



— DELIVERING
SOLUTIONS

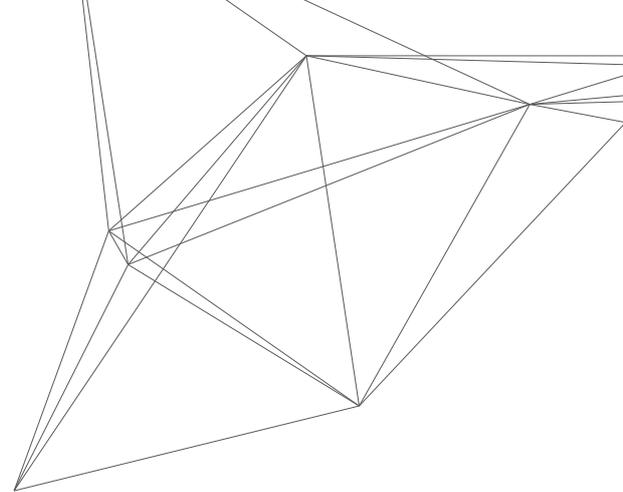
2014 CATALOGUE





— **GEOTECHNICAL INSTRUMENTS
AND STRUCTURAL HEALTH MONITORING**

COMPANY PROFILE



EXPERIENCE AND INNOVATION

SISGEO was founded in 1993 inheriting the abilities of "SIS Geotecnica", the leading company in Italy in geotechnical engineering. Over the years, SISGEO has distinguished itself internationally thanks to a tight and highly motivated working group, that devoted itself with passion and creativity to design and manufacture high quality instruments to meet the broader needs in the field of civil engineering.

Experience is the solid foundation from which we start to develop our products and services with a constant focus on continuous innovation and attention to the sector's future needs. Over the years, SISGEO has become a recognized brand for quality, reliability and innovation.

1



Experience is the solid foundation from which we start to develop our products and our services with a constant focus on continuous innovation and attention to the sector's future needs

MADE IN ITALY



SISGEO is based in Masate, in the industrial area located east of Milan. A three storey building of more than 2.000 sq.m, with offices, laboratories, manufacturing department, warehouse and a separate building dedicated to the production of fibre glass extensometers and over 500 sq.m of outside area for exclusive use.

"Made in Italy" is the heart of our business and at the same time a legacy of history, creativity, style and passion we are proud to bring to the world with our products and services, through a network of international engineers with proven skills.

1 **VK40** vibrating wire strain gauges





WE DELIVER THE FUTURE

We listen to the earth with our instruments and we respect it with our manufacturing processes designed to reduce any environmental impact.

2

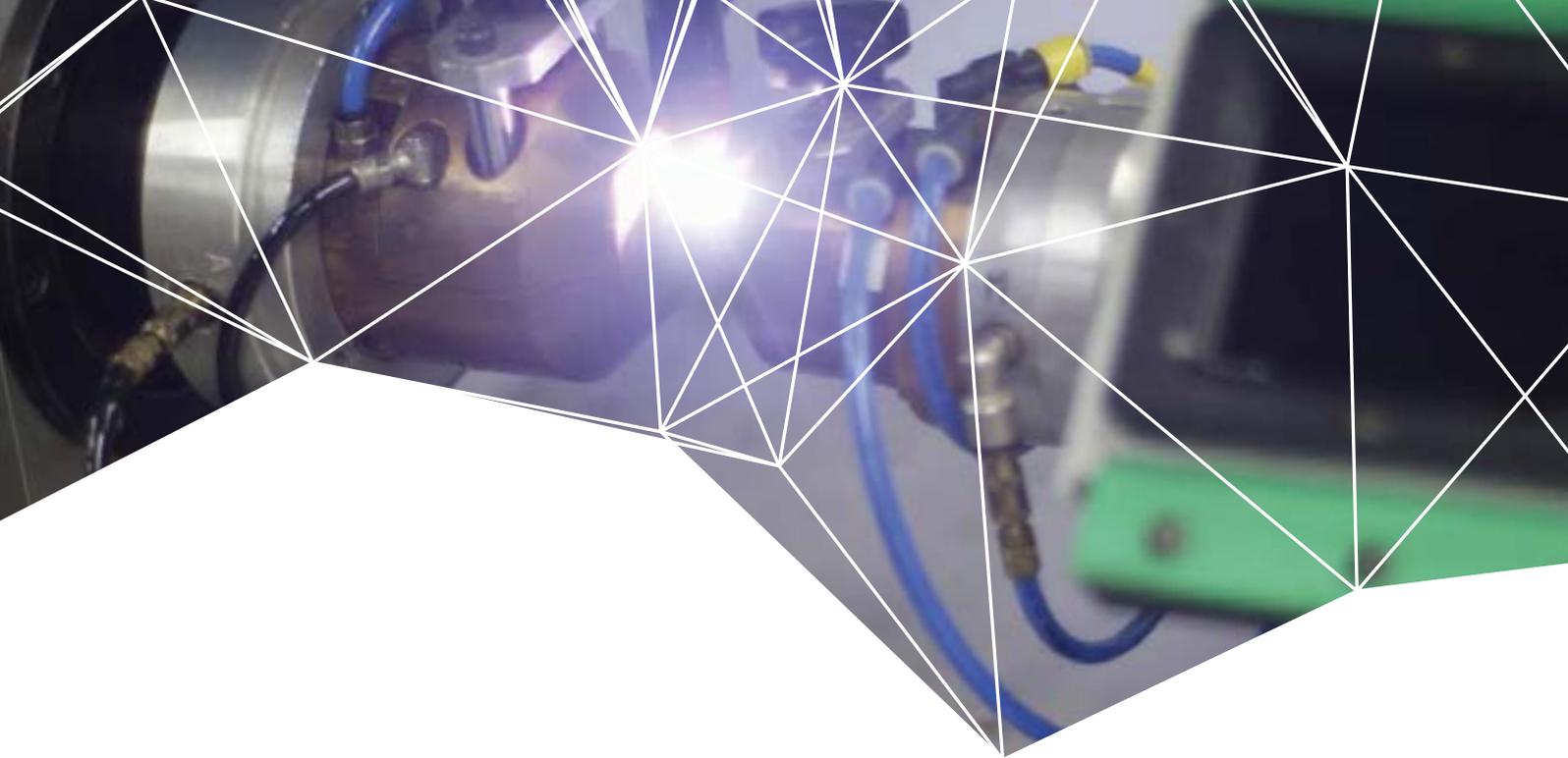


“Tracciamo soluzioni” (delivering solutions) is how we introduce ourselves because it is what we do, giving prominence to people. Acquiring skills and taking note of the ideas of those who work with us, enable ourselves to satisfy our clients’ needs. This is the horizon towards which we trace our route. Planning, design and build are our ways to improve and simplify the work of our clients. We believe that the interaction between clients and ourselves is essential to feed our experience and stimulate our creativity.

We listen to the earth with our instruments and we respect it with our manufacturing processes designed to reduce any environmental impact.

2

S520 waterproof tilt sensor



— OUR GROUP OF COMPANIES

3



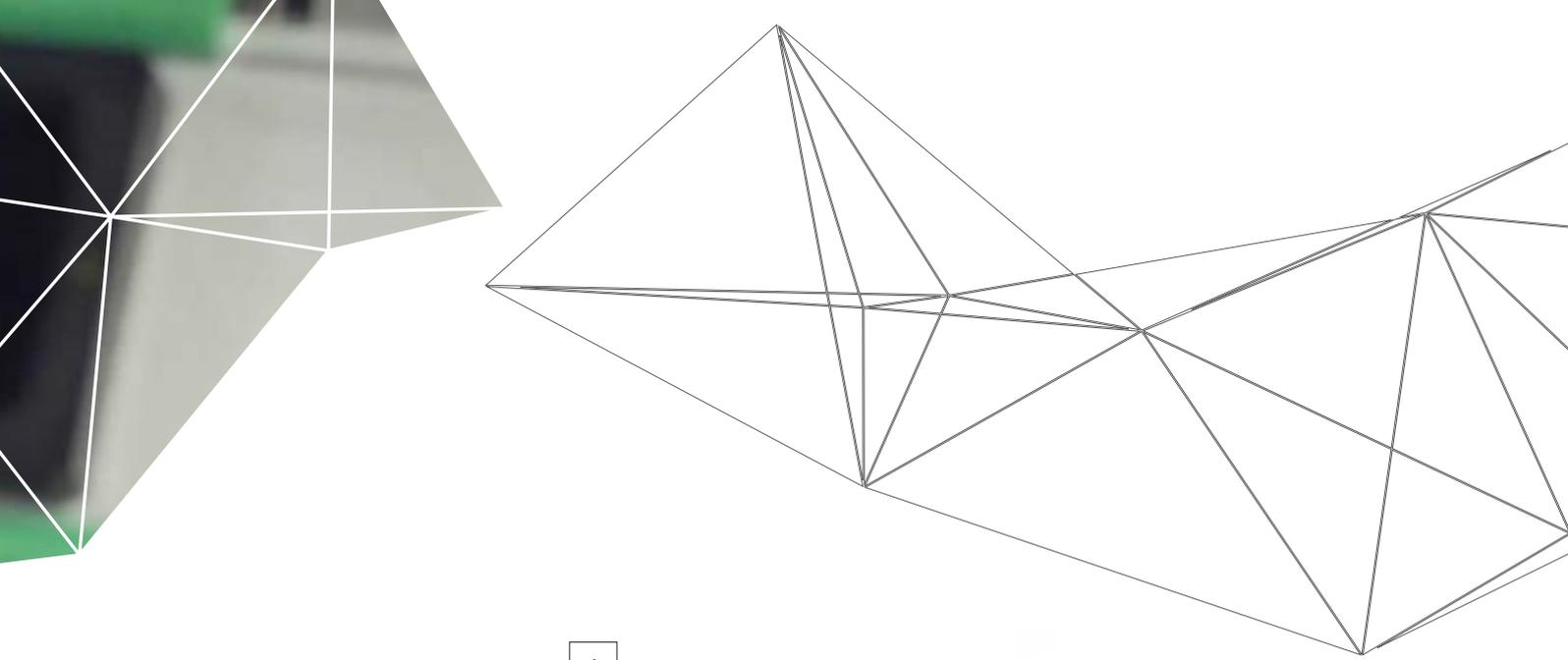
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The establishment of the foreign companies has allowed us to expand the presence of SISGEO abroad offering solutions focused to the needs of individual markets.
—

SISGEO is the head of a Group that includes FIELD S.r.l., SISGEO International S.A., SISGEO Asia Pacific Co., Ltd., SISGEO Zemin A.S. and MONITORIZA S.a.S.

FIELD, founded in 2000, specializes in providing integrated and customized solutions from design, installation and management of geotechnical and structural monitoring systems. Its services include on-site tests and a qualified service of real time data management thanks to the innovative WMS (Web Monitoring System) software.

The establishment of the foreign companies such as SISGEO International (Switzerland), SISGEO ASIA PACIFIC (Thailand), SISGEO ZEMIN (Turkey) and MONITORIZA (Colombia), has allowed us to expand the presence of SISGEO abroad offering solutions focused to the needs of individual markets.

3 **PK45I** push-in vibrating wire piezometer



4



SISGEO considers manufacturing procedures, client feedback and good organization to be the fundamental concepts to achieve quality.

100% RELIABLE QUALITY

**COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
= ISO 9001 =**

SISGEO considers manufacturing procedures, client feedback and good organization to be the fundamental concepts to achieve quality. In 1997 SISGEO obtained the ISO 9001 Certification and since then, the constant and continuous application of our Quality System, widespread at all levels of the company, is a source of improvement, evolution and growth.

4 **L2CE** steel lining load cell

TECHNOLOGICAL PASSION

SISGEO, thanks to innovative automated solutions, has optimized the efficiency of its manufacturing process. This, together with our passion, ensures the highest standard of products to the client.



5

Research and development are hallmarks of SISGEO.

A continuous commitment is reflected both in the design of new and innovative products and in the optimization of equipment used in the manufacturing process, which results in our product line always being technologically up to date.

Following its steady growth in sales, SISGEO, thanks to innovative automated solutions, has optimized the efficiency of its manufacturing process. This, together with our passion, ensures the highest standard of products to the client.

SISGEO's wide range of products employ various technologies including vibrating wire and other industrial sensors such as MEMS which we have tailored to suite many different applications.

5

CDL400 New Leonardo universal portable datalogger



—
A team of SISGEO qualified and experienced engineers, technicians, hardware specialists and software programmers are constantly involved in production, calibration and research activities
—



— PRODUCTION HEART

6

SISGEO utilizes, in its production department and laboratory, quality equipment including:

- assembly jigs for the production of vibrating wire sensors;
- automated calibration tables for inclinometers, displacement and pressure transducers;
- climate chambers for heat treatment including the ageing of vibrating wire sensors;
- TIG welding;
- semi automatic device for de-airing oil and filling under vacuum load/pressure cells;
- in line assembling of multipoint borehole extensometers up to 60m length;
- hydraulic press, up to 3000 KN capacity;
- pressure vessels for waterproofing tests;
- automatic tool for mixing epoxy used for sealing instruments.

The calibration tables are electronically controlled to automatically generate calibration reports. A team of SISGEO qualified and experienced engineers, technicians, hardware specialists and software programmers are constantly involved in production, calibration and research activities.

6

TILLI portable tiltmeter

GEOTECHNICAL INSTRUMENTS AND STRUCTURAL HEALTH MONITORING

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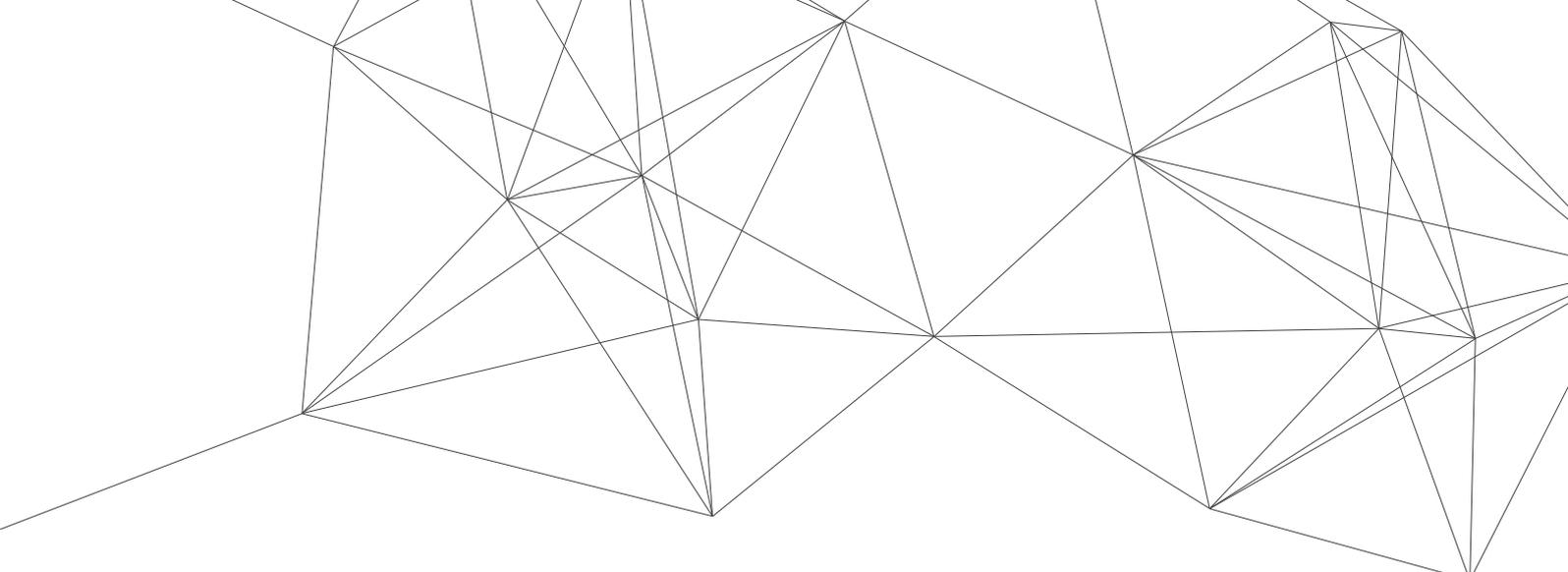
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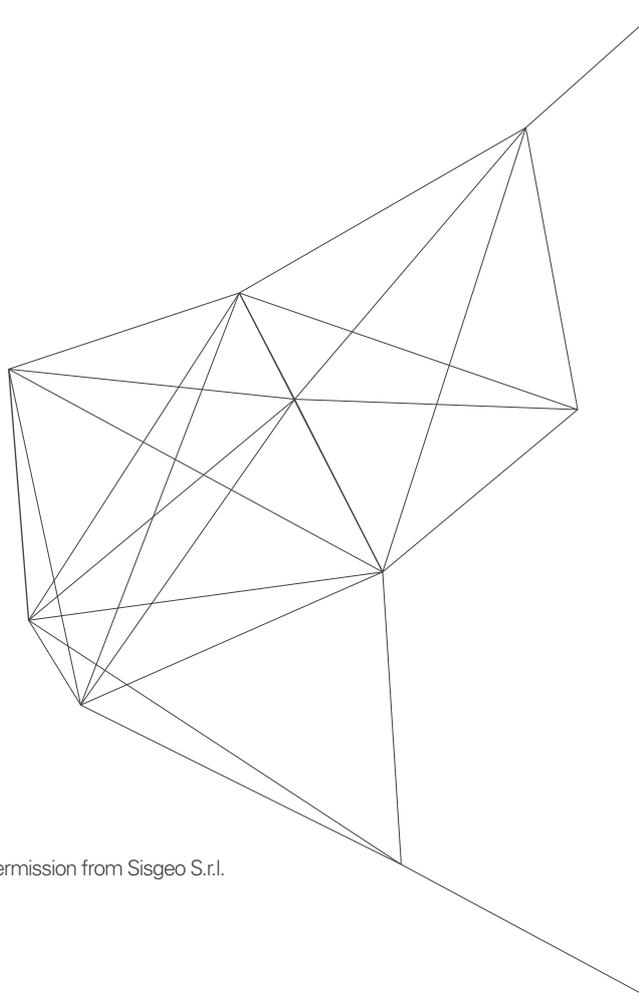
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PIEZOMETERS

_GROUND WATER LEVEL

_PORE WATER PRESSURE

_EARTHFILL DAMS
AND EMBANKMENTS

_UP-LIFT PRESSURE IN
DAM FOUNDATIONS

_SEEPAGE MONITORING

_WATER PRESSURE BEHIND
TUNNEL LININGS

_POTENTIAL LANDSLIDES

_DEWATERING AND PUMP TESTS

_FOUNDATIONS
AND DIAPHRAGM WALLS



Project:
Suvarnabhumi Airport
Bangkok, Thailand



VIBRATING WIRE PIEZOMETERS

VW piezometers consist of a vibrating wire sensing element enclosed in a protective stainless steel housing with filter tip. VW piezometers offer excellent long-term reliability as result from the use of the latest developments in vibrating wire technology. Heavy duty model PK45 is recommended for use in earthfill dams with armoured cable.

