



# Inclination



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## Inclination

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# IN910

## Inclinometric system



### Description

SIM STRUMENTI, in order to measure the landslide movements, has developed the IN910 inclinometric system that has high quality features and also has easy and comfortable usage.

Cured mechanical features, joint with advanced electronics, allow optimizing the measurements without filling endless data.

The software, supply with the acquisition system, can automatically measure the A and B components at specific depths.

The inclinometer probe consists of two wheel-carriages and a central part containing the sensor. The distance between the two carriages (probe step) is 500mm.

The electric cable, equipped with waterproof connector up to 50 bar, is used as supporter for the probe during measurement. The cable has a kevlar core, which assure to cable a non-extendable feature and positioning precision.

The cable is also equipped with reference marks every 50cm and it has a max error of  $\pm 5\text{cm}/100\text{m}$  and a max extensibility, with 20Kg load, of  $<0,05\%$  of the nominal cable length.

SIM supplies, upon request, a dummy probe, which allows to test of the inclinometric casing before measuring, in order to avoid jamming the probe into the tube.

The probe is delivered with a rugged suitcase, used for the inclinometer transportation and the eventual dummy probe.

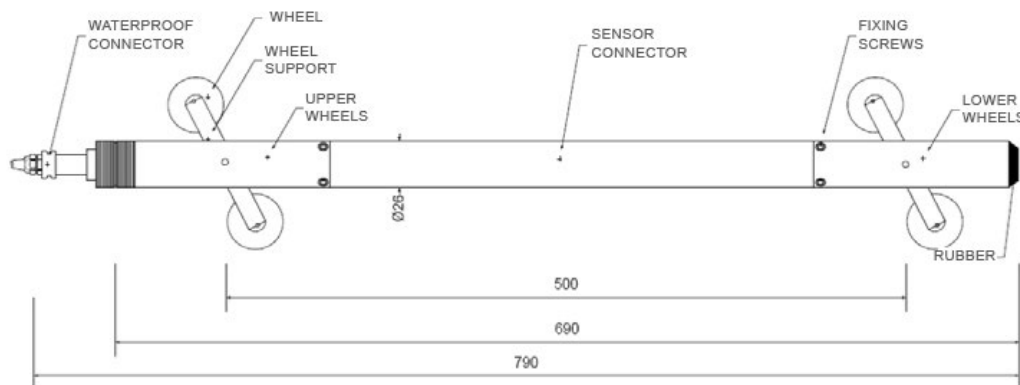
### Applications

Landslides monitoring, dams monitoring etc.



# IN910

## Inclinometric system



### Technical features

|                           |                     |
|---------------------------|---------------------|
| Model                     | <b>IN910-SV-FS*</b> |
| Sensor                    | Servoaccelerometer  |
| Range                     | ±15, ±30            |
| Supply                    | ±15Vcc              |
| Output                    | ±5V                 |
| Linearity                 | 0.02% FS            |
| Repeatability             | 0.005%              |
| Alignment                 | 0.2°                |
| Zero shift in temperature | 0.005% FS/°C        |
| Temperature sensitivity   | 0.0005 V/°C         |
| Operating temperature     | -10 ÷ +50 °C        |
| Diameter                  | 26 mm               |
| Length                    | 690 mm              |
| Probe step                | 500 mm              |
| Weight                    | 2.8 Kg              |
| Probe accuracy (20mt)     | 2 mm                |
| Material                  | Stainless steel     |

|                                        |                                     |
|----------------------------------------|-------------------------------------|
| <b>Inclinometric cable</b>             | <b>IN910-6022-MM**</b>              |
| Conductors / Shielding / Reinforcement | 5x0.15 / copper / kevlar braid      |
| Square footage                         | Stainless steel notches every 0.5mt |
| Diameter                               | Ø6.5 mm                             |
| Weight                                 | 53g / 1mt                           |
| Reel weight with 50m cable             | ~4Kg                                |

|                     |                                      |
|---------------------|--------------------------------------|
| <b>Readout unit</b> | <b>INCLAB</b>                        |
| <b>Software</b>     | <b>INCLAB Manager and Processing</b> |

### Accessories

|                                                 |                        |
|-------------------------------------------------|------------------------|
| <b>Dummy probe</b>                              | <b>IN910-DP01</b>      |
| <b>Cable for dummy probe including reel</b>     | <b>IN910-CR02-MM**</b> |
| <b>Wheels (4), springs (2), pins (4) kit</b>    | <b>IN910-KT01</b>      |
| <b>Caps (2) kit for inclinometer connectors</b> | <b>IN910-KT02</b>      |
| <b>Cable stop</b>                               | <b>IN910-FECV</b>      |
| <b>Bag</b>                                      | <b>IN910-BRIN</b>      |
| <b>Plastic reel for 50 mt</b>                   | <b>IN910-RP50</b>      |
| <b>Plastic reel for 50 mt</b>                   | <b>IN910-RM50</b>      |
| <b>Plastic reel for 100 mt</b>                  | <b>IN910-RP00</b>      |

\*FS Indicate the range  
 \*\*MM Indicate the meters

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# IN915

## Horizontal inclinometer



### Description

SIM STRUMENTI developed the IN915 inclinometer system to control movement and settlements in embankments or foundations.

The mechanical components combined with state of the art electronics, allows optimizing the execution of site measurements, without having to manually insert big amount of data.

The INCLAB Manager & Processing software supplied as standard with the measuring system INCLAB, which automatically detects measurements at the desired distance.

The inclinometer probe consists of two wheel carriers and a central sensor-holder part. It can be equipped with one or two mounted sensors placed at 180° from each other and. The distance between the trolleys (probe step) is equal to half a meter.

The electric connection cable is equipped with a waterproof connector up to 50 bar. A special kevlar core gives the cable an inextensible feature, which guarantees reliability and precision while positioning.

The cable is also equipped with stainless steel reference notches every half meter and can have a maximum error on the length of  $\pm 5\text{cm} / 100\text{m}$  and a stretch, with a load of 20Kg, less than 0.05% of the nominal length.

SIM STRUMENTI provides, upon request, a test probe that allows test the tube before carrying out the measurement, avoiding the risk that the inclinometer probe gets stuck inside the tube.

The inclinometer probe is supplied with a strong carrying case, with the appropriate space for a possible test probe. Upon request it is available a dragging cable, necessary for moving the probe inside the inclinometer tube. If the inclinometer tube is not reachable from both sides, it is possible to order a pulley (placed in a watertight container) and a protection tube, to be positioned parallel to the inclinometer tube, necessary for dragging the probe.

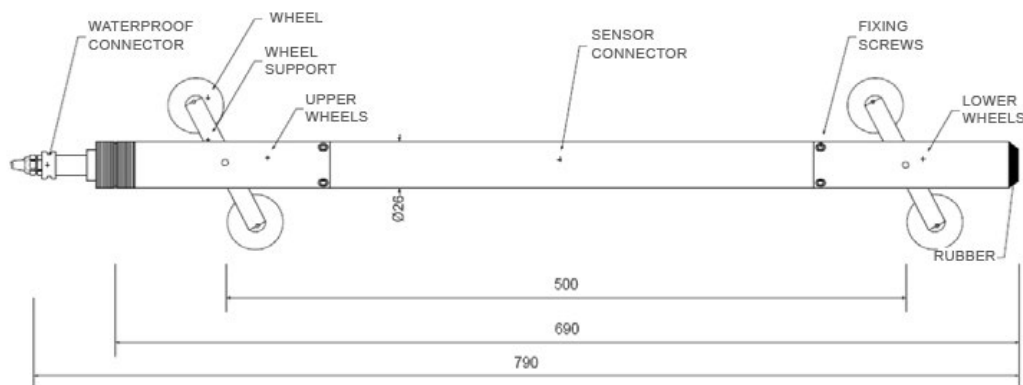
### Applications

Monitoring of embankments, etc.



# IN915

## Horizontal inclinometer



### Technical features

|                           |                     |
|---------------------------|---------------------|
| Model                     | <b>IN915-SV-FS*</b> |
| Sensor                    | Servoaccelerometer  |
| Range                     | $\pm 15, \pm 30$    |
| Supply                    | $\pm 15V_{cc}$      |
| Output                    | $\pm 5V$            |
| Linearity                 | 0.02% FS            |
| Repeatability             | 0.005%              |
| Alignment                 | 0.2°                |
| Zero shift in temperature | 0.005% FS/°C        |
| Temperature sensibility   | 0.0005 V/°C         |
| Operating temperature     | -10 ÷ +50 °C        |
| Diameter                  | 26 mm               |
| Length                    | 690 mm              |
| Probe step                | 500 mm              |
| Weight                    | 2.8 Kg              |
| Probe accuracy (20mt)     | 2 mm                |
| Material                  | Stainless Steel     |

### Inclinometric cable

### IN910-6022-MM\*\*

|                                        |                                     |
|----------------------------------------|-------------------------------------|
| Conductors / Shielding / Reinforcement | 5x0.15 / copper / kevlar braid      |
| Square footage                         | Stainless Steel notches every 0.5mt |
| Diameter                               | Ø6.5 mm                             |
| Weight                                 | 53g / 1mt                           |
| Reel weight with 50m cable             | ~4Kg                                |

### Readout unit

### INCLAB

### Software

### INCLAB Manager and Processing

### Accessories

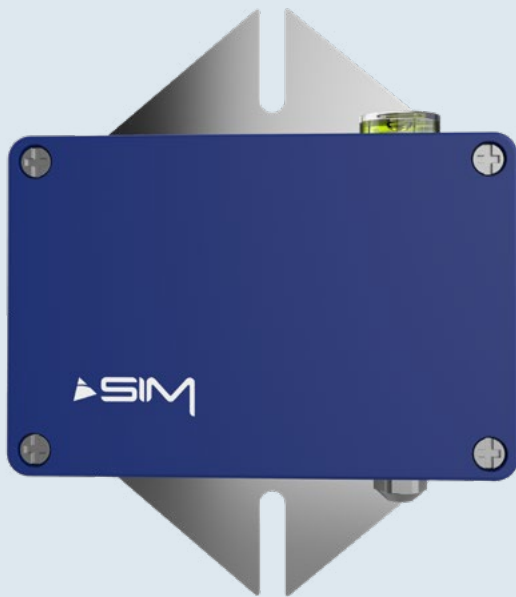
|                                                 |                        |
|-------------------------------------------------|------------------------|
| <b>Test probe</b>                               | <b>IN915-DP01</b>      |
| <b>Test probe cable (reel included)</b>         | <b>IN915-CR02-MM**</b> |
| <b>Kit of wheels (4), springs (2), pins (4)</b> | <b>IN915-KT01</b>      |
| <b>Kit of plugs (2)</b>                         | <b>IN915-KT02</b>      |
| <b>Watertight box with pulley</b>               | <b>IN915-CR00</b>      |
| <b>Dragging tube</b>                            | <b>IN915-CRTU</b>      |
| <b>Dragging cable</b>                           | <b>IN915-AC-MM**</b>   |

\*FS Indicate the range  
 \*\*MM Indicate the meters



# IN920

## Wall fixed inclinometer (tiltmeter)



### Description

With the purpose of constantly controlling structures subject to any kind of rotations, SIM STRUMENTI has developed the wall inclinometers series IN920. These sensors can measure the rotational movement of structures, and they are available with fixed bracket, uniaxial ( $0.5 - 10^\circ$ ) or biaxial ( $3 - 10^\circ$ ), having an electrolytic sensor.

