

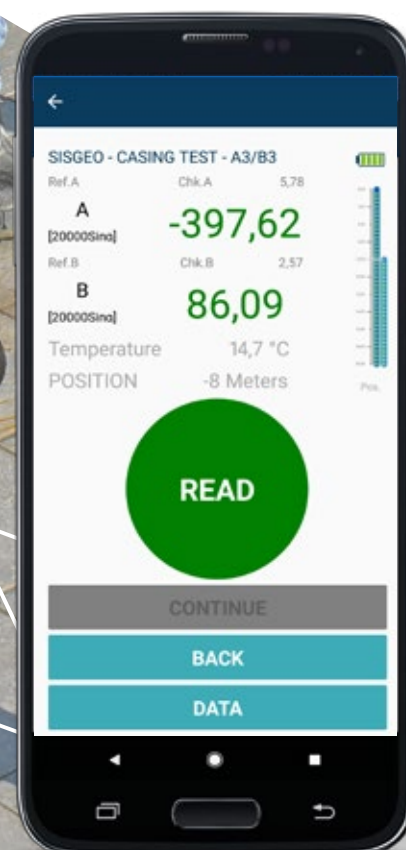
B.R.A.IN.

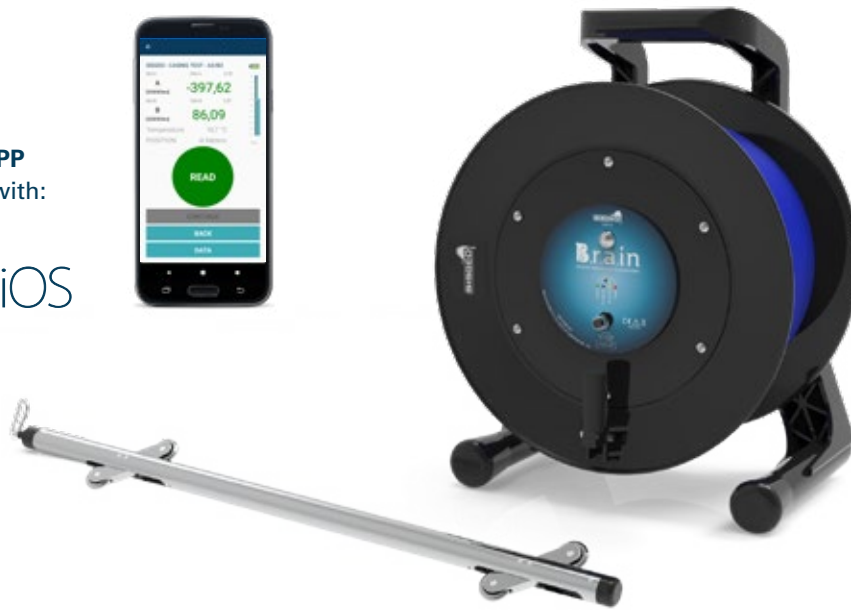


# Brain

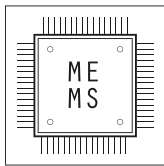
INCLINOMETER SYSTEMS

INCLINOMETERS  
& PENDULUMS





## B.R.A.IN INCLINOMETER SYSTEMS



B.R.A.IN (Borehole Readout Array for INclinometers) system is mainly composed by MEMS inclinometer probe, bluetooth reel with control cable and B.R.A.IN APP compatible with Android and iOS mobile operative systems.

The electronic readout is integrated into the reel and the BLE (Bluetooth Low Energy) wireless protocol permits a fast and safe communication with the management device, with a very low batteries' consumption.

The intuitive B.R.A.IN APP allows the user to manage the inclinometer and spiral meter surveys, and immediately share the readings with the most popular APP installed on the device (i.e. email, Dropbox, Whatsapp, Google DRIVE, OneDrive, iCloud Drive etc.)

Survey could be then imported in KLION software for data analysis and export professional and customizable reports.

The system B.R.A.IN + KLION software is compliant with ISO 18674-3.

### APPLICATIONS

- Landslides and unstable slopes
- Dams and embankments
- Diaphragm walls
- Mines
- Tunneling
- Deep excavations
- LNG tanks

### FEATURES

- The readout is your mobile
- User friendly mobile APP available for both Android and iOS
- Built-in electronics
- Low consumption Bluetooth interface
- Available in metric and imperial/USCS of measurement
- B.R.A.IN with KLION software are compliant with ISO 18674-3 standard

## B.R.A.IN INCLINOMETER SYSTEM IS MAINLY COMPOSED BY:



**B.R.A.IN APP**  
(device not included)



**BLUETOOTH REEL  
WITH LIGHT CONTROL CABLE**



**INCLINOMETER PROBE**

PRODUCT CODE	Description
0BRAIN03000	Vertical inclinometer system composed by biaxial MEMS probe (gauge length 500 mm), 30m light control cable mounted on B.R.A.IN bluetooth reel and B.R.A.IN APP.
0BRAIN06000	Vertical inclinometer system composed by biaxial MEMS probe (gauge length 500 mm), 60m light control cable mounted on B.R.A.IN bluetooth reel and B.R.A.IN APP.
0BRAIN10000	Vertical inclinometer system composed by biaxial MEMS probe (gauge length 500 mm), 100m light control cable mounted on B.R.A.IN bluetooth reel and B.R.A.IN APP.
0BRAIN100FT	Vertical inclinometer system composed by biaxial MEMS probe (gauge length 2 ft), 100 ft light control cable mounted on B.R.A.IN bluetooth reel and B.R.A.IN APP.
0BRAIN200FT	Vertical inclinometer system composed by biaxial MEMS probe (gauge length 2 ft), 200 ft light control cable mounted on B.R.A.IN bluetooth reel and B.R.A.IN APP.
0BRAIN300FT	Vertical inclinometer system composed by biaxial MEMS probe (gauge length 2 ft), 300 ft light control cable mounted on B.R.A.IN bluetooth reel and B.R.A.IN APP.

## VERTICAL INCLINOMETER SYSTEM PERFORMANCE

	With 0S242DV3000 probe (500 mm gauge length)	With 0S242DV3010 probe (1000 mm gauge length)	With 0S242DV300F probe (2 ft gauge length)
Readout value	20000 sin alpha (K*sin alpha on request)	20000 sin alpha (K*sin alpha on request)	20000 sin alpha (K*sin alpha, degree, in/ft on request)
Resolution	0.011 mm / 500 mm	0.023 mm / 1000 mm	0.0005 in / 2 ft
Repeatability (precision) of a complete survey along a measuring line <sup>(1)</sup>	± 1.5 mm / 30 m (reading step every 500 mm)	± 2 mm / 30 m (reading step every 1000 mm)	± 0.079 in / 100 ft (reading step every 2 ft)

## HORIZONTAL INCLINOMETER SYSTEM PERFORMANCE

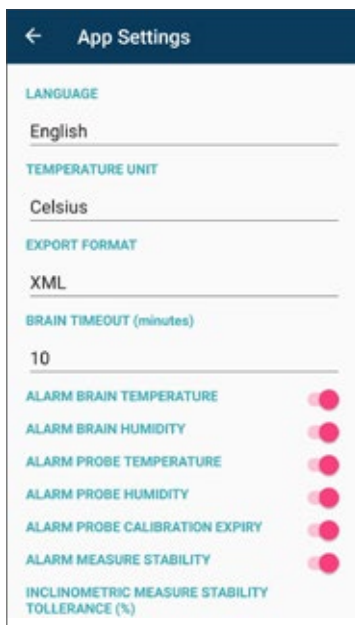
	With 0S241DH3000 probe (500 mm gauge length)	With 0S241DH3010 probe (1000 mm gauge length)
Readout value	20000 sin alpha (K*sin alpha on request)	20000 sin alpha (K*sin alpha on request)
Resolution	0.011 mm / 500 mm	0.023 mm / 1000 mm
Repeatability (precision) of a complete survey along a measuring line <sup>(1)</sup>	± 7 mm / 30 m	± 10 mm / 30 m

<sup>(1)</sup> As for ISO 18674-3, this is the "difference between the cumulated displacements of a measuring point relative to a reference point 30 m apart, when repeatedly carrying out the survey under repeatability conditions. (...) The values are specified for measurements in the A-axis. The B-axis measurements are commonly less accurate."

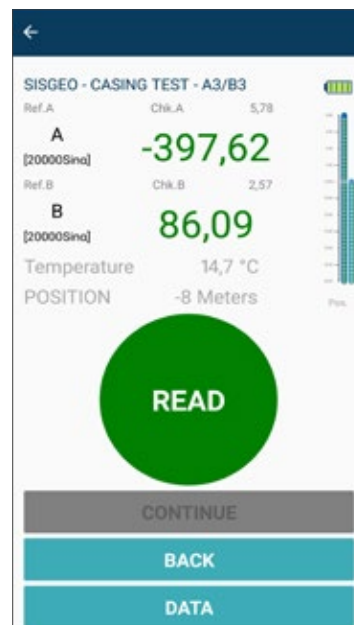
## B.R.A.I.N APP



The system information page allows you to have the entire system always under control (device, probe and reel).



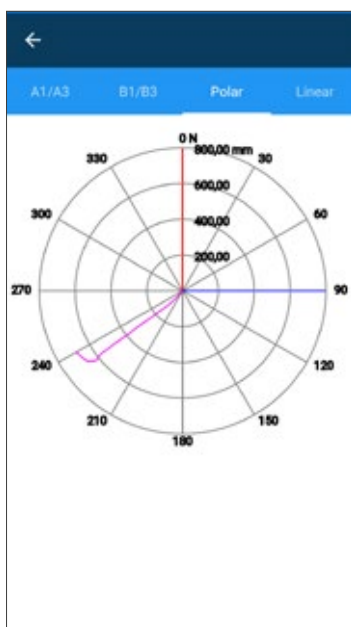
Various alarms can be settled in order to be always informed about the system health.