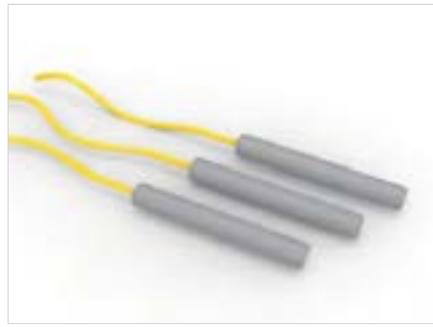
STANDARD VW PIEZOMETERS

MODEL PK20A	with HAE value filter unit
MODEL PK20S	with LAE value filter unit
Standard ranges	170, 350, 700 kPa 1.0 , 1.7, 2.0, 3.5 MPa
Sensitivity	0.025% FS
Total accuracy (*)	< 0.25% FS
Temp. operating range	-20°C +100°C
Filter unit features:	
- HAE	0.25 µ ceramic stone
- LAE (100kPa)	40 µ syntherized s/steel 50 µ syntherized PE
Diameter / length	20 mm / 180 mm

HEAVY DUTY PIEZOMETERS

MODEL PK45A	with HAE value filter unit
MODEL PK45S	with LAE value filter unit
Standard ranges	170, 350, 700 kPa 1.0 , 1.7, 2.0, 3.5 MPa
Sensitivity	0.025% FS
Total accuracy (*)	< 0.25% FS
Temp. operating range	-20°C +100°C
Filter unit features:	
- HAE stone	1 µ ceramic stone
- LAE (100 kPa)	40 µ syntherized s/steel 50 µ syntherized PE
Diameter / length	28 mm / 200 mm

(*) including hysteresis and repeatability, calculated with 3rd degree polynomial



TITANIUM PIEZOMETERS

Titanium piezometers have been specifically designed for installation in high corrosive environments and aggressive soils. All the exposed surfaces are made from titanium and the ceramic membrane (diaphragm) is also chemically inert. Titanium piezometers are recommended in landfills and aggressive mine tailings.

TECHNICAL SPECIFICATIONS

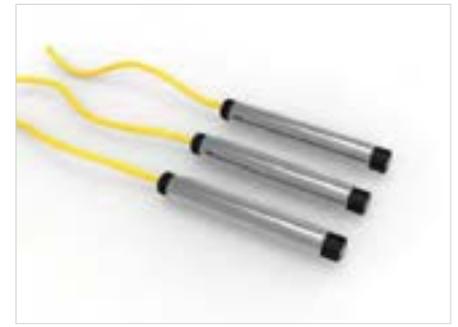
Standard ranges	200, 500 kPa, 1.0, 2.0 MPa
Signal output	4-20 mA (current loop)
Sensitivity	0.01% FS
Total accuracy (*)	< 0.25% FS
Power supply	12 - 30 V DC
Temp. Operating range	-10°C +55°C
Filter unit characteristics:	
- HAE	0.25 µ ceramic stone
- LAE (100 kPa)	40 µ syntherized PE
Diameter / length	27 mm / 200 mm

Sisgeo's tests have verified that titanium piezometers do not have functionality or corrosion problems after one year in a solution with pH = 1 and temperature 20 °C.

OPF01SAT000 SATURATION DEVICE

The filter saturation is a decisive factor of a successful installation of embedded piezometers. Sisgeo provides a device for field use for the saturation of the HAE value filter (ceramic stone).

It consists of a stainless steel pump with manometer and a threaded port to fit the filter unit.



PIEZO RESISTIVE PIEZOMETERS

Piezo-resistive piezometers and pressure transducers combine mechanical robustness, capacity to withstand aggressive environments and performance reliability. Piezo-resistive piezometers are suitable for dynamic measurements of water level or pore water pressure, and when data acquisition system is not compatible with vibrating wire technology

TECHNICAL SPECIFICATIONS

MODEL P235S1	with HAE value filter
MODEL P235S4	with LAE value filter
Standard ranges	100, 200, 500 kPa 1.0, 2.0, 5.0 MPa
Signal output	4-20 mA (current loop)
Sensitivity	0.01% FS
Total accuracy (*)	< 0.25% FS
Temp. Operating range	-10°C +55°C
Filter unit characteristics:	
- HAE	0.25 µ ceramic stone
- LAE (100 kPa)	40 µ syntherized s/steel 50 µ syntherized PE
Diameter / length	28 mm / 200 mm

ACCESSORIES

OPXPUMP0020	Pneumatic hand pump for checking pore pressure transducers calibration.
OPX20CHECK0	Tools for OPXPUMP0020 to permits PK20 connection

SPARE PARTS

OPF20D16000	HAE filter stone for PK20
OPF20D2000P	LAE Vjon filter for PK20
OPF20D20000	LAE s/steel filter for PK20
OPF01D16000	HAE filter stone for PK45
OPF40D2000P	LAE Vjon filter for PK45
OPF40D20000	LAE s/steel filter for PK45

PIEZOMETERS

_GROUND WATER LEVEL

_PORE WATER PRESSURE

_EARTHFILL DAMS
AND EMBANKMENTS

_UP-LIFT PRESSURE IN
DAM FOUNDATIONS

_SEEPAGE MONITORING

_WATER PRESSURE BEHIND
TUNNEL LININGS

_POTENTIAL LANDSLIDES

_DEWATERING AND PUMP TESTS

_FOUNDATIONS
AND DIAPHRAGM WALLS



DRIVE-IN PIEZOMETERS

Drive-in piezometers have the transducer mounted inside a cylindrical body with a conical nose and housing for the push-in rod. The large diameter of the conical nose prevents any chance of overpressure during the installation into the soil (push-in). The push-in rod allows installation using conventional cone penetrometer or drilling rod with adapters.

AVAILABLE MODELS



MODEL PK45I	VIBRATING WIRE
Standard ranges	350, 700 kPa, 2.0 MPa
Sensitivity	0.025% FS
Total accuracy (*)	< 0.25% FS
Temp. operating range	-20°C +100°C

MODEL P235I	PIEZORESISTIVE
Standard ranges	200, 500 kPa, 1.0 MPa
Signal output	4-20 mA (current loop)
Sensitivity	0.01% FS
Total accuracy (*)	< 0.25% FS
Temp. operating range	-10°C +55°C
Filter unit	Ceramic HAE filter
	Filter on request should be saturated at factory.
Diameter / length	28 mm / 260 mm
Nose diameter	35mm

ACCESSORIES

PUSH-IN ROD OP235I R0D00	Stainless steel 430 mm long tube which allow the junction with standard CPT rods. The push-in rod shall be threaded at job site and it must be reused. Length: 430mm OD/ID: 33.7 / 29.1 mm
SATURATION DEVICE OPF01SAT000	Hand pump with manometer and threaded port to fit the HAE (ceramic stone) filter unit.

(*) including hysteresis and repeatability, calculated with 3rd degree polynomial



REMOVABLE PORE PRESSURE TRANSDUCERS

The removable pressure transducers are specially designed for long-term monitoring of soil pore pressure. They can be removed for calibration checks, maintenance or re-used in other boreholes.

The removable pressure transducers is installed in a Casagrande piezometer with the P101 porous filter unit which mates the conical tip of the transducer housing.

AVAILABLE MODELS



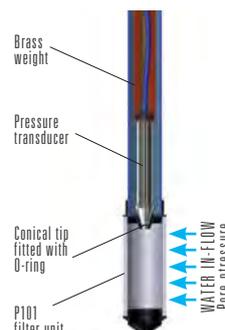
MODEL PK45C	VIBRATING WIRE
Standard ranges	350, 700 kPa
Signal output	frequency
Sensitivity	0.025% FS
Total accuracy (*)	< 0.25% FS
Temp. operating range	-20°C +100°C
Diameter / length	28/30 mm / 230 mm

MODEL P235C	PIEZORESISTIVE
Standard ranges	200, 500 kPa
Signal output	4-20 mA (current loop)
Sensitivity	0.01% FS
Total accuracy	< 0.25% FS
Temp. operating range	-10°C +55°C
Diameter / length	28/30 mm / 200 mm

OP101002000	CASAGRANDE POROUS TIP
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INSTALLATION DETAIL

The transducer tip, fitted with an 'O' ring, is designed to mate the conical port of P101 Casagrande filter unit. Sealing is maintained by ballasting weights insered on the electric cable. A small orifice at the conical tip allows pore pressure to act on the diaphragm sensor. P101 porous filter is normally installed and the transducer is than lowered into the access tube suspended by its own electro-mechanical cable until the piezometer assembly rest on the piezometer. All the transducers can be removed from the borehole by means of the electro-mechanical cable.



MULTIPOINT PIEZOMETER STRING

Multi-point piezometer consists of a string of vibrating wire piezometers connected by single multicore cable, ideal when more than one piezometer is requested at various depth in the same borehole.

The PK45M piezometer string - fully grouted in borehole - prevents the formation of channels for migration of water between different soil levels.

TECHNICAL SPECIFICATIONS



Standard ranges	350, 700 kPa, 1.0, 1.7, 2.0 MPa
Technology	vibrating wire
Sensitivity	0.025% FS
Total accuracy (*)	< 0.25% FS
Temp. operating range	-20°C +100°C
Filter unit	40 μ synthesized s/steel
Diameter / length	48.3 mm / 250 mm

SIGNAL CABLES

OWE1160LSZH	LSZH multicore cable (8 pairs) It permits the realization of a string of 4 VW piezometers.
OWE1320LSZH	LSZH multicore cable (16 pairs) It permits the realization of a string of 8 VW piezometers.

FULLY GROUTED INSTALLATION METHOD

The fully-grouted method is gaining popularity because it is a simple, economical and accurate procedure to monitor pore water pressure in the field. The working principle is based on the idea that a diaphragm piezometer embedded directly in a large mass of low permeability cement-bentonite grout should respond instantly to a pore water pressure change. Grout mixes (water-cement-bentonite) are controlled to give the desired strength of the set grout. Appropriate permeability of the cement-bentonite grout is crucial for the success of the fully-grouted method.

For more details, refer to:

"Piezometers in Fully Grouted Boreholes" by Mikkelsen and Green FMGM proceedings Oslo 2003.

PIEZOMETERS

_GROUND WATER LEVEL

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AND EMBANKMENTS

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DAM FOUNDATIONS

_SEEPAGE MONITORING

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LEVEL PRESSURE TRANSDUCERS

The model P252R is a level transducer equipped with a relative vented piezoresistive pressure sensor which provides automatic compensation of the barometric changes. This transducer provides ground water table monitoring in standpipe and Casagrande piezometers.

TECHNICAL SPECIFICATIONS



Standard ranges	100, 200, 500 kPa, 1.0 MPa
Signal output	4-20 mA (current loop)
Sensitivity	0.01% FS
Total accuracy (*)	< 0.25% FS
Power supply	12 - 24 Vdc
Overload	30%
Thermal zero shift	0.00025 % /°C
Temp. Operating range	-10°C +55°C
Filter unit	synthesized stainless steel
Body material	stainless steel
Diameter / length	28 mm / 200 mm
Cable	0WE203KE000

ACCESSORIES

SUPPORT HEAD OP200CH1000	Lockable support head assembly with data plate. Positioned on the top of the standpipe permits to suspend the transducer by a secure cable stop.
VENTED BOX OEPDP002W00	Vented IP67 plastic box equipped with overvoltage protections and cable glands.

(*) including hysteresis and repeatability, calculated with 3rd degree polynomial



WATER LEVEL LOGGER (WLL)

Water Level Logger (WLL) is an integrated system designed for automatic monitoring of water level and temperature inside wells, standpipes and Casagrande piezometers. WLL with its integrated datalogger must be programmed and lowered in the open pipe below the water level. It has to be periodically retrieved for downloading data.

TECHNICAL SPECIFICATIONS

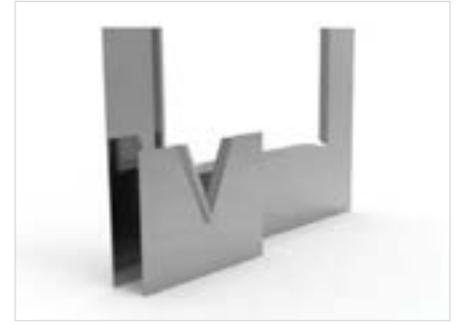
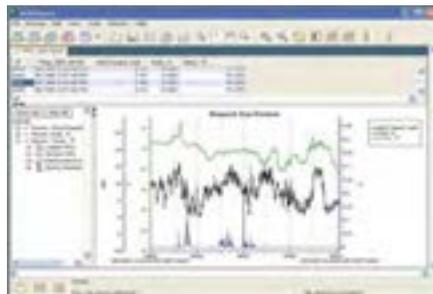
Water level range*	4, 9, 30, 76 m of water
Temp. measurem. range	-20°C +50°C
Accuracy:	
- water level**	±0.05% F.S.
- temperature	±0.5°C
Memory type	Non-volatile
Memory capacity	64k-byte
	>21.000 combined measurements
Measuring Interval	Programmable
	min 1 sec, max 18 hours
Communication port	Optical USB interface
Diameter / length	24.6 mm / 150 mm
Battery life	5 years typical with min. measuring interval 1 min.

* nominal value based on using WLL at sea level

** typical error using reference level measurement and the barometric compensation

OWSBHW10000 MANAGER SOFTWARE

This software permits to check the logger status: verify logger set-up before launch, verify logger operation while logging, display real-time sensor readings and display memory used and battery voltage. Software's powerful graphing features allows plot and filter data for a customized data presentation.



SEEPAGE MEASUREMENTS WEIR MONITORING

V-notch weirs are typically installed in open channels such as streams to determine discharge (flowrate). The basic principle is that the discharge is directly related to the water depth above the bottom of the "V". Leakage measurement is one of the most important indicators of the overall performance of dikes and dams.

V-NOTCH WEIRS

The purpose of the weir is to transform the instantaneous flow values into the pressure/level by means of specific measuring equipment.

0QV45LS1000	10 litre/sec, V-angle 45°
0QV60LS2000	20 litre/sec, V-angle 60°
0QV90LS5000	50 litre/sec, rectangular
	V-notch weirs are preferred for low discharges as the head above the weir crest is more sensitive to changes in flow compared to rectangular weirs.

0QVLIV10000 LEVEL TRANSDUCER



Transducer type	floating unit with high sensitivity load cell
Measuring range	1000 mm of water level
Sensor resolution	1 mm
Accuracy	< 0.3% FS
Output signal	4-20 mA (current loop)

OP251Q10000 LEVEL TRANSDUCER



Transducer type	pressure transmitter
Measuring range	1000 mm of water level
Accuracy	< 0.5% FS
Output signal	4-20 mA (current loop)

STAFF GAUGES

0QVHI030000	300mm long, millimetre division
0QVHI050000	500mm long, millimetre division

PIEZOMETERS

_GROUND WATER LEVEL

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STANDPIPE AND CASAGRANDE PIEZOMETERS

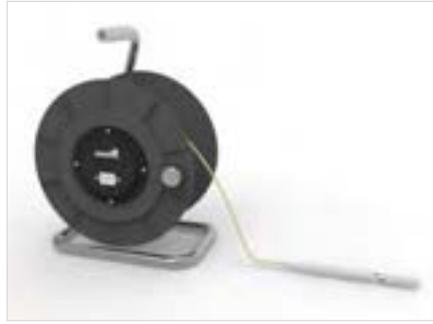
Standpipe and Casagrande piezometers are open piezometers widely used to monitor piezometric water levels in vertical boreholes. Open piezometer consists of two parts: a porous tip and a riser pipe which continues upwards out of the top of the borehole. The porous tips are located within a sand filter zone and a bentonite seal is required between the sand filter zone and the backfill.

AVAILABLE MODELS

P101		Casagrande/standpipe 40 µ porous tip 1-half inch single tube connection Length: 200 mm Outer diameter: 61.5 mm
P112		Casagrande 40 µ porous tip half inch twin tubes connection Length: 200 mm Outer diameter: 61.5 mm
TFH		Standpipe filter unit PVC slotted tube with fabric Available diameters: 1, 1 1/2 and 2-inch Length: 3 meter

ACCESSORIES

LOCKABLE CAP OP100CH1000	Equipped with an identification plate and a topographic pin, the lockable cap ensures protection at the top end of Casagrande and standpipe piezometers.
BENTONITE PELLETS 1000BE20025K	Supplied in 25 Kg bags, the pellets work as a watertight sealant inside the borehole of the piezometer filter unit.