The uniaxial versions are equipped with adjustment bracket for easy levelling. Mounted on a special metal bar provided by the SIM STRUMENTI, they become tilt beam sensors, able to monitor the inclination between two fixed points. Bars are available from 1, 2 or 3 meters. The mounting brackets are different for horizontal (floor) or vertical mounting (wall). The sensors can be mounted to measure the inclination along the axis of the bar or at  $90^\circ$  of it.

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

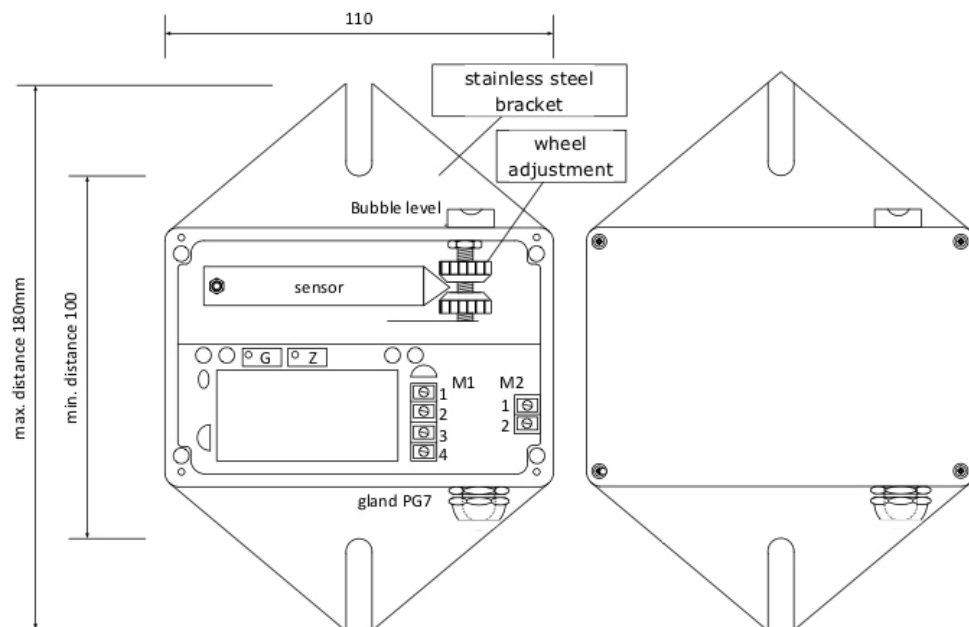
### Applications

Structural monitoring of civil and industrial buildings.



# IN920

## Wall fixed inclinometer (tiltmeter)



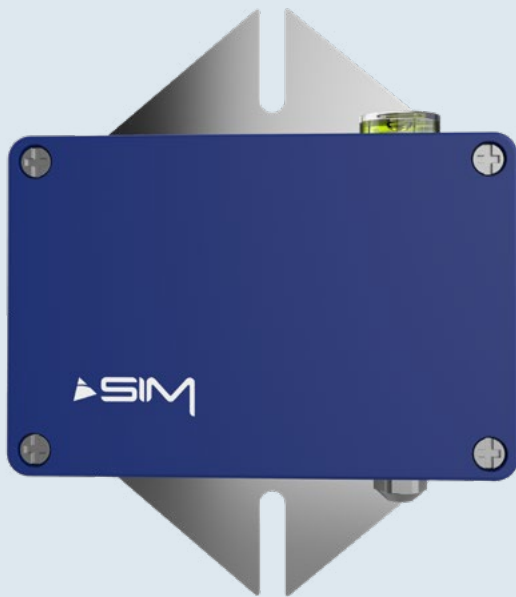
| Technical features                     |         |                                                        |                                                        |
|----------------------------------------|---------|--------------------------------------------------------|--------------------------------------------------------|
| Model                                  |         | <b>IN920-EL-V-XX-FS*</b>                               | <b>IN920-EL-A-XX-FS*</b>                               |
| Sensor                                 |         | Electrolytic                                           | Electrolytic                                           |
| Range                                  |         | ±0.5°, ±1°                      ±3°, ±5°, ±10°         | ±0.75°, ±1.5°, ±3°, ±5°, ±7.5°, ±10°                   |
| Supply                                 |         | 8-24 Vcc                                               | 12-24 Vcc                                              |
| Output                                 |         | Not linear ±1800mV                                     | Linear ±2V                                             |
| Consumption                            |         | 50 mA                                                  | 50 mA                                                  |
| Linearity                              |         | 0.3%FS                                                 | 0.3%FS                                                 |
| Temperature variation                  |         | 0.0008°/ C                                             | 0.0008°/ C                                             |
| Repeatability                          |         | 0.0008° from 0.5° to 3° FS<br>0.005° from 5° to 10° FS | 0.0008° from 0.5° to 3° FS<br>0.005° from 5° to 10° FS |
| Operating temperature                  |         | -20 ÷ 70°C                                             | -20 ÷ 70°C                                             |
| Protection                             |         | IP65 / IP68 **                                         | IP65 / IP68 **                                         |
| Material                               | Body    | Polyester reinforced with Fiberglass                   | Polyester reinforced with Fiberglass                   |
|                                        | Bracket | Stainless steel                                        | Stainless steel                                        |
| Dimensions                             |         | 180x111x60 mm (including bracket)                      | 180x111x60 mm (including bracket)                      |
| Weight                                 |         | 0.875 Kg (including bracket)                           | 0.875 Kg (including bracket)                           |
| Accessories                            |         |                                                        |                                                        |
| <b>Bracket kit for wall mounting</b>   |         | <b>IN920-MR11</b>                                      |                                                        |
| <b>1mt bar</b>                         |         | <b>IN920-BR01</b>                                      |                                                        |
| <b>2mt bar</b>                         |         | <b>IN920-BR02</b>                                      |                                                        |
| <b>3mt bar</b>                         |         | <b>IN920-BR03</b>                                      |                                                        |
| <b>Mounting kit for horizontal bar</b> |         | <b>IN920-STMU</b>                                      |                                                        |
| <b>Mounting kit for vertical bar</b>   |         | <b>IN920-STTE</b>                                      |                                                        |

\*FS Indicate the range  
 \*XX Indicate -MO uniaxial or -BI biaxial  
 \*\* Specify at the order



# IN921

## Wall fixed inclinometer



### Description

In order to keep under constant control structures affected by rotations of any kind and to provide them with an adequate control system and alarm, SIM STRUMENTI developed the IN921 wall fixed inclinometers series.

Equipped with a servoaccelerometer MEMS technology, this instrument detects the angular rotations of the structures and is supplied as standard with wall mounting brackets. It is available in the single-axis version or in a biaxial version. This sensor detects angular rotations of the structures, providing useful indications regarding the rotational movements.

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

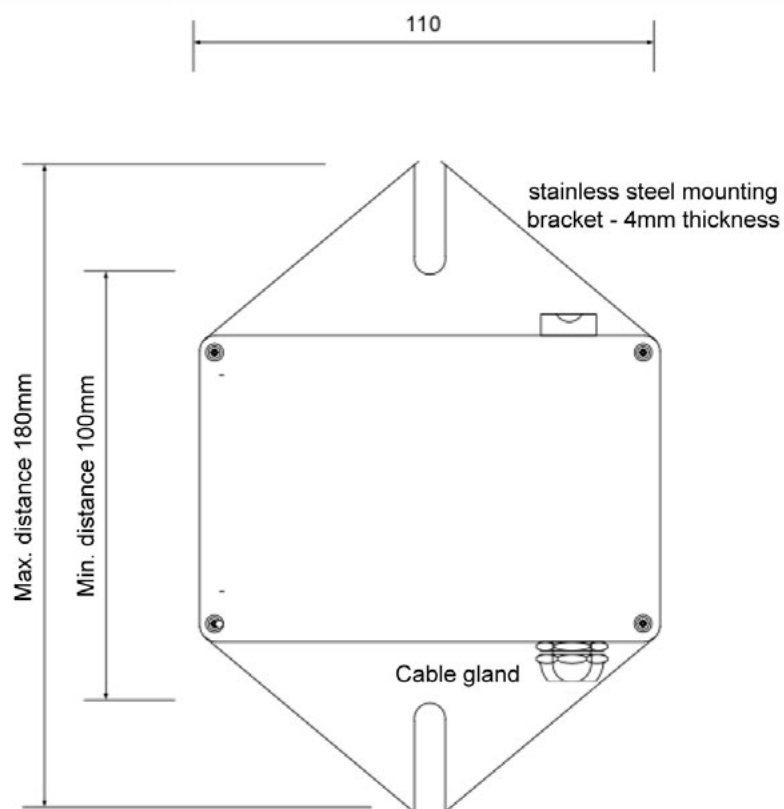
### Applications

Structural monitoring in civil and industrial buildings.