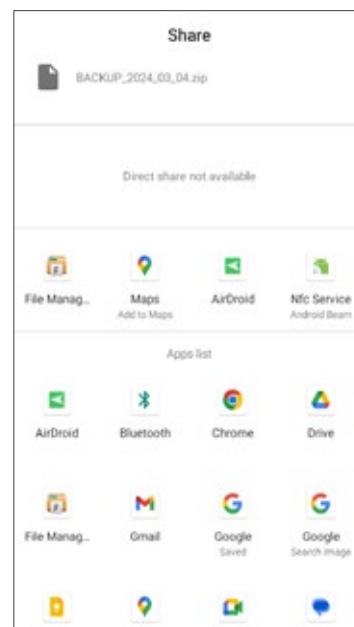
Reading page gives a lot of information such as actual position, data and checksums, probe internal temperature, etc.

	A1/A3	B1/B3	Polar	Linear
SISGEO prova giovani 10/09/2018 12:50:05				
#	A1	A3	ChkSum	
-0,50	-710,17	809,57	99,40	
-1,00	-818,35	819,73	1,38	
-1,50	-568,19	581,94	13,75	
-2,00	47,11	-41,75	5,35	
-2,50	55,90	-49,34	6,55	
-3,00	75,76	-71,07	4,69	
-3,50	124,91	-114,63	10,28	
-4,00	192,55	-184,29	8,26	
-4,50	251,37	-236,45	14,92	
-5,00	296,04	-293,05	2,99	
-5,50	221,06	-211,90	9,16	
-6,00	102,14	-97,25	4,89	
-6,50	99,82	-90,51	9,31	
-7,00	148,12	-141,97	6,15	
-7,50	203,18	-198,87	4,31	
-8,00	280,33	-269,78	10,55	
-8,50	300,65	-294,47	6,18	

Data tables are available during and after the surveys.



Polar graph and cumulative displacement graph can be shown after the survey.




Survey data can be immediately send through any sharing APP installed on your device such as Drive, Email, etc.

Minimum Device Specifications  
(device not supplied by SISGEO)

Bluetooth Low Energy BLE 4.2  
ANDROID OS V. 7 or higher  
APPLE iOS 11 or higher



## BLUETOOTH REEL SPECIFICATIONS

Bluetooth module	band: 2.4 GHz ISM Band (2402-2480 MHz) - power: 4dBm Max		
Communication with device	BLE (Bluetooth Low Energy) 4.2		
On-board sensors <sup>(1)</sup> <ul style="list-style-type: none"><li>- Temperature</li><li>- Humidity</li><li>- Battery voltage</li></ul>	Resolution 0.01 °C 0.025% RH 0.01 V	Accuracy ±1 °C (-10 °C to +85 °C) ±5% (0 to 95% RH) ±5% FS	Range -40 °C to +125 °C 0 to 100% RH 0 to 36 V
Operating Temperature	-40 to 80 °C (batteries -20 to 65 °C)		
Communication with probe	RS485 Modbus RTU Protocol <sup>(2)</sup>		
IP class and material	IP65, unbreakable sysnthetic rubber		
Environmental condition certification	certified for extended environmental conditions: altitude above 2000m		
Power supply	4 x 1.2 V - 5 Ah - Ni-MH rechargeable batteries		
Operating time with NiMH batteries <sup>(3)</sup>	≈ 96 h with inclinometer and spiral probe		
Charger for NiMH batteries <ul style="list-style-type: none"><li>- Input voltage</li><li>- IP rate</li><li>- Max output power</li><li>- Temperature range</li></ul>	90-264 Vac 50-60 Hz IP41 10 W -20 +40 °C		
Led	Different colors for local notifications		
 Directive compliance	2014/53/EU (RED)		



(1) On-board sensors are installed on the internal electronic board to give information in the event of BRAIN reel malfunction.

(2) RS485 not-optoisolated Modbus communication with RTU Protocol (3) Typical values

## CONTROL CABLES

Control cables are used to move the probe incrementally and transmit readings from the probe to B.R.A.IN bluetooth reel and then to the B.R.A.IN APP. The Light and the HD (Heavy Duty) cables are supplied assembled on B.R.A.IN reel and include a factory-attached connector for the probe. Probe-end connectors are watertight to 20 bar.

### B.R.A.IN LIGHT CABLE (STANDARD)

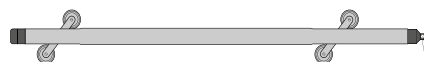
Light cable has a steel stress member. Blue cable jacket has aluminum depth marks.

### B.R.A.IN HD CABLE (OPTION)

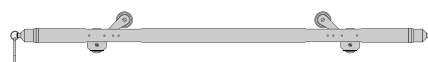
HD cable has a stainless steel core wire to control stretching and a stainless steel torsion braid to prevent twisting. Yellow cable jacket has copper depth marks.

MODEL	<b>OS2RD6000B0</b>	<b>OS2RC6000B0</b>
Cable lengths	30, 60, 100, 150, 200 m 100, 200, 300 ft	30,60,100,150, 200, 250, 300 m
Conductors	2x0.50mm <sup>2</sup> (AWG 21)+ 2x0.24mm <sup>2</sup> (AWG 24)	6x0.50 mm <sup>2</sup> (AWG 21)
Depth tactile marks	AL, every 500mm±0.5mm or 2ft±0.0016ft	Copper, every 500mm±0.5mm
Max strength	150 kg (330 lb)	370 kg (816 lb)
Outer jacket	blue, polyurethane	yellow, polyurethane
Cable diameter	6.5 mm (0.25 in)	10.4 mm (0.41 in)
Weight (cable+marks)	0.054 kg/m (0.036 lb/ft)	0,150 kg/m (0.30 lb/ft)
Operating temp. range	-30°C to 80 °C (-22°F to +176°F)	-30°C to 80 °C (-22°F to +176°F)
Total weight with 60m/200ft cable	6 kg (13.2 lb) with B.R.A.IN reel	14 kg (30.9 lb) with B.R.A.IN reel

## PROBES TECHNICAL SPECIFICATIONS



**OS242DV3000 (500mm gauge length)**  
**OS242DV3010 (1000mm gauge length)**  
**OS242DV300F (2 ft gauge length)**



**OS241DH3000 (500mm gauge length)**  
**OS241DH3010 (1000mm gauge length)**

### MODELS

Applications	vertical casings	horizontal casings
Measurement principle	biaxial MEMS inclinometers	uniaxial MEMS inclinometers
Measuring range	±30°	±30°
Signal output and protocol	RS485 Modbus RTU <sup>(1)</sup>	RS485 Modbus RTU <sup>(1)</sup>
A/D converter	sigma-delta 32 bit, 38-KSPS	sigma-delta 32 bit, 38-KSPS
Sensor resolution (reading frequency 2 Hz)	0.00056°	0.00056°
Accuracy: MPE <sup>(2)</sup>	±0.01% FS	±0.01% FS
Repeatability	±0.0009°	±0.0009°
Stability after 24 hours <sup>(3)</sup>	±0.004°	±0.004°
Temp. operating range	-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)
MEMS shock resistance	20000 g	20000 g
Power supply	from 8 to 28 Vdc	from 8 to 28 Vdc
Max consumption	5.5 mA@24Vdc 11 ma@12Vdc	5.5 mA@24Vdc 11 ma@12Vdc
On-board temperature sensor <sup>(4)</sup> <ul style="list-style-type: none"> <li>measuring range</li> <li>accuracy / resolution</li> </ul>	- 40°C to +125°C ±1°C (-10°C to +85°C) / 0.01 °C	- 40°C to +125°C ±1°C (-10°C to +85°C) / 0.01 °C
On-board humidity sensor <sup>(4)</sup> <ul style="list-style-type: none"> <li>measuring range</li> <li>accuracy / resolution</li> </ul>	0 to 100% RH ±5% RH (0 to 95% RH) / 0.025% RH	0 to 100% RH ±5% RH (0 to 95% RH) / 0.025% RH
On-board supply voltage monitor <sup>(4)</sup> <ul style="list-style-type: none"> <li>measuring range</li> <li>accuracy / resolution</li> </ul>	0 to 36 V ±5% FS / 0.01 V	0 to 36 V ±5% FS / 0.01 V
Material	stainless steel	stainless steel
Body diameter	28 mm (1.1 in)	28 mm (1.1 in)
Total length (without connector)	750 mm (with 500 mm gauge length) 1250 mm (with 1000 mm gauge length) 33.9 in (with 2ft gauge length)	810 mm (with 500 mm gauge length) 1310 mm (with 1000 mm gauge length)
Wheels carriage	pair of wheels (Ø 32 mm / 1.26 in) mounted on long-life sealed ball bearings	2 fixed wheels and 2 spring-loaded wheels mounted on long-life sealed ball bearings
Wheel diameter	32 mm (1.26 in)	32 mm (1.26 in)
IP class	IP68 up to 2.0 MPa	IP68 up to 2.0 MPa
Weight	2.0 kg (with 500mm gauge length) 4.0 kg (with 1000mm gauge length) 5.5 lb (with 2 ft gauge length)	2.0 kg (with 500mm gauge length) 4.0 kg (with 1000mm gauge length)
CE compliant directive	2014/30/EU (EMC)	2014/30/EU (EMC)

(1) RS485 not-optoisolated Modbus communication with RTU Protocol (2) MPE is the Maximum Permitted Error on the measuring range (FSR). In the Calibration Report, the accuracies of the gauge are calculated using the linear regression; the error reported is the maximum residual error on the FSR. (3) Difference after a 24 h period under repeatability conditions, constant temperature, probe powered continuously. (4) On-board sensors are installed on the internal electronic board to give information in the event of probe malfunction. For any further information not inserted in this datasheet please refer to ISO 18674-3 international standard.