WATER LEVEL INDICATORS (WLI)

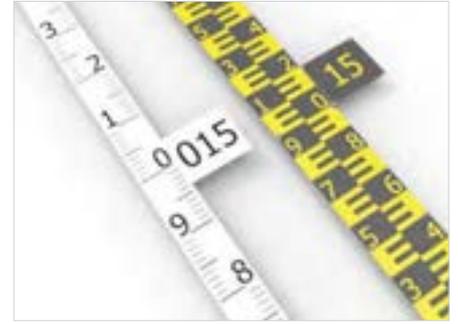
The WLI or Dipmeters are used to measure the water level in standpipes piezometers. WLI is a battery powered portable device equipped with a stainless steel sensor probe connected to a graduated flat cable rolled up on a hand reel containing audio and visual indicators, and battery. The model C112T includes a digital indicator for temperature readings.

AVAILABLE MODELS

MODEL C112	class II flat cable with marks at every millimetre water level detector Cable lengths 30, 50, 100 m 150, 200, 300, 400, 500 m Probe diameter 16 mm Battery 1 x 9V DC disposable
MODEL C112T	class II flat cable with marks at every millimetre water level detector and temperature sensor Cable lengths 30, 50, 100 m 150, 200, 300, 400, 500 m Reel diameter 260 mm, 320 mm, 420 mm Probe diameter 16 mm Display 3.5 LCD (only for C112T) Battery 2 x 9V DC disposable

PROBE SPARE PARTS

OC112KITR00	Probe spare set for the model C112 including sensor probe weights and epoxy.
OC112TKITR0	Probe spare set for the model C112T including sensor probe weights and epoxy.



STAFF GAUGES

The staff gage is used for a quick visual indication of the surface level in reservoirs, rivers, streams and open channels. These environmentally rugged iron gauges are finished with porcelain enamel to ensure easy reading and resist rust or discoloration. Each gauge is accurately graduated and has holes for easy fastening to walls, piers and other structures.

STANDARD COMPONENTS

STAFF GAUGE OHIDR1000S0	Hydrometric rod 1 meter long, black and white colors. It is divided into centimeters with each decimeter numbered. Rods for any elevation may be assembled. Separate number plates are available to show elevation. Available also in different colors on request.
FIGURE PLATE OHIDR1310P0	Number plate with three (3) figures which represent elevation. The three figures are on white porcelain enameled plate. Using a combination of these figures any elevation may be represented. Available also in different colors on request.

SPECIAL PARTS

INCLINED STAFF GAUGES	They are customized gauges for installation onto inclined surface such as upstream face of dams or concrete lined irrigation channels. Mounted flush on the sloped sides, these staff gauges give a direct reading of the vertical stage height.
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INCLINOMETERS

- _LANDSLIDES
- _DAMS
- _UNSTABLE SLOPES
- _PILES
- _DIAPHRAGM WALLS
- _TUNNELING
- _DEEP EXCAVATIONS
- _BRIDGES AND VIADUCTS
- _EMBANKMENTS



Project:
Sogamoso HPP
Colombia



MEMS INCLINOMETER

Digitalized MEMS inclinometer is the most versatile portable device for inclination measurements within grooved casing. It provides a high level of precision, shock resistance, durability and fast response. Available in different versions with or without connector, with light-weight or heavy duty cable, with or without portable reel.

OS242DV0000 MEMS INCLINOMETER CE

Measuring range	±30°, ±90° (optional)
System repeatability (1)	±0.050 mm per 500 mm
System accuracy (1)	±2 mm per 25 meter
Temp. Operating range	-30°C to +60°C
Wheel base	500mm
Length x Diameter	750mm (w/o connector) x 28 mm
Casing size I.D.	38 to 94 mm

(1) with ±30° probe and Archimede readout

LIGHT-WEIGHT CONTROL CABLE

The light-weight inclinometer cable consists of 4-conductors with kevlar stress member and polyurethane external jacket. Aluminum rings are crimped every 500mm on the cable jacket. Kevlar stress has a breaking strenght of 3.0 KN (675 lbs). Portable reel with 50m cable weights only 4.5 Kg.

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

ACCESSORIES

OS2RDOBAG00 SHOULDER BAG

Shoulder carrying case with metallic frame.

Total weight with 50m cable: 7.5 Kg



ARCHIMEDE READOUT

Archimede is an ultra rugged portable inclinometer datalogger with 2 GB memory. It works with vertical and horizontal probes, T-REX removable extensometer and spiral meter.

Archimede is a battery operated readout with a large graphic color backlight display, housed in a crushproof, water-resistant plastic case.

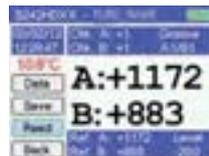
OCDL300INCL ARCHIMEDE READOUT CE

A/D converter	2 x 24 bit, with autocalibration
Storage memory	2 GB
Display color graphic	5.7" sunlight reliable
COMM port	USB 2.0
Temperature oper. range	-20°C +60 °C
Enviroment	IP67
Dimensions	200 x 280 x 65mm (LxWxH)

Bluetooth interface is available on request.

SURVEY AND PLOT

At each depth Archimede displays A and B readings in sinα units, check sums, A and B ref. readings, and level (depth).



High-resolution plots can be easily generated and displayed when the survey is terminated.



The SMART Manager Suite permits to manage ARCHIMEDE directly by your PC, offering also a technical assistance on-line.

OS1CSU10000 PULLEY ASSEMBLY

The assembly consists of a pulley, cable stop and adaptors to suit different casing diameters.

The device also protect the cable from abrasion.



FORCE-BALANCED INCLINOMETER

The inclinometer model S242SV30 is equipped with a biaxial force-balanced servo accelerometer which provides a high level of precision, durability and fast response. In conjunction with Archimede datalogger and the heavy duty control cable offers the top of the range of the inclinometer system.

OS242SV0000 SERVO INCLINOMETER CE

Measuring range	±30°
System repeatability (1)	±0.050 mm per 500 mm
System accuracy (1)	±1.5 mm per 25 meter
Temp. Operating range	-20°C +70°C
Wheel base	500mm
Length x Diameter	750mm (w/o connector) x 28 mm
Casing size I.D.	38 to 94 mm

(1) with Archimede readout

HEAVY DUTY CONTROL CABLE

The heavy duty inclinometer control cable has either a stainless steel shield, molded to the external abrasion and chemical-resistant polyurethane (PU) jacket, and a stainless steel core wire.

The stainless steel shield eliminates any cable twisting and the stainless steel core controls any stretching of the cable itself. An internal binder eliminates slipping of the single conductor relative to the external PU jacket. Cable is graduated every 500mm with copper rings crimped on the external jacket. The control cable includes the submersible probe mating connector which whitstands up to 200m water depth.



Cable lengths 30, 50, 60, 100, 150, 200m
Graduation 500mm

INCLINOMETERS

- _LANDSLIDES
- _DAMS
- _UNSTABLE SLOPES
- _PILES
- _DIAPHRAGM WALLS
- _TUNNELING
- _DEEP EXCAVATIONS
- _BRIDGES AND VIADUCTS
- _EMBANKMENTS



HORIZONTAL INCLINOMETER

The horizontal probe is a variant of the MEMS inclinometer which permits the monitoring of horizontally installed casings. The horizontal inclinometer provides more accurate and repeatable readings than any other settlement profiling system. It is used to measure settlement or heave under embankments, tanks and roadways.

OS241DH3000 HORIZONTAL PROBE

Measuring range	±30°
Sensor type	uniaxial digitalized MEMS
System repeatability (1)	±0.050 mm per 500 mm
System accuracy (1)	±2 mm per 25 meter
Temp. Operating range	-30°C to +60°C
Wheel base	500 mm
Length x Diameter	750mm (w/o connector) x 28 mm
Connector	6 pins, compatible with light weight inclinometer control cable

(1) with ±30° probe and Archimede readout

OPERATIONS

The survey may be taken within a horizontal inclinometer casing installed either with "both sides open" or with "one end closed" by means of a dead end pulley.

The initial measure establishes the profile of the casing and the subsequent measures detect changes in the profile related to the ground movements.

Settlement and heave are calculated at each measurement interval, and the settlement profile is generated by summing displacements.

ACCESSORIES

OS20H0R0D00	Inclinometer connecting rod
OREXR0D10BX	Set of 10 positioning rod (2m)
OREXR0D2000	Positioning rod, 2m
0WRACPVC000	Dragging steel wire, PVC jacket
OS1RINV7000	Dead end pulley, 70mm OD casing
OS1RINV7500	Dead end pulley, 3" casing



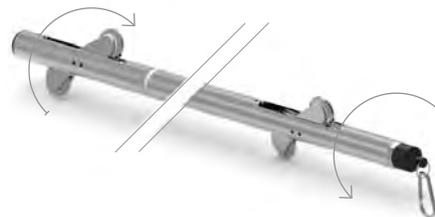
SPIRAL PROBE

The spiral probe is used to define the azimuth of installed inclinometer casing in order to verify that the casing was installed correctly. Spiral is a function of the manufacturing process, couplings and installation technique. Spiral correction improves accuracy and more reliable interpretation of data.

OS30PR12000 SPIRAL PROBE

Measuring range	±5°
Sensor type	rotary contactless potentiometer (magneto-resistive)
Sensitivity	± 0.01°
Accuracy	< 0.5% FS
Power supply	± 2.5 V DC
Diameter	28mm
Length	1.263mm (without connector)
Wheel base	1.000 mm
Connector	watertight, 6 pins

Spiral probe is fully compatible with heavy duty control cables and it is readable by Archimede readout. With INCLI2 inclinometer software, spiral probe data shall be inserted into the calculation in order to correct inclinometer data with tube twisting data. Sisgeo suggest to take spiral data with the inclinometer zero reading for the data correction considering the casing twisting due to installation procedures.



Spiral probe: twisting on the probe axis for measuring the inclinometer casing torsion



INCLI2 INCLINOMETER SOFTWARE

INCLI2 is a specially designed software to process inclinometer data from vertical and horizontal probes, providing graphs and reports. Data files may be created by manual data entry or directly from Archimede portable readout via its USB COMM port. Software functions can be selected from the main menu.

DATA PROCESSING

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

Data processing allows the following choices:

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

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

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

LOCAL DISPLACEMENT vs TIME: deformation versus time of reading at the same depth.

FEATURES

Instant screen graphics allow the measurement status checks, reducing time and the need for printed copy.

Choice of plot types includes vertical checks, absolute position, displacement/time plots, and various combinations of incremental and cumulative displacement.

User could choose between 6 different languages: Italian, English, Spanish, Russian, Arabic and Turkish.

Simplified management of inclinometer casing sites and relative measures.

Up to 30 measures displayed at the same time.

Tables and graphics printer preview.

Graphic output file creation.

OPERATIVE SYSTEM REQUIREMENTS

INCLI2 works on Microsoft® Win 95/98, 2000, Millenium, NT, XP, Vista, Windows 7 and Windows 8.

INCLINOMETERS

- _LANDSLIDES
- _DAMS
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- _DEEP EXCAVATIONS
- _BRIDGES AND VIADUCTS
- _EMBANKMENTS



STANDARD INCLINOMETER CASINGS

Inclinometer casing is a special grooved tube, generally installed into a borehole, and used in conjunction with an inclinometer system to determine sub-surface ground or horizontal soil movements.

The standard inclinometer casing is available either in virgin ABS or aluminium in two different sizes.

ALUMINIUM INCLINOMETERS

Models	S1110075	S1110054
Material	Aluminium	Aluminium
Outer diameter	86.4 mm	58.0 mm
Inner diameter	76.1 mm	49.0 mm
Groove inner diameter	82.0 mm	54.0 mm
Casing length	3 meter	3 meter
Weight	1.4 kg/m	0.92 kg/m
Spiral	<1.0°/3 m	<1.0°/3 m
Coupling O.D.	92.0 mm	62.6 mm

OS131006000 ABS INCLINOMETER

Material	ABS plastic
Tube outer diameter	71.0 mm
Tube inner diameter	60.0 mm
Tube groove inner diameter	64.0 mm
Casing length	3 meter
Weight	0.7 kg/m
Spiral	<0.6°/3 m
Coupling outer diameter	77.0 mm
Coupling length	200 mm

ACCESSORIES

Top / bottom cap	Simple caps to prevent tube clogging.
Lockable top cap	Protective cap with identification plate and topographical survey pin. Designed for accommodate the pulley assembly.
Assembly kit	Provides cement, pop rivets, sealing tape and adhesive tape.



FLUSH-COUPLED AND QUICK-JOINT CASINGS

The Flush-Coupled inclinometer casing is a grooved tube machined at the end to have a self-aligning and flush junction.

The QJ Quick-Joint casing consists of sections with built-in couplings that snap together. O-rings ensure that the joint is groat proof.

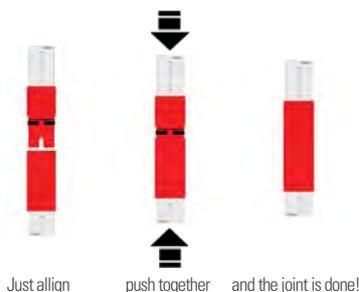
Both models are produced from high-quality virgin ABS.

OS141107000 FLUSH INCLINOMETER

Material	ABS plastic
Outer diameter	70 mm
Inner diameter	59 mm
Groove inner diam.	61,5 mm
Casing length	3 meter
Weight	1.2 kg/meter
Spiral (1)	<0.6°/3 meter
Collapse test (2)	15 bar
Temperature range	- 20°C to + 80°C

OS151107000 QJ INCLINOMETER

Material	ABS plastic
Tube outer diameter	70 mm
Tube inner diameter	59 mm
Overall section length	3100 mm
Overall diameter	84 mm
Colour	white/red
Spiral (1)	<0.6°/3m
Collapse test (2)	15 bar
Temperature range	-20°C +80°C



(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 selfaligning couplings.

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



COMBINED INCLINOMETER AND SETTLEMENT MEASUREMENT

Inclinometer and settlement measurements may be combined in the same borehole or in an embankment. The system consists of ABS inclinometer casing equipped with telescopic couplings and settlement rings with permanent magnets.

Settlement rings are available with spring spiders for installation in borehole or with round plates for embankments.

ACCESSORIES FOR FLUSH CASING

OS141ST0000	TELESCOPIC SECTION 3 meter section with 75 or 150 mm gap
OS141DR7000	DATUM REFERENCE SECTION Bottom section with datum magnet
OS131AF6000	SPIDER MAGNET RING Used in borehole with spring legs (3)
OS131AR6000	EMBANKMENT MAGNET RING Used in fill with plate, OD 300mm

ACCESSORIES FOR QJ CASING

OS151MT0700	QJ TELESCOPIC COUPLING 500mm long with 75 mm gap
OS151DR7000	QJ DATUM REFERENCE SECTION Bottom section with datum magnet
OS151AF8000	SPIDER MAGNET RING, ID 83MM Used in borehole with spring legs (3)
OS151AR8000	EMBANKMENT MAGNET RING Used in fill with plate, OD 300mm

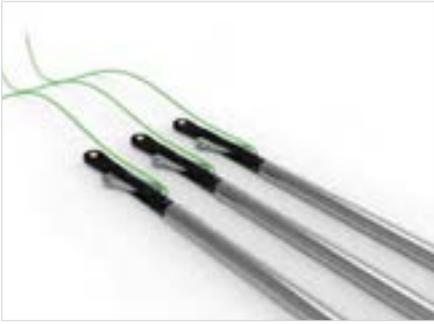
MEASUREMENTS

Manual readings are carried out lowering inside the casing:

- the inclinometer probe for monitoring the horizontal movements;
- the portable magnet extensometer model C121 with millimetre tape for detecting settlements.

INCLINOMETERS

- _LANDSLIDES
- _DAMS
- _UNSTABLE SLOPES
- _PILES
- _DIAPHRAGM WALLS
- _TUNNELING
- _DEEP EXCAVATIONS
- _BRIDGES AND VIADUCTS
- _EMBANKMENTS



MEMS IN-PLACE INCLINOMETERS

In-Place Inclinerometers (IPI sensors) are designed for automatic monitoring of critical locations. Jointed together and suspended inside a vertical casing where deformation may occur, a string of IPI sensors will follow the deformation of the inclinometer casing due to the horizontal soil movements.

AVAILABLE MODELS



MODEL S411HA	uniaxial
MODEL S412HA	biaxial
Sensor type	self compensated MEMS
Available ranges	±5°, ±10°, ±15°, ±20°, ±30°
Sensor sensitivity	0.0013°
Total accuracy	< 0.10% FS with 3order polynome
Thermal drift	±0.005% / °C
Signal output	4-20 mA (current lop)
Power supply	18 - 30 V DC
Temp. operating range	-30°C to +70°C
Temperature sensor	Built-in thermistor

PROBE FEATURES

Outer diameter	28 mm
Wheel base	1000, 2000 mm
Material	s/steel and thermoplastic resin
Cable connection	epoxy sealed up to 1 MPa

ACCESSORIES

OS4TS101000	In-place inclinometer support head
OS4IPIT00L0	In-place inclinom. clamping tool
OWRAC200000	Stainless steel support wire, 2 mm



SUBMERSIBLE MEMS TILTMETERS

Submersible tiltmeters are designed for in-place applications onto surfaces below the water level or where flooding may occur. Submersible tiltmeters are equipped with MEMS sensors and mounted on a base plate in order to monitor tilt changes in either one or two axial planes perpendicular to the surface of the base plate.