# IN921

## Wall fixed inclinometer



### Technical features

| Model                   | <b>IN921-SV-XX-FS*</b>                                                        | <b>IN921-MM-XX-FS*</b>                                  |
|-------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------|
| Sensor                  | Servoaccelerometer                                                            | MEMS                                                    |
| Range                   | $\pm 1^\circ, \pm 14.5^\circ, \pm 30^\circ$                                   | $\pm 5^\circ, \pm 15^\circ, \pm 30^\circ$               |
| Supply                  | $\pm 15V_{cc}$                                                                | 12-24 Vcc                                               |
| Output                  | $\pm 5000$ mV                                                                 | 4-20mA                                                  |
| Consumption             | <25 mA (mono)                                                                 | 30mA + reading                                          |
| Linearity               | $<0.05\% \times \pm 1^\circ$<br>$<0.02\% \times \pm 14.5^\circ, \pm 30^\circ$ | 0.25%                                                   |
| Sensitivity             | 0.001 %                                                                       | 0.001°                                                  |
| Repeatability           | <0.002 V                                                                      | 0.03°                                                   |
| Temperature sensitivity | 0.0005 V/°C                                                                   | 0.02% /°C                                               |
| Operating temperature   | -40 ÷ 80°C                                                                    | -20 ÷ 70°C                                              |
| Protection              | IP65                                                                          | IP65                                                    |
| Material                | Body<br>Bracket                                                               | Polyester reinforced with Fiberglass<br>Stainless Steel |
| Dimensions              | 180x111x60 mm (with mounting bracket)                                         |                                                         |
| Weight                  | 0.875 Kg (with mounting bracket)                                              |                                                         |

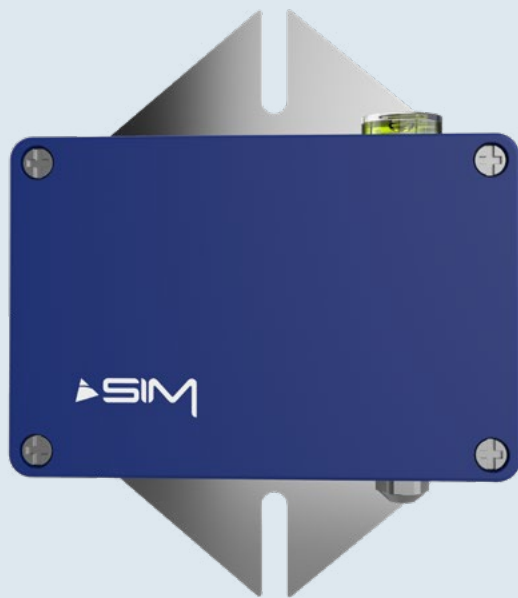
### Accessories

|                           |                   |
|---------------------------|-------------------|
| <b>Temperature sensor</b> | <b>WE710-CN**</b> |
| <b>Datalogger</b>         | <b>MYLOG***</b>   |
| <b>2m rod</b>             | <b>IN920-BR02</b> |

- \*FS Indicate the range  
 \*XX Indicate -MO for monoaxial or -BI for biaxial  
 \*\* For further information about the technical features see the technical sheet of the temperature sensor WE710-CN  
 \*\*\* For further information about the technical features see the technical sheet of the data acquisition unit MYLOG

# IN922

## Wall fixed inclinometer



### Description

In order to keep under constant control structures affected by rotations of any kind and to provide them with an adequate control system and alarm, SIM STRUMENTI developed the IN922 wall fixed inclinometer.

Equipped with a Hall effect sensor, this instrument detects the angular rotations of the structures and is supplied, as standard, with special brackets for wall mounting. It is available both in the monoaxial and in the biaxial version.

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

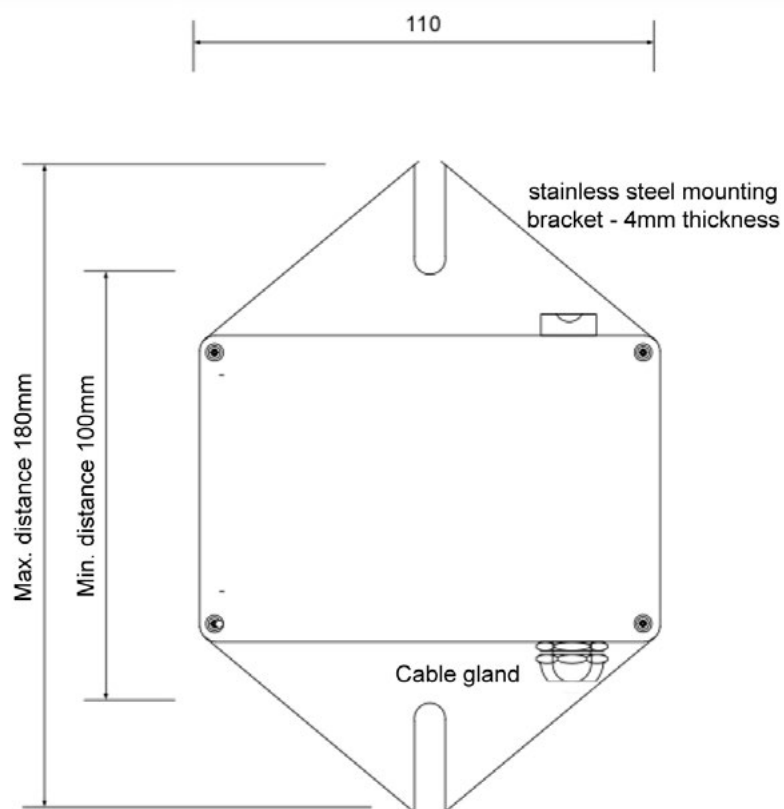
### Applications

Structural monitoring in civil and industrial buildings.



# IN922

## Wall fixed inclinometer



### Technical features

| Model                 | <b>IN922-HL-V-XX-FS*</b>                  | <b>IN922-HL-A-XX-FS*</b>              |
|-----------------------|-------------------------------------------|---------------------------------------|
| Sensor                | Hall Effect                               |                                       |
| Range                 | $\pm 5^\circ, \pm 10^\circ, \pm 20^\circ$ |                                       |
| Supply                | 8-24 Vcc                                  |                                       |
| Output                | 0-2V                                      | 4-20mA                                |
| Consumption           | 5 mA                                      | 20mA + 4÷20mA                         |
| Linearity             | 0.5%FS                                    |                                       |
| Sensitivity           | $0.01^\circ + 0.02\%/^\circ\text{C}$      |                                       |
| Repeatability         | 0.03°                                     |                                       |
| Operating temperature | $-20 \div 70^\circ\text{C}$               |                                       |
| Protection            | IP65                                      |                                       |
| Material              | Box                                       | Polyester reinforced with glass fiber |
|                       | Brackets                                  | Stainless Steel                       |
| Dimensions            | 180x111x60 mm (with mounting bracket)     |                                       |
| Weight                | 0.875 Kg (with mounting bracket)          |                                       |

### Accessories

#### Kit for wall mounting

#### IN922-MRI1

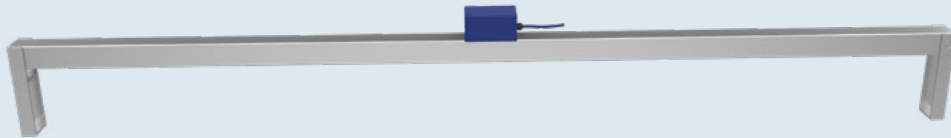
- \*FS Indicate the range  
 \*XX Indicate -MO for uniaxial or -BI for biaxial

# IN923

## Beam tiltmeter



***Wall mounting***



***Pavement mounting***

### Description

The beam tiltmeter has been designed in order to keep under constant control, structures affected by rotations of any kind and provide them with an adequate monitoring and alarm system. Equipped with a servoaccelerometer sensor or electrolytic sensor, this instrument detects the angular rotations of the structures and is supplied, with special brackets for wall mounting. It is available in a single-axial version or in a biaxial version.

The beam tiltmeter are normally mounted in series on the special aluminum beams 1,2 or 3 meters long in order to create a chain.

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

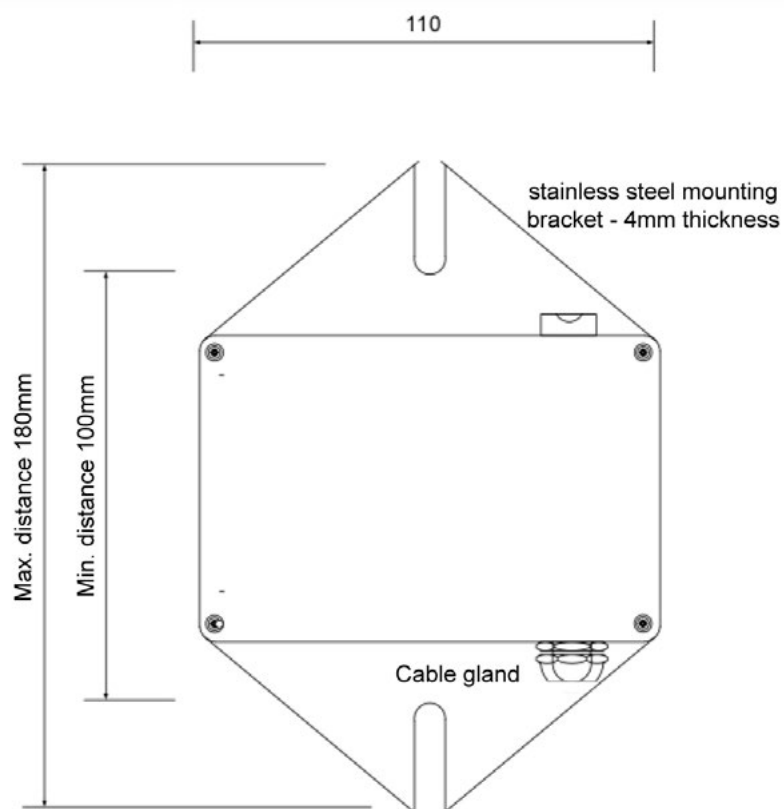
### Applications

Structural monitoring in civil and industrial buildings, tracks, etc.