## ACCESSORIES AND SPARE PARTS

### klion SOFTWARE OKLIONS000

Klion software is designed for data elaboration of inclinometer and T-REX systems.  
For more information refer to the relevant datasheet.

### DUMMY PROBE OS21ST00000

Used to check the integrity of the inclinometer casings before measurements. Supplied with graduated steel wire on reel.  
Available with 500 mm, 1000 mm or 2 feet probe.

### PULLEY ASSEMBLY OS1CSU10000

Assists depth control and eliminates cable abrasion. It includes cable stop, pulley for guiding the cable and adaptors to fit different sizes of casing.



### CALIBRATION FRAME OS0WCAL1000

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 probe check at  $-11^\circ$ ,  $-6^\circ$ , zero,  $+6^\circ$  and  $+11^\circ$ .  
The frame is ready for wall mounting.  
Overall dimensions: 350x800x127 mm (compatible with 500mm probe only)  
Material: epoxy painted aluminium.

### WHEELS FOR INCLINOMETER PROBE (SPARE) OS2SET04WHE

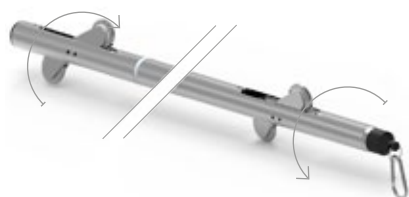
Spare set of four stainless steel wheels with screws for vertical/horizontal inclinometer probe.

### BAG FOR INCLINOMETER PROBE (SPARE) OS2RDOBAG00

Spare shoulder bag for inclinometer probe. It allows to accommodate dummy probe too.

## DIGITAL SPIRAL METER

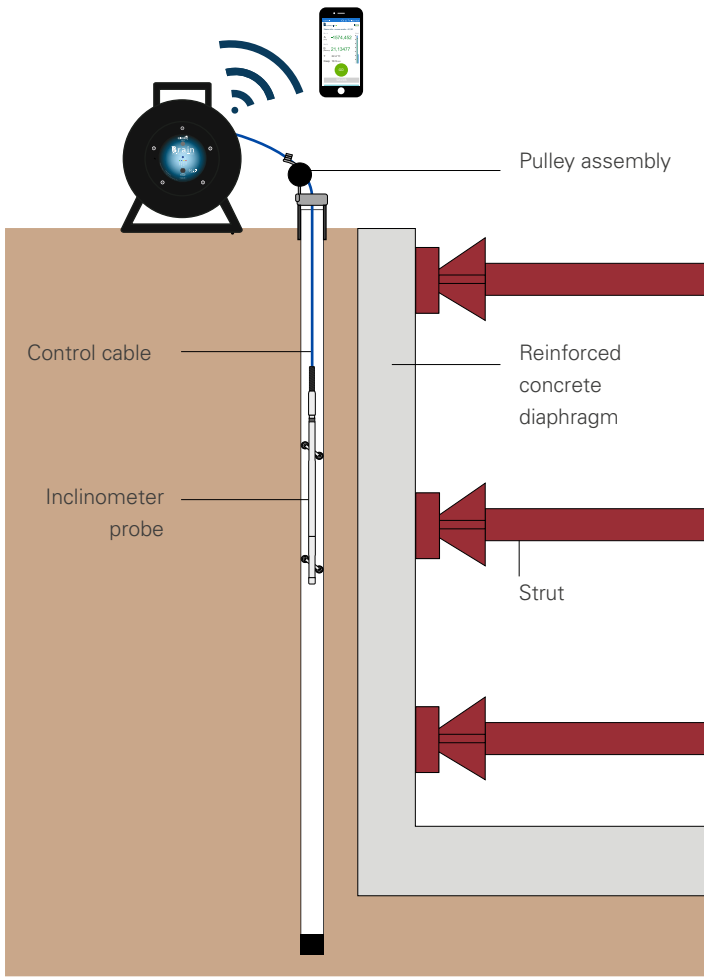
The Spiral meter is used to measure twist in installed inclinometer casings (tubes). The measurements can be used for compensating readings taken from twisted casings. SISGEO recommends to take the spiral surveys at the same time as the initial inclinometer reading. The digital spiral probe is compatible with B.R.A.IN reel.  
KLION software is required to process spiral data and applies compensations to inclinometer readings.



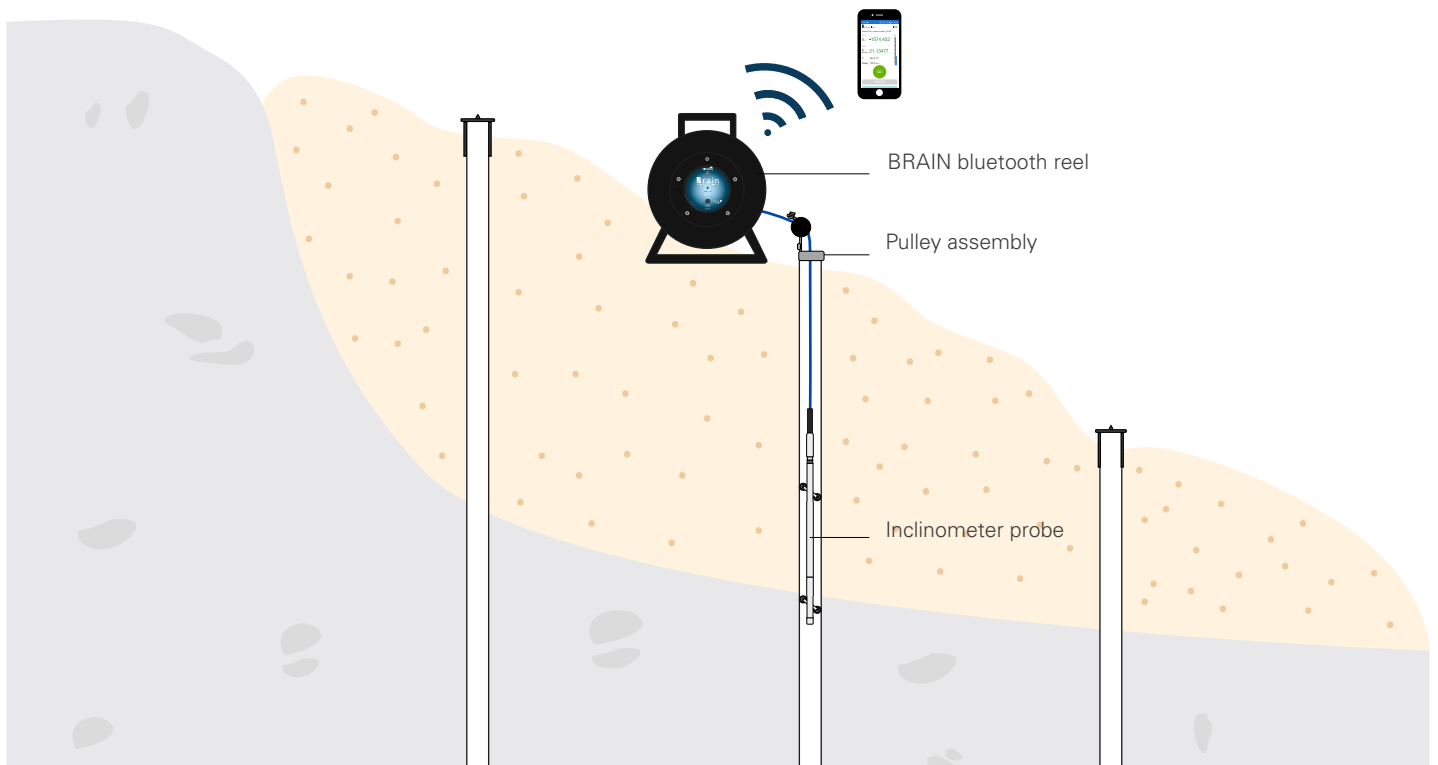
Spiral probe: twisting on the probe axis to measure the inclinometer casing torsion

	OS30PR12D00
Type of sensor	rotary contactless potentiometer (magneto-resistive)
Measuring range (FS)	$\pm 5$ degrees over the wheel base (1 meter)
Resolution	0.001 % FS
Repeatability	$\pm 0.01$ % FS
Stability	$\pm 0.025$ % FS
Accuracy	$< 0.5$ % FS
Connector	watertight. 6 pins compatible
Body diameter	28 mm (1.1 in)
Total length	1250 mm (49.2 in) without connector
Gauge length (distance between wheels)	1000 mm (39.4 in)