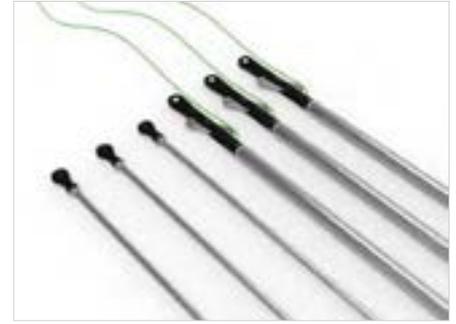
AVAILABLE MODELS



MODEL S521MA	uniaxial
MODEL S522MA	biaxial
Sensor type	self compensated MEMS
Available ranges	±5°, ±10°
Sensor sensitivity	0.0013°
Total accuracy	< 0.10% FS with 3order polynome
Thermal drift	±0.005% / °C
Signal output	4-20 mA (current lop)
Power supply	18 - 30 V DC
Temp. operating range	-30°C to +70°C
Overall dimensions	36 x 68 x 245 mm (LxWxH)
Material	stainless steel
Protection	IP68 until 1.0 MPa
Temperature sensor	Built-in thermistor

ACCESSORIES

OS500PF1000	Stainless steel base plate with three anchors for wall mounting. Overall diam: 100mm
OS500AP3600	"L" shaped base plate for installation of submersible tilt meters onto sloped surface.



HORIZONTAL MEMS IPI SENSORS

A string of horizontal IPIs is usually installed inside inclinometer casing buried within trenches or horizontal drill hole to monitor settlement or heave. Installation can be done by either pushing the inclinometer string with a number of steel rods or by pulling the inclinometer probes with a steel wire.

AVAILABLE MODELS



MODEL S421HA	uniaxial
Sensor type	self-compensated MEMS
Available ranges	±10°, ±15°, ±20°, ±30°
Sensor sensitivity	0.0013°
Total accuracy	<0.10% FS with 3order polynome
Thermal drift	±0.005% / °C
Signal output	4-20 mA (current lop)
Power supply	18 - 30 V DC
Temp. operating range	-30°C to +70°C
Temperature sensor	Built-in thermistor

PROBE FEATURES

Outer diameter	28 mm
Wheel base	1000, 2000 mm
Material	s/steel and thermoplastic resin
Cable connection	epoxy sealed up to 1 MPa

ACCESSORIES

ODEX0TS2350	Horizontal In-place inclinometer head
OS4R0D0AC00	Stainless steel placing rod

INCLINOMETERS

- _LANDSLIDES
- _DAMS
- _UNSTABLE SLOPES
- _PILES
- _DIAPHRAGM WALLS
- _TUNNELING
- _DEEP EXCAVATIONS
- _BRIDGES AND VIADUCTS
- _EMBANKMENTS



Project:
Astana National Library
Kazakhstan



SURFACE TILT METERS

MEMS tilt meters monitor tilt changes in either one or two axial planes perpendicular to the surface of the base plate. MEMS tilt meters that are permanently installed either horizontally or vertically on the structure, provide long term monitoring and are designed to be read manually or by an automatic remote data logging system.

AVAILABLE MODELS



MODEL S541MA	uniaxial
MODEL S542MA	biaxial
Sensor type	self compensated MEMS
Available ranges	$\pm 2.5^\circ$, $\pm 5^\circ$, $\pm 10^\circ$
Sensor sensitivity	0.0013°
Total accuracy	< 0.10% FS with 3order polynome
Thermal drift	$\pm 0.005\%$ / °C
Signal output	4-20 mA (current lop)
Power supply	18 - 30 V DC
Temp. operating range	-30°C to +70°C
Overall dimensions	95 x 60 x 52 mm (LxWxH)
Material	aluminium
Protection	IP67

ACCESSORIES

OS540AP3D00	Fine adjustment base plate especially recommended for small ranges ($\pm 2.5^\circ$ and $\pm 5^\circ$).
OS540AP3600	Adjustment plate for installation of S540MA tilt meters onto sloped surface.

SERVO-ACCELEROMETER TILTMETERS



MODEL S531SV	uniaxial
MODEL S532SV	biaxial
Sensor type	gravity referenced servo inclinometer
Available ranges	$\pm 5^\circ$, $\pm 14.5^\circ$
Non-linearity	$\pm 0.02\%$ FS (least squares method)
Thermal drift	$\pm 0.002\%$ / °C
Temp. operating range	-20°C to +80°C
Overall dimensions	128 x 130 x 195 mm (LxWxH)
Protection	IP67



TILLI PORTABLE TILTMETER

TILLI is a rugged portable tiltmeter. It consists of a durable stainless steel frame with an aluminium housing containing a self compensated MEMS tilt sensor. The surfaces of the frame are machined to allow accurate positioning of the tiltmeter during successive measurements. A single TILLI can be used to measure any number of pre-installed tilt plates.

OSCLIN150H0 TILTMETER



TILLI sensor	uniaxial MEMS accelerometer
Measuring range	$\pm 15^\circ$ from the vertical
Sensor sensitivity	0.0013°
Repeatability	< $\pm 0.003^\circ$
Thermal drift	$\pm 0.005\%$ / °C
Temp. operating range	-30°C to +70°C
Material stainless	Stainless steel frame anodised AL sensor housing
Weight	3 Kg (TILLI only)
Carrying case	IP68 shock-resistant plastic



Measuring activity with TILLI

OSCLTP14B00 TILT PLATE

Material	Bronze
Diameter	135 mm

Stainless steel cover available as option (code OSCLTC14000)



TILT BEAM SENSORS

The tilt beam sensor consists of a MEMS tiltmeter mounted on a rigid beam with a defined gauge length. Each end of the beam is fixed to the structure. This arrangement converts tilt changes to millimeters of movement in order to monitor settlement and heave. Linked together end-to-end they provide settlement profiles.

AVAILABLE MODELS



MODEL S71ATL10H0	horizontal beam
MODEL S71ATL10HV	horizontal, vertical beam
MODEL S71ATL10V0	vertical beam
Sensor type	uniaxial self compensated MEMS
Range	$\pm 10^\circ$
Sensor sensitivity	0.0013°
Total accuracy	< 0.10% FS with 3rd order polynome
Sensor thermal drift	$\pm 0.005\%$ / °C
Signal output	4-20 mA (current lop)
Power supply	18 - 30 V DC
Temp. operating range	-30°C to +70°C
Protection	IP67

ACCESSORIES

OS7BM100000	1 meter beam
OS7BM200000	2 meter beam
OS7BM300000	3 meter beam
Material	Aluminium
Lengths	1,000, 2,000, 3,000 mm
Beam section	40x60 mm (WxH)
OS7BM80SUP0	"L" shaped mounting bracket for floor application
Material	galvanized steel
Dimensions	70x80x80 mm (LxWxH)

INCLINOMETERS

- _LANDSLIDES
- _DAMS
- _UNSTABLE SLOPES
- _PILES
- _DIAPHRAGM WALLS
- _TUNNELING
- _DEEP EXCAVATIONS
- _BRIDGES AND VIADUCTS
- _EMBANKMENTS



DIGITALIZED MEMS IPI SENSORS

Digitalized In-Place Inclinerometers (IPI) offer continuous remote monitoring of casings deformed by active soil movements. The in-place inclinometers are linked together by means of special ball joints, forming one continuous string. All the probes are connected to each other by a single signal cable which, when connected to an OMNIAlog allows for real time monitoring complete with alarms if required.

AVAILABLE MODELS



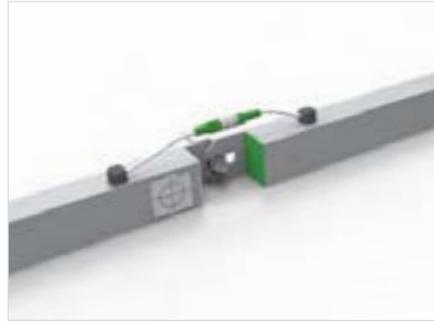
MODEL S411HD	vertical uniaxial
MODEL S412HD	vertical biaxial
MODEL S421HD	horizontal uniaxial
Sensor type	self compensated MEMS
Available ranges	±5°, ±10°, ±20°, ±30°.
Sensor sensitivity	0.0013°
Total accuracy	< 0.05% FS
Power supply	12 - 24 V DC
Thermal drift	± 0.005% / °C
Signal output	RS-485, Modbus RTU protocol
Temp. operating range	-30°C to +70°C

PROBE FEATURES

Outer diameter	28 mm
Wheel base	500, 1000, 2000mm
Material	s/steel and thermoplastic resin
Cable connection	epoxy sealed up to 1 MPa

ACCESSORIES

OS4TS101000	In-place inclinometer support head
OWRAC250000	S/steel support wire 2.5 mm OD



D-TILT BEAM SENSORS

The D-TILT is a digitalized tilt beam sensor; typical application is for building differential settlement monitoring. The rigid beam has a defined gauge length, typically 1, 2 or 3 meter. The D-TILT beam sensors are fixed to the structure - linked end-to-end - in order to provide differential settlements. A single cable transmits the signal of a chain of several digitalized beam sensors to the data acquisition system.

OS71DTL00H0 DIGITIZED TILTMETER



Sensor type	self compensated MEMS
Available ranges	±5°, ±10°
Sensor sensitivity	0.0013°
Total accuracy	< 0.05% FS
Thermal drift	±0.005% / °C
Power supply	12 - 24 V DC
Signal output	RS485, ModBUS RTU protocol
Temp. operating range	-30°C to +70°C
Overall dimensions	36 x 68 x 245 mm (LxWxH)
Material	stainless steel
Protection	IP68 until 1.0 MPa

ACCESSORIES

OS7BM100000	1 meter beam
OS7BM200000	2 meter beam
OS7BM300000	3 meter beam
Material	Aluminium
Lengths	1.000, 2.000, 3.000 mm
Beam section	40x60 mm (WxH)
OS7BM80SUPO	"L" shaped mounting bracket for floor application
Material	galvanized steel
Dimensions	70x80x80 mm (LxWxH)



D-TILTMETERS

The D-Tiltmeters use a digitalized MEMS tilt sensors. They are intended to be permanently installed either horizontally or vertically to provide long term measurements. The D-Tiltmeters monitor tilt changes in either one or two axial planes perpendicular to the surface of the base plate. Waterproof connectors offer simple and easy connection in series.

AVAILABLE MODELS



MODEL S541HD	uniaxial
MODEL S542HD	biaxial
Sensor type	self compensated MEMS
Available ranges	±2.5°, ±5°, ±10°
Sensor resolution	0.0013°
Total accuracy	< 0.05% FS
Thermal drift	±0.005% / °C
Power supply	12 - 24 V DC
Signal output	RS485, ModBUS RTU protocol
Temp. operating range	-30°C to +70°C
Overall dimensions	95 x 60 x 52 mm (LxWxH)
Material	aluminium
Protection	IP67

ACCESSORIES

OS540AP3D00	Fine adjustment base plate especially recommended for small ranges (±2.5° and ±5°).
OS540AP3600	"L" shaped base plate for installation of MEMS tilt meters onto sloped surface.

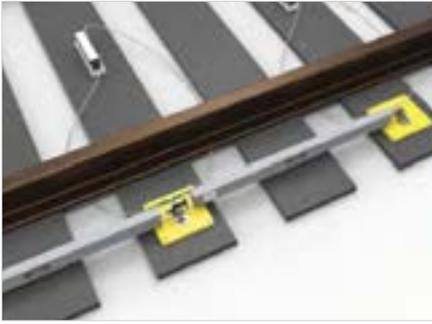
RAILWAY DEFORMATION SYSTEM

_HIGH SPEED RAILWAYS

_METRO RAILWAYS

_INTERFERENCES WITH
EXCAVATION NEAR RAILWAYS

Project:
Milan - Bologna
High Speed Railway
Italy



RDS SYSTEM

RDS, Railway Deformation System, is a unique monitoring system designed by Sisgeo for automatically surveying the longitudinal deformation of the rail tracks and the rotation of sleepers.

The rail track geometry is monitored in terms of longitudinal level and torsion of the track.

RDS can be managed by a single operator on the web with WMS* (Web Monitoring System).

ADDITIONAL INFORMATIONS

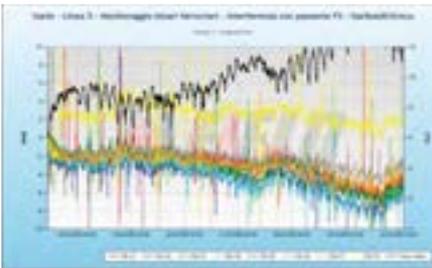
Compared to the traditional systems, including topographic surveys, RDS offers to the Customers either high performances and significant reduction of the operating costs.

In fact when the system is correctly installed there is no field activity required by technicians at site.

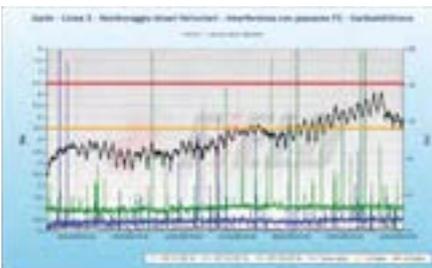
RDS components, connected through digital cable to OMNIAlog with GPRS modem or 3G router, will be managed automatically by WMS* (Web Monitoring System).

FieldStat* software running directly on WMS platform, allows to determine the correlations that may have influence on collected data, for example temperature, and to filter the measures from the effects of external factors. With WMS will be possible to have alarm thresholds and alerting.

(* Trademarks of Field Srl)



RDS data before FieldStat elaboration



RDS data after FieldStat elaboration. Alarm threshold are shown



LONGITUDINAL RDS GAUGES

Track longitudinal deformation shall be measured in "mm" as a difference of level between two points located at preset intervals. For longitudinal deformation the system consists of instrumented aluminum beams with digitalized MEMS tilt sensors and optical target. Special joint between beams is designed in order to reduce the thermal deformation which may influence the readings.

OS7RDSHDLOO LONGITUDINAL GAUGE

Sensor type	digitalized uniaxial MEMS
Measuring range	±10° (±5° on request)
Sensor sensitivity	0.0013°
Total accuracy	< 0.05% FS (±0.09 mm/m, ±10°FS)
Thermal drift	±0.005% / °C
Power supply	12 - 24 V DC
Signal output	RS485, ModBUS RTU protocol
Temp. operating range	-30°C to +70°C
Bar section	60 x 40 mm
Available lengths	1 m, 2 m, 3 m
Material	Aluminum
Protection	IP67

RDS ACCESSORIES AND SPARE PARTS

OS7RDS00LE0 Terminal fixing plate, mandatory to finish the RDS longitudinal chain.



OS7RDS00LSP Spare mounting plate for longitudinal RDS beam. Required when RDS beam is removed from previous installation.



OS7RDS00LWP Mounting plate for longitudinal RDS in case of wooden sleepers.



TRANSVERSE RDS GAUGES

Trak torsion is measured in "‰" as a change in inclination of two sleepers located at the same preset intervals along the track.

For the measurement of torsion the system consists of a 200 mm aluminum box equipped with digitalized MEMS tilt sensor and steel mounting supports.

OS7RDSHDT02 TRANSVERSE GAUGE

Sensor type	digitalized uniaxial MEMS
Measuring ranges	±10° (±5° on request)
Sensor sensitivity	0.0013°
Total accuracy	< 0.05% FS (±0.02 mm, ±10°FS)
Thermal drift	±0.005% / °C
Power supply	12 - 24 V DC
Signal output	RS485, ModBUS RTU protocol
Temp. operating range	-30°C to +70°C
Overall dimensions (LxHxT)	260 x 86 x 76 mm
Material	Aluminum
Protection	IP67

RDS ACCESSORIES AND SPARE PARTS

OS7RDS00TSP Galvanized steel spare mounting plate for transverse RDS.



OS7RDSTER5M Terminal junction box kit to be supplied for each RDS longitudinal chain. It is composed by junction box with 5m electric cable protected with steel.

OWE606IPD2H Signal cable to link terminal junction box to OMNIAlog.

SETTLEMENT GAUGES

- _ BUILDINGS
- _ EMBANKMENTS
- _ FOUNDATIONS
- _ CIVIL STRUCTURES
- _ TUNNELING
- _ CONCRETE AND EARTHFILL DAMS

Project:
Metsovo Viaducts
Greece

Courtesy of EUROTECH SA





DSM SYSTEM

The DSM (Differential Settlement Monitoring) system consists of a series of tank-gauges interconnected by a hydraulic tube. The reference tank is located on a stable point away from the area that is going to be monitored. The measurement of fluid level inside each DSM gauge indicates the difference in elevation between the gauges (differential settlement).

OD422M08000 DSM LEVEL GAUGE

Type of sensor	high sensitivity load cell
Measuring range	±40mm water level
Sensor sensitivity	0.01mm
Sensor accuracy	±0.1mm (thermal effects not included)
Difference in elevation	straight-horizontally
Housing dimensions	400x300x200mm

OD422L08500 LONG RANGE LEVEL GAUGE

Type of sensor	linear potentiometer
Measuring range	800mm
Sensor sensitivity	0.01mm
Sensor accuracy	±0.5mm (thermal effects not included)
Difference in elevation	up to 800mm
Housing dimensions	OD 68mm, 1050mm high

DSM systems are very sensitive to temperature changes. Accurate measurements require that temperatures be monitored at sensor locations. Data is processed utilizing "Fieldstat" software.