# IN923

## Beam tiltmeter



### Technical features

| Model                   | <b>IN923-SV-XX-FS*</b>                                                          | <b>IN923-MM-XX-FS*</b>                                  |
|-------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------|
| Sensor                  | Servoaccelerometer                                                              | MEMS                                                    |
| Range                   | $\pm 1^\circ, \pm 14.5^\circ, \pm 30^\circ$                                     | $\pm 5^\circ, \pm 15^\circ, \pm 30^\circ$               |
| Supply                  | $\pm 15V_{cc}$                                                                  | 12-24 Vcc                                               |
| Output                  | $\pm 5000 \text{ mV}$                                                           | 4-20mA                                                  |
| Consumption             | $< 25 \text{ mA (mono)}$                                                        | 30mA + reading                                          |
| Linearity               | $< 0.05\% \times \pm 1^\circ$<br>$< 0.02\% \times \pm 14.5^\circ, \pm 30^\circ$ | 0.25%                                                   |
| Sensitivity             | 0.001 %                                                                         | 0.001°                                                  |
| Repeatability           | $< 0.002 \text{ V}$                                                             | 0.03°                                                   |
| Temperature sensitivity | 0.0005 V/°C                                                                     | 0.02% /°C                                               |
| Operating temperature   | -40 ÷ 80°C                                                                      | -20 ÷ 70°C                                              |
| Protection              | IP65                                                                            | IP65                                                    |
| Material                | Body<br>Bracket                                                                 | Polyester reinforced with Fiberglass<br>Stainless Steel |
| Dimensions              | 180x111x60 mm (with mounting bracket)                                           |                                                         |
| Weight                  | 0.875 Kg (with mounting bracket)                                                |                                                         |

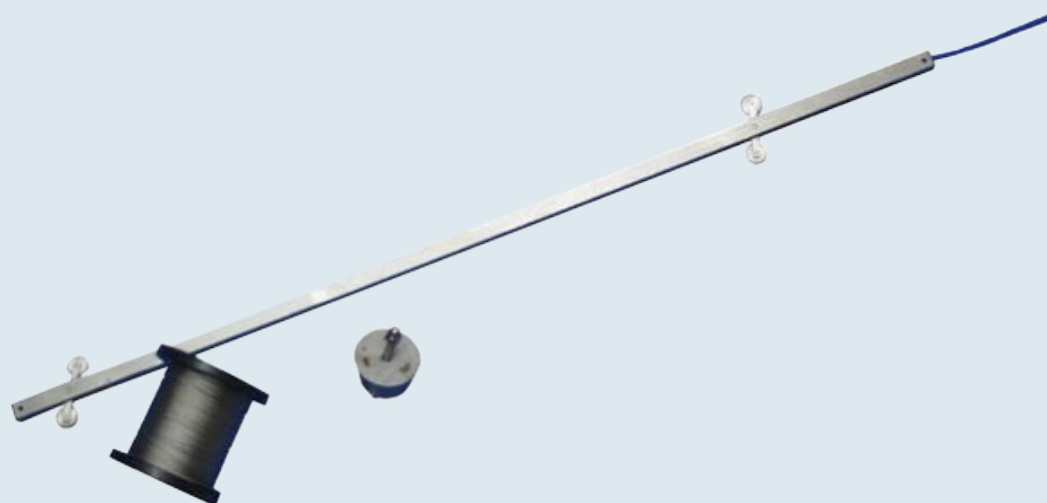
### Accessories

|                              |                   |
|------------------------------|-------------------|
| <b>Temperature sensor</b>    | <b>WE710-CN</b>   |
| <b>1 mt beam</b>             | <b>IN923-01</b>   |
| <b>2 mt beam</b>             | <b>IN923-02</b>   |
| <b>3 mt beam</b>             | <b>IN923-03</b>   |
| <b>Wall mounting kit</b>     | <b>IN923-STMU</b> |
| <b>Pavement mounting kit</b> | <b>IN923-STTE</b> |

- \*FS Indicate the range  
 \*XX Indicate -MO for uniaxial or -BI for biaxial  
 \*\* For additional information on the technical features, refer to the MYLOG technical data sheet.

# IN930

## Depth fixed inclinometer



### Description

The necessity for a continuous monitoring of the landslide areas with effective alarm systems, has led SIM to develop the depth fixed inclinometers model IN930.

Keeping the same high quality features of the inclinometric system IN910, this model has the advantage of resetting the all the occasional errors existing in the mobile inclinometric measurements, as well as having real time landslide monitoring. The IN930 probes can carry servoaccelerometer sensor as well as pendulum. Inserted in inclinometric casing, they can measure position shifts of sliding planes.

The probe consists of a cart having inside the sensor. A desired number of probes are inserted in the inclinometric casing, installed at a specific depth.

The connection between the elements of the inclinometric column is fastened by a stainless steel cable and the distance between the probes can be decided or in the project phase as well as during installation.

The entire inclinometric column is hanged at the top the casing by a element called "Support head".

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

### Applications

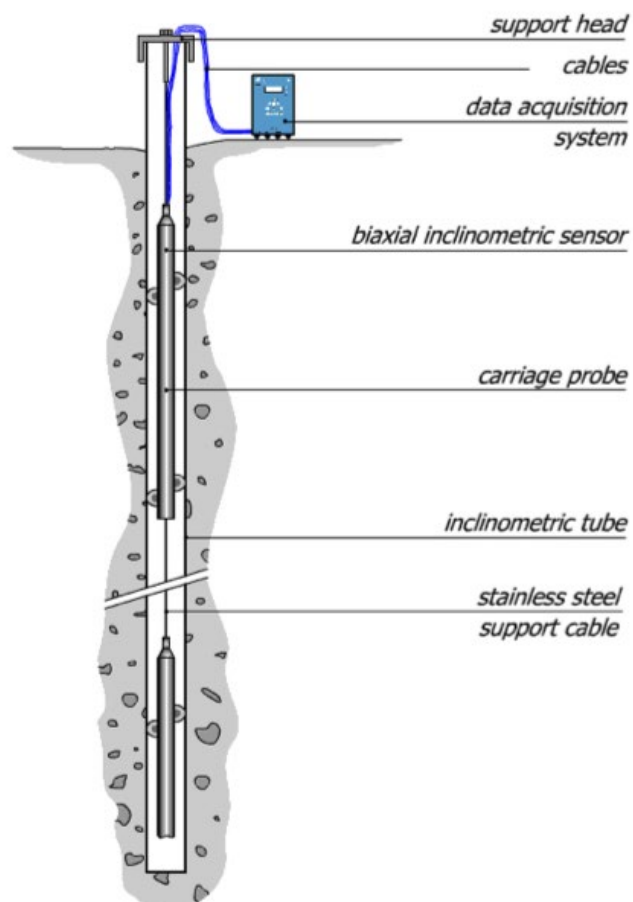
Measurement of horizontal displacement in landslides, dams, embankments, bridges, tunnels etc.





# IN930

## Depth fixed inclinometer



### Technical features

| Model                     | <b>IN930-SV-FS</b>  | <b>IN930-MM-FS*</b> |
|---------------------------|---------------------|---------------------|
| Sensor                    | Servo accelerometer | MEMS                |
| Range                     | $\pm 15, \pm 30$    | $\pm 10, \pm 15$    |
| Supply                    | $\pm 15V_{cc}$      | 12-24Vcc            |
| Output                    | $\pm 5V$            | $\pm 1V$            |
| Linearity                 | 0.05%               | 0.25%               |
| Repeatability             | 0.005%              | 0.03%               |
| Alignment                 | 0.2°                |                     |
| Zero shift in temperature | 0.005%FS/°C         | 0.09%FS/°C          |
| Temperature sensibility   | 0.0005 V/°C         | 0.02 %/°C           |
| Operating temperature     | -40 ÷ 80°C          | -20 ÷ 70°C          |
| Diameter                  | 32 mm               | 25x25 mm            |
| Length                    | 1150 mm             |                     |
| Probe step                | 1000 mm             |                     |
| Weight                    | 2.5 Kg              | 1.8 Kg              |
| Material                  | Stainless steel     |                     |

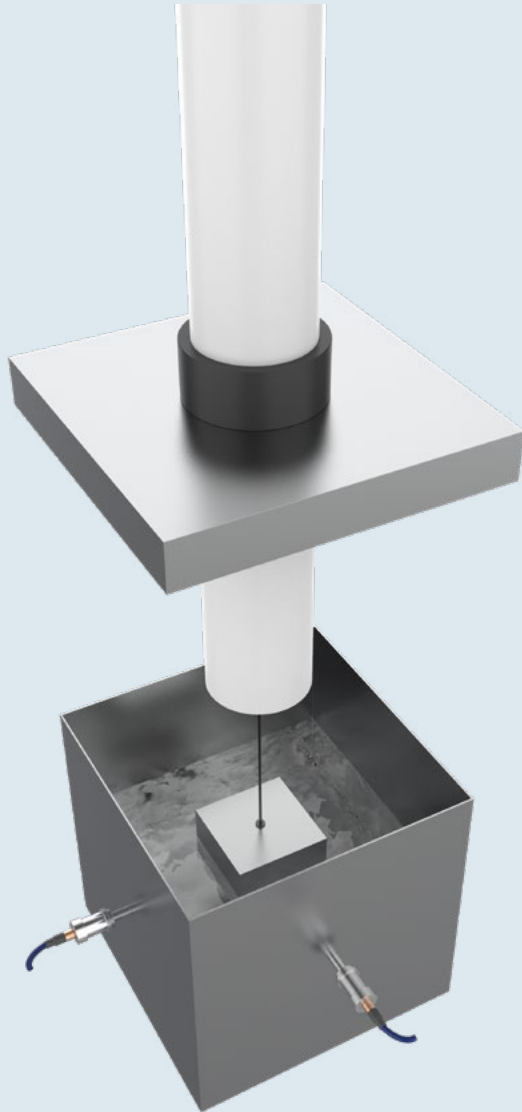
### Accessories

|                                             |                        |
|---------------------------------------------|------------------------|
| <b>Stainless steel cable</b>                | <b>IN930-MWDM-MM**</b> |
| <b>Clamps</b>                               | <b>IN930-MR01</b>      |
| <b>Stainless steel connecting rod (2mt)</b> | <b>IN930-AS02</b>      |
| <b>Stainless steel connecting rod (1mt)</b> | <b>IN930-AS01</b>      |
| <b>Support head</b>                         | <b>IN930-TS01</b>      |
| <b>Bag</b>                                  | <b>IN910-BRIN</b>      |

\*FS Indicate the range  
 \*\*MM Indicate the meters

# IN940

## Direct pendulum



### Description

The direct pendulum IN940 is an instrument able to measure, with great sensitivity, the rotations of structures caused by disruptions of any kind. Based on the plumb line principle, the instrument is able to control rotations on measurement bases, according to the needs.