## EXAMPLE OF APPLICATION IN DEEP EXCAVATION



## EXAMPLE OF APPLICATION IN LANDSLIDE



## ACCESSORIES FOR HORIZONTAL INCLINOMETERS

### ROD CONNECTING TOOL OS20HOROD00

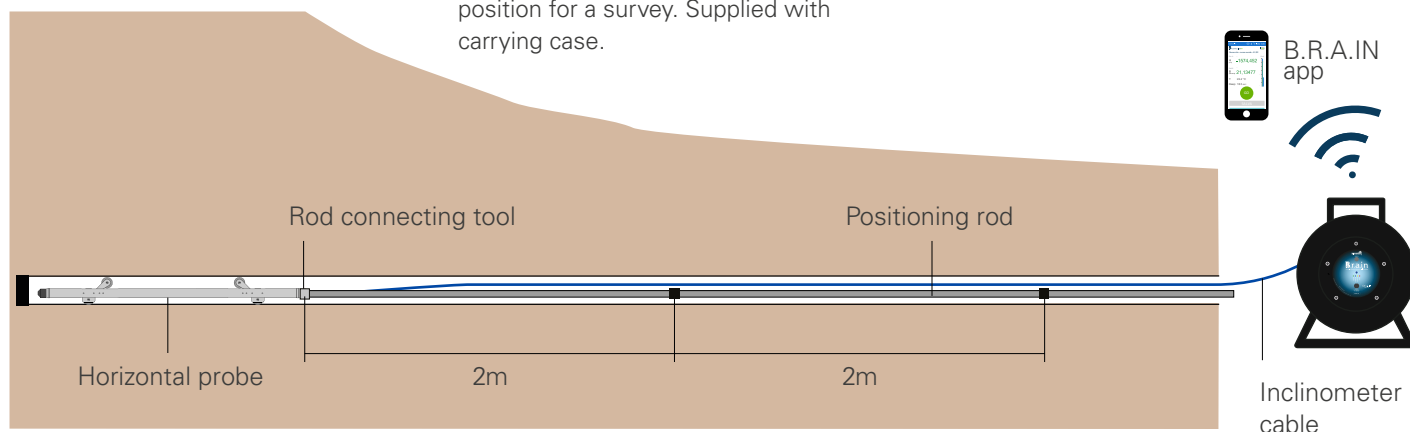
This device permits to connect the positioning rods to the inclinometer cable connector.

### SET OF POSITIONING RODS OREXROD10BX

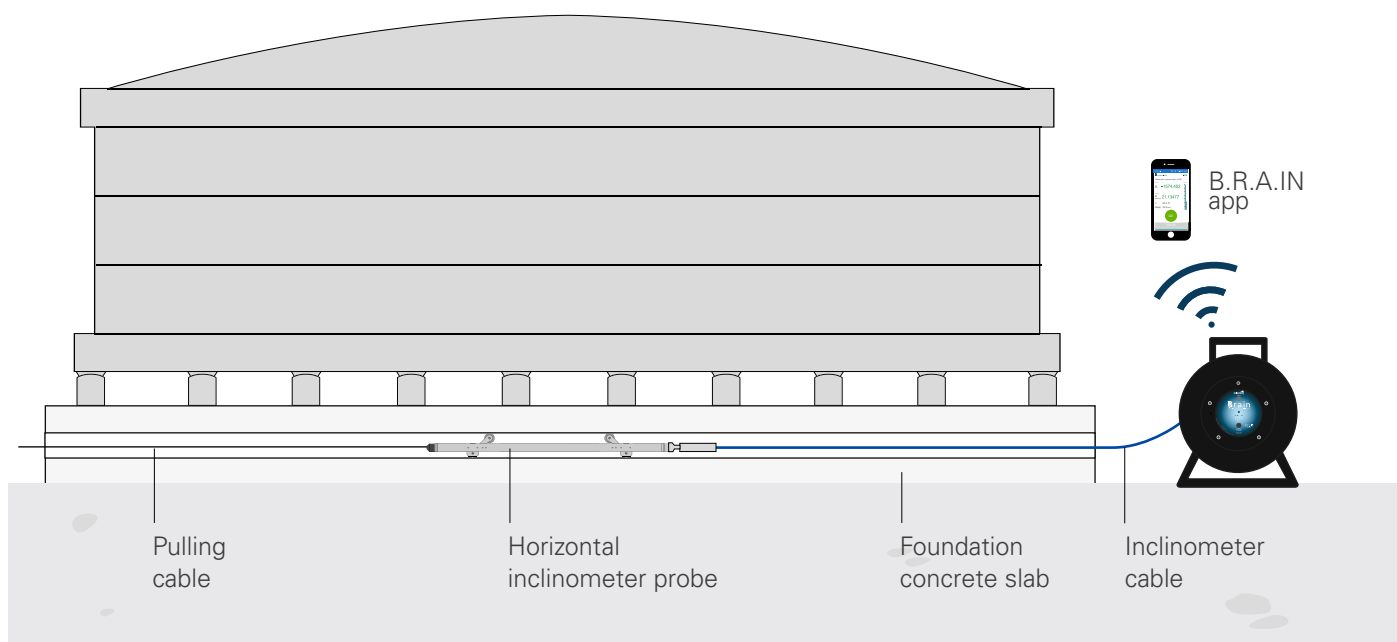
The set includes 10 positioning rods, each 2m long. Used to push inclinometer probe into the starting position for a survey. Supplied with carrying case.

### PULLING CABLE 0WRAC250000

Stainless steel wire utilized to pull the horizontal inclinometer probe into the starting position for a survey.



## EXAMPLE IN LNG TANK APPLICATION



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S131



## — RED STRIPE INCLINOMETER CASINGS

INCLINOMETERS  
& PENDULUMS





## RED STRIPE INCLINOMETER CASINGS

Inclinometer casings are special grooved tubes, generally installed into drilled holes, used in conjunction with inclinometer system or in-place inclinometers to determine sub-surface ground displacements.

Red stripe casings are made with virgin ABS and inclinometer tube assembly require drill, rivets, glue and tape.

Red-Stripe couplings create strong, twistproof joints. They fit directly onto full diameter of the casing.

### APPLICATIONS

- Landslides
- Diaphragms and retaining walls
- Dams and embankments
- Deep excavations
- Tunneling
- LNG and oil tanks

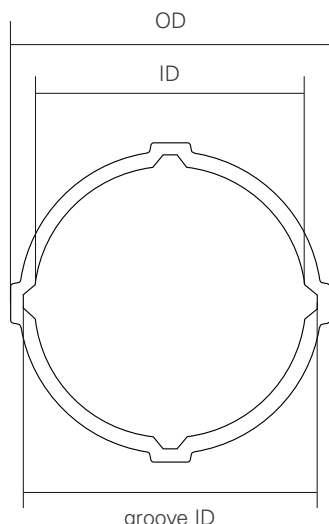
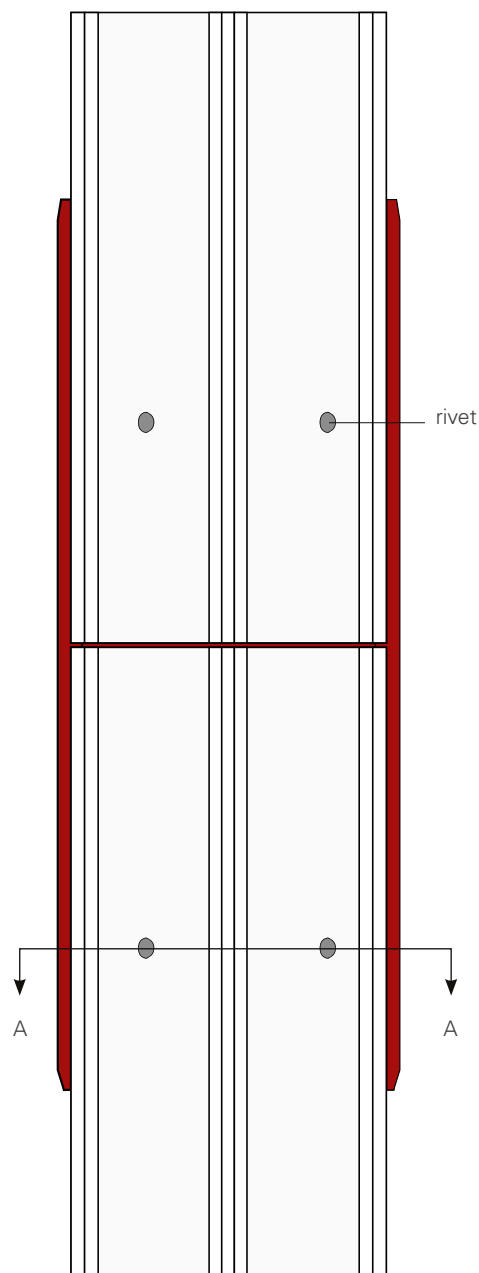
### FEATURES

- Low spiral
- Suitable for inclino-settlement columns
- Inert to the aggressive waters
- Suitable for all inclinometer systems in the market

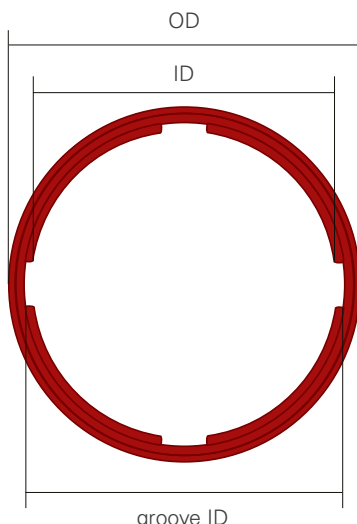
## RED STRIPE CASINGS

PRODUCT CODE	0S13100603M	0S13100610F
Description	metric red stripe casing	English red stripe casing
Material	ABS (Acrylonitrile-Butadiene-Styrene)	
Outer diameter (OD)	71 mm (2.8")	
Inner diameter (ID)	60 mm (2.4")	
Groove ID	65 mm (2.6")	
Thickness	3.75 mm (0.15")	
Length	3 meter	10 feet
Casing weight	2.1 kg	4.6 lb
Spiral	< 0.6° / 3 m	< 0.61° / 10 feet
Suggested borehole drilling diameter	101 mm (4")	
Temperature (max 1 hour)	+80°C (176 °F)	

