set SIS 0S2SET02B00</td>
<td>Each set includes two stainless steel wheel carriages</td>
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