COMPONENTS AND ACCESSORIES

OD422S08000	DSM REFERENCE GAUGE
OD422SERB00	DSM REFERENCE TANK
0TUPE060800	6MM PE TUBE, ID/OD 6/8mm
0TUPE101200	10MM PE TUBE, ID/OD 10/12mm
1000C0PE300	HYDRAULIC TUBE INSULATION
1000L1GL100	WATER-GLYCERINE MIX
OD422SAT200	DSM SATURATION DEVICE, 20lt.



FLUID SETTLEMENT GAUGES

The measurement of soil settlement of ground or embankments is important for monitoring the structural stability during construction works. Depending on the type of application, the settlement gauges are installed in different configurations, linked together by a hydraulic line to a reference gauge and connected to an automatic data acquisition system.

OD422R00000 EMBANKMENT GAUGES

Measuring range	8.5, 17.0, 43.5, 87.0 m (with Sisgeo liquid mix)
Sensor sensitivity	0.01% FS
Sensor accuracy	<0.3% FS
Output signal	4-20 mA

OD422R000VW VW EMBANKMENT GAUGES

Measuring range	15.0, 31.0 m (with Sisgeo liquid mix)
Sensor sensitivity	0.025% FS
Sensor accuracy	<0.5% FS
Output signal	Frequency

OD422F00000 BOREHOLE GAUGES

Measuring range	8.5, 17.0, 43.5, 87.0 m (with Sisgeo liquid mix)
Sensor sensitivity	0.01% FS
Sensor accuracy	<0.3% FS
Output signal	4-20 mA

The operating principle is based on the pressure variation caused by the change in height of a column of liquid. Subsequent height variations occurring between the datum point and the measuring points cause proportional variations of the hydraulic level at each settlement gauge.



PRISMS AND TARGETS

Mini prisms are supplied with aluminum "L" shaped support offering high accuracy and small dimensions. Optical targets are available with various supports, single or double-faced, so as to suit a large number of applications. Simple bolt and benchmark can be supplied to complete the topographic accessories for structural and convergence surveying.

OGMP1040000 MINIPRISM

Max I.R. range	2000m (7000 ft)
Prism diameter	24 mm
Prism body dimensions	Ø 60 mm, thickness 27 mm
Time lag	3-10 sec
Diameter	34 mm
L-support	aluminum, 12x15 mm section
Overall dimensions	76 x 90 x 27 mm

OPTICAL TARGETS

OGCTR005000	REMOVABLE TARGET with rotary plate
OGCTR38ADPO	3/8" G PLASTIC STUD ADAPTOR for OGCTR0050000
OGCTR0050TS	TARGET 50 x 50 MM with rotary plate and M6 anchor
OGCTR0050L0	TARGET 50 x 50 MM with aluminium "L" support
OGCSH165000	SHEET OF N.16 ADHES. REFLECTOR reflector dimensions 50 x 50 mm

TOPOGRAPHIC BOLTS



OGBM025SS00
Head dimensions: Ø 25 mm, height 5 mm
Body diameter: Ø 10 mm
Total length: 55 mm
Material: stainless steel



OGBM000SS00
Head: removable, Ø 20 or Ø 40 mm
Body dimension: 8 x 15 mm
Total length: 177 mm
Material: galvanized and stainless steel

SETTLEMENT GAUGES

- _ BUILDINGS
- _ EMBANKMENTS
- _ FOUNDATIONS
- _ CIVIL STRUCTURES
- _ TUNNELING
- _ CONCRETE AND EARTHFILL DAMS

Project:
Delvari Dam
I.R. of Iran



T-REX INCREMENTAL EXTENSOMETER

T-REX is a removable extensometer which has been designed for incremental measurements along the axis of an inclinometer casing equipped with ring magnets. Thanks to the positioning device, T-REX gives very accurate measurements. T-REX analyzer software includes a smoothing technique that allows for the “best fit” in order to evaluate the real behaviour of the soil movements.

OREX45100S0 T-REX SYSTEM



T-REX extensometer offers several advantages:

- wide measuring range (± 50 mm displacement per meter) which allows applications either in soil or rock
- fully compatible with Sisgeo inclinometer system (cable, connector and readout)
- no mechanical contact between probe and targets
- combined with inclinometer permits 3-D deformation borehole profile

Measuring base	1.000 mm
Measuring range	± 50 mm
Sensor linearity	$\pm 0.02\%$ FS
Sensor repeatability	0.01 mm
Operating temperature	$-10^{\circ}\text{C} + 60^{\circ}\text{C}$
Environmental	IP68 up to 1.5 MPa
Dimensions	$\varnothing 40$ mm, length 1530 mm
Material	s/steel, brass and aluminium

ARCHIMEDE PORTABLE READOUT

Measurements are performed by Archimede dataloggers equipped with external battery pack (product code 0CDL012EXBP0). The battery pack is sealed in a water resistant case, which is connected to the portable readout unit when the operator performs measurement functions.

A/D converter	2 x 24 bit with autocalibration
Storage memory	2 GB
Display	color graphic TFT, LED backlight 320x240 pixel, sunlight reliability
COMM port	USB
Temperature range:	$-20 + 60^{\circ}\text{C}$, IP67
Dimensions	(LxWxH) 200 x 280 x 65 mm



DEX IN-PLACE EXTENSOMETERS

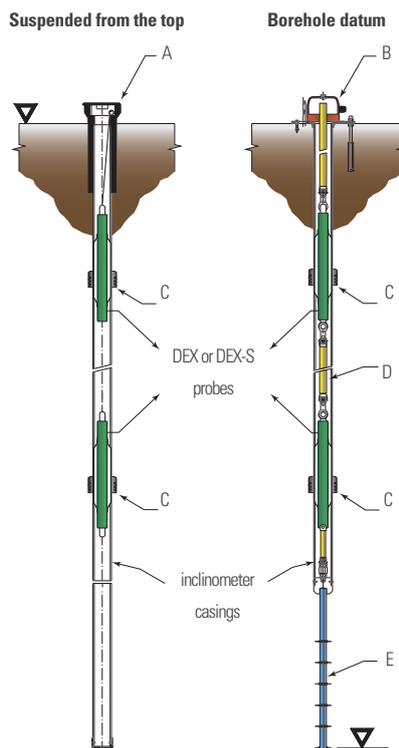
DEX extensometers are used in conjunction with inclinometer casings for automatic monitoring of settlement or heave. Strings of DEX extensometer are joined together with stainless steel wire or rods. DEX probes are placed at different depths where the settlement is likely to occur with reference points at the top or bottom of the casing.

TECHNICAL SPECIFICATIONS



ODEX35010000	Range 100 mm, length 1170 mm
ODEX35050000	Range 500 mm, length 1170 mm
ODEX35100000	Range 1000 mm, length 1670 mm

Sensor repeatability	0.01 mm
Sensor linearity	$\pm 0.02\%$ FS
Signal output	0-10 V DC
Operating temperature	$-20^{\circ}\text{C} + 60^{\circ}\text{C}$
Environmental	IP68 (up to 1.5 MPa)
Outer diameter	35 mm



DEX-S IN-PLACE EXTENSO-INCLINOMETERS

DEX-S are in-place extensometers equipped with a biaxial MEMS tilt sensor for 3-D borehole displacement monitoring. Mixed chains of DEX, DEX-S and IPI give a cost effective solution for comprehensive borehole monitoring. DEX-S probes connected to OMNIAlog datalogger provides automatic monitoring of unattended locations and alerting.

TECHNICAL SPECIFICATIONS



ODEX35S102B0	Axial range 100 mm, Tilt range $\pm 10^{\circ}$
ODEX35S202B0	Axial range 100 mm, Tilt range $\pm 20^{\circ}$

SETTLEMENT SENSOR

Measuring range	100 mm
Sensor repeatability	0.01 mm
Sensor linearity	$\pm 0.02\%$ FS
Signal output	0-10 V DC

TILT SENSOR

Technology	self compensated MEMS
Type	Biaxial
Sensor sensitivity	0.0013°
Sensor accuracy	0.10% FS
Thermal drift	$\pm 0.005\%$ / $^{\circ}\text{C}$.

THERMISTOR

Type of sensor	NTC thermistor (YSI 44005)
Measuring range	$-50^{\circ}\text{C} + 80^{\circ}\text{C}$
Resolution	0.1 $^{\circ}\text{C}$
Accuracy	$\pm 0.5^{\circ}\text{C}$

DEX AND DEX-S ACCESSORIES

OWE104SG0ZH	DEX signal cable, 4 wire
OWE110DX0ZH	DEX-S signal cable, 10 wire
OS4TS101000 (A)	Support head, suspended installation
OWRAC200000	Stainless steel support wire, 2 mm
OS4IPIT00L0	Wire clamping tool
ODEX0TT6000 (E)	Borehole bottom anchor
OS4R0D0AC00 (D)	Stainless steel placement rods
ODEX0TS2350 (B)	Support head, rod installation
OREX0RING93 (C)	DEX ring magnet, ID 71mm OD 95mm
OREX0RING83 (C)	DEX ring magnet, ID 60mm OD 83mm

SETTLEMENT GAUGES

- _ BUILDINGS
- _ EMBANKMENTS
- _ FOUNDATIONS
- _ CIVIL STRUCTURES
- _ TUNNELING
- _ CONCRETE AND EARTHFILL DAMS

Project:
Karahnjukur HPP
Iceland



MAGNET EXTENSOMETER (BRS)

Magnet extensometer is a system for measuring either settlement or heave at various depths in soil and embankments. The system consists of an access tube with external corrugated pipe and ring magnets. Readings are obtained lowering in the access tube a portable readout equipped with a reed switch probe.

COMPONENTS

0D111P30000	3 M SECTION ACCESS TUBE
0D111P15000	1.5 M SECTION ACCESS TUBE
0D111PV5500	CORRUGATED PIPE, OD 55MM
0D111TF6000	TELESCOPIC END AND DATUM
0D111TS1000	SUSPENSION HEAD
0D111AF6000	SPRING MAGNET RING ID 60mm, max span 300mm
0D111AR6000	MAGNET SETTLEMENT PLATE iD 60mm, plate OD 300mm

C121 PORTABLE READOUT

0C121005000	READOUT, 50M FLAT CABLE
0C121010000	READOUT, 100M FLAT CABLE
0C121015000	READOUT, 150M FLAT CABLE
0C121KITR00	DIPPING PROBE SPARE KIT
Probe dimensions	OD 16 mm, length 250 mm
Cable division	millimetre, class II ECC
Cable sheath	nylon
System accuracy	±1 mm
Temp. operating range	-40°C +80°C

HORIZONTAL DISPLACEMENT MAGNET SYSTEM

Magnet system can be installed horizontally to measure horizontal ground movements.

0TUHDPE5000	HDPE ACCESS TUBE, OD 50MM
0D111PV7000	CORRUGATED PIPE, OD 70MM
0D1RINV4000	DEAD END PULLEY ASSEMBLY
0D111AH6500	MAGNET RING ID 70MM



PROFILE GAUGE (PROFILER)

Profiler is a hydrostatic profile gauge designed for settlement or heave monitoring beneath embankments or foundations. The Profiler probe is pulled through a HDPE pipe buried into the soil. The transducer measures the profile of the pipe relative to a reservoir fixed on a tripod located on stable ground.

0D5HPG33100 PROFILER PROBE

Measuring range	8.5 m
Resolution	1 mm
Total accuracy	±20 mm
Time lag	3-10 sec
Diameter	34 mm
Length	280 mm
Material	stainless steel

READOUT AND REEL

Digital display	4.5 digits LCD
A/D converter	14 bits + sign
Reading accuracy	±1 digit
Zero off-set	adjustable
Power supply	12V DC rechargeable battery
Operating time	15 hours
Temp. operating range	-10°C +50°C
Reel diameter	690 mm
Reel cable capacity	< 150 meter
Total weight	25 Kg with 50 m tube

0WE206M1200 PROFILER CABLE

Profiler cable includes electrical cable and liquid tube encapsulated in polyurethane external jacket.

Electric cable	6-cond. with reference tube
Liquid tube diameters	ID 6mm, OD 8mm
Liquid type	de-aired water-glycerine mix
Marks	every meter
External jacket	polyurethane LSZH, OD 13.7 mm



FIXED EXTENSOMETERS

Fixed extensometer is usually defined as a device placed in an embankment fill or inside a borehole for monitoring settlement or heave between two points. Optical surveying of the top of the riser rod provides precise monitoring. Electrical transducers can be used for automatic readings in remote inaccessible locations.

SETTLEMENT PLATFORM

The primary advantage of the settlement platform is its simplicity. The settlement platform consists of a galvanized square plate to which a riser settlement rod is attached. Anti-friction corrugate pipe is placed around the riser rod. Optical levelling measurements, on the survey point mounted on the top cap, provides records of plate elevation.

0D100A20000	2M SECTION RISER ROD
0D111PV5500	CORRUGATE PIPE, OD 55mm
0D100B05000	SQUARE PLATE 500x500mm
0D100T15000	TOP CAP AND SURVEY POINT

TELL-TALE EXTENSOMETER

The tell-tale extensometer is a single-point extensometer which is typically used for precise monitoring of ground surface settlement or heave. It consists of a stainless steel bottom anchor to which a string of riser measuring rods is attached. Anti-friction corrugate pipe is placed around the riser rods. Optical levelling measurements of the top head of the riser rod provides a measure of ground settlement. Sliding rings are located at both ends in order to prevent down drag forces on the rod.

0D100A20000	2M SECTION RISER ROD
0D111PV5500	CORRUGATE PIPE, OD 55mm
0D100T6000	BOTTOM ANCHOR
0D100T0100	TOP CAP AND SURVEY POINT
0D100TTEL10	DTM MEASURING HEAD

0DTM0000000 DTM ELECTRICAL TRANSDUCERS

DTM electrical transducers can be mounted on either settlement platforms or the tell-tale extensometers.

Range	250mm, 500mm, 1000mm
Sensor accuracy	0.25% F.S.
Output signal	4-20 mA

PRESSURE & LOAD CELLS

_ EMBANKMENTS

_ TUNNELING

_ CONCRETE MASS

_ EARTH FILL DAMS

_ PILES

_ DIAPHRAGM WALLS

_ DEEP EXCAVATIONS

_ BRIDGES AND VIADUCTS



EARTH PRESSURE CELLS

Earth pressure cells are utilized to monitor total pressure in earthfill dams and embankments or at the interface between the structure and the excavation wall.

The stress applied to the pad is converted to an electrical signal via the pressure transducer and can be remotely read with a variety of portable readout units or dataloggers.

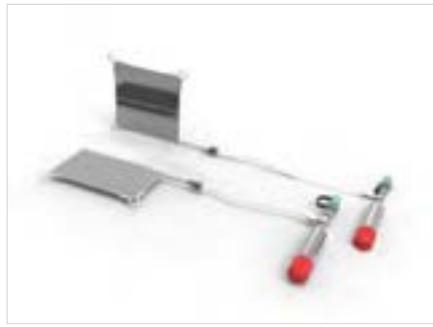
AVAILABLE MODELS



MODEL L143D	vibrating wire technology
Full scales	350, 500, 700 kPa 1, 1.7, 2, 5, 7, 10 MPa
Sensitivity	0.03% FS
Total accuracy (*)	<0.25% FS
Signal output	frequency
Pressure pad size	diameter 230 mm thickness 13 mm
Transducer size	OD 28mm, 180mm long
Material	Stainless steel
Operating temp. Range	-20°C +80°C
Weight	0.6 kg

MODEL L141D	piezo resistive technology
Full scales	200, 500 kPa 1, 2, 5, 10 MPa
Sensitivity	0.002% FS
Total accuracy (*)	<0.25% FS
Signal output	4-20 mA current loop
Pressure pad size	diameter 230 mm thickness 13 mm
Transducer size	OD 28mm, 180mm long
Material	Stainless steel
Operating temp. Range	-10°C +55°C
Weight	0.6 kg

(*) including hysteresis and repeatability, calculated with 3rd degree polynomial



NATM STRESS CELLS

Sisgeo flexible diaphragm NATM stress cells have been designed to optimize measurements of radial and tangential stresses in shotcrete and concrete tunnel linings.

The stress cell consists of a pressure pad connected to the transducer by a hydraulic tube. Readings are taken by the C6002MV portable readout directly connected to the stress cell terminal.

AVAILABLE MODELS



MODEL L112R	radial stress cell
Measuring range	0-5 MPa (50 Bar)
Accuracy	<0.3% FS
Pressure pad size	square 150x150mm
Pad thickness	5 mm
Transducer size	OD 25mm, 130mm long
MODEL L112T	tangential stress cell
Measuring range	0-20 MPa (200 Bar)
Accuracy	<0.3% FS
Pressure pad size	rectangular 100x200mm
Pad thickness	5 mm
Transducer	size OD 25mm, 130mm long

OC6002MV000 DIGITAL INDICATOR



Digital display	3.5 LCD
Resolution	10 kPa (0.01 MPa)
Environmental	-5°C +50°C, dust-proof case



OL111PUMPOO REPRESSURIZING DEVICE

This device permits to increase the volume of the hydraulic oil inside the cavity of the pressure pad, expanding it, in order to maintain close contact between the pad and the surrounding material after the concrete has cured.



HYDRAULIC PRESSURE CELLS

Hydraulic pressure cells are designed to measure stress in mass concrete or at the interface between the structure and the excavation wall. They are filled under vacuum with de-aired oil that guarantees the maximum rigidity.

A re-pressurizing device is used in order to maintain close contact when the concrete has cured.