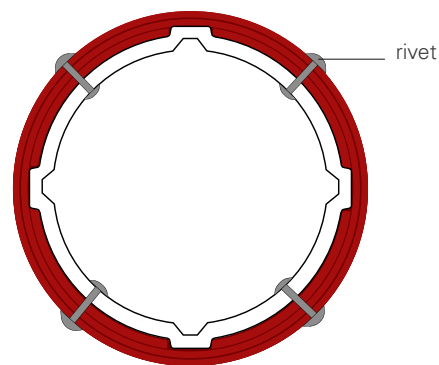
PRODUCT CODE	0S131MF6000
Description	coupling for red stripe casing
Material	ABS (Acrylonitrile-Butadiene-Styrene)
Outer diameter (OD)	77 mm (3.0")
Inner diameter (ID)	67 mm (2.6")
Groove ID	71.5 mm (2.8")
Thickness	5 mm (0.2")
Length	200 mm (7.9")
Casing weight	0.20 kg (0.44 lb)
Spiral	-
Suggested borehole drilling diameter	-



SECTION AA CASING ONLY



SECTION AA COUPLING ONLY



SECTION AA  
CASING AND COUPLING

## ACCESSORIES AND SPARE PARTS

### LOCKABLE TOP CAP OS100CH1000

Consists of a 12" steel sleeve and an ABS plastic top. The sleeve is embedded in the concrete pad at the top of the casing. The top consists of a collar and a hinged lid. The collar has a clamp that holds a pulley. The lid has a survey pin and can be locked.



### S131 SIMPLE TOP CAP OS131TS6000

Simple top cap for S131 casings, made by ABS.

### S131 BOTTOM CONICAL CAP OS131TF6000

Conical bottom cap for S131 casings, made by ABS.

### CASING ASSEMBLY KIT OS1ABKIT200

Suitable for 100 m of casing, it includes rivets, adhesive tape, self-amalgamating tape and three drill bits.



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S143

 **STANLEY**<sup>TM</sup>

## --- EASY-LOCK INCLINOMETER CASING

INCLINOMETERS  
& PENDULUMS



## EASY - LOCK

### INCLINOMETER CASING

The easy-lock inclinometer casing is a grooved tube machined at one end in order to have a self-aligning junction and a pre-assembled coupling at the other end. The special design of the coupling with an internal O-ring provide waterproof joint and nearly flush surface between tube and coupling.

The locking system is extremely simple, performant and cost-effective: the coupling contains a hole aligned with a groove of the next casing. A nylon wire is pushed through the hole in the groove, covering the circumference of the casing. That's it: no need of rivets or glue.

#### APPLICATIONS

- Landslides
- Diaphragms and retaining walls
- Earth and rockfill dams
- Embankments
- Deep excavations
- Tunneling
- LNG and oil tanks

#### FEATURES

- Nearly-flush joint
- Negligible twisting (spiral)
- Suitable for T-Rex and DEX extenso-inclinometer columns
- Inert to the aggressive waters (acid waters, brackish or marine waters)
- Suitable for all inclinometer systems in the market

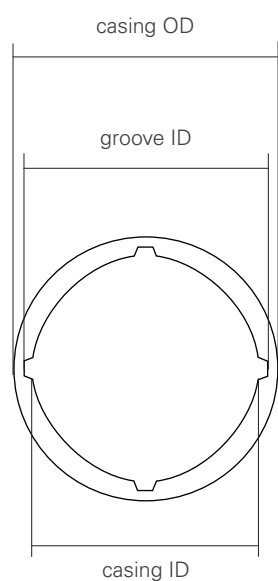
## TECHNICAL SPECIFICATIONS

### INCLINOMETER CASING

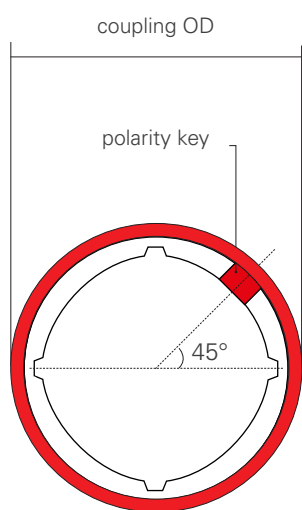
### MODEL 0S143107000

Casing outer diameter	70 mm (2.75")
Coupling outer diameter	76 mm (3.00")
Casing Inner diameter	58 mm (2.32")
Groove inner diameter	63.5 mm (2.5")
Thickness	6 mm (0.22")
Overall section length (casing+coupling)	3055 mm (10.02')
Total section weight with coupling	3.6 kg
Spiral <sup>(1)</sup>	< 0.2° / m
Material	Shock-resistant ABS
Maximum tensioning load	200 kg
Casing tensile strength	40 MPa
Casing breaking elongation	20%
Casing elastic modulus	2700 MPa
Collapse test <sup>(2)</sup>	15 bar
ABS transition temperature	+105 °C (221 °F)
HDT test ISO 75 <sup>(3)</sup>	+83°C (181 °F)
Minimum borehole drilling diameter	101 mm (4")

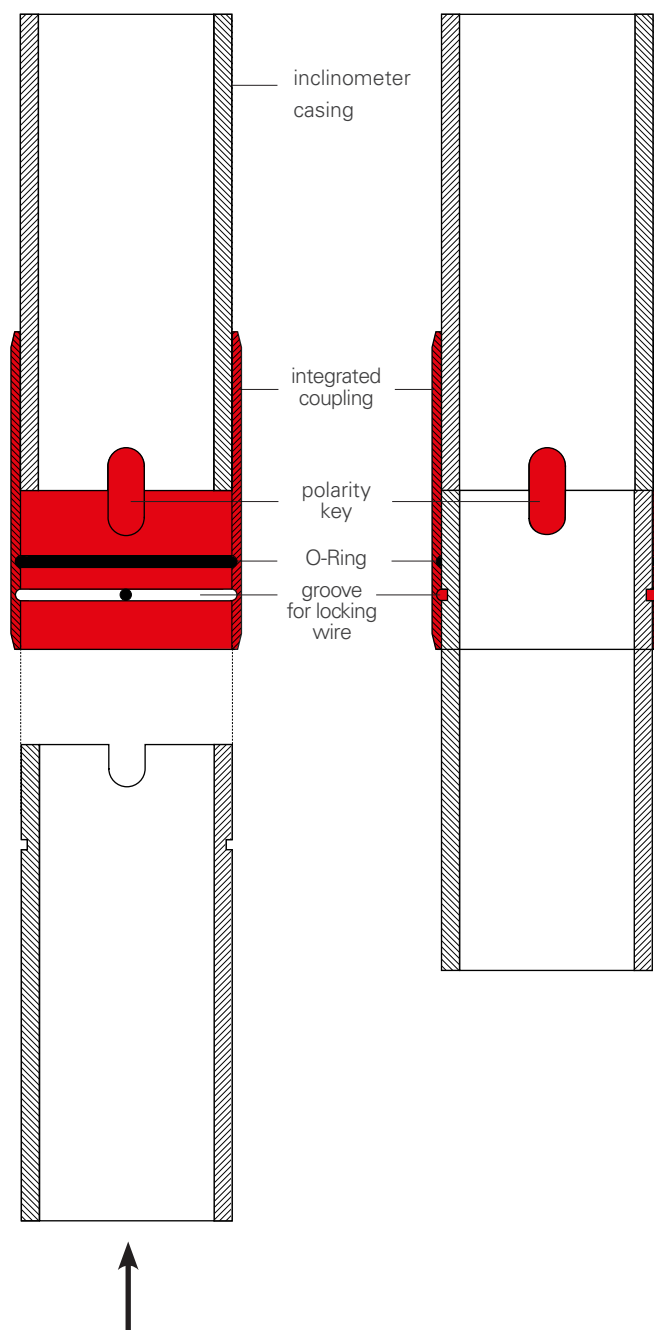
- (1) During manufacturing particular attention is paid to minimise the spiral of the casing grooves and to machine the aligning key for casing junction with self aligning couplings. Spiral value is verified connecting 10 inclinometer casings of a batch and verifying the spiralling between the two ends.
- (2) Test was performed in a water pressure chamber with empty casing sealed at the two ends.
- (3) Heat deflection temperature is defined as the temperature at which a standard test bar deflects a specified distance under a load of 1.80 MPa.



CAS ING SECTION



COUPLING  
AND CAS ING SECTION



## ACCESSORIES AND SPARE PARTS

### LOCKABLE TOP CAP OS100CH1000

Lockable protective cap with survey pin permits topographical surveying in order to define and check the borehole coordinates. It also provides temporary fixing for OS1CSU10000 pulley and cable stop during manual inclinometer measurements.

### EASY-LOCK BOTTOM CAP OS143TF70EL

Bottom cap for 143 casings, made of ABS with easy-lock system for faster installation.

### SIMPLE TOP/BOTTOM CAP OS143TF7000

Top/bottom cap for 143 casings, made of ABS. Need to be riveted.