The pendulum consists of a damping tank, a ballast, a rod and an anchor. The size and shape of the adjustable bracket that holds the rod will vary depending on the problems of each installation.

The measuring system consists of inductive or laser sensors, positioned orthogonally in the damping tank. On request, sensors are available which, placed at various points along the shaft, measure the possible variation of the position of the rod itself.

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

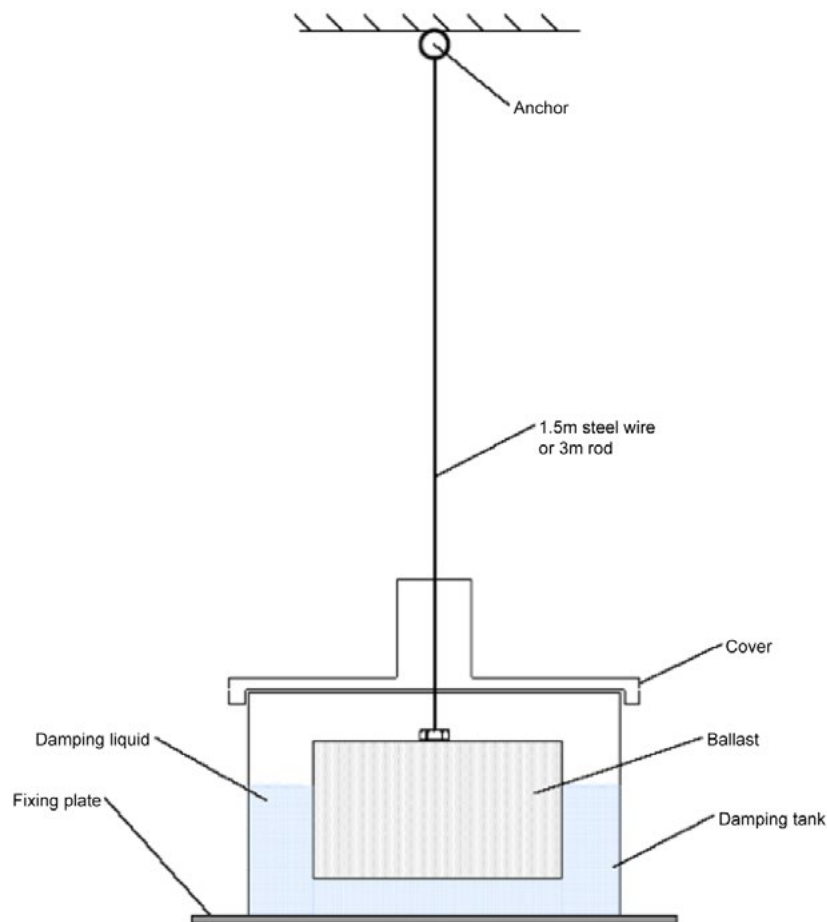
### Applications

Rotation measurement in dams, bridges, viaducts, bell towers, buildings etc.



# IN940

## Direct pendulum



### Technical features

|                           |  |                                          |                    |
|---------------------------|--|------------------------------------------|--------------------|
| <b>Tank</b>               |  | <b>IN940-VS</b>                          |                    |
| Material                  |  | Stainless Steel                          |                    |
| Dimension                 |  | 250x250x250 mm                           |                    |
| <b>Ballast</b>            |  | <b>IN940-ZA</b>                          |                    |
| Material                  |  | Stainless Steel                          |                    |
| Dimension                 |  | 150x150x150mm                            |                    |
| Weight (tank+ballast)     |  | 20Kg                                     |                    |
| <b>Rod</b>                |  | <b>IN940-AS-MM**</b>                     |                    |
| Material                  |  | Stainless Steel                          |                    |
| Diameter                  |  | Ø3mm                                     |                    |
| Available lengths         |  | 0.5, 1, 2 mt                             |                    |
| <b>Protection tube</b>    |  | <b>IN940-TU</b>                          |                    |
| Material                  |  | PVC                                      |                    |
| Dimension                 |  | Ø120mm 3mm thickness                     |                    |
| <b>Anchor* (standard)</b> |  |                                          |                    |
| Material                  |  | Stainless Steel                          |                    |
| Dimension                 |  | "L" bracket with adjustment 200x500x4 mm |                    |
| <b>Liquid</b>             |  | <b>Glycerine 98%</b>                     |                    |
| <b>Sensor</b>             |  | <b>IN940-SE-IN</b>                       | <b>IN940-SE-LA</b> |
| Type                      |  | Inductive                                | Laser              |
| Range                     |  | 8 mm                                     | 20 mm              |
| Supply                    |  | +15 ÷ 30V                                | ±15V               |
| Consumption               |  | 40mA                                     | <120mA             |
| Output                    |  | 4-20mA                                   |                    |
| Linearity                 |  | 400 µm                                   | 0.04% FS           |
| Repeatability             |  | <15µm                                    | 0.02% FS           |
| Operating temperature     |  | -10 ÷ 70°C                               | -20 ÷ 50°C         |
| Protection                |  | IP67                                     | IP65               |
| Weight                    |  | 0.200Kg                                  | 0.920Kg            |

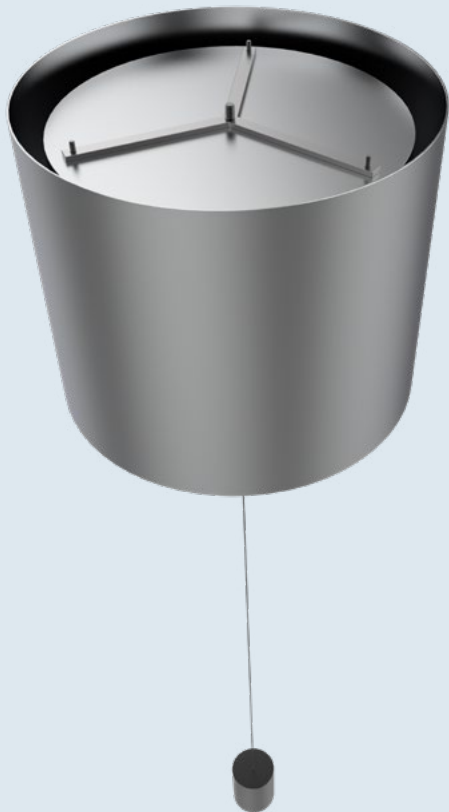
### Accessories

|                                  |                       |
|----------------------------------|-----------------------|
| <b>Connecting rod connection</b> | <b>IN940-RS-M3</b>    |
| <b>Upper rod stopper</b>         | <b>IN940-FA</b>       |
| <b>Liquid (glycerine)</b>        | <b>IN940-GL-LT***</b> |

- \* The bracket size and shape will change depending on the installation  
 \*\*MM Indicate the rod length  
 \*\*\*LT Indicate the quantity

# IN950

## Inverted pendulum



### Description

The inverted pendulum IN950 is an instrument able to measure with great sensitivity the rotations of structures, caused by disruptions of any nature. Based on the plumb line principle, the instrument is able to control rotations on measurement bases, according to the needs.

The pendulum consists of a damping tank, a float, a wire or a rod and an anchor (ballast). It is particularly indicated for the control of the rotations of a structure with respect to a deep and fixed point of the ground, in which the anchorage point is positioned. This tool is suitable for all those applications where the anchor point is not accessible.

The measuring system consists of inductive or laser sensors, positioned orthogonally in the damping tank. On request, sensors are available which, placed at various points along the shaft, measure the possible variation of the position of the rod itself.

Every sensor is provided with a calibration certificate that attests the results of the test performed and all electromechanical features.

Manual read out with DATAVIEW.

Automatic read out with MINILOG, MYLOG.

Readout units with NATUN.