AVAILABLE PRESSURE PADS

OL111151500	for radial stress in concrete
Pad size	150X150 mm
Working pressure	up to 5 MPa
OL111102000	for tangential stress in concrete
Pad size	100x200 mm
Working pressure	up to 20 MPa
OL111204000	for contact soil/rock-structure
Pad size	200x400 mm
Working pressure	up to 5 MPa
OL111D05000	for contact soil-concrete
Pad size	circular 500mm OD
Working pressure	up to 1 MPa

AVAILABLE TRANSDUCERS



MODEL PK45H	VW pressure transducers
Full scales	350, 500, 700 kPa, 1, 1.7, 2, 5, 7 MPa
Sensitivity	0.03% FS
Total accuracy (*)	<0.25% FS
Output signal	frequency
Operating temp. range	-20°C +80°C
Transducer size	OD 27mm, 180mm long
MODEL P252A	electrical pressure transducers
Full scales	200, 500 kPa, 1, 2, 5, 10 MPa
Sensitivity	0.002% FS
Total accuracy	<0.20% FS with 3 rd order polynome
Output signal	4-20 mA current loop
Operating temp. range	-10°C +55°C
Transducer size	OD 27mm, 180mm long

PRESSURE & LOAD CELLS

Courtesy of EMPÍRICA INGENIEROS S.L.

_ EMBANKMENTS

_ TUNNELING

_ CONCRETE MASS

_ EARTH FILL DAMS

_ PILES

_ DIAPHRAGM WALLS

_ DEEP EXCAVATIONS

_ BRIDGES AND VIADUCTS



Project:
Monitored anchors in Barajas Airport
Madrid, Spain



HYDRAULIC ANCHOR LOAD CELLS

Hydraulic anchor load cells are utilized to monitor loads in tiebacks, rock bolts and cables. The pressure pad between the plates is filled, under high vacuum, with deaired oil. The load is directly measured in KN by a Bourdon manometer. Electrical conversion by means of pressure transducer is also available for remote readings.

GAUGE MANOMETER MODEL

0L2M04030H0	300 KN, ID 40MM, OD 140MM
0L2M07050H0	500 KN, ID 71MM, OD 164MM
0L2M09075H0	750 KN, ID 92MM, OD 204MM
0L2M11100H0	1000 KN, ID 110MM, OD 228MM
0L2M13100H0	1000 KN, ID 138MM, OD 245MM
0L2M16150H0	1500 KN, ID 165MM, OD 293MM
0L2M22250H0	2500 KN, ID 225MM, OD 380MM
Overload	120% with less than 2% FS zeroshift
Manometer accuracy	class $\pm 1.5\%$ FS
Material	AISI 304 stainless steel
Comp. temp. range	-35°C +60°C

ELECTRICAL MODEL

0L2E0705000	500 KN, ID 71MM, OD 164MM
0L2E0907500	750 KN, ID 92MM, OD 204MM
0L2E1110000	1000 KN, ID 110MM, OD 228MM
0L2E1310000	1000 KN, ID 138MM, OD 245MM
0L2E1615000	1500 KN, ID 165MM, OD 293MM
Overload	120% with less than 2% FS zeroshift
Accuracy	$\pm 1\%$ FS
Signal output	4-20 mA (current loop)
Temperature drift	0.05 % FS / °C
Material	AISI 304 stainless steel
Comp. temp. range	-35°C +60°C



0L2E Electro-hydraulic anchor load cell



ELECTRIC ANCHOR LOAD CELLS

Electrical resistance anchor load cells consist of a ring shaped stainless steel body which incorporate from 8 to 16 electrical resistance strain gauges in a full bridge configuration. The cell design minimizes the sensitivity to the eccentric load. A very stiff distribution plate is required, in order to ensure that the load is applied equally over the anular loading surface of the cell.

AVAILABLE MODELS

0L204V03000	300 KN, ID 40MM, OD 155MM
0L205V05000	500 KN, ID 50MM, OD 155MM
0L207V07500	750 KN, ID 71MM, OD 155MM
0L211V07500	750 KN, ID 110MM, OD 200MM
0L212V10000	1000 KN, ID 120MM, OD 220MM
0L216V12000	1200 KN, ID 165MM, OD 260MM
0L216V15000	1500 KN, ID 165MM, OD 260MM
0L219V18000	1800 KN, ID 190MM, OD 300MM
0L222V25000	2500 KN, ID 225MM, OD 340MM

Full scales	from 300 KN to 2500 KN
Overload	150%
Sensitivity	0.06% FS
Accuracy	< 0.5% FS
Thermal zero shift	< 0.005% FS / °C
Signal output	1.5mV/V at FS or 2 mV/V at FS
Power supply	from 2V DC to 10V DC
Bridge resistance	1400 ohm standard
Compens. temp. range	-10°C +60°C
Operating temp. range	-15°C +70°C
Material	stainless steel

DISTRIBUTION PLATES

0L20040PD00	centre hole 40mm, OD 110mm
0L20050PD00	centre hole 50mm, OD 110mm
0L20071PD00	centre hole 71mm, OD 110mm
0L20110PD00	centre hole 110mm, OD 155mm
0L20120PD00	centre hole 120mm, OD 180mm
0L20165PD00	centre hole 165mm, OD 210mm
0L20190PD00	centre hole 190mm, OD 250mm
0L20225PD00	centre hole 231mm, OD 290mm

ACCESSORIES

0ECON07MV00	MIL male connector with cap
0ELC420MA00	4-20 mA transmitter (2 wires)



ELECTRIC LOAD CELLS

This model of load cells is used to monitor stresses in steel linings, piles and support beams.

They consist of a pressure pad connected to a pressure transducer. The pressure pad is composed by two stiff stainless steel plates saturated by de-aired oil. Special distribution plates are also available for better load distribution.

AVAILABLE MODELS

0L2CE019000	1900 KN, OD 191 MM
0L2CE030000	3000 KN, OD 245,5 MM

Accuracy	< 1% FS (linearity, hysteresis and repeatability)
Signal output	4-20 mA (current loop)
Temp. operating range	from -20° to +80°C
Protection Class	IP 68 up to 100 KPa
Material	stainless steel

DISTRIBUTION PLATES

0L2CE200PD0	Twin plates, overall diam. 200mm
0L2CE252PD0	Twin plates, overall diam. 252mm

SOLID LOAD CELLS

Specially designed for pile testing, they consists of a cylinder body, heat-treated steel, instrumented with 4 strain-gauges. L2CT load cells are tested for long-term stability under heavy operating conditions.

0L2CT030000	3000 KN, OD 135 mm
0L2CT050000	5000 KN, OD 180 mm
0L2CT100000	10000 KN, OD 230 mm

Overload	150%
Sensitivity	0.01% FS
Accuracy	0.2% FS
Power supply	max 12 V DC
Output signal	2 mV/V at FS
Temp. operating range	-40°C +75°C
Protection Class	IP 65

Calibration report for load cell FS > 3000 KN can be issued separately by qualified testing laboratory.

EXTENSOMETERS & JOINTMETERS

_TUNNELING

_DAMS

_HISTORICAL BUILDINGS

_EMBANKMENTS

_DEEP EXCAVATIONS

_LANDSLIDES

_BRIDGES AND VIADUCTS



Project:
Mazar HPP
Ecuador



DIGITAL TAPE EXTENSOMETER

A tape extensometer is used to take accurate measurements between pairs of target points that have been permanently installed. It is available with either a hook or a 3/8" threaded termination.

Typical applications include convergence monitoring of tunnel linings, according to NATM practice, shafts, underground openings and caverns.

AVAILABLE MODELS

0DN0020D000	20 M TAPE, HOOK TERMINALS
0DN0030D000	30 M TAPE, HOOK TERMINALS
0DN0020D380	20 M TAPE, THREAD.TERMINALS
0DN0030D380	30 M TAPE, THREAD. TERMINALS

Gauge resolution	0.01 mm
Gauge repeatability	0.1 mm
Gauge accuracy	±0.01 mm
Operating temperature	-10°C +80°C
Tape tension	13.5 kg
Tape material	stainless steel
Tension indicator	optical
Weight	1.4 kg (20 m tape) 1.6 kg (30 m tape)

REFERENCE BOLTS

A wide range of measuring bolts are available: to be grouted, welded or anchored to the structure.

0DN0CH20000	200 mm groutable 3/8" stud bolt
0DN0CH50000	500 mm groutable 3/8" stud bolt
0DN0CHE1000	1000 mm groutable 3/8" stud bolt
0DN0CH05000	50 mm weldable 3/8" stud bolt
0DN0CH20E00	200 mm groutable eyebolt
0DN0CH05E00	50 mm weldable eyebolt
0DN0TS10E00	eyebolt with Fisher-type anchor



EMBEDMENT JOINTMETERS

Embedment jointmeters are usually installed across the joints in concrete dams in order to measure relative movement between two concrete blocks.

Their design allows them to be installed directly onto the formwork. The internal VW displacement transducer is assembled at middle range allowing movements in both directions.

AVAILABLE MODELS

0D314C025VW	VW EMBEDMENT JOINTMETER, 25 MM RANGE
0D314C050VW	VW EMBEDMENT JOINTMETER, 50 MM RANGE
0D314C100VW	VW EMBEDMENT JOINTMETER, 100 MM RANGE
0D314C150VW	VW EMBEDMENT JOINTMETER, 150 MM RANGE

TECHNICAL CHARACTERISTICS

Type of sensor	vibrating wire transducer with built-in thermistor
Measuring range	25, 50, 100, 150 mm
Sensitivity	<0.025% FS
Accuracy	<0.5% FS
Signal output	frequency
Operating temperature	-20°C +80°C
Material	stainless steel



Embedment jointmeter installation scheme



EMBANKMENT EXTENSOMETERS

Embankment (soil) extensometers are used to measure soil strains in large earth structures.

The system consists of a number of anchor plates connected by extension rods to a VW displacement transducer.

Connected to a data acquisition system, they provide automatic real time monitoring and alerting.

SYSTEM COMPONENTS

0D2320B100	EXTENSION ROD, 1 M
0D2320B200	EXTENSION ROD, 2 M
0D2320B300	EXTENSION ROD, 3 M
0D111PV5500	PVC CORRUGATE ANTI-FRICTION SLEEVE
0D232AN5000	ANCHOR PLATE, DIAM 500 MM
0D232AN5500	ANCHOR PLATE, 500x500 MM

MEASURING ELEMENTS

0D232T050VW	50 mm (±25 mm) range
0D232T100VW	100 mm (±50 mm) range
0D232T150VW	150 mm (±75 mm) range
Type of sensor	vibrating wire displacement transducer with built-in thermistor
Measuring range	50, 100, 150mm
Sensitivity	<0.025% FS
Accuracy	<0.5% FS
Signal output	frequency
Operating temperature	-20°C +80°C
Material	stainless steel

EXTENSOMETERS & JOINTMETERS

_TUNNELING

_DAMS

_HISTORICAL BUILDINGS

_EMBANKMENTS

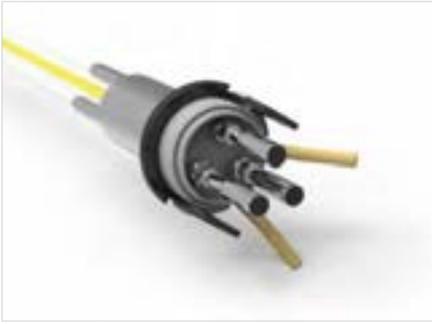
_DEEP EXCAVATIONS

_LANDSLIDES

_BRIDGES AND VIADUCTS



Project:
Letlhakane Mine
Botswana



MULTIPOINT ROD EXTENSOMETERS

Multipoint rod extensometers (MPBX) are installed in boreholes in order to monitor displacements at various depths using rods of different materials and lengths. A pre-set length of measuring rod is inserted into a nylon tube to avoid soil friction and its end is fixed to a steel groutable anchor. Displacements are read with linear transducers (DTE) or with a digital gauge.

AVAILABLE MODELS

OD222AC00A0	s/steel or invar rods, DTE < 100 mm
OD222AC00B0	s/steel or invar rods, DTE > 100 mm
OD222FG00A0	fibre glass rods, DTE < 100 mm
OD222FG00B0	fibre glass rods, DTE > 100 mm
Number of bases	1 (single), from 2 to 7 (multiple)
Multiple head top tube	OD 120 mm
Extensometer rods	FG fibre glass continuous AC stainless steel, 2 m sections IN invar, 2 m sections
Protective sleeve	nylon 11 (riksan), OD 12 mm
Groutable anchor	FG: rebar 16 mm OD, 400 mm long AC/IN: rebar 22 m OD, 400 mm long

DISPLACEMENT TRANSDUCERS (DTE)

ODTE1A00000	LINEAR POTENTIOMETER DTE
Measuring range	25, 50, 100, 150, 200mm
Signal output	4-20 mA (current loop)
Accuracy	<0.3% FS
Protection	IP68 (watertight up to 100 kPa)
ODTE000VW00	VIBRATING WIRE DTE
Measuring range	25, 50, 100, 150 mm
Signal output	frequency
Accuracy	< 0.5% FS
Protection	IP68 (watertight up to 100 kPa)

ODIGD020000 DIGITAL GAUGE

The digital gauge kit consists of a depth caliper with LCD (readings in metric and imperial units), a set of extension rods and carrying case.

Measuring range	from 0 to 200mm
Resolution	0.01 mm



MEXID EXTENSOMETERS

MEXID are miniaturized MPBX extensometers that allow installation into a 50mm diameter borehole. Displacement transducers are incorporated into the instrument head so, after positioning and grouting, the external encumbrance is the cable gland only (20mm). Dedicated tubes allow grouting to fix the anchors to rock or soil.

AVAILABLE MODELS



OD2MX00A000	fibre glass rods, 4-20mA output available with 50 and 150mm range
OD2MX00W000	fibre glass rods, vibrating wire sensors available with 50 and 150mm range
Number of bases	from 2 to 4
Head diameter	48.3 mm
Head length	500 mm for 50 mm range 840 mm for 150 mm range
Extensometer rods	fibre glass, OD 7 mm
Protective sleeve	nylon 11 (riksan), OD 12 mm
Groutable anchor	rebar 16 mm OD, 400 mm long

TECHNICAL CHARACTERISTICS

Signal output	4-20 mA (current loop) or frequency
Accuracy	<0.3% FS (4-20mA output) <0.5% FS (Vibrating wire)
Protection	IP68 (watertight up to 100 kPa)

RODS AND CABLE

OD221BMFG00	FIBRE GLASS ROD, 7 MM OD with protective sleeve
OWE1160LSZH	LSZH MULTICORE CABLE, 8 PAIRS 8x2 (24AWG) conductors, M1 jacket



DBS MEASURING ANCHORS

Measuring anchors are a combination of rock bolt and extensometer. They consist of a 4 point mini extensometer inside a hollow anchor body, the four anchor points at different levels. Readings can be taken manually by a dial gauge or could be also automated by using vibrating wire displacement transducers kit.

AVAILABLE MODELS

ODBS2503244	DBS 4M LONG
ODBS2503264	DBS 6M LONG
ODBS2503294	DBS 9M LONG
Loading capacity	250 KN
Anchoring points	4
Overall outer diameter	40 mm
Drilling diameter	50 mm
Materials:	
- Rods	iron
- Central anulus	brass
- Head	Stainless steel

ODBS04DTE00 ELECTRIC ASSEMBLY

Displacement transducer	4 nos. vibrating wire transducers
Range	+/- 5mm
Sensitivity	<0.025% FS
Accuracy	< 0.5% FS
Operating temperature	-20°C +80°C
Signal output	frequency
Dimension	Length 270mm, OD 54mm

ODIG10KDBSO MANUAL READOUT

It is a manual measuring equipment with a dial gauge that shall be placed on DBS head to take readings in manual mode.

Range	0 – 10 mm
Resolution	0.01 mm

EXTENSOMETERS & JOINTMETERS

_TUNNELING

_DAMS

_HISTORICAL BUILDINGS

_EMBANKMENTS

_DEEP EXCAVATIONS

_LANDSLIDES

_BRIDGES AND VIADUCTS

Courtesy of GPIKO.LTD



Project:
Luge and Bobsleigh Track
Krasnaja Poljana (Sochi), Russia



WIRE CRACKMETER AND DEFORMETER

Wire crackmeter is designed to monitor changes in distance between two anchor points located at up to 30m apart. The wire deformer is used to monitor the displacement between two opposite surfaces (convergence in tunnels, rock masses, etc...). USB deformer incorporates a small logger for automatic monitoring.

OD241A20000 WIRE CRACKMETER

Mechanical range	2000 mm
Electrical range	240 mm
Sensitivity	0.03 mm
Accuracy	±1 mm (depends mainly from the thermal effects on the wire)
Signal output	4-20 mA (current loop)
Operating temperature	-20°C +80°C
Wire diameter	2 mm, stainless steel
Max. wire tension	8 Kg
Transducer housing	300x200x185 mm
Target assembly	eyebolt expansion anchor

OD313F00000 WIRE DEFORMERS

Type of sensor	linear potentiometer or vibrating wire
Signal output	4-20 mA, frequency
Measuring range	25 mm (±12.5), 50 mm (±25)
Sensitivity	0.001 mA, <0.025% FS
Total accuracy	<0.3% FS (4-20mA) <0.5% FS (vibrating wire)
Operating temperature	-20°C +80°C
Body diameter	16 mm
Base (wire) length	Kevlar, up to 10 meter
Protection	IP68 (watertight up to 100 kPa)

OD314FV8000 USB DEFORMETER

Type of sensor	rotating potentiometer
Displacement range	80 mm
Resolution	0.003 mm
Accuracy	<0.1% FS
Operating temperature	-10°C +60°C
A/D converter	15 bits
Storage capacity	>51.000 measurements
Battery life	4 years with 1 saving per hour
Protection	IP65



ELECTRICAL AND VW CRACKMETERS

Crackmeters and jointmeters are utilized to monitor movements of surface cracks and joints in concrete structures or rock. The displacement transducer housed in the sensor body is positioned across the joint/crack which enables measurement of the changes in the distance between the anchors.