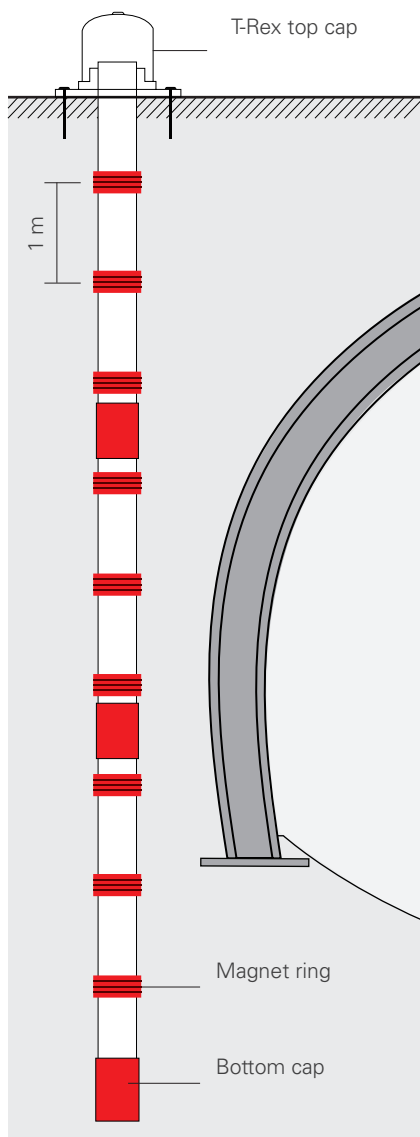
### ASSEMBLING KIT FOR 100 M OS143KIT000

Assembling set composed by 5 O-rings, locking wire and Sisgeo adhesive tape. (Mandatory)

### REPAIRING & ELONGATION KIT OS143KITR00

Kit for elongation of casing already cutted. It includes 5 coupling and mounting jig.

## EXTENSO-INCLINOMETER COLUMN (T-REX AND DEX-S COLUMN)



S143 ABS casings are suitable to realise an extenso-inclinometer tube for high-precision measurements in borehole with T-REX or DEX-S extensometers.

Measuring targets are special magnet rings which are externally attached to ABS casing every meter.

Measurements are taken meter by meter inserting into the casing the T-REX mobile extensometer and the inclinometer probe for obtaining a detailed cumulative and accurate 3-D borehole profile.

Automatic 3-D borehole monitoring is allowed using DEX-S in-place extenso-inclinometer probes; DEX-S shall be connected to OMNIAlog datalogger for data storage, remote management and alerting.

Extenso-inclinometer column can be read with the C121 magnetic probe to check the position of the rings after column grouting, and to take interim measurements before using T-REX or DEX.

### MAGNET REFERENCE RING OREXORINGRO

Simple measuring reference ring for T-REX incremental extensometer and DEX in-place extensometers.

OD: 93 mm

ID: 71 mm

Material: PVC with permanent magnet

### SPIDER REFERENCE RING OREXOAF71R0

Spider measuring reference ring for T-REX incremental extensometer and DEX in-place extensometers.

OD: 93 mm

ID: 71 mm

Max spring span: 300 mm

Material: PVC with permanent magnet

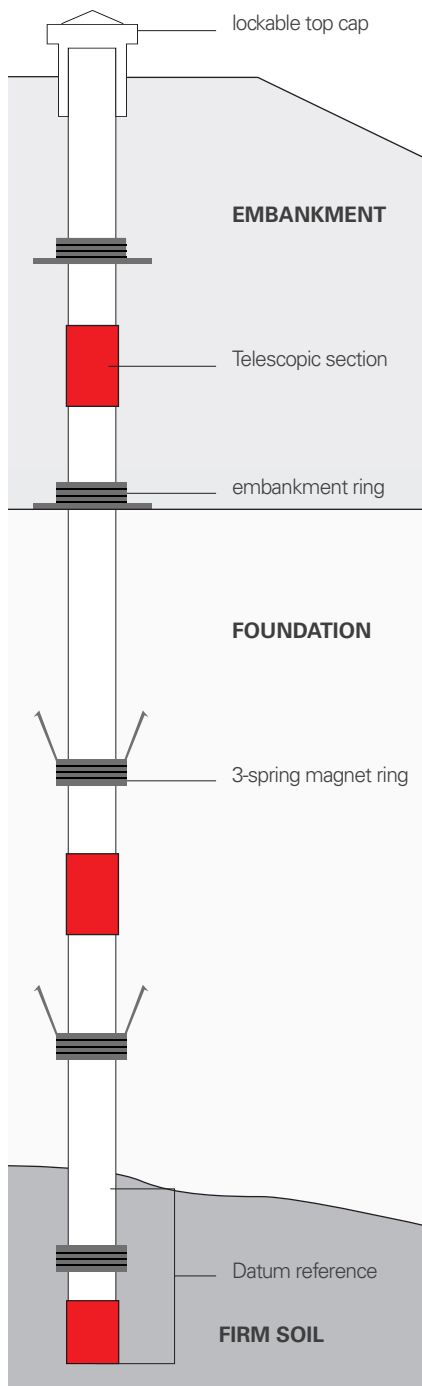
### T-REX TOP CAP OREXOTS2350

Lockable top cap ready with fixing plate for T-REX positioning system.

### MAGNET RING JIG OREXODIMA00

Setting rod for positioning the rings 1 m apart.

## INCLINO-SETTLEMENT COLUMN (BRS MAGNET EXTENSOMETER COLUMN)



Inclino-settlement column is a cost-effective solution when inclinometer and settlement measurement are requested. It is composed by ABS inclinometer casing with a number of magnet rings; telescopic sections are provided for columns where big settlements are expected with consequent damage of the casings. Spider magnet rings are usually installed in borehole; embankment magnet rings with circular plate are available for installation during embankment construction. Measurements are performed with removable inclinometer system and C121 portable magnet settlement probe.

The magnet rings utilized for the inclino-settlement column are not compatible with T-REX, DEX and DEX-S probes.

### 3-SPRING MAGNET RING OS143AF6000

BRS magnet ring with 3 nylon springs for borehole installation. Not compatible with T-REX, DEX and DEX-S.  
Ring ID 71 mm  
Ring OD 95 mm  
Max. spring span 300 mm

### 6-SPRING MAGNET RING OS143AF6060

BRS magnet ring with 6 nylon springs for borehole installation. Not compatible with T-REX, DEX and DEX-S.  
Ring ID 71 mm  
Ring OD 95 mm  
Max. spring span 300 mm

### EMBANKMENT RING OS143AR6000

BRS magnet ring with circular settlement plate for embankment installation. Not compatible with T-REX, DEX and DEX-S.  
Ring ID 71 mm  
Ring OD 95 mm  
Plate OD 300 mm

### DATUM REFERENCE OS143DR7000

Bottom datum reference for S143 casing, total length 1500mm. It includes a magnet ring.

### 70MM TELESCOPIC SECTION OS143ST0700

Telescopic section with 75 mm gap (movement range).

### 150MM TELESCOPIC SECTION OS143ST1500

Telescopic section with 150 mm gap (movement range).

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S151



## — QUICK JOINT INCLINOMETER CASING

INCLINOMETERS  
& PENDULUMS





## QUICK JOINT INCLINOMETER CASING

Sisgeo QJ casing is an alternative to the traditional inclinometer tubes, mainly designed for earth-fill and rock-fill dams, and deep borehole applications.

QJ tube offers simple and fast installation, consistent joint and deeper tube grooves. O-rings prevent ingress of grout or water.

The fitted-at-factory coupling and the alignment keys assure a perfect grooves continuity.

Telescopic section and a variety of settlement rings for either borehole and embankment installations permit to combine inclinometer and settlement measurements in one borehole.

### APPLICATIONS

- Earth-fill and rock-fill dams
- Deep borehole installations
- Landslides
- Diaphragms and retaining walls
- Embankments
- Deep excavations
- Tunneling

### FEATURES

- Simple assembling, no rivets, tape or glue required
- Fast installation reducing costs and drilling-rig stand-by
- Heavy duty, suitable for extreme installations
- High precise and deep tube grooves
- Available a special settlement plate for rock-fill dams



Meet the essential requirements of the EMC Directive 2004/108/EC

## TECHNICAL SPECIFICATIONS

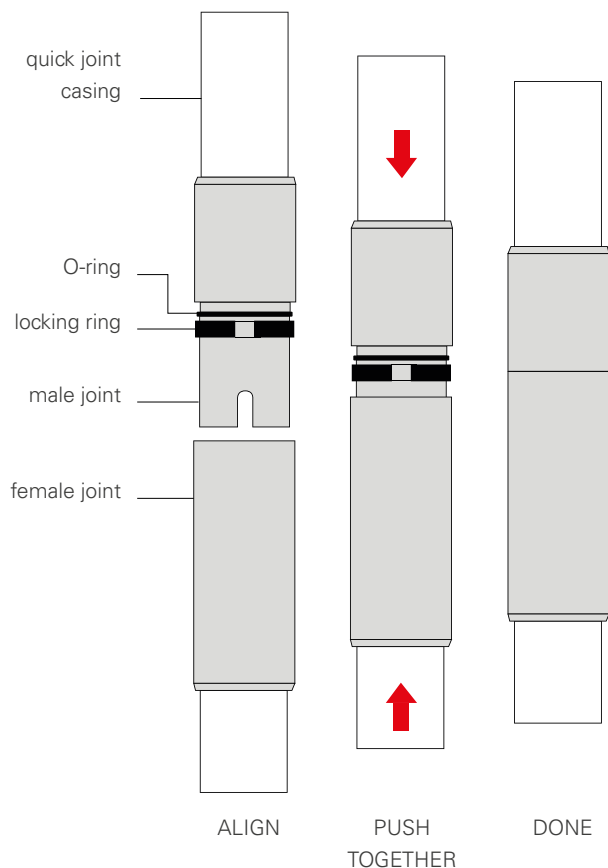
	MODEL OS151107000	MODEL OS151MT0700
Description	Standard QJ section	QJ Telescopic section 75 mm gap (3")
Tube outer diameter	70 mm (2.75")	70 mm (2.75")
Tube inner diameter	59 mm (2.32")	59 mm (2.32")
Tube groove ID	63 mm	63 mm
Overall section length	3100 mm	500 mm
Overall diameter	84 mm	84 mm
Thickness	5.5 mm	5.5 mm
Material	ABS (Acrylonitrile Butadiene Styrene)	ABS (Acrylonitrile Butadiene Styrene)
Colour	white/red	white/red
Spiral (1)	< 0.6° / 3 meter	-
Collapse test (2)	15 bar	15 bar
Temperature (max 1 hour)	+80°C (176 °F)	+80°C (176 °F)
Max working load (3)	> 500 Kg	> 500 Kg

(1) During manufacturing particular attention is paid to minimise the spiral of the casing grooves and to machine the couplings.