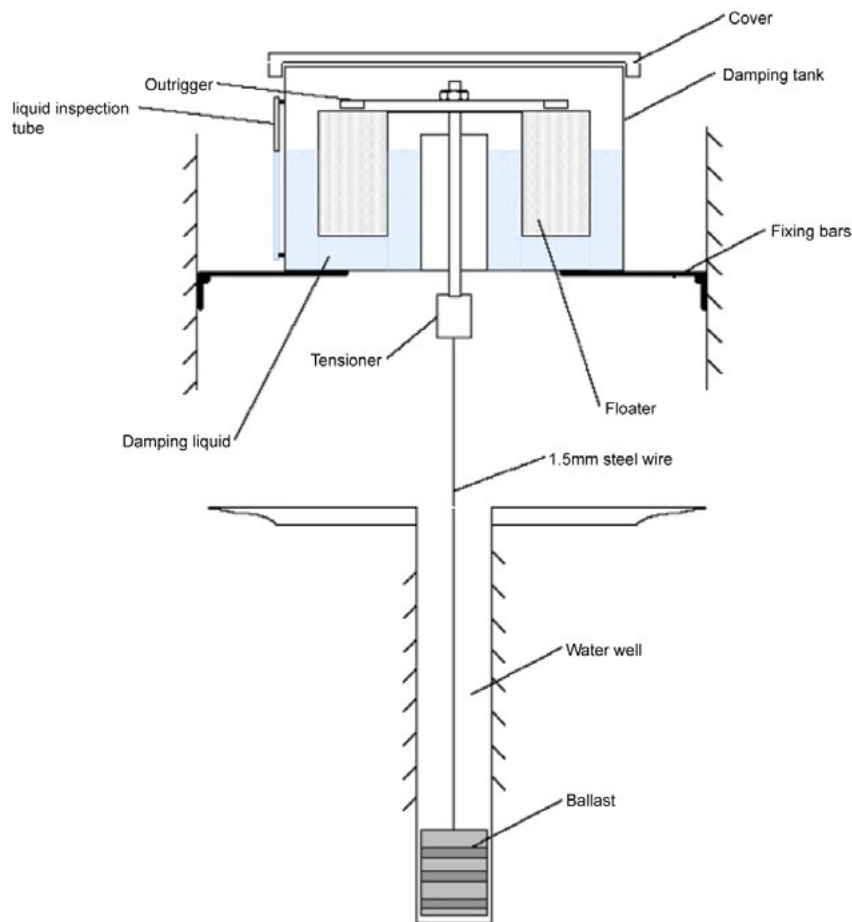
### Applications

Rotation measurement in dams, bridges, viaducts, bell towers, buildings etc.



# IN950

## Inverted pendulum



### Technical features

|                                  |  |                        |                    |
|----------------------------------|--|------------------------|--------------------|
| <b>Tank</b>                      |  | <b>IN950-VS</b>        |                    |
| Material                         |  | Stainless Steel        |                    |
| Dimension                        |  | Ø600x500 mm            |                    |
| <b>Floater</b>                   |  | <b>IN950-GL</b>        |                    |
| Material                         |  | Stainless Steel        |                    |
| Dimension                        |  | Ø520x420 mm            |                    |
| Wight (tank+floater)             |  | 40Kg                   |                    |
| <b>Rod</b>                       |  | <b>IN950-AS-MM**</b>   |                    |
| Material                         |  | Stainless Steel        |                    |
| Diameter                         |  | Ø3mm                   |                    |
| Available lengths                |  | 0.5, 1, 2 mt           |                    |
| <b>Protection tube</b>           |  | <b>IN950-TU</b>        |                    |
| Material                         |  | PVC                    |                    |
| Dimension                        |  | Ø120mm Sp. 3mm         |                    |
| <b>Anchor* (standard)</b>        |  |                        |                    |
| Material                         |  | Stainless Steel + Lead |                    |
| Dimension                        |  | Ø 200x150mm            |                    |
| <b>Sensor</b>                    |  | <b>IN950-SE-IN</b>     | <b>IN950-SE-LA</b> |
| Type                             |  | Inductive              | Laser              |
| Range                            |  | 8 mm                   | 20 mm              |
| Supply                           |  | +15 ÷ 30V              | ±15V               |
| Consumption                      |  | 40mA                   | <120mA             |
| Output                           |  | 4-20mA                 |                    |
| Linearity                        |  | 400 µm                 | 0.04% FS           |
| Repeatability                    |  | <15µm                  | 0.02% FS           |
| Operating temperature            |  | -10 ÷ 70°C             | -20 ÷ 50°C         |
| Protection                       |  | IP67                   | IP65               |
| Weight                           |  | 0.200Kg                | 0.920Kg            |
| <b>Accessories</b>               |  |                        |                    |
| <b>Connecting rod connection</b> |  | <b>IN950-RS-M3</b>     |                    |
| <b>Upper rod stopper</b>         |  | <b>IN940-FA</b>        |                    |
| <b>Liquid (mineral oil)</b>      |  | <b>IN950-OL-LT***</b>  |                    |
| <b>Floating adjustment bar</b>   |  | <b>IN950-BR-03</b>     |                    |

\* The anchor dimensions change depending on the installation

\*\*MM Indicate the rod length

\*\*\*LT Indicate the quantity

# IN980

## Spiral probe



### Description

The spiral probe is recommended when very accurate inclinometer measurements are required, with very deep inclinometer tubes (> 50mt) or when data processing shows an unlikely direction.

The mechanical components combined with state of the art electronics, allows optimizing the execution of site measurements, without having to manually insert big amount of data.

The INCLAB Manager & Processing software supplied as standard with the measuring system INCLAB, which automatically detects measurements at the desired distance.

The spiral probe consists of two wheel carriers and a central sensor-holder part. The distance between the trolleys (probe step) is equal to half a meter.

The rotary displacement sensor, positioned at the center of the probe, measures the axial deviation in degrees between the lower and the upper wheel.

The electric connection cable is equipped with a waterproof connector up to 50 bar. A special kevlar core gives the cable an inextensible feature, which guarantees reliability and precision while positioning.

The cable is also equipped with stainless steel reference notches every half meter and can have a maximum error on the length of  $\pm 5\text{cm} / 100\text{m}$  and a stretch, with a load of 20Kg, less than 0.05% of the nominal length (it is possible to use the same inclinometer cable also for the spiral probe).

The spiral probe is supplied with a strong carrying case.

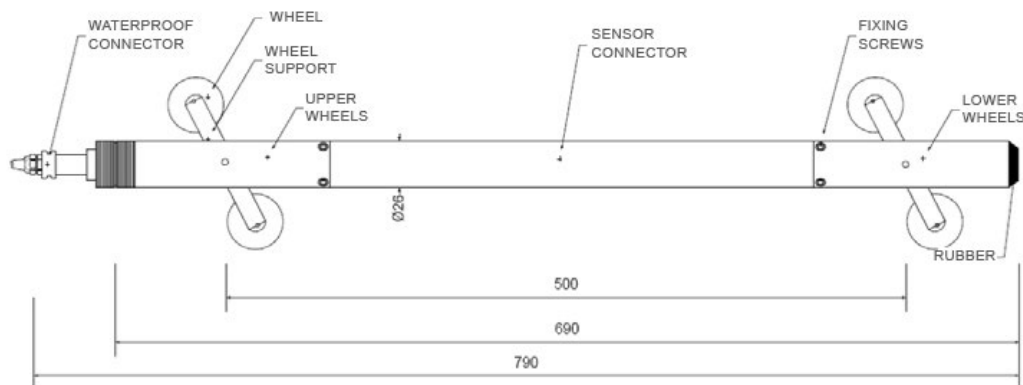
### Applications

Inclinometer tubes monitoring.



# IN980

## Spiral probe



### Technical features

|                       |                       |
|-----------------------|-----------------------|
| Model                 | <b>IN980</b>          |
| Sensor                | Rotary potentiometric |
| Range                 | 359°                  |
| Supply                | 15Vcc                 |
| Output                | ±5V                   |
| Linearity             | 0.1% FS               |
| Repeatability         | 0.01%                 |
| Operating temperature | -10 ÷ +50 °C          |
| Diameter              | 32 mm                 |
| Length                | 690 mm                |
| Probe step            | 500 mm                |
| Weight                | 2.8 Kg                |
| Probe accuracy (20mt) | 2 mm                  |
| Material              | Stainless Steel       |

|                                        |                                     |
|----------------------------------------|-------------------------------------|
| <b>Inclinometric cable</b>             | <b>IN910-6022-MM**</b>              |
| Conductors / Shielding / Reinforcement | 5x0.15 / copper / kevlar braid      |
| Square footage                         | Stainless steel notches every 0.5mt |
| Diameter                               | Ø6.5 mm                             |
| Weight                                 | 53g / 1mt                           |
| Reel weight with 50m cable             | ~4Kg                                |

|                     |                                      |
|---------------------|--------------------------------------|
| <b>Readout unit</b> | <b>INCLAB</b>                        |
| <b>Software</b>     | <b>INCLAB Manager and Processing</b> |

### Accessories

|                                                 |                   |
|-------------------------------------------------|-------------------|
| <b>Kit of wheels (4), springs (2), pins (4)</b> | <b>IN910-KT01</b> |
| <b>Kit of plugs (2)</b>                         | <b>IN910-KT02</b> |
| <b>Cable stopper</b>                            | <b>IN910-FECV</b> |
| <b>Bag</b>                                      | <b>IN910-BRIN</b> |
| <b>Plastic reel 50m</b>                         | <b>IN910-RP50</b> |
| <b>Plastic reel 50m</b>                         | <b>IN910-RM50</b> |
| <b>Plastic reel 100m</b>                        | <b>IN910-RP00</b> |