ELECTRICAL CRACKMETERS

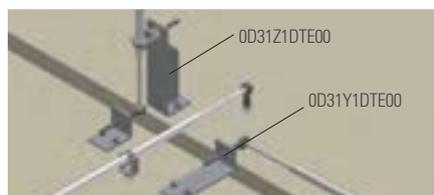
Technology	Linear potentiometer
Full scales	10, 25, 50, 100, 150mm
Sensitivity	0.001 mA
Total accuracy	<0.3% FS including linearity and hysteresis
Signal output	4-20 mA (current loop)
Power supply	12-24V DC
Operating temperature	-20°C +80°C
Sensor diameter	16 mm
Material	stainless steel
Protection	IP68 (watertight up to 100 kPa)

VIBRATING WIRE CRACKMETERS

Technology	Vibrating wire
Full scales	10, 25, 50, 100, 150mm
Sensitivity	<0.025% FS
Total accuracy	<0.5% FS
Signal output	frequency
Operating temperature	-20°C +80°C
Body diameter	16 mm
Material	stainless steel
Protection	IP68 (watertight up to 100 kPa)

ACCESSORIES

OD31Y1DTE00	Y-AXIS STAINLESS STEEL FIXING KIT
OD31Z1DTE00	Z-AXIS STAINLESS STEEL FIXING KIT



MECHANICAL CRACKMETERS

Uniaxial and 3-D (triaxial) mechanical jointmeters are available to monitor joints and cracks. The movements between the two anchors are obtained by mechanical dial gauges. Simple and inexpensive, the TT-1 tell-tale crack monitor, installed across a fissure, allows the crack survey in two directions.

AVAILABLE MODELS

OD3101D3000	UNIAXIAL CRACKMETER
OD3103D3000	3-D CRACKMETER ASSEMBLY
Mechanical range	0-30mm
Base lengths	500 mm (uniaxial) 200 mm (3-D)
1-D anchors	2 shell expanding anchors Ø 14 mm, length 55 mm
3-D anchors	2 groutable rebar Ø 16 mm, length 80 mm
Material	Stainless steel

ODIG30KIT00 DIAL GAUGE KIT

Compatible with	OD3101D3000 OD3103D3000
Measuring range	0-30 mm
Gauge accuracy	0.05 mm

OD300LINE00 TT-1 CRACK MONITOR

Model	2-D biaxial
Mechanical range	±20 mm (X-axis) ±10 mm (Y-axis)
Resolution	1 mm
Material	acrylic resin

STRAIN-GAUGES & THERMOMETERS

_PILES AND MASS CONCRETE

_CONCRETE STRUCTURES,
BEAMS AND COLUMNS

_CONCRETE FOUNDATIONS
AND DIAPHRAGM WALLS

_TUNNEL SEGMENTS

_STEEL STRUCTURES, PIPES
AND ARCH SUPPORTS

_GRAVITY AND ARCH DAMS

_BRIDGES AND VIADUCTS



VIBRATING WIRE STRAIN-GAUGES

Vibrating wire strain-gauges are used to monitor variation in strain, which allows stress evaluation in steel or concrete structures. A thermistor incorporated into the gauge gives the temperature at the point of measurement allowing temperature compensation. No-stress gauge and 3-D rosette mounting are also available.

AVAILABLE MODELS

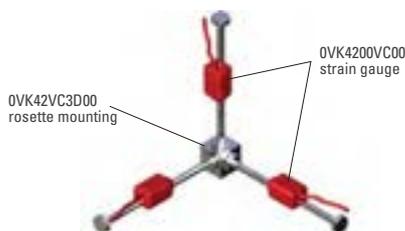


OVK4000VS00	ARC-WELDABLE GAUGE
OVK4200VC00	EMBEDMENT GAUGE

Active gauge length	150 mm
Excitation method	pluck and sweep
Range (nominal)	3000 $\mu\epsilon$
Sensitivity	1.0 $\mu\epsilon$
Accuracy	$\pm 0.5\%$ FS
Stability	0.1% FS/ yr
Typical frequency	800-1200 Hz
Coil resistance	150 ohm
Thermistor type	NTC 3 k Ω
Thermal coeff. of expansion	5 ppm / $^{\circ}\text{C}$
Temperature range	-20 $^{\circ}\text{C}$ + 80 $^{\circ}\text{C}$

ACCESSORIES

OVK42VC3D00	3D rosette mounting block for embedment strain gauges.
OVK400JIG00	Spacing jig for mounting the arc-weldable strain gauges end blocks.
OVK400MB200	Pair of arc-weldable surface mounting blocks.
OVK400COVER	S/steel protective cover with lugs and pair of weldable blocks



VW strain gauges in 3D configuration



VIBRATING WIRE REBARS

Rebar strain meters are "rebars" which incorporates vibrating wire strain gauge element with plucking coil. A thermistor is included in each strain meter. Vibrating wire rebar strain meters are available in different units in order to match the sizes of the concrete reinforcing bars.

AVAILABLE MODELS



OVKBAR01800	VW REBAR 18 MM
OVKBAR02200	VW REBAR 22 MM
OVKBAR02600	VW REBAR 26 MM
OVKBAR03000	VW REBAR 30 MM

Active gauge length	47.5 mm
Range (nominal)	$\pm 1500 \mu\epsilon$
Sensitivity	1.0 $\mu\epsilon$
Accuracy	$\pm 0.5\%$ FS
Stability	0.1% FS/year
Typical frequency	from 600 to 2500 Hz
Coil resistance	150 Ohm
Thermistor type	NTC 3 k Ω
Thermal coeff. of expansion	5 ppm / $^{\circ}\text{C}$
Temperature range	-20 $^{\circ}\text{C}$ a +80 $^{\circ}\text{C}$



SPOT WELDABLE STRAIN GAUGES

Vibrating wire spot-weldable strain gauges are mainly designed to measure strain on steel surfaces. They consist in a weldable SG and a cover which contains the plucking coil. SG is pre-tensioned during manufacturing at mid range. SG installation is preferred using the spot welder recommended by the manufacturer.

OVK4100VS00 SPOT WELDABLE SG



Active gauge length	47.5 mm
Range (nominal)	$\pm 1500 \mu\epsilon$
Sensitivity	1.0 $\mu\epsilon$
Accuracy	$\pm 0.5\%$ FS
Stability	0.1% FS/year
Typical frequency	from 600 to 2500 Hz
Coil resistance	150 Ohm
Thermistor type	NTC 3 k Ω
Thermal coeff. of expansion	5 ppm / $^{\circ}\text{C}$
Temperature range	-20 $^{\circ}\text{C}$ a +80 $^{\circ}\text{C}$

OVK4100VSPO PLUCKING COIL



OVK4100VSG0 STRAIN GAUGE ONLY



ACCESSORIES AND COMPONENTS

OVK410PSW00	Portable spot-welder for VW spot-weldable strain gauges
OWE104SG0ZH	LSZH signal cable
OVK4100VSG0	Strain-gauge only
OVK4100VSPO	Plucking coil only

STRAIN GAUGES & THERMOMETERS

Courtesy of FIELD SRL

_PILES AND MASS CONCRETE

_CONCRETE STRUCTURES,
BEAMS AND COLUMNS

_CONCRETE FOUNDATIONS
AND DIAPHRAGM WALLS

_TUNNEL SEGMENTS

_STEEL STRUCTURES, PIPES
AND ARCH SUPPORTS

_GRAVITY AND ARCH DAMS

_BRIDGES AND VIADUCTS



Project:
"Geremia 2" Viaduct
Sicily, Italy



RESISTIVE STRAIN GAUGES

This model of SG incorporates resistive strain gauges in full bridge configuration bonded to a steel bar.

This arrangement allows compensation for both temperature and bending effects.

Resistive strain-gauges offer a valid alternative to the vibrating wire type when continuous dynamic measurements are required.

AVAILABLE MODELS

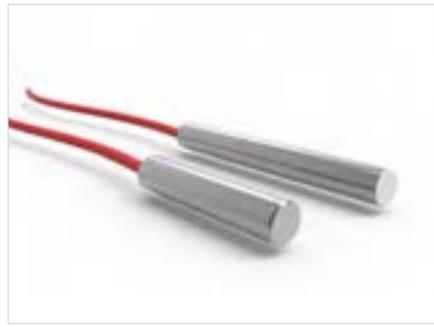


OL3400VS000	STRAIN-GAUGE BAR, mV/V output
OL3400VSC00	STRAIN-GAUGE BAR, V output
OL3400AS000	STRAIN-GAUGE BAR, 4-20 mA output
Bar section / length	8x8 mm / 400 mm
Measuring range	±1500 µε (nominal)
Sensitivity	0.0015 mV/µε
Total accuracy	< 1% FS
Signal output	2 mV/V at FS (OL3400VS000) 10 mV at FS (OL3400VSC00) 4-20 mA current loop (OL3400AS000)
Temp. operating range	-20°C +70°C



CABLES AND ACCESSORIES

OWE1060LSZH	Electric cable 6 wires (24 AWG) for strain gauges mV/V or V output
OWE102KE0ZH	Electric cable 2 wires (20 AWG) for strain gauges 4-20mA output
OL3400MB200	Pair of welding blocks for resistance strain gauges



EMBEDMENT THERMOMETERS

Temperature is a very important parameter to measure so as to evaluate the influence of thermal effects on the recorded data associated with the structure being monitored. Sisgeo uses three types of technologies to monitor temperature: thermistors, RTDs (Resistance Thermal Detectors) and vibrating wire sensors.

OT111PT1000 PT100 THERMOMETERS



Type of sensor	PT100 (RTD) platinum resistance 100 Ω at 0 °C
Measuring range	-50°C +80 °C
Resolution	0.1°C
Accuracy	±0.2°C
Diameter	22 mm
Length	100 mm
Body material	stainless steel

OT3800GKA00 THERMISTORS



Type of sensor	NTC thermistor (YSI 44005)
Measuring range	-50°C +80 °C
Resolution	0.1 °C
Accuracy	±0.5 °C
Diameter	12 mm
Length	55 mm
Body material	stainless steel

OT2200VW000 VW THERMOMETER



Type of sensor	vibrating wire
Measuring range	-20°C +80 °C
Resolution	0.1 °C
Accuracy	±0.5 °C
Diameter	27 mm
Length	200 mm



TEMPERATURE STRINGS

Temperature strings are often used to monitor the thermal profile in boreholes or mass concrete temperature during curing. They consist of RTD or thermistor sensors mounted on a length of multicore cable. The spacing between two sensors is customized following Client requests.

OTS00RTD000 RTD STRINGS



Type of sensor	PT100 platinum resistance
Number of sensor	until N.4 with OWE1160LSZH cable until N.8 with OWE1320LSZH cable
Measuring range	-50°C +80 °C
Resolution	0.1°C
Accuracy	±0.2°C
Sensed section	Ø20 mm, length 150 mm

OTS00NTC000 THERMISTOR STRINGS



Type of sensor	NTC thermistor (YSI 44005)
Number of sensor	until N.8 with OWE1160LSZH cable until N.16 with OWE1320LSZH cable
Measuring range	-50°C +80 °C
Resolution	0.1 °C
Accuracy	±0.5 °C
Sensed section	Ø20 mm, length 150 mm

CABLES FOR TEMPERATURE STRINGS

OWE1160LSZH	LSZH MULTICORE CABLE, 8 PAIRS
OWE1320LSZH	LSZH MULTICORE CABLE, 16 PAIRS
single conductor	tinned copper, CU ETP 5649/88
Inner jacket	flame retardant polyolefin
Outer jacket	technopolymer M1, LSZH
Diameter	9.2 mm for OWE1160LSZH 12.2 mm for OWE1320LSZH

PENDULUMS & READOUT

- _ARCH DAMS
- _CONCRETE DAMS
- _SKYSCRAPERS
- _SLENDER STRUCTURES
- _BELL TOWERS
- _MINARETS



Project:
Ermenek Dam
Turkey



DIRECT AND INVERTED PENDULUMS

Direct and inverted pendulums are simple, reliable and accurate systems used to monitor horizontal movements. Commonly utilized in concrete dams, they permit to measure the change of verticality. The inverted pendulum anchored in foundation in combination with a direct pendulum allow to obtain a complete profile of the verticality of the dam.

OS911002500 DIRECT PENDULUM

The direct pendulum is a gravity-referenced instrument. It consists of:

- stainless steel cylindrical fluid tank with cover
- wire tensioning weight and damping unit
- upper wire anchor system with rail and sliding block
- turnbuckle for trimming the damping unit position

Tank dimensions	415mm diam, 476mm high
Material	stainless steel
Damping fluid (mineral oil)	SAE 50-90 (not supplied)

OS912006000 INVERTED PENDULUM

The inverted pendulum provides a fixed datum from which structural movements can be measured. It consists of:

- stainless steel anular damping chamber with cover
- stainless steel floating unit
- adjustable tie bar with 100mm vertical stroke
- external tube for liquid level survey
- steel ballast for borehole wire anchoring

Tank dimensions	615mm diam, 495mm high
Floating unit	allows ± 72 mm movement in any direction
Groutable anchor diameter	75mm, adjustable from 80mm to 160mm by centralized pins, steel.
Material	stainless steel
Damping fluid (mineral oil)	SAE 50-90 (not supplied)

OWRAC200000 PENDULUM WIRE

Material	stainless steel
Diameter	2mm



OPTICAL PENDULUM READOUT

The pendulum readout (coordinometer) is a reliable and simple instrument for manual readings of pendulum systems. It allows calculation of the horizontal movements of the pendulum wire, a digital LCD displays the X and Y coordinates in millimetres. It can be utilized for either in-place installation or removable measurements in different locations.

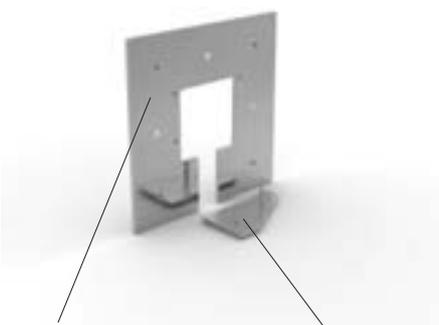
OS9RTB15000 MANUAL READOUT

Measurement area	X-axis: 0-150mm (± 50 mm) Y-axis: 0-150mm (± 50 mm)
Gauge resolution	0.01 mm
Gauge accuracy	<0.1 mm
Gauge protection	IP67
Temp. operating range	-20°C +60°C
Material	aluminium
Dimensions	340x340x115mm
Weight	3.5 kg

ACCESSORIES

OS9RTPLT100	SUPPORT BASE PLATE
Material	galvanized steel
Dimensions	415x415x10 mm (LxWxH)

OS9RTFR1000	CALIBRATION FRAME
Material	stainless steel /aluminium
Overall dimensions	204x120x98 mm (LxWxH)



OS9RTPLT100

OS9RTFR1000



TEL-310S TELECOORDINOMETER

The Sisgeo TEL-310S (Telependulum) is a contactless automatic pendulum readout which uses infrared diode (emitters/receivers) in order to determine the position of the pendulum wire. The measurements are automatically compensated. TEL-310S consist of three separate units: SUS (sensor unit), CUS (control unit with web server on board) and PWS (power supply unit).

OTEL3103GS0 TELECOORDINOMETER

Measuring system	contactless
Measurement area	X-axis: 0-150 mm (145 mm real) Y-axis: 0-60 mm
Resolution	0.005 mm
Repeatability	X-axis: ± 0.007 mm Y-axis: ± 0.012 mm
Total accuracy	X-axis: ± 0.010 mA (repeatability+accuracy+hysteresis) Y-axis: ± 0.015 mA
Power supply	110/220V AC, 50-60Hz
Communication	
- Local readings	Ethernet, USB 2.0, Bluetooth (option)
- Remote monitoring	RS485, 4-20mA (to OMNIAlog)
Memory	2 GB
Temp. operating range	-10°C +60°C
Overall dimensions and weight	
- SUS optical unit	630x280x165 mm, 11.2 kg
- CUS control unit	330x345x111 mm, 4.8 kg
- PWR power supply unit	330x250x111 mm, 5.8 kg
Detectable wire	minimum 1 mm diam.
Protection	IP68 until 50 kPa

ACCESSORIES

OTEL310ANS0	ADJUSTABLE MOUNTING BRACKET Material: stainless steel and aluminium Dimensions: 240x310x170 mm (LxWxH)
OTEL310AND0	BRACKET MOUNTING JIG
OTEL310CAL0	CALIBRATION FRAME
OTEL310XBT0	BLUETOOTH MODULE
OTEL310XC53	IP68 CABLE FOR RS485 NETWORK
OTEL310X485	RS485 TO USB INTERFACE
OTEL310XC83	IP68 CABLE FOR 4-20 mA NETWORK

READOUTS , DATALOGGERS & ACCESSORIES

Courtesy of SIGGEO ASIA PACIFIC

- _ TUNNELLING
- _ DAM SURVEILLANCE
- _ STRUCTURAL MONITORING
- _ MINING EXPLORATION
- _ DEEP EXCAVATION
- _ LANDSLIDE SAFETY IMPLEMENTATION
- _ RETAINING WALLS
- _ GEOTECHNICAL INVESTIGATION CAMPAIGN



Project:
MRT (Mass Rapid Transit) Metro
Singapore



MINI OMNIALOG FIELD LOGGER

Mini OMNIAlog is a 4 channels, battery powered logger designed for field use with low power consumption. It permits to read and store data from both analogue (VW mA, V, etc...) and digital instruments. Internal display and keyboard are available for simple field operation like device status, data download, FW/web pages update, etc...