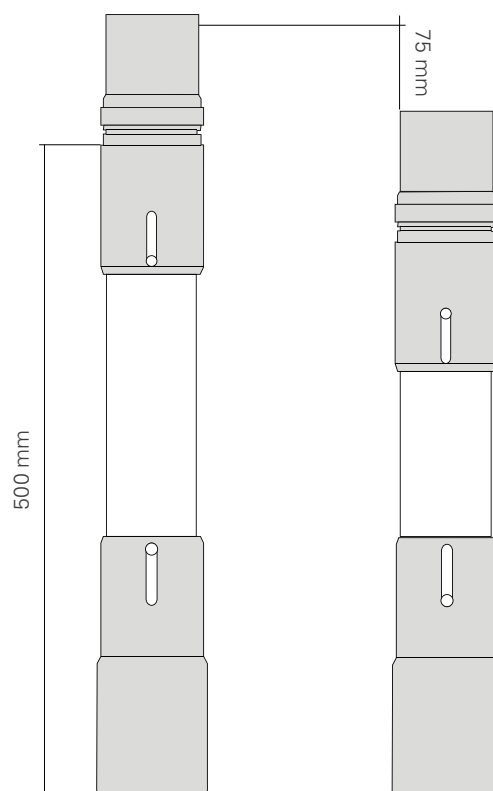
(2) Test was performed in a water pressure chamber with empty casing sealed at the two ends.

(3) Pulling test is performed on a two QJ tube sections jointed together under a thrusting machine.

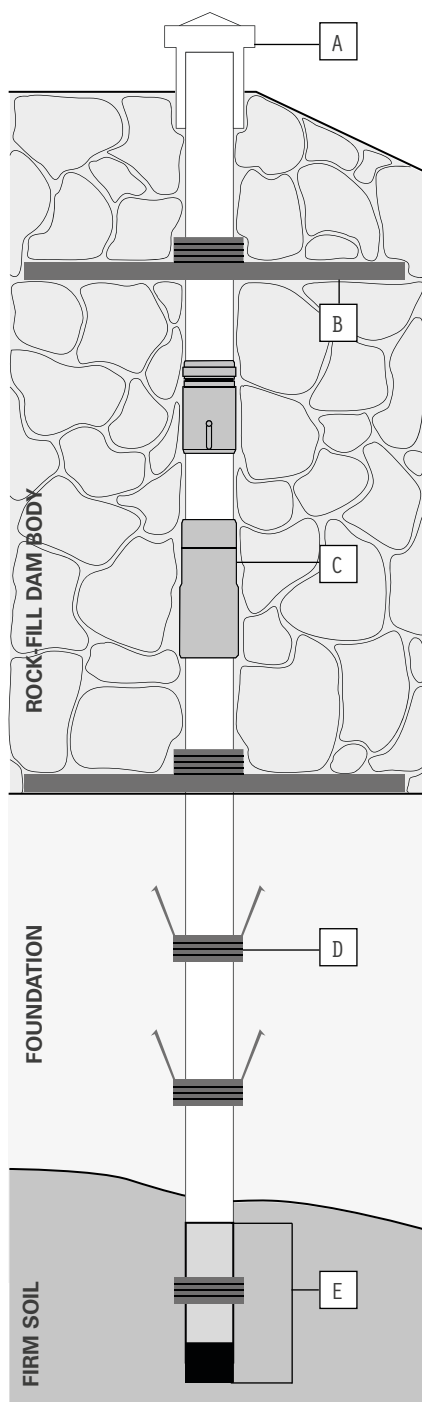
### ASSEMBLY SEQUENCE



### QJ TELESCOPIC SECTION



## QUICK JOINT ACCESSORIES AND INCLINO-SETTLEMENT COLUMN



### LOCKABLE TOP CAP OS100CH1000

Lockable protective cap with survey pin permits topographical surveying in order to define and check the borehole coordinates. It also provides temporary fixing for OS1CSU10000 pulley and cable stop during manual inclinometer measurements.

### ABS QJ TOP CAP OS151TS7000

Simple top cap to prevent tube clogging with topographic survey point

### ABS QJ BOTTOM CAP OS151TF7000

Bottom cap with femal quick joint coupling for fast column assembling

### SPARE KIT FOR QJ OS151KIT000

This kit includes No.10 "O" rings and No.10 locking rings

### REPAIRING KIT FOR QJ OS151KITR00

It includes No.5 female joints, No.5 male joints, No.7 "O" rings and No.7 locking rings

### 3-SPRING MAGNET RING OS143AF6000<sup>(1)</sup>

BRS magnet ring with 3 nylon springs for borehole installation.  
Ring ID 71 mm  
Ring OD 95 mm  
Max. spring span 300 mm

### 6-SPRING MAGNET RING OS143AF6060<sup>(1)</sup>

BRS magnet ring with 6 nylon springs for borehole installation.  
Ring ID 71 mm  
Ring OD 95 mm  
Max. spring span 300 mm

### EMBANKMENT RING OS143AR6000<sup>(1)</sup>

BRS magnet ring with circular settlement plate for embankment installation.  
Ring ID 71 mm  
Ring OD 95 mm  
Plate OD 300 mm

- A. LOCKABLE TOP CAP
- B. PLATFORM TARGET
- C. QJ TELESCOPIC SECTION
- D. SPRING MAGNETIC RING
- E. QJ DATUM REFERENCE

### QJ DATUM REFERENCE OS151DR7000

It provides bottom datum point in borehole for inclino-settlement column.

### PLATFORM TARGET OS151AR80RC

Platform magnet target designed for rockfill dams.  
Material: stainless steel  
Platform area: 900x300 mm  
Platform thickness: 30 mm  
Hole ID: 83 mm

Inclino-settlement columns with QJ casing are a cost-effective solution when inclinometer and settlement measurement are required. A typical application is in rock-fill dams thanks to QJ extreme robustness and availability of magnet platform target. The columns are composed by QJ casings with a number of magnet rings/platforms; telescopic sections are provided for columns where big settlements are expected with consequent damage of the casings. Measurements are performed with removable inclinometer system and portable settlement probe C121 model.

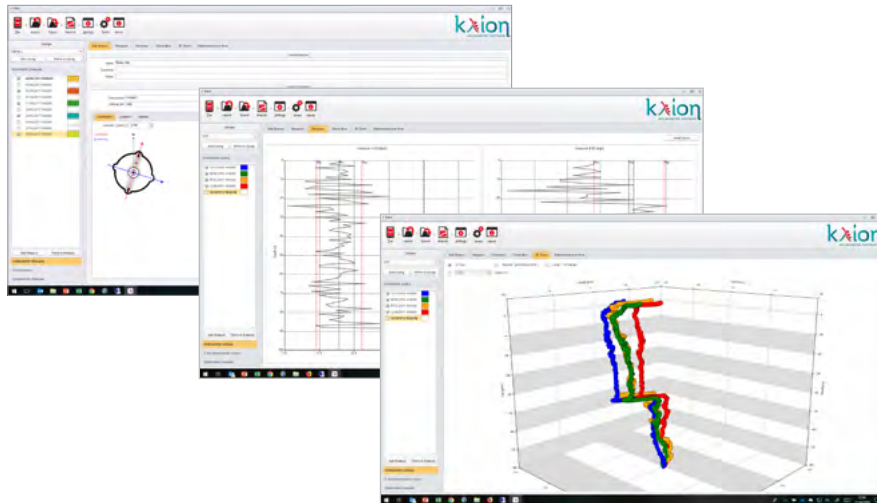
<sup>(1)</sup> Magnet ring shall be installed on the casing during production.

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**kxion**  
SOFTWARE

CABLES,  
ACCESSORIES  
& SOFTWARE



## KLION SOFTWARE

KLION is a powerful tool designed to manage vertical and horizontal inclinometer readings, spiral meter compensation and T-Rex extensometer surveys. The software was developed in cooperation with the Geohazard Monitoring Group (GMG) of CNR-IRPI (the Research Institute for Geo-hydrological Protection, a branch of CNR, the Italian National Research Council).

KLION allows to import data from B.R.A.IN systems and Archimede readout to create incremental, cumulative, local and absolute graphs. KLION permits to correct zero point and data elaboration according to the advanced suggestions published by Mikkelsen in 2003 in the article "Advances in Inclinometer Data Analysis".

KLION is supplied with two USB flash drives: one "installation flash drive" and one "licence flash drive". If the licence flash drive is plugged in, KLION can run on any compatible PC.