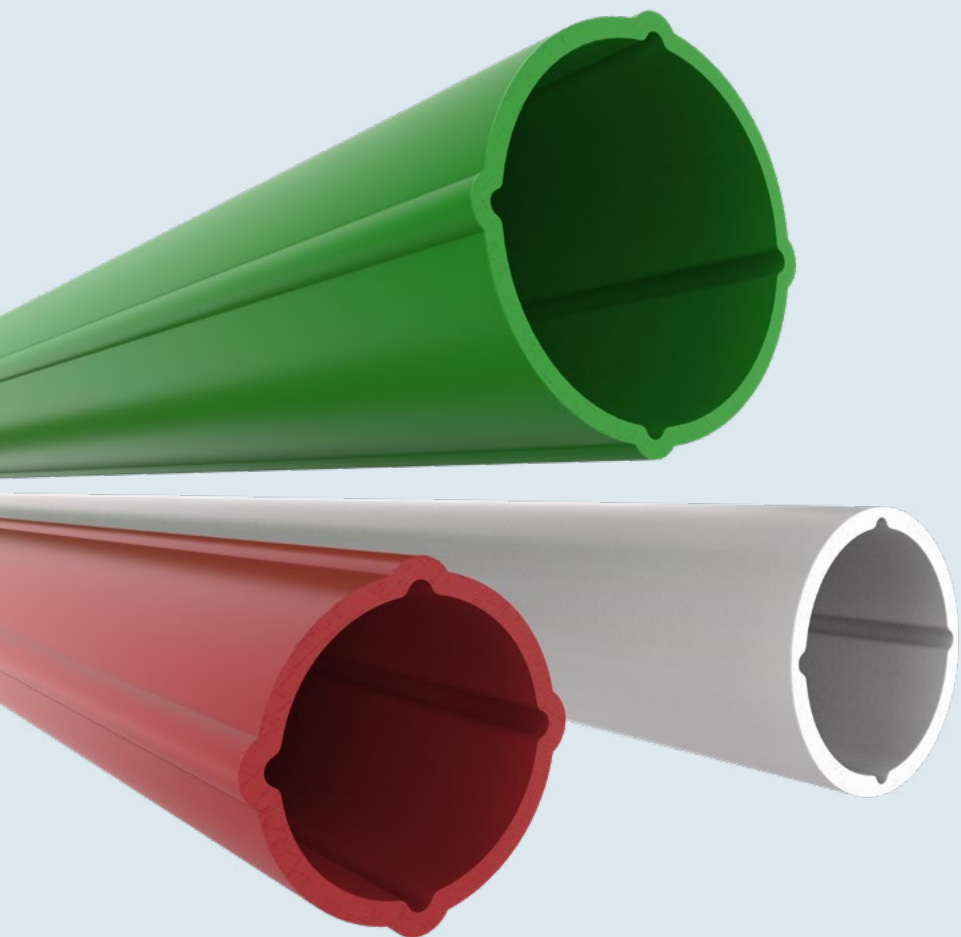
\*\*MM Indicate the meters

ED-06/22



# INT

## Inclinometer casing



### Description

ABS and PVC inclinometer casings are used as a driving tube for the inclinometric system IN910 and for the fixed depth inclinometer model IN930, which allow to monitor sliding movements of dams, embankments, and all retaining structures. It is necessary to make particular attention to the installation of the casing, and the gluing of the couplings to the tube using the special glue provided by SIM. Once the mounting stage is ended, it is necessary to fill the annular space (i.e. the space between the external casing and the borehole wall) with cement grout or gravel pack, to ensure a perfect tight seal to the surrounding soil. The upper end of the casing must be fully protected to avoid damage and to allow several subsequent measurements.

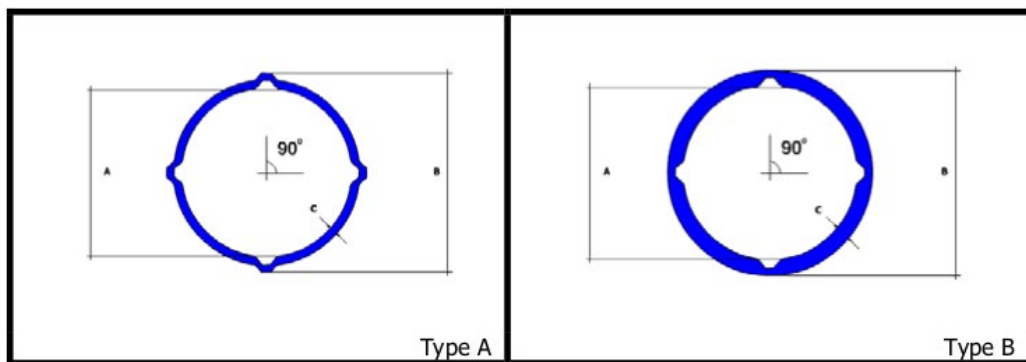
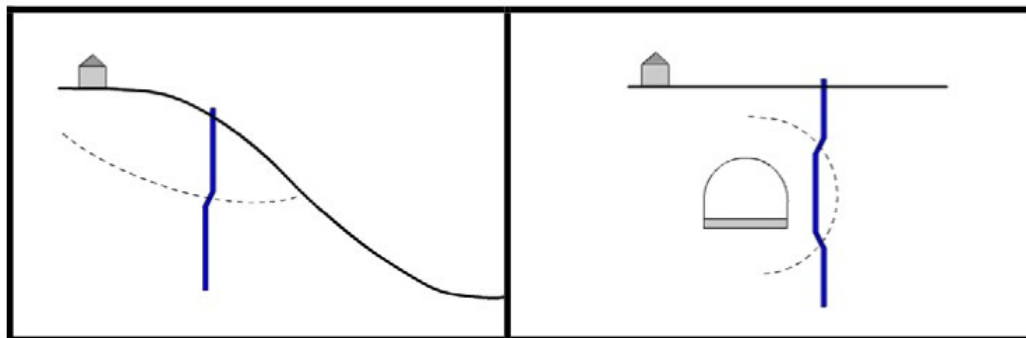
### Applications

Used in landslide, excavations, embankments, piles, load test etc.





# INT Inclinometer casing

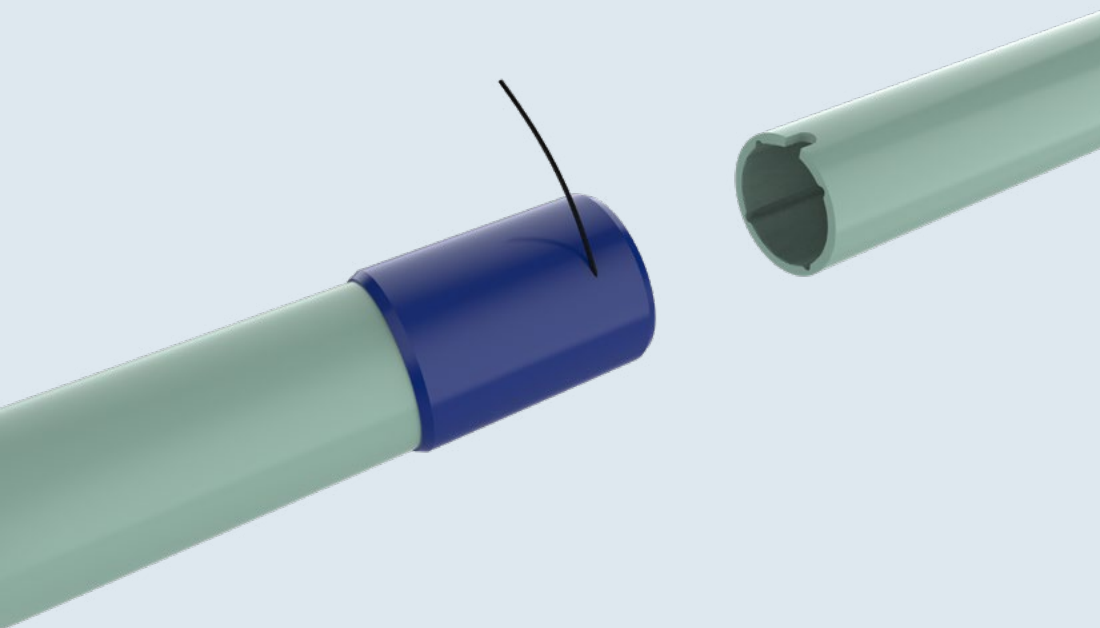


| Technical features       |                     |                             |               |                 |                           |
|--------------------------|---------------------|-----------------------------|---------------|-----------------|---------------------------|
| Model - Type A           |                     | INT-A2                      |               | INT-A3          |                           |
| Nominal diameter         |                     | 2"                          |               | 3"              |                           |
| Length                   |                     | 3 mt                        |               |                 |                           |
| A (Internal diameter)    |                     | 47 ± 0.7 mm                 |               | 74 ± 1.0 mm     |                           |
| B (External diameter)    |                     | 60 ± 0.5 mm                 |               | 87 ± 0.7 mm     |                           |
| C (Grooves diameter)     |                     | 54 ± 0.5 mm                 |               | 80 ± 0.6 mm     |                           |
| Linear weight            |                     | 625 g ± 5%                  |               | 1050 g ± 5%     |                           |
| Groove spiral            |                     | -                           |               | 0.3° / 3 mt     |                           |
| ABS Shock-Resistant      |                     |                             |               |                 |                           |
| Material                 | Density             | ASTM D1505: 1.0 ± 0.1 g/cm³ |               |                 |                           |
|                          | Tensile properties  | ASTM D638                   |               |                 |                           |
|                          | Tensile Strength    | ≥ 40 MPa                    |               |                 |                           |
|                          | Breaking Elongation | ≥ 10 %                      |               |                 |                           |
| Connection socket        | Material            | ABS                         |               |                 |                           |
|                          | Length              | 120 ± 2.0 mm                |               | 191 ± 2.0 mm    |                           |
|                          | External diameter   | 66 ± 0.5 mm                 |               | 95 ± 1.0 mm     |                           |
|                          |                     |                             |               |                 |                           |
| Model - Type B           |                     | INT-B57-A                   | INT-B60-A     | INT-B57-P       | INT-B60-P                 |
| Nominal diameter         |                     | 57/70 mm                    | 60/70 mm      | 57/70 mm        | 60/70 mm                  |
| ABS Shock-Resistant      |                     |                             |               |                 | PVC rigid Shock-Resistant |
| Material                 | Density             | 1.0 ± 0.1 g/cm³             |               | 1.5 ± 0.1 g/cm³ |                           |
|                          | Tensile Strength    | 40 MPa                      |               | 30 MPa          |                           |
|                          | Breaking Elongation | 20%                         |               | 50%             |                           |
|                          | Elastic Modulus     | 2700 MPa                    |               |                 |                           |
| Length                   |                     | 3 mt                        |               |                 |                           |
| A (Internal diameter)    |                     | 57 mm                       | 60 mm         | 57 mm           | 60 mm                     |
| B (External diameter)    |                     | 70 mm                       | 70 mm         | 70 mm           | 70 mm                     |
| C (Grooves diameter)     |                     | 61 mm                       | 64 mm         | 61 mm           | 64 mm                     |
| Weight                   |                     | 1350 g/m                    | 970 g/m       | 1850 g/m        | 1360 g/m                  |
| Grooves                  |                     | 4 every 90°                 |               |                 |                           |
| Collapse pressure (20°C) |                     | 20 bar                      | 7 bar         | 25 bar          | 13 bar                    |
| Connection socket        | Material            | -                           | ABS           | -               | PVC                       |
|                          | Length              | -                           | 105 mm        | -               | 105 mm                    |
|                          | External diameter   | -                           | 76 mm         | -               | 76 mm                     |
| Accessories              |                     |                             |               |                 |                           |
| Mounting kit             |                     |                             | INT-AX-KT01   |                 |                           |
| Injection tube           |                     |                             | INT-AX-TB01   |                 |                           |
| Lockable top cap         |                     |                             | INT-AX-ME01   |                 |                           |
| Head cap Type A 2"       |                     |                             | INT-A2-AX-HCP |                 |                           |
| Bottom cap Type A 2"     |                     |                             | INT-A2-AX-BCP |                 |                           |
| Head cap Type A 3"       |                     |                             | INT-A3-AX-HCP |                 |                           |
| Bottom cap Type A 3"     |                     |                             | INT-A3-AX-BCP |                 |                           |
| Head cap Type B          |                     |                             | INT-B-AX-HCP  |                 |                           |
| Bottom cap Type B        |                     |                             | INT-B-AX-BCP  |                 |                           |

Tolerances ± 0.8 mm on internal or external diameter | ±8% on weight | ± 1.5 mm on connection socket

# INTQL

## Quick Lock Inclinometer casing



### Description

Quick Lock ABS and PVC inclinometer casings are used as a driving tube for the inclinometric system IN910 and for the fixed depth inclinometer model IN930, which allow to monitor sliding movements of dams, embankments, and all retaining structures. It is necessary to make particular attention to the installation of the casing.