OOMNIAMINIO MINI OMNIALOG CE

Processor	ARM Cortex - M3, 20 MHz CPU
A/D converter	24 bit with autocalibration
Type of measurement	mA, mV, mV/V, V, °C (NTC), Hz (VW)
Mass storage	2 GB for data and WEB pages
Resolution	1 µA at F.S. 20 mA 1 µV at F.S. ±10 mV 0.001mV/V at F.S. ±10 mV/V 0.1 Hz at FS 400-6000 Hz 0.1 °C for NTC
Accuracy	0.05% FS (0.1% FS for NTC)
Analog differential inputs	4 channels, configured at factory
Digital input	1 chain of RS485 digitized sensor
Digital output	one relay for alarm, 30V, 1A
Temperature drift	<10 ppm/°C (-30°C +70°C)
Internal battery	6 x 1.5V AA not rechargeable
Environmental	-30°C +70°C, IP67
COMM port	USB 2.0, RS232 for GPRS modem

GPRS BUILT-IN MODULE (OPTION)

OOMNIAMINIG is equipped with a GSM/GPRS modem for sending the stored data to the user FTP folder or email.

The set-up software also permits to program alarm thresholds and send alerting messages through SMS, email or FTP.

Technology	Quad-band EGSM, GPRS class 10, 850/900/1800/1900 Mhz
Environmental	Ext. temp. range, -40°C +85°C



CRD-400 MULTIPURPOSE READOUT

CRD-400 is an hand-held readout designed to take readings from any Sisseo's instruments. Easy to use, come in a splash proof plastic case with color graphic display (good in sunlight), Ni-MH rechargeable battery, battery charger and clips jumper cable. CRD-400 displays readings in both electrical and engineering units.

CRD-400 READOUT CE

Type of measurements	mA, mV, mV/V, V, °C, Hz, µsec
A/D converter	24 bit Sigma-Delta (22 true-bit)
Display	TFT LCD panel, LED backlighted 320x240 pixel, sunlight reliable
Resolution	1 µA at F.S. 20 mA 1 µV at F.S. ±10 mV 0.001mV/V at F.S. 10 mV/V 0.1 Hz at FS 400-6000 Hz 0.1 °C for PT100 and NTC
Accuracy	0.01% FS (0.1% for NTC and PT100)
Rechargeable battery	4 x AA NIMH, 2450 mAh
Environmental	-20°C +60°C, IP67
Dimensions and weight	100 x 230 x 45 mm, 0.5 Kg

SPARE PARTS AND ACCESSORIES

0ECABC RD400	Battery charger 100-240 V AC input 12 V DC output
0ECAV8P6A00	Clips jumper cable with 6 alligator clips for instrument reading
0ECAV08V2S0	Jumper cable with 2 connectors for reading connectorized instruments
0ECAV08V2S0	Switch jumper cable with 2 connectors for switch panels and measuring boxes



PORTABLE DATALOGGERS

Galileo and New Leonardo are durable, water resistant and easy-to-use portable dataloggers. They are equipped with high performance microprocessor, Ni-MH batteries and color graphic display. SMART MANAGER SUITE software allows to manage the dataloggers directly from PC and automatic FW up-dating.

NEW LEONARDO DATALOGGER CE

Number of channels	two (2)
A/D converter	2 x 24 bit with autocalibration
Display	TFT graphic backlight LCD, 5.7" 320x240 pixel, sunlight reliable
Type of measurement	mA, mV, mV/V, V, °C (PT100/NTC), Hz, µsec
Storage memory	2 GB
Resolution	1 µA at F.S. 20 mA 1 µV at F.S. ±10 mV 0.001mV/V at F.S. 10 mV/V 0.1 Hz at FS 400-6000 Hz 0.1 °C for PT100 and NTC
Accuracy	0.01% FS (0.1% for NTC and PT100)
Battery	12 V DC, 4500 mAh Ni-MH
Dimensions and weight	200 x 280 x 65 mm, 2 kg
Environmental	-20°C +60°C, IP67
COMM port	USB 2.0 (pen drive style)

GALILEO VW DATALOGGER CE

Number of channels	two (2)
A/D converter	2 x 24 bit with autocalibration
Display	TFT graphic backlight LCD, 5.7" 320x240 pixel, sunlight reliable
Type of measurement	vibrating wire (Hz, µsec), °C (NTC)
Storage memory	2 GB
Resolution	0.1 Hz at FS 400-6000 Hz, 0.1 °C
Accuracy	0.01% FS (0.1% for NTC)
Battery	12 V DC, 4500 mAh Ni-MH
Dimensions and weight	200 x 280 x 65 mm, 2 kg
Environmental	-20°C +60°C, IP67
COMM port	USB 2.0 (pen drive style)

READOUTS , DATALOGGERS & ACCESSORIES

- _ TUNNELLING
- _ DAM SURVEILLANCE
- _ STRUCTURAL MONITORING
- _ MINING EXPLORATION
- _ DEEP EXCAVATION
- _ LANDSLIDE SAFETY IMPLEMENTATION
- _ RETAINING WALLS
- _ GEOTECHNICAL INVESTIGATION CAMPAIGN



Project:
Concordia Cruise salvaging operations
Giglio Island, Italy



OMNIALOG DATALOGGER

OMNIALog is a web-based datalogger designed for geotechnical and structural monitoring applications. OMNIALog offers extensive measurement and control functionality; it is supported by a selection of communication options. On-board keyboard/display and external storage using USB pen drive are also included. OMNIALog doesn't require any proprietary software and stored data can be sent to the user FTP folder or email.

00MNIALOG00 MODULE CE

Processor	ARM Cortex M3, 120 MHz, 1Mb RAM
A/D converter	24 bit (22 true bit)
Memory	2GB SD card for data and web pages
Analog inputs	N.8 differential expandible by multiplexer (MUX) up to 384 channels
Digital inputs	N.2 opto-isolated RS485, ModBUS RTU, for MUX and digital instruments
Resolution	1 μ A at F.S. 20 mA 1 μ V at F.S. \pm 10 mV 0.001mV/V at F.S. 10 mV/V 0.1 Hz at FS 6000 Hz 0.1 $^{\circ}$ C for PT100 and NTC
Measurement accuracy	0.01% FS (0.1% FS for NTC and PT100)
Temperature drift	< 10 ppm/ $^{\circ}$ C over all temp. range
Comm. ports	LAN 10/100, USB 2.0, RS232
Protections	electro-mechanical relays on every channel
External battery	and gas discharge tubes on circuit
Operating temp. range	12V DC nominal -30 $^{\circ}$ C +70 $^{\circ}$ C (display -20 $^{\circ}$ C +70 $^{\circ}$ C)

00MNIALOGD0 D-MODULE CE

Processor	ARM Cortex M3, 120 MHz, 1Mb RAM
A/D converter	24 bit (22 true bit)
Memory	2GB SD card for data and web pages
Digital inputs	N.1 opto-isolated RS485, ModBUS RTU, for digital instruments
Measurement accuracy	0.01% FS (0.1% FS for NTC and PT100)
Temperature drift	< 10 ppm/ $^{\circ}$ C over all temp. range
Comm. ports	LAN 10/100, USB 2.0, RS232
Protections	electro-mechanical relays on every channel and gas discharge tubes on circuit
External battery	12V DC nominal
Operating temp. range	-30 $^{\circ}$ C +70 $^{\circ}$ C (display -20 $^{\circ}$ C +70 $^{\circ}$ C)



OMNIALOG CABINETS

The versatility and the flexibility of OMNIALog allow customized systems to meet the Client needs and the project requirements. A variety of "cabinet" with internal relay multiplexers are offered in order to expand the number of channels (sensors) managed by one datalogger. On the same multiplexer, each channel can be independently configured minimizing the number of multiplexer.

COMPONENTS AND ACCESSORIES CE

00MNIA CAB 20	IP65 cabinet, 00MNIALOG00 module polycarbonate, 500x400x200mm, ready for max No.2 MUX and comm interface
00MNIA CAB 2D	IP65 cabinet, 00MNIALOGD0 module polycarbonate, 500x400x200mm, ready for digital power supply kit and comm interface
00MNIA CAB 30	IP65 cabinet, 00MNIALOG00 module stainless steel, 600x400x250mm, ready for max No.3 MUX, digital power supply kit and comm interface
00MNIA CAB 80	IP65 cabinet, 00MNIALOG00 module stainless steel, 600x600x250mm, ready for max No.8 MUX, digital power supply kit and comm interface
00MN24 MUX 00	MUX board, 24 channels overvoltage protections on every channel
00MN24 V100W	Additional kit for digital instruments including DC/DC 12/24V 100W power supply and No.4 input wiring board

MAIN COMM INTERFACES

00MXGSM2GQB	GSM/GPRS Quad band modem Suggested when only data shall be pushed on user FPT server.
00MXROUTVPN	HSPA 3G router with VPN service Is the fastest and easy way for remote OMNIALog managing and data download.
00MXROUT3G0	HSPA 3G router Users can use it only if mobile provider allow both data incoming and outgoing.
00MXF0MMSWT	Optical fiber interface It is an ethernet switch with multimode optical fiber inputs.



REMOTE MULTIPLEXERS

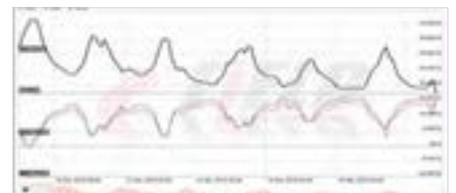
Multiplexer boxes offer a valid alternative to OMNIALog cabinets when a distributed sensor network is preferred. The relay multiplexer boards, mounted inside an IP67 box, operate as peripheral units; they are connected - series or star mode configuration - to a remote OMNIALog datalogger which controls, collects and stores data as the brain of the networking system.

COMPONENTS AND ACCESSORIES CE

00MNIA BOX 00	IP65 box, 00MNIALOG00 module polycarbonate enclosure, 400x300x180mm ready for external MUX box connection and communication interface
00MN24 MUX B0	MUX box, 24 channels inputs polycarbonate enclosure, 300x300x180mm overvoltage protections on every channel
00MN48 MUX B0	MUX box, 48 channels inputs polycarbonate, 300x300x180mm overvoltage protections on every channel
0WE610 MUX ZH	Connecting cable from MUX to MUX or from MUX to OMNIALog datalogger
00MX4 MUX EXT	External MUX connection board for maximum No.4 external MUX.
0AXBC022000	IP67 power supply kit AC/DC charger, Vin 85-265 Vac 50-60Hz, Vout 13.2V / 0,9A.
0AX00W000AH	Solar power supply package available in different model, including panel, battery and charge controller.

WMS WEB MONITORING SYSTEM

WMS runs inside a dedicated WEB portal and allows authenticated users to access customized pages where many advanced services can be displayed such as raw data automated conversion, manual and automatic data validation, real-time data analysis and graphical display, SMS/e-mail advanced alarms setup, synoptic chart with instruments status alarm, etc...



READOUTS , DATALOGGERS & ACCESSORIES

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- _ DEEP EXCAVATION
- _ LANDSLIDE SAFETY IMPLEMENTATION
- _ RETAINING WALLS
- _ GEOTECHNICAL INVESTIGATION CAMPAIGN

Courtesy of EUROTECH SA



Project:
Boguchanskaya HPP
Russia



JUNCTION AND TERMINAL BOXES

Different models of waterproof junction boxes are available for single or multicore cables. Three levels of overvoltage protection may be used.

Measuring switch boxes are available in different sizes to connect 6, 12, 18 or 24 instruments. They are equipped with rotary switches and connectors for reading by portable readouts.

JUNCTION BOXES

Available in different models up to 10 cable glands input.

0EPD000000 JUNCTION BOX UP TO 10 INPUT
with cable glands, IP67

JUNCTION BOXES WITH OVP PROTECTIONS

0EPDP000W00 IP67 JUNCTION BOX FOR OVP
Up to 30 leads OVP

0EXKY302W00 3-LEVEL O.V.P., 2 LEADS

0EXKY306W00 3-LEVEL O.V.P., 6 LEADS

0EPDP002W00 JUNCTION BOX WITH OVP, 2 LEADS
3-level OVP, IP67 box

0EPDP006W00 JUNCTION BOX WITH OVP, 6 LEADS
3-level OVP, IP67 box



MEASURING BOXES

0EPM000000 MEASURING BOX UP TO 3 INSTRUM.
MIL connector, IP67 box

TERMINAL SWITCH BOXES

Available up to 6, 12, 18 or 24 position for 2-wire and 6-wire instruments

0EPC0020S00 SWITCH TERMINAL BOX UP TO 24 POS.
For 2 wires instruments

0EPC0060S00 SWITCH TERMINAL BOX UP TO 24 POS.
For up to 6 wires instruments



READOUT ACCESSORIES AND SPARE PARTS

In order to simplify installation and reading procedures, Sisgeo offers a variety of accessories to meet all the Client's requirements such as cable splicing kits, connectors, cable end protections, etc... Cable splicing kits permit to make cable joints at site by means of bi-component epoxy resin.

ACCESSORIES

0EGSM0K0200 CABLE SPLICING KIT (2 TUBES)
with caps and epoxy resin

0EGSM0K1000 CABLE SPLICING KIT (10 TUBES)
with caps and epoxy resin

1000RES2C0R BI-COMPONENT EPOXY RESIN
0,5 Kg pack

0ECON07MV00 FLYING MIL CONNECTOR AND CAP
7 PIN male MIL connector

0ETPOP60700 CABLE END PROTECTION
for cable with OD 2.3 to 6.7 mm

0ETPOP60900 CABLE END PROTECTION
for cable with OD 4.8 to 8.0 mm

0ETPOP61300 CABLE END PROTECTION
for cable with OD 7.0 to 12.0 mm

CDL READOUTS SPARE PARTS

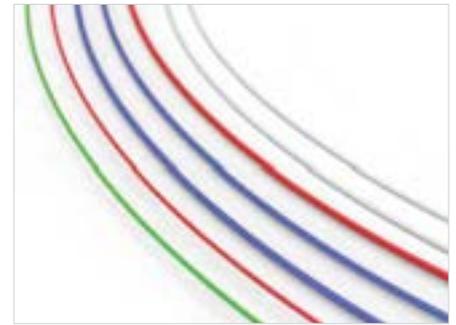
0ECAV7P2A00 JUMPER SHIELDED CABLE, 2 ALL CLIP
MIL connector and no. 2 clips + GND

0ECAV7P4A00 JUMPER SHIELDED CABLE, 4 ALL CLIP
MIL connector and no. 4 clips + GND

0ECAV7P6A00 JUMPER SHIELDED CABLE, 6 ALL CLIP
MIL connector and no. 6 clips + GND

0ECAV07V200 FLYING SHIELDED CABLE, 2 CONN.
MIL connector M/F 7 pins

0ECAB12VNMB BATTERY CHARGER 220V / 12V
for Archimede, Galileo and New Leonardo



SIGNAL AND MULTICORE CABLES

Sisgeo cables are designed for a variety of geotechnical and hydro-geological applications and can be embedded in concrete or buried in the soil. All Sisgeo signal and multicore cables have LSZH (Low Smoke Zero Halogen) jackets according to the latest required standards.

INSTRUMENT CABLES

0WE102KE0ZH 2-LEADS 20-AWG CABLE, KEVLAR
Polyolefin + M1 technopolymer jackets

0WE104K00ZH 2-TWISTED PAIRS 22-AWG CABLE
Polyolefin + M1 technopolymer jackets

0WE104SG0ZH 2-TWISTED PAIRS 22-AWG CABLE
M1 technopolymer red jacket

0WE104X20ZH ELECTRIC ARMoured CABLE
Polyolefin + M1 technopolymer jackets

0WE1060LSZH ELECTRIC CABLE 6 COND.
Polyolefin + M1 technopolymer jackets

0WE106IPOZH ELECTRIC CABLE 6 COND.
Polyurethane external jacket

0WE110DX0ZH ELECTRIC CABLE 10 COND-24
Polyolefin + M1 technopolymer jackets

0WE606IPDZH EL. CABLE 6 COND FOR DIGITIZED IPI
Polyurethane external jacket

VENTED CABLES

0WE203KE0ZH 2-LEADS VENTED CABLE, KEVLAR
Polyolefin + M1 technopolymer jackets

MULTICORE CABLES

0WE1160LSZH 8-TWISTED PAIRS 24-AWG CABLE
Polyolefin + M1 technopolymer jackets

0WE1320LSZH 16-TWISTED PAIRS 24-AWG CABLE
Polyolefin + M1 technopolymer jackets

OMNIALOG-MUX CONNECTING CABLE

0WE610MUXZH OMNIA-MUX CONNECTING CABLE
4+2 twisted pairs, M1 technopol. jacket



Courtesy of CENTENO RODRIGUEZ & ASOCIADOS S.C.





In construction underground, where the engineer deals with materials having properties that vary not only in space but also in time, details of construction often have significant or even overwhelming influence on the behavior of the structure and of the surrounding soil.

For an understanding of the behavior, these details must be observed and recorded.

Ralph B. Peck (1972)



SISGEO S.R.L.
VIA F. SERPERO 4/F1
20060 MASATE (MI) ITALY
PHONE +39 02 95764130
FAX +39 02 95762011
INFO@SISGEO.COM

WWW.SISGEO.COM