### SYSTEM REQUIREMENTS

- Microsoft ® Windows ® Vista, 7, 8, 8.1, 10 (32 and 64 bit)
- RAM memory 512 MB minimum
- Hard Disk 100 MB for software installation
- Internet connection for up-dates
- Licence USB flash drive pluggen in

### BENEFITS

- Advanced data elaboration
- 3-D inclinometer data view
- Compatible with old INCL12 files
- Fully customizable report plot
- Multilanguage
- With XML BRAIN file, user can import survey data and notes, site and casing names, descriptions and GPS coordinates, and many other information in one click.

## SOFTWARE MAIN FEATURES

### DESCRIPTION

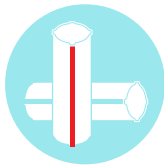
### COMPATIBILITY



User - oriented interface

All functions are displayed in a user-oriented interface that permits to manage most operations using a point and click action.

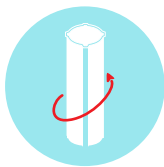
Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer



Vertical and horizontal casings

Klion permits to set-up and manage both vertical and horizontal readings.

Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer



Spiral data correction

With deep borehole installations, casing twisting can occur. Klion software allows the automatic compensation of the inclinometer data with spiral meter survey.

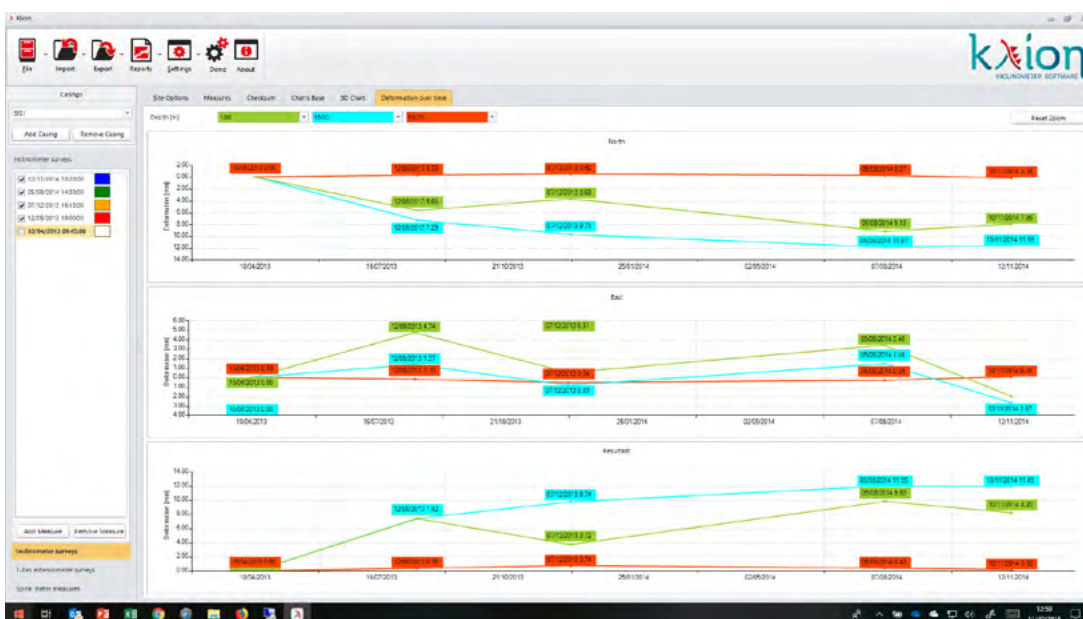
Vertical inclinometer  
Horizontal inclinometer



Deformation over time

For inclinometer readings, user can view data behaviour over the time in three specific depths. Default positions are top, bottom and middle, but is possible to customize the depths with dedicated dropoff windows.

Vertical inclinometer  
Horizontal inclinometer



DEFORMATION OVER TIME

## FEATURE

## DESCRIPTION

## COMPATIBILITY



Zooming charts

All the graphs are presented in an automatic scale for a general overview of the readings. Klion permits to zoom-in or zoom-out with a simple mouse scroll. With simple right-click on the each graph, user can print or save it in different formats.

Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer



Customizable report file

User can choose the report to generate: with all the elaborations, or only with inclinometer data, extensometer data, spiral data or check sum. After the creation, an advanced Word Processor permits to edit, format and print the report.

Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer



Multilanguage software

Klion is a native multilanguage software: it is available in English, Italian, French, Spanish and German.

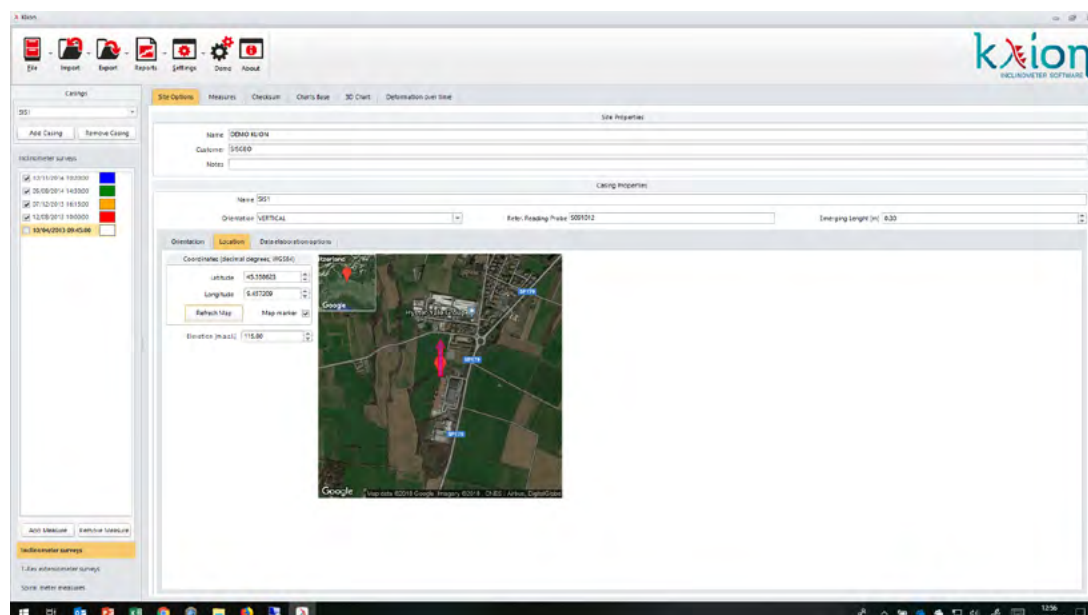
Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer



Geolocation and displacement vector

Klion has a built-in Google Map tool that allows the borehole view on a map. Two displacement vectors are plotted over the map: the blue one represents the top borehole displacement direction and the red one represent the maximum displacement direction over all the borehole length.

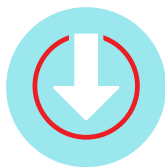
Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer

GEOLOCATION AND  
DISPLACEMENT VECTORS

## FEATURE

## DESCRIPTION

## COMPATIBILITY



**On-line software updates**

If Klion is installed on a PC/notebook connected to the Internet, it will be automatically updated.

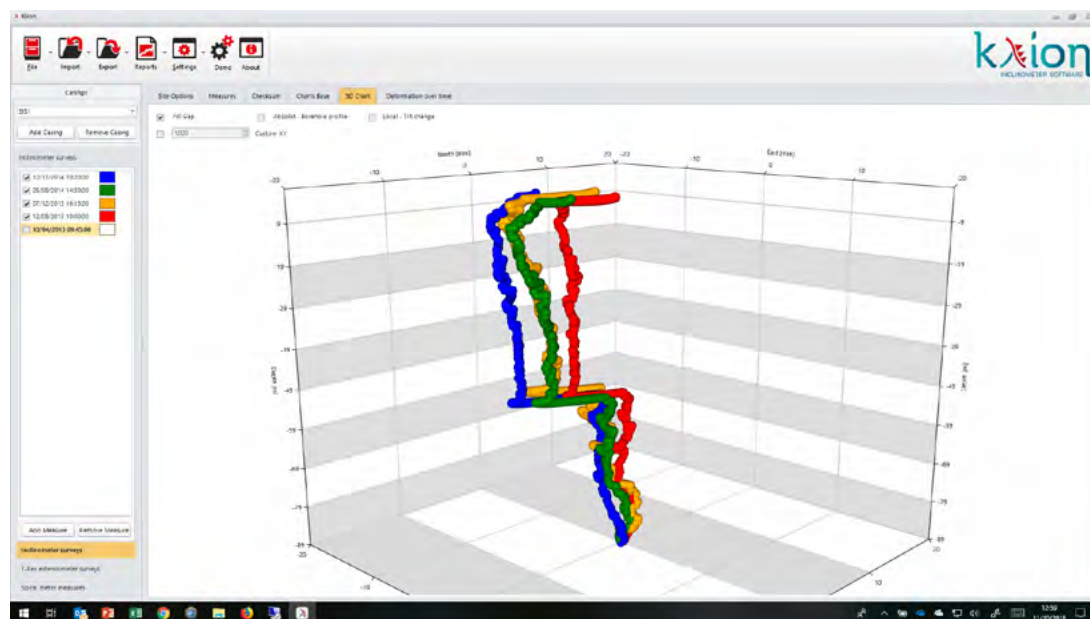
Vertical inclinometer  
Horizontal inclinometer  
T-Rex extensometer



**3D graphs**

With this powerful program, user can view the inclinometer data elaborations in a 3D graph. Drag the mouse to rotate the graph in the space and scroll for zooming in and out.

Vertical inclinometer  
Horizontal inclinometer



**3D  
GRAPH**

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