Quick Lock inclinometer casing is designed to be assembled quickly and accurately, and used for long and short-term monitoring in the most adverse field conditions.

Once the mounting stage is ended, it is necessary to fill the annular space (i.e. the space between the external casing and the borehole wall) with cement grout or gravel pack, to ensure a perfect tight seal to the surrounding soil.

The upper end of the casing must be fully protected to avoid damage and to allow several subsequent measurements.

### Applications

Used in landslide, excavations, embankments, piles, load test etc.



# INTQL

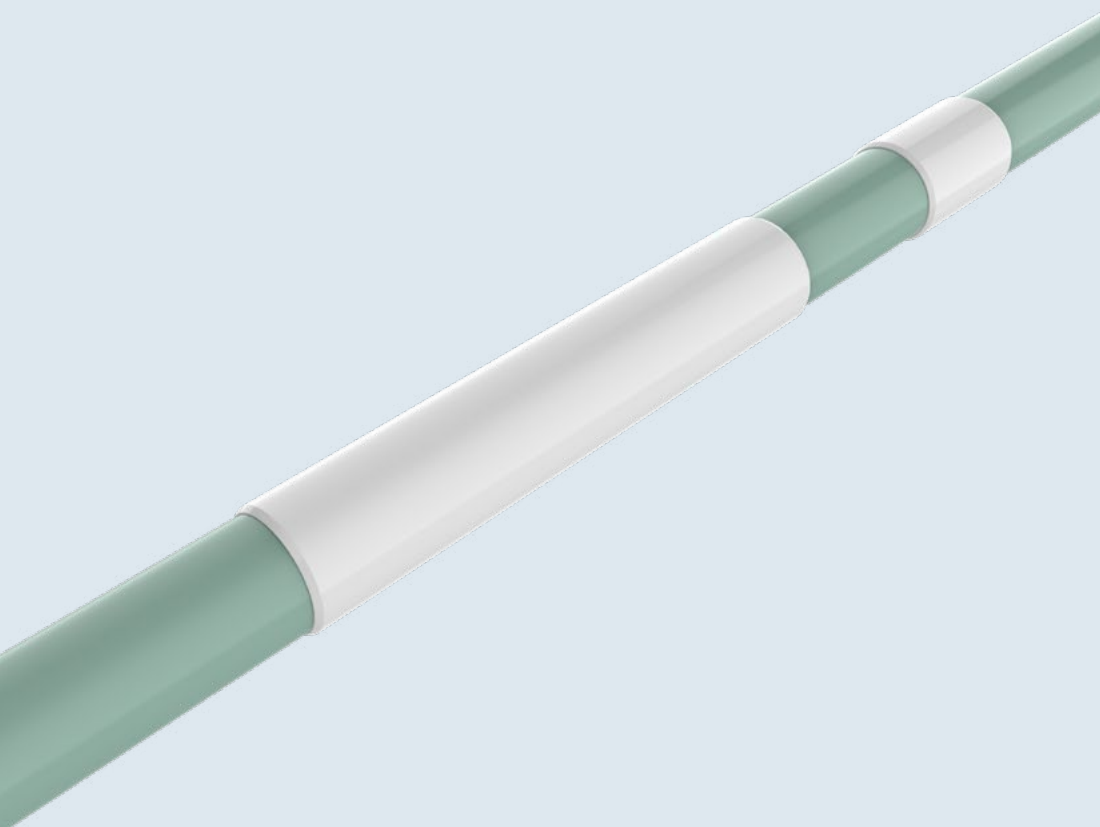
## Quick Lock

### Inclinometer casing

| Technical features       |                     |            |                           |            |
|--------------------------|---------------------|------------|---------------------------|------------|
| Model                    | INTQL-57-A          | INTQL-60-A | INTQL-57-P                | INTQL-60-P |
| Nominal diameter         | 57/70 mm            | 60/70 mm   | 57/70 mm                  | 60/70 mm   |
| Material                 | ABS Shock-Resistant |            | PVC rigid Shock-Resistant |            |
|                          | Density             |            | 1.0 ± 0.1 g/cm³           |            |
|                          | Tensile Strength    |            | 40 MPa                    |            |
|                          | Breaking Elongation |            | 20%                       |            |
|                          | Elastic modulus     |            | 2700 MPa                  |            |
| Length                   | 3 mt                |            |                           |            |
| Internal diameter        | 57 mm               | 60 mm      | 57 mm                     | 60 mm      |
| External diameter        | 70 mm               | 70 mm      | 70 mm                     | 70 mm      |
| Grooves diameter         | 61 mm               | 64 mm      | 61 mm                     | 64 mm      |
| Weight                   | 1350 g/m            | 970 g/m    | 1850 g/m                  | 1360 g/m   |
| Grooves                  | 4 every 90°         |            |                           |            |
| Collapse pressure (20°C) | 20 bar              | 7 bar      | 25 bar                    | 13 bar     |
| Connection socket        | Material            | -          | ABS                       | -          |
|                          | Length              | -          | 105 mm                    | -          |
|                          | External diameter   | -          | 76 mm                     | -          |
| Accessories              |                     |            |                           |            |
| Mounting kit             | INT-AX-KT01         |            |                           |            |
| Injection tube           | INT-AX-TB01         |            |                           |            |
| Lockable top cap         | INT-AX-ME01         |            |                           |            |
| Head cap                 | INT-B-AX-HCP        |            |                           |            |
| Bottom cap               | INT-B-AX-BCP        |            |                           |            |

Tolerances ± 0.8 mm on internal or external diameter | ±8% on weight | ± 1.5 mm on connection socket

# INTSP Telescopic Inclinometer casing



## Description

ABS and PVC inclinometer casings are used as a driving tube for the inclinometric system IN910 and for the fixed depth inclinometer model IN930, which allow to monitor sliding movements of dams, embankments, and all retaining structures. Telescopic inclinometer casings are used when the casing will be subject to large amounts of settlement.

Thanks to the telescopic socket it is possible to manage the length of the tube, increasing or decreasing it according to the need.

It is necessary to make particular attention to the installation of the casing, and the gluing of the couplings to the tube using the special glue provided by SIM.

Once the mounting stage is ended, it is necessary to fill the annular space (i.e. the space between the external casing and the borehole wall) with cement grout or gravel pack, to ensure a perfect tightseal to the surrounding soil.

The upper end of the casing must be fully protected to avoid damage and to allow several subsequent measurements.

## Applications

Used in landslide, excavations, embankments, piles, load test etc.



# INTSP

## Telescopic Inclinometer casing

| Technical features  |                     |                 |                           |           |
|---------------------|---------------------|-----------------|---------------------------|-----------|
| Model               | INTSP-C60           | INTSP-T60       | INTSP-C57                 | INTSP-T57 |
| Nominal diameter    | 60/70 mm            |                 | 57/70 mm                  |           |
| Admissible movement | - 100 mm            | + 150 mm        | - 100 mm                  | + 150 mm  |
| Material            | ABS Shock-Resistant |                 | PVC rigid Shock-Resistant |           |
|                     | Density             | 1.0 ± 0.1 g/cm³ | 1.5 ± 0.1 g/cm³           |           |
|                     | Tensile Strength    | 40 MPa          | 30 MPa                    |           |
|                     | Breaking elongation | 20%             | 50%                       |           |
|                     | Elastic modulus     | 2700 MPa        |                           |           |
| Length              | 3 mt                |                 |                           |           |
| Internal diameter   | 60 mm               |                 | 57 mm                     |           |
| External diameter   | 70 mm               |                 | 70 mm                     |           |
| Grooves diameter    | 64 mm               |                 | 61 mm                     |           |
| Telescopic socket   | Material            | PVC             | PVC                       |           |
|                     | Length              | 400 mm          | 400 mm                    |           |
|                     | External diameter   | 80 mm           | 80 mm                     |           |
| Rivet type          | Material            | Alluminum       | Alluminum                 |           |
|                     | -                   | 105 mm          | 105 mm                    |           |
|                     | -                   | 4 mm            | 4 mm                      |           |
| Connection socket   | Material            | ABS             | PVC                       |           |
|                     | Length              | 105 mm          | 105 mm                    |           |
|                     | External diameter   | 76 mm           | 76 mm                     |           |
| Accessories         |                     |                 |                           |           |
| Mounting kit        | INT-AX-KT01         |                 |                           |           |
| Injection tube      | INT-AX-TB01         |                 |                           |           |
| Lockable top cap    | INT-AX-ME01         |                 |                           |           |
| Head cap            | INT-B-AX-HCP        |                 |                           |           |
| Bottom cap          | INT-B-AX-BCP        |                 |                           |           |



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